



# **Esfahan Multi-node Metropolis:**

## **Conflicts and opportunities on urban nodes and intersections**

Doctoral Thesis 2022

Omid Omrani

Departament d'Urbanisme i Ordenació del Territori

ETSAB - Universidad Politécnica de Cataluña · Barcelona Tech

Thesis supervisors:

Julian Galindo González

Carles Crosas Armengol

# **Esfahan Multi-node Metropolis:**

## **Conflicts and opportunities on urban nodes and intersections**

Doctoral Thesis 2022

Omid Omrani

Departament d'Urbanisme i Ordenació del Territori

ETSAB - Universidad Politécnica de Cataluña · Barcelona Tech

Thesis supervisors:

Julian Galindo González

Carles Crosas Armengol

## TABLE OF CONTENTS

ACKNOWLEDGEMENTS

THE RESEARCH BACKGROUND

**CHAPTER 1: INTRODUCTION** .....15

- 1.1. THEME AND OBJECTIVES
- 1.2. THE GAP OF KNOWLEDGE AND RESEARCH QUESTIONS
- 1.3. THREE CITY IMAGES, ONE HYPOTHESIS
- 1.4. METHODOLOGICAL NOTES AND ORIGINAL SOURCES
- 1.5. VARIOUS EXPRESSIONS OF A HISTORIC CITY
- 1.6. A MATTER OF IDENTITY AND EXCHANGE
- 1.7. BETWEEN TRADITION, MODERNISM AND “WESTOXIFICATION”

**CHAPTER 2: ESFAHAN, A GENERAL APPROACH TO AN IRANIAN CAPITAL** .....35

- 2.1. GENERAL CHARACTERISTICS OF THE COUNTRY’S LAND
- 2.2. THE TRADITIONAL CENTRAL IRANIAN CITY AT A GLIMPSE
- 2.3. GEOGRAPHICAL FRAMEWORK AND URBAN FORM
  - 2.3.1. Water as Urban Essence
  - 2.3.2. Harsh Climate Conditions as Context
  - 2.3.3. Topography and Territorial Control as Driving Force
- 2.4. GENESIS OF THE CITY: FOUR CRITICAL PERIODS
  - 2.4.1 The Twin Towns: Jay and Yahudiyyah, and Satellite Villages (Until Early Islamic Period - 772 AC)
  - 2.4.2. Switching the Center from Jay to Yahudieh (Abbasid Period - 8th to 10th Centuries)
  - 2.4.3. The Walled City and the Mahallahs Organization (Al Buyid and Seljuq Period - 925 to 1138 A.C.)
  - 2.4.4. Esfahan Four Centuries Later: One of the Wealthiest and Most Prosperous Capitals in the World (Safavid Period - 1597 to 1722 A.C.)

**CHAPTER 3: THE “GROUND” AND “WATER” CITY ..... 65**

- 3.1. ANCIENT “DIRT ROADS”: FROM THE GLOBAL TO THE LOCAL INTEGRATION
  - 3.1.1. Beyond the City Gates: Commercial and Intercity Roads
  - 3.1.2. Inside the City Gates: Interweaving Different Systems of Mobility
- 3.2. THREE CATEGORIES, FOUR CASES OF “GROUND” AND “WATER” CITY
  - 3.2.1. The Bazaar: A Chain of Various Nodes
  - 3.2.2. From the Center of the Neighborhood to the Courtyard of a House
  - 3.2.3. Two Cases of Encounter Points with “Water” System

**CHAPTER 4: THE “ASPHALT” CITY ..... 163**

- 4.0. INTRODUCTION
- 4.1. DIFFERENT APPROACHES IN THE CONSTRUCTION OF ESFAHAN “ASPHALT” CITY, (1920s-1960s)
  - 4.1.1. Adaptation of Existing Structure for the Use of New Vehicles
  - 4.1.2. Demolition and Crossing Over the Historic Urban Fabric
  - 4.1.3. The Construction of Three Ring Roads
- 4.2. THE ECHOS OF THE “ASPHALT” CITY APPROACHES ON THE FIRST MASTER PLAN OF KOCKS, (1958-1961)
  - 4.2.0. Introduction
  - 4.2.1. Regional Infrastructures and Big Facilities
  - 4.2.2. Historical City Domain and City Center
  - 4.2.3. Planned Neighborhoods
- 4.3. TWO CASES OF “ASPHALT” CITY
  - 4.3.1. Chahar-Bagh Avenue: From a Ludic Hall to the Most Influential City Center
  - 4.3.2. Atiq Square: Doubling the Ground Level

**CHAPTER 5: THE “IRON” CITY ..... 241**

- 5.0. INTRODUCTION
- 5.1. ESFAHAN RAILWAY PROJECTS, A REVIEW SINCE 1969
- 5.2. TERRITORIAL RAILWAY LINES: THE REGIONAL DIMENSION OF THE METROPOLIS
  - 5.2.1. Three Suburban Railway Lines: A Sequence of Territorial Incidences
- 5.3. ESSENTIAL FEATURES IN THE CONFIGURATION OF ESFAHAN’S METRO SYSTEM
  - 5.3.1. Metro Line 1, The Most Critical Metro Line
  - 5.3.2. Metro Line 2, Linking the West and Northeast Regional Corridors to The City Center
  - 5.3.3. Metro line 3, The First Provisional Metro Ring Line
- 5.4. THREE CASES OF METRO STATIONS: SITES AND PROXIMITIES
  - 5.4.1. Emam Hossein Station
  - 5.4.2. Takhti Station
  - 5.4.3. Shohada Station

**CHAPTER 6: CONCLUSIONS ..... 305**

- 6.1. A New Form of the City’s Identity
  - 6.2. The Current Relation of the Three City Images, Challenges and Opportunities
  - 6.3. Three Interweaving City Projects in Progress
    - 6.3.1. Atigh (Emam Ali) Square: The Transition Space as Key Element
    - 6.3.2. Chahar-Bagh Avenue: Metro Stations Polarity and Central Area Pedestrianization
    - 6.3.3. Four simple steps in the integration of Takhti station to its surrounding area
- Final note

## ACKNOWLEDGEMENTS

The first lines of this thesis should be words of gratitude to my beloved family, my father Gholamreza, and my mom Habibeh, for their great encouragement, understanding, patience, and sacrifice. If it was not for them, this work could never get done.

I would like to express my sincere gratitude to my advisors, Julian Galindo González and Carles Crosas Armengol, for their continuous support and patience, guidance, and encouragement in seeing this research through to completion. The ones whom I learned most from their kindness, knowledge, vast experience in research and design, and tireless capacity to follow and involve in the sequential process of revisions and feedbacks regarding each particular part of this study.

I want to express my heartfelt appreciation to the professors listed below who gave me their insightful comments and suggestions on the final commissions of my two preceding master theses, which helped in structuring the current work.

- To Dr. Joaquin Sabaté Bel, professor at Departament d'Urbanisme i Ordenació del Territori, DUOT, Universidad Politècnica de Catalunya . Barcelona Tech - UPC,

- To Dr. Bruno De Meulder, professor at Katholieke Universiteit Leuven, department of architecture,

- To Dr. Paola Pellegrini, professor at Università' luav di Venezia, department of architecture,

- To Dr. Vincent Nadin, professor at Technische Universiteit Delft, department of architecture and the built environment,

- To Dr. Francesc Peremiquel Lluch, professor of departament d'Urbanisme i Ordenació del Territori, DUOT, Universidad Politècnica de Catalunya . Barcelona Tech - UPC,

- And finally, to Dr. Fernando Álvarez Prozorovich, professor of history of art and architecture at ETSAB, Universidad Politècnica de Catalunya . Barcelona Tech - UPC.

I also want to give my cheers to the following list of individuals and experts who are or earlier were in charge in various academic departments, governmental and municipal offices, private architectural and urban consultant companies, in Iran, who have kindly supported this study in terms of accessing the primary sources and permission in case of the site visit and photography.

- To Dr. Maryam Ghasemi, associated professor at the Architectural and urban department of Khorasan Azad University.

- To Dr. Mahin Nastaran and Ramin Madani, associate Professors at the Architecture and urban department of Esfahan University of Art.

- To Mr. J. Samsam-Shariat, the former Dean of architecture and urban deputy of Esfahan Municipality.

- To Dr. Alireza Salavati, the former Dean of Transportation and Traffic deputy of Esfahan Municipality.

- To Mr. Javad Sherbaf, the former Dean of Esfahan Road & Urban Development deputy of Esfahan Municipality.

- To Dr. Lehun Asadi, the director of Esfahan Urban Planning and Architecture Department of the Ministry of Roads and Urban Development,

- To Mr. Nasser Taheri, the vice dean of Esfahan Department of Cultural Heritage, Handicrafts, and Tourism.

- To Dr. Sirus Shafaghi, the founder of the Department of Geography, University of Esfahan.

- To Dr. Mohammad Reza Ghanei, the founder of Safavi House, who hosted us to have an open seminar, in Esfahan.

- To Mr. Ahmad Reza Jouyafar, at Shahr Va Khaneh Architects Planners Engineer company.

- To the members of two voluntary groups of 'Chahar-Bagh Thinking Room'<sup>1</sup> and 'Reading Contemporary Esfahan'<sup>2</sup>, interested in dealing with the current architectural and urban issues in Esfahan.

- And my many special thanks to my great peers, Dr. Vahid Mahdavian, Mr. Rouhollah Saadatpour, and Ms. Atoosa Omrani, as individuals and in link with different deputies of Esfahan municipality.

Last but not least, I am deeply grateful to my dear brothers, Vahid and Navid, as well as my dear friends, Hassan Kharaji, Omid Behruzian, Reza Pouladvand, Nasim Zand, Kamelia Radmanesh, Mehdi Hosseinzadeh, Foad Fazileh, Ali Sheykh-al-Eslam, Mehrdad Keyhanfar, and Farzad Beygi, and many others, who have supported this study in many requested ways.

<sup>1</sup> Otagh-e-Hamandishi-e-Chaharbagh

<sup>2</sup> Kahndan-e-Esfahan-e-Moaser



## RESEARCH BACKGROUND AND PREVIOUS STUDIES

The present research has its origins in two previous master's theses. The first one, "City Crossings, building the city," was about a new perception of the city of Esfahan through looking at its historical urban nodes and contemporary forms of intersections, completed in September 2015. The two-year professional program was a joint work to achieve the European postgraduate master's in urbanism at Barcelona, Fundació Politècnica de Catalunya supervised by Professor Dr. Julian Galindo González and validated together with the departments of Architecture and Urban Planning at KU Leuven, TU Delft, and IUAV Venice.

The importance of the first study lies in the introduction of the system of historical centralities accessible through the old ground routes and water canals, considerably affected by the insertion of the new street mesh since the 1930s. The research presented three scenarios, one strategy, and ten guidelines that were tested in the eight selected corners among the historical central nodes and the intersection of the new street with the primary historical water and ground routes. Finally, the study proceeded further in designing a possible project on one of the described cases<sup>1</sup>.

The Second Master Thesis, "Esfahan Metro Stations, Opportunities for Urban Regeneration," expanded the first research. The study was presented as the Final Thesis for the "Master of Urbanism" in Barcelona, UPC. Universitat Politècnica de Catalunya with the supervision of Prof. Dr. Julian Galindo González and Prof. Dr. Carles Crosas Armengol<sup>2</sup>.

This study began by introducing the historic city and the city's rapid transformation from the 1930s through the construction of a network of new streets and focuses mainly in the new metro and railway system. The study considered the proposal for territorial suburban railway lines, including their relevant features and their possible relation with the new underground system of Metro. Previous projects for the construction of the network of Metro were examined before explain the current lines and stations. Finally, the research focused on the connectivity of the ground with the underground platforms in looking at three selected case studies and their opportunities.

<sup>1</sup> Access link to the first study: [https://issuu.com/omidomrani/docs/finaaal\\_the\\_cross\\_building\\_the\\_city](https://issuu.com/omidomrani/docs/finaaal_the_cross_building_the_city)

<sup>2</sup> The document is hosted in UPCommons; <http://hdl.handle.net/2117/99027>

**Fig. 1.** Esfahan, bird view over the Bazaar and Naghsh-e-Jahan square, 1990s. Source: Esfahan Province Construction and Housing Company



Fig. 2. Jurjir Portal, Esfahan, Iran, Powell, Josephine, 1919-2007, American [photographer], 1963

## CHAPTER 1: INTRODUCTION

- 1.1. THEME AND OBJECTIVES
- 1.2. THE GAP OF KNOWLEDGE AND RESEARCH QUESTIONS
- 1.3. THREE CITY IMAGES, ONE HYPOTHESIS
- 1.4. METHODOLOGICAL NOETS AND ORIGINAL SOURCES
- 1.5. VARIOUS EXPRESSIONS OF A HISTORIC CITY
- 1.6. A MATTER OF IDENTITY AND EXCHANGE
- 1.7. BETWEEN TRADITION, MODERNISM AND “WESTOXIFICATION”

## 1.1. Theme and Objectives

According to most Iranianologists and archaeologists worldwide, Esfahan is one of the most notable Islamic cities and has a special place and prestige in the Islamic world. In this regard, it could be considered one of the best concrete examples of Islamic cities with all the characteristics of a pre-industrialized city, providing with a very interesting sustainable model adapted to its warm and dry climate.

The natural beauties of the Zayandehrud river and the political, economic, and cultural role of the city of Esfahan have made this city one of UNESCO's world's most valuable cultural treasures and a famous historical cities in the world<sup>1</sup>. The election of Esfahan as the Islamic world's cultural capital in 2009, the 4th Conference of Ministers of Culture of the member countries of the Organization of the Islamic Conference, is another affirmation of this city's glory and prestige in the Islamic period (Shafaghi, 2006, p. 19).

The city is very rich in terms of its cultural roots in consecutive historical periods. It has been the capital of an extensive Dynasty, further from the current country boundaries, and has achieved worldwide prosperity. The history of the Esfahan Region goes back to the pre-Islamic Periods, which means the city has experienced many changes resulting from the confluence of various urban moments expressed in their complex and mutant structures.

<sup>1</sup>Till 2002, Esfahan has concluded a friendship treaty of sister-city with the following ten ancient and world-famous cities: Florence in Italy, St. Petersburg in Russia, Xi'an in China, Iași in Romania, Yerevan in Armenia, Havana in Cuba, Freiburg in Germany, Kuala Lumpur in Malaysia, Barcelona in Spain, and Kuwait City.

## 1.2. The Gap of Knowledge and Research Questions

forms and interchange, to comprehend the opportunities for transformation and making a new meaning or value based on the synergy of coincident forms of crossing individualities.

The possibility of linking the multiple mobility systems and their corresponding elements at the intersections and corners gives the maximum interest on encounter places. Thus, the main objective of this thesis is to highlight the interest and value of the encountering central places, where people experience living together in diversity, for a prospective understanding of the current in Esfahan metropolis. At the same time, look for some tools that can be applied to promote the existing or create new urban or territorial central places concerning building a constructive dialogue between diverse forms of territorial, urban, and local mobility in each site.

In this regard, the study has followed a multi-scale approach to understanding the idea of continuity and performance of each node or intersection, applying two essential concerns. First, the perception of the place, through different analyses of architectural form, spatial organization, and the internal relationship between distinct domains, uses, and constituent elements. Second is the understanding of relations of the place to its surrounding area, encompassing many valuable things through various movement systems on an influential middle-scale range and to further territories and outside of the city on a regional scale.

Being one of the most notable historic cities in the Islamic world, Esfahan is a well-researched city that has been studied through numerous works exploring the city's history and urban evolution. As briefly mentioned, Esfahan has been formed and got more complex chronologically by overlapping three logics and forms of movement systems belonging to the traditional, contemporary, and current epochs, which follow different approaches in constructing the actual city.

However, some specific angles and issues have received less attention and still require further investigation and study, some of which are listed below:

1-The volume of studies that have analyzed either the architectural values of traditional buildings or the city's historical geography (from the ancient times up to the end of the 19th century and the beginning of the 20th century) is far greater than those that deal with contemporary architecture and urban planning (20th century), and the current eras (21st century).

2-At the same time, a significant number of studies that have dealt with the values and characteristics of contemporary modern architecture and urbanism have focused on its confrontation and destructive effects on the historical city structure, with less attention paid to its positive or constructive aspects.



3-Considering the short two decades that have passed since developing and building the most recent types of urban and territorial nodes of Esfahan metro stations, including their various lines, requires more attention and research in its new forms of city construction.

For this reason, this study has tried to critically collect, examine and read three independent city images during three crucial historical periods in the form of its three main central chapters. Finally, the concluding chapter focuses on the way of communication these three approaches, challenges, and opportunities for promoting cooperation between them to improve the city's overall performance that will be investigated and pondered at some selected and specific encounter points.

Since the study identifies linkage improvement of diverse urban systems<sup>1</sup> as the key opportunity for building the city's future, these systems' encounter points and intersections naturally attract the most attention by hosting the greatest range of coincidence, diversity, and exchange forms<sup>2</sup>.

Analyzing different types of historical city centers as successful concrete examples of such encounter places brings with it many lessons that have been obtained through many experiences and methods and have promoted the knowledge of the city during different centuries. The knowledge that can still be used to improve the current situation and build the future forms of the intersection and central places of Esfahan. In this term, some essential questions could help us to put our findings concerning the matter of exchange in the construction of the city's central nodes, including:

- Is it possible to read the city of Esfahan by interpreting the evolution of different movement systems materialized in various categories of encounter places?

- How has the idea of urban centrality been changed by adding new forms of movement and building infrastructures in the city in different urban periods? What types of encounter points and networks construct the triple critical moments in the process of the city evolution? What are their constructive elements? How do they interact with one another?

- What are the interesting and successful historical cases? What are the current territorial and urban projects that could roughly address the idea of interchange in the sense of building a new form of identity and favorable encounter points?

- How are those intersection points that could not succeed in exchanging different movement logics or making a meaningful place? What could be opportunities and guidelines in there?

<sup>1</sup>belong to the "Ground" and "Water," "Asphalt" and "Iron" cities

<sup>2</sup>"A city is composed of different classes of men; people who are the same cannot make a city." If there were no difference, there would not be any interchange, and the city would not exist. This well-known quote from Aristotle, reminded by Richard Sennet, points to diversity and exchange as fundamental aspects of the city's construction. Many authors have widely disseminated the quote. It is taken from the "cities, corners," by Manuel de Sola Morales in 2004, in the "coincidence and difference" section P. 13.

### 1.3. Three City Images, One Hypothesis

The thesis states that Esfahan has not one but three identities overlapped in its urban structure. It's about the city of "Ground" and "Water" (from ancient times), the city of "Asphalt" (from mid-twenty century), and the city of "Iron" (from the last decades) with their systemic movement logic, their urban forms and concrete elements, different scales, and their historical moments. The three main chapters' analyse discuss and depict the three images, unveiling the leading logics of the three cohabit models in the current city.

The **first image** of the trilogy considers many stages in the transformation of the old city belonged to the "Ground" and "Water" city since the presence of the multi-nodal ancient rural hubs on the northern side of a river, which were settled in an influential short distance of an old citadel before the Islamic periods. The first city image shows how the nearby rural centers became more prosperous, developed, and transformed into an enormous city in the Islamic period. The prosperity and development of former rural centers were based on the multiplication of intermodal, arrival, and landing places, which were added up and incorporated with other primary and complementary functions and services like water wells, mosques, bathrooms, commercial shops to serve the local residents in common with outsiders who were coming through the multi-directional city's gates and regional roads.

The **second image** represents the "Asphalt" city, which has been dramatically changed the previous way of city performance since the 1930s, for the city to adopt a new means of transportation. Responding to the need for car communication within the city and connection with surrounding territories, a network of arterial roads, rings, and further complementary streets are provided for automobiles and trucks. As elements of the new mobility mode, the new vehicles contributed to new central and public places like new sidewalks, involved commercial street fronts or other central

buildings engaged with parking and embankment spaces.

Finally, the **third image** depicts the city of "Iron", which appeared much earlier in many countries, and was recently born and materialized in Esfahan. The provisioned territorial railway lines and the city's metro plan linking the central city areas to surrounding territories are based on three metro lines with a total length of approximately 54 km and 55 stations, in continuity and linked with three territorial railway lines with a total length of 156 km. Among the provisional "Iron" city image, only the Metro Line 1 (with its 20 stations) has been fully implemented and working since 2018. The other metro lines, and territorial railway lines, are either under construction or in the study and design phases.

The Metro concerns a more proper way of relation with its former structures by passing from the underground level and flourishing to the ground surface at the specific points of station entrances. On the opposite side, the "Asphalt" system has not set a constructive dialogue with its previous city structure in many cases through constructing arterial streets based on bulldozing the historical city fabric and transversal elements in terms of connecting the city center to surrounding territories.

These three historical moments allow us to identify three urban realities, three ways of understanding the city, three approaches in its construction and three forms of the city's identities, which builds the core of this investigation.

Finally, aside from developing and inventing new modes of mobility and urban forms, a real opportunity for the city to enhance its efficiency and raise its urban quality is building up cooperation and synergy between its already existing and diverse urban systems.

## 1.4. Methodological Notes and Original Sources

The research employs in-depth analysis of some case studies as the investigation's main methodological, qualitative, and exploratory nature. Applying the research case study approach through some periodical fieldworks over almost ten years (including two previous and related master's courses) has been accompanied by informal interviews and observing users' behavior. This approach has helped the study, besides finding out each place's strengths and weaknesses, achieve a more inclusive understanding of urban space.

The research has tried to read and discover the three city models in three separated chapters by studying the logics of the mobility systems and urban growth presenting the continuity and connectivity of the central city areas to the outside and surrounding territories.

The particular cases in the three chapters put in relation the different systems of mobility and exchange with different urban forms, looking for specific expressions in the city's central and encounter places. Finally, some examples in the conclusions illustrate how it is possible to improve the quality or the urban condition of various city nodes and intersections through enhancing the relationship of their different corresponding logics.

The research is based on the prior, local, interpretive, descriptive, and documentary-cited contributions, specifically about Esfahan and the context of the Iranian Islamic cities, taking various visions and approaches.

The performing process of the thesis elaboration has alternated phases of documentation, interpretation, and elaboration of arguments without following a linear but fluctuating order. The documentation has been built both on primary and secondary sources.

### Main Graphic Sources and Interpretation

The graphic interpretation of the historical and contemporary none written sources have allowed us to build a general discourse and new particular arguments, constituting the original contribution of the research as a whole. The drawing has had play a fundamental role in reading and interpreting

the city and presenting the different parts of the investigation.

Among the **historical and primary visual sources**, we can mention the photographs collections, architectural and technical drawings, and urban maps, being the most outstanding the following items, listed chronologically.

(1) The great perspective drawing of Esfahan by Adam Olearius, "View on Esfahan," which shows the city in the middle of the 17th century.

(2) The drawing and sketches by Jean Chardin in the 1670s from architectural monuments and urban spaces in Esfahan that reveal many facts about the city of that age<sup>1</sup>. His ten-volume book "The Travels of Sir John Chardin" is regarded as one of the finest works of early Western scholarship on Persia and the Near East in general.

(3) The images and drawings made by Pascal Coste and Eugène Flandin, French painters, architects, and orientalists who came to Iran together in 1840 during the reign of Mohammad Shah Qajar and were commissioned by the French Academy of Arts to prepare reports, maps, and images of Iranian cities and antiquities, including Esfahan<sup>2</sup>.

(4) The notes and photographs collection of the German telegrapher Ernst Holster, who came to Esfahan in late 1863, assigned by the Kingdom of Great Britain to work at the Esfahan Telegraph Office, present the city and people's lifestyle in the precedent time. A major part of his photo collection and descriptions was published in the book "Iran in One Hundred and Thirty Years Ago" in 1976 in Persian-German languages.

(5) "Sultan Seyyed Reza Khan" Map, 1920-1923, the first authentic graphic primary and historical document that provides information about the turning point or the new era of modern city transformation in Esfahan.

Among the principal other **contemporary and primary visual records**, it is of note:

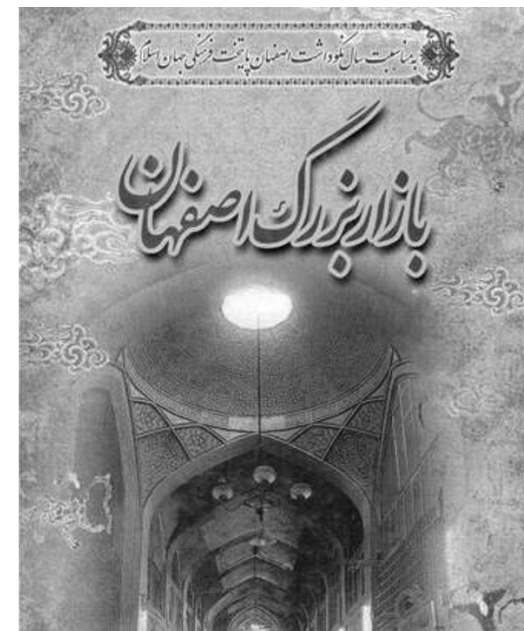
(1) The aerial photographs of Erich F. Schmidt taken in 1937 from the city of Esfahan, published in his book "Flights over the ancient cities of Iran," in

<sup>1</sup> Jean Chardin was a French jeweler and traveler who reached Persia early in 1666, at the same time with the Shah Abbas II (the Safavid King) and was honored to be his agent for purchasing jewels.

<sup>2</sup> Their collection of images is openly available on Wikipedia.



**Fig. 3.** "In memory of my wife Mary-Helen Warden Schmidt and in tribute to her who founded the aerial work in Iran", 1940. Source: Flights over ancient cities of Iran



**Fig. 4.** Bazaar-e-Bozorg-e-Esfahan (Esfahan Grand Bazaar). Source: Sirius Shafaqi

1940 and composed and printed by the University Chicago Press. The importance of the images is in letting us see things as they were, ancient cities and towns, including Esfahan, in their complete geographic environment, streets, and buildings revealing the ancient plans.

(2) The successive digital orthophotos of different years, including: (a) Esfahan aerial photos taken by the geographical unit of the army headquarters in 1944, (b) US military aerial photos taken in 1956, (c) and later aerial photos taken in the following decades, helped us to follow the city transformation and the logic and characteristics of new approaches for construction and new developments.

### Documentation

The research combines various cultural approaches from Academic Iranian tradition and the urban studies in the Barcelona School of Architecture and the Laboratori d'Urbanisme de Barcelona in the Department of Urbanism and Regional Planning at the Universitat Politècnica de Catalunya, mainly based on forms of growth and urban morphology as its main areas of study. The study took some primary and authentic Iranian and worldwide sources discussing and putting together traditional, contemporary and Iranian Islamic cities with the ideas of mobility and encounter places.

The thesis has contributed in the translation of some primary and secondary Iranian sources, including some of the most important local texts on:

(1) Selected parts from four books of Dr. Sirius Shafaqi, geographer, as Primary, edited and translated sources, including (a) Esfahan Geography, 2002, (b) Bazaar-e-Bozorg-e-Esfahan (Esfahan Grand Bazaar)<sup>3</sup>, 2006, (c) An Introduction to the Recognition of the Islamic-Iranian City (Volume 1), 2016, (d) An Introduction to the Recognition of the Islamic-Iranian City (Volume 2), 2016.

<sup>3</sup> From the Primary sources related to the study's conceptual framework, the book "Der Bazaar von Esfahan," by Heinz Gaube and Eugen Wirth, 1978, translated in Farsi and edited by Sirius Shafaqi, published in 2006, was very useful, especially in the third chapter concerning the historic city lecture, and in interpretation and re-reading Esfahan Bazaar nodes and neighborhood's centers. The importance of the book, as mentioned above, is related to introducing and showing the participating buildings in making up the Great Bazaar concerning some of its surrounding local neighborhood centers connecting through the main historical passages, which are presented in 444 items with explanations.

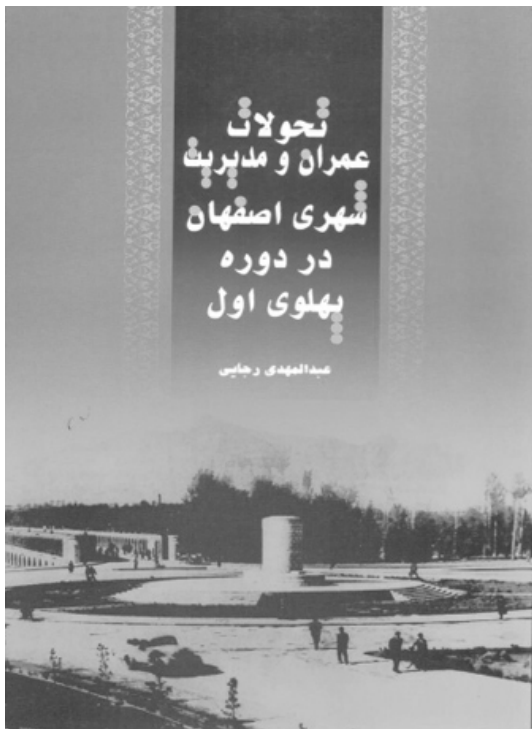


Fig. 5. "Urban changes and management of Esfahan in the Pahlavi I Period." Source: Abdolmehdi Rajaei



Fig. 6. A copy of Akhgar newspaper written in Farsi

(2) The chronicles published in Akhgar newspaper concerning Esfahan's urban issues from 1921 to 1941, collected, categorized, and edited by Abdolmehdi Rajaei, published in a book entitled "Urban changes and management of Esfahan in the Pahlavi I Period," in 2008. The book, published in Farsi, was a great source in terms of lacking maps and information about Esfahan's City's urban transformation around the 1930s could help this study track the City's transformation over this period and let the study construct its arguments.

The research also could access and review some **primary government sources** and documents, referring to the contemporary projects and mainly included in the fourth and the fifth chapters:

(1) Primary government documents of six Master plans of urban development of Esfahan in the contemporary period, since the early sixties, which helped to read and understand the city's evolution. Among the most used ones are:

(a) Kocks master plan (1961) as the first comprehensive plan of Esfahan, from the category of original and unpublished documents, examined in the fourth chapter of this research.

(b) Visual documents and maps of the Organic master plan (1971). Organic maps have a high quality in the sense of including so many details, such as: the land parcels presented in mass and space: the name and location of contemporary public buildings: valuable historical and monumental buildings, and fabrics: the names of historical passages, including the Madi paths.

(c) Visual documents related to the fourth (1988) and sixth (2002-2006) comprehensive Esfahan master plans for interpretation and dragging out different layers such as "the situation of neighborhood centers" in 1986, and land parcels and new street networks up to the last two decades.

(2) Other primary government documents include projects related to public transportation and traffic in Esfahan and projects associated with the metro building. Accessing the archives of Esfahan Municipality Deputy of Traffic and Transportation and the Esfahan Urban Railway Organization helpt us reach the following primary sources related to public transportation study projects in Esfahan:

(a) Volvo's study on Esfahan urban transport in 1976,

(b) Kumagai Gumi and Pacific consultants' study on the Comprehensive Urban Transport in the Esfahan Metropolitan, In 1984,

(c) Esfahan Urban Railway Organization (EURO), and International French consultants of SOFRETU's study of "Prefeasibility and Feasibility Study" of the "Esfahan Mass Rapid Transit System," in 1992,

(d) Sydney Australia's PPK Environment & Infrastructure study for introducing the Mass Rapid Transit System for Esfahan and the Region and the preliminary design of a priority metro line in the City and one railway line in the Region, In August 1997.

(e) EURO (Esfahan urban railway organization) additional surveys and geological investigations on the preliminary design of the priority lines, 1998.

(f) The detailed plan of some of the Metro Line 1 stations including different floor plans and longitude and transversal sections of the stations along with the architectural and technical reports, which has been done by consulting engineers of Naghsh Jahan Pars and Bavand companies between 2003 and 2006.

The study also reviewed some **journals and scientific articles** dealing with the historical and contemporary city narratives that have focused on Esfahan and the opportunity of cooperation between modernity and tradition. Among many diverse sources, it can be mentioned:

1. The Architectural Review Journal's Special issue about Esfahan was published in May 1976, edited by Sherban Cantacuzino and Kenneth Browne. The study was formed by various articles discussing the city's historical values by introducing three lifelines of Bazaar, Chahar-Bagh Street, and Water. And then, it warns about the destructive effects of the structure and function of the modern city on the logic and values of the previous city. Finally, it suggests 12 immediate actions for Esfahan to survive as a historical and dynamic city.

2. Iranian Studies Journal (published by Taylor & Francis and Routledge) devoted to Iranian and Persian history, including various volumes and issues which discuss the traditional Iranian cities, Esfahan, and the contemporary urban change in Iran.

At last, the interviews with varying individuals and experts in charge in Esfahan municipality and governmental planning and executive organizations

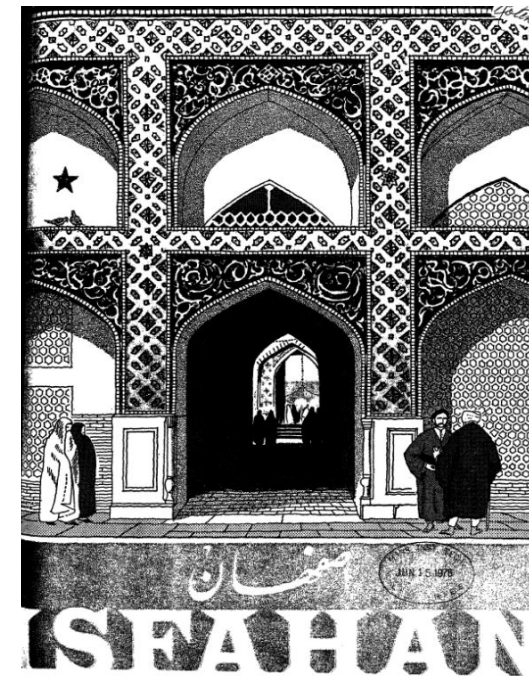


Fig. 7. Architectural Review Journal, May 1976

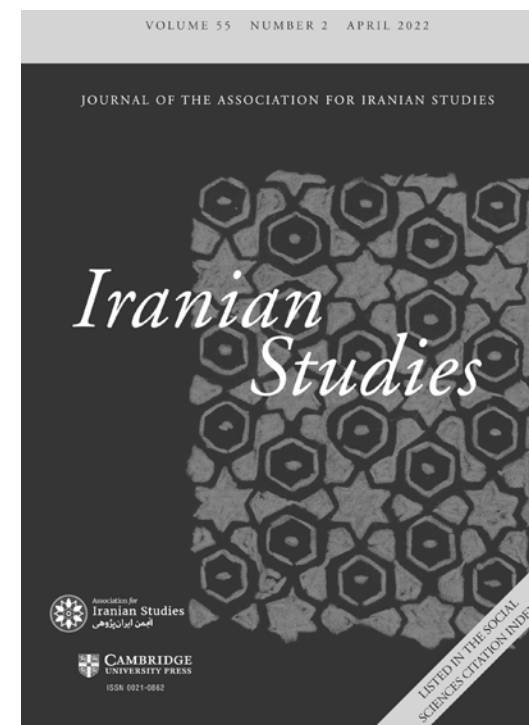


Fig. 8. Iranian Studies, Journal of the association for Iranian studies.

could help the study share ideas through discussing and presenting the research content. At the same time, the research could receive different entities' support in accessing the documental primary and secondary references and doing sites visits and photography.

The research took advantage of getting involved in different academic, public, and scientific meetings and seminars to present and discuss the thesis methodology and content.

The academic seminars are mentioned in the three following events:

The seminar was held in cooperation with Dr. Francesc Peremiquel Lluch (in November 2022) in the frame of the official MBArch course, ETSAB.

The panel was performed in association with Dr. Maryam Ghasemi (in June 2017) in the P.hD architecture and urban planning course at Azad Khorasgan University.

A meeting was held up at the Art University of Esfahan, in July 2017, with the former head of the urban department, Ms. Dr. Mahin Nastran, and four other associated professors of architecture and urban department at Esfahan Art University.

The study was also presented in a public seminar held at the Safavid House on April 17, 2019. The House hosted a meeting in Esfahan, where Dr. Carles Crosas, Dr. Mohammad Reza Ghanei, and the author presented their content on various projects and experiences that Barcelona, Esfahan, and other Iranian cities have had with urban and regional centers.

Finally, the research also participated in three scientific seminars between different universities<sup>4</sup>, which allowed it to intercommunicate contents and benefit from the feedback and debate among professors and researchers.

<sup>4</sup>The three seminars were:

· "On the road" Joint Doctoral Research Seminar, Barcelona, January 25-26, 2016, Streetscape Territories Research Project, with the assistance of KU Leuven, Department of Architecture, Belgium Research Group "Urban Projects, Collective Spaces, and Local Identities" and UPC, ETSAB, Department of Urbanism and Regional Planning Research group Barcelona Laboratory of Urbanism.

· First International Conference of Future of Urban Public Spaces that was performed by Trbiat Modares University, Tehran, between 25 and 27 September 2018.

· 2nd Ph.D. Research Seminar "ON INFRASTRUCTURE AND COLLECTIVITY," 4th March 2019 with the assistance of Laboratory of Urbanism of Barcelona - DUOT - UPC / Urban Projects, Collective Spaces and Local Identities KULeuven.

## 1.5. Various Expressions of a Historic City

Historically, Esfahan as many other cities, has not only one but various histories, referring to the ancient, Islamic, medieval, early and late modern and contemporary times, giving different characteristics, forms and identity to the city.

Regarding the traditional city, many authors and references discuss its forms and structures in various terms of: traditional and Islamic city, organic city, natural city, among others, presenting various features and characteristics. Nevertheless, the primary aspect, which puts all these various terms in common, is the basic manner of dislocation into the city and in the territory.

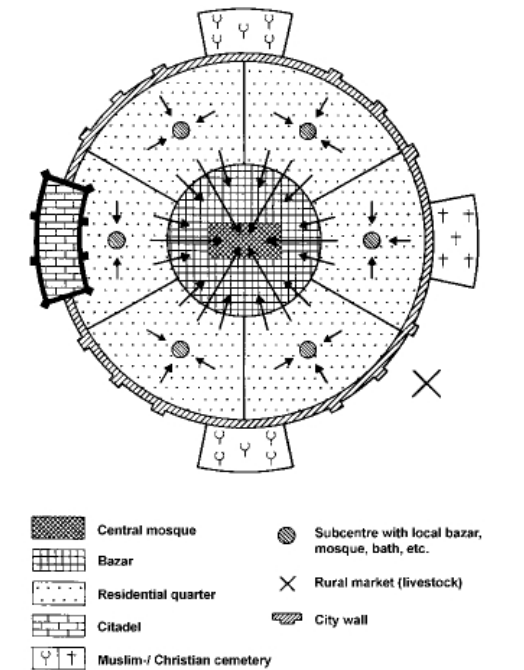
When people and animals were walking, coming from surrounding territories or long distance places, reach to various linear and nodal encounter places, where they could land their cargos, rest, drink water, sell and buy new products or raw materials, go to pray, or clean their bodies, etc. in common with surrounding and local residents.<sup>1</sup>

Concerning the traditional Iranian-Islamic city, Sirus Shafaghi (2016) considered German geographers the first researchers who modeled the Islamic city. Among them, the two schematic models of Dettmann and Eugen Wirth, prepared in the 1960s, represent some common principal aspects: (1) in both schemes, the Jame- Mosque<sup>2</sup> and the Bazaar have been formed the city center, (2) the city center is extended and linked with the city gates, and outside territories, through some centripetal main roads<sup>3</sup>, (3) the residential districts are surrounded the neighborhoods centers and filled the space in between the city center, radial, and arterial passages, and city walls. Nevertheless, in both schemes, the relation of the neighborhood centers with the arterial passages is not well defined.

<sup>1</sup> Ali Bakhtiar (1974) The royal bazaar of Esfahan, Iranian Studies, 7:1-2, 320-347, "On the backs of camels, donkeys and mules, long trains brought the leather, wool, cotton, metals, skins and countless other articles to Esfahan. The raw material for the manufacture of new goods within the bazaar, or the crafts of outlying villages in the desert, from the Caspian Sea to the Persian Gulf and beyond, were brought to the market in a never-ending stream that flowed for centuries".

<sup>2</sup> "Jame" means comprehensive, and Jame Mosque is the same as the Friday Mosque, where the Friday prayers are held.

<sup>3</sup> These primary roads, called 'Gozar' in Iran, were usually linked to various neighborhood centers and had a considerable width so that two loaded animals could simultaneously cross each other.



Model of the functional structure of oriental-islamic old cities according to Dettmann (1969:203).

Fig. 9. The model of the traditional Islamic city. Source: Dettman, 1969

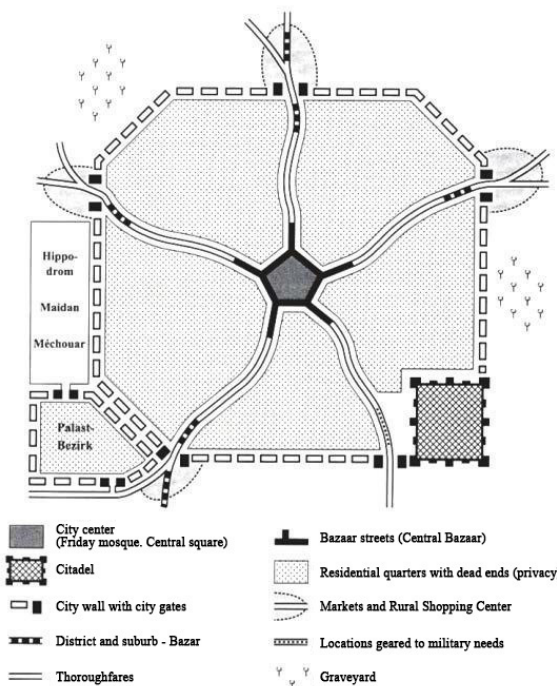
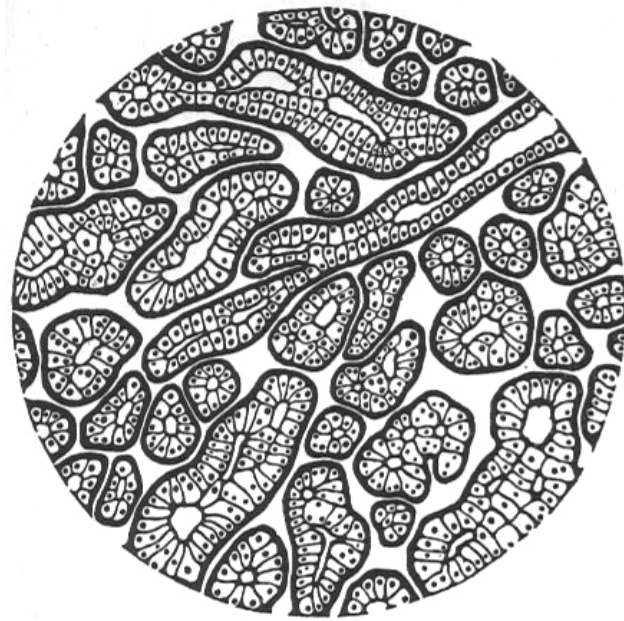
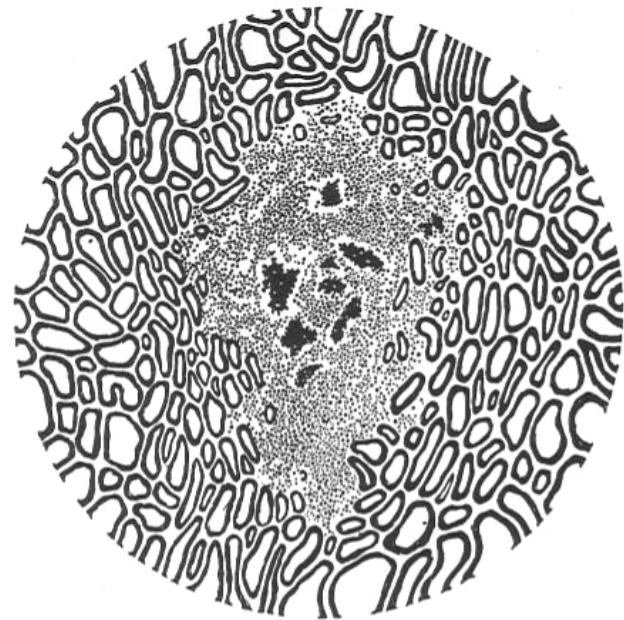


Fig. 10. Wirth's model of an Islamic city in the middle east



**Fig. 11.** Healthy cell tissue: microscopic "community planning."  
Source: Eliel Saarinen



**Fig. 12.** Disintegrating cell tissue: Microscopic "slum growth."  
Source: Eliel Saarinen

Considering the same way of mobility and the sequence of the encounter places, the model of the Islamic city, which Eugen Wirth and Dettmann suggested, has overlapped with the idea of "Organic city", examined by different authors.

Eliel Saarinen had written, in the 1940s, about the principles of organic order; he tried to focus on those town-building principles inherent in the nature of things from immemorial time, which can be found inside any circumstance. To do this, he compared the city to a cell tissue, where the individual buildings are just those "cells," to find such processes that could be considered analogous to the operation of town-building. (Saarinen, 1945, p. 8).

He considered two crucial phenomena in building a healthy cell tissue: (1) the individual cells' existence and (2) the correlation of these cells in the cellular tissue. He agreed that this dual idea of individuals and individuals' relationship to the whole is constituted from the most microscopic to the utmost macroscopic. So then, vitality in all life manifestation would depend on the quality of the individual and the quality of their correlation.

He argued "any form-manifestation in nature is a true expression of the meaning behind this form-manifestation; and this is a rule from which there is no exception in the universe. It is a principle: the said principle of expression." Through a closer study of natural processes, two fundamental principles of "Expression" and "Correlation," are perceived, giving each individual form-shaping in nature an accurate interpretation of the meaning behind the different forms, and which bring the individual forms into organic correlation (Saarinen, 1945, p. 9).

Kayvan Karimi (1998) the Iranian author, also refers to the organic cities. By analyzing some Iranian and English historic cities, he has come up with some results. He states that despite of being Iranian or English, in all the organic city cases, the urban grid tends to form a compact core in the center; some major routes, which tend to be more linear and less winding, link the core to the outside and the rest of the city. The rest of the urban grid develops around the core and thoroughfares, providing more local sub-structures.

In this sense, organic cities maximize center integration to accept the potential of accommodating the main urban activities. Furthermore, the historic extension of primary roads connecting city centers and city gates reduces the city's isolation from the outside world and the rest of the city from the center. This process becomes a natural and spontaneous mechanism for growth in organic cities.

Similar to Saarinen, Karimi also provided another interesting spatial finding: the relation between "the parts and the whole" in organic cities.

The urban layout in a local setting is not identical to the global norm, although there are some rational degrees of overall part-whole exchange. However, more importantly, it became clear that the range of this exchange varies in multiple areas. It is strongly associated in the center, where maximum legibility is needed, but becomes less significant when reaching the edges, where privacy and control are expected, although this correlation is rising in local centers. Therefore, the logic of spatial structure in organic cities can be revealed by the differentiation of urban spaces through the local or global configuration of the urban forms and the differentiation of the part-whole correlation among major urban areas.

The analysis of urban elements shows an essential connection between their socio-functional role and their position in the urban structure. The hierarchy of their incorporation within the urban format makes a sensible order. The most critical elements in social and functional terms are integrated into the core to maximize the efficiency of each element. In contrast, the less significant elements occupy the more segregated positions in a local or global context, preserving a clear hierarchy.

Karimi concludes that, despite their apparent irregularity, organic cities produce their kind of order. Any in-depth analysis of organic structures can reveal the principles and laws of urban growth based on the evolutionary fulfillment of the inhabitants' needs during the spatial formation process. The exact nature of organic cities, widely admired everywhere, seems to be created by the harmony between what the city is and what the city needs to be (Karimi, 1998, pp. 114, 181-183).



He introduced the matter of city corners, as the visible forms that architecture gives to various networks of intersections, the places that accommodate the most forms of movement and activity, and where divergent dynamics and intentions coincide. He claims that it is the frequency of corners that establishes the urbanity or, in other words, “The multiplication of corners makes cities. The city is a network of corners: space articulated to facilitate the interaction of people and activities.”<sup>3</sup> When Manuel de Solà took the idea of the corner, it was not a discussion on structural issues but a discussion about the authenticity, originality, and identity of cities.

In the same work<sup>4</sup> he raised the question if there is a contemporary form of the corners emerging that are indicative of new forms of activity and movement. He argued: “It is the enormous expansion of communications and transport that is at the root of major urban changes, and also, no doubt, the key factor that will determine future corners. The total urbanization of vast areas and the frequency and facility of transit make the territory a field of constant movement. The city is transport, and crossings and interchanges give rise to new constructions in the form of terminals, shopping centers, and concourses of new architecture. Stations are the urban spaces with the heaviest transit, and the variety of their users ensures their urbanity. These are crossroad-corners, where the interaction between different movements and different speeds (trains, cars, cyclists, pedestrians, etc.) is developed on a concentrated site, often vertically.” (p. 41)

Considering the matter of exchange in the construction of the city, Richard Sennett is another well-known author who discusses the creation of ambiguous edges between parts of the city as a way to be well designed. He draws our attention to an essential distinction in natural

ecologies between two kinds of edges condition: boundaries and borders, and he compares them in the city and within other environmental organisms.

He defines that “The boundary is an edge where things end; the border is an edge where difference groups interact. At borders, organisms become more inter-active, due to the meeting of different species or physical conditions; for instance, where the shoreline of a lake meets solid land is an active zone of exchange where organisms find and feed off other organisms. Not surprisingly, it is also at the borderline where the work of natural selection is the most intense. Whereas the boundary is a guarded territory, as established by prides of lions or packs of wolves. No transgression at the boundary: Keep Out! which means the edge itself is dead.”

He also considers another natural edge condition at the cellular level; the cell wall and the cell membrane, “The cell wall retains as much as possible internally; it is analogous to a boundary. The cell membrane is more open, more like a border.” He notes that the membrane does not function as an open door, “a cell membrane is both porous and resistant at the same time, holding in some valuable elements of the city, letting other valuable elements flow through the membrane”.

He believes that a well-being city is a bottom-up place; it belongs to the people and possesses more borders and membranes, while our modern cities can be designed and operated top-down; it is a city that belongs to the masters and dominates by the boundaries, “The urban habitat is cut up into segregated parts by streams of traffic, by functional isolation between zones for work, commerce, family, and the public realm”.

<sup>3</sup> Manuel de Solà-Morales i Rubió, 2004, “Cities, corners”

<sup>4</sup> Manuel de Solà-Morales i Rubió, 2004, “Fixed corners for a mobile territory”

## 1.7. Between Tradition, Modernism and ‘Westoxification’



Fig. 14. The First International Congress of Architects, “the interaction of tradition and technology”, 1970.

The crisis of the modern movement, based on cars and new asphalt streets, represented a point of rupture for a traditionally capillar city, altering the identity of Iranian cities. The imposition of imported urban planning systems on traditional cities has resulted in a drastic change in people’s lifestyles, a decline in the traditional system, and manifest the identity crisis in Iranian cities.

The diversity, which in its nature could cause conflict, is often wrongly resolved through taking wrong approaches such as superimposing new streets for car mobility, zoning, functional segregation, and homogenizing planning to simplify and manage an increasingly complex territory. The modern movement led to significant degradation of public space and the practical disappearance of its collective meaning.

The difficulty of the conflict often dominates the outcome in a network of numerous urban junctions: where there is the lack of proper exchange between different parties, for instance

where the predominance of traffic circulation instead of providing a service creates separation and distance; where there is uniformity without admixture, monotony without a difference, density without interchange; movement without contact, and interactions; or where there is extension without reference.

A radical break with the past, which is evident in the large scale redevelopment and the total physical transformation, dominated twentieth-century attitudes towards the historic contextual environment by planning and implementing largescale redevelopment projects that have continued and grown over the last few decades. (Izadi, 2008)

Among the first voices heard alarming this identity crisis, contradictory images of modernity and tradition was from Vartan Avanesian, who in the first issue of the magazine ‘Architect’ published in August 1946 raised a challenging question that is still relevant for Iranian architects and urban

planners. He noted that Iranian architects are faced with two differing viewpoints; should one imitate the past and recreate the valuable works of that era, or should one look to the future and adapt the architectural design to the modern way of life. "This oscillation between two extremes of modernity and tradition has been the essential, ontological, and practical question which has overwhelmed the production of urban space in Iran during the past 150 years." (Shirazi, 2018)

Another "Iranian architect Bahram Shirdel, in an interview with Shargh Daily (18 June 2016), contends that Iranian architects usually suffer 'Westoxification'<sup>5</sup> (Gharbzade). He argues that traditionalist and modernist architects in Iran are two sides of the same coin; they are incapable of bringing original Iranian archetypes into the twenty-first-century context and generating a particular type of development rooted in our historical architecture and urbanism." (Ibid. p. v)

Paul Ricoeur's classic text, *Universal Civilization and Natural Culture* (1965) intends to show how developing countries, including Iran, confront a

<sup>5</sup> "Westoxification" in *The Oxford Dictionary of Islam* "coined by the Iranian secular intellectual Jalal al-e Ahmad to describe the fascination with and dependence upon the West to the detriment of traditional, historical, and cultural ties to Islam and Islamic world. The West's inherent dangers are described as moral laxity, social injustice, secularism, devaluation of religion, and obsession with money, all of which are fueled by capitalism; the common result is cultural alienation. The term was adopted by Ali Shariati, ideologue of the Iranian revolution, to describe the results of Iran's modernization program."

twofold problem: the necessity of understanding the country's profound personality and rootedness in the soil of the past, at one extreme, and at the other, the scientific, technical and cultural rationality of modern civilization. In other words, these countries face the crucial challenge of becoming modern and yet returning to their original sources, or of simultaneously reviving an old, dormant civilization while also taking part in universal civilization. (Ibid. p. 1)

The rapid development of the country using modern techniques caused a critical crisis of modern movement and, through the inability to create a constructive interaction between two forms of identity, initially rooted in the change in the mode of movement and the spaces of interaction. In this regard, the First International Congress of Architects<sup>6</sup>, "the interaction of tradition and technology", was held in 1970 to discuss how to combine tradition with modern technology in architecture.

<sup>6</sup> The congress was sponsored by the Ministry of Housing and Development, co-operating with the Ministry of Fine Arts, the Faculty of Fine Arts of Tehran University, and the Iranian Association of Architects. The opening ceremonies were presided over by H.I.M. Farah Pahlavi at the historic palace of ChehelSetoon in Esfahan on September 14, 1970. Eighteen architects from fourteen different countries were invited to participate in the Congress, including some of the world's leading architects such as Louis Kahn, Paul Rudolf, Buckminster Fuller, and several prominent Iranian architects such as Mohsen Foroughi and Nader Ardalan. The conference lasted for six days, and the speakers gave their views and opinions on the three topics of tradition, technology, and synthesis in education and the profession. Finally, on the last day, the issues were summarized in three cases.

The resolutions of the congress included various items<sup>7</sup>. Among them, the deliberations of the congress were summarized in the three following items:

(1) "Tradition is valuable in assuring the identity, the material and human particularities of man, region, country, place, and universe. The perception of "tradition" is delicate, subtle, and sometimes dangerous. The architecture of the past is a book that explains the history of a country and its eternal renewal. To respect tradition is to build the dwellings, the cities, and the environment in the real condition of our epoch and at the same time anticipating the future.

(2) Each epoch uses its own technology and heralds a new technology. What differentiates our era from the past is that in the past, technology was limited, while at present, it offers unlimited possibilities which provoke accelerated change, confusion, and contradictions. In this situation, we can only make a technological choice conditioned by the known historical and geographic factors.

<sup>7</sup> More information can be found in "The international congress of Architects resolutions, Esfahan 1970, the interaction of tradition and technology" report, pages 247- 248.

But above all, it is the creation of the human environment which is our primordial goal. Consequently, the choice of technology must be inspired by this aim. No matter in what age, whether that of yesterday or today, one must never forget that technology is only a means, not an end<sup>8</sup>.

(3) The relationship between tradition and the training of the architect is expressed specifically when the methods of teaching provide the students with the inspiration and means by which to acquire an overall knowledge of their epoch and to confront them at all times with the realities of the world and their own country, in order for them to evaluate the past, understand the present and discover the future."

Thus, the research of Esfahan urban transformation sets a dialogue with this discussion that goes beyond Architectural Design and links with the current challenges citywide.

<sup>8</sup> Richard Sennett, *The Open City*, 2006, "The art of designing cities declined drastically in the middle of the 20th century. That's a paradox because today's planner has an arsenal of technological tools, from lighting to bridging and tunneling to materials for buildings, which urbanists even a hundred years ago could not begin to imagine: we have more resources to use than in the past, but resources we don't use very creatively."





**Fig. 15.** Esfahan, Masjid-i Jami, 1963-1971, source: Powell, Josephine, 1919-2007, American [photographer]

## CHAPTER 2: ESFAHAN, A GENERAL APPROACH TO AN IRANIAN CAPITAL

- 2.1. GENERAL CHARACTERISTICS OF THE COUNTRY'S LAND
- 2.2. THE TRADITIONAL CENTRAL IRANIAN CITY AT A GLIMPSE
- 2.3. GEOGRAPHICAL FRAMEWORK AND URBAN FORM
  - 2.3.1. Water as Urban Essence
  - 2.3.2. Harsh Climate Conditions as Context
  - 2.3.3. Topography and Territorial Control as Driving Force
- 2.4. GENESIS OF THE CITY: FOUR CRITICAL PERIODS
  - 2.4.1 The Twin Towns: Jay and Yahudiyyah, and Satellite Villages - Until Early Islamic Period (-772 AC)
  - 2.4.2. Switching the Center from Jay to Yahudieh - Abbasid Period (8th to 10th Centuries)
  - 2.4.3. The Walled City and the Mahallahs Organization - Al Buyid and Seljuq Period (925 to 1138 A.C.),
  - 2.4.4. Esfahan Four Centuries Later: One of the Wealthiest and Most Prosperous Capitals in the World - Safavid Period (1597 to 1722 A.C.)

## CHAPTER 2. ESFAHAN: A GENERAL APPROACH TO AN IRANIAN CITY

According to Sirius Shafaghi (2016), temperature plays an essential role in developing human cultures and civilizations because warm climates with access to suitable water and soil, will cause a surplus of crops, and therefore, excess production will form culturally self-sufficient cities. Furthermore, a favorable geographical environment, including climate, water, and soil, has been the city originator and has established human civilization hubs. Many ancient civilizations in which the world's oldest cities and towns originated are located in the current cultural area of the Islamic lands.

The Mesopotamian, Nile, Sindh, and Punjab civilizations, which are in the present Islamic lands, have directly impacted the urban culture and development of the Islamic era, using the local knowledge and resources of the conquered territories such as Iran, Egypt, and India. Specifically, the early Islamic city planners were strongly influenced and inspired by the Sassanid architecture and urban design for many centuries.

Currently, the Muslim world consists of vast land from the northwest coast of Africa to the southeast of Asia and the Indonesian archipelago, and from the Caucasus in the north to the southern coast of the Arabian Peninsula. The length of this extensive land is about eleven thousand kilometers, and its width is approximately five

thousand kilometers. It comprises about twenty-four percent of the total land area and twenty percent of the world population. Most parts of this land are in Asia and Africa, and a small part of it is in continental Europe.

The Islamic world has rich geography and human diversity, and religious sharing is the only cultural-social factor that has brought this great community together. This massive area lies in the desert belt and warm and arid regions of the world, with little rainfall, high heat, soil salinity, and unfortunate vegetation characteristic of most Islamic countries.

The availability of abundant oil and gas resources has increased the importance of this area. At the same time, most Islamic countries are now classified as underdeveloped and the false prosperity of some of these countries is due to the single-product economy of the region that is unstable, transitory, and imposed on their society. Nevertheless, this temporary income has undermined some of these countries' economic stability and has also exacerbated the socio-economic failures of these countries. One of the region's human characteristics is its racial, linguistic, ethnic, and religious diversity, which has caused divisions and conflicts in the Muslim world that have divided these lands. (Shafaghi, 2016a, p. 106)

### 2.1. GENERAL CHARACTERISTICS OF THE COUNTRY'S LAND

Iran is part of the Eurasian mountain belt that starts from the Iberian Peninsula goes through the Alps, the Balkans, the Carpathians, the Taurus, and the Pontus to the Elburz and Zagros Iranian highland rims. Iran is also part of the arid belt of the Old World that extends across the Arab Peninsula from Sahara on the Westside to the Central Asian deserts on the east side of the Iranian plateau. These two belts traverse the old world, intersecting in Iran. Therefore, mountains and deserts are the two determinants for the geographical appearance of Iran (Fig. 16). The majority of settlements having more than 50,000 inhabitants are located either near the foothills of Elburz and Zagros highlands or in the intermontane basins (Gaubé, 1979, p. 2).

The amount of freshwater and its aquifers have not been great except in a few parts of the country. On average, the annual rainfall in Iran is not more than two hundred millimeters per year, and with drought and warm weather in most places, any crop needs irrigation (Fig. 17). Excluding rainfed crops in the mountains' narrow slopes and two or three more areas with more annual rainfall, rainfed crops yields are rarely good (Abari, 2000).

The water availability may explain locating large settlements in the inter-mountain basins or on the foothills of the high mountain chains (Fig. 18). The lack of arable space in the entangled terrain of the mountainous regions with more than 300 mm of rainfall per year that is the minimum necessary for dry-farming, has favored the growth of larger cities in just a few places where agricultural surplus could meet the growing inhabitants (Gaubé, 1979, p. 4).

Like any other Islamic city, to a great degree, a traditional Iranian city's physical form and structure is a rational response to the severe arid conditions and climatic characteristics. The harsh climatic conditions induced by the unique physiography of the region have a significant influence on the distribution of settlements and their internal physical development. (Karimi, 1998, p. 346; Kheirabadi, 2000, p. 5).

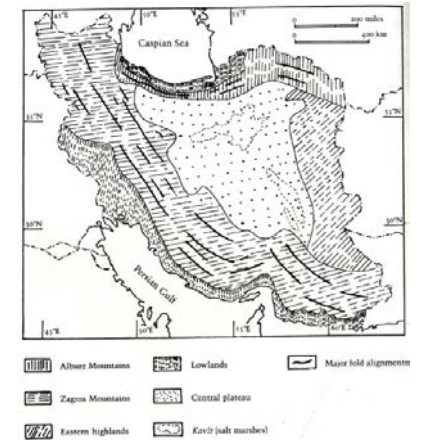


Fig. 16. Physiography of Iran. Source: (Kheirabadi, 1991).

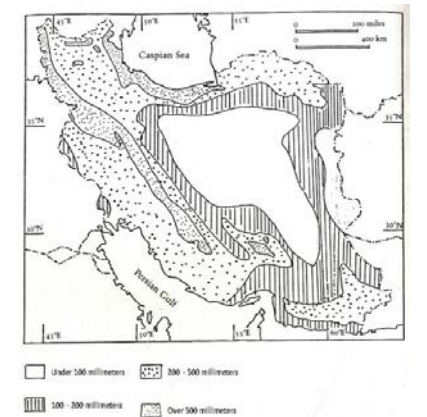


Fig. 17. Approximate average annual precipitation in Iran. Source: (Kheirabadi, 1991).

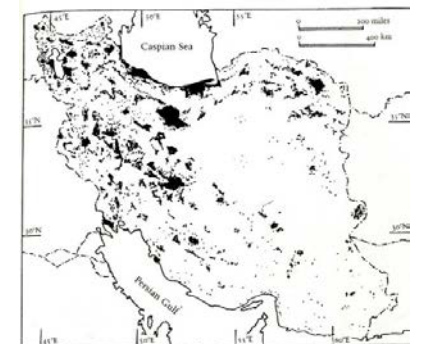


Fig. 18. Population distribution in Iran. Source: (Kheirabadi, 1991).

## 2.2. THE TRADITIONAL CENTRAL IRANIAN CITIES AT A GLIMPSE

Iran is an arid country, except for two narrow regions (one along the Caspian Sea and the other along the western slopes of the Zagros Mountains) (Fig. 17). Water scarcity, higher evaporation than precipitation (resulting in low humidity), intense solar radiation (especially during hot summer days), high seasonal and diurnal temperature levels, torrential but sporadic precipitation spurts, and damaging dust and sandstorms characterize its extreme climatic conditions.

The urban form of Iranian cities was developed through the millennia to cope with such climatic conditions. Traditional Iranian urban planners have learned to reduce the direct impact of solar radiation, soften the flow of harmful and unpleasant winds, and optimize the use of shade, breeze, and water to adapt to the hostile climate by using different techniques:

1. Forming a compact urban model and specific street and alley patterns,
2. Entering the water and green into the city and in various ways,
3. Regulating the courtyard form for residential and public buildings (Kheirabadi, 2000, p. 20)

The presence of mountains directly influences the countrywide distribution of rainfall. However, this relationship becomes less apparent from the northwest to the southeast (Figs. 16 & 17). Major settlement sites are very ancient and close to new cities such as Hamedan, Shiraz, Esfahan, and Tehran or on the site and nearby. The majority of the Iranian population lives in various oases of varying sizes and settlements scattered along the foothills of the high mountain chains, where water is accessible (Figs. 17 & 18). Water has always been an influential factor in settlement distribution patterns and the intensity of human activity across Iran due to its general dryness (Gaube, 1979, p. 2; Karimi, 1998, p. 346; Kheirabadi, 2000, pp. 12, 13).

The aforementioned extreme climate has created three significant morphological features in the traditional and central Iranian cities: (1) compact urban structure, (2) winding street design, and (3) courtyard housing. The urban fabric had a very compact structure for both building and land-use patterns. Land uses were closely linked, particularly in the public sector, and accessible for residential houses. There were no gaps between buildings, and the central courtyards maximized the built-up area. There were very few large open spaces, and any significant public square was completely enclosed. Each building seemed to cover its surrounding houses and their local access passages as much as possible (Karimi, 1998, p. 347).

The urban texture's compactness has many benefits. It decreases external radiation and evaporation, thus supplying fresh air, shade, and shadow. It also minimizes daytime heat gain and nighttime heat loss and thus regulates temperature. It hinders damaging windy days and nights and decreases the damage caused by storms. Besides, this urban form promotes human movement and activity, both public and private, throughout the city. Finally, a compact system has some other socio-economic strengths, such as: reducing the consumption of energy, offering a more economically viable infrastructure and transportation network, creating a more coherent community, and maintaining the urban environment employing passive systems (Kheirabadi, 2000, p. 22).

The roads are firmly and intensively enclosed by buildings and high walls, which provide well-shaded spaces in hot summers. Compared to Western streets, alleys and arteries in traditional Iranian cities are twisty and short. Finally, the morphology of houses and buildings accomplishes the role of the city form in environmental control. The enclosed shape of the building helps to optimize the compactness of the entire urban fabric. The courtyard in the middle provides light and ventilation and avoids unhealthy conditions for the inhabitants. A pool and foliage improve the performance of the courtyard to create a pleasant microclimate (Karimi, 1998, p. 347).

## 2.3. GEOGRAPHICAL FRAMEWORK AND URBAN FORM

The excellent geographical location of Esfahan in the heart of the Iranian plateau has led to being repeatedly chosen by Kings and National Administrators as the country's capital. The city is situated at the north-south and east-west intersections of national corridors, an encounter point of various ethnic groups and cultures that have met throughout history. The Great Esfahan region is confined by the north and east deserts, and the Zagros range from the western and southern parts. (International Affairs Dept of Esfahan Municipality, 2015, p. 32)

With an area of 106,179 square kilometers, Esfahan province accounts for about 6.25 percent of the country's total area. It is situated in central Iran as the third-largest city after Tehran and Mashhad. This province has ten neighboring regions, from the north to Markazi and Semnan regions, from the south to the regions of Fars and Kohkiluyeh & Boyer Ahmad, from the east to Yazd, and Khorasan regions, and from the Maghreb to Khuzestan and Chaharmahal Bakhtiari and Lorestan. In terms of size, Esfahan is the fifth largest province after Khorasan, Kerman, Sistan and Baluchestan, and Fars. Esfahan city is the province's capital, which is located northwest of the county of Esfahan (Fig. 19) (Shafaghi, 2002, pp. 5, 6).

Fate has already played a part in civilization's evolution in places where the fertile plains have

been around for thousands of years. The first question which arises from the study of historical geography is the reasons for the existence and development of a city at a particular point in time. The founding of the large and ancient town of Esfahan is mainly due to adequate water and fertile soil in the region.

Even though central Iran is considered one of the world's most arid areas, a permanent river such as Zayandeh-Rud provides excellent conditions for human life, and a suitable and warm climate enables the people of the region to carry out their agricultural activities. Thus, the settlement alongside Zayandeh-Rud's fertile ground, favorable climatic conditions, and adequate defensive aspects played a crucial role in building and establishing the city of Esfahan. Most scholars agree that in determining the age of a city, it is necessary to consider its geographical, historical, and economic role. Humanities Scientists believe that villagers have founded the early nucleus of the oldest cities, or in other words, the ancient cities have been transformed from village to town. One of the main conditions in forming satellite and rural centers in the Esfahan region was easy access to drinking water and water needed to irrigate gardens and farms, which was provided by digging wells and surface water canals branched from the river. (Shafaghi, 2002, pp. 242, 243).

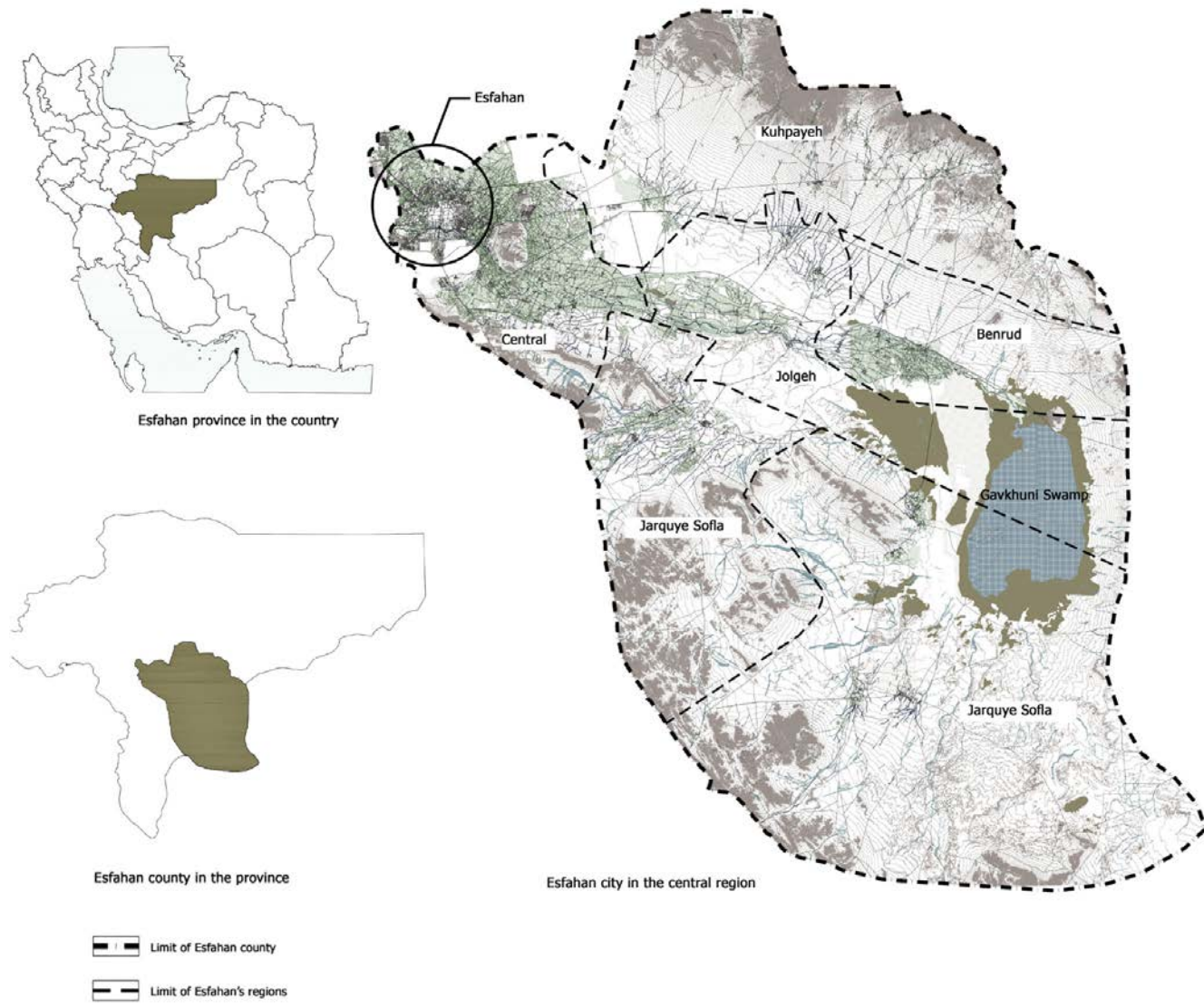


Fig. 19. The location of Esfahan province, county, and city. Source: Esfahan municipality, 2014.

### 2.3.1. Water as urban essence

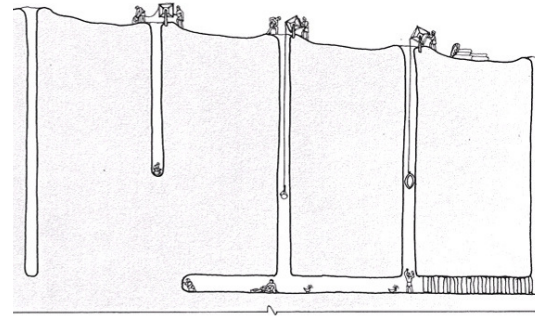
The presence of water, particularly surface water, played a vital role in developing the first cities in the hot and dry Middle East; indeed, the world's oldest cities were all also born on the riversides.

Except for some limited areas in the Caspian lowlands, where water is plentiful, all major cities are located in regions not favored by sufficient annual rainfall. Most Iranian cities, situated in the south of the Elburz and east of the Zagros mountain ranges, depended on groundwater brought from the foothills by way of Qanāts<sup>1</sup>.

As a result, these cities could only exist and grow in areas where water supply was guaranteed from sources other than rainfall.

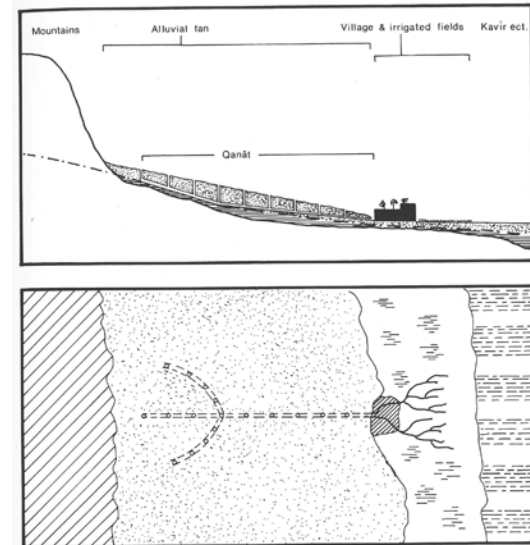
Using the digging subterranean aqueduct technique (Qanāt) to lead the underground water to the surface led to a radical change in the settlement pattern by unfolding new areas to man formerly unpopulated. The establishment of a network of long-distance roads, with posts for the army for communication, administration, and trade, was only possible after the introduction of the Qanāt. Therefore, a significant part of Iranian settlements was due to the existence of aqueducts, which had a complex construction process, high maintenance costs, and could significantly influence the social structure and settlement pattern (Gaubé, 1979).

<sup>1</sup>The qanāt is a subterranean aqueduct. It collects groundwater in the alluvial fans at the foot of high mountains and carries it, following the descent of the terrain, to settlements and fields. The length of the qanāts varies considerably. Qanāts longer than 10 kilometers are quite common. The outstanding importance of the qanāt for Iran justifies a proper investigation. The art of creating artificial springs by water tunnels, originated in the first half of the first millennium B.C. in the Iranian and Armenian highlands; which led to a radical change in the settlement pattern by unfolding new areas to man hitherto unpopulated. The introduction of the qanāt created one of the bases on which the first world empire in history, the Achaemenid state, could be built. The establishment of a network of overland roads, with posts for the army, for communication, administration, and trade, was only possible after the introduction of the qanāt. The most considerable part of Iranian settlements owes their existence to the qanāt, which, due to its complexity and high construction and maintenance costs, had a significant influence on the social structure and the settlement pattern. (Gaubé, 1979)



8. Cross section showing how an underground canal system (qanat) is dug. From F. Rahimieh and M. Robubi, *Original use in Iran* (Tehran: Student Society of University of Tehran, n.d.).

**Fig. 20.** Cross-section showing how an underground canal system (Qanat) is excavated. Source: Urban form as a physical expression of the social structure in the arid zones of Iran, by Cyrus Bavar



**Fig. 21.** Plan and section of Qanat. Source: Iranian cities, Heinz Gaubé, 1976.



**Fig. 22.** Zayandeh Rud from its source to the mouth, Seyed Hasan Hosseini Abari



Fig. 23. Zayandeh Rud from its source to the mouth, Seyed Hasan Hosseini Abari

The permanent existence of the Zayandeh Rud river, the largest in the central plateau of Iran, provided an excellent position for Esfahan and has played the most critical role in the creation and significant growth of this city in different periods. The river originates from the highlands of Zardkouh Bakhtiari in the southwest of Esfahan province. After passing some 360 km from the west to the east, it irrigates the Esfahan Plain and eventually terminates in the swamp of Gavkhuni, 140 km east of the city. Esfahan is located on a gently flat plane with a northeast slope of around 3 percent. For many centuries the city's growth has been in the southwest direction due to better access to the water and pleasant weather.

For drinking water, till less than 50 years ago (1966), water supply for urban housing was often

provided from wells with a shallow depth of about 5 to more than 8 meters. Each house had its water well/s; at the same time, other public wells were distributed in all local and primary central places to present drinking water for the animals, residence, and passengers. It should be noted that the presence of the Madies<sup>2</sup> irrigation networks in the city was raising the surface of underground water in Esfahan (Shafaghi, 2002, pp. 243, 244).

The soil and arable land of Esfahan Plain are composed of high-quality and fertile sedimentary soils derived to a considerable extent from Zayandeh-Rud. The quality and quantity of arable land made it possible for surplus agricultural production to contribute to the development of larger cities and food supply to the inhabitants of the region (Shafaghi, 2002, p. 245).

<sup>2</sup> The term Madi is specific to the city of Esfahan. It refers to significant creeks or water canals which were separated from the river to irrigate the farms and gardens belonging to the historical city of Esfahan and its surrounding villages.

### 2.3.2. Harsh climate conditions as context

Following the presence of water and fertile soil for agriculture, the climate of the region should be conducive to human life and agricultural activity. The region's climate and rainfall (125 mm per year) indicate that it is dry and desert, though the Zayandeh-Rud River compensates for this dehydration. Furthermore, the temperature factor extends the duration of plant growth, allowing for more significant cultivation and utilization of agricultural land.

Due to its location at the desert's edge, the city has cold winters and hot summers with an annual average temperature of around 16 °C. The winds of Esfahan are not strong because the mountains shelter the Esfahan region, and the appearance of the region is such that there are no direct corridors to create severe winds. The wind's main direction is southwest and west for most of the seasons, and it is only in the summer that the wind blows from the northeast and east directions (Naghsh-e-Jahan Pars Consulting Engineers, 2014, pp. 4, 5).

Esfahan is known to have four full seasons. Compared to the other Iranian cities having a harsh climate and located at the fringe of the central plateau, Esfahan generally has milder weather due to the existence of the permanent river<sup>3</sup>. However, of the 365 days per year, 75 days indicate temperatures below zero, but the rest of the year is ideal for plant growth and agricultural activities (Shafaghi, 2002, p. 245).

<sup>3</sup> In the last few years, the river changed from a permanent to a seasonal river due to exceeding water consumption needs, wrong water management policies, an extended drought period, and many other reasons.

### 2.3.3. Topography and territorial control as driving force

The third main factor that contributed to the establishment and growth of Esfahan is its defensive aspects. Located in Central Iran, far from the country's boundaries, it had repeatedly raised its value and importance in defense-military terms throughout history, particularly during the Buyid, Seljuk, and Safavid dynasties, when the city was chosen as the capital of the Persian Empire.

Having defensive fortresses over the mountains has given this city and region exceptional military value and strength. The ruined castles are still visible throughout Iran, particularly in the central parts. Paying attention to the Esfahan appellation reflects that Sepahan or Esfahan was one of Iran's major defense cities in the pre-Islamic and post-Islamic times (Shafaghi, 2002, pp. 328, 329).

Furthermore, castles and defenses have made life easier for the various human groups in the vicinity; ergo, most of the pre-Islamic cities, especially the Medes and the Achaemenids, had become cities in the vicinity of the citadels. The city of Jay also played such a role in ancient times and was a military center in the pre-Islamic era and was a center of collecting troops during the Sassanid era. In the sources and references related to Esfahan, we face the name of the Sarouyeh Fortress (9), located in Jay, considered to be the stronghold of central Iran. The presence of numerous castles in the Esfahan area, such as Atashgah Fortress (3), Sarouyeh (9), Tabark (10), and Shah Dezh (1) castles, and also the towers and barracks that belong to various historical periods, all prove the defensive aspect of the city of Esfahan (Fig. 24) (Shafaghi, 2002, pp. 246, 247).

The strategic-defensive condition of this area has to do with the geographical framework and provided a favorable location for protecting Esfahan. The city is located east of the Zagros Mountains, placed at approximately 1,580 meters above the sea. Most of the highlands have a north-south-east direction, and the mountainous area of Esfahan has made this area known as the "Jebal" back in history. The Province owns a wide

range of rough terrain forms. The plain of Esfahan extends only from the southeast to the lowlands, while significant elevations surround the other directions.

During the Seljuk era, fortresses were starting to be built on impenetrable mountains and their footprints are still visible. Shah Kuh is the highest mountain near the city of Esfahan, with a height of 2,369 meters. The Sofeh mountain<sup>4</sup>, 2,232 meters high in the south of Esfahan, as the nearest mountain to the city since ancient times, was of interest to the city's inhabitants. The fortress of "Shah-Dezh" was built on the top of this mountain during Seljuk Malek-Shah rule for military and defense purposes. Seyed Mohammad Mountains (5) is located northwest of Esfahan City, on the left side of Esfahan Road to Tehran. Very close to Esfahan, 6 kilometers to the west, lies Atashgah hill (3), which has a high cultural value named after the Sasanid fireplace on the top of it (Shafaghi, 2002, pp. 7, 9, 2016b, p. 1026).

To sum up, this section observed (a) easy access to water resources and fertile soil, (b) proper temperatures for plant growth and agricultural activities, and (c) ideal defense ability were among the main aspects, which led to the form and growth of the city and its surrounding settlements in the Esfahan area and around the river basin.

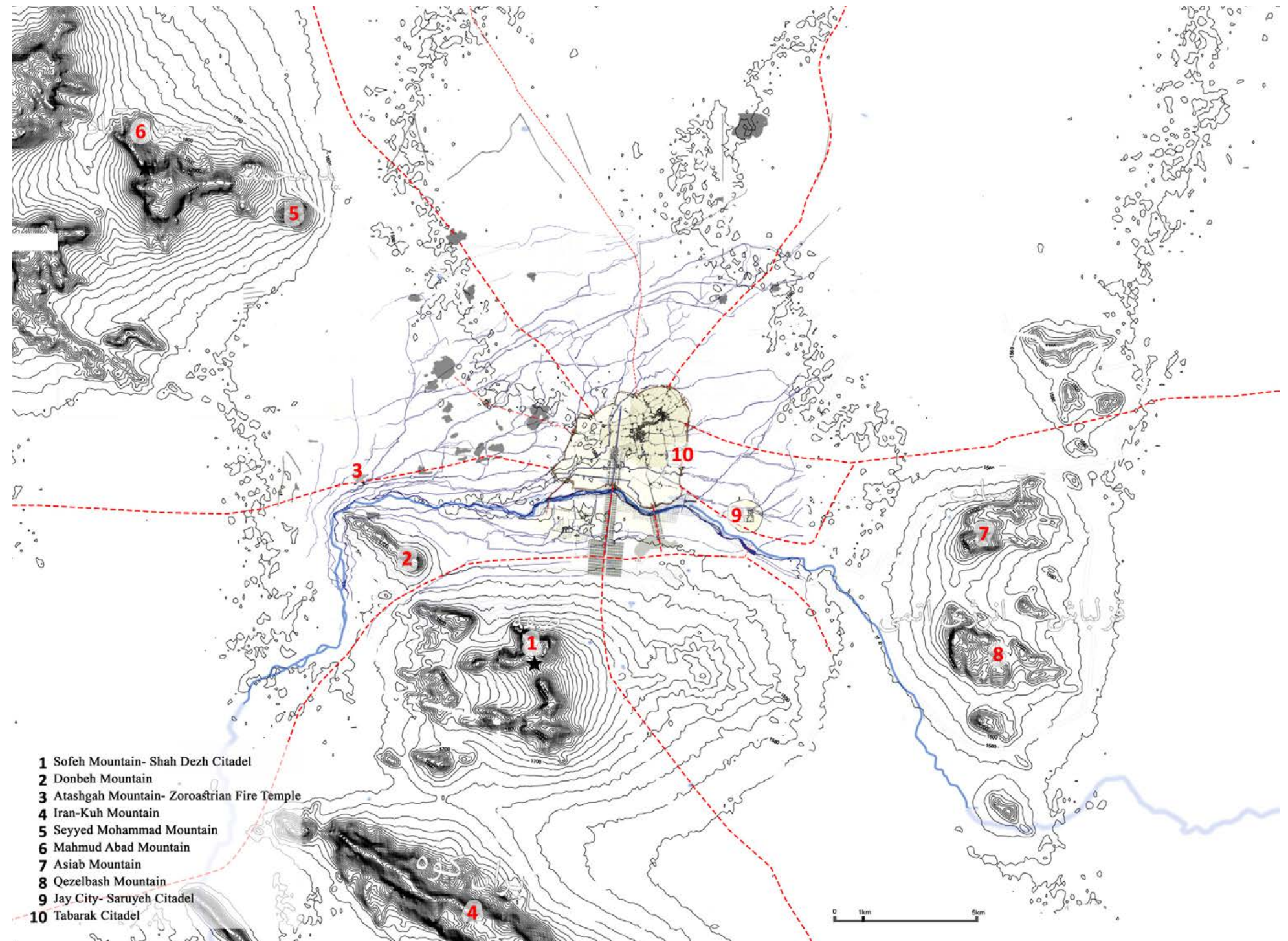
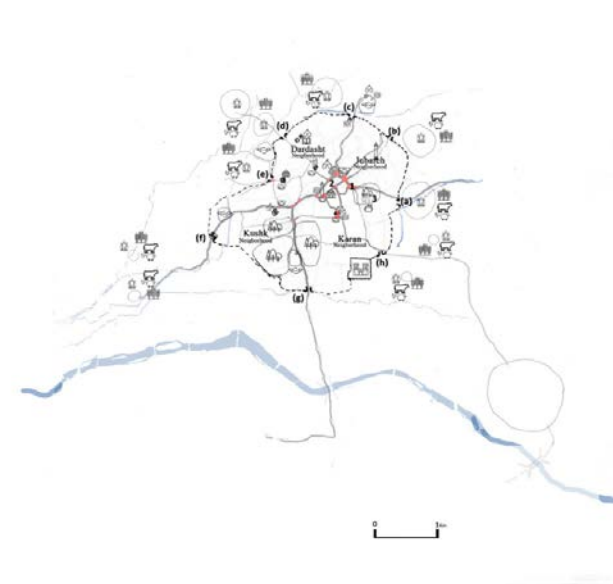
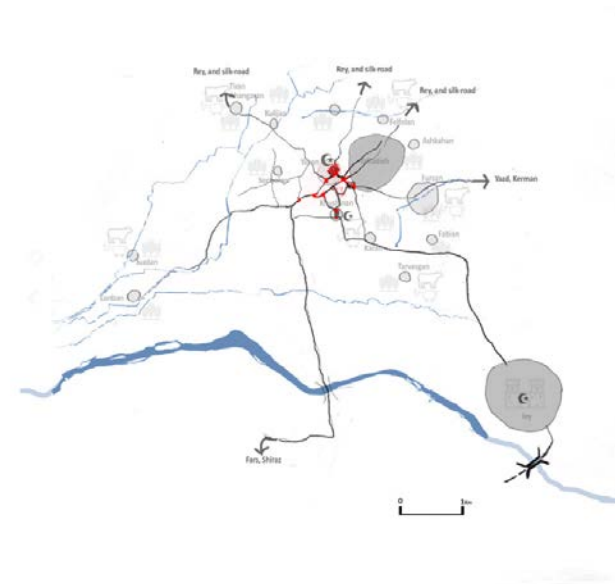
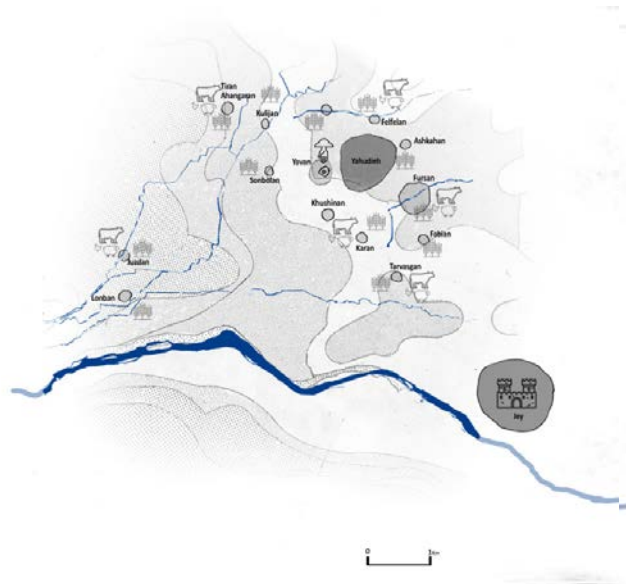


Fig. 24. The geographical location of Safavid city in the Esfahan plain.

<sup>4</sup> With the implementation of the Sofeh Mountain Plan in recent decades, it has become one of the most beautiful parks in the city.

## 2.4. GENESIS AND EVOLUTION OF THE CITY: FOUR CRITICAL PERIODS



The twin towns (Jay and Yahudieh), and satellite villages - late Sasanian and early Islamic periods (up to 772 A.C)

Switching the center from Jay to Khushinan and Yahudieh - Abbasid period (from the 8th to 10th century)

The walled city and the Mahallah organization - Al Buyid and Seljuq period (925 to 1138 A.C.)

Esfahan four centuries later, one the wealthiest and most prosperous capitals in the world - Safavid period (1597 to 1722 A.C.)

According to various historical narratives, the conquest of Esfahan by the Arab army took place in the year 21 of the Solar Hijri calendar (in Caliphate of Umar ibn al-Khattab) peacefully, by few minor clashes and losing few lives.

The First Crusade (1096-1099) began with the Seljuk conquest of Jerusalem in the 11th century and the Byzantine Empire's goal of reclaiming the Holy Land, which Muslims had occupied for hundreds of years.

Constantinople was defeated by the powerful Ottoman Islamic State and became the capital of the Ottomans in 1453 AD, about 150 years before the rise of the Safavids. The presence of the strong Ottoman government was a severe threat to the Safavid kings and European governments, so friendship and military alliance for simultaneous war on two fronts against the Ottoman government were at the forefront of foreign policy on both sides.

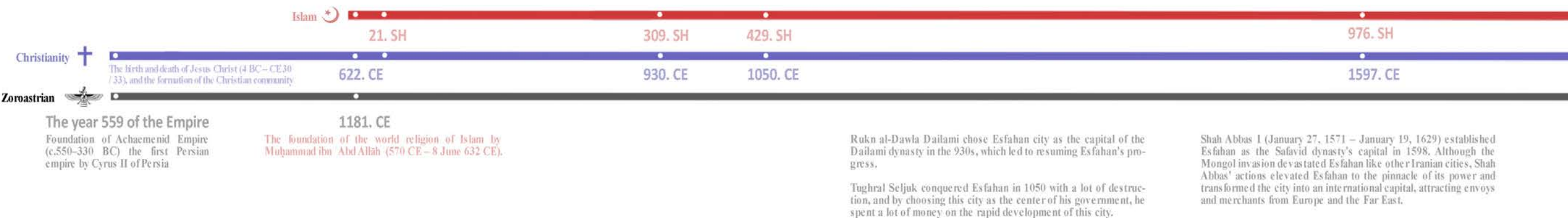


Fig. 25. The City's Origins and Evolution: Four Significant historic Periods. Source: author



Considering the geographical and natural advantages of city location, it is likable that Esfahan represents one of the earliest urban developments in the Iranian Plateau (Ministry of Culture and Arts of Iran, 1976, p. 14). In this section, the process of formation and urban development of Esfahan is discussed through four critical periods:

(a) Since the **late Sasanian and early Islamic periods (772 A.C)**: The satellite villages.

(b) **Abbasid period**, from the 8th to 10th century, growth and integration of rural areas in the formation of a single town.

(c) **Al Buyid and Seljuq period (925 to 1138 A.C.)**, Iran regained its political autonomy, turning to a walled town.

(d) **Safavid period (1597 to 1722 A.C.)**, the most significant development of the city occurred at this period.

#### 2.4.1. The twin towns (Jay and Yahudieh), and satellite villages- late Sasanian and early Islamic periods (up to 772 A.C)

In the beginning, Esfahan did not have the characteristics of a prestigious city; rather, it was a community of scattered villages. The most important one was Yahudieh, three kilometers northwest of Jay and its few small satellite settlements. Historical evidence, especially archeology, never reach the history of these satellite settlements to the pre-Sassanid era (224–651 A.C) (Shafaghi, 2002, p. 254).

Generally, it is believed that during the first Islamic century, Esfahan consisted of “twin cities” that were separated by a short distance. First, the ancient city of Jay, which is today identified with the neighborhood known as “Shahristan”, now joined to the modern Esfahan metropolis at its eastern edge and on the north bank of the river. The second twin town was known as “Yahudiyyah”, literally the “Jewish Quarter” and has always been identified with the large quarter of “Jubareh”, which is northeast of Masjid-i Jame (Fig. 26) (Golombek, 1974, pp. 20, 21).

The founding of Jay was more a matter of royal faith. Jay was the administrative and governmental center in the Sassanid era, a walled city with great military importance and some essential urban elements such as a square, a Bazaar, and an inner fortification (Saruyeh). Jay held only a defensive military role during the Arab conquest. The villages in the Zayandeh-Rud irrigation area were all obeying the Jay city, which, as mentioned, was the center of the ruler of the whole region. While Yahudieh did not play such a defensive role in that era, it was not more than a village with other satellite villages around it, where different social strata and followers of different religions lived. Various traditions regarding the origins of the Jewish colony attribute either to Queen Shushan-Dokht, the Jewish woman of Yazdgerd I (399-421) or to the Assyrian and Babylonian times (about 1750 B.C.) (Shafaghi, 2002, p. 255).

Whatever the truth may be, it is clear that they had come to the Esfahan region long before the founding of Jay. Ibn Hawqal<sup>5</sup> (the 10th century)

<sup>5</sup> Ibn Hawqal was a 10th-century Arab Muslim writer, geographer, and chronicler who traveled from 943 to 969 AD.

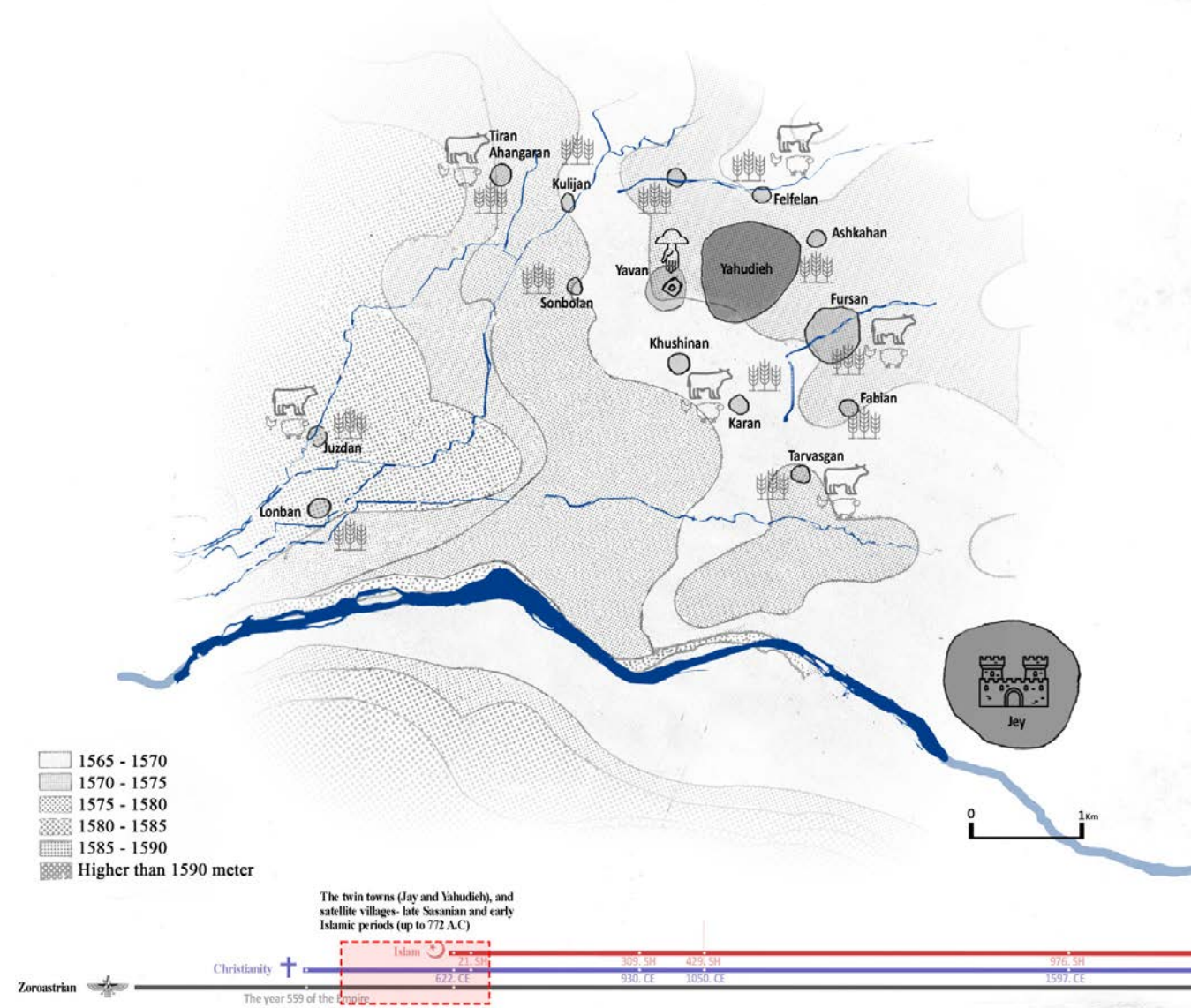


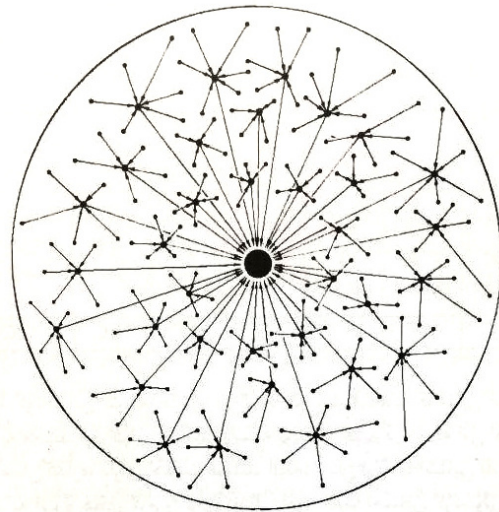
Fig. 26. Late Sasanian, Early Islamic Period to 772 A.C, source: editing and overlapping different graphical. Source: author

preserves the most compelling account: “The Jews settled in a place they called Ashkahan, meaning in their language ‘We stopped here.’ It was then an uncultivated land. Struggles with the people pasturing in the region stirred up conflict. The Jews were able to subdue the encroachers and founded Yahdiyyah, where they began to introduce irrigation and domesticate animals.” (Golombek, 1974, pp. 20, 21).

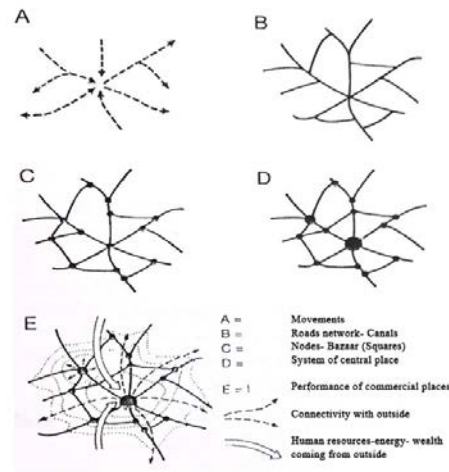
During the Sassanid era, cities were distinguished by two different functions; some had a military-defense role, made for that purpose. Their inhabitants were the military, the army, the province’s governors, and the royal family. The general public, who were not the army and mainly were farmers, lived under the influence of these defensive cities and inside the villages. In times of insecurity, the villagers could come to these military defensive cities, being Jay one of them (Shafaghi, 2002, pp. 329, 330).

As the countryside could produce food beyond its requirements, the city dwellers could live without growing their crops or raising their livestock. As a result, they may devote themselves to manufacturing, trade, administration, and other services for the hinterland. There was a constant flow of commodities from the countryside to residential centers and significant central places. As long as the partnership of cities with villages goes on, cities will continue to survive; and by breaking this relationship, cities will collapse (Figs. 27 & 28) (Gaube, 1979, p. 8; Shafaghi, 2016a, p. 72).

According to the reports by historians, the conquest of Esfahan by the Arabs happened between 640 to 644 A.D. At the time of the Arab invasion of Iran and the subsequent conquest of cities, those with more significant military and defense-richness were forcefully invaded and looted by Arab troops. Jay was one of them, which was an important gathering and command center for the army. When the Arabs conquered the area, they founded their first mosque within the walls of Jay, in a noble’s house. At that time, the small, weak, and poor settlements, including Yahudieh, were spared from enemy attacks and thus became a safe place for immigrants (Golombek, 1974, p. 24; Shafaghi, 2002, p. 329).



**Fig. 27.** The ongoing flow of agricultural products from villages to small towns and from there to the larger cities and capitals, each of the major cities, has its area of influence. Source: Sirus Shafaghi



**Fig. 28.** The process of forming cities and their evolution. Source: Sirus Shafaghi

## 2.4.2. Switching the center from Jay to Khushinan and Yahudieh - Abbasid period (from the 8<sup>th</sup> to 10<sup>th</sup> century)

In respect to the transfer of power from the military city of Jay to near Yahudieh, Lotfollah Honarfar<sup>6</sup> quotes in his book “A treasure of historical monuments of Esfahan,” by Abu Nucaym<sup>7</sup> : in 767 A.D., Ayub, the tax agent and war commander of Baghdad Caliph in Esfahan set up residence in the village of Khushinan, which laid between the two towns of Yahudieh and Jay. A new mosque was built overlooking the banks of a water canal, the Nahr Fursan, and opposite the palace of Ayub. The Abbasid governor of Esfahan also established markets in the area toward Yahudieh, and at this time, the houses of Khushinan touched those of Yahudieh (Golombek, 1974, pp. 24, 25).

From that day forward, Jay, as a sender of migrants, lost his former boom, and the lack of attention of Arab rulers led to a steady decline in its growth. The administrative section has lost its role and has started to devastate. The relocation of the administrative and religious center from Jay to Khushinan adjacent to Yahudieh in 773 AD for a variety of reasons, including inviting adherents of other religions (Jews, Christians, Zoroastrians) to convert to Islam and beginning construction of the current Jame Mosque on the foundation of the former Zoroastrian fireplace (some sources pointed to a Church or a palace), led to increased development of Yahudieh.

Nevertheless, the rule of the Islamic regime brought about enormous social changes. The abolition of the “caste system”<sup>8</sup> in the area

reduced the ethnic class and religious differences between villages near Yahudieh, which had no significant socio-economic relationship until then and were living much more in a closed system.

Fig. 29 shows that the primary trend of these residential areas was toward the north of the river and around Yahudieh. As the relationship between these communities increased over time, they provided the basis for urban mass development. The need for inter-urban, urban and rural communication, economic prosperity, and the region’s privileged geography, all came together to promote Yahudieh’s commerce. In particular, its location along the caravan route (Fars and Kerman to Rey) significantly contributed to its rapid growth. The agricultural boom in the region, thanks to the Zayandeh-Rud river, resulted in a surplus of agriculture entering the city. It also made interactions between the city and the village more reliable and made the city’s economy and life more dependent on land. Esfahan of this era can be considered as an Islamic organic city.

As shown on the maps (Fig. 29), the names of the neighboring villages were: “Yavan, Khushinan, Ashkahan, Felfelan, Fursan, Karan, Travasgan, Fabian, Sonbolan, Khulijan, Tiran-Ahangran, Juzdan, and Lonban.” Most of these villages have formed old neighborhoods of present-day Esfahan, such as Felfelan, Sonbolan, Khushinan, and Fabian. Although some of these settlements, like Juzdan and Lonban, were relatively far from the old town center and located about three to four kilometers in the west and south-west direction. Reducing ethnic and religious conflicts and growing economic exchanges improved the communication lines and road networks. Gradually with the development of villages and population growth, they reached each other and formed the whole city of Esfahan (Golombek, 1974; Ministry of Culture and Arts of Iran, 1976; Shafaghi, 2002).

<sup>6</sup> Lotfollah Honarfar (Esfahan, 1919-2006) was a historian, Esfahanologist, archaeologist, writer, researcher, and professor at an Iranian university. From 1952 to 1960, he was the head of the Archaeological Department of Esfahan. In 1962, he received a doctorate in history from the University of Tehran, and after that, he taught Iranian history at the University of Esfahan.

<sup>7</sup> Abu Nucaym was a medieval Persian scholar and traveler, who was born in Buwayhid era Esfahan (934 to 1062)

<sup>8</sup> Sassanid society was immensely complex, with separate systems of social organization governing numerous different groups within the empire. Historians believe society comprised four social classes: 1/ Asronan (priests), 2/ Arteshtaran (warriors), 3/ Wastaryoshan (commoners), and 4/ Hutukhshan (artisans). At the center of the Sasanian Caste system, the Shahanshah ruled over all the nobles. The royal princes, petty rulers, great landlords, and priests constituted a privileged stratum and were identified as Wuzurgan or grandees. This social system appears to have been relatively rigid. The Sasanian caste system outlived the empire, continuing in the early Islamic period.

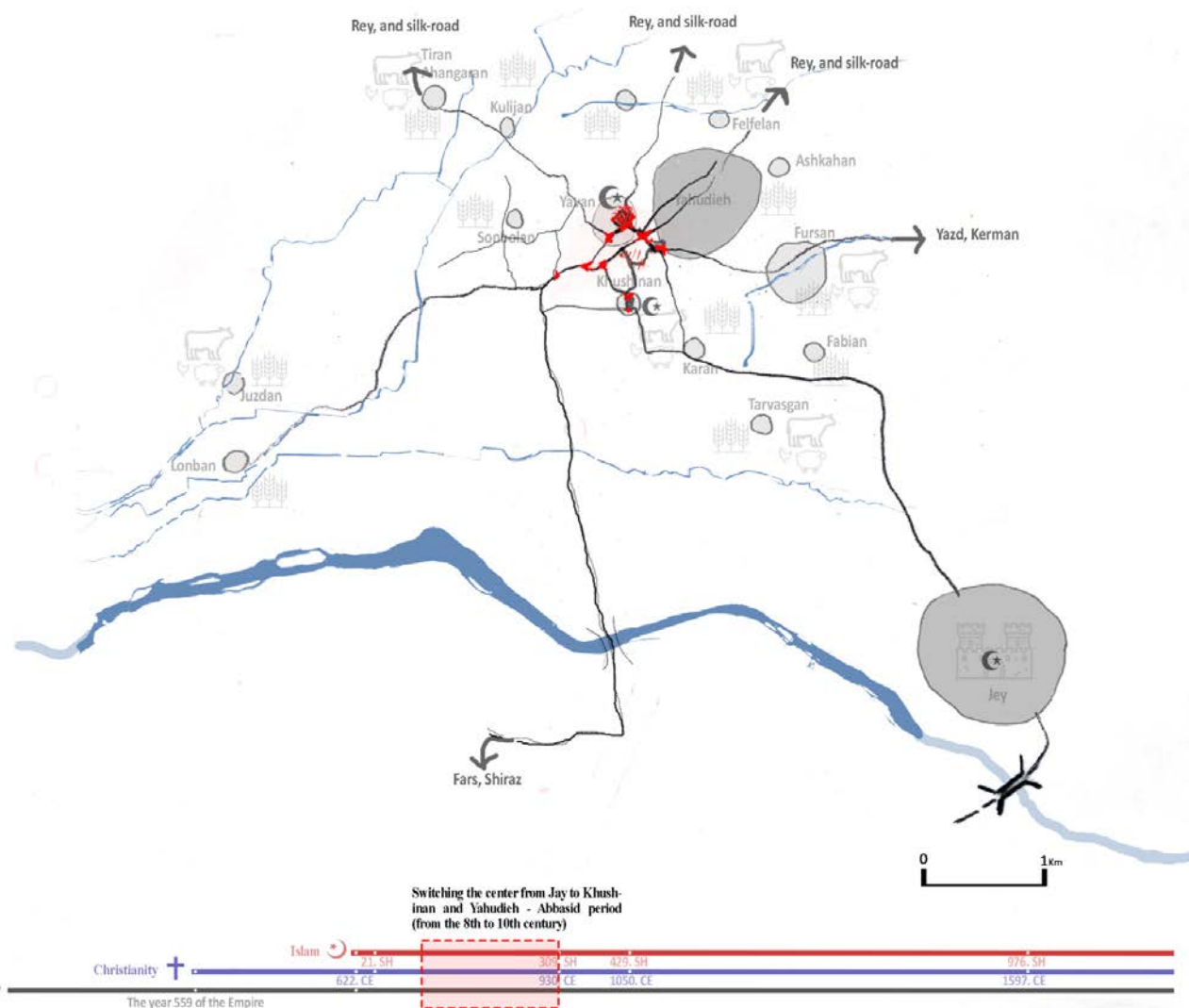


Fig. 29. Internal movement 955 A.C. Abbasid Period. Source: author

### 2.4.3. The walled city and the Mahallah organization - Al Buyid and Seljuq period (925 to 1138 A.C.)

In the 10th century, Iran regained political autonomy, with consequent economic, social, and cultural revitalization. In the first half of the 10th century, the most populated part of Esfahan was encircled by a fortified wall. The urbanized area outside the walled city incorporated Lonban to the west, Jay to the east, and the agricultural lands between them into a crescent-shaped area north of the river. By that time, Iran had not only achieved political autonomy but had fully absorbed Islamic ideals and principles into its traditional culture. This fact provided the creative impulse for a new direction and carried out over the following centuries. This synthesis is evident in the flourishing of science, the arts, literature, and the enormous surge in urban development (Ministry of Culture and Arts of Iran, 1976, pp. 18, 19).

Before the mid-10th century, there was no significant defensive change in the city. The city had no fortress until the arrival of Mardavij Ziyarid, who conquered Esfahan in the 930s, settled in the city until 935, and ended the Arab hegemony. He revived ancient Iranian customs, such as the celebration of the Sadeh and Mehregan in the city after three centuries. Esfahan became part of the Al-Buyid dynasty after Mardavij's assassination in the year 944. Hassan Rukn Al-Dawla tried to develop the city so that he chose it as the capital. The city's economic developments and relative security in the Diyalameh era made it possible for some world-renowned scientists<sup>9</sup> to live and work in the city (Shafaghi, 2002, pp. 329, 330).

The exact date of the walls is unknown, but the writing of Muqaddasi<sup>10</sup> dated 985 described

Esfahan as a walled city with twelve gates. Tradition attributes the construction of the city walls to Rukn al-Dawlah and the citadel to Fakhr al-Dawlah. Other structures known to have been built by the Buyids are the Vizier Sahib ibn Abbad House near the Toghchi Gate, where he was buried, the Jurjir Mosque built by the same Vizier, and the Ibn Sina Madrasah near the Dardasht Gate. Extensive work has also been done in the Jame Mosque. Tradition also attributes to this period the Maidan and the royal residence known as the Maydan-i Mir, which was situated in the old quarter of Dar al-Matbakh, on the east side of Atigh Square (Golombek, 1974, pp. 25, 26).

Soon after the walling of the city, the roughly oval area inside was divided into mahallahs or quarters. Although the names vary, most sources indicate four quarters inside the walls, including (A) Jubarah, (B) Karan, (C) Dardasht, and (D) Kushk (Fig. 30). Jubarah is still a well-known for the northeast quadrant of the city, corresponding to the ancient settlement of Yahudiyyah. According to Chardin<sup>11</sup>, Karan occupied the southeast quadrant of the city and was the older name for a large area, which more recently divided up into several districts. Dardasht district, in Chardin's description, covered the broad zone of the northwest quadrant and was also divided into several subdistricts. Dardasht neighborhood incorporated the villages of Yavan and Sonbolan. Kushk was the southwest quadrant of the walled city, which eventually became the Safavid quarter of Dawlat, the seat of government. These four neighborhoods, listed as the four original villages, joined together to form Esfahan (Golombek, 1974, pp. 26, 27).

<sup>9</sup> Including Abu Ali Sina, Sahib ibn Abbad, and Muhammad ibn Zakariya al-Razi.

<sup>10</sup> Muqaddasi, p. 389; Qazvini, p. 48; Mafarrukhi, p. 51, mentions a variant tradition naming Ala' al-Dawlah as the builder of the walls. The only reference to the building of the citadel is in Shaykh Hasan Jabiri, p. 18.

<sup>11</sup> John Chardin (1643- 1713) was a French jeweler and traveler whose ten-volume book *The Travels of Sir John Chardin* is regarded as one of the finest works of early Western scholarship on Persia and the near east in general.

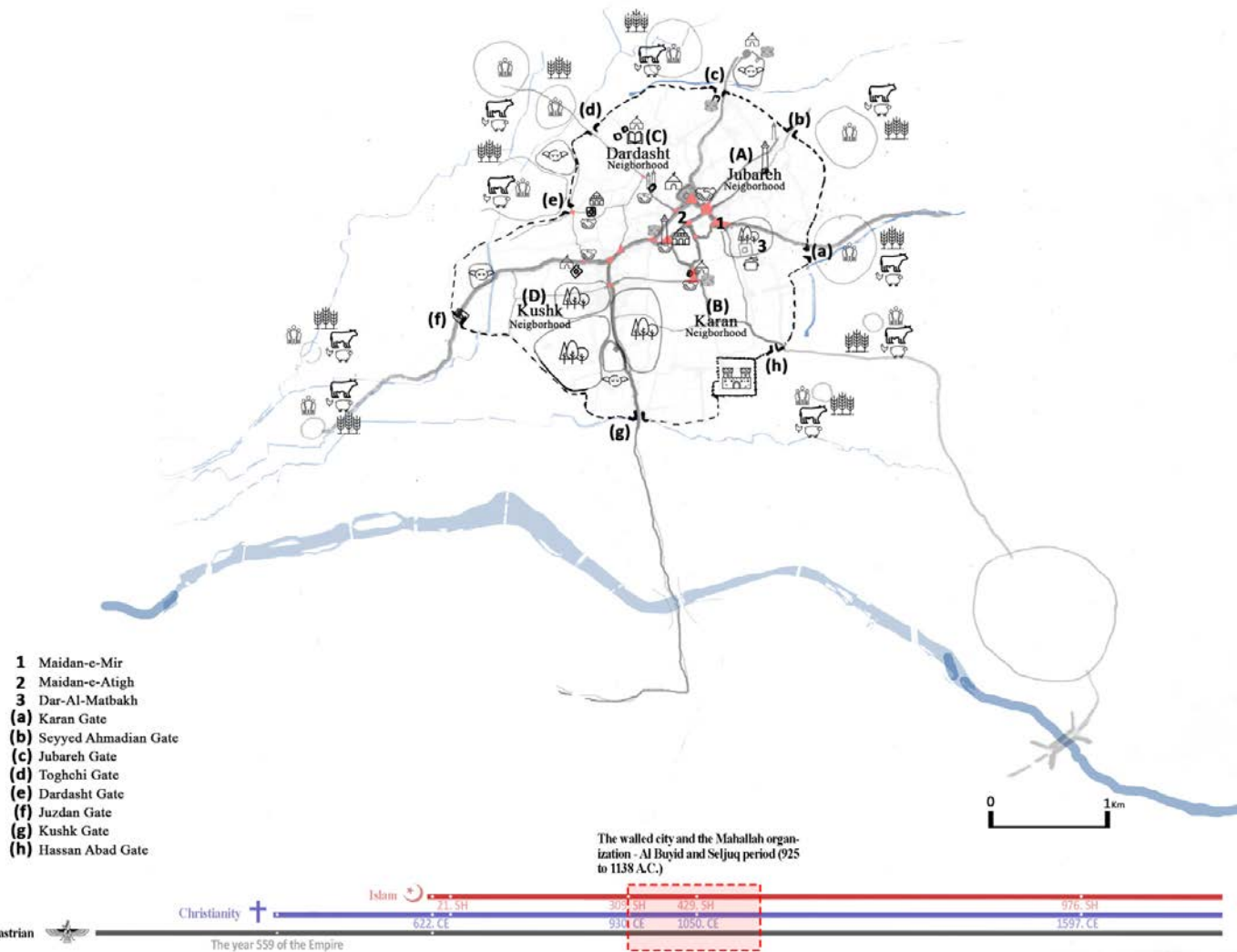


Fig. 30. Al Buyid and Seljuq Period, 935-1186 A.C.. Source: author

The city of Esfahan reached its glory days during the Seljuk era when the city became the capital of the great Seljuk Empire. The city expanded through the construction of many mansions and gardens built during this period. The Jame mosque and the Atigh Square, in their current form, remained of the works of this period. The prosperity and wealth of this city, in the middle of the 11th century, is evident in Nasser Khosrow's words<sup>12</sup> : "I have not seen a better, more comprehensive, and prosperous city than Esfahan in all Persian lands." Although he visited Esfahan in 1052 AD, one year after the Seljuq leader Tughril Beg captured Esfahan in 1051 AD (Naghsh-e-Jahan Pars Consulting Engineers, 2014, pp. 6, 7).

The writings of the traveler, Persian scholar, and scientist, Nasser Khosrow, in the eleventh century, highlight the main geographical features of Esfahan at that time:

- Madies existed throughout the city,
- There was a high water level in town wells,
- The impact of the construction of the city wall on raising the temperature of the city was notable,
- The existence of many caravans in central areas of the city transformed them into the commercial centers of the city,
- There was a credible Bazaar that traded only two hundred men in the currency exchange in a specified part of it.
- The Free importation of goods into the city was a specialty of Esfahan, represented the city's commercialization (Shafaghi, 2002, p. 272).

<sup>12</sup> Naser Khosrow (1004 - 1088 AD) was a Persian poet, philosopher, Isma'ili scholar, traveler, and one of the greatest writers in Persian literature. The Safarnama, an account of his travels, is his most famous work still used as an essential reference.

#### 2.4.4. Esfahan four centuries later: one of the wealthiest and most prosperous capitals in the world - Safavid period (1597 to 1722 A.C.)

After the Seljuk dynasty's extinction, Esfahan declined and was severely damaged in the thirteenth century by the Mongolian and Timur invasions; the city lost population, and many of its buildings were destroyed. The growth and prosperity of Esfahan occurred again after four centuries, during the Safavid era, and reached its highest point in all ages. Shah Abbas, who was continuously at war with the Ottoman Turks, moved its capital from Qazvin to Esfahan, further away from its hostile neighbor. By this way, by 1597, Esfahan became the capital of the Safavid dynasty. The prosperity of Esfahan during the Safavid period achieves its peak as one of the wealthiest and most prosperous cities in the world, with a population of about half a million people in an area of 80 square kilometers (Chardin, 1711). A new barrier, which had almost 55 kilometers of length, was built around the city, and the most significant urban development occurred in Esfahan during this time (Naghsh-e-Jahan Pars Consulting Engineers, 2014, pp. 6, 7) (Fig. 31).

We can imagine a very dense city within the walls, as seen in the precious perspective drawing of Esfahan by Adam Olearius<sup>13</sup>, "View on Esfahan" (Fig. 32). His drawing shows the capital in the middle of the 17th century as a walled traditional compact city, having different gates, tall minarets, dome roofs, prominent royal, and public buildings, and the primary central Maidan. The image also depicts some different camps of some rural residences outside the city walls, including other environmental elements such as the river and the surrounding landscape.

To develop and flourish the capital city and present the glory of the Safavid Kingdom, Shah Abbas ordered some experienced architects and urban planners who were called to Esfahan from all over the lands under his command to figure out how the city should be transformed. To this aim, they decided to expand the new city to the western and southern directions on both sides of the Zayandeh-Rud River.

<sup>13</sup> Adam Olearius was a German scholar, mathematician, geographer, and librarian. He became secretary to the ambassador sent by Frederick III, Duke of Holstein-Gottorp, and reached the Persian court at Esfahan (3 August 1637) and was received by the Safavid king, Shah Safi, and published two books about the events and observations during his travels.

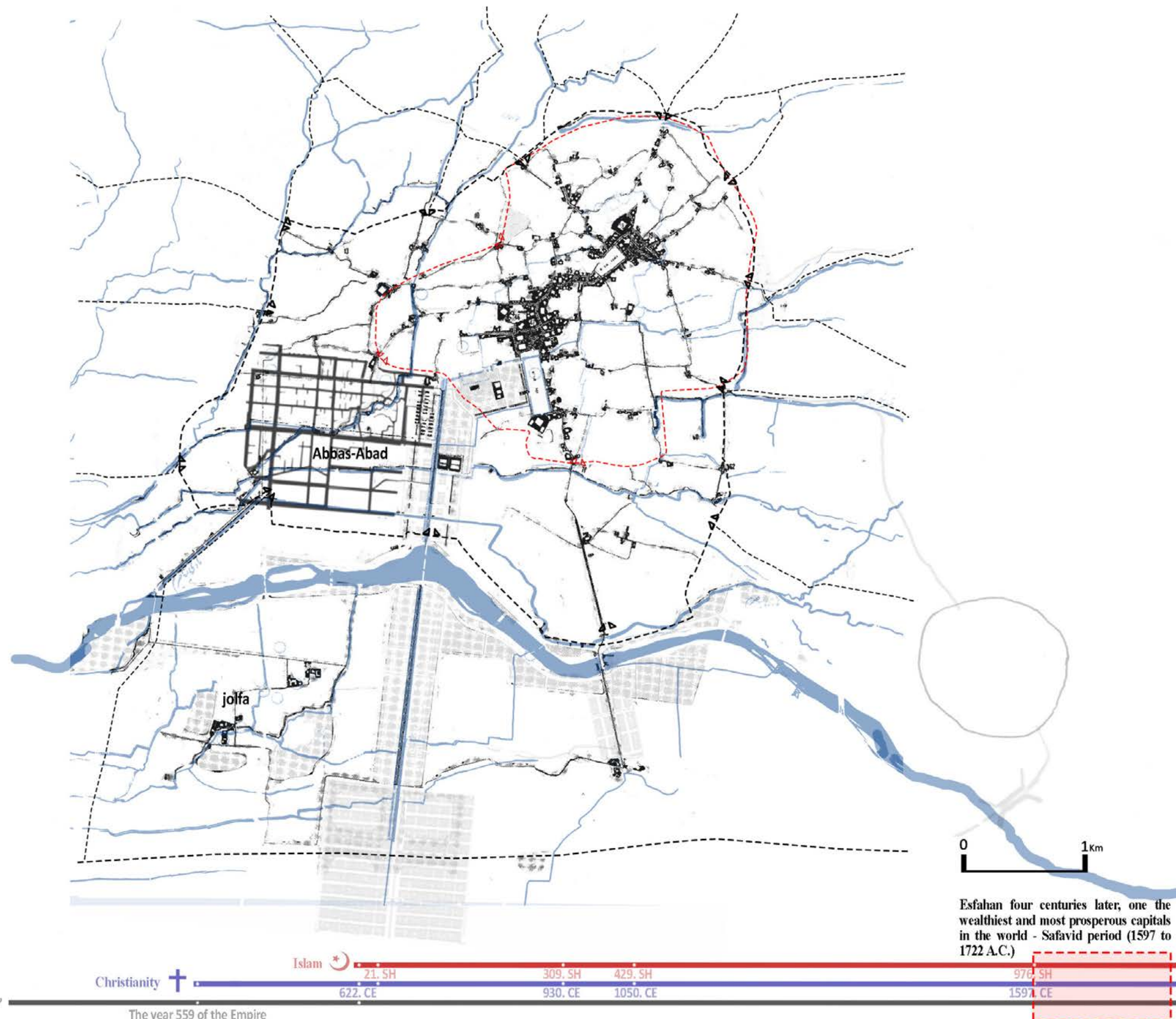
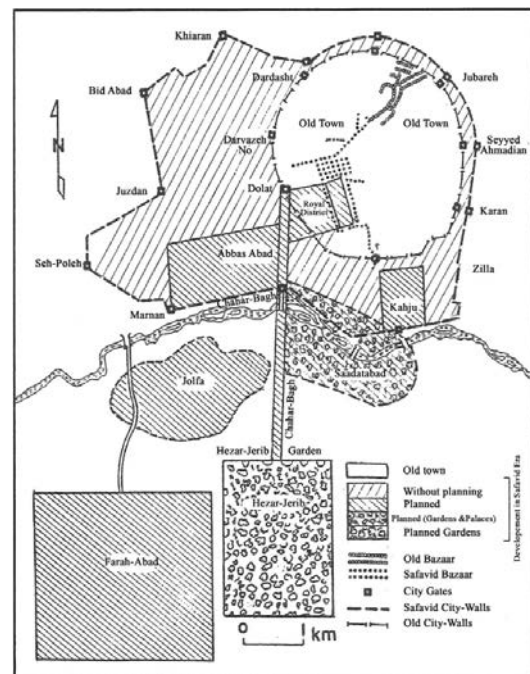


Fig. 31. Esfahan in Safavid Period, 1597-1722. Source: author



Fig. 32. View on Esfahan, seen in Adam Olearius, Vermehte Neue Beschreibung Der Muscowitischen und Persischen Reyse (Schleswig, 1656)

Since Esfahan was considered as one of the most important business centers in the world, urban planners of the Safavid era were mostly concerned with developing economic centers. The Esfahan Bazaar played a role in joining the old and new economic, cultural, and religious urban settings established along its course to enhance their prosperity. The new city developments extended from the southernmost parts of the city, mostly covered with gardens and agricultural lands; the plan did not face land ownership and transfer issues. Simultaneously with the city's expansion, the Bazaar extended toward the south. To preserve the old Bazaar segment and avoid economic downturns, the urban planners of that era linked the new Bazaar to the old Bazaar. In this way, they could link the two Maidans and their relevant central places through Bazaar. The entire project lasted about half a century, and Shah Abbas's successors could make great strides in developing the plans of that period (Shafaghi, 2016a, pp. 239, 240, 241).



**Fig. 33.** Esfahan Safavid Era Development Plan. Source: Sirius Shafaghi

Shafaghi's map represents two distinct surfaces: those parts that the government carried out based on the planned Safavid developments and the other part of the city that was developed and built by the people and residents and finally merged with the city (Fig. 33).

Different periods and various forms of development, each of which have imposed unique features on the geometry of the city, contributed to the construction of the Safavid city (Falahat, 2014, p. 102). The planned development areas include:

1. The new Maidan's construction (Shah Abbas square), and its surrounding incorporating and significant buildings as well as Ali-Qapu palace and royal district at its western edge,
2. The construction of 48-meter-wide Chahar-Bagh street and the Allahverdi-Khan Bridge (Si-o-Se Pol) to develop the city toward the southern side of the river and collect and connect all newly developed areas to the main Maidan, Bazaar and the center of the old city,

3. New residential neighborhoods including (a) Khaju neighborhood at the northern head of Khaju bridge, (b) Abbas Abad neighborhood<sup>14</sup> in the west of Chahar-Bagh and the north of the river, (c) Jolfa neighborhood in the west of Chahar-Bagh, and the south of the river, (d) Farah-Abad neighborhood in the west of Chahar-Bagh and south of the river.

4. Finally, new developments in the form of gardens and palaces, including (a) Hezar Jerib Garden in the southern head of Chahar-Bagh avenue, and (b) the complex of Saadat Abad gardens and palaces into the east of Si-o-Se Pol bridge and mainly at the southern bank of the river,

The rest of the city areas developed spontaneously and inside the new city:

1. The southeastern areas belonged to those parts of Saljuqid city ruined by the Mongol invasion, which people gradually redeveloped during the Safavid period,
2. The west and northwestern developed areas with a village origin were setting outside of Saljuqid city walls turned to different neighborhoods of the new city by fitting inside new city walls extension.

The attack of Ashraf-e-Afghan put an end to the Safavid dynasty (1722 A.C), a depressing vacuum occurred, which brought the city to the verge of destruction; city quarters that had once contained 600,000 active inhabitants suddenly found themselves empty. The remaining population of 100,000 people continued a little life in the surviving parts of the city (Ministry of Culture and Arts of Iran, 1976, p. 20).

The city almost kept its previous size during the 18th and 19th centuries without having any growth, until the 1920s. Since then, it started to change enormously through the rapid industrialization and modernization of the country, which led to a considerable increase in growth rates for the urban population and the beginning of the migration from rural to urban centers. Despite the city's extensive changes over the last century, the center of Esfahan still contains many of the same structures that were built during the Safavid period throughout the 16th to 18th centuries.

<sup>14</sup> The southwest part, including Tabriziha (Abbas Abad) neighborhood, is one of the important developing areas of Shah Abbas's plan areas, evidently using a regular grid in terms of new developments in this sector.



## CHAPTER 3: "GROUND" AND "WATER" CITY

### 3.1. ANCIENT "DIRT ROADS": FROM THE GLOBAL TO THE LOCAL INTEGRATION

#### 3.1.1. Beyond the City Gates

#### 3.1.2. Inside the City Gates: Interweaving Different Systems of Mobility

##### 3.1.2.1. Primary Movement System

- Bazaar and Rastih

- Guzar

##### 3.1.2.2. Secondary and Tertiary Movement Systems

- Kuchihs and Bunbasts, The Residential Pathways

##### 3.1.2.3. Planned Straight Passages

##### 3.1.2.4. Madi Network: Watering the Land, Structuring the City

### 3.2. CASES OF STUDY

#### 3.2.1. The Bazaar: A Chain of Various Nodes

##### 3.2.1.1. Development and Growth of Bazaar

##### 3.2.1.2. Critical Aspects in the Construction of a Bazaar Node; Se-Rah-e-Nim Avard

#### 3.2.2. From the Center of the Neighborhood to the Courtyard of a House

##### 3.2.2.1. Permeability in the Configuration of a Residential Cluster

##### 3.2.2.2. Interior Spatial Organization of Traditional Houses

##### 3.2.2.3. Public, Private, and Service Domains in Two Ordinary and Wealthy Traditional Houses

#### 3.2.3. Encounter Points with the Water Movement System

##### 3.2.3.1. The Complex of Madrasah-Yi-Mādar Shah: Synergies among Different Building Programs

##### 3.2.3.2. Historic Bridges as Urban Intersections

- Shahrestan Bridge

- Marnan Bridge

- The Precedent of Si-o-Se Pol Bridge

- Khaju Bridge: An Intersection as a Hybrid Infrastructure

Fig. 34. Esfahan Bazaar, Serah-e-Nimavard and Serah-e-Bagh Ghalandarha. Source: "Esfahan city of light" exhibition catalogue, 1976.



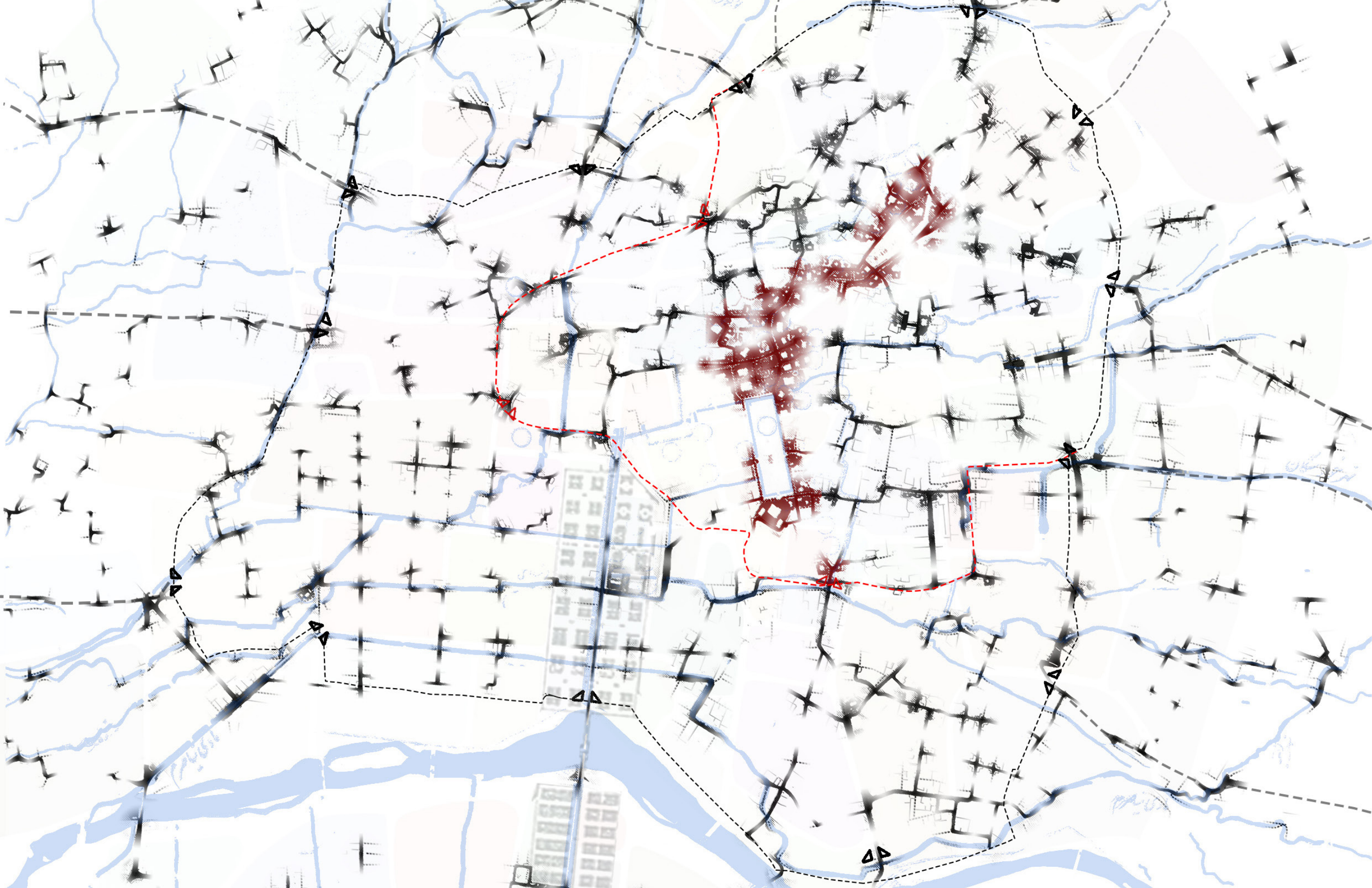




Fig. 35. Esfahan with mountain background from 400m altitude, February 1925. Source: Walter Mittelholzer

### 3.1. ANCIENT "DIRT ROADS": FROM THE GLOBAL TO THE LOCAL INTEGRATION

#### 3.1.1. Beyond the City Gates

Esfahan city's central location in the country has turned into a destination and it has a prominent position in terms of network connections. Esfahan has always played the role of linking the country's eastern lowlands to the western mountainous regions. Caravans chose Esfahan as a destination for relieving their road fatigue when traveling from the western mountainous region to the eastern low-areas (Shafaghi, 2002, p. 247).

The growth and development of historic cities, including Esfahan, might be sought from the perspective of exchange and commercialization. Generally, important manufacturing production centers are in cities, governments become dependent on the cities' economies, so that they are normally concerned about commercial centers' development. This fact led the attention, to the setting up of roads, Caravansarais<sup>1</sup>, and Abanbars<sup>2</sup>, especially in dry areas with less rainfall such as the eastern part of the Esfahan region. Also, the safety of commercial roads was one of the essential tasks of the central government.

Since ancient times, almost all major Iranian cities have been situated along major trade routes and the desert fringe, which nowadays are considered major modern cities. The main east-west route was for commercial and military purposes, which mostly followed the southern foothills of the Alburz Mountains. It was part of the famous Silk Route (Jāddih-ye-Abrisham), the most important commercial route of the ancient world, covering more than ten thousand kilometers from China to Syria. Starting at the northern and western borders of China and passing through the present Soviet Central Asia. This route crossed the Iranian Plateau and, passed through Mesopotamia, proceeding through Syria to the port of Antioch on the shore of the Mediterranean Sea (Kheirabadi, 2000, pp. 40, 41).

<sup>1</sup> A Caravansarai or caravansary, was a large building within the city where the caravans were staying or a roadside inn where travelers (caravans) could rest and recover from the day's journey. Caravansarai supported the flow of commerce, information, and people across the network of trade routes covering Asia, North Africa, and Southeast Europe, most notably the Silk Road.

<sup>2</sup> "Ab" means water, and "Anbar" signifies storage facility. An Ab-Anbar (water reservoir) is a traditional reservoir or cistern of drinking water in Greater Iran in antiquity. This specially designed subterranean space holds clean water, usually employing wind-catchers and was fed by Qanats.

Within the Iranian Plateau, the Silk Road linked some significant ancient cities such as Nishāpūr, Rey, Qazvin, and Tabriz. Among them, major capitals of Iran were situated along the route since the time of the Median Empire in the seventh century B.C., as well as Dāmghān, Ecbatana (present Hamadan), Qazvin, and Rey, adjacent to the country's current capital, Tehran (Kheirabadi, 2000, p. 41).

Another significant north-south route linked the cities of Rey with Esfahan and continued through Shirāz and down to the Persian Gulf (Siroux 1949).

In Esfahan, six major trade routes were converging in the location of Atiq square and included the main directions north-south, east-west, and northeast-southwest (Fig. 36).

- Both **the northwest** (1) and **the northeast** (2) corridors linked the city to the Silk Road in long distance. The north-western corridor was linked with the gates of Dardasht and Darvazeh Tehran and passed through some prominent cities such as Meimeh, Delijan, Salafchegan, Saveh, and Tehran. The northeastern corridor was linked to the gates of Toghchi and Yahudieh and passed through Zeinabieh's tomb (ninth century) and linked the cities of Ardestan, Kashan, Qom, Rey, and Tehran.

- **The southern** corridor (3) connected the southern gates to various cities such as Shahreza, Abadeh, Persepolis (Achaemenid Empire's ceremonial capital-550-330 BC) and, after reaching Shiraz, it divided into different branches, each leading to distinct ports on the Persian Gulf-front, such as Bandar-e-Bushehr and Bandar Abbas.

- **The east** corridor (4) connected the eastern historic gateways to various ancient cities such as Naien, Yazd, Rafsanjan, Kerman, Bam. It continued in various subdivisions as far as Bandar-e-Chabahar, in the shore of the Oman Sea, and some neighboring countries such as Pakistan and India in South Asia.



Fig. 36. Esfahan on the intersection of national and international ancient trade routes. Source: Abbas Shahab, Sahab geographic & drafting institute, founded in 1936, edited by the author

- **The western corridor (5)** connected the western city gates to diverse cities of Najaf-Abad, Khonsar, Golpayegan. It continued toward Brujerd, where it met with the other old road coming from Soltanieh and Qazvin, crossing through Khorramabad and running toward Baghdad by passing through Nahavand, Kangavar, and Kermanshah valleys (Siroux<sup>3</sup>, 1978).

- **The south-western corridor (6)** linked the city gates to such essential cities as Shahre-Kord, Izeh, and Ahvaz, and continued toward the Persian Gulf and Lower Mesopotamia. Due to ridges as high as 4000 meters in summits and folds parallel to the mountain range that required crossing several bends and meandering paths, the high mountains that separate the plateau from the lower Mesopotamia were a severe obstacle. Due to harsh winters and constant storms, these paths were undependable and unreliable, particularly during times when modern transportation did not exist. (Siroux, 1978).



**Fig. 37.** Qaleh Tabarak, (1912-1914) taken by Henry Viollet, the French archeologist and architect.

Besides the six ancient primary trade routes, which went to very far distances, the two other ancient routes provided additional accessibility in the region.

First, the southeast corridor was considered to be one of the most critical passages linking the ancient bridge of Shahrestan and the ancient city of Jay (in less than a 500-meters distance from each other) located in the southeast of Yahudieh village and the old temple (the current Jame Mosque) in a distance of almost 4.5 kilometers. The construction of the Qale Tabarak<sup>4</sup> (built in the 9th century) adjoined with the first city defensive wall and adjacent to the Karan gate might reflect the conflicts between the city of Esfahan and the ancient Jay's citadel at that time (Fig. 37).

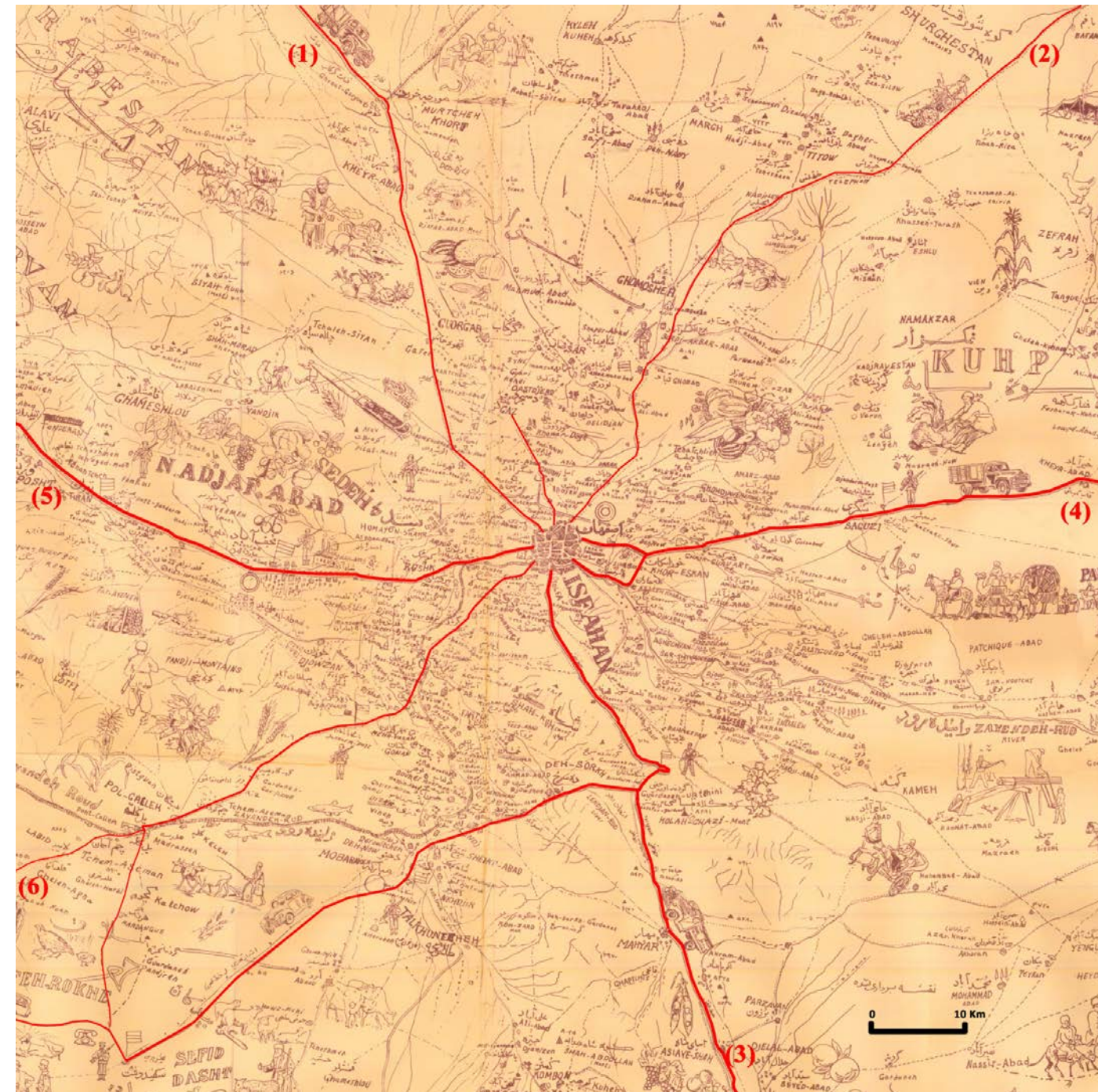
Second, in the north direction, there have been a series of radial roads connecting the northern gates of Toghchi and Yahudieh to some multi-centric and historic agrarian villages, such as Dolat Abad, Habib Abad, Dastgerd, Gaz, Khorzuq, 10 to 20 kilometers away.

In the Safavid period, these eight territorial ancient trade routes went through the thirteen gates that included (1) Chaharbagh, (2) Khaju, (3) Darvazeh Zilla, (4) Karan, (5) Seyyed Ahmadian, (6) Jubareh, (7) Toghchi, (8) Dardasht, (9) Darvazeh Tehran, (10) Bid-Abad, (11) Juzdan, (12) Se-Poleh, (13) Marnun (Fig. 40).

<sup>3</sup> French Engineer Maxime Siroux, who passed away in 1976, determined the Caravansarais and major buildings alongside caravan ancient routes. The French Association of Eastern Archeology has published his notes and reviews in Cairo, I. F. A. O. C, in his diary, and the book "Ancient Roads of the Esfahan Region and their Affiliated Buildings" is one of them (Mashayekhi, 1978).

<sup>4</sup> Qaleh Tabarak, located in the southeast of Esfahan, has been one of the most important works of the Buyids period (932-1055). Tabarak Castle was not the oldest citadel in the region, as Ibne Rasta, who lived in Esfahan in the 10th century, wrote about Kohandehz, situated in Jay's town (Old Esfahan). Kohandehz was a fortress outside of the city until the end of the Safavid period, when it was destroyed by the Ashraf-e-Afghan invasion and became known as Ashraf hill.

The Tabarak citadel transferred to one of the Esfahan families during the reign of Zel-Al-Sultan in Esfahan (1910-1919). After the castle's demolition from 1941 to 1946, its land was divided into smaller parcels and converted into 615 plaques, residential units, and stores, forming a new community of the same name on the castle site. The inhabitants of Tabark Castle are, now, non-indigenous people and immigrants from other cities and villages near Esfahan.



**Fig. 38.** Esfahan in the province, the eight Ancient roads that linked the city to outside, source: Abbas Shahab, Sahab geographic & drafting institute, founded in 1936, Edited by the author

### 3.1.2. Inside the City Gates: Different Interweaving Systems of Mobility

Like many cities, Esfahan had gates and defense walls that through daily communication routes, led to significant urban centers such as the Jame-Mosque, the Bazaar, and the principal city squares. As intermediate elements, the city gates were linked to the suburbs and the city's outskirts by joining the significant routes of intra-city access to the previously listed regional corridors. These primary urban public passageways were built in a way to cater pack-animals<sup>5</sup> traveling to warehouses, stores, and retail shops. (Shafaghi, 2016a, p. 257).

The gateways to the cities were often places for collecting customs duties upon entry and exit of goods and at the same time, monitoring the aliens' entry and exit. The best example of this can be seen at the northern head of Shahrestan bridge (near the former location of the ancient city of Jay), which continued to operate until the Pahlavi era (1921-1978), and was known as the Navagholi<sup>6</sup>, dating back to the early Islamic centuries (Shafaghi, 2016a, p. 260) (Fig. 39).

From the middle ages to modern times, the gateways of Islamic cities in the Middle East offered many religious and spiritual services to travelers, including a guarded area with a small mosque and a temporary accommodation for passengers to pray, and for their visitors to escort them and say their goodbyes.

These gates were closed at night, and all passengers and business convoys had to reach the city before they were closed. (Shafaghi, 2016a, p. 262).

Merchandise and goods coming from faraway distances, after being isolated and examined outside the city's defensive walls, would be transported to the central Bazaar by pack-animals or by a specific group of people who were



Fig. 39. Esfahan, Nawagholi of Shahrestan bridge, July 2010. Source: Petr Adam Dohnálek

transporting goods as their profession called "Hamal"<sup>7</sup>. The Hamal-ha mosque located in the central Bazaar of Esfahan is reminiscent of them. (Shafaghi, 2016a, p. 263).

From the city gates, different systems of movements defined their respective "harmonic orders" and spheres of gravity, weaving together an overall pattern. The distinct primary, secondary, and tertiary systems were noticeable, while the intersection points generated diverse urban "blossoms" at the city, community, and neighborhood levels.

A close analysis will show how these synchronized movements and their interactions have resulted in a complex unity that points out Safavid Esfahan as a remarkable example of "harmonic order" (Ardalan and Bakhtiar, 1975, pp. 96, 97). Despite the basic image of Islamic cities' networks that are mazes of irregular and twisting lanes, the Esfahan system of mobility was not random, but was rational in its design (Kheirabadi, 2000, p. 30).

<sup>5</sup>Pack-animals: an animal used to carry loads, like donkeys, camels, etc.

<sup>6</sup>Nawagholi is one of those jobs that had much higher salary compared to other jobs. The administration of the Nawagholi was the same as the Road Administration.

<sup>7</sup>Carrier

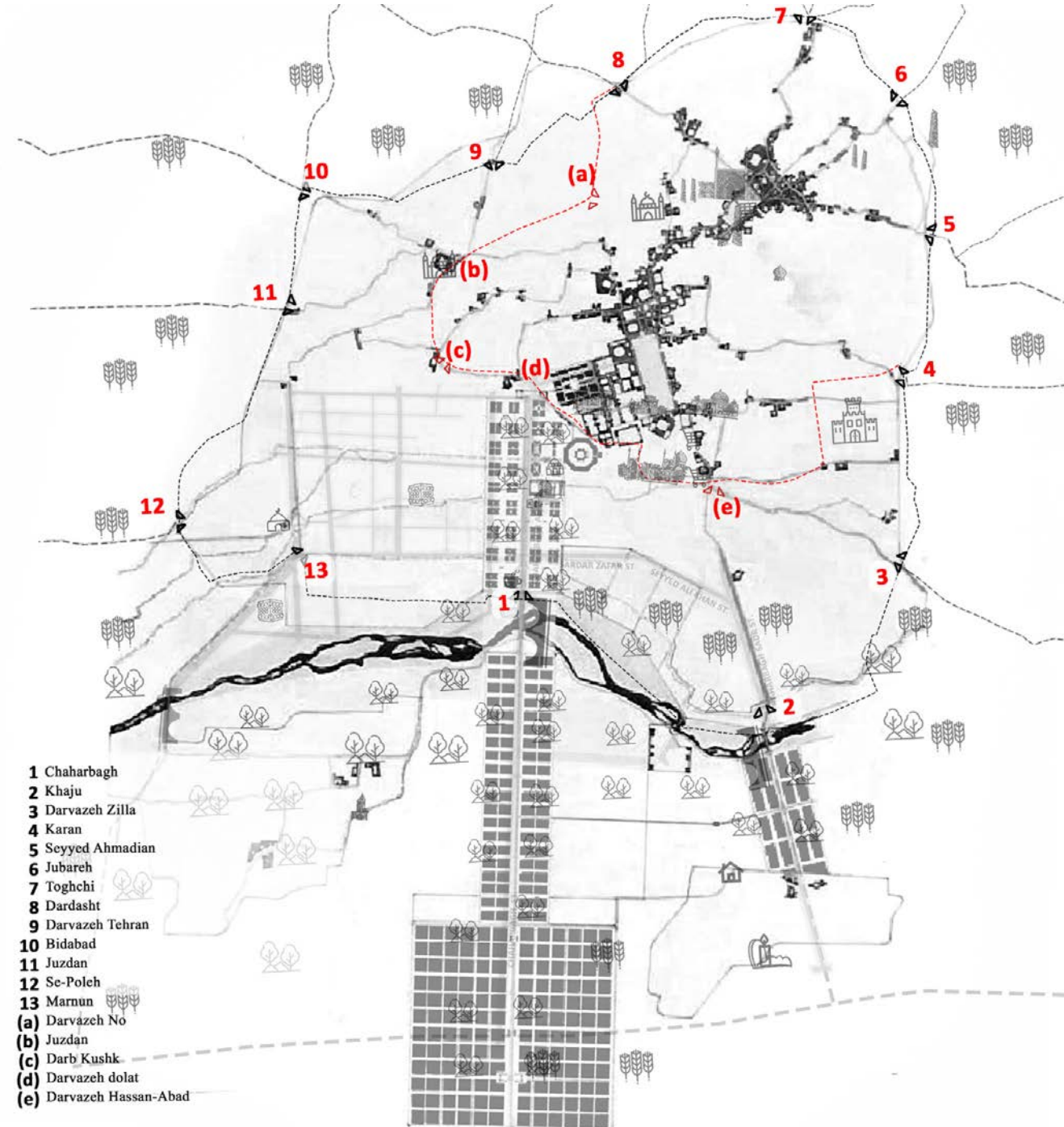
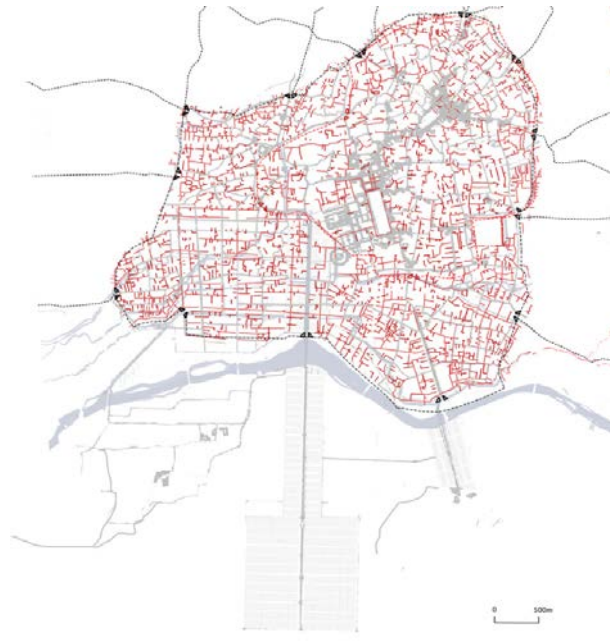


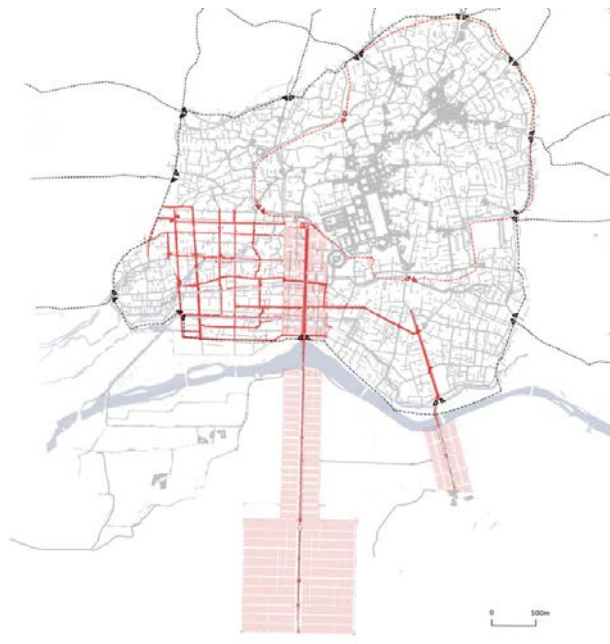
Fig. 40. From the gates to the centers, the plan was reproduced by the author from the maps of Safavid Esfahan by Naghsh-e-Jahan Pars consulting engineers and the reconstructed map of Esfahan in the Safavid era by Mahvash Alemi.



**Fig. 41.** Primary road system of Bazaar, Rastihs, and Guzars, Source: author



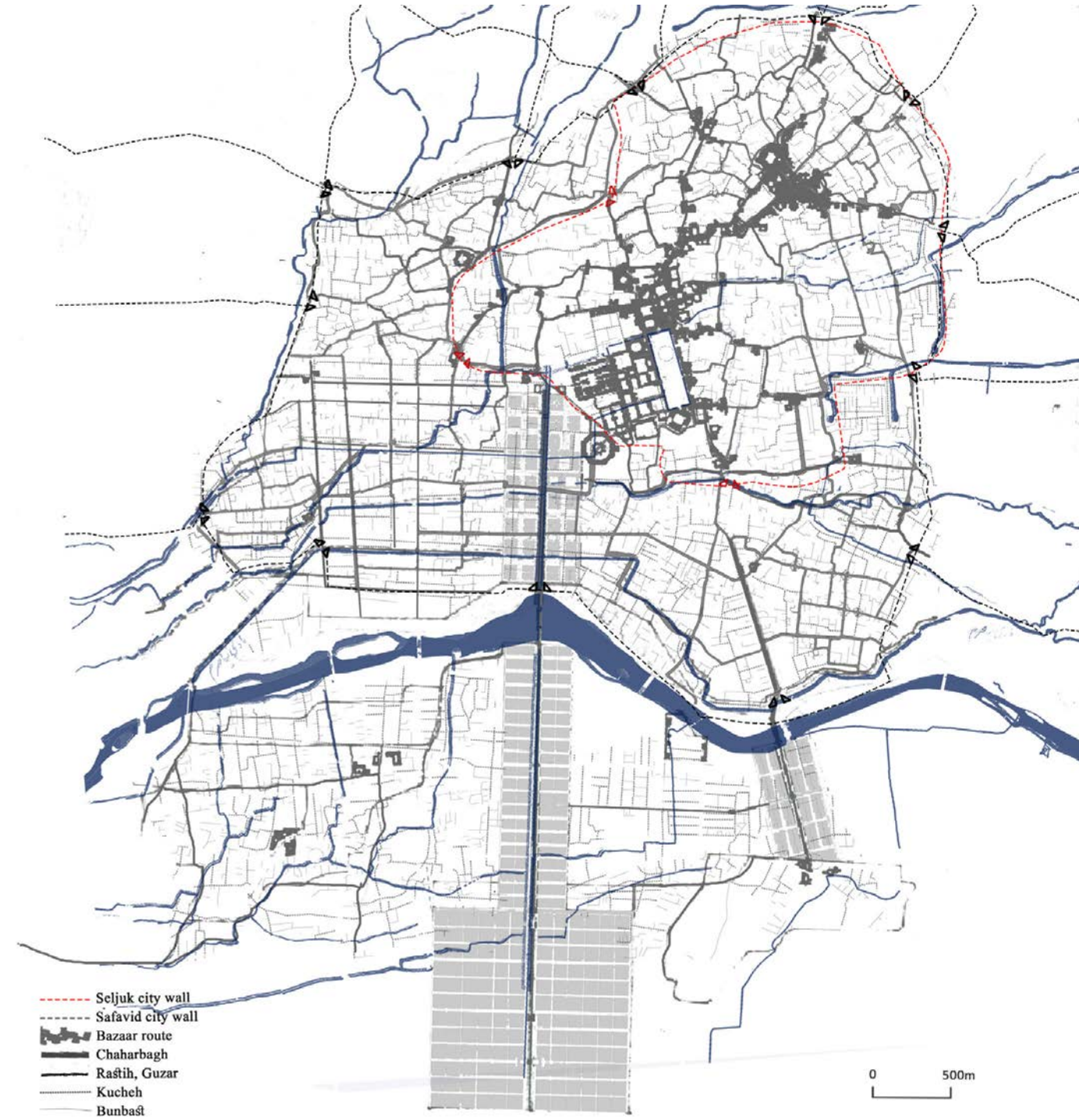
**Fig. 42.** Secondary and tertiary road systems of Kuchihs and Bunbasts, Source: author



**Fig. 43.** Straight planned passage of Chahar-Bagh Avenue and the Abbas-Abad neighborhood's regular grid. Source: author



**Fig. 44.** The infrastructure network of Madies accompanied by ground passages. Source: author



**Fig. 45.** Hierarchy of mobility system, Source: author

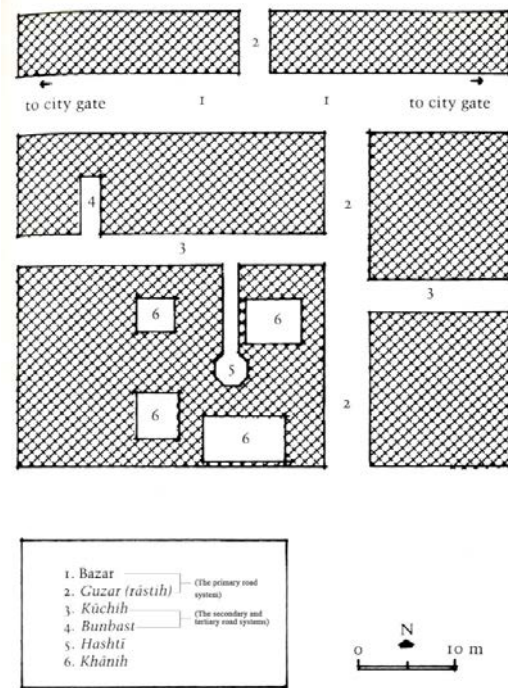
To understand the logic of the system of movements inside the city, different factors must be considered: (a) the origin and destination of each course, (b) the path functions, (c) the adjacent urban elements, and (d) the type of accessibility (Ahari, 2001, p. 171). Taking them into concern and considering the planned or organic geometry of the passages, the mobility system of the city can be hierarchized into four distinct categories:

- The primary road system included, the **Bazaar** as the city spine, constituted by varying nodes chained by different stretches called **Rastih** and **Guzars**, which were the main passages connecting the city center to the surrounding neighborhoods centers and the city gates.

- The secondary and tertiary systems included **Kuchihs** (connecting different Guzars) and cul-de-sacs' (**Bunbasts** in Persian) with narrower sections related to the residential areas<sup>8</sup>.

- A new typology of **straigh and planned passages** was introduced in the Safavid period, including Chahar-Bagh Avenue and the Abbas-Abad neighborhood's regular grid.

- The infrastructure network of **Madies**, along with their role of irrigation, is often accompanied by ground passages on one or two sides and spread throughout the whole city, bringing water and green inside the city borders (Figs. 41 - 45).

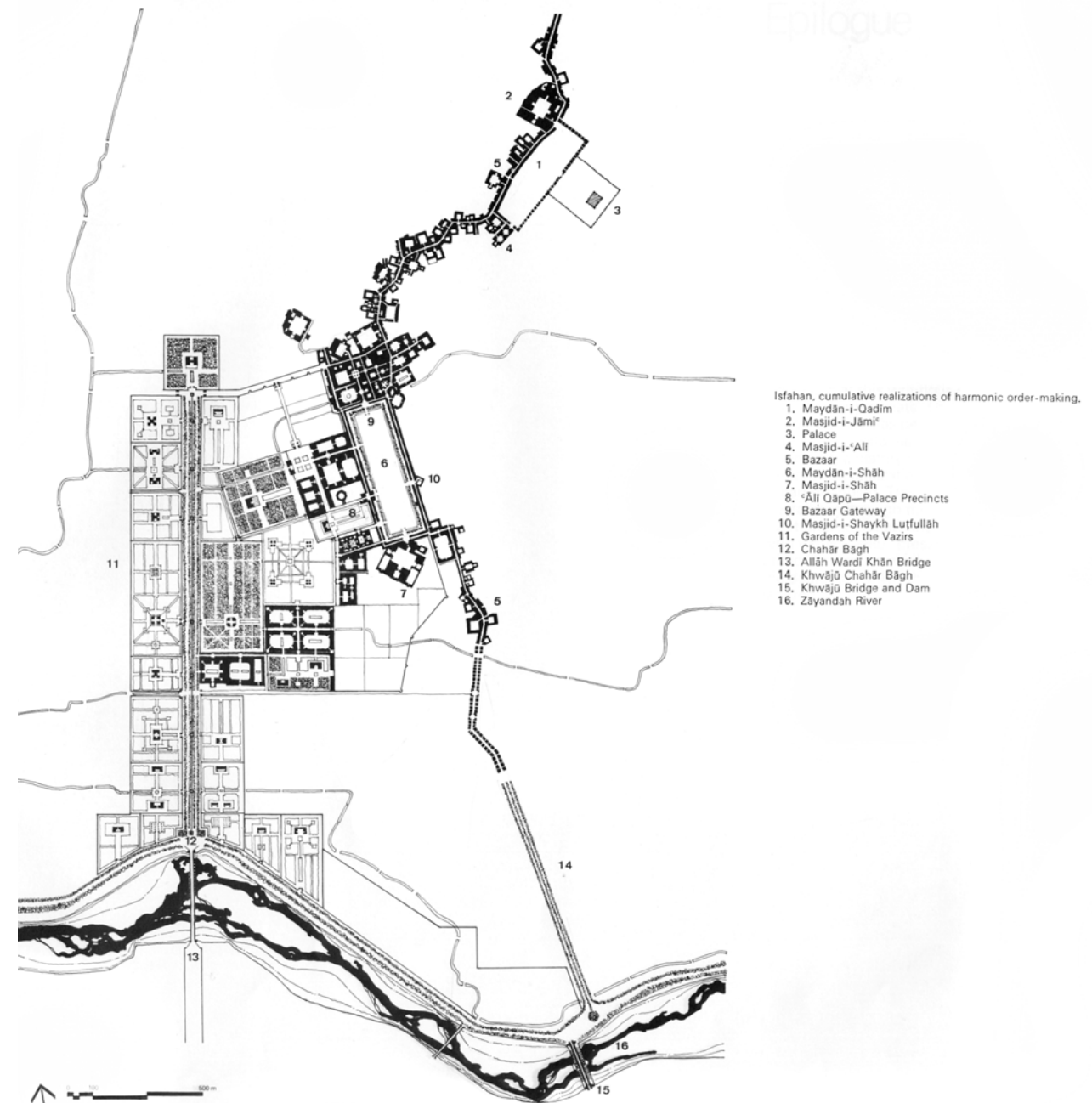


**Fig. 46.** Model of the access system in the traditional Iranian cities, Source: Masoud Kheirabadi

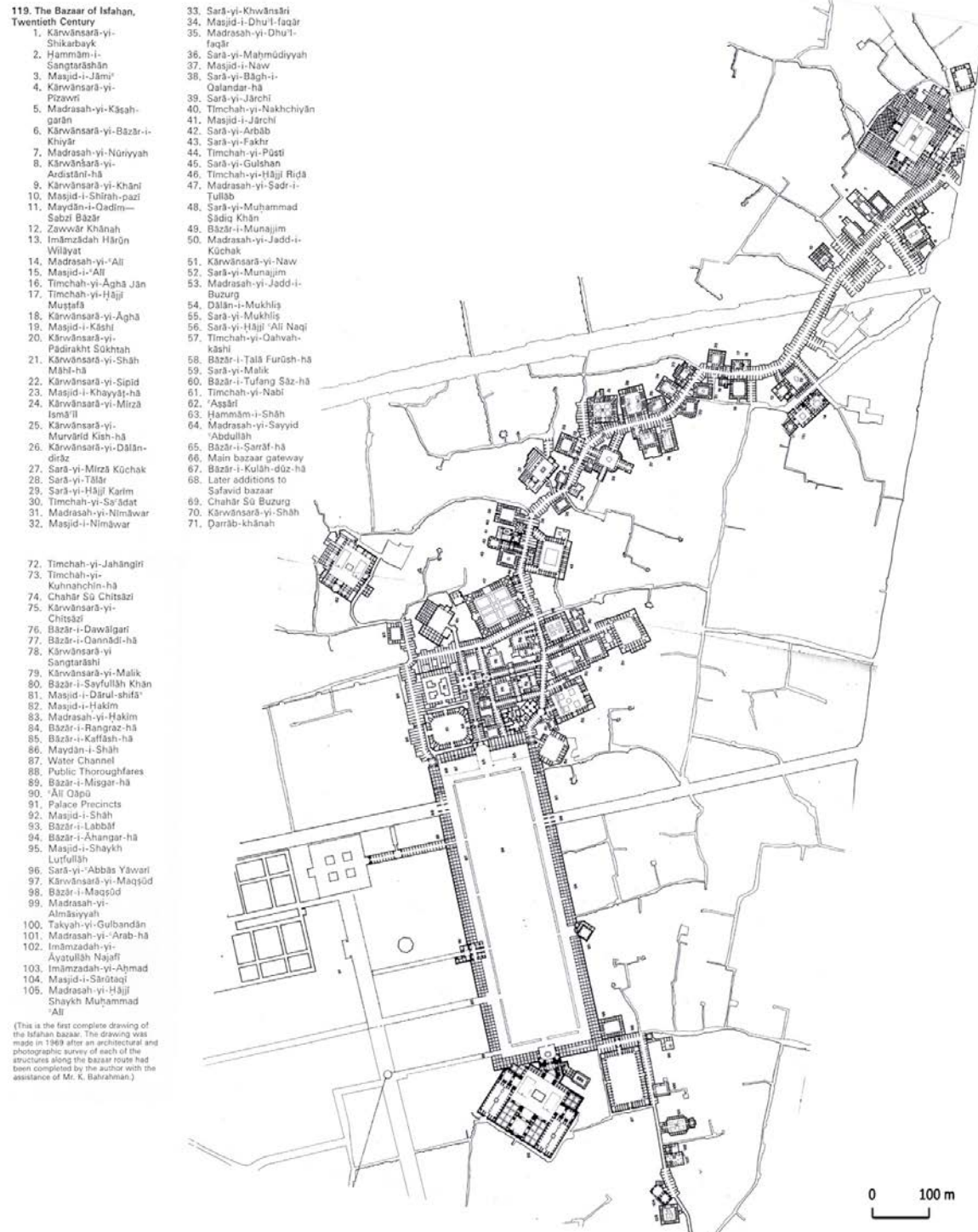
<sup>8</sup> Considering the traditional traffic network hierarchy, Masoud Kheirabadi explains: "A model of the access system for traditional Iranian cities can be devised utilizing all elements of the traffic network. This model may not totally fit all traditional Iranian city traffic networks, particularly those of smaller towns. However, it can, with some minor variations, explain the spatial hierarchy dominating the traffic network in traditional Iranian cities. This model traffic network in its totality includes five major elements: the bazar, guzars, kuchihs, bunbasts, and hashtis" (Kheirabadi, 2000, pp. 28).

### 3.1.2.1. Primary Movement System

#### ▪ Bazaar and Rastih



**Fig. 47.** Plan of Esfahan showing the essential of the pre-Safavid city and of the Safavid development. Source: "The sense of Unity" by Nader Ardalan and Laleh Bakhtiar. University of Chicago Press, 1973.



**Fig. 48.** Plan of Esfahan Bazaar, from 'The Sense of Unity' by Nader Ardalan and Laleh Bakhtiar. University of Chicago Press, 1973.

Since Esfahan Grand Bazaar's starting point coincides with Esfahan Jame-Mosque's entrance (Masjid-i-Jāmi'), it makes sense to start the Esfahan Bazaar study by briefly addressing this place. This historical milestone represents the cumulative work of many generations built mainly during the Seljuq period (Ardalan and Bakhtiar, 1975, p. 105).

As a crucial reference point, the Jame Mosque has been built on the foundation of an ancient temple (some sources point to a church or a palace) inherited from before the Islam period with a slightly higher topographical elevation, which this slight elevation difference has been very important (Fig. 50). Due to the immense size of the mosque (over 20,000 square meters) and its multiple entrances<sup>9</sup>, the mosque formed a pedestrian hub, linking the arterial network of paths across the city. Far from being a holy and religious insular monument, the mosque facilitated public mobility and commercial activity and thus, exceeded its primary function as solely being a place of prayer.

According to many references, Bazaar-e-Arabha adjacent to the front of the main entrance of the Jame-mosque (southeastern door) is supposed to be the original place in the formation of Esfahan Grand Bazaar.

Due to the city's expansion and development, the Grand Bazaar's main route was extended from the North Gate (Toghchi gate) to the Seljuq Maidan-i-Qadim, which served as the western edge of the large Atiq square. The old square with its surrounding residential districts has formed the oldest city central areas. This square probably being officially built and advanced during the Seljuq era, was the ending point for all the city gates and was surrounded by the royal palaces of the Shah. This square has been the city's beating heart for centuries, however, with the rise of the Safavid dynasty and the construction of the new square, its importance has declined. The Atiq square, which has recently been rebuilt and rehabilitated as part of a national project, will be one of the study cases of the fourth Chapter (Fig. 51).

<sup>9</sup> Initially, nine entrances to the mosque provided easy access from all directions in line with its position as the city's heart.

Later in the Safavid period, by the construction of the Maidan-i-Shāh in the 16th century, the Bazaar route was extended further over time, up to the Seljuq gate of Hassan Abad and Khaju Bridge. Thus, a shaded route was created from the Khaju Bridge on the southeast to the northern gateway, encompassing the primary commercial, religious, and governmental activities of the city, and formed some central nodal and dependent spaces of this system (Ardalan and Bakhtiar, 1975, p. 97).

The length of the Grand Bazaar of Esfahan as the most integrated passage of the city is approximately 2,500 meters. This passage was 4 to 7 meters wide and 4 to 8 meters high, linking the Toghchi to Hassan Abad gates in the Safavid period. Today, although there is no significant trace of these gates, a significant part of this central passage is still covered with old brick arches and domes due to numerous repairs and reconstruction projects over time (Shafaghi, 2016a, pp. 491, 492).

Actually, the Bazaar, City square, and Caravansarai are the principal elements in Iranian cities as the places that accommodated the most intensive part of urban activities in a traditional city and provided the interface between city residents and outsiders (Karimi, 1997, p. 05.12).

The origin of the "Bazaar" term in the Pahlavi<sup>10</sup> language was "Vachar," which means a gathering place. This term clearly shows that the Bazaar was the city's life, and its urban role goes beyond the basic perception of being a mere place for trading or buying and selling goods. People could easily access many needs and activities in and around the Bazaar, which had economic (trade, storage, and production) and non-economic origins (religious, educational, sociopolitical, recreational, and services). However, this classification is mainly useful in terms of research, for the reason that separating the structural elements of the Bazaar can bring along the risk of oversimplification in a traditional society where religious, political, economic, and other activities are closely interrelated (Kheirabadi, 2000; Ameli Najafabadi, 2015)

<sup>10</sup> The Modern Persian language (the current official language of Iran, Afghanistan, and Tajikistan) is a continuation of the Pahlavi or Middle Persian language, the official religious and literary language of the Sassanid Empire (224-651 AD), which itself is a continuation of the Old Persian language used in the Achaemenid Empire (550-330 BC).





**Fig. 49.** Looking north towards the Friday Mosque with the bazaar route (foreground) traced by the continuous line of brick domes, Source: The architectural review, Sherban Cantacuzino, 1976.



**Fig. 50.** The elevation difference between the floor of Pishkhan Maydan and Jame mosque entrance, March 2022 source: author



**Fig. 51.** Atiq (Emam Ali) square, 2014, by Mousa Soltanian

The commercial elements of Caravansarais<sup>11</sup>, Sarais<sup>12</sup>, Timche<sup>13</sup>, had the highest spatial significance in the Bazaar, besides other essential non-economic structural elements such as Mosques, Madrasahs<sup>14</sup>, Emamzadehs, and Husayniyyehs<sup>15</sup> (religious-educational-sociopolitical), Mariz-Khaneh<sup>16</sup> and Hamams<sup>17</sup> (health-medical), Zur-Khanehs<sup>18</sup>, Qahveh-Khanehs<sup>19</sup> (recreational-sports), Saqa-Khaneh<sup>20</sup>, Asiab<sup>21</sup> (services) altogether were a powerful urban complex in the heart of the city, metaphorically named as the 'city spine.' All these elements being dispersed in a certain distance served Bazaarians (people who work in the Bazaar) and other users making it unnecessary for the Bazaarians to go out of the Bazaar or back to

their homes during noon prayers. The Bazaar's multiplicity of uses and services raised its influence and functionality (Shafaghi, 2016a, p. 479).

As a city backbone, the Bazaar was not only the most integrated part of the city, yet it was a very legible and perceptible structure in terms of the local and global relationship, which means that if somebody needed to find an address, they could walk through the Bazaar to the appropriate Guzar or Rastih, and then to the appropriate Kuchihs or Bunbast on which the destination house was located. Thus, a distinct hierarchy of passage size and function formed the traffic network of the city (Karimi, 1998, p. 159; Kheirabadi, 2000, p. 28).

<sup>11</sup> Caravansarai, literally meaning houses of the caravans, were located either within or outside the cities along the old trade routes. Caravansarais within the cities were located near the entrance gates and along the main Rastih-Bazaars (fundamental primary pathways of the Bazaar, which usually has been roofed). In addition to their role as major economic centers, they were also major cultural centers, serving as merchants and travelers' gathering places from different parts of the world. Those caravansarais inside Bazaars were located along Rastih-Bazaars or between branches of the Bazaar. Their basic design and structure were similar to those located outside the cities but less spacious. The fortification was less critical for Bazaar Caravansarai; they were used more for economic purposes than for any other use. Their primary function was to store goods for wholesalers and distribute them among shops within the Bazaar.

<sup>12</sup> Sarais were much like Caravansarai, only smaller. As the name might indicate, Sarais, unlike Caravansarai, did not provide lodging for Carvanis (caravan members), yet they were primarily used to store merchandise and contained offices where trading activities were conducted. Although different, Sarais are often not distinguished from Caravansarai due to their physical resemblance. Many Iranian maps showing Iranian Bazaars group Sarais and Caravansarai together, calling them all Sarais.

<sup>13</sup> A Timcheh is a central meeting place for merchants, where most business contacts are made. The rooms of the Timcheh are mainly used as offices of the Bazaar merchants, with few storage or production activities conducted there. These main business activity centers are usually located within the Bazaar, connecting a Rastih-Bazaar and a Sarai or Caravansarai. Timchehs are two or three-story buildings, usually in round or hexagonal shapes, with rooms surrounding a small central pool. Their ceilings are often decorated with glass, plaster, and tilework and are quite elegant architecturally.

<sup>14</sup> In an architectural and historical context, the term of Madrasah generally refers to a particular kind of institution in the historic Islamic world that primarily taught Islamic law and jurisprudence (fiqh) and on occasion, other subjects. The origin of this type of institution is widely credited to Nizam al-Mulk, a vizier under the Seljuks in the 11th century, who was responsible for building the first network of official Madrasahs in Iran, Mesopotamia, and Khorasan. From there, the construction of Madrasahs spread across much of the Islamic world over the next few centuries, often adopting similar architectural design models.

<sup>15</sup> While mosques are common features in all Islamic cities, Emamzadihs and Husayniyyihs are usually peculiar to Islam's Shi'ite sect. Emamzadih means a descendant of an Imam. In this case, an Imam is a person whose roots can be traced to one of the Twelve Shi'ite Muslim Emams. Husayniyyih is another type of religious building built in the memory of Emam Hussein, the Third Shi'ite Imam. According to the Shi'ite belief, in an unfair war against the army of Yazid, the caliph at the time, Hussein Ibne Ali and a small group of his followers were martyred in 680 A.D.

<sup>16</sup> Mariz-Khaneh: Clinic, hospital

<sup>17</sup> Hammams are health and social institutions where people go to bathe, massage, shave, and converse, found in all traditional cities of the Islamic world.

<sup>18</sup> Zur-Khaneh is the traditional Iranian gymnasium originating in pre-Islamic times and means the strength house.

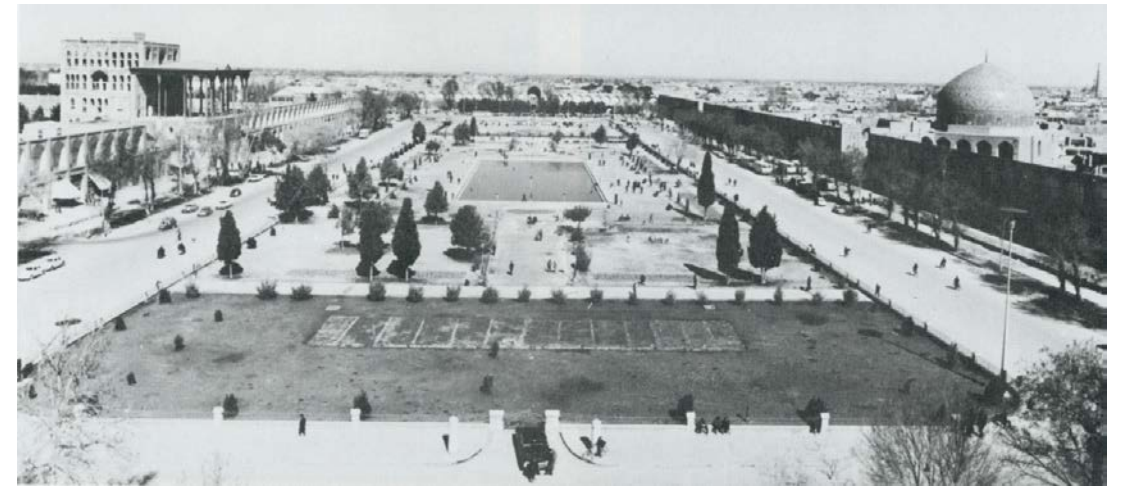
<sup>19</sup> Qahvih-khānih: coffeehouse

<sup>20</sup> Saqa-Khaneh or water fountain was a small pond located at the edges of multi-node city centers (Bazaar and neighborhood centers) where drinking water was provided by the water well for people to quench their thirst and had some sort of blessing and religious sanctity.

<sup>21</sup> Asiab: mills and granary



**Fig. 52.** On the top of the entrance to Qaysariyyeh Bazaar on the north side of the Maydan-e-Shah, 2019. Source: author



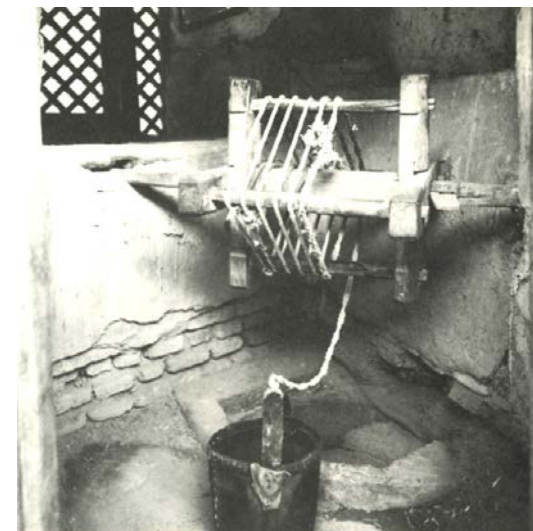
**Fig. 53.** Esfahan, Maydan-e-Shah. Source: Ardalan and Bakhtiar, 1975



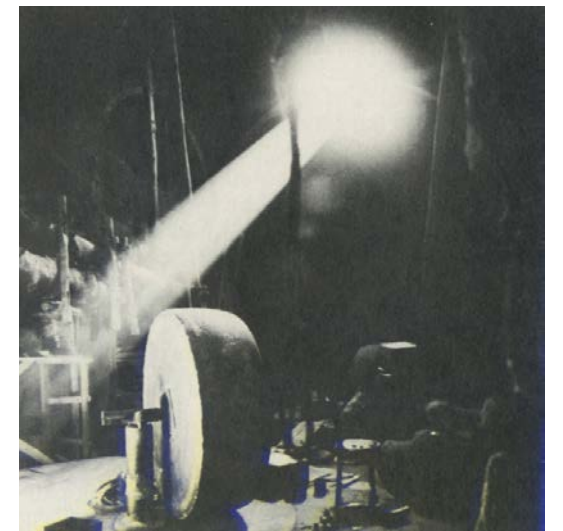
**Fig. 54.** Madrasseh Nimavard. Source: Der Bazar von Esfahan, Heinz Gaube and Eugen Wirth, 1978.



**Fig. 55.** Carvanserai Monajem. Source: The architectural review, Kenneth Browne, 1976.



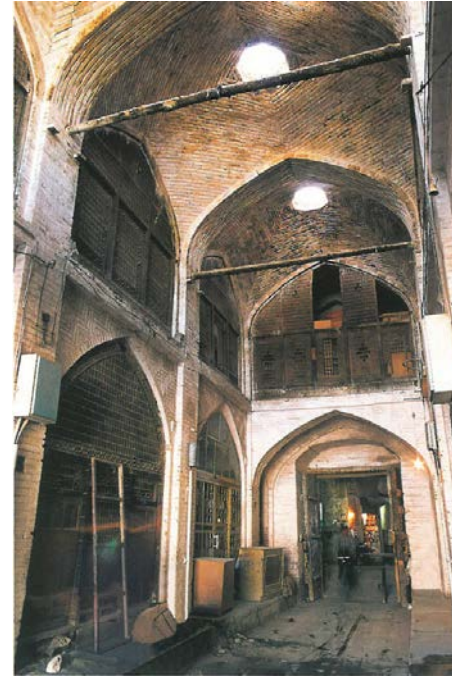
**Fig. 56.** Endowed public well (Saqa-Khaneh). Source: 'The Sense of Unity' by Nader Ardalan and Laleh Bakhtiar, 1973



**Fig. 57.** Mill and Granary, no longer in operation. Source: 'The Sense of Unity' by Nader Ardalan and Laleh Bakhtiar, 1973.



**Fig. 58.** Northern Dalan of the Sarai-e-Golshan. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Vol. 9



**Fig. 59.** Western Dalan of the Sarai-e-Haj Karim. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Bazaar buildings- Vol. 9

One of the main elements involved in trade activities within the Bazaar is the **Rastih**, which is a long stretch of the Bazaar, usually roofed, lined with Dukkans<sup>22</sup> and other commercial buildings on both sides. Rastihis are the meeting places of customers and shopkeepers, the most crowded and noisy areas of the Bazaar complex. Each Bazaar complex contains several major Rastihis, leading to minor Rastihis and other elements such as **Dalans**<sup>23</sup>.

To this day, each guild still has its own unique Rastih to deliver similar products in the Bazaar. The Rastihis have taken their name from their type of activity, such as Tofangsazan (gunsmiths), Davatgaran (soldiers), Mesgaran (coppersmiths), Chitsazha (coloring of floral cotton fabrics), Qanadha (confectioners), etc. In other cases, they are called after the names of their founders, such

<sup>22</sup>Dukkans (literally meaning shops) were the smallest units within the Bazaar; functioning as retail shops, they lined both sides of the Rastih.

<sup>23</sup>Dalans or corridors connect the Rastihis to the central yards of Sarays.

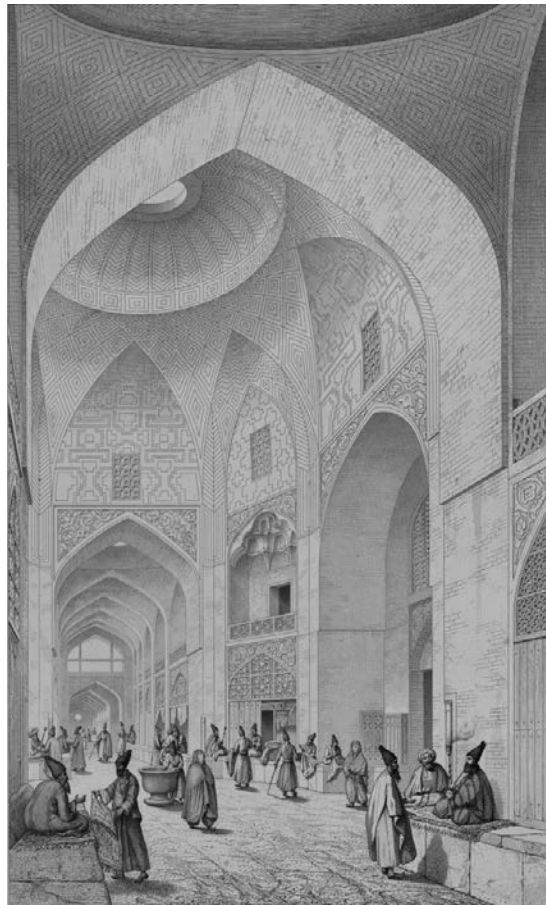
as Sarotoghi Bazaar, Jarchi Bashi, and Hassanabad. Assigning a similar trade to each Rastih helped customers shop for what they wanted by comparing the quality and price (Shafaghi, 2006, pp. 65, 247, 250) (Fig. 60).

The length and width of the various Rastihis are very different. They sometimes reach a height of 8 meters and sometimes only 4 meters above the ground. The height at the intersections of the two main Rastihis (Chaharsuqs) is higher and more remarkable in terms of architecture (Figs. 61 - 63).

The minor Rastihis of Esfahan Bazaar are branched out of the main Rastihis and have less length, width, and height and, consequently, have less traffic than the primary ones. However, they are significantly important in terms of unique professions and crafts. Usually, the continuation of Rastihis ends up linking the main Guzars, which will be described below, to the residential areas, and finally to the city gates.



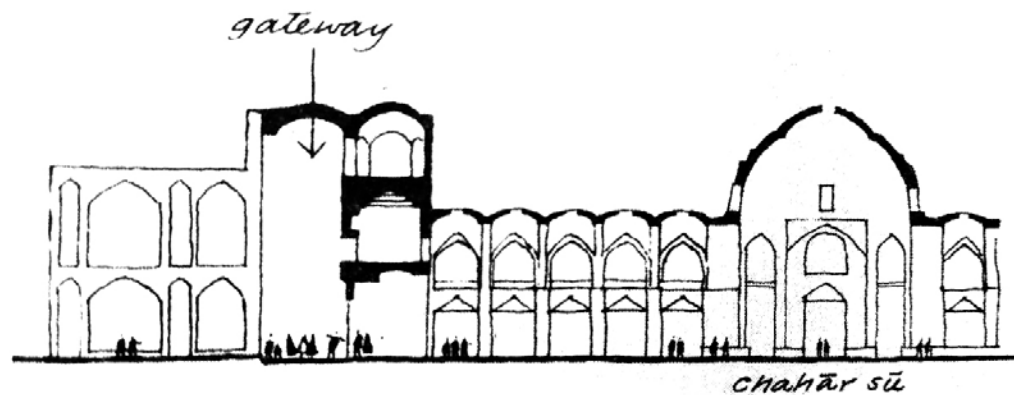
**Fig. 60.** Rastih Davatgarha (soldiers) April 2018. Source: Carles Crosas Armengol.



**Fig. 61.** Bazar tailors (Bazar Qeisaria), 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867



**Fig. 62.** Chaharsuq Qeisaria, 2014. Source: [https://commons.wikimedia.org/wiki/File:Bazar\\_tailors\\_by\\_Pascal\\_Coste.jpg](https://commons.wikimedia.org/wiki/File:Bazar_tailors_by_Pascal_Coste.jpg)



**Fig. 63.** Section through Bazaar and Qeisaria Chaharsuq and gateway. Source: *The architectural review*, Kenneth Browne, 1976.

## Guzar

In addition to the Bazaar, some main routes had clear origins and destinations in the city. In other words, the primary routes, often named **Guzars**, started at one of the city gates and ended at the center of the city, the Bazaar or the main city squares. They accommodated some essential and local urban elements such as Bazarches (centers of the neighborhood), Caravansarais, mosques, other religious buildings, public bathhouses, and tea-houses with a relatively high integration value inside the quarters (Karimi, 1997; Kheirabadi, 2000).

The Guzar is often named after some influential and generous rich local people or merchants who have contributed to the development of the city by investing their money through the tradition of Waqf<sup>24</sup> in the construction of neighborhood centers and by establishing mosques, baths, Bazaars, Caravansarais, Husseiniyahs, and Saqakhanehs (Kheirabadi, 2000, pp. 27, 28).

Due to the origin, destination, and adjacent urban elements, these passages were mainly used by convoys and vehicles, such as carts and wheels for carrying goods, which defined a specific range of dimensions and proportions. These passages had a width of 3 to 5 meters and a width-to-height ratio of close to 1, similar to the primary passage of the Grand Bazaar, which was roofed from the northern gate of Toguchi to the southern entrance of Hassanabad. Many of these Guzars were also partially roofed in the intersection points of the neighborhood centers (Bazarches) (Ahari, 2001, p. 171).

In the final part of this chapter, one of the primary contributing nodes in the Bazaar's building will be examined as one of the case studies to analyse in-depth the Bazaar formation process as the center of the city's public and collective life.

<sup>24</sup> The distinguished Waqf tradition is one example of Islamic values such as justice, mercy, and property forgiveness. This tradition is considered the largest economic-charitable organization of Islamic cities, known as a critical finance source for alleviating poverty in society, the distribution of wealth, and its income in the sustainability of urban buildings. Waqf is the only movement capable of protecting religious rights by overthrowing governments, changing dynasties, and political and economic crises. For more information on this subject, refer to chapter 5 (the role of Waqf in the spatial structure of Islamic cities) of the book titled "Introduction to the Theory of Islamic Cities", Volume One, written by Sirus Shafaghi.



**Fig. 64.** The main Guzar of Haruniyeh is passing by the minaret of Masjid Ali and forming the eastern edge of Atigh Square, 2018. Source: author



**Fig. 65.** Haruniyeh Guzar, 1923. Source: Ernst Herzfeld - [https://collections.si.edu/search/results.htm?q=record\\_ID=FSA.A.06\\_ref28232&repo=DPLA](https://collections.si.edu/search/results.htm?q=record_ID=FSA.A.06_ref28232&repo=DPLA)

### 3.1.2.2. Secondary and Tertiary Movement Systems

#### Kuchihs and Bunbasts, The Residential Pathways

**Kuchihs**, or secondary access routes, are narrow alleys that branch off the main Guzars and drive through the neighborhoods, usually ending at another main road. They have an average width of 2 to 4 meters, and the height of the adjacent walls is 1.5 to 2.5 times its width. Houses are either located directly along these secondary passages or connected by the Bunbasts. Kuchihs can directly branch off from the Bazaar instead of being connected through the main Guzars. Compared to the Kuchihs, the Guzar segments are longer and have smoother angles along their whole course. Unlike Guzars, which often have essential urban elements in their path, Kuchihs are more intra-neighborhood and have limited urban elements (Karimi, 1997; Kheirabadi, 2000, p. 30; Ahari, 2001, p. 172).

As the most common lanes in traditional Iranian cities' plans, many small blind alleys, known as **Bunbasts**, were divided at approximately right angles from the Kuchihs (and sometimes from Guzars), forming residential clusters and providing access to each unit. The city's urban structure ends in these Bunbasts (cul-de-sacs) as they are the ultimate penetration points and are highly segregated in the city's global organization. Like Kuchihs, Bunbasts were also bounded on both sides by high, windowless walls, broken only by an occasional door into a residential complex (Karimi, 1997, p. 05.5; Kheirabadi, 2000, pp. 28, 30).

The residential house may not open directly into a public pathway, but rather into a **Hashti**, typically a polygonal covered space, immediately set behind the entrance door to the alleyway. The Hashti

contains several doors on its sides belonging to neighboring houses' entrances. This transitional space offered further privacy for the residents by setting an intermediary or threshold space between public and private domains (Kheirabadi, 2000, p. 30).

Bunbasts are sometimes roofed, highlighting the semi-private space. The shape, dimensions, and proportions of these passages reinforce the feeling of entering residential areas and confront the stranger with a mental barrier and a ban on entry. The width of such passages is usually less than 2 meters, and the width to height ratio is often between 1 and 0.5 (Ahari, 2001, p. 172).

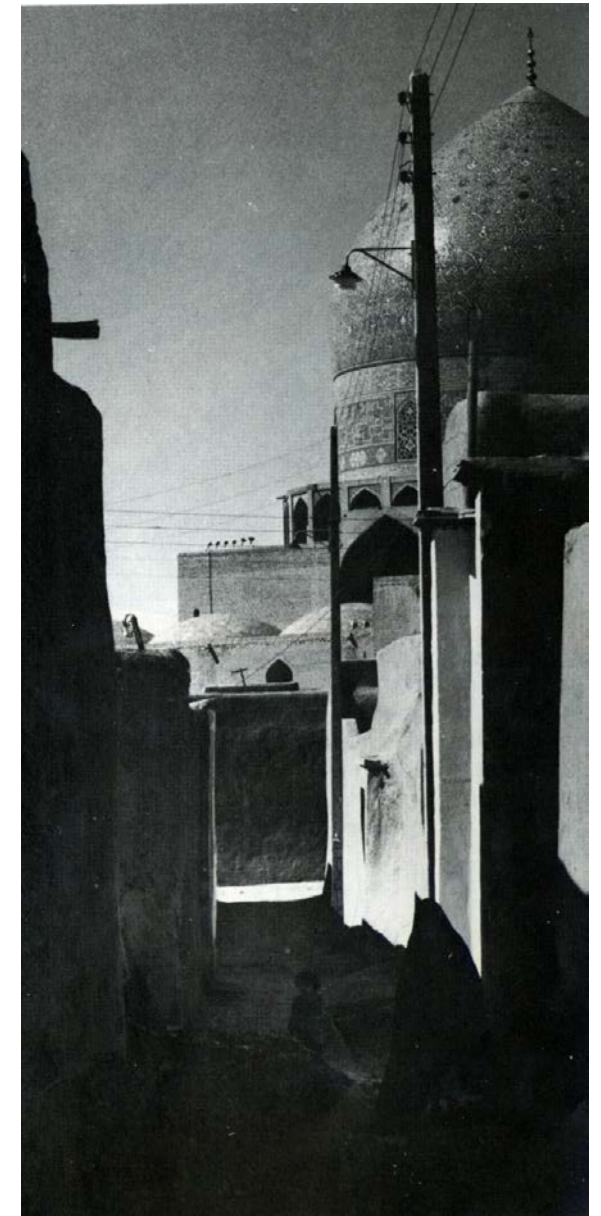
Therefore, depending on being in the private or public domain, the spatial behavior of different areas was not the same; where a great deal of legibility was needed, such as the Bazaar complex, the global city structure developed a different pattern from the local structure of the residential quarters, where privacy and tranquility were required (Karimi, 1997, p. 05.9).

It is interesting to figure out how complex the process of interlinking the private and public domains was and how this process characterized different parts of the city. Besides the idea of collective space, this is strongly related to the so-called "territorial depth configuration and sequences" (Scheerlinck, 2011). Territorial Depth<sup>25</sup> is considered as a successive crossing of territorial boundaries from a public realm to a private one, or vice versa, which gained a different meaning by being applied to the idea of collective spaces.

<sup>25</sup> "Territorial depth is measured by the number of boundary crossings needed to move from the outer space to the innermost territory" by N.J. Habraken, "The Structure of the Ordinary" MIT Press Cambridge 1998.



**Fig. 66.** The secondary and tertiary movement systems zoom in on the central bazaar and its surrounding area. Source: author



**Fig. 67.** Esfahan, typical Kutche. Source: Ardalan and Bakhtiar, 1975



**Fig. 68.** Esfahan, Bunbast Poshte-Matbakh, 2015. Source: Foad Fazileh.

### 3.1.2.3. Planned Straight Passages

As discussed previously, regarding the critical Safavid period, the growth and prosperity of Esfahan reached its highest point in all ages, and the city grew vastly in its southern and western directions. The Safavid period's constructions, which are mainly attributed to Shah Abbas-I's ideas, have specific characteristics that differentiate them from other parts of the city, which were built up to that moment, as people were contrasting each part by calling them differently as "New City" and "Old City." The "Old City" referred to those parts founded before the Safavid era, while the "New City" referred to a set of plans related to the expansion of the city through some specific designs and projects of a new square, a set of palaces, and gardens and the Safavid house government, the Chahar-Bagh axis and new residential areas formed by a regular grid of paths.

The Safavid planned part of the city is the manifestation of the King's power, who had the necessary potency and authority to construct an immense urban spatial landscape. This power led to his massive city's new constructions that imposed the new special geometry on the city. The exclusive geometry of the new Safavid developments, including Chahar-Bagh avenue and the regular grid of passages of Abbas-Abad & Shams-Abad neighborhoods<sup>26</sup> at the south-western part of the city, can be easily identified on various historical city maps, as they were derived from the Shah's ideas and power (Falihat, 2014, pp. 122, 123).

The Chahar-Bagh avenue had a definite origin and destination. It directly extended from the Darvazeh Dolat (in front of the current municipal mansion) to the foothills of Mount Sofeh (former Hezarjerib Garden). It has a length of about 4 kilometers and is about 48 meters wide, divided into two longitudinal sections at the northern and southern banks of the river<sup>27</sup>.

<sup>26</sup> According to the so-called Sheikh Bahai's plans for the extension of the Safavid city, Abbas-Abad and Shams Abad neighborhoods were developed in the eighteen and nineteen centuries. Currently, the area covers more than two hundred hectares and is defined by a regular grid of streets parallel or perpendicular to the grand axis of Khiaban-e-Chahar-Bagh.

<sup>27</sup> From Jahan Nama Palace, located at Darvazeh Dolat, to Allah Verdi Khan Bridge (Si-o-Se Pol), is called Chahar-Bagh-e-Abbasi, and from the mentioned bridge to the former Abbas Abad Garden (Hezar Jarib Garden) is Chahar Bagh-e-Bala. The cross-sections of both streets are the same, and only the gardens next to Chahar Bagh-e-Bala were more extensive than the lower parts (Honarfard, 1971, p. 487).



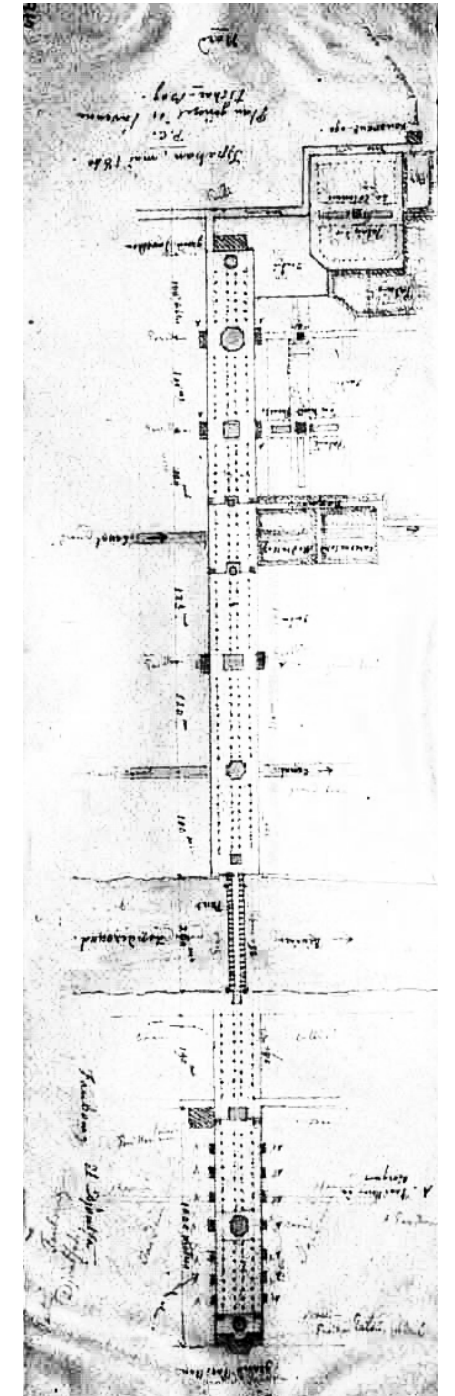
**Fig. 69.** Chaharbagh, College of mother of Shah Sultan Hussein. Source: *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867



**Fig. 70.** Chahar-Bagh-e-Paieen. Source: Ernst Hoeltzer, 1860s.



**Fig. 71.** The Chehar-Bagh Avenue, source: "From Khorassan to the Land of the Backhtiaris: Three Months of Travel in Persia" by Henry-Rene D'Allemagne published in 1911 by Hachette, Paris, France.



**Fig. 72.** Plan of Chehar-Bagh Avenue, Drawn by Pascal Coste in the 1800s.

The urban elements next to it were mainly royal and private pavilions and gardens. However, in the late Safavid dynasty, a significant urban node, including various critical urban elements was built on its eastern front and at the corner of its intersection with Farshadi Madi (Honarfar, 1971, pp. 479, 480; Ahari, 2001, pp. 172, 173), which will be discussed in the final part of this chapter.

As a distinctive form of the pathway, the Chahar-Bagh avenue provided access to newly established residential areas from the city center. This main street did not only devote to pedestrians but also provided separated lines for riders. At the same time, the street was a linear urban space dominated by recreational activities and formed by the rows of plantain trees, a central water stream that sequentially intersected with transversal water canals, and passages. The gardens' entrance buildings, which were generally arranged in two stories in front of the street, provided platforms and balconies with a view of street activities and events (Ahari, 2001, pp. 172, 173).

According to Chardin, the French tourist who lived in Esfahan from 1673 to 1677, two parallel lanes for riders were separated from the central pedestrian pathway by broad planting strips, which were extended for the entire length of the upper and the lower Chahar-Bagh sections, at either side of the river. Numerous pavilions were lined on the two sides of the avenue. Down in the middle of the central pedestrian section, a water channel intersected at intervals by other waterways or was widened into pools, which some were covered with wooden boards to be used as seats. The stream turned into a waterfall depending on the land slope in different places and created a pleasant sound and landscape. Proximity to wealthy palaces and gardens and access to residential areas belonging to the elite and relatives of the king also gave a ceremonial character to Chaharbagh (Ardalan and Bakhtiar, 1975, p. 100; Cantacuzino, 1976, p. 284; Ahari, 2001, pp. 172, 173). An in-depth explanation for the transformation of this important axis can be found in section 4.3.1.

#### 3.1.2.4. The Madi Network: Watering the Land, Structuring the City

As mentioned in the second chapter, considering the geographical and natural advantages, it is likely that Esfahan represents one of the earliest urban developments in the Iranian Plateau due to adequate water and fertile soil in the region.

It has been a long time since our ancestors learned how to control the river by building bridges, dams, digging irrigation ditches, water mills, and other related water structures. The Madies' branches could draw water from the upstreams and distribute it throughout agricultural lands and gardens of the ancient city and its surrounding agrarian villages.

Generally, the Zayandehrud river could not support transportation due to its low water level, especially in dry seasons. Compared to the surrounding cities and settlements located in the central desert's fringe, the former Esfahan's permanent river could provide abundant freshwater to the city and keep the underground water level at high levels. The freshwater was available through drilling shallow wells and digging Madi canals to access the river water and distribute it into the Esfahan plain. Public access to freshwater made Esfahan relatively exceptional among other cities in the desert fringe, where people had to use other standard systems to reach and reserve drinking water, such as digging long-distance underground aqueducts (Qanat), cisterns, or reservoirs (Ab-Anbar), and Yakhchals.

In the Esfahan dialect, 'Madi' refers to a large and wide stream branched from the Zayandehrud River to contiguous lands for irrigational purposes (Arsiya & Mehrabani Golzar, 2017). Many historical references considered that the term "Madi" is related to the Median Empire period (during the 8th -7th century BC). Ibne Rasteh, the 10th century Persian and Esfahanian explorer and geographer points to Ardashir Babakan, the founder of the Sasanian Empire (180-242 AD), as the pioneer in the water distribution and regulation of Zayandeh Rud by determining definite water shares for each village depending on its size (Abari, 2000).



Fig. 73. Typical water channel in Esfahan, From 'La Perse' by Jane Dieulafoy, 1887.



Fig. 74. Farshadi Madi, March 2022, Source: author.

In the Seljuk era (the 11th to 12th centuries), gardens were shaped based on the Madies system, which had the most significant role in irrigation. Although some historical texts describe and point to the passing of some water canals inside the Seljuk city walls, nowadays, the Madies are not seen in the most ancient central parts adjacent to the Bazaar, Atiq Square, and Jama Mosque belonged to the Seljuk city domain.

In various periods, the expansion of Madi's irrigation system had been linked to the city's development and growth. For instance, in the Safavid period (the 16th to 18th centuries), the entire country experienced high development rates when the water network expanded significantly, preparing a base for further developments.

An authentic document (Tumar<sup>28</sup>-e-Sheykh Bahaie) was inherited from the 17th century, assigned to Sheykh-Bahaie regarding the division Zayandeh-Rud river's water into the entire region. According to this Tumar and some other historical references, digging canals for distributing the water to the residential settlements, gardens, and agricultural lands dates back to the early period of human settlement in Iran. Many inherited examples and reasons confirm the existence of irrigation discipline in this ancient land: dams, bridges, irrigation water canals, mills, and so on.

The influence of the Madies network on the city's shape has been presented in Fig. 75. Madi's courses have seen a mutual relation with the geographic location of residential neighborhoods, public and central places, administration and governmental buildings, city walls and neighborhood borders, gardens,

and agricultural fields. The structure of Madies' network diversified and added to the historical mobility system as they were often accompanied by dirt roads dedicated to pedestrians and caravans, extending from the west and southwest towards the center, the north, and northeast of the city.

Five main Madies watering the lands belonged to the city and its surrounding villages were: "Madi-e-Niasarm," "Madi-e-Farshadi," "Madi-e-Fadan," "Madi-e-Juy Shah," and "Madi-e-Tiran-Va-Ahangaran."

**Madi-e-Niasarm (1)** is the largest Madi in Esfahan, closer to the river, and was a southern limit of the city until a century ago. This Madi branched of the river from the northern head of the Marnan Bridge and went east into the neighborhood of Lonban and Janat Garden. The Madi is divided into three branches on the historic city's eastern side and used to irrigate Khorasgan, Zardanj, and some other population centers (Fig. 75).

**Madi-e-Farshadi (2)** is one of the longest Madies, extending more than 15 kilometers. Compared to Niasarm Madi, the Farshadi Madi branches from the higher points of the river, near the village of Mariban to the west, and ends in Kerd Abad and Khorasgan lands toward the eastern edge of the city. The Madi was crossing the historical domain of the city, meeting many urban elements such as (a) the Lonban and Shams Abad neighborhoods, (b) Madraese-ye-Chaharbagh and CaravanSarai-e-Madar Shah (at the corner of the intersection with Khiaban-e-Chahrbagh), (c) the royal Safavid district, (d) and agricultural lands of Khaju and Pa Qaleh districts (Fig. 75).

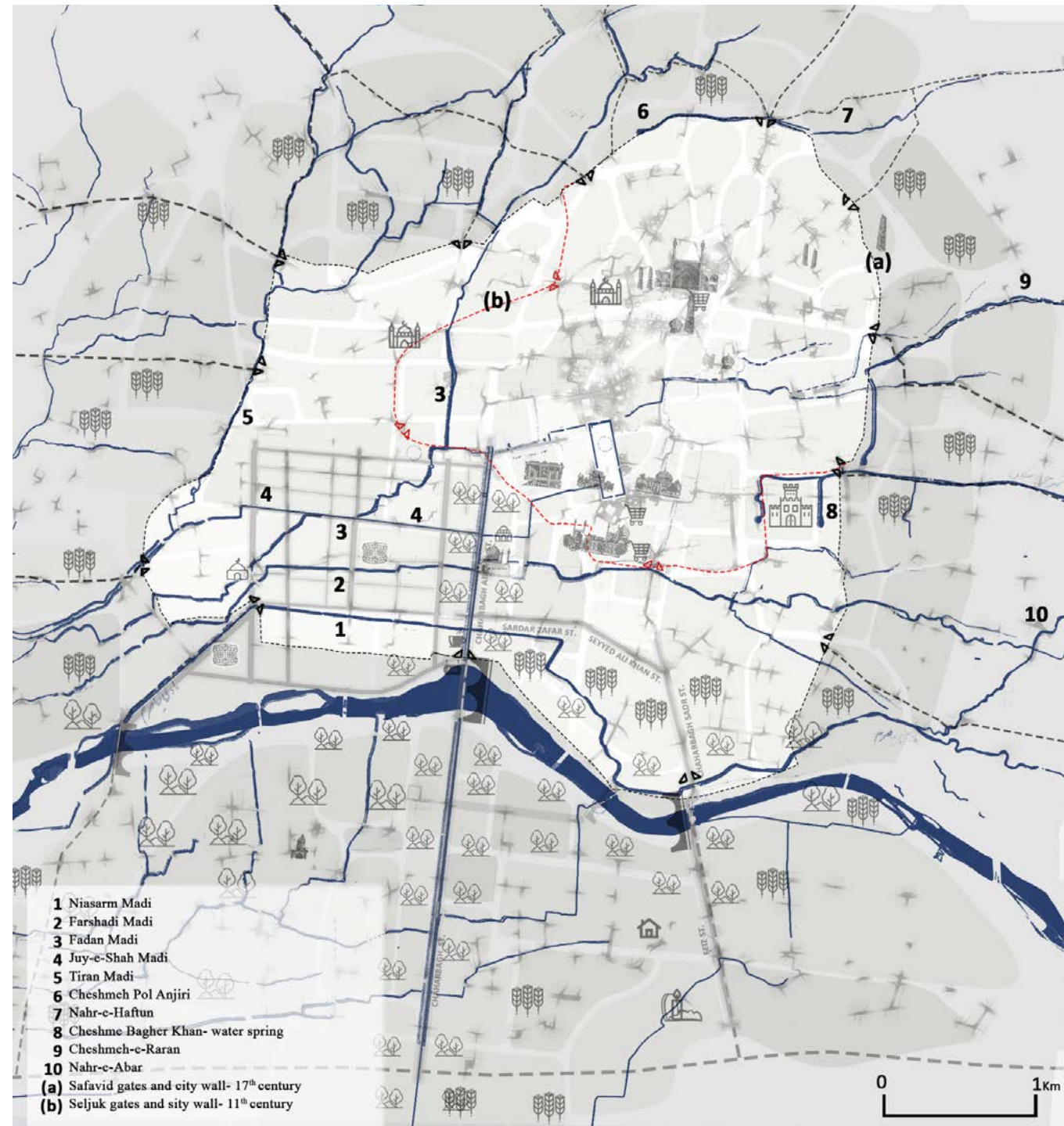


Fig. 75. Esfahan water Madi network in Safavid period, Source : author

<sup>28</sup> Tumar: Scroll

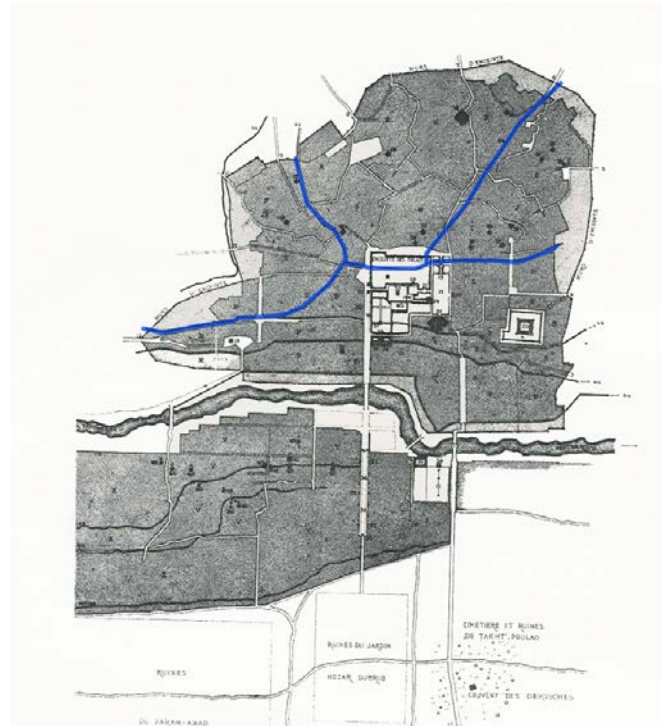


**Madi-e-Fadan** (3) separates at a higher point from the river than the two first cases. The Madi used to pass through Lonban and Shams-Abad neighborhoods toward the west of the city, which nowadays is mainly disappeared through Sheikh Bahai Street's construction in the 1930s. Close to Darvazeh Dolat (the northern head of Chahar-Bagh), the Madi had been divided into two branches. The first branch runs toward Darbe Kushk, Bidabad, and Aliqoli-Agha neighborhoods and links to some prominent monuments like Masjed Seyyed and Bazarche Ali Gholi-Agha (Figs. 75 & 76).

Due to Bab-Al-Rahmeh street and Maidan-e-Darvazeh Dolat (Emam Hossein) construction, there is no sign of this Madi left on the ground surface and around the Darvazeh Dolat area. During recent years, part of this Madi was discovered through the construction of the Emam Hossein metro station. By moving towards the east direction, the Madi passed and watered the Chehel-Sotun royal Safavid garden, and further to the east; it was divided into two branches adjacent to the great Safavid Maidan: first moving from the north head of the Safavid square, entering to the central yard of Madrese-ye-Mola Abdolah and went toward some historic neighborhoods south of the Old square like Kahran districts, gardens, and agricultural lands at the edge of the historic city.

Except for some limited parts, most of this section of Fadan Madi has been filled through new constructional development. Nowadays, there is no trace of the other branch, that was running along the historic Bazaar route reaching Jubareh gate as shown on the Pascal Coste map (Fig. 76). However, according to Shafaghi's map of Esfahan topography (Fig. 77), this Madi may have reached Atiq Square, although due to the form of ground surface and varying ground elevations, it is not clear how it could reach the gate of Jubareh.

**Madi-e-Juy Shah** (4) was mainly associated with the royal mansions and gardens, which crossed through different quarters of Lonban and Shams-Abad and entered the pre-existed pool at its intersection point with Chahar Bagh Avenue, located in the front of the gate of the Hasht Bahesht garden. The Madi used to irrigate the former royal gardens, governmental halls, and some other gardens at the two sides of the

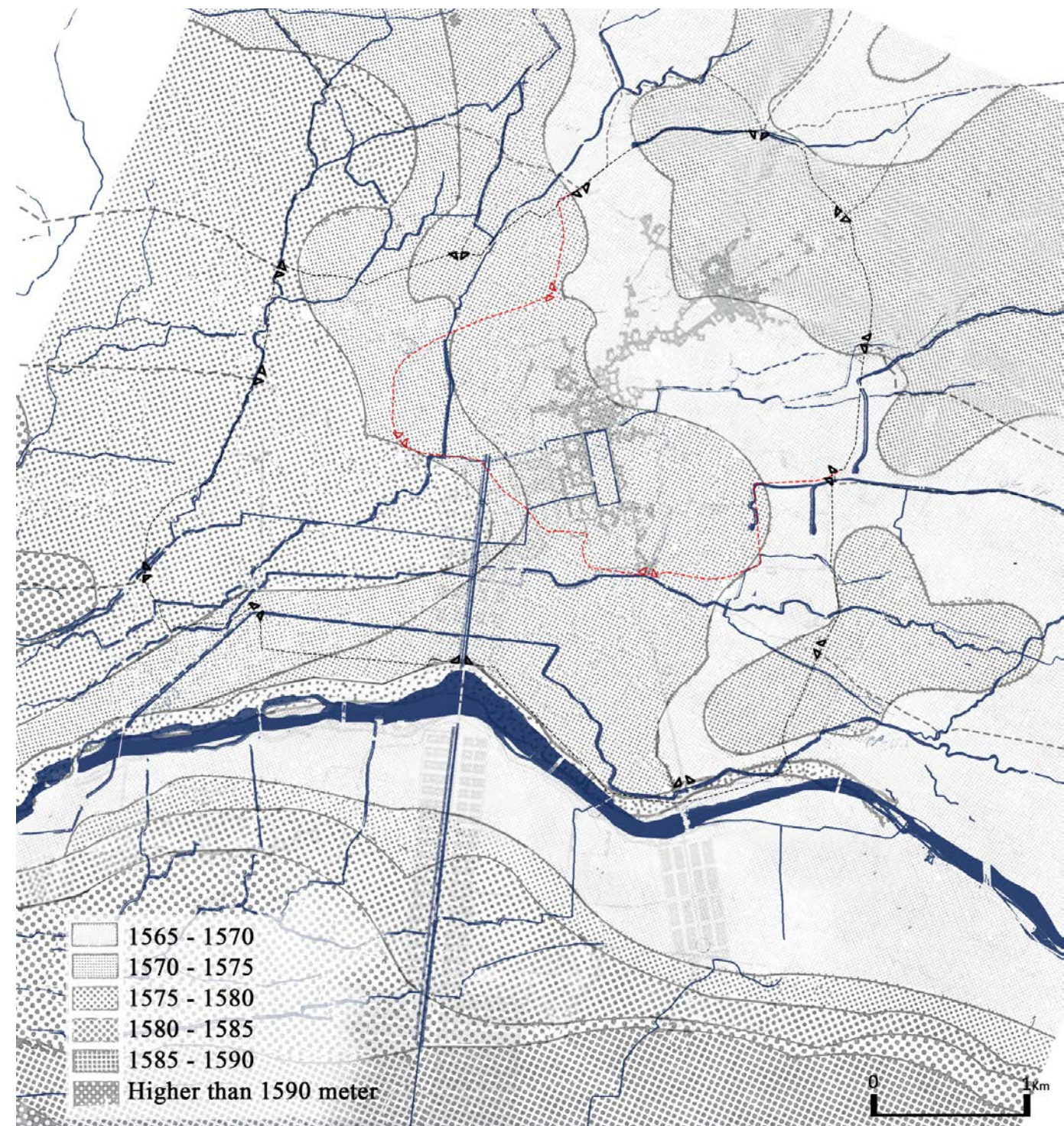


**Fig. 76.** The water course of Madi-e-Fadan on the map of Esfahan drawn by Pascal Coste, 1840.

Chahar-Bagh axis. This Madi also partially merged with Madi-e-Faden at its corresponding section on Sheikh Bahai Street, which has been filled and is not recognizable anymore (Fig. 75).

**Madi-e-Tiran & Ahangaran** (5) flowed along the city's western edge, partly passing along the preceding city's western wall and the gates of Juzdan and Bidabad, then divided into different branches. The Madi irrigated the lands of the various neighborhoods of Chaharsuq-e-Shiraziha, Mahale No, Bidabad, Shish, and Murnan and headed for Tiran-Va-Ahangaran (Fig. 75).

There were also three natural fountains were located on the eastern and the northern side of the city wall (no.6 & 8 & 9) (Fig. 75). On the east side of the city wall, Cheshmeh Bagher Khan and Cheshmeh Raran existed since ancient times and irrigated Jay's agricultural lands and some other ancient agrarian settlements, like Karan, Travasgan, Fabian, Fursan. These rural villages later grew up and transformed into different neighborhoods of the old city. Cheshmeh Pol-Anjiri, on the north side, was linked with some ancient agriculture



**Fig. 77.** Overlapping Esfahan's Madi courses with the map of Esfahan topography by Sirus Shafaghi

and livestock-dependent settlements like Khulijan and Felfelan, which gradually became the old city neighborhoods through the improvement of trade and commerce during the Daylamits and Seljuk period (the 10th -11th century). Thus it can be said that the water streams of these natural fountains, which were linking various population centers, became a model for digging more canals for irrigation and further development.

Intersections of these canals with the network of historical ground passages make some strategic and significant points of encounter (Ardalan and Bakhtiar, 1975, p. 102). In the continuation of the current chapter, a representative case of these water encounter points have been discussed in more detail.

### 3.2. CASES OF STUDY

The first part of this chapter describes how the networks of roadways and waterways configured the ancient city's skeleton. The diverse nature of these elements and their classification leads to forming an interweaving and efficient mobility system that links the entrance of each residential unit (private life) to the heart of the city (public life) and outside the city gates.

In this part, the study will present a complementary view of this urban reality through an in-depth description of some representative nodes that configure the primary constellation of "Ground" and "Water" intersections. Regarding the city of the "Ground" and "Water", three categories of centers can be observed, illustrated in figure 78:

- the most dominating nodes of the Bazaar that made up its linear structure
- the encounter points with the water system
- the center of neighborhoods

Four representative cases of these three categories have been selected to show the old Esfahan city's construction model, expressing its inhabitants' daily lives.

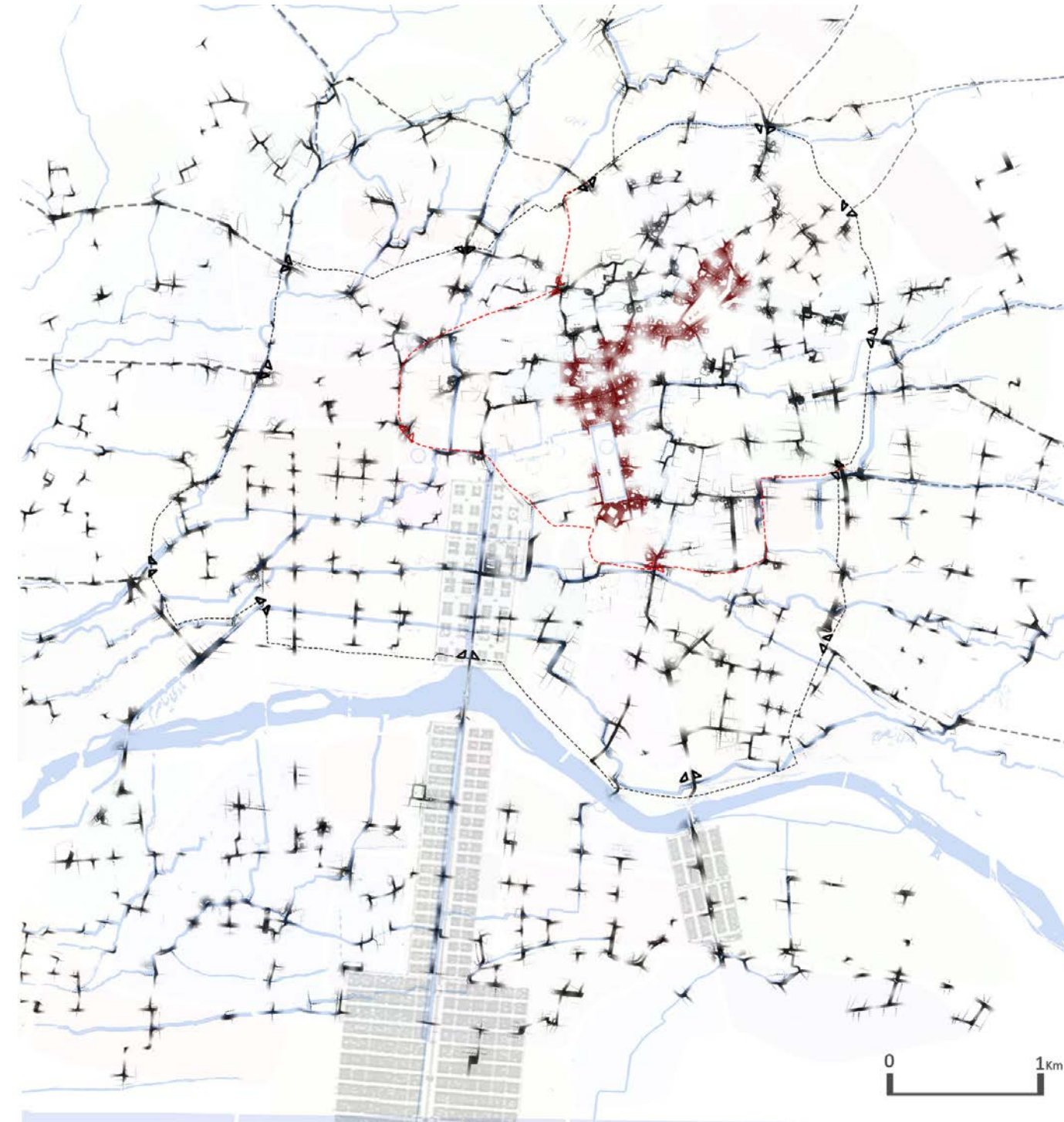
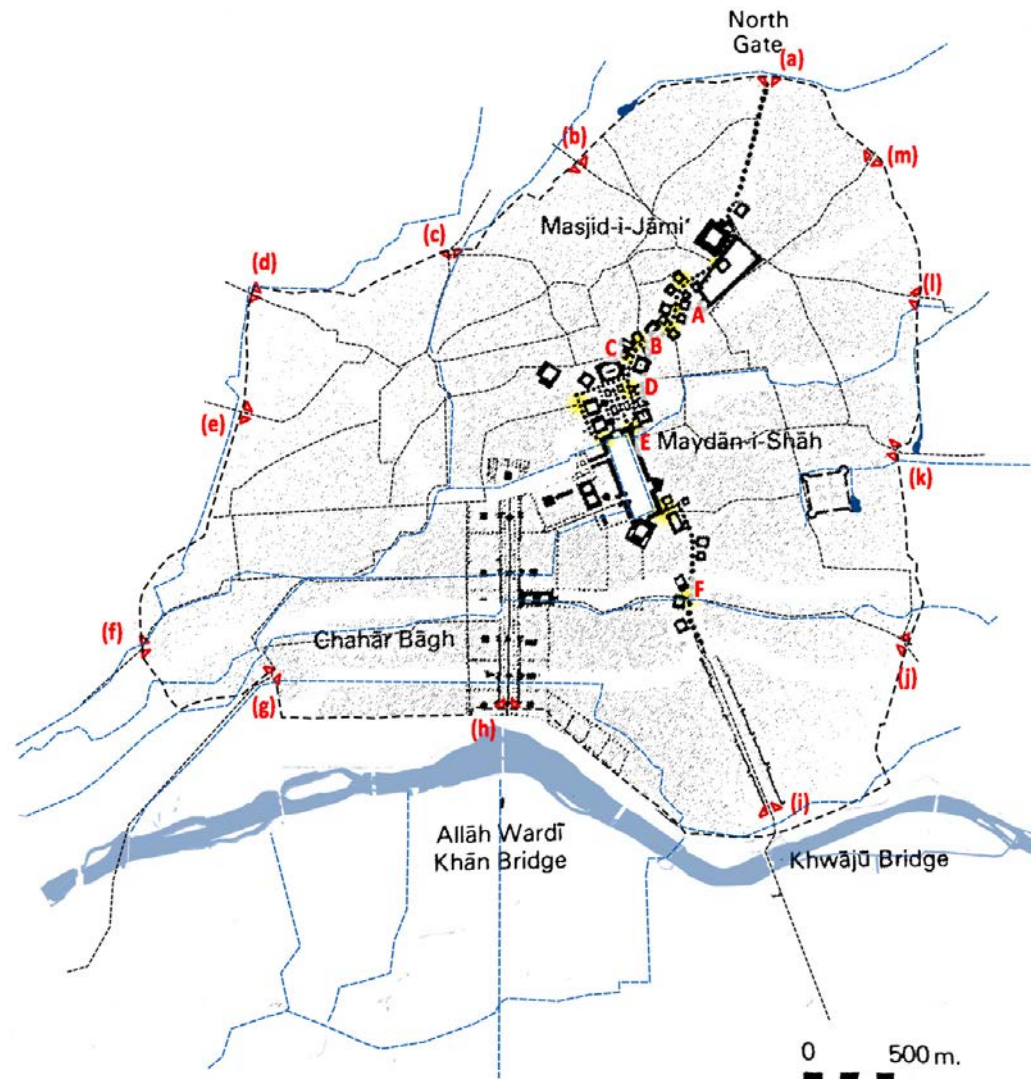


Fig. 78. The city of "Ground" and "Water," the constellation of urban nodes and intersections. Source: author





**Fig. 80.** Safavid Esfahan, from the gates to the central Bazaar nodes. (a). Toghchi, (b). Dardasht, (C). Darvazeh Tehran, (d). Bidabad, (e). Juzdan, (f). Seh-Pole, (g). Marnan, (h). Chaharbagh, (i). Khaju, (j). Darvazeh Zilla, (k). Karan, (l). Seyyed Ahmadian, (m). Jubareh, A. Harunieh, B. Se-Rah-e-Nim Avard, C. Se-Rah-e-Bagh Ghalandarha, D. Darvazeh Ashraf, E. Chah Haj Mirza, F. Bazaarche Hassan Abad, Source: author.

### 3.2.1.1. Development and Growth of Bazaar

As mentioned in section 3.1.2.1., Caravansarais and Sarais were the principal elements in Iranian cities. These were the places that accommodate the most intensive urban activities in the traditional city as they were the first places of embarkment, disembarkment, and the interface among city residents, merchants, and outsiders (Karimi, 1998, p. 175).

Caravans have been used in the past to deliver goods to customers who live in different areas. The arrival of the primary routes from the gates led the caravans to the various Sarais, where the animals could rest, and the goods were priced, negotiated, accounted for, and distributed in different Bazaar sections (Bakhtiar, 1974, p. 323).

Generally, Caravansarais and Sarais<sup>30</sup> were the commercial complexes with more than one entrance, which each admitted to Caravans of animals, Bazarians, merchants, and travelers. The Caravans reached the warehousing section where their goods were unloaded, assessed, weighed, delivered, and stored. The animals had a separate entrance to be kept and fed. Their food was stored in haylofts and barley stores, and their mule drivers were housed in dormitories. The merchant or visitor could enter and reach the shopping or administrative areas by another entry, where the products were available to be inspected by the wholesalers and distributors, and where shopkeepers selected the commodities they would sell (Bakhtiar, 1974, p. 324).



**Fig. 81.** Se-Rah-e-Nim-Avard\_ ceiling of Timche Haj Karim. Photo took by Peyman Baktash, June 2020.



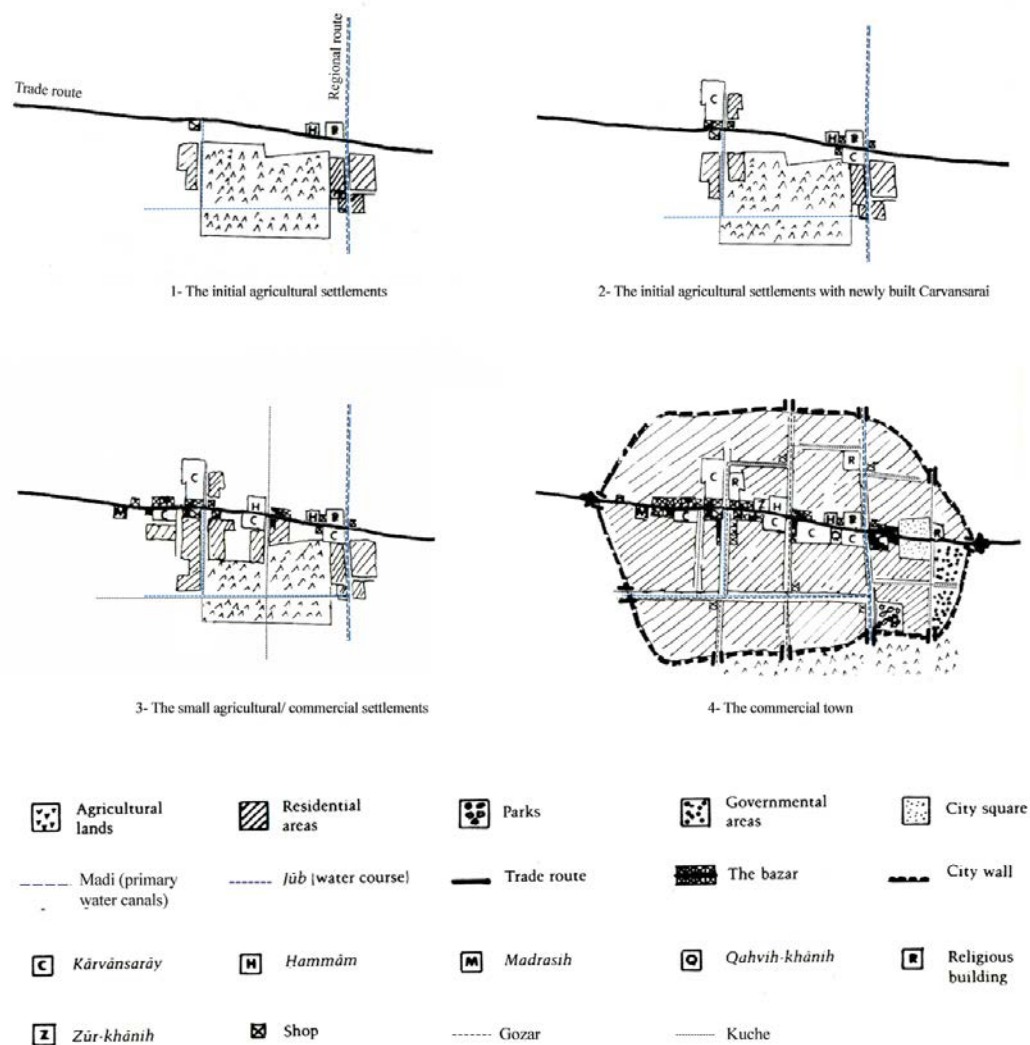
**Fig. 82.** Se-Rah-e-Nim-Avard\_ Timche Haj Karim. Photo took by Peyman Baktash, June 2020.

<sup>30</sup> As mentioned in section 3.1.2.1, the majority of authors considered the Sarai similar to the caravanserai in their scientific reports, although there are differences between them, like:

· Caravanserai is an ancient phenomenon that archaeologists date it back to the pre-Achaemenid times (522 BC to 486 BC) in Iran. In contrast, Sarai is a new phenomenon (17th century) and is considered a main Bazaar element.

· The caravanserais were for the purpose to evacuate the caravans, while the Sarais did not have such a role, and the entry of livestock there was prohibited, or only cargo was unloaded there.

· There was no overnight stay in the Sarais, while the caravanserais had the aspect of temporary accommodation, and the caravans left after trading and delivering or receiving their goods. Caravanserais were sometimes uninhabited and sometimes crowded due to their function, but they were usually crowded at night, whereas Sarais were empty at night and were largely populated during the day with permanent employees forming their main population (Shafaghi, 2016a).



**Fig. 83.** Schematic evolution of commercial city along a trade route. Source: Masoud Kheir Abadi, adopted by author in terms adding the "Water" system of Madi canal, and hierarchical mobility systems of "Ground" passages, including Gozars, and Kuches.

Displaying and sales areas in larger Sarais incorporated within Timchehs (shopping arcades), where separate facilities for the Sarai were provided. The Timchehs normally had two levels: the lower level, where the products were on sale, and the upper-level stores mostly devoted to offices. The small shops and merchants' stalls as the essence of the Bazaar were located adjacent to different Sarais and Caravansarais. They were usually associated with the most dominant manufacturers, and products belong to a particular trade that could have been different in the case of various Sarais. The shops were at the very entrance of the Sarai itself. The Sarais served shoemakers, sandal makers, cobblers, and leather workers with the relevant materials of their same trade and related to the members of one industry (Bakhtiar, 1974, p. 324).

Due to the attraction of more traders and the population growth, more Caravansarais were built in different intersections along the most dominant city route (Bazaar) and gradually changed the former uses of their surrounding lands. Drawing more shops in the adjacent Caravansarais areas, the previous agricultural land gradually gave way to other residential, and commercial land uses. As the further settlement expansion needed additional services, several complementary and public buildings were added to meet the common needs of the residents, merchants, and travelers (Kheirabadi, 2000, pp. 45, 95).

Progressively, as more shops were established along the main route of the Bazaar, the gaps between the nearby encounter points that joined other primary routes and linked with different gates were filled and resulted in the linear Bazaar form (Fig. 83).

### 3.2.1.2. Critical Aspects of a Bazaar Node's Construction: Se-Rah-e-Nim Avar

Se-Rah-e-Nim Avar<sup>31</sup> (three-way junction) is a paradigmatic example of the Bazaar's generative intersections, which is located in one of the same name's old neighborhoods. It is said that the Nim-Avard neighborhood was the center of the military and Daylamite barracks, and the residence of princes and nobles during mid 11th century (Shafaghi, 2006, p. 642).

This three-way junction was where Nim-Avard Rastih branched out of the primary route of the Bazaar. It ran toward the north and connected to some critical components like Haj Mohammad Jafar Bazaarche, Dardasht Bazaarche, and different former gates like Dardasht and Toghchi (Fig. 84).

At the place of Se-Rahe-Nim-Avard, the Bazaar's main route is divided into two Rastihis of Bazaar-e-Bagh-Qalandar-ha and Bazaar-e-Darb-Talar. The eastern extension of Bazaar-e-Drabe-Talar goes toward Atiq Square and Jame-Mosque. In the other direction, the Bazaar heads to the southwest, and, in less than a 200-meter distance, it arrives at the next principal and involving nodes of the Bazaar, Se-Rah-e-Bagh-Qalandar-ha. This intersection point is where the primary branch of the Bazaar turns to the south direction leading to some other primary nodes of the Bazaar and finally reaching the Shah-Abbas Square in around 400 meters (Figs. 86 & 89).

Looking closer at the Nim-Avard threeway's intersection, the Masjed-No Raste-Bazaar branches off from Bagh-Qalandar-ha Raste-Bazaar around 30 meters away from Nim-Avard intersection. This Raste-Bazaar is linking the western entrance door of Sarai-e-Haj Karim, at the front of the main course of the Bazaar to Kucheye-Masjed-No and Bar-Andaz-e-Khansari-ha<sup>32</sup> (Figs. 90 & 92).



Fig. 84. Se-Rah-e-Nim-Avard. Photo by Peyman Baktash, June 2020.



Fig. 85. Se-Rah-e-Nim-Avard\_ Masjed-e-No Raste-Bazaar. Photo by Peyman Baktash, June 2020.

<sup>31</sup>"Nim-Avar" means the archer or the keeper of the bow

<sup>32</sup>Bar-Andaz-e-Khansari-ha is located at the corner of the meeting point of Masjed-No Raste-Bazaar and Masjed-No Kuche. The low height of Masjed-No Raste-Bazaar, seen in Fig. 84, was for abandoning the entrance of big animals to the Bazaar.

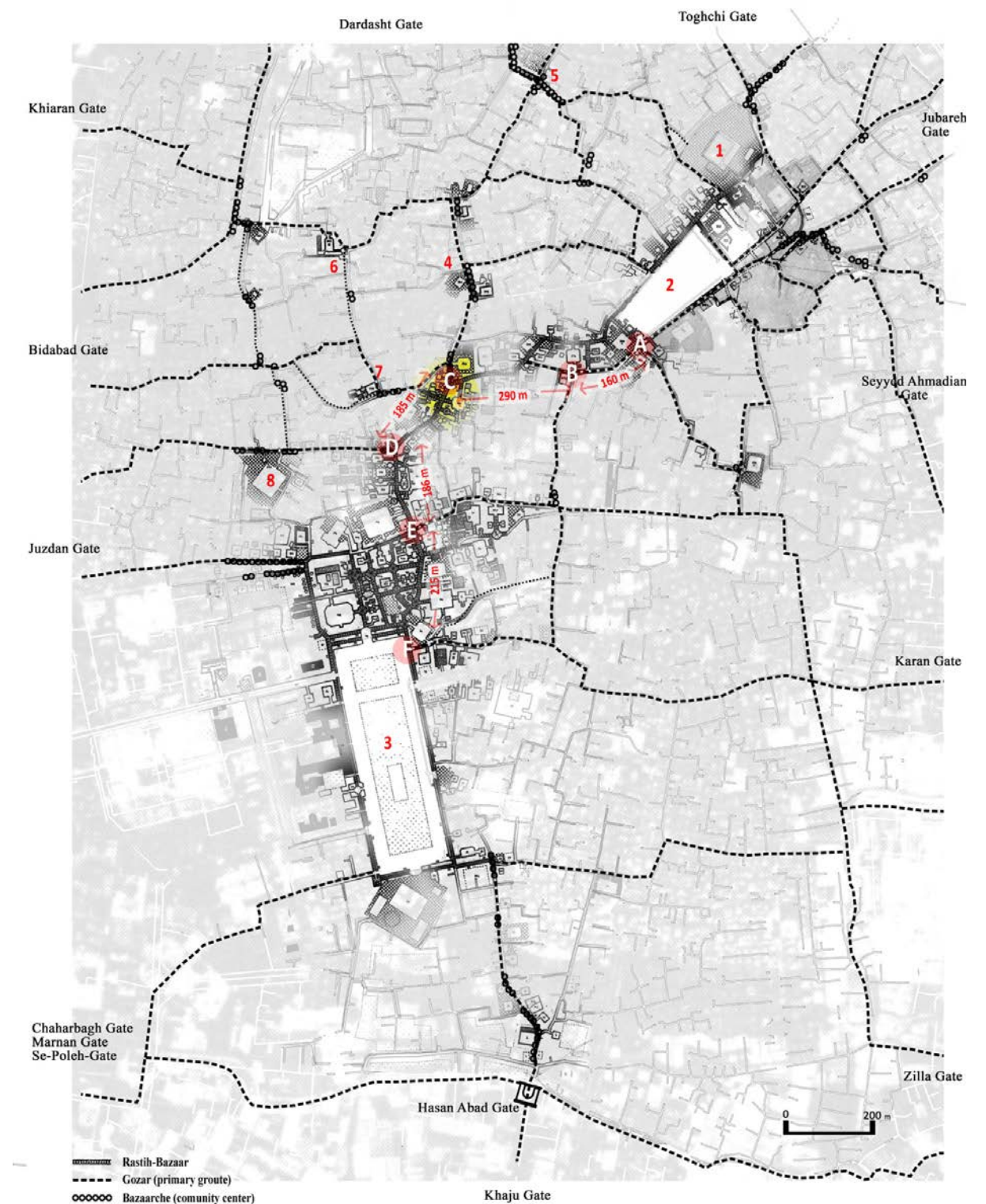


Fig. 86. The Bazaar, chained by varying encounter points, Seh-Rah-e-Nim-Avard, (1) Jameh mosque, (2) Atiq square, (3) Shah-Abbas square, (4) Haj-Mohammad-Jafar Bazaarche, (5) Dardasht Bazaarche, (6) Qasr-e-Jamilan, (7) Shishegar Bazaarche, (8) Hakim mosque, (A) Harunieh, (B) Seh-Rah-e-Golbahar, (C) She-Rah-e-Nim-Avard, (D) She-Rah-e-Bagh-Qalandar-ha, (E) Darvazeh Ashraf, (F) Chah Haj Mirza, Source: author



**Fig. 87.** Se-Rah-e-Nim-Avard\_ Sarai-e-Shishe-Garan. Photo by Peyman Baktash, June 2020.



**Fig. 88.** The Kuche and Bonbast branching off the main Gozar connected the entrances of the residential houses to the Bazaar Nodes. Photo by Peyman Baktash, June 2020.

Running towards the east, Kuche-ye-Masjed-No meets Bazaar-e-Nim-Avard and the entrance door of the Nim-Avard school. In the opposite direction, the Kuche intersects with Masjed-No Raste-Bazaar, and further, it divides into two primary routes at the place of Bazaarche and Sarai of Shishe-Garan. As explained, these primary ground routes (Guzars) were used to connect to various former city gates. The northern intersecting branch connected to the Qasr-e-Jamilan (Palace of Jamilan) and reached two gates of Dardasht and Khiaran, and the western branch moved towards the gate of Biabad. (Figs. 86 & 90).

The creation of thematic and sequential maps helped us simplify and understand the complexity of this central place and illustrates some essential aspects in forming a Bazaar node concerning its relationship with its surrounding residential clusters and, at the same time, with other territories.

Fig. 91 shows how this Bazaar node could relate with its surrounding residential clusters or configure in depth through different forms of intermediary and sequential spaces such as Kuches, culdesacs, and Dalans<sup>33</sup>.

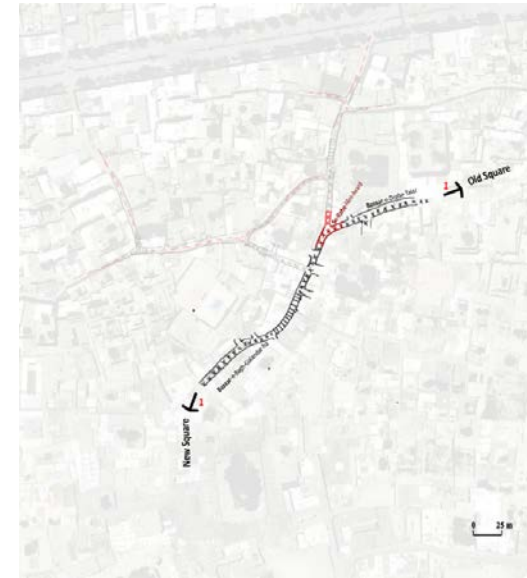
On the other hand, Kuche and Raste-Bazaar have extended the public domain deep into the central yards of Sarais and Carvansarais through the spatial sequence of the Raste-Bazaar, the Sarai entrance, the Dalan<sup>34</sup>, and finally the collective central yard.

The permeability and porosity of Raste-Bazaar, Dalan, and central yard edges provided diverse forms and spaces for simultaneous mixed uses and activities.

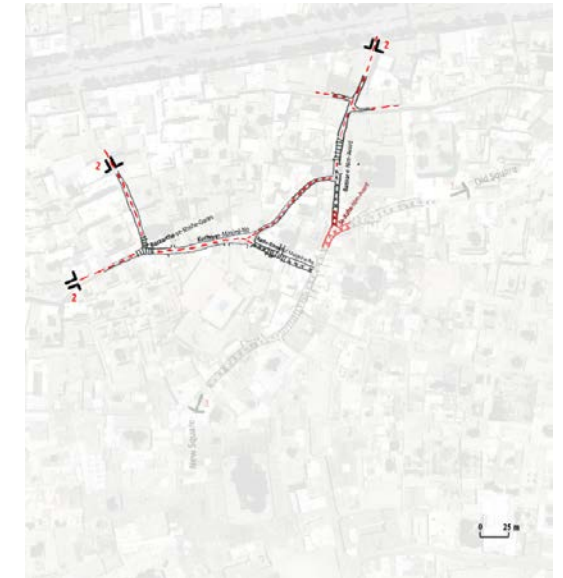
The diversity and addition of complementary activities met further needs of residents and visitors in distinct forms of mosques, schools, baths, mills, and other buildings and held other political, religious, educational, health, and welfare activities.

<sup>33</sup> The community of residential clusters and houses with central city nodes has been studied in detail concerning the Haj Mohammad Jafar neighborhood center (in section 3.2.2.).

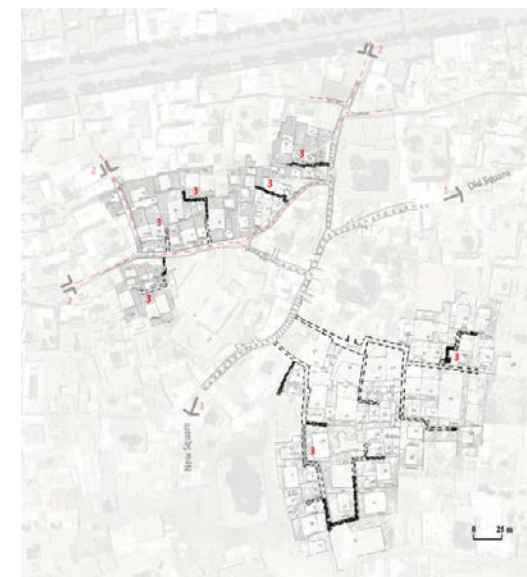
<sup>34</sup> As mentioned in section 3.1.2.1., major Rastih give way to Dalans to connect with the central yards of various collective spaces. Dalan is a less significant and narrower Rastih that connects the main Rastih of Bazaar to the courtyards of Sarais or Caravansarai. Compared to the Raste-Bazaar, the Dalan length and width are smaller, and they have platforms or small stores on both sides. Some Dalans have a broader section with two stories, such as the Dalan of Sarai-e-Mokhles and Sarai-e-Golshan, which are among the most well-known Dalans of Esfahan Bazaar.



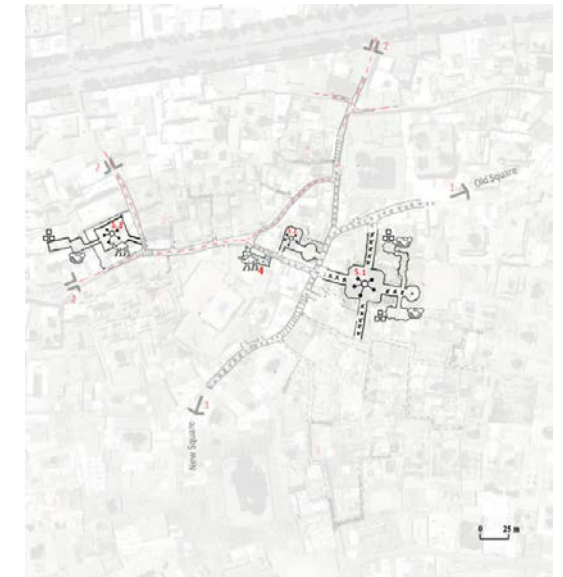
**Fig. 89.** Se-Rah-e-Nim-Avard\_ the main course of Bazaar. Source: author



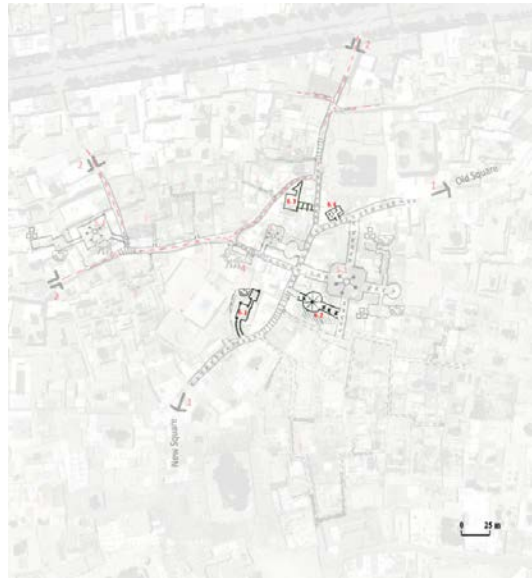
**Fig. 90.** Se-Rah-e-Nim-Avard\_ Primary dirt roads, connectivity with the gates, and surrounding regional and local nodes. Source: author



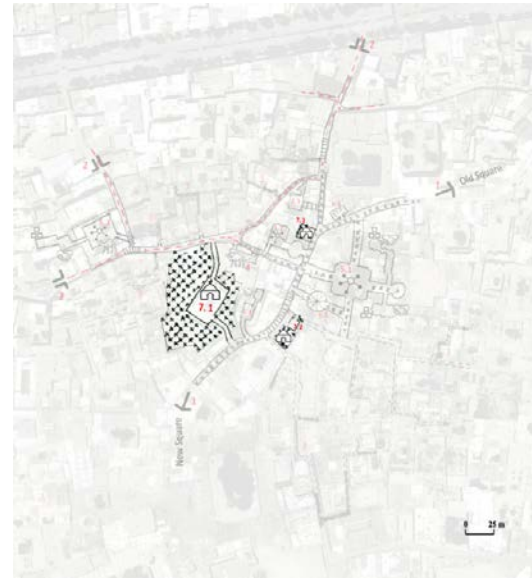
**Fig. 91.** Se-Rah-e-Nim-Avard\_ 3. Accessibility to the residential courtyard houses through Kuche, Bonbast, Dalan, Hashti. Source: author



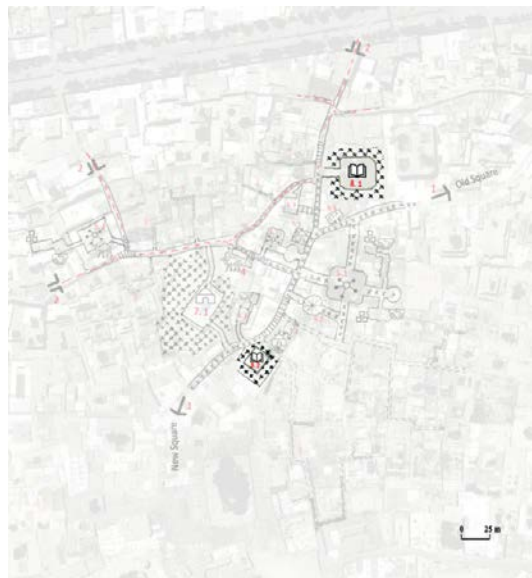
**Fig. 92.** Se-Rah-e-Nim-Avard\_ Economic centers, Bar-Andaz (Loading, and unloading places), and Sarais (Buildings for whole selling and distribution of merchandise, storing, and deal-making), 4. Bar-Andaz-e- Khansari-ha, 5.1. Sarai-e-Haj Karim, 5.2. Sarai-e-Khansariha, 5.3. Sarai-e-Shishe Gari, Source: author



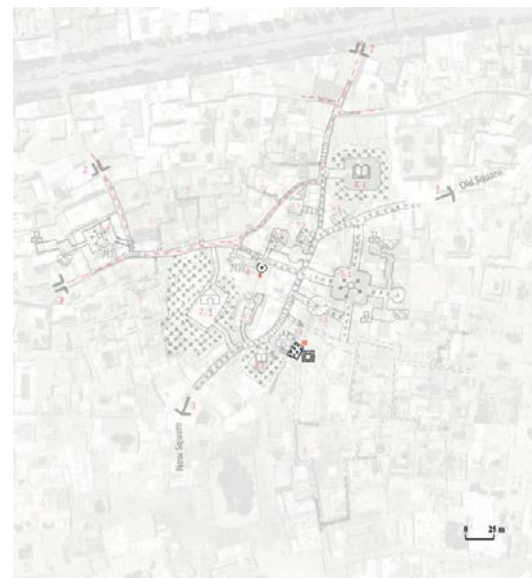
**Fig. 93.** Se-Rah-e-Nim-Avard\_ Timches, 6.1.Timche Qazviniha, 6.2. TimcheHaj Karim, 6.3. Timche Haj Karim-Poshti, 6.4. Timche Saadat, Source: author



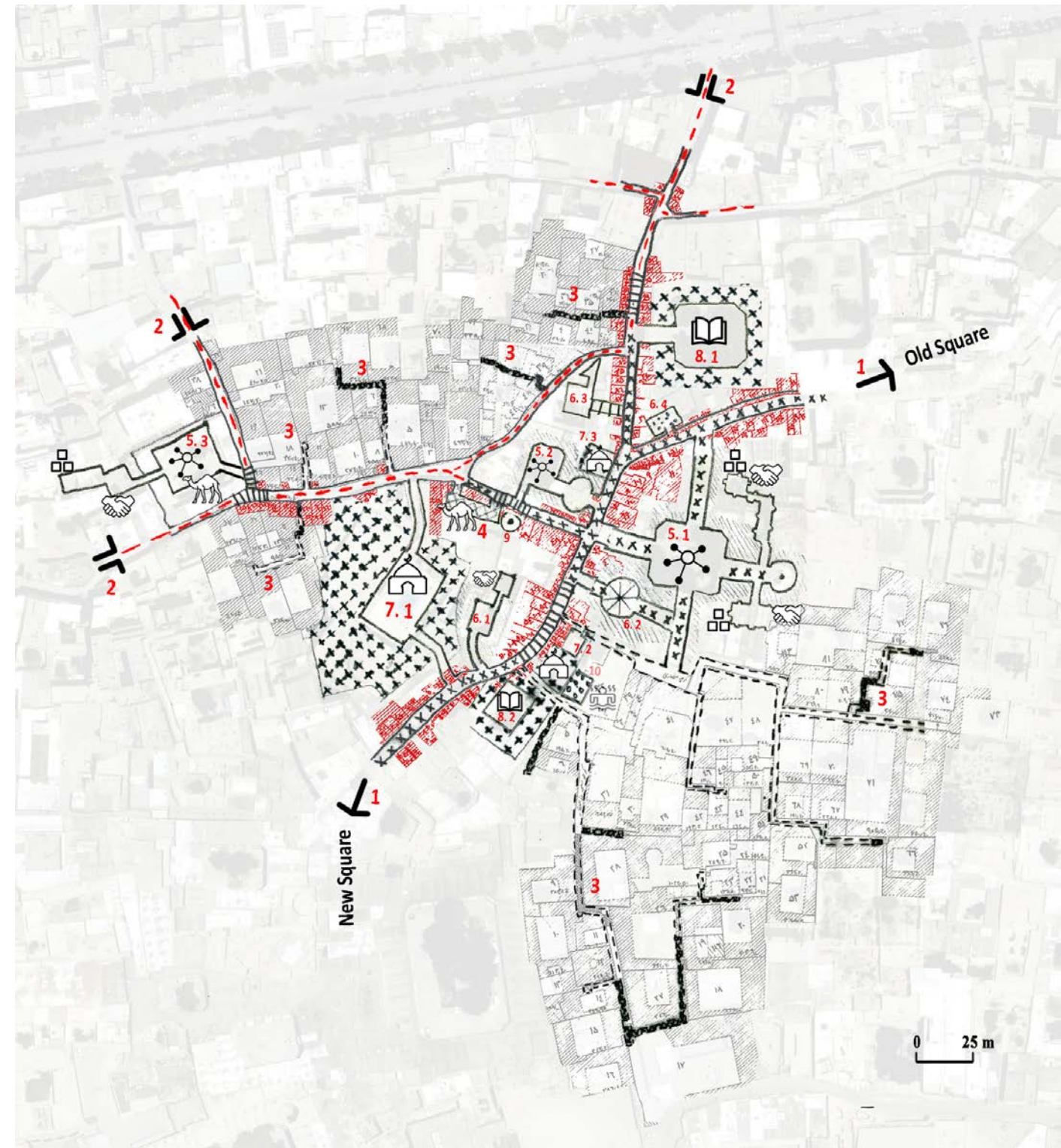
**Fig. 94.** Se-Rah-e-Nim-Avard\_ Mosques, 7.1. Masjed No (The New Mosque), 7.2. Masjed-e-Zolfaghar, 7.3. Masjed-e-Nim-Avard, Source: author



**Fig. 95.** Se-Rah-e-Nim-Avard\_ Schools, 8.1. Madrese-ye-Nim-Avard, 8.2. Madrese-ye-Zolfaghar, Source: author



**Fig. 96.** Se-Rah-e-Nim-Avard\_ 9. Spice mill, 10. Bath (Hamam-e-Zolfaghar), Source: author



**Fig. 97.** Se-Rah-e-Nim-Avard\_ economic centers and complementary elements, Source: author

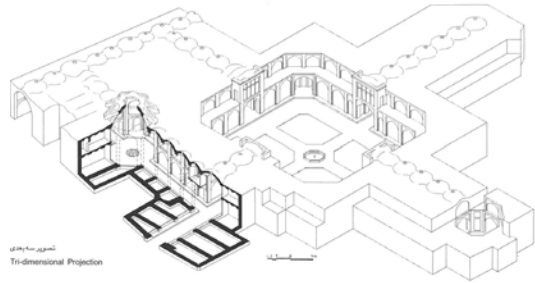




**Fig. 98.** Northern two stories Dalan of Haj Karim Sarai, 2020. Source: Frazad Beygi



**Fig. 99.** Eastern one-story Dalan of Haj Karim Sarai, 2020. Source: Frazad Beygi



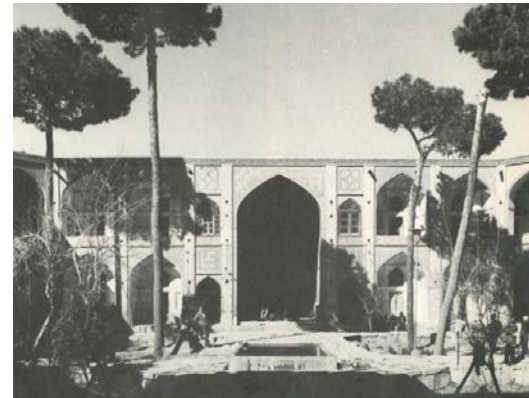
**Fig. 100.** Se-Rah-e-Nim-Avard, tridimensional projection of Sarai-e-Haj Karim. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Bazaar buildings- Vol. 9



**Fig. 101.** Se-Rah-e-Nim-Avard, Sarai-e-Haj Karim, culmination space of main courtyard. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Bazaar buildings-Vol. 9



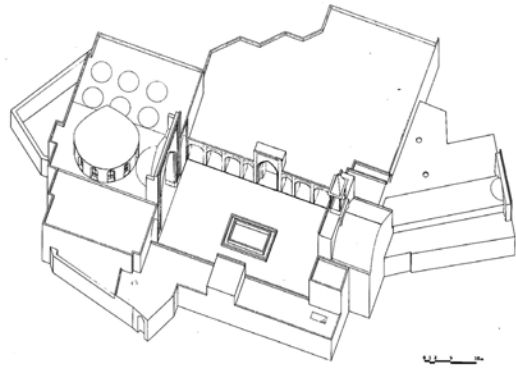
**Fig. 102.** Se-Rah-e-Nim-Avard, tri-dimensional projection of Madrese-ye-Nim-Avard. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture - Madrasahs, Vol. 5



**Fig. 103.** Se-Rah-e-Nim-Avard, Madrese-ye-Nim-Avard, the main courtyard. Source: 'The Sense of Unity' by Nader Ardalan and Laleh Bakhtiar, 1973.



**Fig. 104.** Aerial photo of Se-Rah-e-Nim-Avard, 2013



**Fig. 105.** Se-Rah-e-Nim-Avard, tridimensional projection of Masjed-No. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Mosques of Esfahan, Vol. 2



**Fig. 106.** Se-Rah-e-Nim-Avard, culmination space of main courtyard yard of Masjed-e-No. Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture- Bazaar buildings-Vol. 9

The other critical characteristic, seen in the Nim-Avard Bazaar node, is how the architectural forms and materials responded to the environmental and climate condition. For instance, applying various techniques in covering the roof of Raste-Bazaars and Dalans has increased the spatial quality and provided environmental comfort for Bazarians and outsiders.<sup>35</sup>

The roofing process of the Bazaar partially started at the intersection points and gradually filled the distance between the intersection, turning to an entirely covered linear form. Below the roof vaults, the tunnel-like Bazaar is usually lower than the surrounding areas to cause better air circulation. Under the Bazaar ceiling is shaded, cool, and lit only by shafts of sunlight entering a small hole at the center of each mound (Kheirabadi, 2000, p. 50; Shafaghi, 2016a, p. 473)

<sup>35</sup> The covering of Rastih-Bazaars provided a favorable comfort condition in the hot and cold seasons of the year inside the Bazaar for buyers and sellers or for maintaining the goods and protected them from severe cold, heat, sun exposure, rain, wind, and storms (Shafaghi, 2016a, p. 470).

Finally, using a central courtyard as one of the key characteristics in organizing the spaces and connections was applied as an approved response to the region's climatic conditions for a long time.

Central courtyards, which used to shape domestic architecture and other public and private buildings such as mosques, Madrasahs, and Sarais, were fundamental components in the configuration of different central nodes (Shafaghi, 2016a, pp. 414, 416). Sarai-e-Haj Karim, Madrese-ye-Nimvard, and Masjed-e-No are still significant collective buildings that shape the central node of Se-Rah-e-Nim-Avard, which follow the similar pattern of the central courtyard.<sup>36</sup>

<sup>36</sup> Except for the courtyards of mosques, which typically do not have greenery and trees, all other public and private buildings involved in the development of the Bazaar, such as Caravansarais, Sarais, schools generally have water pools, trees, and greenery, which could increase the humidity, and keep the air fresh and pleasant; in the effort to materialize the image of the heaven on the earth (Bakhtiar, 1974, p. 326; Shafaghi, 2016a, p. 447).

### 3.2.2. From the center of Haj Mohammad Jafar neighborhood to the courtyard of a house

The simplest definition of a Mahalleh (neighborhood) can be "a small part of a city whose inhabitants have been able to meet their daily needs from the same place and have been inhabited by ethnic, racial, religious, and professional groups" (Nafisi, 1939, p. 3181). In addition to human factors, which have received a great deal of attention, natural factors have also played a vital role in defining physical units and their borders, such as watercourses (river, Madies) and topography.

In Safavid Esfahan, the total area of traditional neighborhoods was about 1,833 hectares, which nowadays is known as the historical area of Esfahan, and in early the 21st century represents 13.5% of the city's total area. Studies by Cyrus Shafaghi regarding Esfahan city (2016) show that in the 1970s there were about 157 neighborhoods, including the small and large alleys, which have kept their old names. The extension of these neighborhoods can be seen in yellow color in figure 107. According to the same studies, most of these neighborhoods have an area between 10 and 15 hectares and 300 and 400 residential units, with an average population of about 1,000 to 1,500 people (Shafaghi, 2002, pp. 380, 422, 2016a, p. 665).

In addition to the central Bazaar nodes and the prominent and common centers of neighborhoods, other essential factors, such as watercourses (including the river and the irrigation network of Madies), have been pointed out. Five centers marked in black, correspond to their dominant state and engagement in larger-scale activities compared to their surrounding centers. The Haj Mohammad Jafar neighborhood center taken as

the main case study in this section is shown in red (Fig. 107).

Out of the 157 neighborhoods, 31 are named after prominent people involved in building the core of those neighborhoods. The buildings that formed the neighborhoods' centers varied according to their condition, size, and importance and consisted of rows of shops and public buildings such as mosques, schools, baths, Hosseinieh, CaravanSarai, Saqakhaneh, and Ab-Anbar. Previously, the rich and philanthropists used to build some of these primary and complementary buildings, which were dedicated to the neighborhood and the city and took part in the construction of the neighborhood centers. They also built their luxurious houses close by, and their names remained in the center of these neighborhoods. These buildings' maintenance costs were paid with the income of their attached economic units, such as the rows of small shops, baths, and Caravansarais (Shafaghi, 2016a, pp. 664, 665).

Residential areas have been organized into different Mahallehs. Mahalleh's division was based on differences in ethnic backgrounds, religion, language, profession, and the original birthplace of the coming immigrants. People of similar interests or backgrounds were clustered together for comfort, protection, and greater security. Esfahan's oldest neighborhoods have been made up of the same old communities as there are neighborhoods like Fefelan, Sonbolan, Khoshian, and Tarvaskan, which have inherited their names from the ancient villages (Kheirabadi, 2000, p. 79; Shafaghi, 2002, pp. 378, 398).

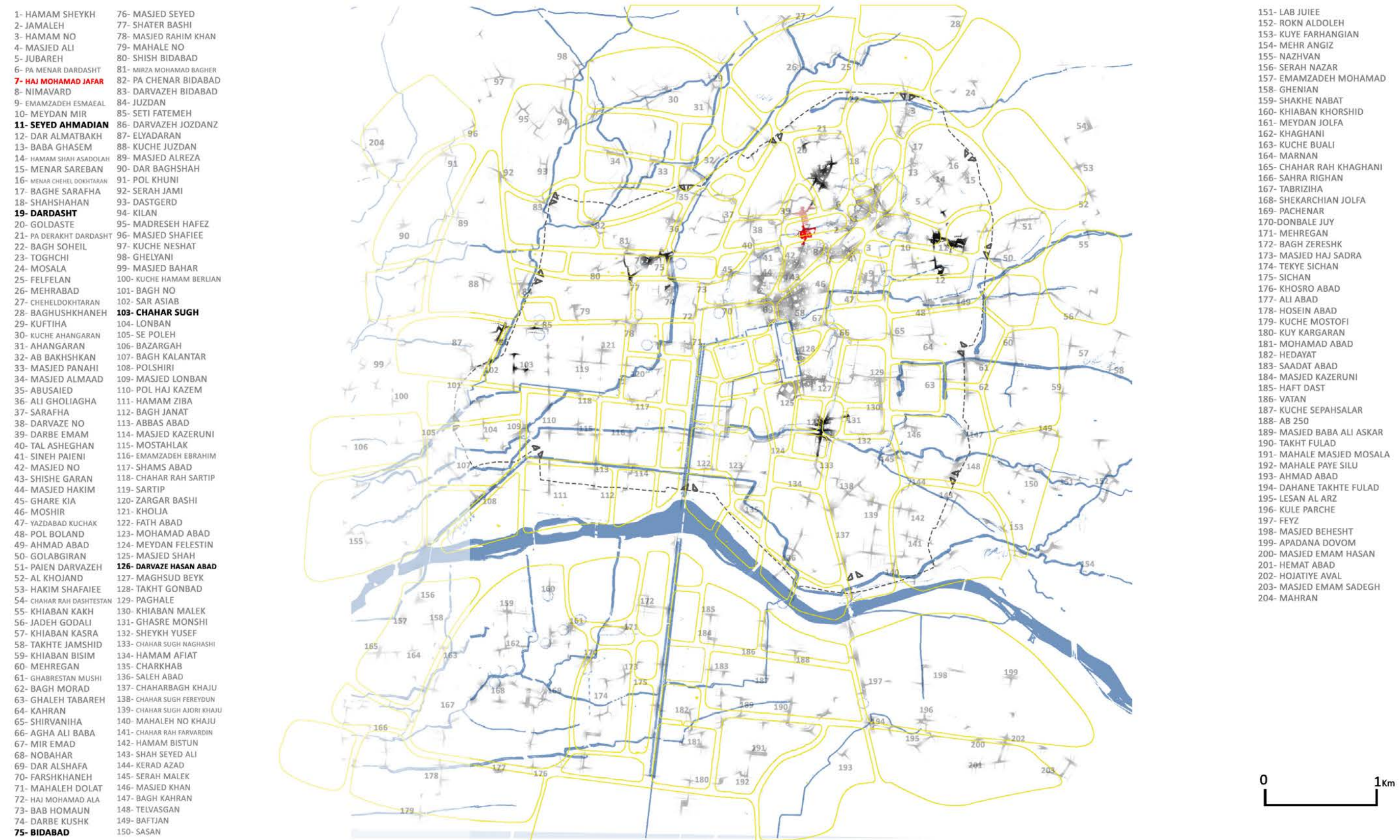
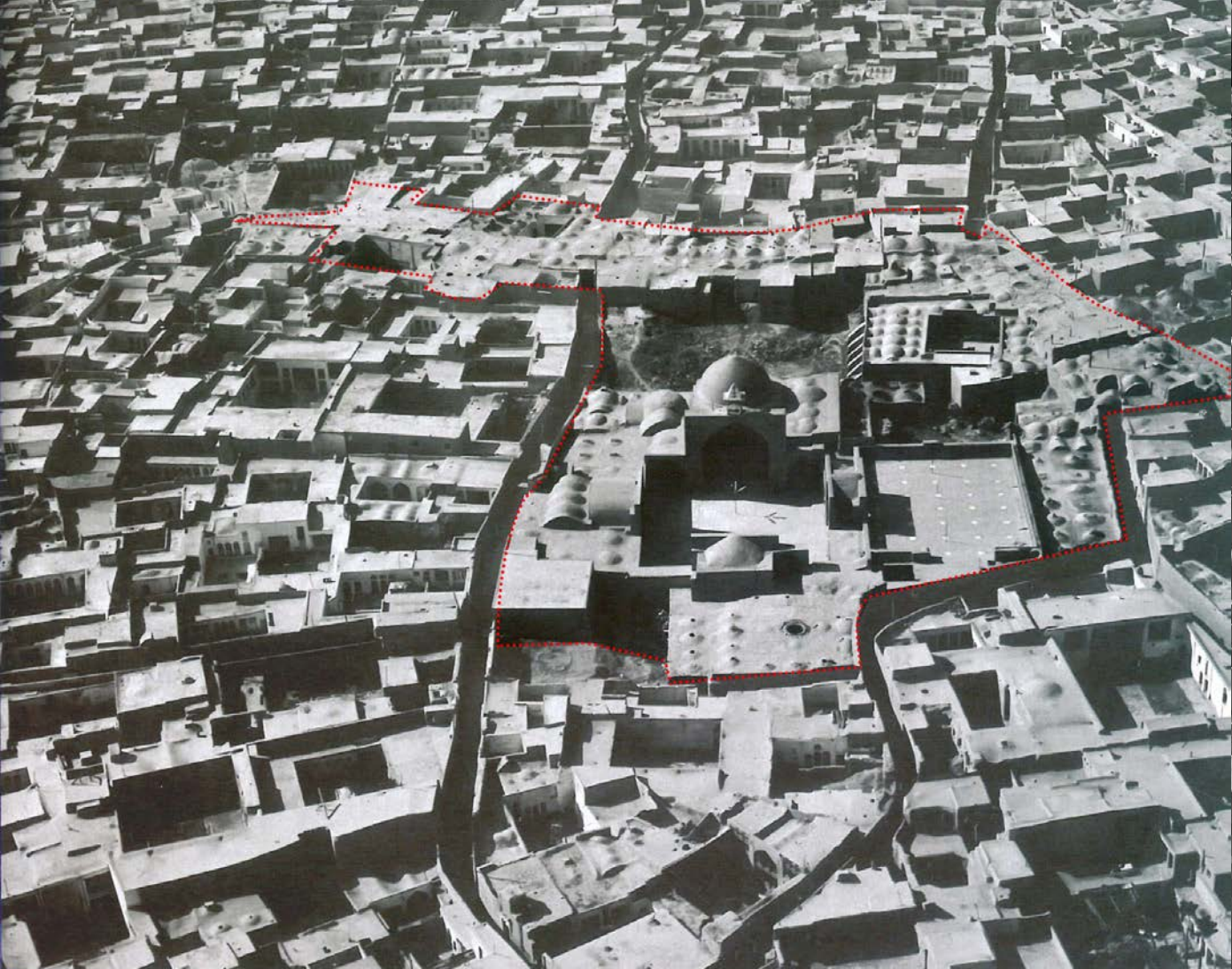


Fig. 107. Esfahan's neighborhoods and their centers prepared by the author based on Shafaghi's map of the city's neighborhoods, 1973.



**Fig. 108.** Aerial view of Dardash Quarter- one of the oldest quarters of Esfahan. Source: Ministry of Culture and Arts of Iran, 1976.

Some selected inhabitants used to manage Malalleh affairs within the community. Thus, they had their specific traditions and ordinances to regulate social relations. Although these rules were known and obeyed by the residents, they were never officially written (Kheirabadi, 2000, p. 80).

Compared to the central nodes' public and collective nature, the neighborhood or residential districts had an entirely different private nature. However, their relationship is essential, as the residential district compliments the Bazaar. From the smallest unit within the city (a private house) to the number of residential clusters (a neighborhood) to the main city center (the Bazaar), all were closely interrelated and had

cell-like connections. Households were receiving services from both the center of neighborhoods and the Bazaar. Different public buildings and amenities constituted each neighborhood's center, providing drinking water, shade, and religious, social, and recreational services. While the center of Mahalleh supplied the residents with daily needs, the central Bazaar provided more higher-end and expensive goods. Mahalleh's centers were well integrated into the city and were in constant contact with the main Bazaar, and neighborhood shops received their supplies from the Bazaar merchants (Kheirabadi, 2000, p. 81).

Some neighborhood centers encompass more comprehensive public facilities and significant elements than the other common neighborhoods.



**Fig. 109.** The center of Dradasht neighborhood in respect to its surrounding area. The map is overlapped by the aerial photo of 1974 with the ABFA (Esfahan Province Water and Sewerage Company) map of 1975. Source: author

These neighborhoods are called 'Fara Mahallah,' which means ultra-neighborhood. The centers of ultra-neighborhoods met the needs of their surrounding residents and engaged in larger-scale activities. They were generally located at the intersections of the main historical passages, which were linked to the city gates, their surrounding local centers, and finally, the Bazaar nodes and the city's main centers. They often had such elements, which generally were not seen in ordinary neighborhoods of the city, including shrines, schools, Hosseiniyah, Takieh, and prominent shopping centers. These neighborhoods had more urban influence by mediating between the city center (main Bazaar) and its surrounding minor neighborhoods.

According to Sirus Shafagi, Esfahan had five ultra-neighborhoods centers, which are illustrated in black in Fig. 107:

- The center of the Hassanabad neighborhood located in the south of old Esfahan,
- The center of the Seyed Ahmadian neighborhood located in the northeast,
- The center of the Dardasht neighborhood located in the north,
- The center of the Bidabad neighborhood, in the northwest,
- The center of the Chaharsuq neighborhood located in the west (Shafaghi, 2002, pp. 385, 386).

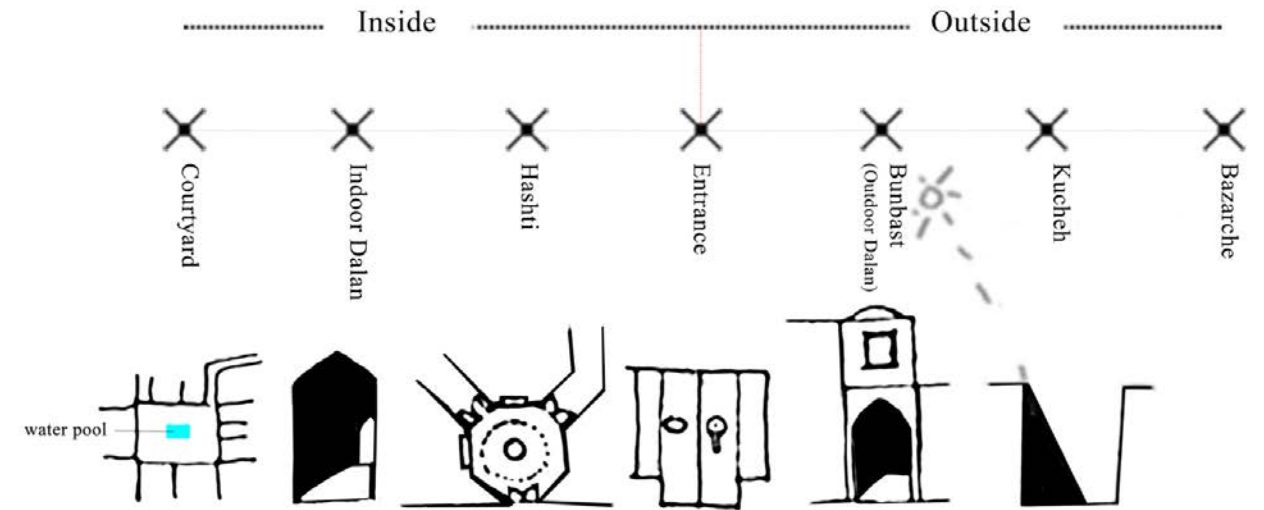


**Fig. 110.** Aerial view of Jamaleh Quarter and its linear centers of Haj Mohammad Jafar and Wazir Bazaarche. Source: Ministry of Culture and Arts of Iran, 1976.

The 'Foru Mahalat' or regular communities originated from neighboring residential units with a conventional shopping center or Bazaarche (limited number of linear stores, generally under a brick-vaulted or wooden roof), including various participating buildings addressing their inhabitants' daily needs. The centers of the ultra-neighborhoods have various general elements with higher quantity and quality than the smaller centers. The number of these minor centers in each neighborhood was almost inevitable and consisted of a certain number of residential houses. Vast and densely populated neighborhoods had more,

and the smaller ones had fewer minor centers (Shafaghi, 2002, p. 385).

In addition to the enormous development projects undertaken by the government, especially during the glorious dynasties of Seljuk and Safavid that significantly changed the body of the city, accordant to their financial affordability, the private initiative also took decisive steps in city development; therefore, the generous and wealthy citizens contributed significantly to the city's growth and expansion by participating in building the neighborhood centers.



**Fig. 111.** The sequential process of connection of the center of a traditional house to the center of the neighborhood. Source: author

Concerning different references, as well as the "territorial depth" concept mentioned in section 3.1.2.2., for reaching the Andaruni (the most private part of the traditional courtyard house) from the city center (Bazaar nodes) or the neighborhood centers (Bazaarches), people needed to pass through a hierarchical system of Kucheh, Bunbast (outdoor Dalan<sup>37</sup>), the main house entrance, Hashti, and the indoor Dalan. A sequence of intermediate spaces were connecting the public realm to a private one, the center of a house (central courtyard) (Fig. 111).

As a subset of the Dardasht neighborhood, the Jamaleh neighborhood is located on the western side of Atigh square and dates back to the pre-Safavid period; likely, it dates back to the Dialameh and Seljuk periods (the 10th -11th centuries). The area of the Jamaleh neighborhood approximately covers 17 hectares. However, we don't have figures for the current population of this specific area; studies done in the 1980s by the housing and urban planning experts of Esfahan province estimated its population as more than 3,000 inhabitants. Jamaleh neighborhood has three

Bazaarches (the center of the neighborhood), including the Haj Mohammad Jafar's Bazaarche being stronger and closer (less than 200 meters) to Nimavard, Bazaar node (3.2.1.), and Wazir and Domenar Bazaarches with a less influential impact (Shafaghi, 2002, p. 435).

Considering the connection of the private domain of a central house to the public domain of a neighborhood center, a residential cluster of four different sized courtyard houses, placed at a close distance from Haj Mohammad Jafar and Wazir community centers, is chosen to get more in-depth study.

Comparing the studies conducted in 1970 by Mrs. Nasrin Faghih concerning the condition of this area, including this cluster of residential houses, with its current situation, shows the dramatic changes that have occurred during the last four decades in the area around the Haj-Mohammad Jafar neighborhood.

Although the Bazaarche is still there, it is experiencing a major decline due to many reasons such as the predominance of car traffic and the ever-growing purpose of car penetration and permeability in the historical central areas.

<sup>37</sup> Unfortunately, nowadays, the mutual relationship of Bazaarche and the entrances of houses that is presented in the aforementioned particular hierarchy, dramatically has changed.

Kuches and Bonbasts were widened, and most of the Dalans, not only in this center but in the entire city, were demolished for modern services, including gas pipes and access to parking. In other words, the intermediary character and former transitional and spatial sequence, which was linking the public domain of the neighborhood center to the private domain of residential units, in various steps, nowadays, has changed and become more direct.

Haj Mohammad Jafar Bazaarche is located along Haj Mohammad Jafar Guzar, crossing Darb-e-Qasr and Jamaleh alleys. In an eastward direction, Jamaleh Alley connects this Bazaarche to Atiq Square. In the opposite direction, Darb-e-Qasr Kuche connected this Bazaarche to essential elements such as Jamilan Palace, Hakim Mosque, some other Bazaarches, and finally, Bidabad and Juzdan gates.

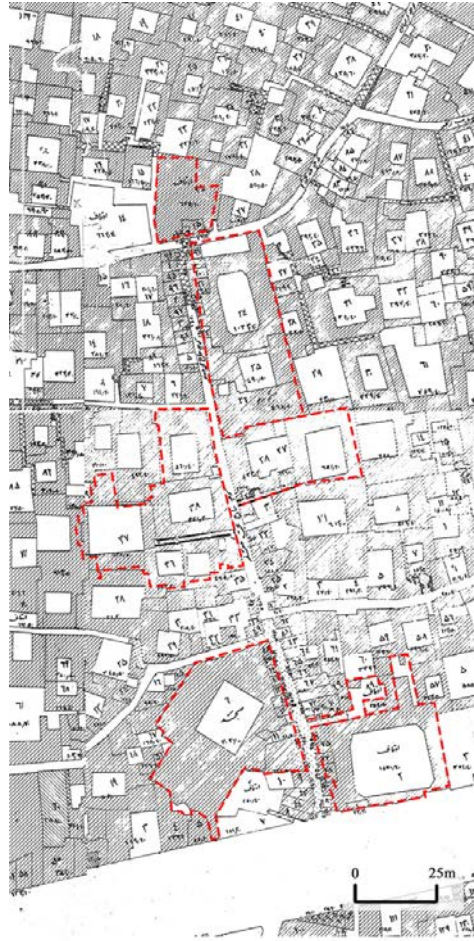
The Bazaarche was formed by the accumulation of primary elements and public buildings such as Haj Mohammad Jafar Mosque, Hobbeh Beygom Sarai, two Saqakhanehs at the two heads of the Bazaarche, which all were endowed and founded by the philanthropists in the Qajar period and since the early 19th century to 20th century.

In a distance of approximately 150 meters away from Haj Mohammad Jafar Bazaarche on the north side, Wazir Bazaarche is formed by the association of some fundamental elements of Dorchei Mosque, the Caravansarai, and the Bath of Wazir. This Bazaarche is located within a short distance of Emamzadeh Darb-e-Emam on its western side, connected to another Bazaarche of Darvazeh-No, the Posht-Baru alley, and the Darvazeh-No and Bidabad gates.

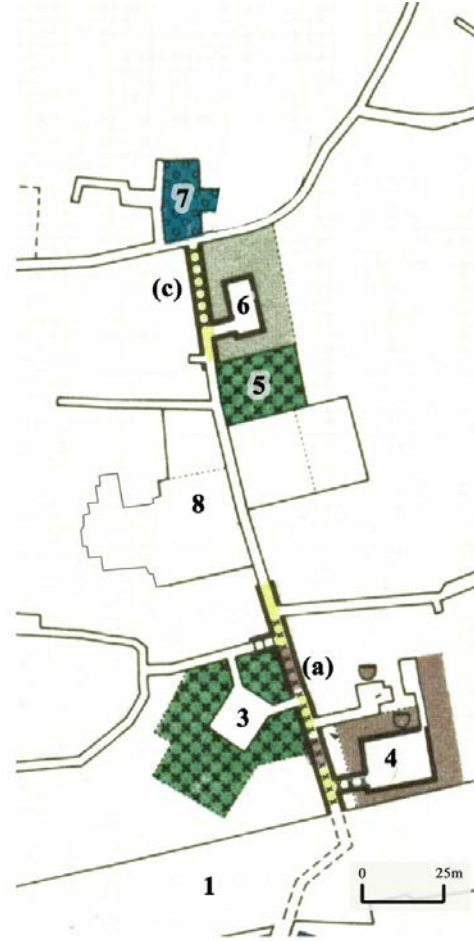
On the other hand, Wazir Bazaarche continues toward the east and northeast and then is divided into two branches in the place of the Darb-e-Zanjir caravansarai, of which only a ruin remains. One branch led to Domenar Bazaarche and from there to Atiq Square, and the other branch reached Dardasht Bazaar in the north, where it was connected to Dardasht and Toghchi Gates.

**Fig. 112.** The location and connection of Haj Mohammad Jafar Bazaarche with the surrounding crucial elements. (a) Haj Mohammad Jafar Bazaarche, (b) Se-Rah-e-Nim Avard, (c) Wazir Bazaarche, (d) Domenar Bazaarche, (e) Dardasht Bazaarche, (1) Abdolrazaq street, (2) Jame mosque, (3) Haj Mohammad Jafar mosque, (4) Hobbe Beygom Sarai, (5) Dorcheie mosque, (6) Sarai, (7) Hamam-e-Vazir, (8) the plan of this residential cluster of houses published in Cantacuzino-Browne, Architectural review, 1976, (9) Emamzadeh Darbe Emam.

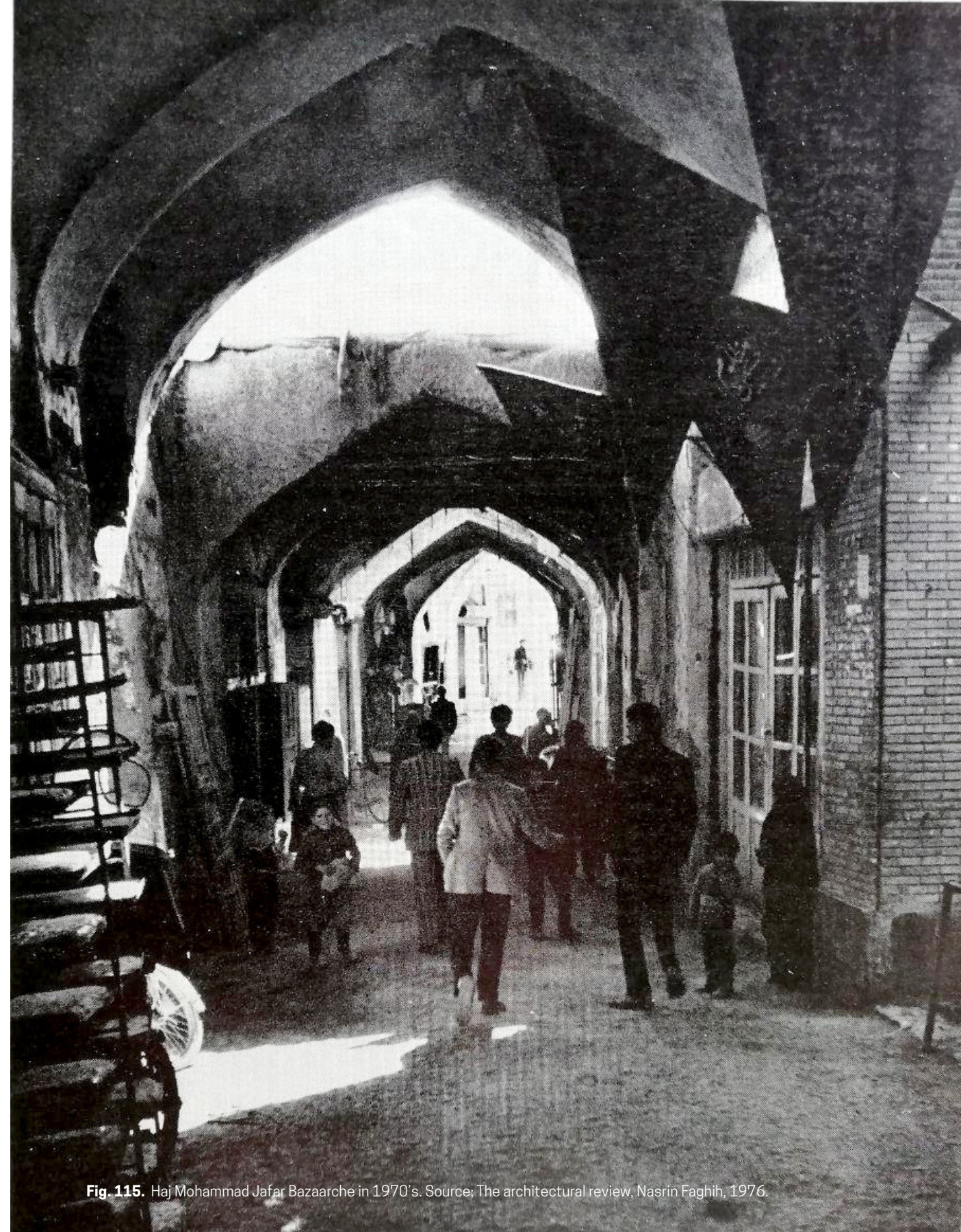




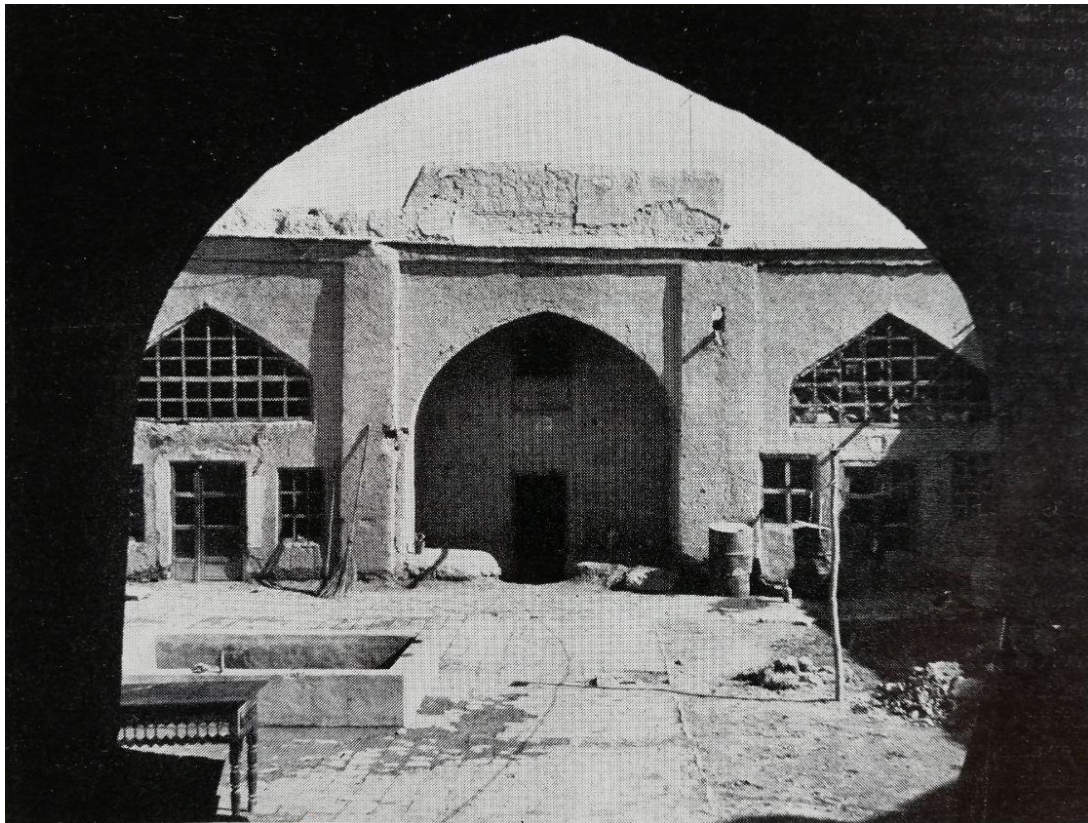
**Fig. 113.** Land parcels in the area around Haj Mohammad Jafar and Wazir bazaarches, selected frame of the Organic map, 1963.



**Fig. 114.** Components of Haj Mohammad Jafar and Wazir bazaarche. 1. Abdolrazaq street, 3. Haj Mohammad Jafar Mosque, 4. Hobbeh Beygom Sarai, 5. Dorchei Mosque, 6. Wazir Caravansarai, 7. Wazir Hamam, 8. A residential cluster of courtyard houses. The plans of this complex published by Cantacuzino-Browne



**Fig. 115.** Haj Mohammad Jafar Bazaar in 1970's. Source: The architectural review, Nasrin Faghieh, 1976.



**Fig. 116.** Habeh Begum Serai, 1970's. Source: The architectural review, Nasrin Faghih, 1976.

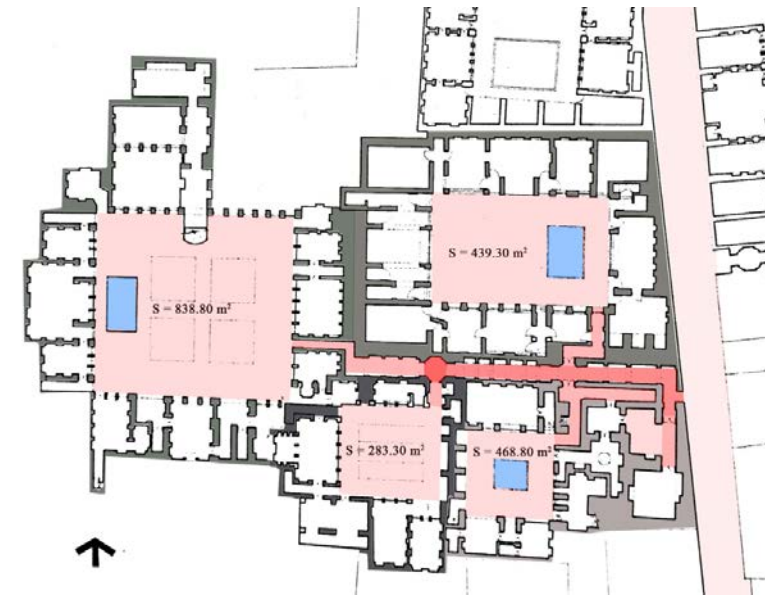


**Fig. 117.** Saqakhaneh, Bazarche Haj Mohammad Jafar, 2014. Source: author



**Fig. 118.** Haj Mohammad Jafar Mosque's main entrance, Bazarche Haj Mohammad Jafar, 2014. Source: author

### 3.2.2.1. Permeability in Configuration of a Residential Cluster



**Fig. 119.** A cluster of residential courtyard houses in close to the Haj Mohamad Jafar center of the neighborhood. The connectivity of the courtyards to the primary passage. Source: The architectural review, Nasrin Faghih, 1976.

In the final part of section 3.2.1.2., related to the case of the Nimavard Bazaar node, the study considered how this node could extend depth into its surrounding areas by using some intermediary spaces of Dalan and courtyards belonging to the public city domain. This section will show how the intermediary spaces of Dalans, Hashties, and courtyards could configure the residential clusters and their residential units (private domain) connecting to the city's central urban nodes. The cluster we chose is previously mapped by Nasrin Faghih (published in the Architectural Review, 1976) and referred to and numbered in the study of Heinz Gaube and Eugen Wirth about Esfahan's Bazaar.

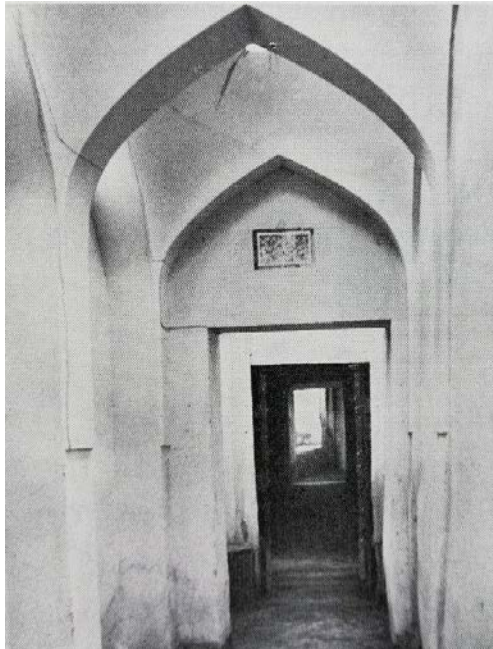
Unfortunately, today, this residential cluster is difficult to be recognized as the Dalans and

Hashties are demolished, and the previous covered and narrow Dalan passage turned to a broader Bunbast. The only residential unit left of this cluster is located at the end of the current Bunbast, working as a center for the Education and Employment of the Disabled people. The rest of the houses are destroyed and replaced with modern and exterior houses set at the front of current and more expansive Bunbasts and passages.

The diagram (Fig. 119) shows four different size courtyard houses that compile a cluster<sup>38</sup>, and it points out the sequential spaces connecting each central courtyard to the main Guzar, linking Haj Mohammad Jafar and Wazir neighborhood centers. This cluster was located at a very short distance from Haj Mohammad Jafar Bazaarche

<sup>38</sup> An outstanding aspect of the development of Mahallehs in traditional Iranian cities was the lack of social class segregation. The rich did not cluster in exclusive groups away from the poor. In many cases, the rich and poor lived in the same neighborhood, sometimes next to each other. One of the benefits of the poor and the rich living together was that the more capable bodies were obliged to support the less fortunate ones, within the family, which prevented any embarrassment of the poverty and deprivation of close relatives (Kheirabadi, 2000, pp. 80, 81).





**Fig. 120.** The covered cul-de-sac access of the presented cluster of the traditional houses. Source: The architectural review, Nasrin Faghhi, 1976.

(between the two Bazaarches of Haj Mohammad Jafar and Wazir) (Figs. 112 - 114).

Each of these residential houses was not only a social unit but also represented its inhabitants' lifestyle. The highest percentage of historic neighborhoods was covered by the mass number of traditional residential houses, which generally had at least a central and rectangular courtyard with rooms arranged on two or more sides. The houses were giving the city a compact, organic appearance by clustering together in a cell-like pattern. It is possible to compare each house's central courtyard to the neighborhoods' centers because they both arranged and linked different spaces and activities to a greater whole.<sup>39</sup> Besides, the central yard of a house and a neighborhood's center can be seen as a physical reflection of the social relationship, between family members

<sup>39</sup> Manuel de Solà-Morales, *Public and Collective Space: The Urbanization of the Private Domain as a New Challenge*, 1992. "the city is the very place where the private domain can be, and often is, a social domain- just as much as or indeed even more than the public domain. (...) Private buildings as public elements, radiating social meaning and value that extend beyond the actual buildings embody their urban character".



**Fig. 121.** The main entrance door of Daruiee house, source: Maisons d'Ispahan, Darab Diba.

and neighborhood residents to respond to their daily affairs and needs (Kheirabadi, 2000, p. 35; Shafaghi, 2002, p. 382, 2016a, p. 235).

The access routes' width was inversely related to the degree of privacy. Therefore, blind alleys (Bunbast) and corridors (Dalan) provided direct access to residential houses by locating at the final points of the access routes, being less than two meters wide with a semi-public or semi-private nature (Ahari, 2001, p. 172).

The narrowest access routes or Bunbasts were used exclusively by the Mahallah residents and belonged to them for practical purposes. Women from the neighboring houses gathered there, sitting on the platforms in front of their Hashti while performing their daily errands, like weaving, sewing, or knitting. This fact created a sense of privacy in these narrow passages so that the presence of a stranger became curious (Kheirabadi, 2000, pp. 82, 83).

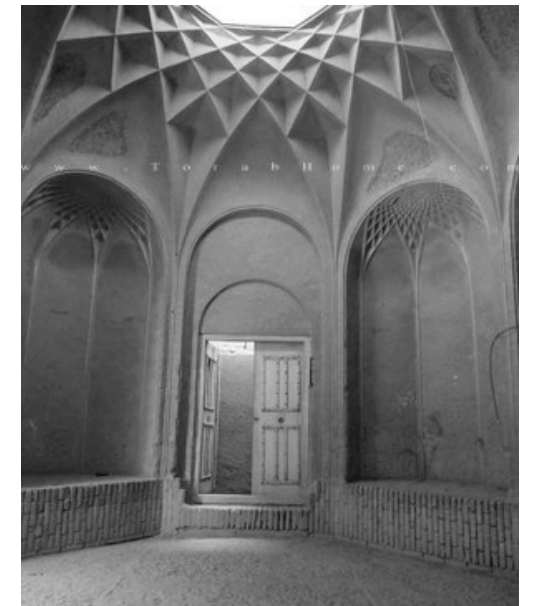
### 3.2.2.2. Interior Spatial Organization of Traditional Houses

The residential houses all look similar from the outside, having the same color, height, and even design. With few exceptions, they are often built of sun-dried bricks and without exterior decorations. Houses differ in interior design and architecture, yet are indistinguishable in their exterior appearance. Size and interior decoration are indicators of the taste and financial affordability of the owner.

The main entrance door of each house had two different Kubehs<sup>40</sup>. One of them consisted of a metal hammer-like tool producing a bass sound when hit on its metal plate below, and the other included a metal ring shape tool that delivered a treble sound. This difference was to distinguish between male and female visitors: the ring-shaped Kubeh was devoted to women, and the hammer shape was for men. The house entrance often consisted of two platforms called Pirneshin on either side of the door, which was set up for visitors to sit and rest, especially the older people (Fig. 121).

The Hashti is reached by passing through the entrance. As the name implies in the Persian language, the Hashti (vestibule) was often octagonal and could divide in different directions for adjusting the movement based on the purpose and destination. The Hashti could locate inside or outside the main entrance door. If it is immediately located outside the entrance door, it usually includes several doors on its sides, being devoted to the adjacent houses' entrances. However, if it is located inside the house, it could be a space to be accessed or prepared to enter different parts of the house, including the inner private spaces (Andaruni or the family part), the outer half-private spaces (Biruni or the business part) and the service part. There was a relatively dark place inside the Hashti, and sometimes a hole on the Hashti's roof where light could pass through into the Hashti.

<sup>40</sup> Kubeh was a metal tool that could be installed on the house's main entrance door, which by tapping the a metal plate below it was for informing the people of the house.



**Fig. 122.** Entrance Hashti in Sfaie Arani traditional house, source: <https://images.app.goo.gl/M341wS9PbE43nj8V9>



**Fig. 123.** The connection of the Hashti to the central courtyard by Dalan in the traditional houses, 2009 Source: Ehsan Soleimanpour

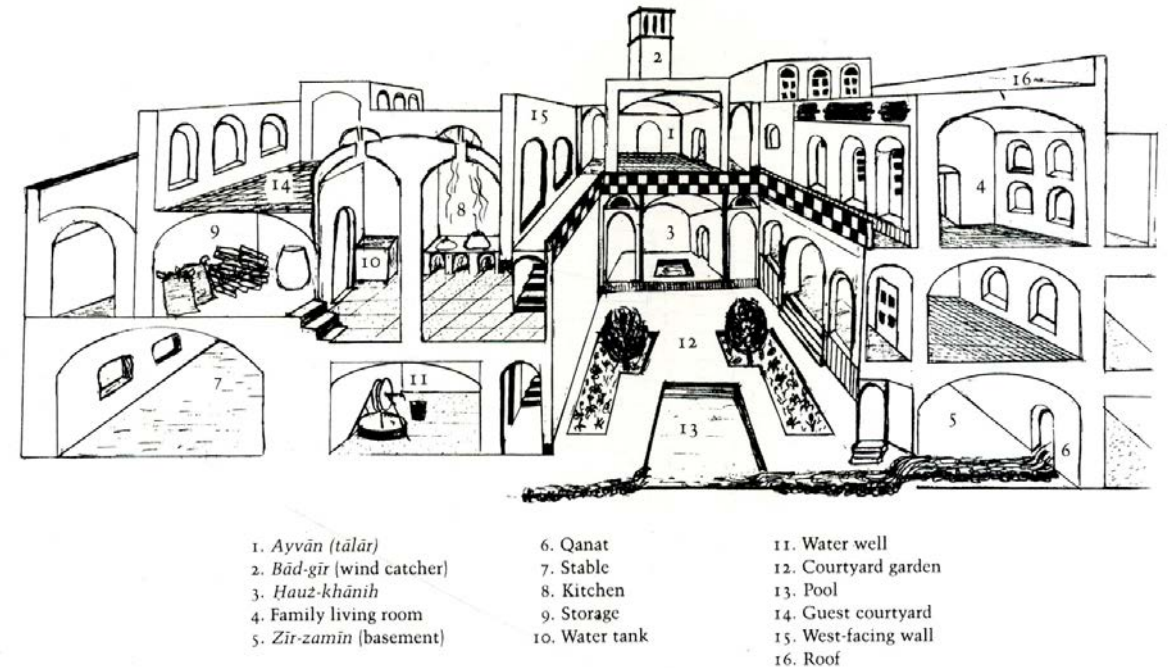


**Fig. 124.** The courtyard seen from the roof of the summer part, with the grander north block of ceremonial rooms and the wind-catching tower on the top of Howzkhaneh on the opposite side. Source: The architectural review, Nasrin Faghhi, 1976.

The thickness of the inner walls of the Hashti allowed the installation of niches and platforms inside the walls. People entering the house could sit there waiting for the house owner without entering the yard and disturbing the people's privacy inside the house. Typically, there is a winding or long straight Dalan after the Hashti, depending on the shape and area of the plot, allowing access to the courtyard. Staying in the dark and passing through a long corridor gives people a contrasting experience of the light explosion when they reach the central courtyard. The accumulation of trees, greenery, and water ponds formed peaceful spaces and great views (Diba, 2012, pp. 130, 131, 136).

In the traditional houses, the courtyard garden combined natural elements like the skylight, wind, water (a pond that provides ambient humidity), plants, flowers, and various trees. This combination produced a sub-climate by regulating the environmental temperature during the day and night and providing favorable conditions for its inhabitants' comfort. The yard was located on a lower level so that it was shaded most of the time and maintained coolness for a long time during the day.

Traditional houses in Esfahan usually consisted of one floor and were limited in height above ground level. The organization of these houses was central and was based on two symmetrical axes



**Fig. 125.** Elements of an affluent house in arid regions (based on Bazley and Haverson 1982), Source: Iranian cities, Masoud Kheirabadi.

perpendicular to each other. Rooms were usually arranged around the courtyard as the summer rooms were always facing the north, away from the hot afternoon summer sun. The shady, cool side of the house facing away from the sun was known as the *Nisār*. Summer rooms in their ideal form include components such as *Tālār*<sup>41</sup> (no.1), *Eyvān*<sup>42</sup>, *Bād-Gīr*<sup>43</sup> (no.2), *Howz-Khāneh*<sup>44</sup> (no.3), *Panj-Darī*<sup>45</sup> (no.4), and *Zīr-zamīn* or *Sardāb*<sup>46</sup> (no.5) (Fig. 125).

Although these elements were the main components of the houses' summer area, not all of them were necessarily found in all residences. *Tālār* and *zīr-zamīn* frequently found in most houses, regardless of the size or financial status of their owners. The houses' winter areas were

located on the opposite side of the summer areas, facing the south to be more effectively exposed to the winter sun (Kheirabadi, 2000, pp. 36, 39).

According to this structure, there was a seasonal migration between the northern and southern fronts inside the houses. Rooms located on the east and west fronts have been mostly used for the daily activities of family members and have played a secondary and less important role compared to the north and south fronts, but have been used all year-round, and have been very homogeneous in terms of interior landscape and harmony with other parts of the house (Diba, 2012, p. 115).

<sup>41</sup>The *Tālār* was one of the most important and beautiful rooms with the highest ceilings in Iranian houses for guests' reception and usually had a rich and unique decoration

<sup>42</sup>The *Eyvān* was an open archway facing the courtyard

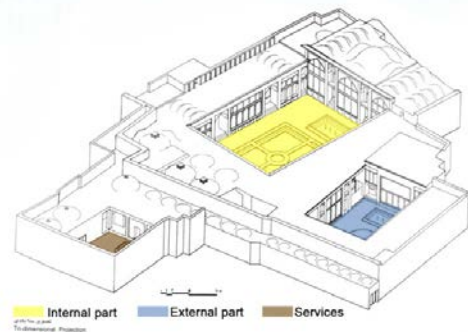
<sup>43</sup>*Bād-Gīr* is a ventilation wind tower or windcatcher that effectively works as an air conditioner, particularly in Iran's central arid regions. Due to the milder weather condition of Esfahan because of the existence of a permanent river, this component does not necessarily found as much as it is seen in more central arid cities at the fringe of the desert, like Yazd, Kashan, and Kerman.

<sup>44</sup>*Howz-Khāneh* was a room usually beneath the *Tālār* containing a little pool

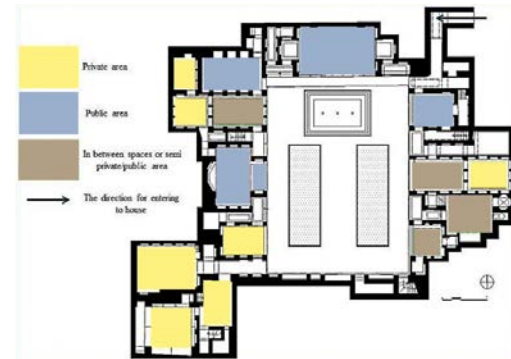
<sup>45</sup>*Panj-Darī* means a room with five doors, the largest room of the summer section, which worked as a family living room.

<sup>46</sup>*Zīr-zamīn* or *Sardāb* is a large and deep basement, which was also used as a family living area during the summer day's hotter hours.

### 3.2.2.3. Public, Private and Service Domains in Two Ordinary and Wealthy Traditional Houses



**Fig. 126.** Different yards assigned to different uses and functions in Ghafuri House in Esfahan, Source: Ganjnameh: Cyclopaedia of Iranian Islamic Architecture, volume 4, Mansions of Esfahan



**Fig. 127.** The arrangement of public, semi-private and private spaces in the historic Khoshnevis house, including a single courtyard. Source: Elmira Ardakani, *Sitting on the Ground as an Important Factor in Formation of Traditional Houses in Hot Arid Region*



**Fig. 128.** Zoroastrian Patriarchal extended family in the late of Qajar Period, Source: [http://zinati.eu/Zartushtian\\_Historie.htm](http://zinati.eu/Zartushtian_Historie.htm)

In most historic houses, the service spaces such as staircases, warehouses, Matbakh (kitchen), and sanitary spaces (toilets) were mostly located in the courtyard corners where they did not receive light from the courtyard. Walls and roofs were thick and made of clay or brick. Flat roofs were used for sleeping surfaces during the summer nights. The family could enjoy the refreshing breezes not possible below due to the nightly irradiation of heat from the walls that is absorbed during the hot afternoon hours. (Kheirabadi, 2000, p. 39)



**Fig. 129.** Women role in economic affair in Qajar Period, weaving the carpet, Source: <http://media.qudsonline.ir/>

Most of the houses were not limited to residential use and encompassed various purposes and activities that could be performed in the same spaces or the separated ones depending on every family's economic status. The house could have more than one yard in the wealthier families, each assigned to different uses, the internal part or Andaruni used for women and children's life. The Andaruni area was usually more prominent than the outer part (Birouni), which was used to greet guests, carry out certain religious ceremonies and social tasks, or was used as an office or workshop

assigned to visitors and men. There could also be a third yard associated with a variety of services (Mirmoghtadaee, 2009, p. 74; Diba, 2012, p. 111) (Fig. 126).

In smaller houses belonging to ordinary and middle-class people, these subdivisions could appear in different spaces arranged around a single courtyard, where the public area or Biruni spaces that were often for the gathering of guests were designed to be at the front close to the entrance door. In contrast, the semi-private and private parts belonged to the Andaruni, and service areas were distributed in the other fronts of the courtyard or the corners. The semi-private parts were in-between spaces such as Matbakh (kitchen) and other parts of the house like the living room, which were shared between patriarchal families where all the close relatives lived together. The private area used as the more proper place included all of the boundaries needed to create a single location, like the three-door room (Seh-Dari), mainly the sleeping and living room of the house as a private room (Fig. 127) (Diba, 2012, p. 111; Ardakani, 2013, pp. 33, 34).

Women played a significant role in economic activities at home. They created handicrafts such as rugs and textiles, cooking, washing clothes and dishes, and taking care of children. House spaces had been adapted to suit these diverse activities. Therefore, an Iranian house was a multifunctional unit in sense of having private, economic, and service sections.

Extended families were the dominant household model in Iran, composed of up to three generations living together in the same house. According to the household economic status, the house would expand or be sub-divided to create new living spaces after the sons' marriage. In this case, the house, would grow and adapt to the dynamic situation, like a living organism. Studies show an average of 6.5 live births in a traditional urban house, which means 6 to 7 children for each initial couple. After their teens' marriage, these children remain close to the family and have their kids. Furthermore, polygamy was common in wealthier families, increasing the number of family members. By growing the family, the house should accommodate the new needs of each growing family (Mirmoghtadaee, 2009, pp. 71, 73).

### 3.2.3. Encounter Points with the Water Structure

In the second chapter, it was mentioned how the presence of surface water played a vital role in the development of ancient cities such as Esfahan in the hot and dry Middle East, and how the original residents who settled in satellite-based agricultural and domestic dependent villages along the river began to learn to dominate the river by digging irrigation ditches and distribute the water inside the plain. Section 3.1.2.4 discussed the linear irrigation system of the Madies network, which extended throughout the city and territory, as linear structural elements linked with the city development and growth.

The intersections of watercourses with the road system result in significant encounter points. In the more critical cases, some of the best architecture samples are placed in these intersections, becoming memorable city nodes of Esfahan. Among all of the waterway intersections, two significant cases have been selected to illustrate very different forms of intersecting points, which have formed the two outstanding territorial and urban nodes in the city of Esfahan: The Complex of Madrasah-Yi-Mādar Shah and the Khaju Bridge, framed in Fig. 130.



Fig. 131. Niasarm Madi, 2018, source: author



Fig. 132. Farshadi Madi, 2018, source: author

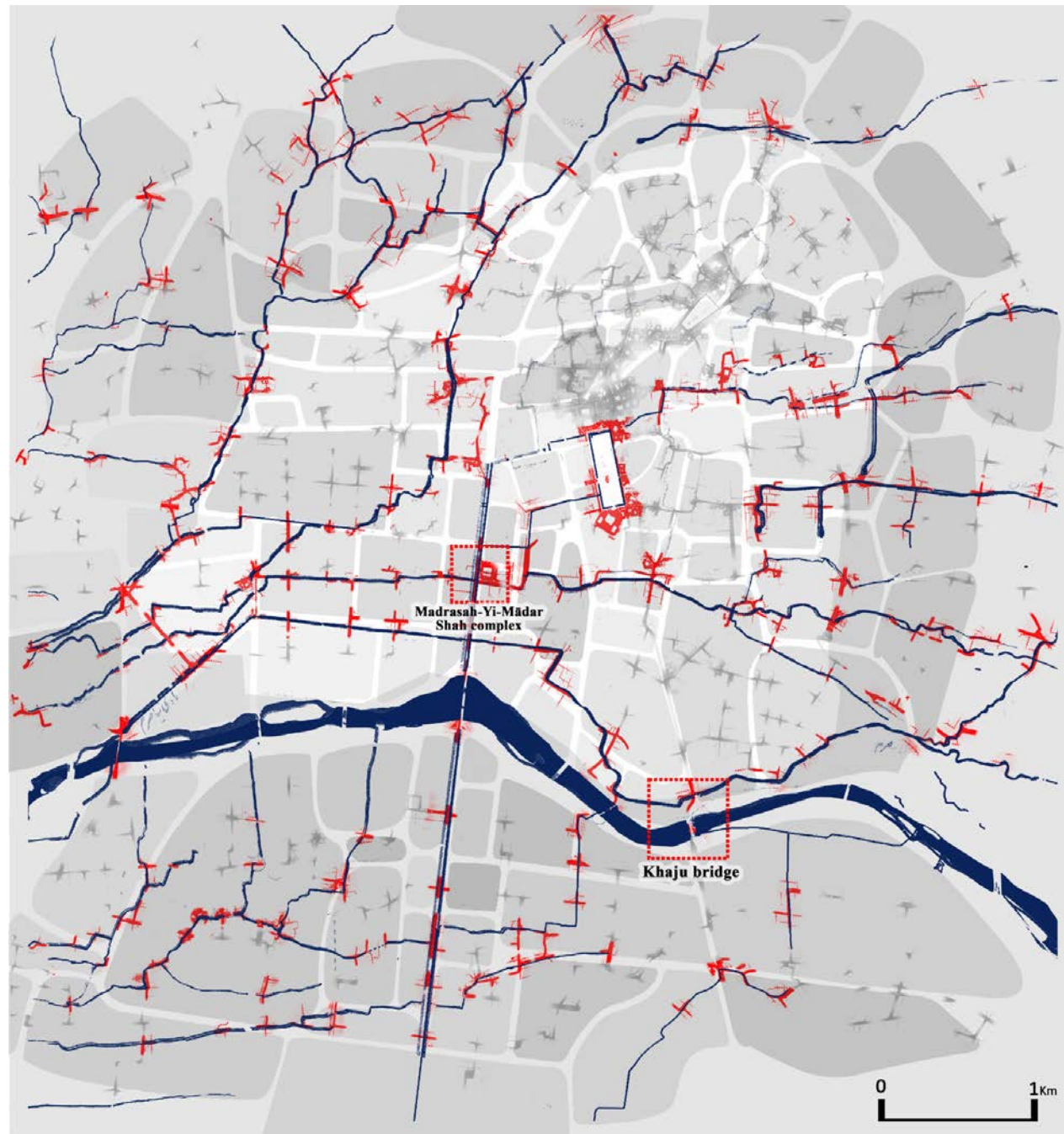


Fig. 130. The intersections of Madi's streams with other mobility systems- two cases of study; Chahar-Bagh school (the Madrasah-Yi-Mādar Shah) complex, Khaju Bridge, Source: author

**3.2.3.1. The Complex of Madrasah-Yi-Mādar Shah: Synergies among Different Programs**

Chahar-Bagh school complex is not a product of completion in a gradual process, but a project which was planned and built at once, including different programs, in the form of significant buildings, placed all together in this particular intersection, as well as Chahar-Bagh school, the Caravansarai, and the Bazaar-e-Boland.

This complex, built and endowed by the mother of Sultan Hussein in the late Safavid era (18th century), creates a significant urban node, which was built at the north-eastern corner of the intersection of Chahār Bāgh avenue with the stream of Farshadi Madi. The Madi has been merged with Chaharbagh school and Madar-Shah caravan Sarai by passing through their courtyards. Parallel to the caravansarai, a small Bazaar allowed merchants who could stay on the second floor of the Caravansarai to work appropriately with the Bazaar. The school's maintenance costs were paid from the Bazaar and the Caravanserai incomes (Ardalan and Bakhtiar, 1975, p. 102) (Figs. 133 & 134).

This complex consists of the Soltani or Chaharbagh School, the Madar-Shah CaravanSarai, and the Shahi Bazaar placed on a relatively large rectangular land plot of less than 30,000 square meters, which have been simultaneously worked since the beginning of the 18th century. Unlike most schools built in the Bazaar, this one was constructed next to the Government district, including royal palaces and gardens, on the eastern front of the Chahar-Bagh avenue, where the primary school's entrance is located.

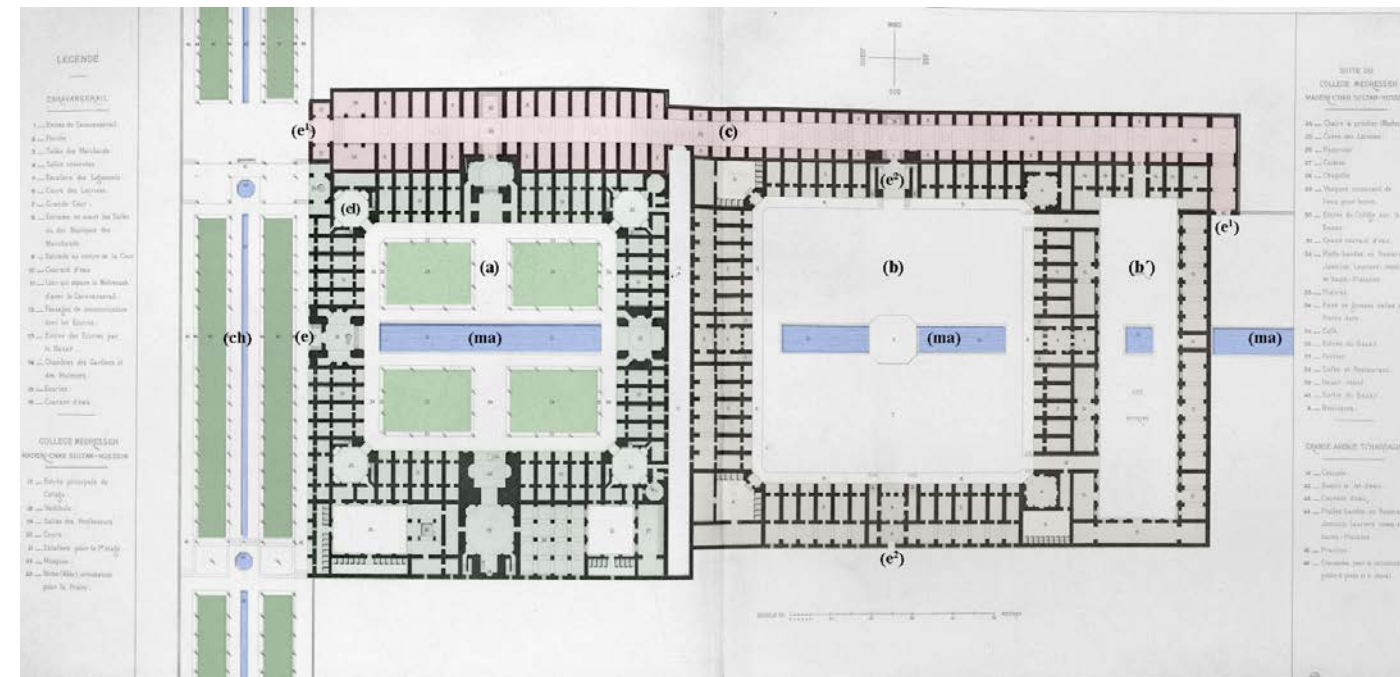
The school is built on two floors and has a rectangular plan, with dimensions of 90 × 95 meters and an area of about 8,500 square meters, and includes various constructive elements such as the entrance door, Hashti, courtyard, four porches, dome, minarets, Shabestan<sup>47</sup>, Madras's and Hojreh's<sup>48</sup> (Mollazadeh and Mohammadi, 2003, pp. 51-53; Shafaghi, 2016a, pp. 658-660).

Since the 18th century, the Chaharbagh School has maintained its physical form and primary use as a residence and a location for teaching and learning religious science. The school courtyard is rectangular, being 55.5 × 65.5 meters, and

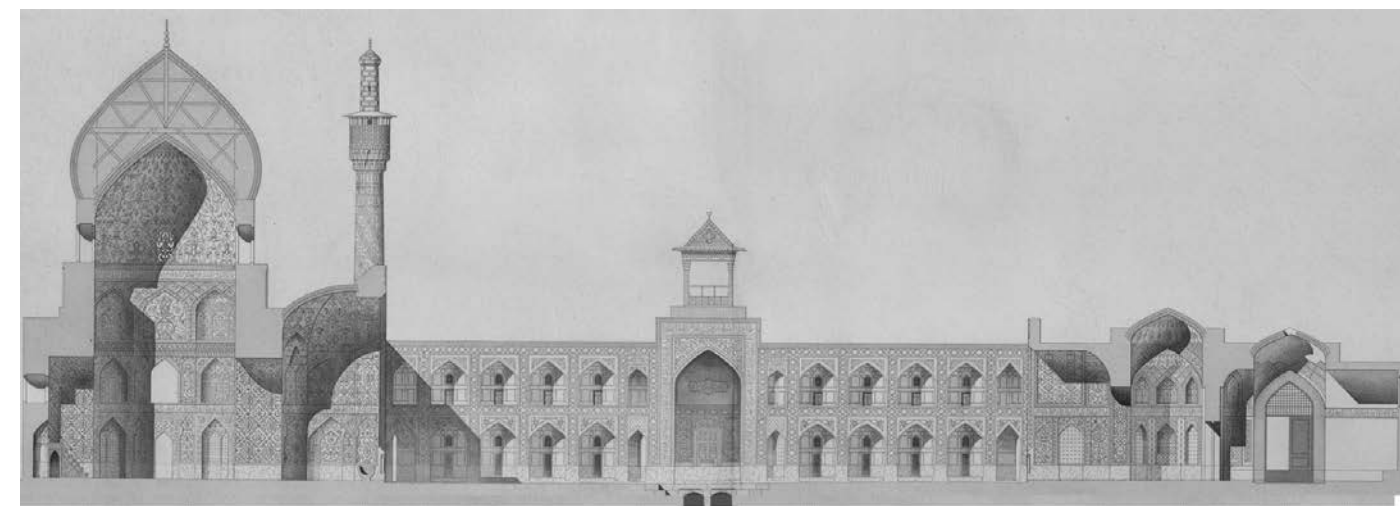


**Fig. 133.** The complex of Madar-Shah school, at the corner of the intersection of Chahar-Bagh avenue with Farshadi Madi, Source: Nader Ardalan and Laleh Bakhtiar, edited by author

chamfered in its four corners to accommodate the classroom entrances. In the middle of each side, there is a porch that differs in function from the other. On both sides of the porches, there are two-story rooms with small balconies on the front. The total number of Hojrehs (rooms) is 134. The western porch links to the school's main entrance, having a Sangab filled with drinking water. The school prayer hall has been built in a mosque appearance with a dome and two minarets in the southern part (Fig. 135). Then the southern porch links the courtyard to under the mosque dome. The eastern porch provided a place where students could relax and socialize. Behind the



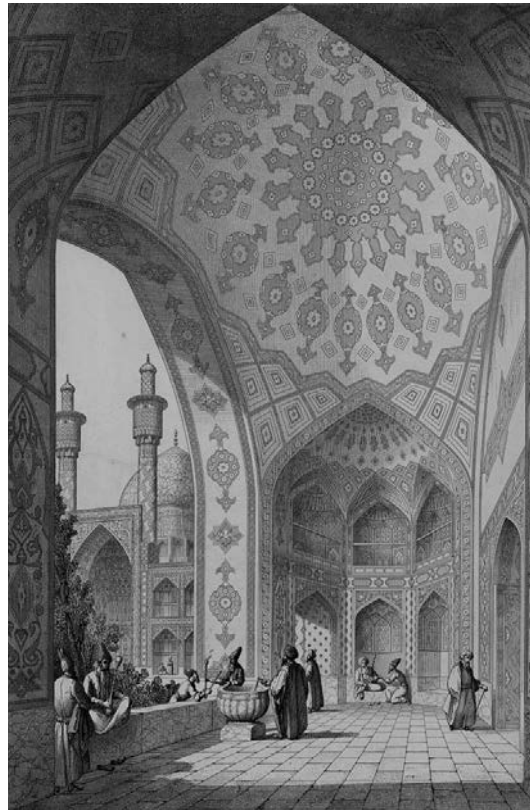
**Fig. 134.** College of mother of Shah Sultan Hussein, Map, 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867, edited by author. (a) Chaharbagh School, (b) Madar-Shah Caravansarai, (b') Stable Yard, (c) Bazaar, (e) Principal entrance of school, (e1) Bazaar entrance, (e2) Carvansarai entrance, (cl) Classroom, (ch) Chaharbagh Avenue, (ma) Farshadi Madi



**Fig. 135.** College of mother of Shah Sultan Hussein, 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867

<sup>47</sup> part of mosque designed for sleeping or nocturnal prayers

<sup>48</sup> chamber



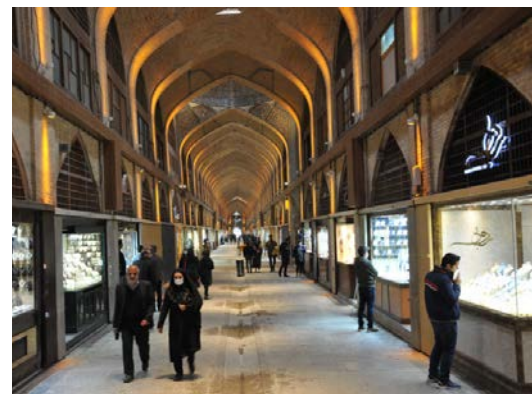
**Fig. 136.** College of mother of Shah Sultan Hussein, Vestibule of the main entrance, 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867



**Fig. 137.** Farshadi Madi stream passing through the middle of the courtyard of Chahar-Bagh School, April 2018. Source: Ali Malekzadehfard



**Fig. 138.** Farshadi Madi stream passing through the middle of the courtyard of Madar-Shah Caravanserai. Source: <https://i.pinimg.com/originals/0f/fe/f4/0ffef41497e0d13f9be668c7bbe80439.jpg>



**Fig. 139.** Bazaarche Boland (Madar-Shah or Soltani Bazaar), March 2022. Source: author



**Fig. 140.** Caravanserai of mother of Shah Sultan Hussein, 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867.

north porch, a Hashti and the northern entrance lead to Bazaarche Boland's course (Madar-Shah or Soltani Bazaar). (Jaberi Ansari, 1999, pp. 138, 139; Mollazadeh and Mohammadi, 2003, p. 52; Shafaghi, 2016a, pp. 658-660).

Soltani Bazaar is located in the northern part of the school and Caravansarai, with an east-west direction and consists of 111 shops and workshops. Due to its 8-meter height, this Bazaar has been known as "Bazaarche-Boland"<sup>49</sup>. An essential feature of this Bazaar is that it has had two floors; the upper floor is used for workshops and warehouses, and the lower floor is used to offer goods to buyers. Nowadays, most of these stores are dedicated to selling gold jewelry and handicrafts (Mollazadeh and Mohammadi, 2003, p. 53; Shafaghi, 2016a, p. 660)

Several examples show that the Madi network could interact with the buildings by crossing through their inner courtyards. In the case of Chaharbagh School, Farshadi Madi, in the frame of 6 meters width stone channel, passing through the middle of the school's courtyards and the Madar-Shah caravanSarai in the east-west direction. The presence of Farshadi Madi, and the existence of old trees, have turned the schoolyard into a garden and is one of Soltani schools' prominent and attractive features. This thoughtful decision contributed to the beauty of the school and Caravansarai while also softening the air by

increasing humidity (Mollazadeh and Mohammadi, 2003, p. 52; Shafaghi, 2016a, p. 659)

The Madar-Shah Caravansarai was an enormous example of the kind built simultaneously as the Chaharbagh School and Soltani Bazaar during the late Safavid period (the 18th century), forming an entire complex. The Caravansarai's income could be used to cover the expenses of students and the maintenance of the school.

The four-porch rectangular Caravansarai is 128 meters long and 93 meters wide and has a massive courtyard consisting of 140 rooms on two floors. There were two stalls across the back of the room. The Caravansarai was almost destroyed after the Afghan invasion in 1722. However, the image that Pascal Coast painted of this Caravansarai during the reign of Mohammad Shah Qajar (1840), shows that the Caravansarai was in operation at that time. At the end of the Qajar period (the late 19th century and the early 20th century) and at the same time as the reign of Mass'oud Mirza Zell-e Soltan<sup>50</sup>, the Qajar prince, this building was restored to accommodate and to be used for the military army. Finally, around 1964, with the Government's support and the agreement of the Endowment and Insurance Organizations, the Caravansarai was refurbished and since then been used as a hotel (Rajaei, 2013; Shafaghi, 2016a, p. 659).

<sup>49</sup> Boland: High

<sup>50</sup> Zell-e Soltan, ruler of Esfahan during Nasser al-Din Shah Qajar's reign, is known for two things in history: oppression and cruelty against the people during his 34-year ruling and the extensive destruction of buildings and monuments left over from the Safavid era. He destroyed more than 50 buildings and historical monuments related to the Safavid era in Esfahan.

### 3.2.3.2. Historic bridges as urban intersections

The Five historic bridges built over the river, illustrate periods of prosperity and glory of different kingdoms. These bridges were responding to various city's needs during previous ages, as well as: (a) the long-distance ancient roads' continuity across the river, (b) and the city's expansion towards the river, and into the fertile land and rural settlements in the southern part of the river.

These bridges were built during successive periods connecting the old town with different population centers and have remained in their places throughout subsequent reconstructions and repairs. The three bridges of "Shahrestan," "Khaju," and "Marnan" were built on the foundations of the ancient bridges of the pre-Islamic era, concerning the regional and primary routes and the hydraulic system for irrigation and water supply (Madi's system). In comparison, the Si-o-Se Pol and the Joui bridges were built in the late 16th and 17th centuries with a more recreational and ludic character (Moravej Torbati and Pournaderi, 2013).

After briefly mentioning the Shahrestan, Marnan, and Si-o-Se Pol bridges, the Khaju bridge will be examined in detail as the last case study of this chapter. Due to the short distance (around 500 meters) and effective interaction of Khaju Bridge with the complex of Joui bridge, Haft Dast Palace, and the Saadat Abad Garden, the Joui Bridge will be, also explained in the same section.



**Fig. 141.** Esfahan's five historical bridges, 1. Shahrestan Bridge, 2. Khaju Bridge, 3. Joui Bridge, 4. Si-o-Se Pol Bridge, 5. Marnan Bridge. Source: author

## Shahrestan and Marnan Bridges



Fig. 142. Marnan Bridge, April 2022. Source: author

On the east side of the city, and next to Jay's former settlement, the **Shahrestan Bridge** (1) is located over the Zayandeh River, being approximately 105 meters long and 4 to 5 meters wide. According to many sources, the bridge was the oldest one built during the Sassanid era (224 to 651 AD) and then was repaired during the Dyalameh and Seljuk eras (925 to 1138 A.C.) (Fig. 141).

From the late Sasanian, early Islamic period (772 A.C) to Al Buyid and Seljuq periods (925 to 1138 A.C.), the Shahrestan bridge was functioning as a territorial and urban bridge while the other bridges at the places of Khaju and Marnan bridges had a more local character. Over time, when the center of power shifted from the Shahrestan citadel to the Yahudieh district, adjacent to the Jame-Mosque, Atiq Square, and the Grand Bazaar, the Khaju Bridge turned into an urban bridge, while the Shahrestan bridge gradually declined to a local one.

**Marnan Bridge** was the most western historical bridge on Zayandeh-Rud and the western edge of the Safavid City (16th-18th century). The bridge was constructed on an ancient bridge foundation by a wealthy Armenian man in the 17th century to facilitate the connectivity of the newly built Jolfa neighborhood on the southern side of the river to the center of the old town on the north riverside.

The early bridge was strategically located on an ancient road that came from the western mountain range of Zagros (the current Chaharmahal Va Bakhtiari province) and connected different ancient growing villages like Marnan, Juzdan, Lonban, in a short distance from the Bazaar as the old town center (Figs. 141 & 142).

At the northern head of the bridge, a branch of the water stream was separated from the river into the Niasarm Madi to irrigate the agricultural land and gardens located along the river's northern bank.

## The Precedent of Si-o-Se Pol Bridge

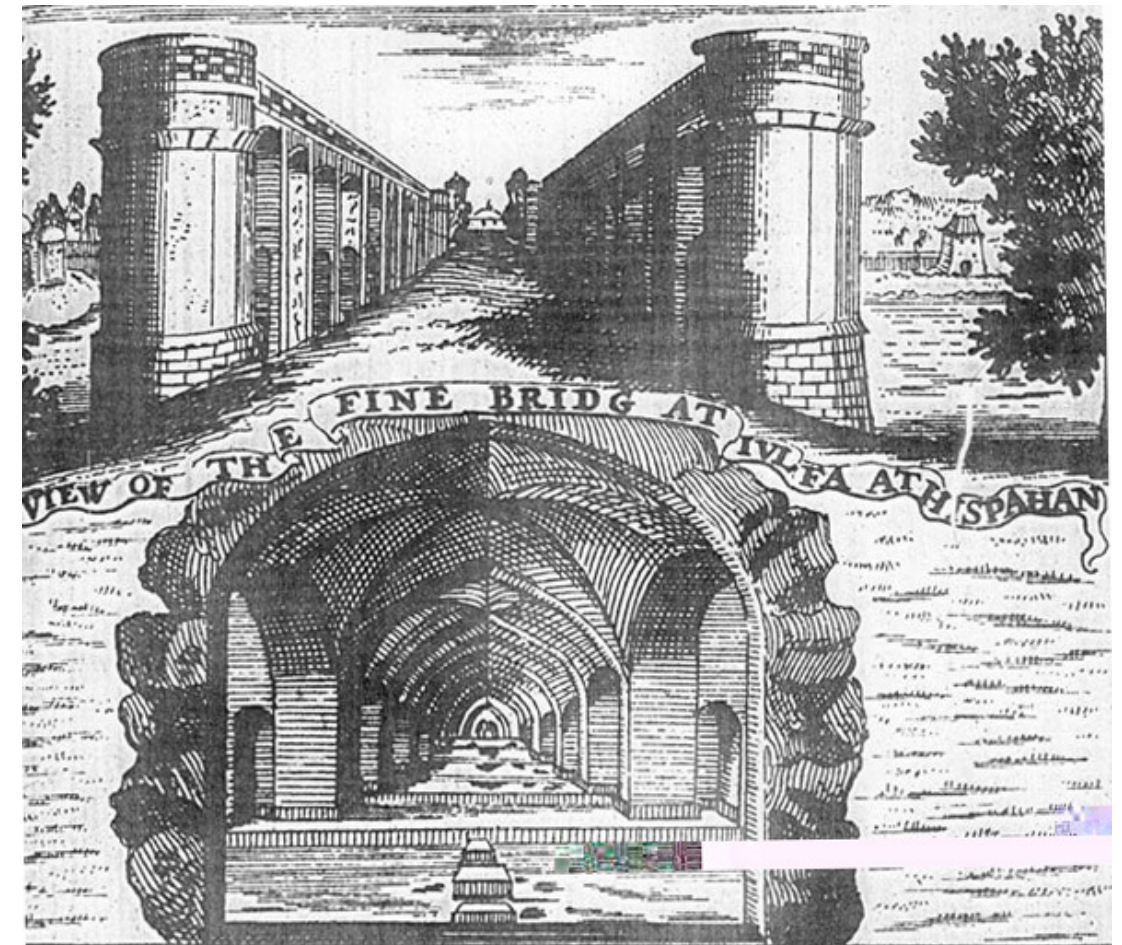


Fig. 143. The Allahverdi-Khan Bridge, Adam Olearius, 17th century

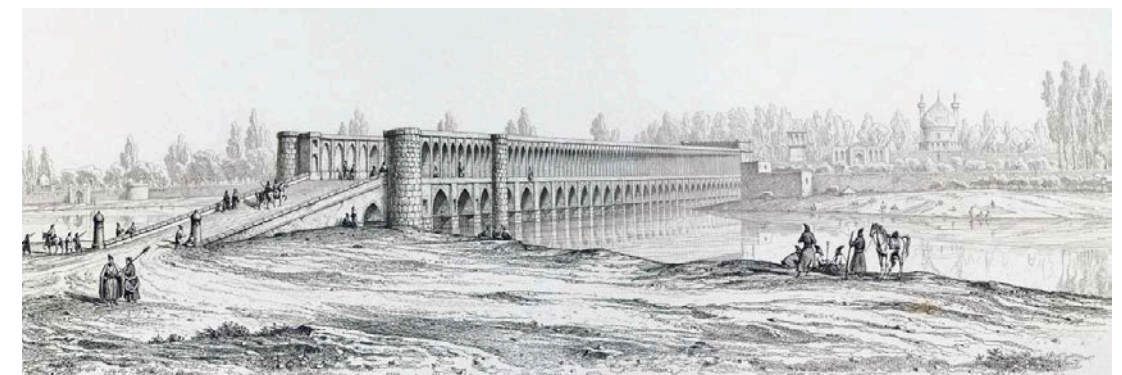


Fig. 144. Allahverdi Khan Bridge, great perspective view by Pascal Coste. Source: *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867.





**Fig. 145.** The north head of Si-o-Se Pol Bridge, April 2022. Source: author

By the order of Shah Abbas I, the **Si-o-Se Pol Bridge** was built in 1632, in front of the Chahar-Bagh gate and on the Zayandehrud River to connect the two northern and southern longitudinal sections of Chaharbagh. With a length of 360 meters, the bridge was the longest in Esfahan and responded very well to the climate conditions.

The bridge was built on two levels with a width of 13.5 meters. It was divided into three parallel corridors, with the central roadway devoted to passing caravans from the middle and flanked by two covered passages on two sides for pedestrians to pass or sit in the shade while admiring the spectacular scenery of the surrounding gardens and river. There are also platforms connected with cubic stones under the arches and between the piers, which provide an appropriate micro-climate for passengers to gather and chill in the shade and touch the passing water. The bridge was more than just an urban artifact for people and animals to cross over, yet it also had a ludic and recreational function representing the glory and majesty of the kingdom.

The foundation of the Si-o-Se pol bridge that was built 50 years before the early 17th century had some essential lessons for building the Khaju bridge, as the main focus of this section. Similar to Si-o-Se Pol, the Khaju bridge was also built-in multi-levels and remarkably responded to the climate condition. Therefore, the he Khaju bridge can be considered an improved version of the Si-o-Se pol, as discussed further in the following section.

### Khaju Bridge: An Intersection as a Hybrid Infrastructure



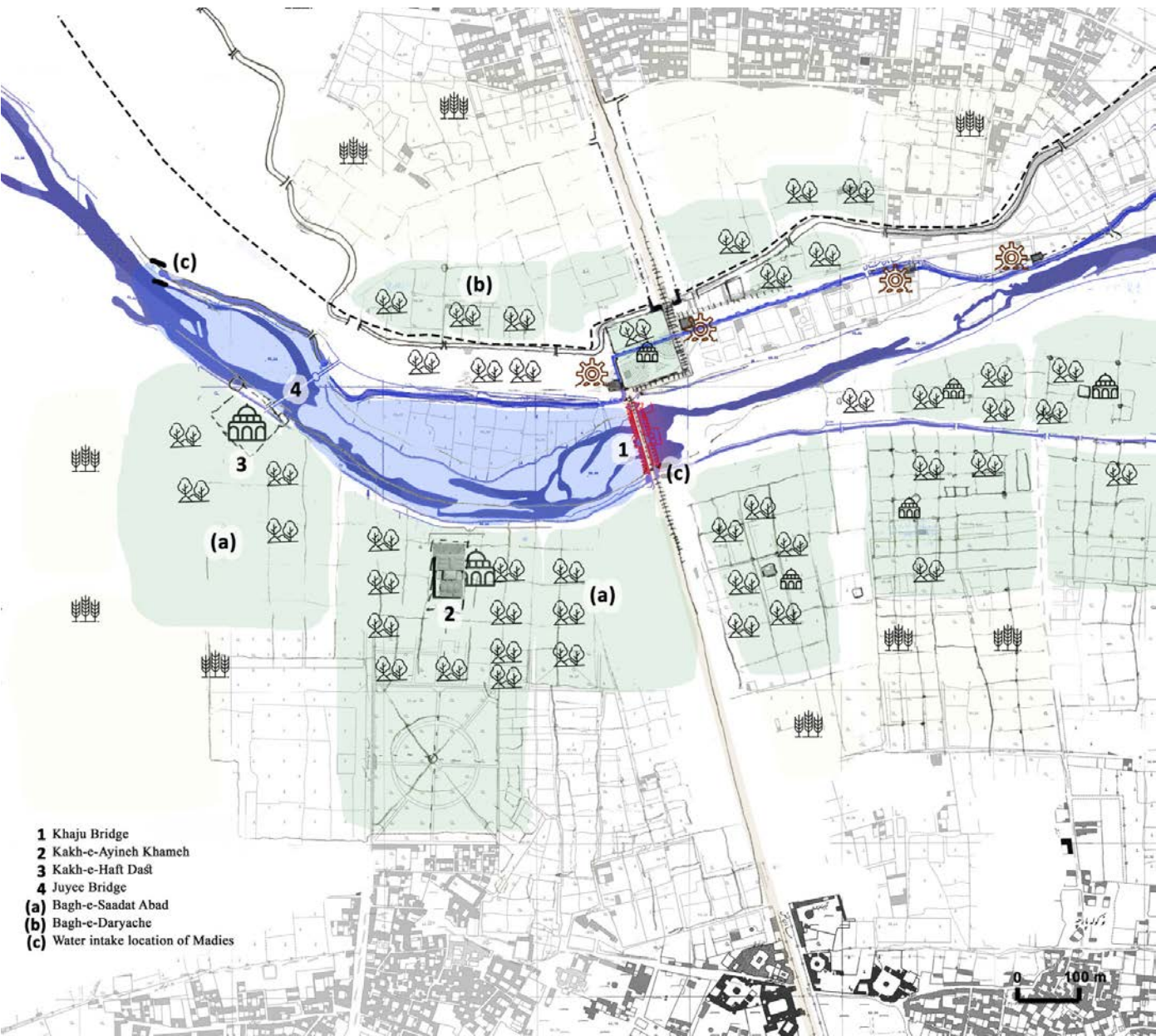
**Fig. 146.** Khaju Bridge, Nowruz Holidays, "Sizda-be-Dar", April 2022. Source: author.

The **Khaju Bridge** is one of Esfahan's most popular public places and represents a paradigmatic urban node in the intersection with the main river. As one of the most critical entry points into the city through the gate of Khaju, the Bridge had a particular potency of celebrating the city entrance over the river and the commencement of the southern extension of the Great Bazaar. The Bridge has provided tranquil shady platforms under its deep arcades and recessed niches, allowing people to sit in midstream of the former scenic river and enjoy the running river water (Ardalan and Bakhtiar, 1975, p. 102).

The bridge of Khaju was built on the Zayandehrud River on the foundation of an older Bridge and had a new and advanced architectural design with multiple uses. Besides the obvious aim of

linking the two sides of the river, the bridge could also serve as a dam, raising the height of water up to six meters, leading the water into the Madi network's irrigation system, especially during the dry months. Furthermore, sealing the water at its western side of the bridge could make an artificial lake in front of royal palaces and gardens in a short distance from the bridge and mainly at the river's southern bank (Shafaghi, 2016b, p. 1084).

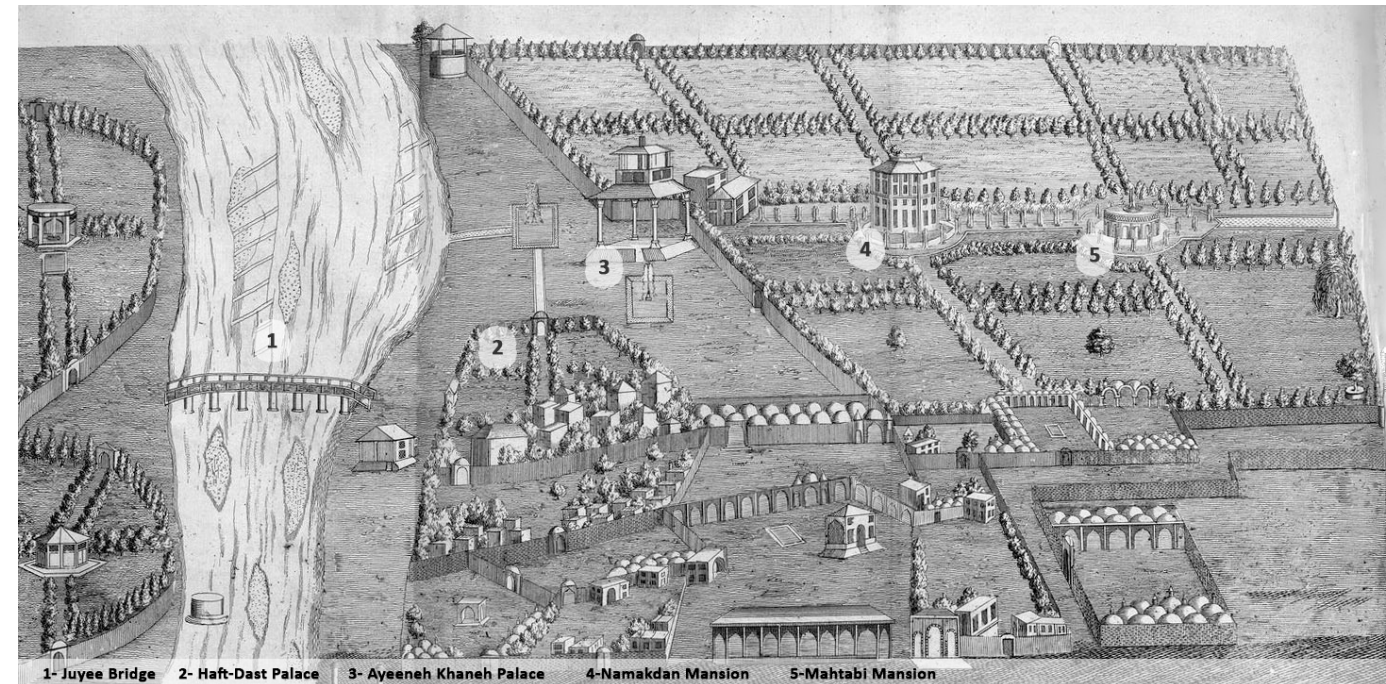
Khaju Bridge can be understood as a hybrid infrastructural element in a symmetrical form, being 133 meters long and 12 meters wide. Studying this bridge's various functions and influential domains can offer essential lessons that can be insightful in the intervention or invention of other forms of territorial and urban nodes.



**Fig. 147.** Khaju bridge, participate in the construction of a genius whole unit. Source: author



**Fig. 148.** Hassan Beik (Khaju) bridge, Facades, 1840. Source: Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867



**Fig. 149.** Royal palaces and gardens of Saadat-Abad, 1670s. Source: *Travels of Mr. Le Chevalier Chardin in Persia and other places of the Orient*



**Fig. 150.** Edges Zendeh Rud [Palace Haft Dast & Joui bridge], Esfahan, 1840. Source: *Journey to Persia*, with Flandin, ed. Gide and Baudry, 1851.

Due to its location, the Khaju Bridge played a critical territorial role. The bridge provided access to and from the old town center by standing at the intersection of the extension of the North-South trade route or the Royal Bazaar with the Zayande-Rud River. Many key and central nodes were involved in this prominent trade route, which extended from north to the south of the city. The northern Toghchi Gate, Jame-Mosque, Atiq Square, the Bazaar's successive central nodes, Shah Abbas Square, other historic neighborhood centers, Seljuk Hassan Abad Gate, Safavid Khaju Gate, and further relative monumental buildings were among the main elements chained through this main road; respectively from north to south and within Safavid City. In the southern part of the river and outside the Safavid City gate, the southern primary trade route, which was primarily used by caravans and pilgrims, was linking various essential places, such as:

- the royal district of Saadatabad included massive gardens, palaces, pavilions,
- agricultural lands and residential areas such as Gabrabad and Takht-e-Foolad,
- some existent monasteries located in the Takht-e-Fulad Cemetery (Figs. 141 & 147).

In the mid 17th century, 50 years after Esfahan was elected as the capital of the Safavid Empire under the rule of the great Shah Abbas I, his grandson, Shah Abbas II, ordered the replacement of Hassan Beyk's previous bridge with the new Bridge-Dyke-Palace of Khaju. The Shah Abbas I had extended the city into the west and the south directions by constructing Naghshe Jahan Square's complex, including its magnificent constructive elements and the new axis of Chahar-Bagh flanked by royal pavilions and gardens. In contrast, Shah Abbas II extended the city to the south through the



**Fig. 151.** Ayineh-Khaneh Palace in the late Qajar Period, Taken by Ernst Holtzer



**Fig. 152.** Namakdan Mansion in the late Qajar Period, Taken by Ernst Holtzer



**Fig. 153.** Pavillon of Aynekhane (House of mirrors), in a short distance and on the western side of Khaju bridge, 1840. Pascal Coste, *Monuments modernes de la Perse mesurés, dessinés et décrits*, éd. Morel, 1867

construction of the Bridge-Dyke Palace of Khaju, the bridge of Joui, and the massive garden of Saadat Abad at the southern edge of the river (Figs. 148 & 149).

The Khaju bridge's construction was done based on the pre-existing bridge, turning it into a more complex structure: from a single bridge to a bridge-dyke-palace. The new Khaju bridge was not just an isolated infrastructural artifact for transferring people and caravans from one bank of the river to the other; yet an element that cooperated in a more extensive set of Saadat-Abad gardens, including palaces and pavilions, Joui bridge, and Madie's irrigation canals and related mills forming an entire genius system.

In 1655 AD, 5 years after the Khaju Bridge was constructed, the Joui Bridge was built around half a kilometer to the west of the Khaju Bridge. The bridge was private and dedicated to the king and the royal family, nobles, guests, and embassies, who were allowed to visit Shah Abbas II. The bridge was founded to connect such essential elements as the new government house (Haft Dast Palace), the Kakh-e-Ayineh-Khane (Palace of the Mirror House), Namakdan, and Mahtabi mansions in the south, to the Bagh Daryache<sup>51</sup> and some other gardens in the northern parts of the river. These palaces, mansions, and gardens formed a unit of the massive garden of Saadat Abad, through which the river passed. (Shahidi Marnani, 2016) (Figs. 149 - 153).

<sup>51</sup> Bagh-Daryache: Lake-Garden

### Turning into a Dike for Water Control

The bridge was used to block the flow of water during the summer season when the surface of river water was low. The bridge was possible to turn into a dam by using durable wooden sliders that could fit into its built-in stone tracks or edges (Figs. 154 & 155).

The water level could rise to its maximum level, where the vaulted bricks' ceilings laid on the stone pillars by the bridge acting as a dike. By raising the water level, the river turned to an artificial lake on the western side of the bridge, which was favorable for boating and linking the other participating elements around the lake to a whole unit (Fig. 156).

The lake's formation behind the Khaju dike bridge also increased the underground level of water used by settlements scattered around the water canals for drinking and household use by digging very shallow wells.

Two water channels passed from the north and another branched from the southern head of the bridge, playing different roles. Besides evacuating the accumulated water behind the dike, the channels led water through the gardens and pavilions owned by the king, princes, warlords, or wealthy merchants on both sides of the river. In the northern part, some water mills complemented the complex water canal system (Fig. 147).



**Fig. 154.** Embedded stone edges supporter for keeping the wooden boards' frames inside the water corridors, Khaju Bridge. taken by the author



**Fig. 155.** Sealing the water and creating a dam under the Khaju bridge's arches. Source: <https://www.itto.org/iran/image-bin/khaju-bridge-arches.jpg> edited by the author



**Fig. 156.** The artificial lake behind the Khaju bridge dike and in front of Saadat-Abad royal gardens in the late Qajar Period, Taken by Ernst Holtzer

### A Place for Recreational and Ludic Activities



**Fig. 157.** Biglar-Beigi, In the middle of Khaju Bridge, the photo is taken by Christian Baume

Two unique and significant octagonal pavilions were built in the middle of the two sides of the bridge (east and west) for the Shah's recreational residence, called "Bigler Beigi." This part of the bridge, also known as the royal residence, has painted rooms and beautiful decorations. Each pavilion had three balconies on each side and opened to the view of the river and gardens, palaces, and mansions<sup>52</sup>. The importance and value of the royal pavilion buildings were also in creating weight in the middle of the bridge, which made it more resistant to massive floods (Fig. 157).

The lower bridge level may be accessed by pedestrians where the platforms under the arches and between the piers, provide comfort and convenience places, in touch with the passing water, creating a fresh and shaded atmosphere when it was not easy to stay under the direct sun for long.

<sup>52</sup>The King, his guests, and the royal family could stay inside the bridge central building or present on its balconies, which offered the best view of the surrounding during public cultural and water festivals. The bridge and its surrounding riverfront could, also, get banned for presenting outsiders because of swimming and the stay of the royal family.

### Multiplying the Ground Level

The Khaju Bridge evolved from a specialized to a hybrid infrastructure by multiplying its levels, giving it a multidisciplinary character. The addition of supplementary horizontal surfaces to the Bridge enriched its image, enhanced various modes of mobility, and finally made its use more complex and intense.

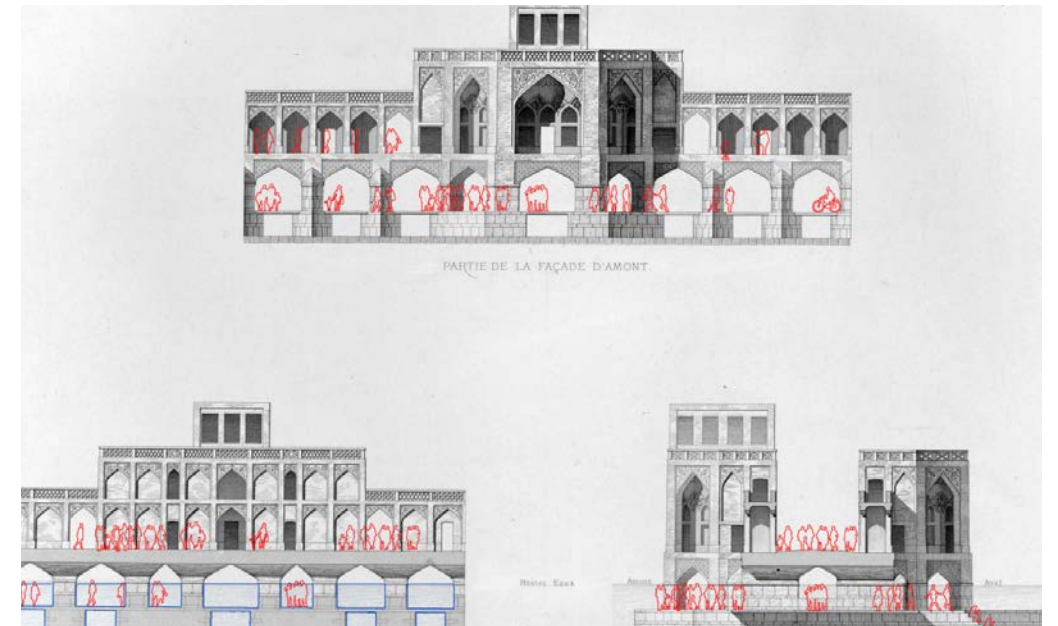
Fig. 158 presents the western elevation and the two longitudinal and transversal sections of the bridge, clearly showing the bridge's multilevel character. Apart from the river bed's level (the water channels) and the upper level of the central octagonal pavilion<sup>53</sup>, two additional levels allowed people to freely move between the two heads.

There are some rows of stone stairs at the eastern front of the bridge, which link the level of the lower pedestrian platform to the riverbed level and allow people to sit there and enjoy the beautiful view and the sound of flowing water. When the bridge acted as a dike and the water level was at its maximum level, people could only stay at the bridge's eastern edge on the two levels including the lower platform and the upper ground level.

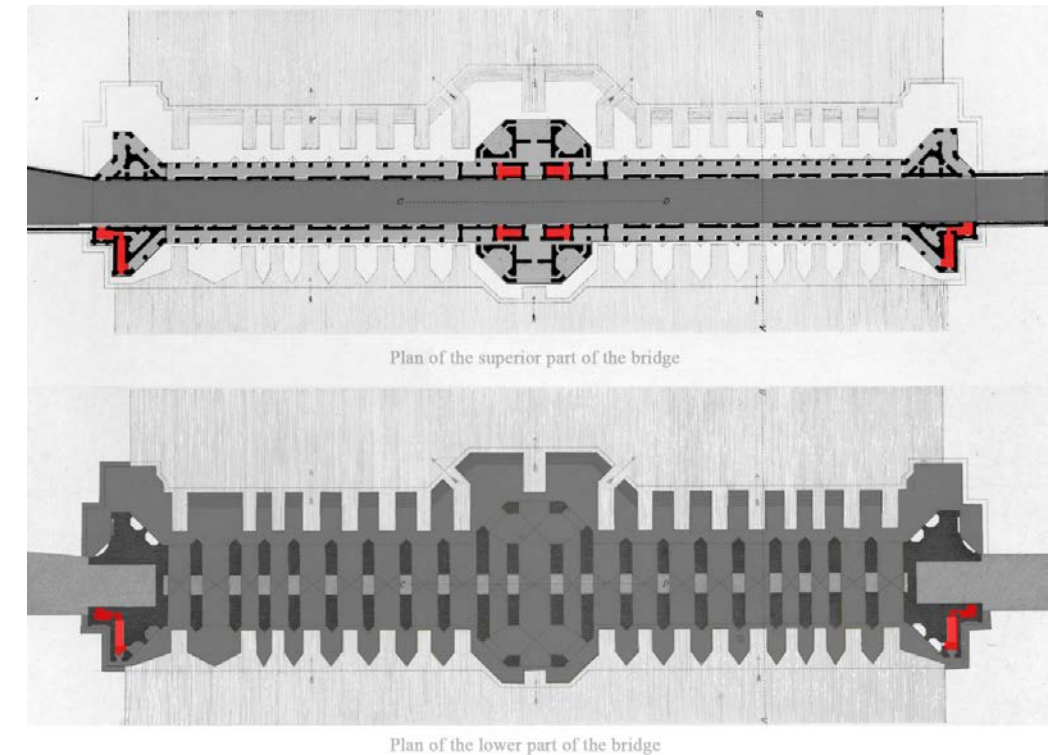
Fig. 159 describes the two different plans of the lower pedestrian platform and the upper (ground level) of the bridge. There are four sets of staircases embedded in the more extended sections of the two heads and the middle of the bridge joining different levels.

In the bridge's middle section, the stairs connected the half-floors inside the royal residence at the bridge's upper level and accessed the bridge's roof. In contrast, the stairs at both bridges' heads connected the bridges' lower levels to the upper and the central passage levels.

<sup>53</sup> During the Safavid period, a building was on the top of the central pavilion called Biglerbegi that was destroyed during the Qajar period, which can be seen in the bridge elevation and section drawn by Pascal Coste in 1876.



**Fig. 158.** Multiplying the surface of ground level, the sections have been produced by Pascal Coste (1867), edited by the author



**Fig. 159.** The pedestrian lower and the upper level of the bridge of Khaju, the plans have been produced by Pascal Coste (1867), edited by the author

### The Capacity of Flexibility

New requirements were imposed by the car's arrival, not only in alleys and passages but also for city bridges. Khaju Bridge, which for centuries was in charge of passing pack-animals, then by the beginning of the modern era it had to sustain the weight of multi-ton trucks making their way across the country. Excessive pressure and extensive damages to Khaju and other historic bridges caused Esfahan's city administration to decide in 1921 to save the Khaju and Si-o-Se Pol bridges by imposing traffic restrictions; only Marnan Bridge was responsible for crossing trucks over the river.<sup>54</sup>

The bridge's surrounding environment and engaging elements have changed significantly since the 1930s affecting the bridge's performance. In the mid 17th century, the bridge was placed a short distance away from the Safavid city gate, in the middle of a more extended and open space. The bridge was much more complex than its present look, due to inducing new projections and cooperating with the other essential components and systems of the dyke, the lake, the royal gardens and palaces, the irrigating water canals, and cereal mills.

Today, the bridge is situated in a much closer environment, limited in between the two riverfronts. Luckily, the river's two fronts were prohibited from developing any individual building and are dedicated to the public, taking part in a linear river park. The park is stretched all along the river for over 8 kilometers from the Nazhvan woodland park, located on the western edge of the metropolitan city, to the city's eastern limit at the Shahrestan bridge. The ruin of the former Safavid royal gardens and palaces located at two fronts of the river were replaced by industrial textile factories in the 1920s and later with parks and residential and administrative buildings. Comparing the historical and actual conditions of the Khaju bridge reveals how it could be flexible and perform successfully in different periods (Fig. 160).

<sup>54</sup> The restrictions were temporary, and the need was so great enough for breaking the laws after a while; there was no way for city managers to re-enforce the curfew more frequently. The passage of heavy vehicles continued from time to time until the completion of the metal bridge (Pol-e-Felezi) in 1959, when passing heavy trucks and cars definitively were banned over the Khaju and Si-o-Se Pol bridges.



**Fig. 160.** The current condition of the Khaju bridge, intermediate scale. 1. Khaju Bridge, 2. Amin residential complex designed by Philip Johnson, 3. Blood Bank, 4. IRIB Esfahan (Iran Republic Islamic Broadcasting), 5. Meli Bank, 6. Esfahan Regional Water Organization, 7. Hilal Ahmar (Red Crescent), 8. Feyz Post Office, (P). car parking, (B). Bus stop, (H1). Southern head of the bridge, (H2). Northern head of the bridge. Source: author



Fig. 161. Aerial view of Khajoo Bridge with linear park on both sides of the river, 2013, source: Imna News



Fig. 162. People are relaxing on the platforms located under the Khaju Bridge's arches, 2009. Source: author



Fig. 163. Khaju Bridge, Nowruz Holidays, "Sizda-be-Dar", April 2022. Source: author



**Fig. 164.** The southern head of Khaju bridge in the festival of Esfahaniyam (11m from Esfahan) in 2018. Source: [https://www.piwox.com/media/1238143485132697559\\_2639149890](https://www.piwox.com/media/1238143485132697559_2639149890)



**Fig. 165.** The northern head of the Khaju bridge: the 2.5 meters height difference between the Khaju square and the bridge's northern head, the narrow sidewalks and excessive number of cars treat the pedestrian lively activities, March 2022. Source: author

During recent years, due to being changed from a permanent to a seasonal river, the bridge has declined to a different condition. The bridge is not being used as a dam anymore, lacking the possibility of forming an artificial lake. The northern water channel has been filled; there are no water mills, no gardens, and palaces. However, it seems that the bridge has risen in terms of its social and cultural influence. It is one of the most demanding urban nodes and public places, which is famous in the country for having the capacity to attract and join visitors and citizens, not only to cross from one side to another but enjoy their time individually or in the company of friends and family.

The bridge is also famous because of the tradition of singing and dancing under its arches. Each constructive and repetitive unit modules keep the voices inside of itself; the people who sit or stands under the arches can hear their voice closer and higher, which gives them the courage to start singing (Yilmaz Çakmak and Khaleghimoghaddam, 2016).

Although the bridge has a symmetrical plan, its two bridgeheads have a different character due to the existing free spaces and the placement of various facilities and buildings on the two riversides. The strategic power of the two heads has always absorbed certain formal and informal commercial activities. Comparing the two bridgeheads, the southern has more open spaces, encompasses further diverse forms of pedestrian-like activities, and holds ceremonial events (Figs. 164 & 165).

The main lesson of the Khaju bridge is its capacity to harmonize and create the infrastructural artifact of mobility with the public space and with the system of water management, through its dike role and the irrigation of the Madies network. Although some of these systems do not function anymore, new systems are replaced, including "Asphalt" roads, discussed in the following chapter.

The current square was built at the northern head of Khaju Bridge at the intersection point of Yazd and Shiraz Roads in the mid-1930s. Nowadays, different mobility systems support the bridge in conflictive and separated ways of the pedestrian and local passages, arterial and historical Madies, and new forms of Maidans and streets. The heavy traffic and excessive presence of cars, lack of parking space, and difficulty in pedestrians' crossing, especially at the northern head of the bridge, have caused challenges for communication between the bridge and local pedestrian and territorial car accessibilities around it.

From this viewpoint, improving the existing dialog between the varying mobility systems referring to the Khaju bridge, as one of the most paradigmatic examples of the city nodes, can help in the higher integration of the bridge with the city and its surrounding area as well as gaining new dimensions and higher capacity of attracting different people and pedestrian activities.





## **CHAPTER 4: THE “ASPHALT” CITY**

### **4.0. INTRODUCTION**

### **4.1. DIFFERENT APPROACHES IN THE CONSTRUCTION OF ESFAHAN “ASPHALT” CITY (the 1920s-1960s)**

#### **4.1.1. Adaptation of Existing Structure for Use of New Vehicles**

#### **4.1.2. Demolition and Crossing Over the Historic Urban Fabric**

##### **4.1.2.1. The Extensions of the Three Main Vertical Axes**

##### **4.1.2.2. The Extension of the Main Horizontal Axis**

##### **4.1.2.3. Complementation of the New “Asphalt” Street Network**

##### **4.1.2.4. Duplication of Chahar-Bagh Avenue**

#### **4.1.3. The Construction of Three Ring Roads**

##### **4.1.3.1. The First Ring Road, The Historical City Edge**

##### **4.1.3.2. The Second Ring Road, The Primary Highways Composition**

##### **4.1.3.3. The Third Ring Road of the Metropolis**

### **4.2. THE ECHOS OF THE “ASPHALT” CITY APPROACHES ON THE FIRST MASTER PLAN OF KOCKS, 1958-1961**

#### **4.2.0. Introduction**

#### **4.2.1. Regional Infrastructures and Big Facilities**

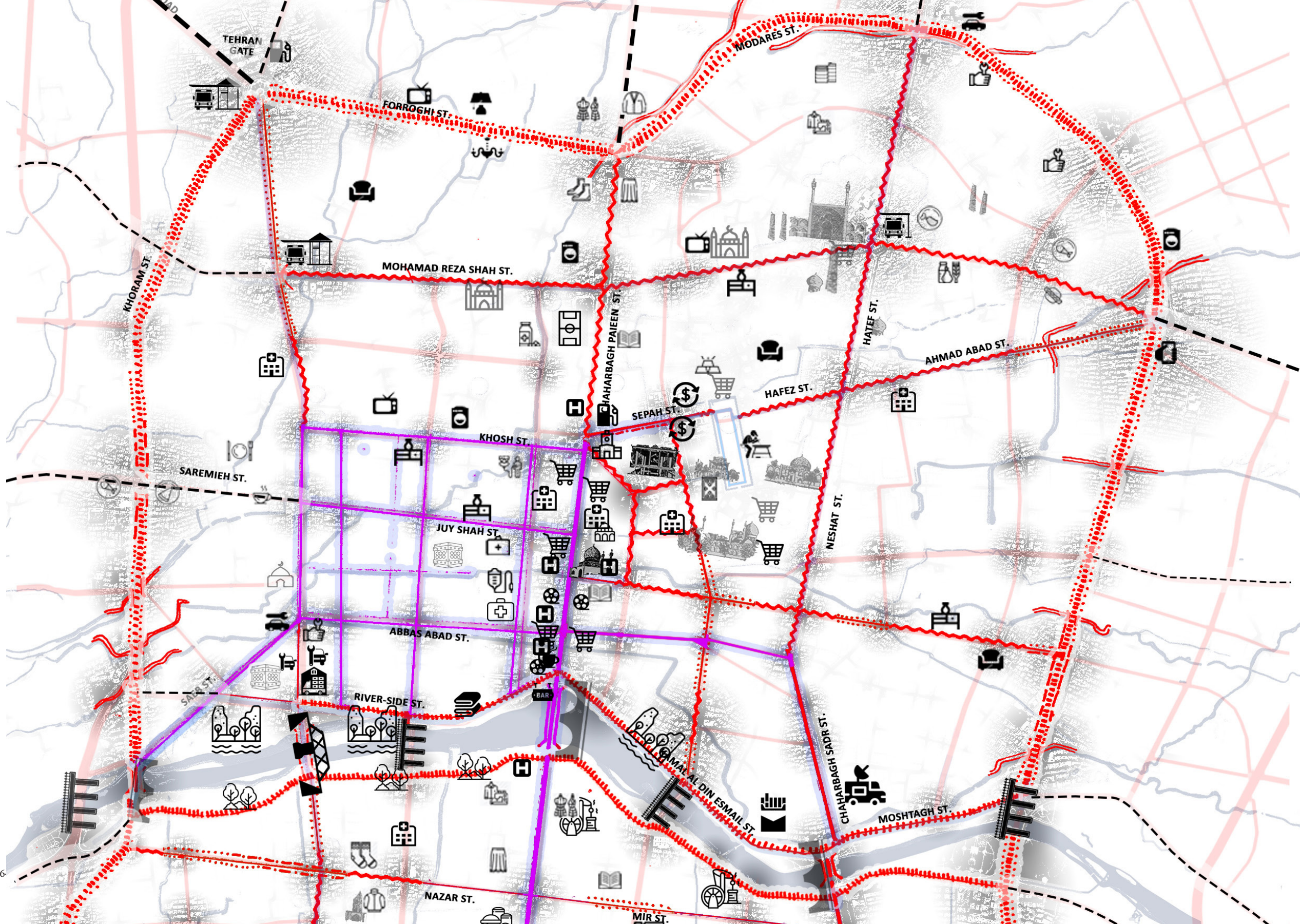
#### **4.2.2. Historical City Domain and City Center**

#### **4.2.3. Planned Neighborhoods**

### **4.3. TWO STUDY CASES OF “ASPHALT” CITY**

#### **4.3.1. Chahar-Bagh Avenue: from a Ludic Hall to the Most Influential City Center**

#### **4.3.2. Atiq Square: Doubling the Ground Level**





## 4.0. INTRODUCTION

In the previous chapter, different models of city construction were discussed based on the forms of historical central nodes of different sizes and scales and characterized by forms of mobility, such as caravans of desert animals and pedestrians. In this chapter, some alien approaches (dismissing previous traditions) will be examined in the construction of a modern city that will be based on trucks and cars movements as new forms of mobility through the construction of new asphalt roads<sup>1</sup>.

The changes in mobility, new manufacturing methods, distribution, retailing, new space, and housing standards have led to considerable changes. Renewals have gradually happened and have not only been experienced by Esfahan but all major cities across the country.

Different approaches in the construction of "Asphalt" City are discussed in this chapter. Among them, the most critical expression was the new streets that cut through the city's older parts contributing to the city's new street network system. Due to increasing population and the rapid residential development, the city's dimensions started to grow, becoming less adaptive to pedestrian activity. The vehicular commute was becoming more common, and the development of industrial work-places in the city peripheries was enforcing this trend by increasing journey lengths (Proudlove, n.d., pp. 17, 18).

The term "Asphalt" City is a metaphor that refers not merely to the name of the material but also to the critical and accelerating role that new

<sup>1</sup>The arrival of trucks to Iran was mostly accompanied by oil exploration in May of 1908, and the two World Wars made trucking more likely to enter Iran, especially during World War II, when the Allied forces used Iranian territory to help Russia, and many companies and workshops were set up for car services and repair.

asphalt paved streets played in transforming the city from functioning traditionally to a modern style operating. Asphalt paving the city streets was a specific and limited part of the entire street development process yet a significant phase in developing the new system.

The "modernization" or rather "westernization" of Persia started in the mid-19th century. "Tehran seized with the idea of rising to the level of European cities resulting from 'Naser al-Din Shah' travel (King of Qajar) to Paris in the 1870s. Although Iran was never politically colonized, negotiations with the colonial powers led to parallel local elite-led processes of "self-colonization" that selectively appropriated European modernization." (Pakseresht, n.d., p. 9).

Since the constitutional revolution<sup>2</sup>, for the first time and under the "Baladieh Act<sup>3</sup>", which was approved by the National Assembly in 1907, constituent assemblies called "Baladieh Associations" were formed and granted a wide range of authorities. Baladieh committed to doing a wide variety of tasks; the most notable was the election of the Baladieh Office head or the mayor. Baladieh's primary duties were to comment on urban issues, collect taxes people were bound to pay and provide affordable food for citizens. In the case of supplying sufficient food, especially during times of crisis, such as drought or the World War I, the municipality failed to do, which led to the people's disappointment and protestation. The people of that time were not satisfied with the Baladieh: they believed that their tax money

<sup>2</sup>"During the early 1900s, the only way to save the country from government corruption and foreign manipulation was to make a written code of laws. This sentiment caused the Constitutional Revolution. There had been a series of ongoing covert and overt activities against Naser al-Din Shah's despotic rule, for which many had lost their lives. The efforts of freedom fighters finally bore fruit during the reign of Mozaffar-Din Shah. Mozaffar -Din Shah ascended to the throne in June 1896. In the wake of freedom fighters' relentless efforts, Mozaffar od-Din Shah of the Qajar dynasty was forced to issue the decree for the constitution and create an elected parliament (the Majlis) on August 5, 1906. The royal power limited and a parliamentary system established" (Iran Chamber Society, n.d.).

<sup>3</sup>Baladieh: Municipality

that was being collected to be dedicated for urban affairs was not being used in the right place. Therefore, the activity of the institution ceased (Abdol Mehdi, 2008).

The actual act of modernization in Iran occurred between 1920 and 1940 when Reza Shah (the founder of the Pahlavi dynasty, 1925-1941) came to power and was confronted with a collapsing economy. He soon began an impressive modernization program, based on the principle of 'modernization from above' and seen as the only way of survival and improvement. The primary objectives of development were based on rapid industrialization and rapid modernization of the country's infrastructure, which consequently, followed by urban modernization in cities (Karimi, 1998, p. 206).

The two fundamental laws that have had a great impact on the development process of the city are "Qanun-e-"Baladieh-ha" (the municipal law) and the code called "Tose-ye-Maaber" (road development). The municipal law was approved in 1930 and was a significant attempt to reform the city and contribute to its modernization. This law restricted buildings' height and obliged shops to have a glass window giving onto the street, which was an apparent move for transforming the streets' appearance in conformity with the Modern Western-style (Habibi and Hourcade, 2005).

The second law concerning road development was ratified in 1933 and helped the municipality fund street development. This law allowed the municipality to collect a percentage from the

owners of the properties on the new street fronts as added value tax and spend it on purchasing the needed land for constructing new streets. Nevertheless, not all municipality actions were dedicated to the matter of city streets' development, but also encompassed other matters such as city health concerns, municipal waste collection, restoration of historic buildings, monitoring business work, securing people's livelihoods, addressing poor people's issues, and so on.

The establishment of several large factories from the 1920s thru the 1940s, and the taxes that the municipality put on their products, relying on that income, significantly contributed to the municipality's ability to pay for the high-cost road asphalt program.

After the mid-1930s, "the urban population growth rates considerably increased, signaling the beginning of the migration to urban centers. This phenomenon was partly due to the state development policies, especially the industrial policy, which created new job opportunities for unemployed male and female laborers. It was also partly influenced by the fact that from the 1930s onwards, medical health services concentrated in the cities contributed significantly to improved health and sanitary conditions, focusing on developments in water and sewage, electricity, and other public services. These significant changes that took place in urban morphology introduced a completely new lifestyle (Ehlers & Floor, 1993).

Many religious and social norms in the traditional society resisted the Reza Shah's reforms in favor of a 20th-century national values. The administrative machinery and bureaucracy were widely expanded to exercise control over various fractions of society and different parts of the country. Educational reform took place to substitute secular primary and secondary schools for traditional institutions governed by clerics. The establishment of the University of Tehran, in 1935, as the country's first European-style university and the foundation of other universities in other essential cities resulted in the secularization of education and the emergence of a new social middle class as the driving force for the process of extensive modernization (Shirazi, 2018).

One of the most immediate consequences of intra-urban modernization was the emergence of a socioeconomic dualism between the traditional bazaar and modern "Westernized" shopping areas along the new avenues. Imported goods of higher value and prestige, in particular, tended to be concentrated in modern and Western-style shops, attracting a clientele that henceforth avoided the bazaars (Ehlers & Floor, 1993).

Despite the lack of maps and specific research on Esfahan's city's urban transformation around the 1930s, the fabulous descriptions from "Akhgar" daily news help study the urban changes over this period. This newspaper was founded by "Fatholah Vazir-Zade" in 1920; later, in 1928, it was delegated to "Amin Gholi Amini," which was regularly published until 1942. Unlike other local newspapers, this mainly focused on Esfahan's urban issues from 1921 to 1941. The book "urban changes and management of Esfahan in the Pahlavi I period" by Abdol Mehdi Rajaiee is based on mostly collecting, revising, and ordering the Akhgar newspaper content, which can help in tracking the city transformation during this period.

#### 4.1. DIFFERENT APPROACHES IN THE CONSTRUCTION OF ESFAHAN "ASPHALT" CITY (the 1920s-1940s)

Many experts agree that Iran's modernization developments started with the constitutional revolution in the early 20th century and intensified during the Pahlavi era. As it is said, it took three years (1920 - 1923) for the "Sultan Seyyed Reza Khan Map" to be drawn at the Nazmieh<sup>4</sup> office. The map is the first authentic graphic document that gives us information about the turning point or the new era of modern city transformation (Fig. 166).

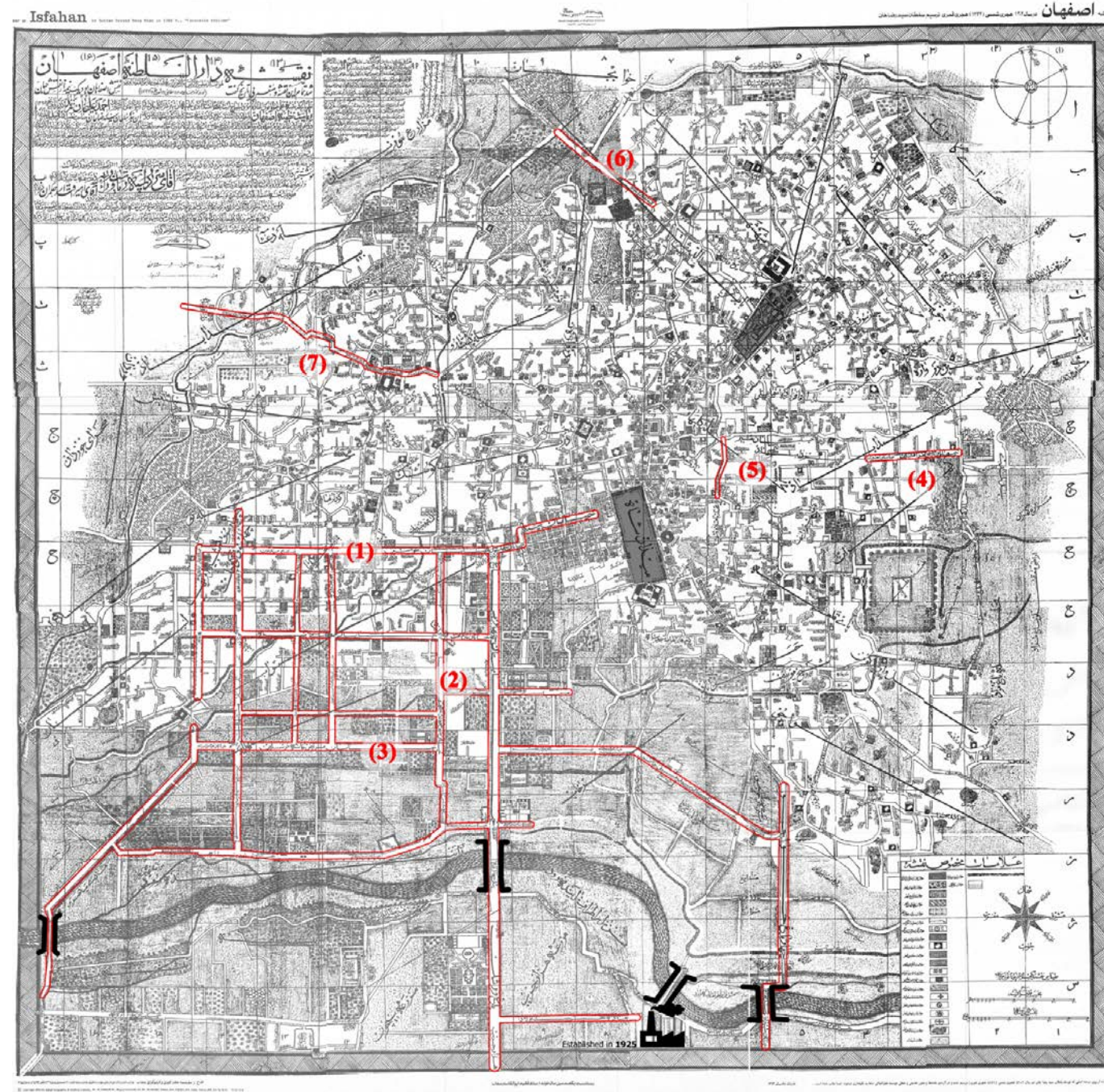
In the upper-right corner of the map, there is a written text which gives more information about it and addresses places that were recently under construction, like Khiaban<sup>5</sup>-e-Khosh, Khiaban-e-Marizkhane, Khiaban-e-Ahmadabad, Khiaban-e-Golbahar, Jade<sup>6</sup>-e-Bidabad, and Jade-e-Bab al Dasht.

These interventions were taking place simultaneously throughout the city, and each one had its specific character and logic. The widening of Khiaban-e-Khosh and Khiaban-e-Marizkhane that have belonged to the Abbas Abad and Shams Abad's Safavid neighborhoods, both have improved the connectivity of the two vertical axes of Chahar-Bagh Avenue being in the center, and Khiaban-e-Chaharsugh-e-Shiraziha and Khaiban-e-Lonban, being in the western limit of these neighborhoods. Furthermore, Khiaban-e-Khosh was the most crucial connection, through which the trucks and cars coming from the old Tehran road were linked to the northern head of Khiaban-e-Chaharsugh-e-Shiraziha, and to the head of Chahar-Bagh Avenue (Davazeh Dolat) in the vicinity of the Bazaar, Shah Abbas Maidan, and Safavid royal palaces and gardens.

<sup>4</sup>Police office

<sup>5</sup>street

<sup>6</sup>road



**Fig. 166.** The "Sultan Seyyed Reza Khan" Map, 1920-1923. Source: The archive of Makansazan architecture and urban development company. Appropriated directions for passing the cars, till 1921. (1). Khiaban-e-Khosh, (2). Khiaban-e-Marizkhane Inglisiha, (3). Khiaban-e-Marizkhane Morsalin, (4). Khiaban-e-Ahmadabad, (5). Khiaban-e-Golbahar, (6). Jade-e-Bidabad, (7). Jade-e-Bab al Dasht

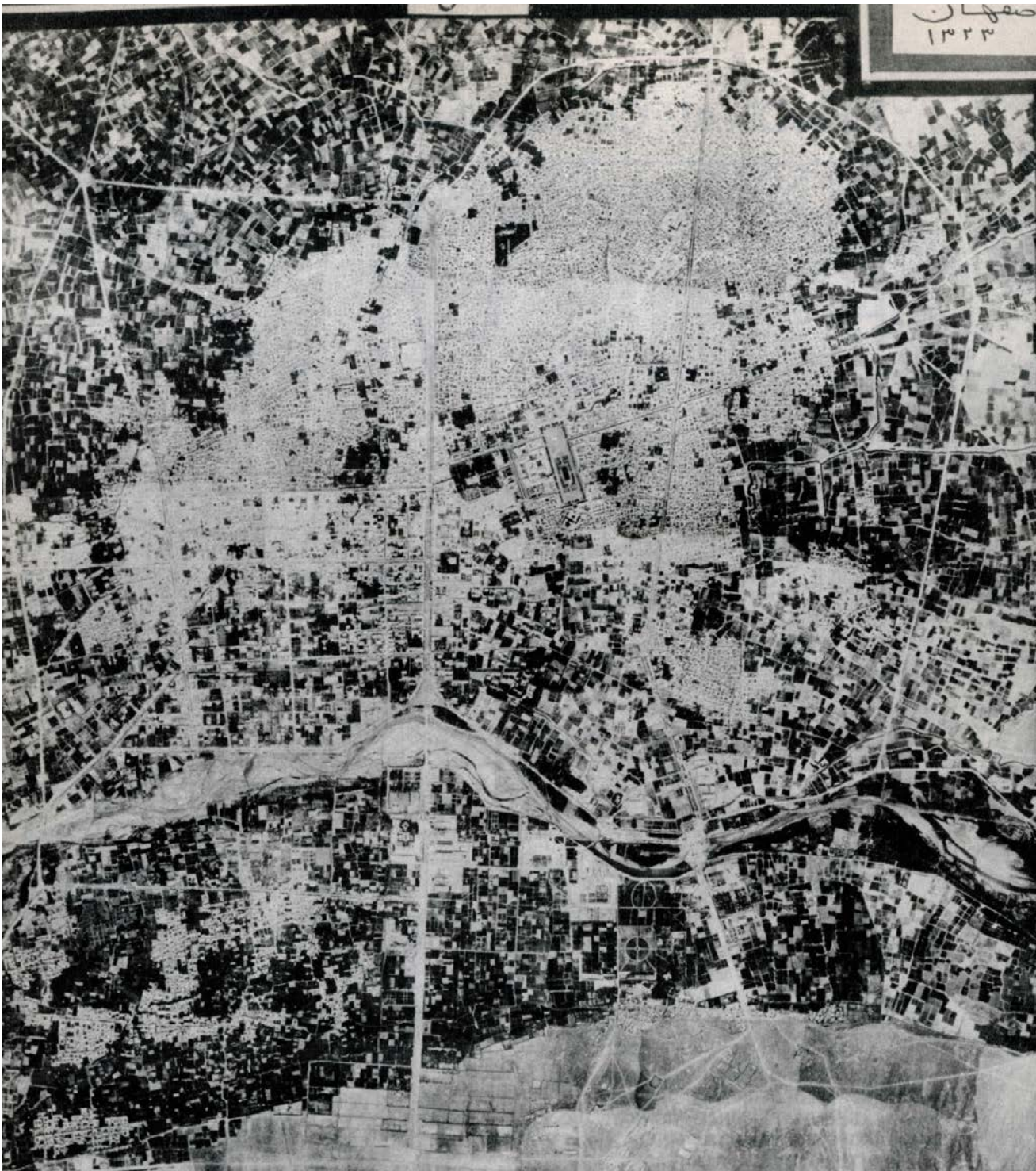


Fig. 167. Esfahan aerial photo in 1944 with a population of less than three hundred thousand people, sc:1 / 50,000. Source: the report of the Esfahan Master Plan prepared by Kocks Consulting Engineers.

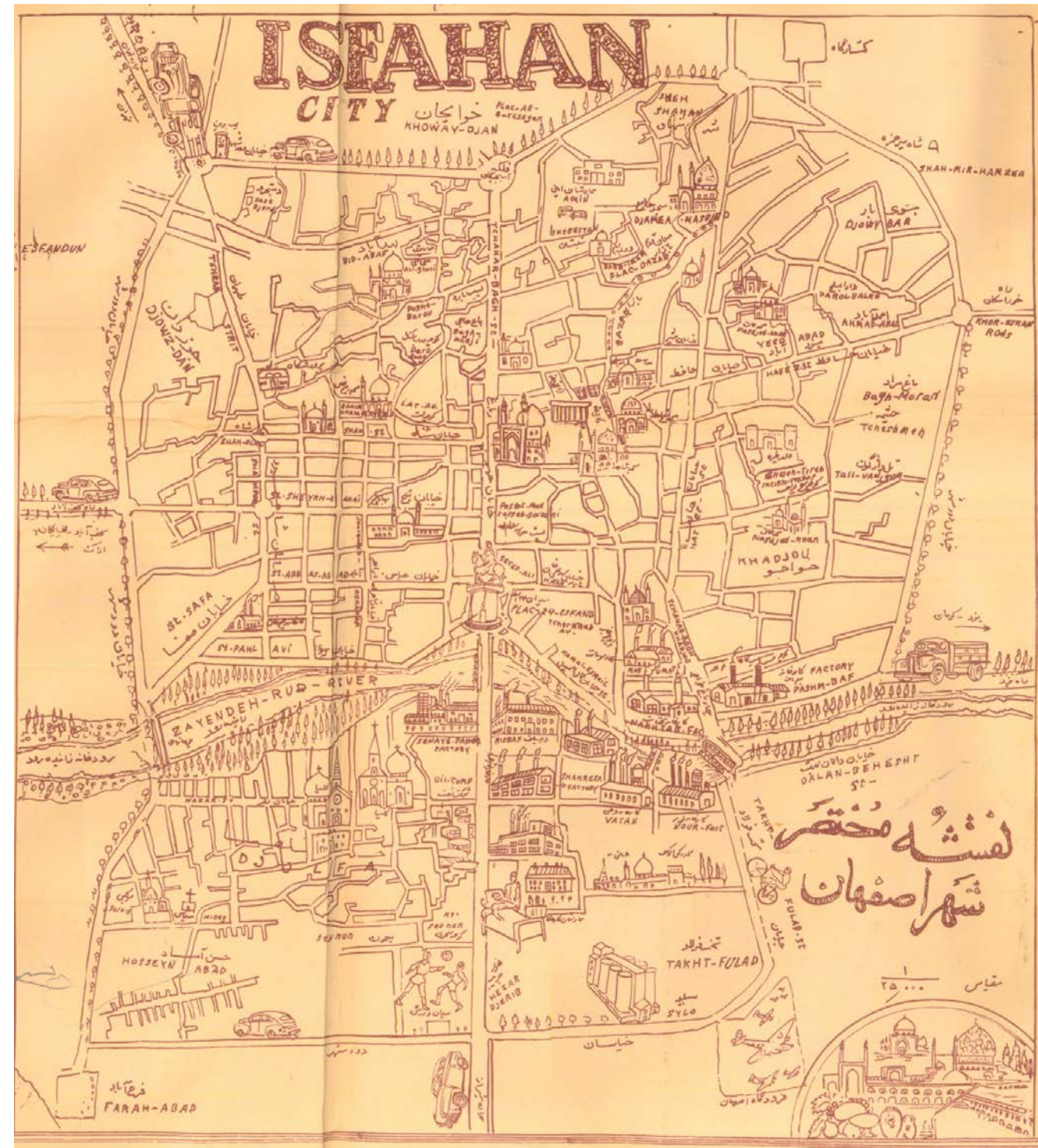


Fig. 168. Esfahan city in 1953, by Abbas Shahab, Sahab geographic & drafting institute, founded on 1936.

Khiaban-e-Ahmadabad and Khiaban-e-Golbahar were not entirely mapped out by Seyyed Reza Khan, as they were recently under construction at that time. However, they intended to connect the Bazaar and the great center of Safavid Square to around the Seyyed Ahmadian gate's previous location, where it met the head of the major eastern territorial corridor of Khiaban-e-Jay.

Finally, the last two Bidabad and Baboldasht roads, mentioned on the Map's corner, were located on the city's outskirts, approximately where the former city gates were; the meeting points of the main internal historic arteries with the regional corridors.

In 1944, the geographical unit of the army headquarters performed a massive general aerial photography covering the entire province of Esfahan (Fig. 167), which later got the base for elaborating the map of "Esfahan City" by Abbas Sahab in 1953. This map clearly illustrates the idea of "Asphalt" City in the '50s, before preparing the first Esfahan master plan by the German Kocks' company (Fig. 168).

The original map provides information at national, provincial, and city scales. This map's national and provincial scales have been presented in the previous chapter showing the ancient dirt routes beyond the historic former city gates. The Esfahan Province map shows that caravans and trucks traveled in sync on significant intercity routes for a particular period, between the '30s and '60s. On the map, there was no factory seen other than the "Mihan-e-No" spinning and weaving factory of Shahreza, built by the Germans in 1936. However, at the same time, on the Esfahan city map, several spinning and weaving factories are located along the riversides.

The city map also shows the new street network in the 1950s, built through different approaches of the regional corridors' continuity into the central city areas and the construction of the First Ring, linking all the regional corridors together and avoiding the trucks' entrance the city. Other essential features are:

- Bicycle, private cars, and trucks simultaneously are using of new streets network.

- If the Bazaar was the most principal route in the historic "Ground" and "Water" City, then the Chahar-Bagh Avenue has become the most dominant and central street of the "Asphalt" City, extending over five and a half kilometers from "Falake"- ye-Ab Pakhshkan in the north to "Falake-ye-Darvazeh Shiraz" or the Shiraz road in the south. Some modern buildings' types are seen especially set in fronts of the southern extension of Chahar-Bagh street, from the south to the north: a sports complex, hospital, oil fuel reservoir, weaving spinning mills, the statue square (maidan-e-Mojasameh).

- The riverfront street and the ring (Khiaban-e-Dore Shahr) have been planted all over.

- Other important modern structures are placed on the First Ring's two fronts, including a Silo in the south, an airport in the southeast, a slaughterhouse on the northeast, and a gas station on the northwest.

- No new bridges were built on the river till that moment.

Three main interventions' typologies drove the construction of the new model of the "Asphalt" City:

- The former road structure's adaptation to new vehicles.

- Demolishing and crossing over the historic urban fabric.

- Construction of the ring (defining a new city edge).

The closer to the central parts of the city, the construction of new streets was much more complex and controversial since it required demolishing and crossing over an intense residential fabric, while, as the construction moved toward the outside at the edges, it was much cheaper, faster, and more gentle (Fig. 169).

<sup>7</sup>In Persian dialectic, "Falake" means roundabout or a traffic circle.

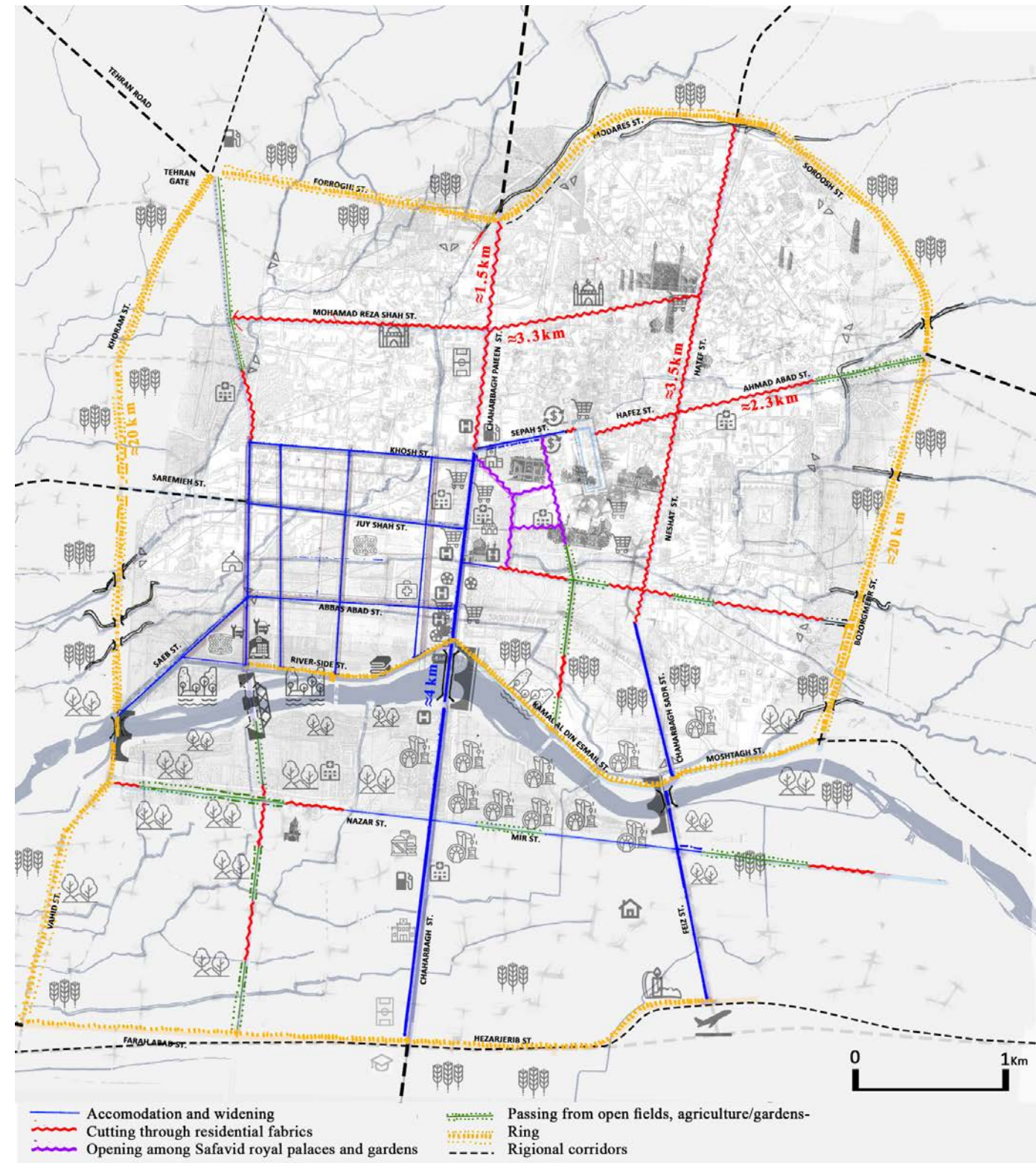


Fig. 169. Different approaches in the construction of Esfahan "Asphalt" city (1920s-1940s)

#### 4.1.1. Adaptation of Existing Structure for use of new Vehicles

In the early 20th century, by introducing new vehicles, caravanserais and primary historic passages started to be shared between modern vehicles and traditional caravans, giving a dual character. This period was characterized by a cooperative attitude among the traditional and modern city aspects through adopting a complementary approach to the existing structure.

It was a "dual" condition made by the existence of two different realities at the same time: on the one hand, the historical city was functioning by Caravans arriving from different directions through territorial trade roads; each having a specific gate and gradually distributed and developed in various interior central nodes. On the other hand, the automobile took some specific, historical, and structural elements, including primary dirt Guzars, bridges, and Caravanserais, and shared them with new vehicle road mobility elements (Fig. 170).

Regarding the hierarchy of traditional mobility system inside the city gates described in the previous chapter on the "Ground" and "Water" City, it was considered a new typology of planned direct passages introduced in the Safavid period Chahar-Bagh Avenue, Khiaban-e-Chahar-Bagh-e-Khaju, and the regular grid of Abbas-Abad and Shams-Abad neighborhoods. According to their regular features and appropriate physical dimensions, these planned passages were the primary roads, in which cooperating with the three historic bridges provided the city access to new vehicles from its southern and western edges with applying minimum adjusting interventions. Although some of these passages belonging to the regular Safavid grid of Abbas-Abad and Shams-Abad neighborhoods, having narrower stretches, got widened through the demolition

of their fronts, encompassing some commercial shops and house-gardens to reach at least eighteen meters. This fact raised the land price and division of former oversized parcels on these streets' fronts.

In the northern parts of the historic city, the dense fabric of residential neighborhoods, including narrow and winding ground passages connecting the gates to the historic neighborhood's centers and Bazaar, did not let trucks get inside and reach the central areas. Then, the only possible option left for the trucks to receive new services such as garages, offices, and warehouses to cater to lorries, trucks, and motor-cars and also loading or unloading people and cargos was to use the previous caravanserais that were initially meant for camel caravans (Ehlers & Floor, 1993).

Three main vertical axes are presented in Fig. 170, belonging to the historical structure of the city which their extensions are passing over the river:

- The grand recreational axis of Chahar-Bagh,
- The territorial axis of Chahar-Bagh-e-Khaju,
- Khiaban-e-Charsugh-e-Shiraziha and Khiaban-e-Lonban, which affirm the western limit of the regular grid of Abbas-Abad and Shams-Abad neighborhoods.

Chahar-Bagh Avenue was an outstanding planned pathway with a width of almost 44 meters that extended for approximately four kilometers perpendicular to the river, from the location of Darvazeh Dolat (in the front of the current location of the city hall) toward the south, into Sofeh mountain hillside and the former location of Bagh-e-Hezar Jarib.

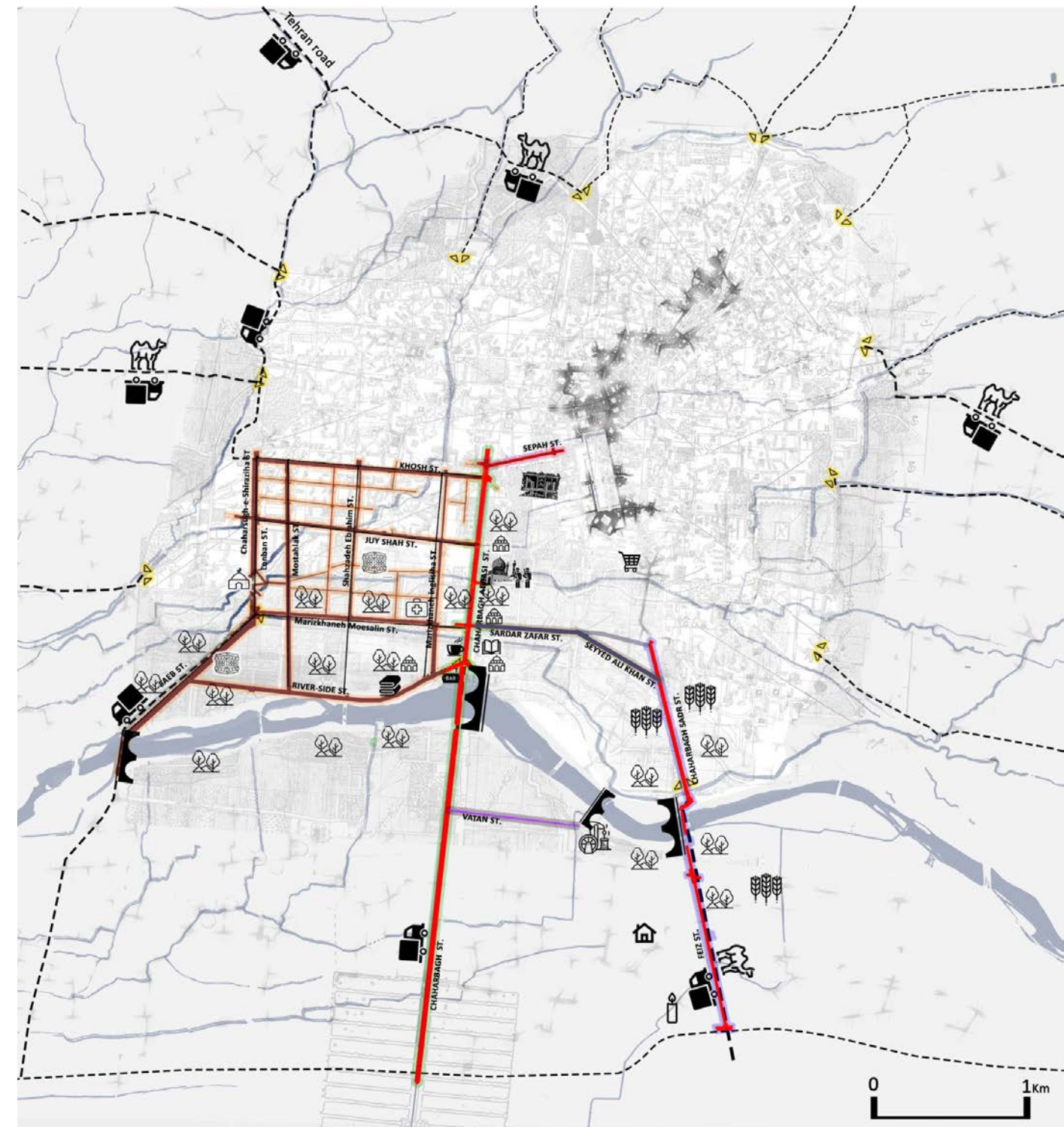


Fig. 170. Adaptation of the existing structure to new vehicles, 1920-1930.



In the early 20th century, the two fronts of Khiaban-e-Chahar-Bagh Avenue were dedicated to different uses and activities:

- Safavid gardens, offices, mansions, and aristocratic gardens belonged to merchants and prominent people of the city that remained from the past,
- The complex of Chahar-Bagh School-Mosque accompanied with Madar-Shah Caravanserai and Bazaar-e-Boland, at the intersection of Farshadi Madi with Chahar-Bagh axis,
- Watermill, Kharabat<sup>8</sup>, Ghahveh-Khaneh<sup>9</sup>, at the northern head of Chahar-Bagh (Fig. 171).

Easy and fast accessibility for the cars, cooperating with the sidewalks, rapidly changed the two fronts of the Chahar-Bagh Avenue, where different types of business activities were concentrated on both sides of the street.

The southern extension of Chahar-Bagh Avenue is longer than two kilometers distant from the southern head of the Si-o-Se-Pol bridge to the location of the prior Hezar-Jerib<sup>10</sup> garden. The street had the two sections of Khiaban-e-Bagh-Zereshk, linked with the southern head of the Si-o-Se Pol bridge, passing by a garden of the same name, and Khiaban-e-Hezar-Jerib with the same name as the massive garden, which was located at the southern head of this great axis. Seyyed Reza Khan's map only presented the northern part of this axis, which was flanked by agricultural farms, gardens, and mansions inherited from the Safavid era. Setting several textile factories along this street during the '30s considerably raised the land price around that area. According to the Naghsh-e-Jahan Newspaper published in September of 1945, these factories agreed to pay for asphaltting the floor of this avenue (Abdol Mehdi, 2008) (Fig. 172).

As one of the case studies, the Chahar-Bagh Avenue will be discussed in-depth as a modern linear form of centralities dependent on the new form of mobility.

The idea of connecting Darvazeh-Dolat and Khiaban-e-Sepah to Safavid Shah Abbas Square was reflected in 1929 in the Akhgar newspaper, stating that the Baladieh prepared a new map for constructing the city based on building and adjusting streets to the new mobility form. Baladieh sent the map to the Interior Ministry, including some proposals like turning the Safavid square into the national garden and connecting Khiaban-e-Sepah to the Maidan. At the northern head of the Chahar-Bagh Avenue, Khiaban-e-Sepah was extended in the east-west direction, defining the northern limit of the royal Safavid garden of Chehel Sotun. In 1933, this street opened to the great Maidan through the demolition of the portal of Edare-ye-Amnieh<sup>11</sup>.

Khiaban-e-Chahar-Bagh-e-Kahju, mentioned in the previous chapter, was a part of an ancient territorial north-south axis entering through the Khaju gate, linking some crucial elements of Chaharsough-e-Naghasiha, Hasan-Abad gate, Safavid Square, and the Grand Bazaar. The street is approximately one-kilometer-long and is limited between the northern head of Khaju bridge with Khiaban-e-Chaharsough-e-Nagahshi. In the 19th century, this axis was refurbished by looking after the Chahar-Bagh thoroughfare, devoting the central section of the avenue to pedestrians and separating it from the riders of the two side lanes through planting two rows of plane trees. The street has a narrower section of around thirty-five-meter wide. Referring to the Seyyed Reza Khan map, there were mostly agricultural lands and gardens lined along the two sides of this axis, incorporated with some other elements such as the school-mosque of Sadr-e-Chahar-Bagh at the upper section and Mirza-Alikhan mansion-garden, and two water mills on the lowest part; at the northern head of Khaju bridge.

Khiaban-e-Sardar-Zafar and Khiaban-e-Seyyed Ali-Khan, located on the eastern side of Chahar-Bagh Avenue, connected this central axis to Khiaban-e-Chahar-Bagh-e-Khaju by passing over Charkhab agricultural lands and gardens (Fig. 170).

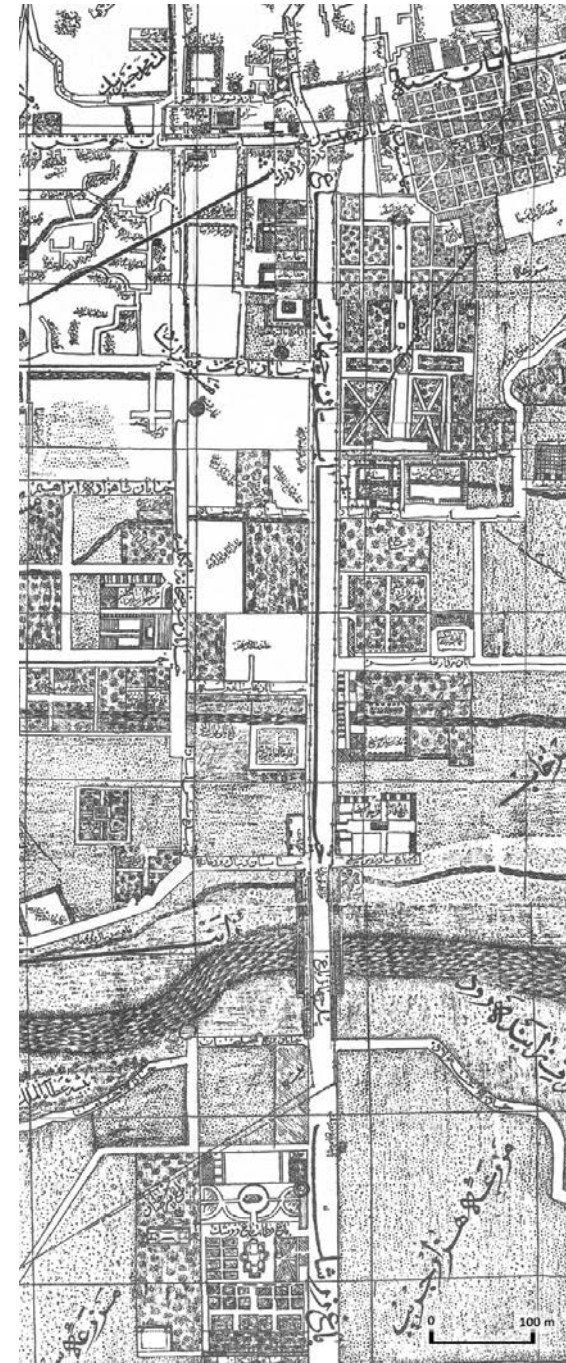


Fig. 171. Chahar-Bagh Avenue on "Sultan Seyyed Reza Khan" Map, 1920-1923.

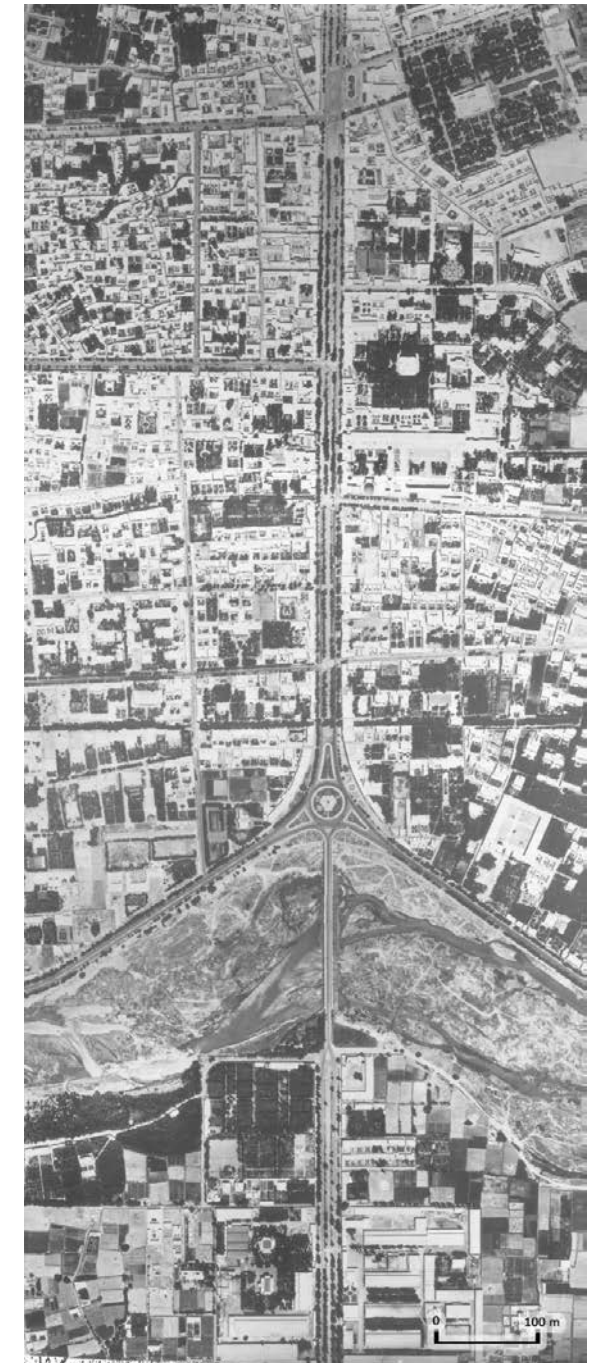


Fig. 172. Chahar-Bagh avenue, on aerial photo 1956

<sup>8</sup> Pub

<sup>9</sup> Coffee house

<sup>10</sup> One thousand acres' equals to more than 4 Square Kilometre

<sup>11</sup> Gendarmerie

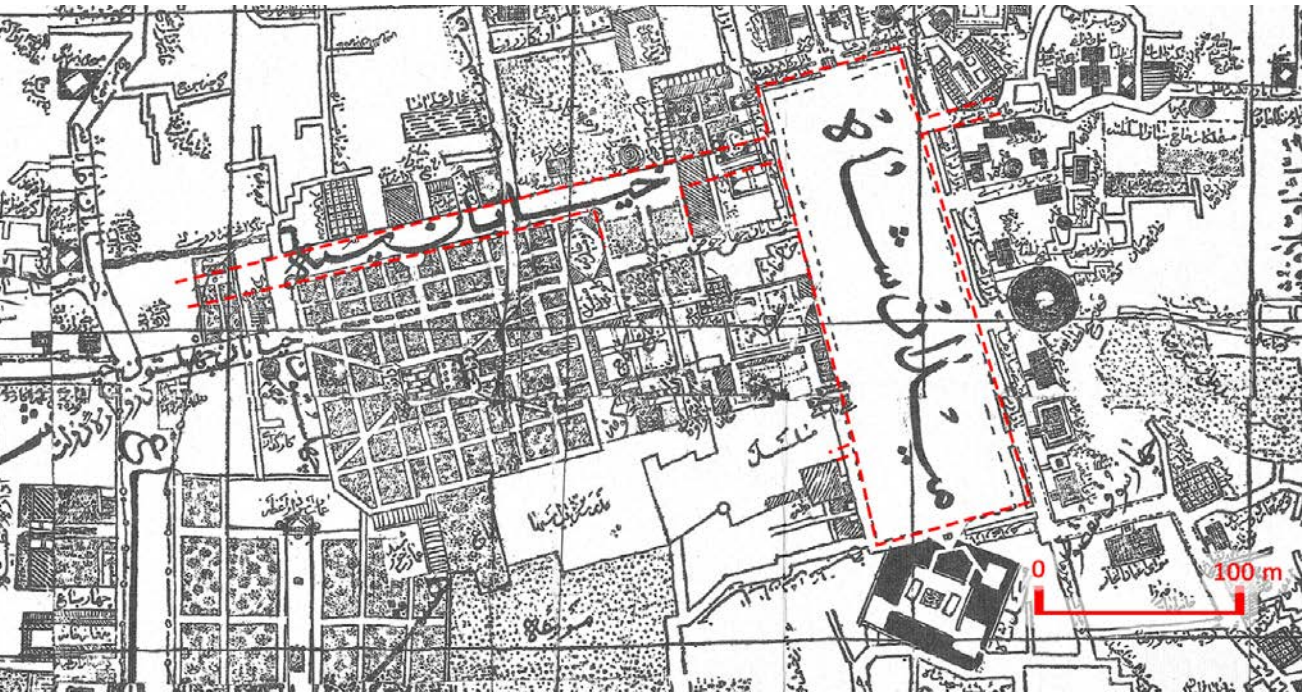


Fig. 173. Khiban-e-Sepah on "Sultan Seyyed Reza Khan" Map, 1920-1923.

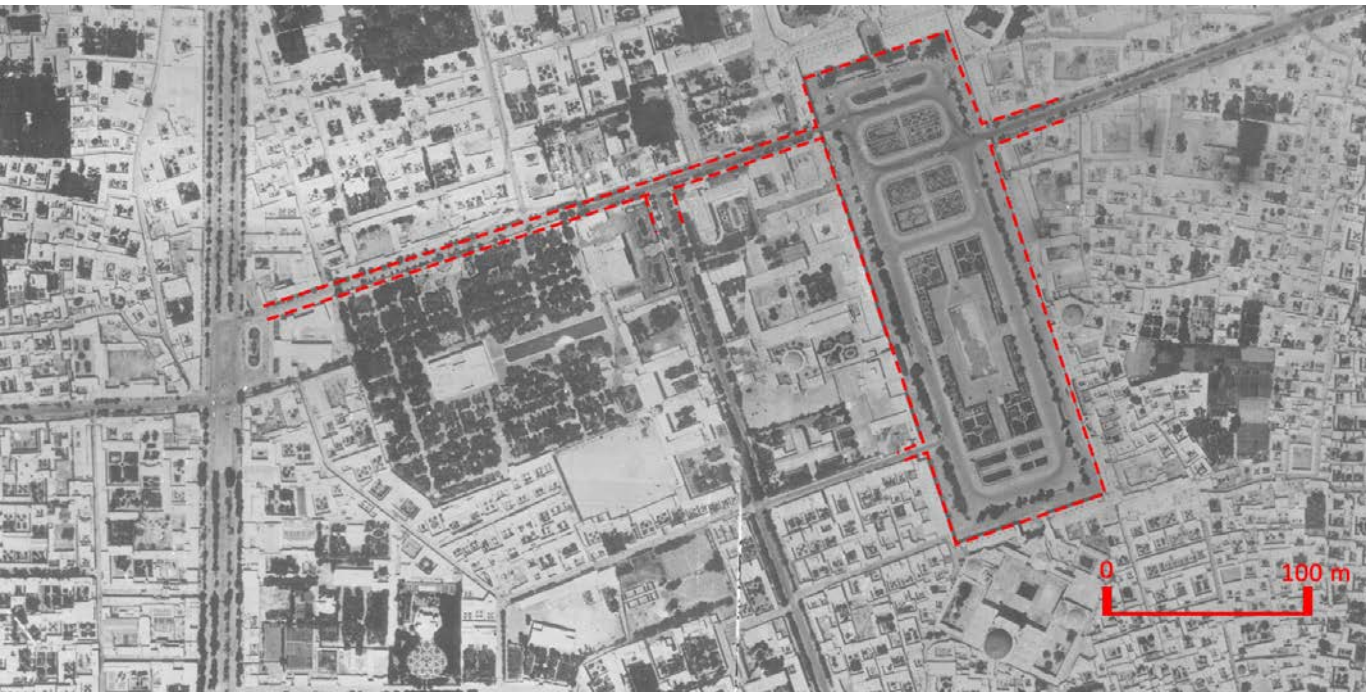


Fig. 174. Connectivity of the northern head of Chahar-Bagh, with the Safavid Maidan, 1956.

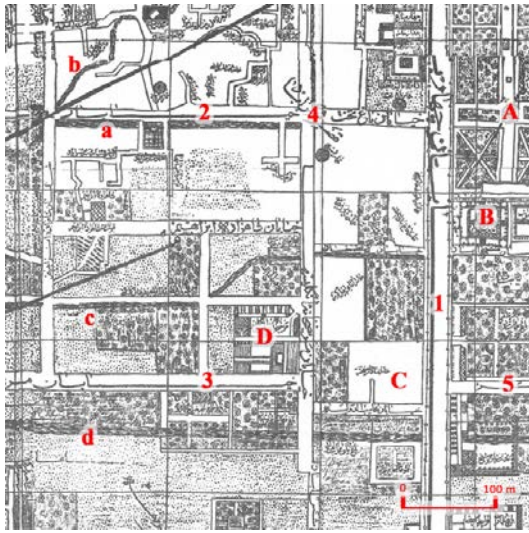


Fig. 175. The Car park around the square in the seventies. Source: The Architectural Review, Kenneth Browne, 1976.



Fig. 176. The bird eye view of the Safavid Shah Abbas square, in 1937. Source: Flights over the ancient cities of Iran, by Erich F. Schmidt

ORINST. AE 590 ISFAHAN, IRAN. CAPITAL OF THE SAFAVID KINGDOM. THE MOSQUE OF THE SHAH FILLS THE CENTER FOREGROUND. VIEWED FROM AN ALTITUDE OF 200 METERS ON JULY 6, 1937.



**Fig. 177.** (1) Chahar-Bagh avenue, (2) Khiaban-e-Juy-e-Shah, (3) Khiaban-e-Marizkhaneh-ye-Morsalin, (4) Chahar-Rah-e-Qasr-e-Shams Abad (a) Madi-e-Juy-Shah, (b) Madi-e-Fadan, (c) Madi-e-Farshadi, (d) Madi-e-Niasarm, (A) Hasht-Behesht garden, (B) Chahar-Bagh school, (C) Salar Mafkham house, (D) Christian Mission Hospital, source: "Sultan Seyyed Reza Khan" Map, 1920-1923.

The Abbas-Abad and Shams-Abad neighborhoods' planned passages forming a regular grid rapidly adapted to cars and modern lifestyle and transformed into the top neighborhoods to live in at that time. In the August of 1929, Akhgar newspaper wrote: "there is no doubt that freshness of the air, the abundance of water, and the placement of governmental administrations has become the most attractive area to Esfahanians and those who were visiting Esfahan, as far as many wealthy people sold or left their previous houses, closer to the city center, and started to construct at this part of the city." (Rajaiee, 2006).

Khiaban-e-Chaharsugh-e-Shiraziha and Khiaban-e-Lonban had submitted the Abbas-Abad and Shams-Abad neighborhoods' western limit, connected with the main road relating to Tehran. This principal axis used to apply by those bypassing cars and trucks coming from the north and headed the



**Fig. 178.** Comparison of the same location with its constituent elements over a period of more than thirty years, source: aerial photo, 1956.

south or the southwest to cross without entering the city over the Marnan historical bridge (Fig. 170). In 1930, the municipality had to build four bridges on the intersecting points of four Madies in different sections of this new street to widen and adapt it for passing trucks. The widening of Khiaban-e-Chaharsugh-e-Shiraziha and Khiaban-e-Lonban to twenty-five meters was done by 1931.

At the southern head of Khiaban-e-Lonban and the western head of Khiaban-e-Abbas-Abad; around the earlier place of the historical gate of Marnan, the diagonal axis of Khiaban-e-Saeb, supplemented by the Madi-e-Niasarm, connected the western city edge to the Marnan bridge and the southwest territorial corridor.

Khiaban-e-Khosh<sup>12</sup>, forming the northern edge of the Abbas-Abad and Shams-Abad neighborhoods, was the most fundamental horizontal axis connecting the northern head of Chahar-Bagh

<sup>12</sup> The street has been called by different names of Khiaban-e-Khosh, Khiaban-e-Shah, which is changed to Khiaban-e-Taleghani after the Islamic revolution, 1979.

(Darvazeh-Dolat) to Chaharsugh-e-Shiraziha<sup>13</sup> (the intersection point of Khosh street with Chaharsugh-e-Shiraziha street) in more than one-kilometer distance. The street had a relatively more extensive section than others in its area, and there were many stores and houses set along its two sides.

Various projects have been defined for modification and widening of this main street, which was on the way to Tehran. Following the annual construction program set by Baladieh, in 1932, it affirmed to demolish excessive protrusions of stores and houses that were set along this vital passage and were disturbing the movement of passengers and vehicles. Based on the Akhgar newspaper, it took one year for the municipality to complete the deconstruction action to widen this street to twenty meters.

Besides the fundamental Khiaban-e-Khosh being the western section of the city's primary east-west axis, the widening of some other complementary horizontal streets belonging to the grid of Abbas-Abad and Shams-Abad neighborhoods (like Khiaban-e-Juy-Shah (Sheikh Bahaie) (2) and Khiaban-e-Marizkhaneh-ye-Morsalin (Abbas-Abad) (3) to approximately 18 meters in the late 1920s and early 1930s has improved the connectivity of central Chahar-Bagh (1) with the western edge of the city.

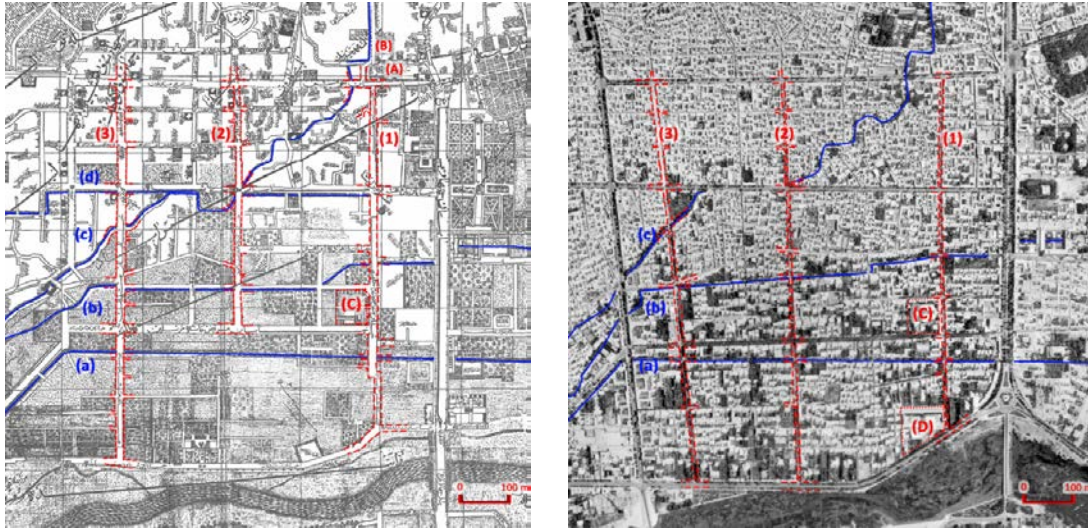
In October 1929, Akhgar newspaper published a note concerning the residents and owners'

problems with living on the southern side of Khiaban-e-Juy-e-Shah (Khiaban-e-Sheikh Bahaie) (Fig. 177). The problem was keeping people in an uncertain state for almost two years to let them know about the result of discussions over this street's development. Before the widening project of this passage, in 1930, the municipality changed the format of this Khiaban by filling the water canal of Juy-e-Shah located on the southern side of this axis (Fig. 177-a) to free 10-12 meters of its width and prevent the demolition of houses in the northern side of this street.

The demolition of the southern front of this street started in 1933, from its eastern head across the Hasht-Behesht garden entrance (A) (Figs. 177 & 178). Deconstructing houses in the southern front of this axis, to reach the twenty-meter width, was completed in 1937. To complete the construction of this street, its two fronts were aligned while maintaining the Madi-e-Fadan (b) water flow, which irrigated the northern agricultural lands, two bridges were built at the place of encountering this Madi with the newly reformed street in 1939.

A garden-house belonging to the commander of the army (Salar Mafkham) (C) was located at the eastern head of Khiaban-e-Mariz Khaneh-ye-Morsalin, which decided to be partially demolished to connect Mariz Khaneh-ye-Morsalin (Christian Mission Hospital) (D) to Khiaban-e-Chahar-Bagh and the western head of Khiaban-e-Modaber (Sardar-Zafar) (5). In this way, they could connect the three main vertical axes.

<sup>13</sup> The Chahar-Sough deconstructed over the widening act of Khiaban-e-Chaharsough Shiraziha and its northern extension to Darvazeh-Tehran roundabout, in 1931.



**Fig. 179.** Location of Shams-Abadi, Shahzadeh Ebrahim (Azar), and Mostahlak (Ordibehesht) streets, on the "Sultan Seyyed Reza Khan" Map (1920-1923), and the aerial photo of 1964. (1) Khiaban-e-Shams-Abadi, (2) Shahzadeh Ebrahim (Azar), (3) Khiaban-e-Mostahlak (Ordibehesht), (A) Kazeruni Sarai, (B) British Government Consulate, (C) Christian Mission Hospital, (D) Honarestan-e-Honarhaye Ziba (a) Madi-e-Niasarm (b) Madi-e-Farshadi (c) Madi-e-Fadan (d) Madi-e-Juy-Shah.



**Fig. 180.** Sketch drawn by F. A. Evans from the Christian Hospital in 1975

Khiaban-e-Shams-Abadi (1), Khiaban-e-Shahzadeh Ebrahim (Azar) (2), and Khiaban-e-Mostahlak (Ordibehesht) (3) are other engaging vertical axes parallel to Chahar-Bagh, in developing the regular grid of Abbas-Abad and Shams Abad communities. The idea of widening these streets to the minimum of eighteen meters in the 1930s was to improve the riverfront's connectivity with Khiaban-e-Khosh as the most dominant east-west axis of the City and enhance the integration and car accessibility to the historical and organic districts of Darbe-Kushk and Mahaleh-No on the western side of the old town (Fig. 179).

According to the Akhgar newspaper, the demolition work of Shams Abadi street's fronts took place in 1937 toward the riverfront, and it was accompanied by landlords' action in constructing facades at two front edges of this street.

Khiaban-e-Shams Abadi is 1.3-kilometer-long and is the closest parallel passage to Chahar-Bagh Avenue (approximately 200 meters). Toward the north direction, the street was connected to some essential elements of (A) Kazeruni Sarai adjacent with Darvazeh Dolat, (B) the British Government Consulate, the Fadan Madi, and Darbe-Kushk and Bid-Abad neighborhoods centers. In the lower section of this street, (C) the Christian Mission Hospital (1904) and (D) Honarestan<sup>14</sup>-e-Honarhaye Ziba (1936), were among primary buildings located at the intersection corners of it with Khiaban-e-Abbas-Abad, and with the riverfront street; respectively (Khiaban-e-Pahlavi) (Fig. 179).

<sup>14</sup>School of Art

#### 4.1.2. Demolishing and Crossing Over the Historic Urban Fabric

In the early 1930s, the city administrators began to explore alternatives to reach the city's central parts by cars and trucks and crossing some new traces over existing urban fabrics. Throughout one decade, dozens of main streets were built on the base of the first missing plan<sup>15</sup>, which was set for the city based on the new day-to-day life dependency on trucks and cars for different transportation means.

Since then, the new approach of bulldozing and crossing over the former fabrics was implemented simultaneously with the earlier described approach of adaptation of existing structural elements to the new form of mobility. This continuity of regional corridors to the city's inner central parts caused transversal discontinuity of such contextual and historical elements as historical passages and Madi streams.

Slowly, more asphalt roads were built to complement a grid of new streets, giving car access to historic residential districts or developing new urban fabrics.

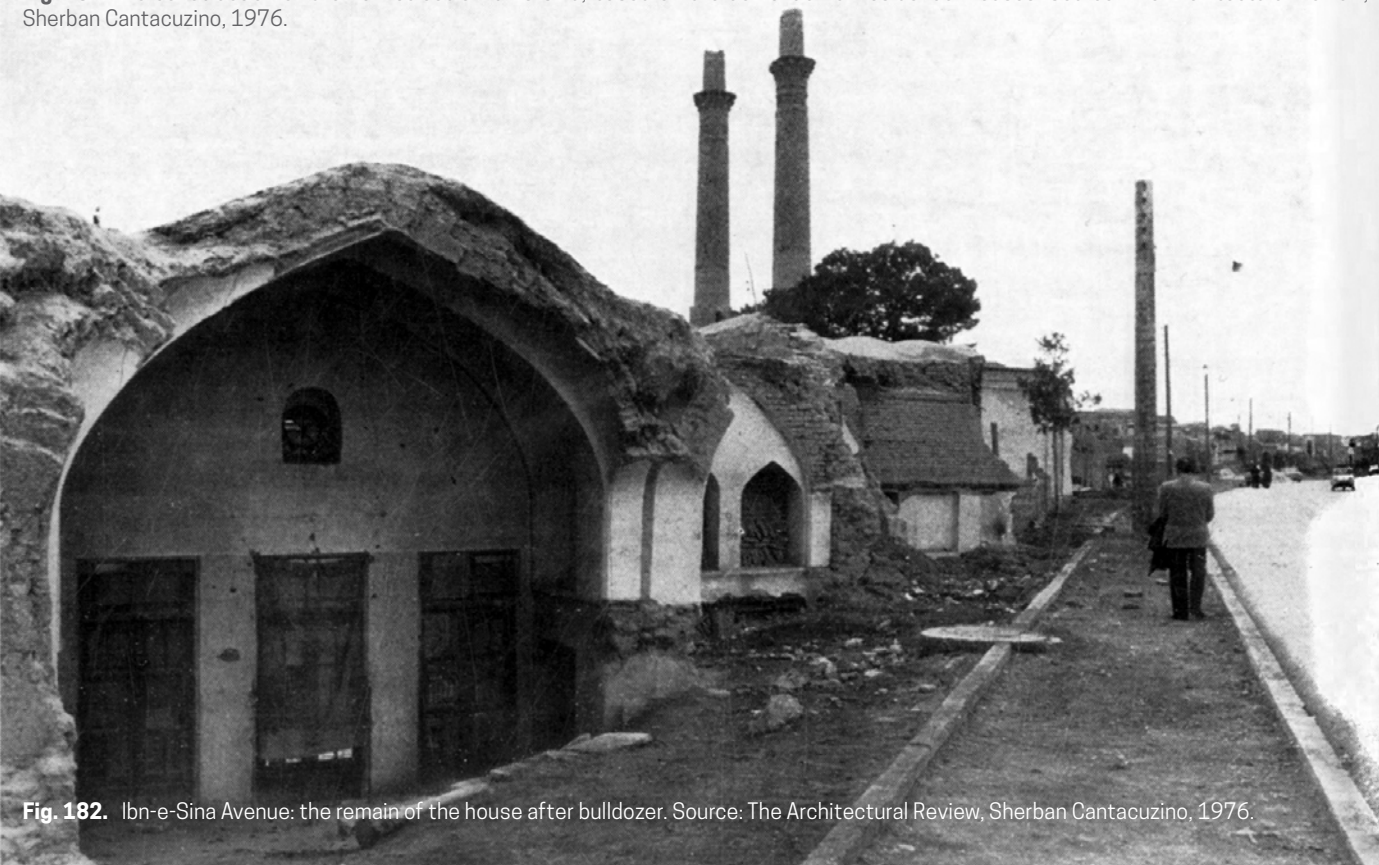
The logic for constructing new streets that were built between the '30s until the '60s can be explained through the following four matters:

- 1- Extensions of the three main vertical axes
- 2- Extension of the main horizontal axis
- 3- Complementation of the new asphalt street network
- 4- Duplication of Chahar-Bagh Avenue

<sup>15</sup>In 1961, in the Esfahan Master Plan report, F. H. Kocks, K. G., Consulting engineers, Friedrich Pfeil, and Peter Von Bohr, it was mentioned that there was a plan prepared for the city by the German Nimmegern in the early 1930s. However, the report also notes that no traces of the plan found in the Municipal Archives. There could be a link between the missing plan, which F. H. Kocks mentioned in his report, with the map Ruznameh-ye-Akhgar mentioned in various numbers concerning the necessity of preparing it. In the May of 1930, Akgar news declared that the map was prepared by the ministry of the interior and was presented to the public. Akhgar listed the recommendations of the map as twenty-six items, which were mostly implemented until 1941 the end of the first Pahlavi period.



**Fig. 181.** The construction of the new street of Ibn-e-Sina, based on the demolition of residential houses. Source: The Architectural Review, Sherban Cantacuzino, 1976.



**Fig. 182.** Ibn-e-Sina Avenue: the remain of the house after bulldozer. Source: The Architectural Review, Sherban Cantacuzino, 1976.

#### 4.1.2.1. Extensions of the Three Main Vertical Axes

**The northern extension of Chahar-Bagh Avenue** (Khiaban-e-Chahar-Bagh-e-Paieen) (1.3) was extended for about 1.7 kilometers between “Darvazeh Dolat” at the northern head of Safavid Chahar-Bagh to “Falake-ye-Ab Pakhshkan” (current Shohada roundabout). Having the same width as Chahar-Bagh Avenue, the street crossed over some dense historic neighborhoods as Darb-e-Kushk and Posht-e-Darvazeh and was completed in 1936 (Fig. 183).

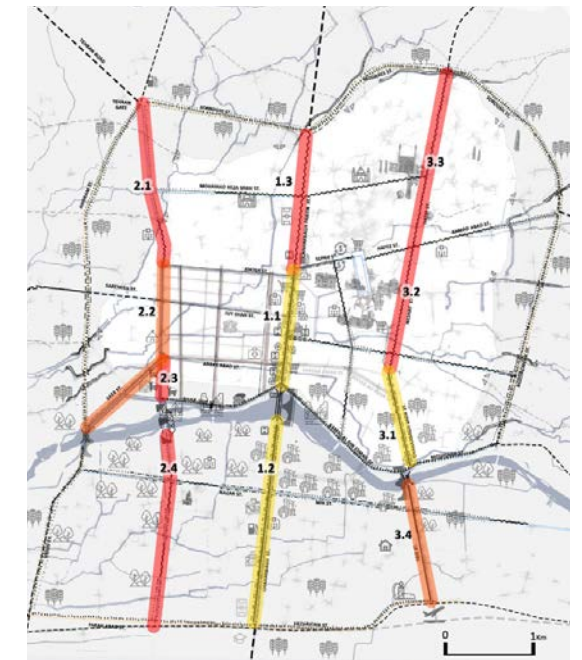
**The western vertical axis** (Khiaban-e-Shahpour) can be divided into three main north, central, and south sections.

The northern extension of Khiaban-e-Shahpour (2.1) passed through a small part of Mahale-No , and the border of Ghabrestan-e-Seti-Fateme, and the locations of former Juzdan and Bidabad gates. The new extension continued by passing over agricultural lands until reaching the Tehran road.

By itself, the central section (2.2) had three parts, which mentioned in the previous section (4.1.1). The first two parts of Khiaban-e-Chaharsugh-e-Shiraziha, and Khiaban-e-Lonban, determined between Chaharsugh-e-Shiraziha roundabout to its intersection with Fadan Madi, and from there to Niasarm Madi. The first two streets constructed through the widening of the former route belonged to the Safavid structure.

Simultaneously with the widening of the former route of Khiaban-e-Chaharsugh-e-Shiraziha and Khiaban-e-Lonban, the construction of the southern extension of this axis, Khiaban-e-Shahpour (2.3), with a width of 25 meters began at the northern front of the river. A considerable number of garages were built along the two fronts of this new extension for catering and also for loading and unloading trucks that were travelling through Tehran, Esfahan, Shiraz, and Kerman by passing over Marnan bridge (Akhgar newspaper, Jan.1930).

The complex of Khiaban-e-Chaharsugh-e-Shiraziha and Khiaban-e-Lonban and its northern and southern extensions from Jade-e-Tehran to Khiaban-e-lab-e-Rudkhaneh made it one out of the three primary vertical axes in the city of Esfahan.



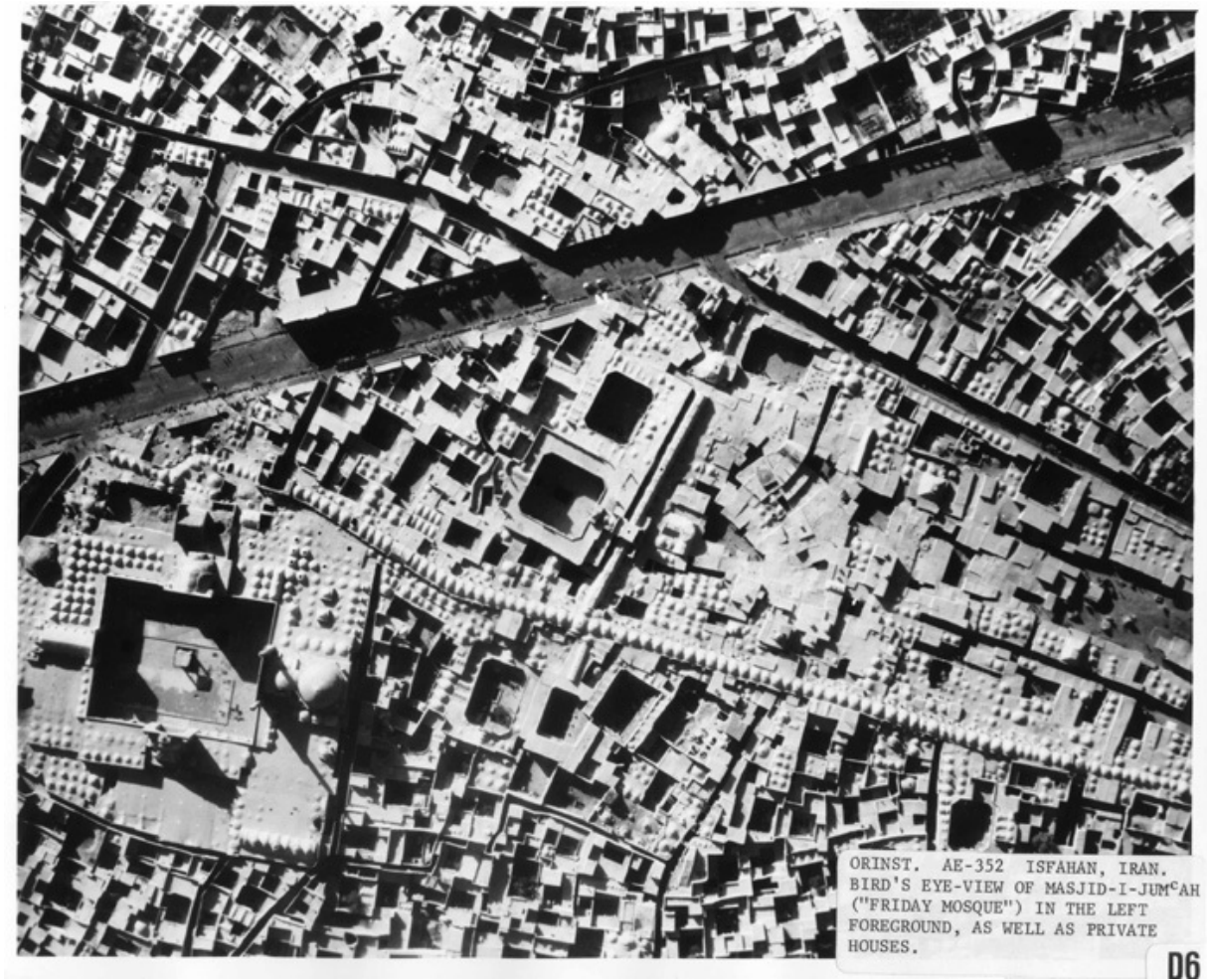
**Fig. 183.** The extension of the three primary vertical axes. (1.1) Kh. Chahar-Bagh-e-Abbasi, (1.2) Kh. Chahar-Bagh-e-Bala, (1.3) Kh. Chahar-Bagh-e-Paieen, (2.1) Kh. Shahpour - north section, (2.2) Kh. Shahpour - middle section, (2.3) Kh. Shahpour - south section, (2.4) Kh. Hakim Nezami, (3.1) Kh. Chahar-Bagh-e-Khaju, (3.2) Kh. Neshat, (3.3) Kh. Hatef, (3.4) Kh. Feyz. (Red lines- Demolition and crossing over residential fabric), (Orange lines- Widening the existing ground passages), (Yellow lines- Adaptation of the existing ground passages to motor vehicles)

The construction of the first new bridge in front of the new southern extension of Khiaban-e-Shahpour lasted for twenty-five years. Since 1933, Akhgar wrote about constructing a new bridge; first, it took fifteen years for the construction to start by building the bridge’s foundation with concrete in the April of 1948. Then, the road ministry concluded a contract with Daydé and Eiffel companies to build the bridge’s metal deck, and the bridge opened in May of 1959 (being 138 meters long and 16 meters wide).

At the southern head of the new bridge, the construction of Khiaban-e-Hakim Nezami (2.4) started in 1933 to connect Khiaban-e-Shahpour (on the north side of the river) to Khiaban-e-Nazar and Jolfa neighborhood in the southern parts. The street needed to cross over the groves and fields



**Fig. 184.** The aerial perspective photo taken in the 1990s shows the eastern vertical axis of Hatef passing built over the city's historic fabric. Source: The archive of Makansazan architecture and urban development company.



**Fig. 185.** The construction of Khiaban-e-Hatef cutting through the corner of Atigh square and the front of the Friday mosque. Source: Flights over the ancient cities of Iran, by Erich F. Schmidt, 1936.

near the river and toward the south, demolishing some residential buildings that belonged to Jolfa and Hossein Abad neighborhoods.

#### **The eastern vertical axis, Khiaban-e-Hatef**

The construction of the northern extension of Khiaban-e-Hatef (3.3) started from Mahale-e-Baghala Forushha on the eastern side of Maidan-e-Shah, traversing through the neighborhoods of Yazd-Abad and Emamzadeh Esmail's dense residential fabric to the place of previous Seljuk square. Further along this axis, the new street crossed through the eastern side of Jame mosque and continued by overpassing Jubareh and Toghchi

neighborhoods to the last place of Darvazeh-e-Toghchi, connecting to the north regional corridors.

The demolition operations needed for the construction of the new street were completed by November of 1932. In 1936, the southern extension of Khiaban-e-Hatef, Khiaban-e-Neshat (3.2) met the northern head of Chahar-Bagh-e-Khaju (3.1) by crossing through Hasan-Abad and Pa-ye-Qale neighborhoods. The repair of the Khaju bridge, the construction of Khaju roundabout at the northern head of the bridge, and the construction of the first Esfahan airport at the southern head of this vertical axis were the primary interventions that took place during the same period.

#### 4.1.2.2. Extension of the Main Horizontal Axis

The arterial horizontal axis constituted of different sections and projects, each built in a certain period with its specific characteristics, made the full extension from the main eastern regional corridors to the center and from the center to the western vertical axis Tehran road, and the western regional corridor. Some of the most important events and projects built concerning the construction of different sections of this axis are:

- Khiaban-e-Hafez (4) and Khiaban-e-Ahmad-Abad (5): the construction of these two streets was completed by August 1931, and it linked the eastern territorial corridor around the place of former Seyyed Ahmadian gate to the eastern edge of Safavid square. The new street was planned to be thirty meters wide and started to widen from its western head by widening the existing Kucheye-Bigdeli and demolishing residential fabrics Mahale-ye-Baghala-Forushha to the Bazarche-ye-Esmaiel Kusaj. The street continued with the same width by crossing over Yazd-Abad and Ahmad-Abad neighborhoods until joining the eastern regional corridor.

- Khiaban-e-Sepah (3) and Khiaban-e-Khosh (2) formed the central and western sections of the main horizontal axis of the "Asphalt" City, which were mentioned in the previous section (4.1.1.) concerning the prior road structure adaptation to the use of new vehicles.

- The idea of connecting the western corridor of Jade-ye-Atashgah<sup>16</sup> linking the western provinces to the city dates back to the early 1930s. However, in 1937, the new extension of Khiaban-e-Saremieh (1), over the existing agricultural lands, completed and joined the western regional road of Atashgah to Khiaban-e-Sheikh-Bahaie, and Chahar-Bagh central avenue.



**Fig. 186.** The extension of the main horizontal axis. (1) Khiaban-e-Saremieh, (2) Khiaban-e-Khosh, (3) Khiaban-e-Sepah, (4) Khiaban-e-Hafez, (5) Khiaban-e-Ahmad Abad, (Red lines- Demolition and crossing over residential fabric), (Orange lines- Widening the existing ground passages)



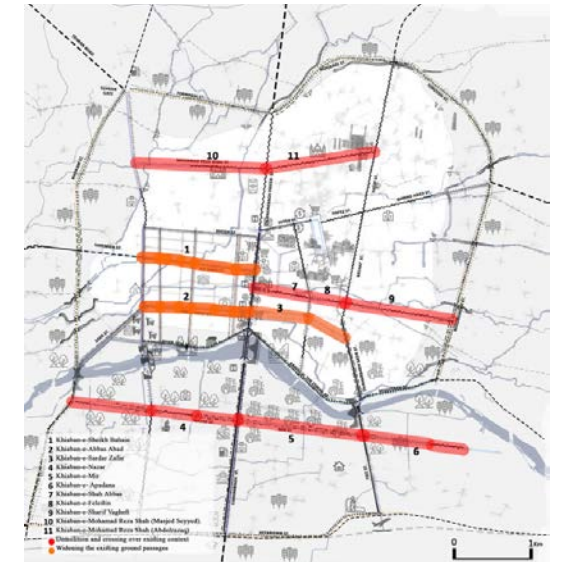
**Fig. 187.** Connecting the Safavid square to the new city's entrances through the primary axis; Khiaban-e-Hafez, and Khiaban-e-Sepah, 1936. Source: Flights over the ancient cities of Iran, by Erich F. Schmidt

#### 4.1.2.3. Complementation of the New "Asphalt" Street Network

There are five additional significant and complementary horizontal axes, each divided into different sections, built during the '30s to the '60s, which contribute to developing the network of asphalt streets. Four of these streets were built on the northern side of the river and inside the city's historical domain. Except for the Khiaban-e-Sheikh-Bahaie (1), Khiaban-e-Abbas-Abad (2), and Khiaban-e-Sardar Zafar (3), which were built based on an extension of the inherited historical passages and discussed in the previous section, the rest were superimposed on the central former urban fabrics or agricultural lands and gardens in the outskirts of the old city (Fig. 188).

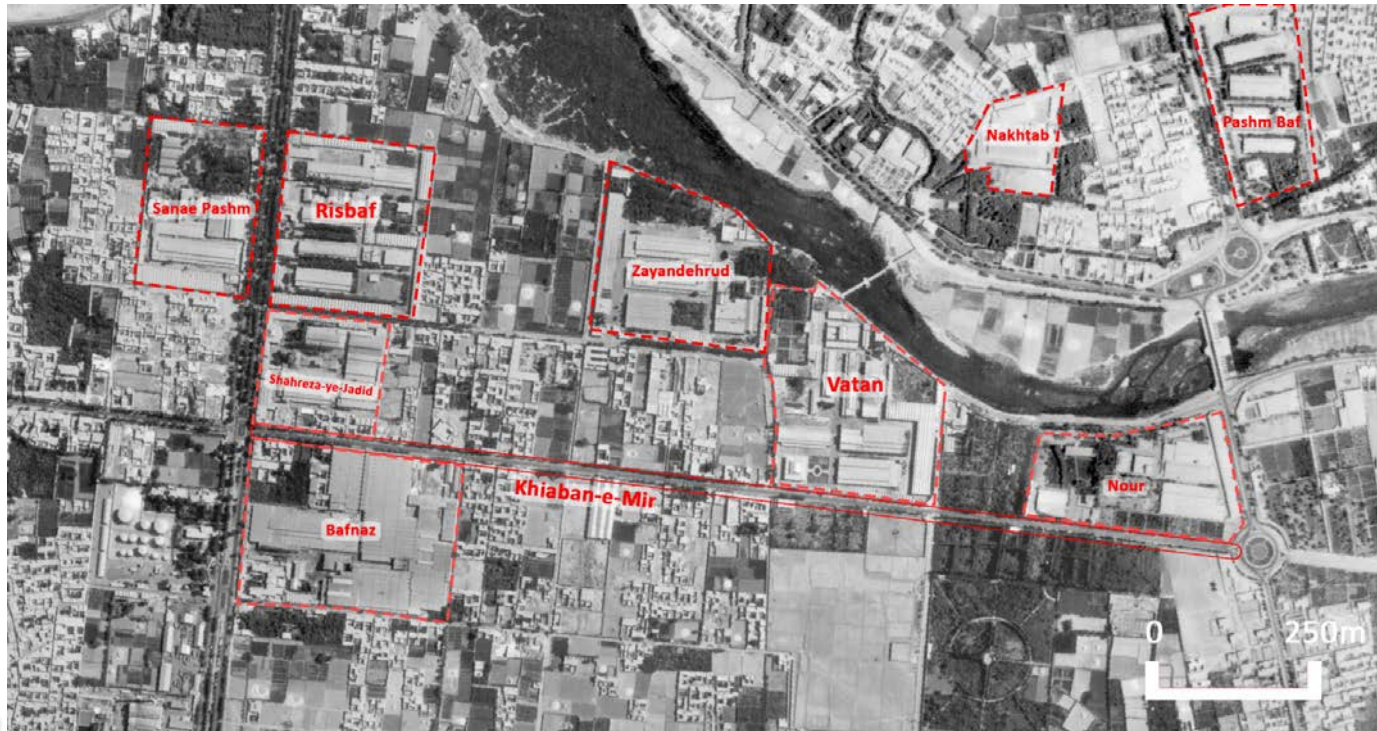
- The construction of Khiaban-e-Nazar (4) was a proposal action on the municipality plans' list to get done in 1932. According to the Akhgar newspaper, it was in April of 1933 when the municipality made a tender offer for the construction of Khiaban-e-Nazar, including leveling and preparing the floor for the asphalt pavement, and constructing two-sided planting strips. The new street was connecting the southern head of Marnan bridge and the southwestern regional corridor to Chahar-Bagh Avenue and was mostly used by the trucks giving services to the various textile factories along the southern section of Chahar-Bagh Avenue.

The construction of Khiaban-e-Nazar on the southern side of the Zayandeh-Rud river was completed during the development of the northern riverfront Khiaban-e-Kamal Esmail and Pahlavi in July 1933. The northern riverfront street will be discussed in the next part that is related to the First Ring's construction. The construction of Khiaban-e-Nazar and the northern riverfront street extended along the two sides of the river, and repairing the Marnan Bridge, allowed the municipality to stop truck traffic over the two historic bridges of Khaju and Si-o-Se Pol. Then the trucks passing over the Marnan bridge would often take the Khiaban-e-Nazar to move toward the southern section of central Chahar-Bagh and to textile factories.



**Fig. 188.** The complementary horizontal axes, connecting the Chahar-Bagh to the other regions. (1) Khiaban-e-Sheikh Bahaie, (2) Khiaban-e-Abbas Abad, (3) Khiaban-e-Sardar Zafar, (4) Khiaban-e-Nazar, (5) Khiaban-e-Mir, (6) Khiaban-e- Apadana, (7) Khiaban-e-Shah Abbas, (8) Khiaban-e-Felestin, (9) Khiaban-e-Sharif Vaghefi, (10) Khiaban-e-Mohamad Reza Shah (Masjed Seyyed), (11) Khiaban-e-Mohamad Reza Shah (Abdolrazaq). (Red lines- Demolition and crossing over residential fabric), (Orange lines- Widening the existing ground passages)

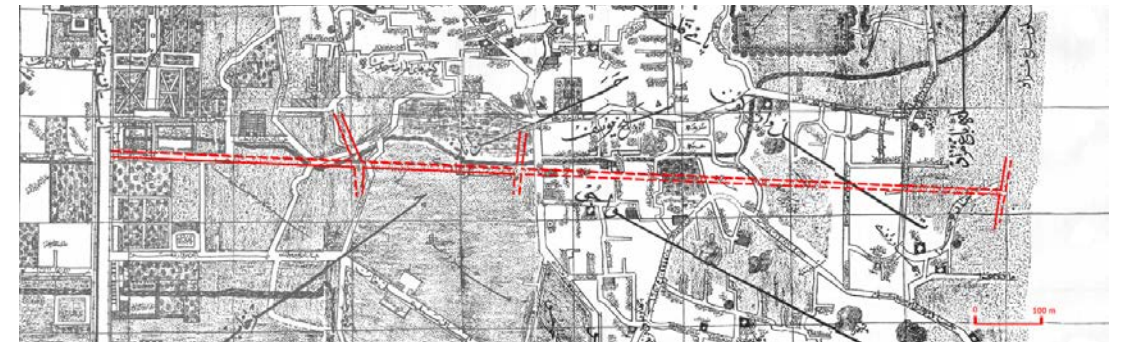
<sup>16</sup>Atashgah: Fireplace. The primary western regional corridor



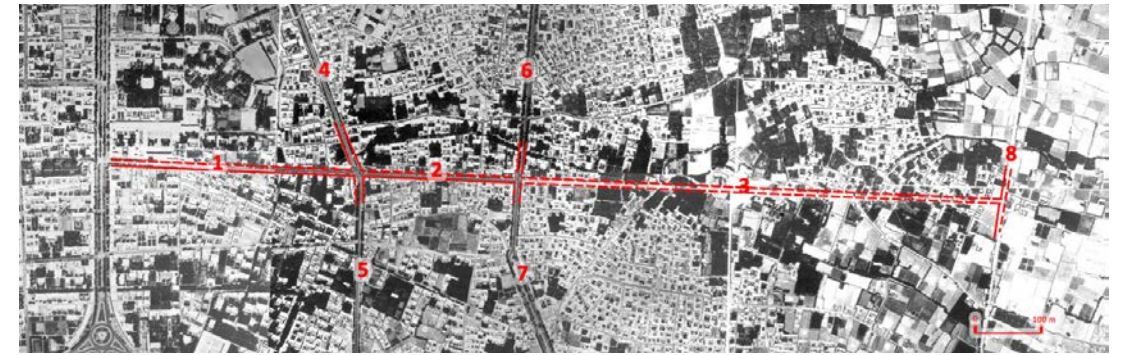
**Fig. 189.** Khaban-e-Mir at the southern part of the river, connecting the southern head of Khaju Bridge to Chahar-Bagh Ave- Positioning of textile factories on aerial photograph 1956.



**Fig. 190.** Esfahan Risbaf textile factory, hall F, source: "The heritage of Iranian industrial architecture: Esfahan province" by Leila Pahlavanzadeh.



**Fig. 191.** Overlapping Khaban-e-Shah Abbas on "Sultan Seyyed Reza Khan" Map, 1920-1923.



**Fig. 192.** Khaban-e-Shah Abbas, the aerial photo of 1956. (1) Khaban-e-Amadegah, (2) Khaban-e-Felestin, (3) Khaban-e-Sharif Vagefi, (4) Khaban-e-Teymuri, (5) Khaban-e-Ferdowsi, (6) Khaban-e-Hatef, (7) Khaban-e-Chahar-Bagh-e-Khaju, (8) The First Ring (Khaban-e-Bozorgmehr)

- Khaban-e-Mir (5) foundation was on the list of a six-year plan of Baladieh for Esfahan city reforms (1933). The street was the eastern extension of Khaban-e-Nazar and was linking Chahar-Bagh Avenue to the southern head of the Khaju bridge. Although the construction started in December of the same year, yet it proceeded slowly until it was completed in the 1940s.

Except for the Vatan factory being the first textile company that started its work in 1925, eight other factories were built in 1932 until 1940, mostly, in the southern bank of the river and at where the Safavid gardens and agricultural lands were located. Among them, three were placed at the two fronts of Khaban-e-Mir: Karkhaneh<sup>17</sup>-ye-Noor, Karkhaneh-ye-Shahreza, and Karkhaneh-ye-Bafnaz (Fig. 189).

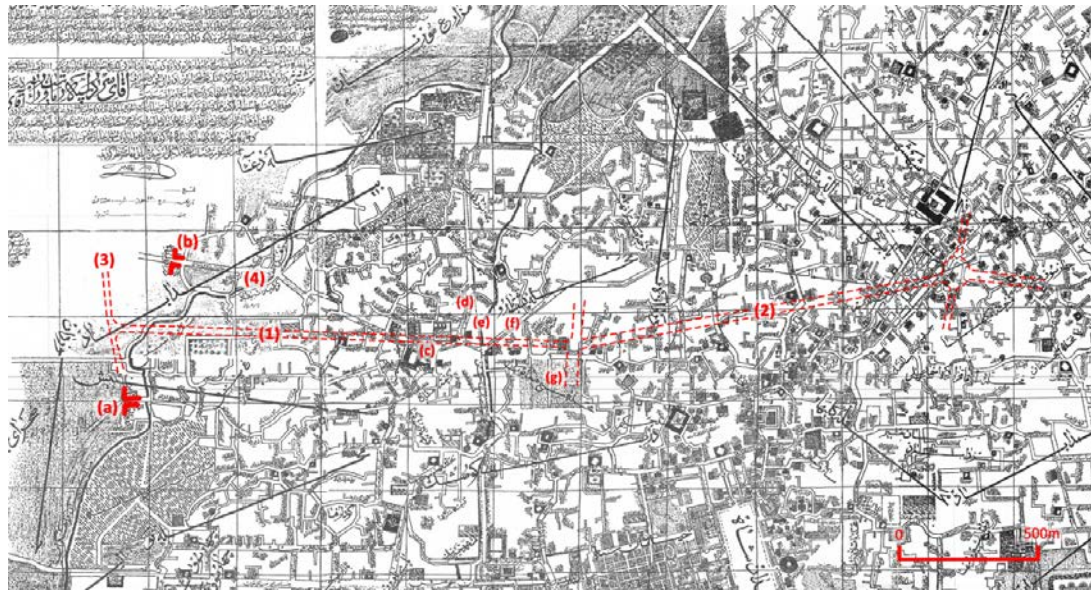
- In regards to the first plan for the adjusting and building streets in the early 1930s, the Akhgar

newspaper pointed out the idea of developing the Khaban-e-Shah Abbas as the extension of Khaban-e-Fathieh. The southern edge of Chahar-Bagh school and Caravansarai toward the east linked the central axis of Chahar-Bagh to the eastern section of the First Ring. The street was divided into different sections of Khaban-e-Amadegah (1), Khaban-e-Felestin (2), Khaban-e-Sharif Vaghefi (3), in between its intersections with other north-south directed streets of Teymuri (4), Ferdowsi (5), and Hatef (6), Chahar-Bagh-e-Khaju (7).

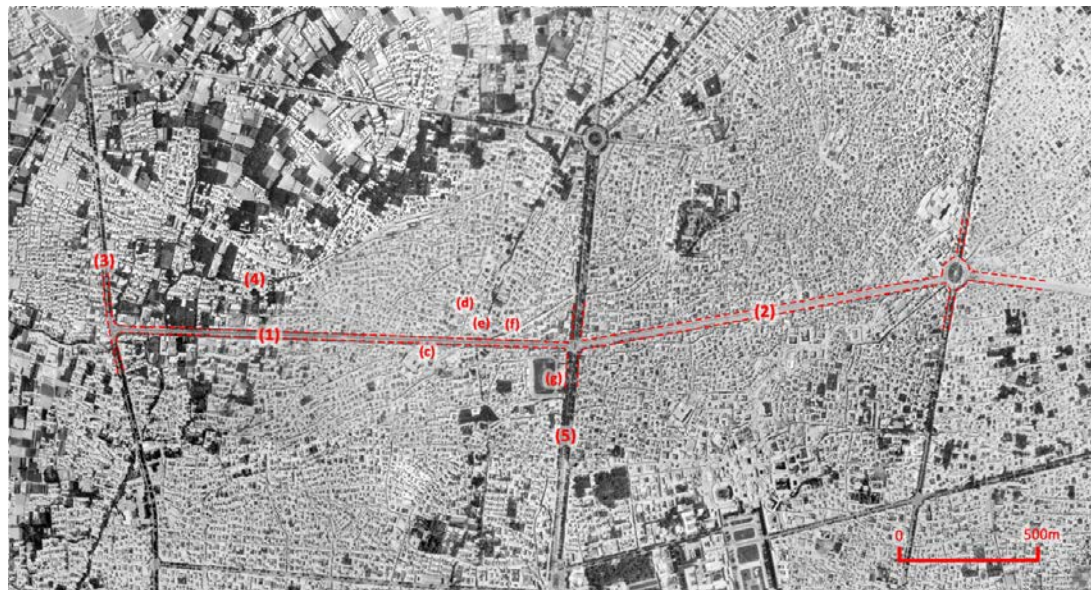
The new street was directed parallel with Madi-Farshadi and crossed over the agricultural lands of Charkhab at its western sections and the residential fabrics of Khaju and Tal-e-Vazhegun neighborhoods at its eastern one (Figs. 191 & 192).

<sup>17</sup> Factory





**Fig. 193.** Determine Khiaban-e-Mohammad Reza Shah's limits (Masjed Seyyed- Abdol Razzagh streets) on "Sultan Seyyed Reza Khan" Map, 1920-1923,

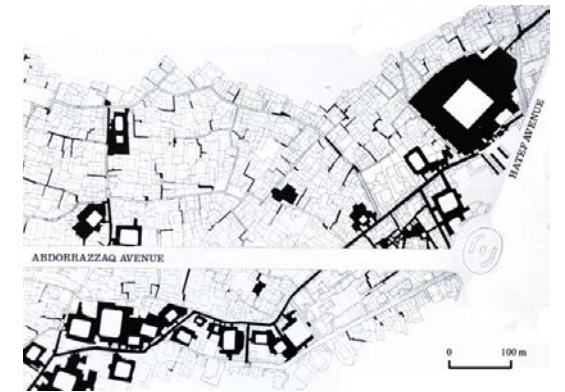


**Fig. 194.** Khiaban-e-Mohammad Reza Shah, the aerial photograph of 1964. (1) Khiaban-e-Masjed Seyyed, (2) Khiaban-e-Abdolrazaq, (3) Khiaban-e-Shahpour, (4) Madi-ye-Tiran-Va-Ahangaran, (5) Khiaban-e-Chahar-Bagh (a) Juzdan gate, (b) Bidabad gate, (c) Masjed Seyyed, (d) Kuche Chaharsughe Aligholi Agha, (e) Madi-e-Fadan, (f) Kuche Posht Baru, (g) Takhti Stadium.

- The Mohammad Reza Shah Street was divided into two main sections, which after the Islamic revolution of 1979, were called by Khiaban-e-Masjed Seyyed (1) and Khiaban-e-Abdolrazaq (2) (Figs. 193 & 194).

The western section was first built around the middle of the 1950s with a width of thirty meters and less than two kilometers long. The new street extended from the Khiaban-e-Shahpour (3), somewhere between the last place of the two gates of "Juzdan" (a) and "Bidabad," (b) and crossed over Madi-ye-Tiran-Va-Ahangaran<sup>18</sup> (4), and some agricultural lands and gardens at its western edge. From the west to the east direction, the street extended toward the center of the historical city. It opened through the Bid-Abad neighborhood's historical fabric by passing through the front of Masjed Seyyed (c) and crossing over some essential structural elements. "Bazaarche-ye-Bid Abad," "Kuche Chaharsughe Aligholi Agha," (d) "Madi-e-Fadan," (e) "Kuche Posht Baru" (f) were some of these structural elements, which were meeting at the center of Bid-Abad neighborhood, "Mahaleh-ye-Bid Abad." The street reached Chahar-Bagh Avenue (5) by passing through the northern front of Takhti Stadium<sup>19</sup> (g) (Figs. 193 & 194).

The eastern section of Khiaban-e-Mohammad Reza Shah (Khiaban-e-Abdolrazagh) was constructed in the early 1960s with the same width as its western extension. The new section intended to connect the central axis of Chahar-Bagh to the original place of Atigh Square as the primary center of the ancient city. According to many scholars, this street is considered as one of the worst cases in the construction of new streets in Esfahan, to the extent that apart from numerous cases of demolition of traditional courtyard houses and other public buildings, it caused a significant break in the main route of the Grand Bazaar of Esfahan (Fig. 195).

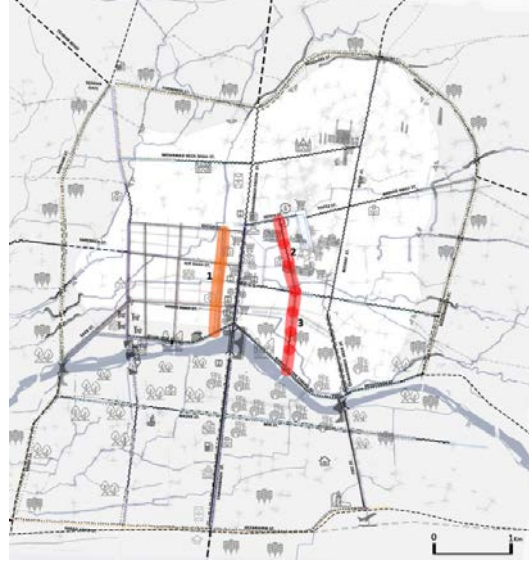


**Fig. 195.** The new Abdolrazagh has severed both major and minor connections and has contributed to the decline of surrounding quarters. Source: The Architectural Review, volume number 951, May 1976.

<sup>18</sup>"Tiran" and "Ahangaran" were the two ancient agricultural-based settlements in the north and the north-west of the historic city.

<sup>19</sup>In the middle of the 1930s, the Esfahan City Council decided to build a sports stadium on the land that belonged to "Bagh Haji" (Garden), having almost three hectares.

#### 4.1.2.4. Duplication of Chahar-Bagh Avenue



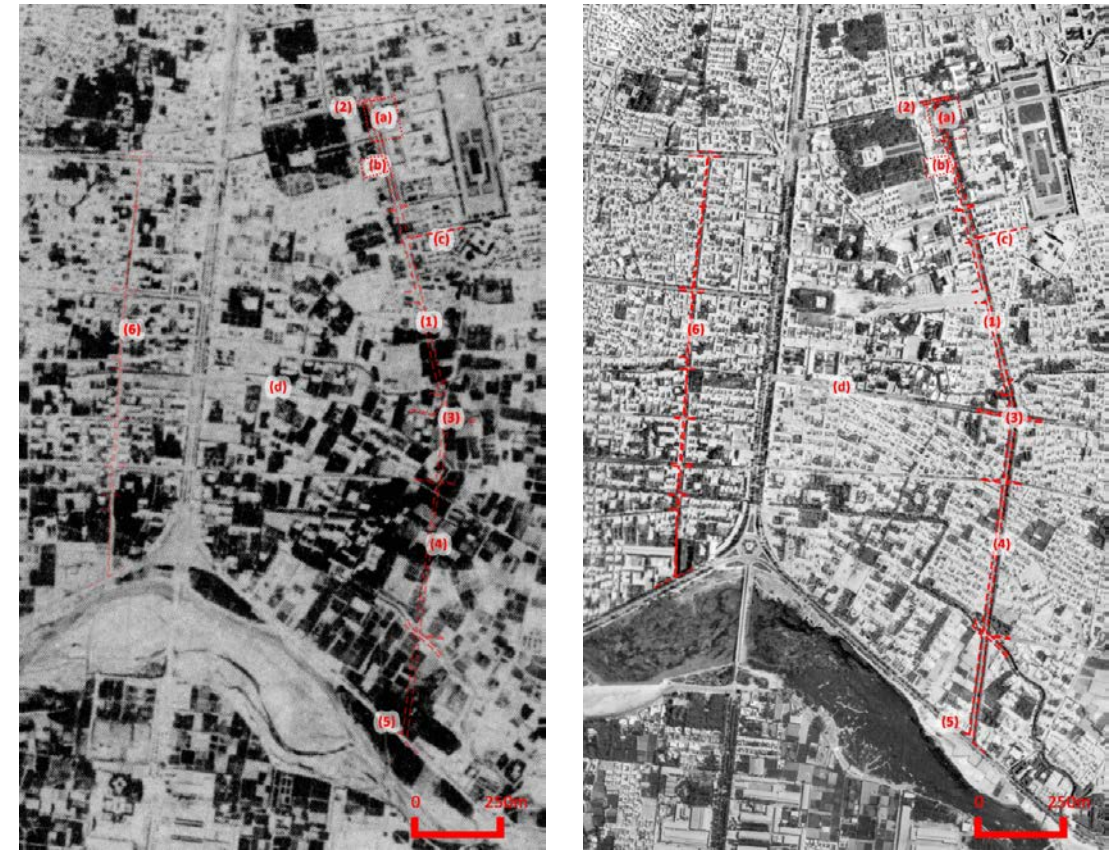
**Fig. 196.** Duplication of Khiaban-e-Chahar-Bagh. (1) Khiaban-e- Shams Abadi, (2) Khiaban-e-Ostandari, (3) Khiaban-e-Ferdowsi.

The rapid transformation of Chahar-Bagh Avenue from being a recreational and royal boulevard to becoming the central axis and principal shopping center of the city<sup>20</sup> raised the idea of duplicating this axis on its two sides. This proposal could improve the connection of the riverfront and the central horizontal axis of the city.

The concept came into practice by widening and modifying Khiaban-e-Shams Abadi in the late 1930s and the construction of Khiaban-e-Teymuri in the 1940s. The development of Khiaban-e-Shams Abadi through widening an existing passage belonging to the Safavid period, was mentioned in the previous section of historic structure adaptation to new vehicles (Fig. 196).

The construction of Khiaban-e-Teymuri was different in terms of the variety of land uses where the street was established. In the upper parts, the construction required demolishing some residential buildings, while in the southern

<sup>20</sup> congested with heavy traffic related to walking people, cyclists, horse-carts, donkeys, and motor vehicles



**Fig. 197.** Teymouri and Shams Abadi streets' location parallel to Chahar-Bagh avenue on aerial photographs related to 1944 and 1964. (1) Khiaban-e-Teymuri, (2) Khiaban-e-Sepah, (3) Ferdowsi intersection, (4) Khiaban-e-Ferdowsi (5) Khiaban-e-Kamal-Esmail (6) Khiaban-e-Shams Abadi (a) Maidan-e-Chahar-Hoz, (b) Edare-ye-Hokumati (c) Kuchih Poshte Matbakh (d) Khiaban-e-Fathieh.

parts, the street had to pass over gardens and agricultural lands until reaching the riverfront.

The building of this street began in 1941, but according to the Akhgar's reports, the idea of linking Khiaban-e-Sepah and Maidan-e-Chahar-Hoz (located on the western side of Shah Abbas Square) (a) to the front of Edare-ye-Hokumati<sup>21</sup> (b), and connecting to Kuchih Poshte Matbakh (c) and the extension of Khiaban-e-Fathieh (d) date back to the early 1930s.

<sup>21</sup> Edare-ye-Hokumati or Government office, later the building turned to the contemporary art museum.

The street has been called by different names such as Khiaban-e-Taymuri, Sour Esrafil, Farmandari, and Ostandari<sup>22</sup>. This extension has two main sections: Khiaban-e-Ostandari (1) that is from Khiaban-e-Sepah (2) to Ferdowsi intersection (3), and Khiaban-e-Ferdowsi (4) that is from the Ferdowsi intersection to the Khiaban-e-Kamal Esmail (5) in front of the river (Fig. 197).

<sup>22</sup> Provincial Government

### 4.1.3. The Construction of the Three Ring Roads

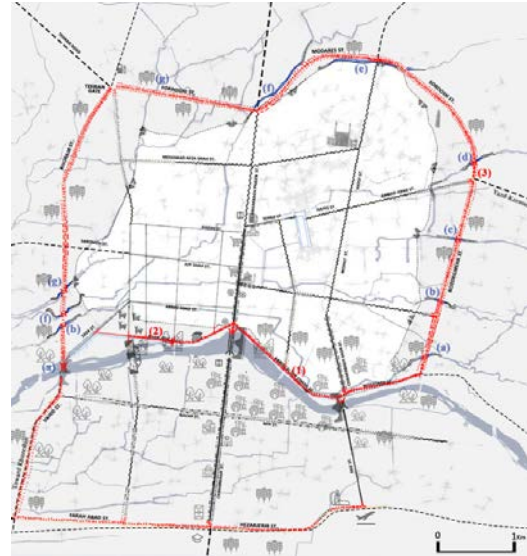
#### 4.1.3.1. The First Ring Road, The Historical City Edge

In the mid-1930s, a new strategy on mobility was set with the construction of the First Ring road that would link all radial and regional corridors among them, allowing vehicles to bypass the city central areas. Actually, the street along the northern front of the river can be considered the First Ring road's initial section. This street links various essential elements such as the three main (north-south) arterial streets, the strategic places of the former historic city gates, the monumental bridges at their crossing point with the river, and regional corridors.

In June 1929, considering the necessity to build a riverfront street, Akhgar newspaper referred to this area as the most dominant public promenade of the city, which could attract hundreds and thousands of people who would be interested in going to the riverfront to enjoy their time daily during afternoons. The report criticized the problematic condition of the surface's roughness and the narrow width of the passageway in many sections that were only three meters or even less wide.

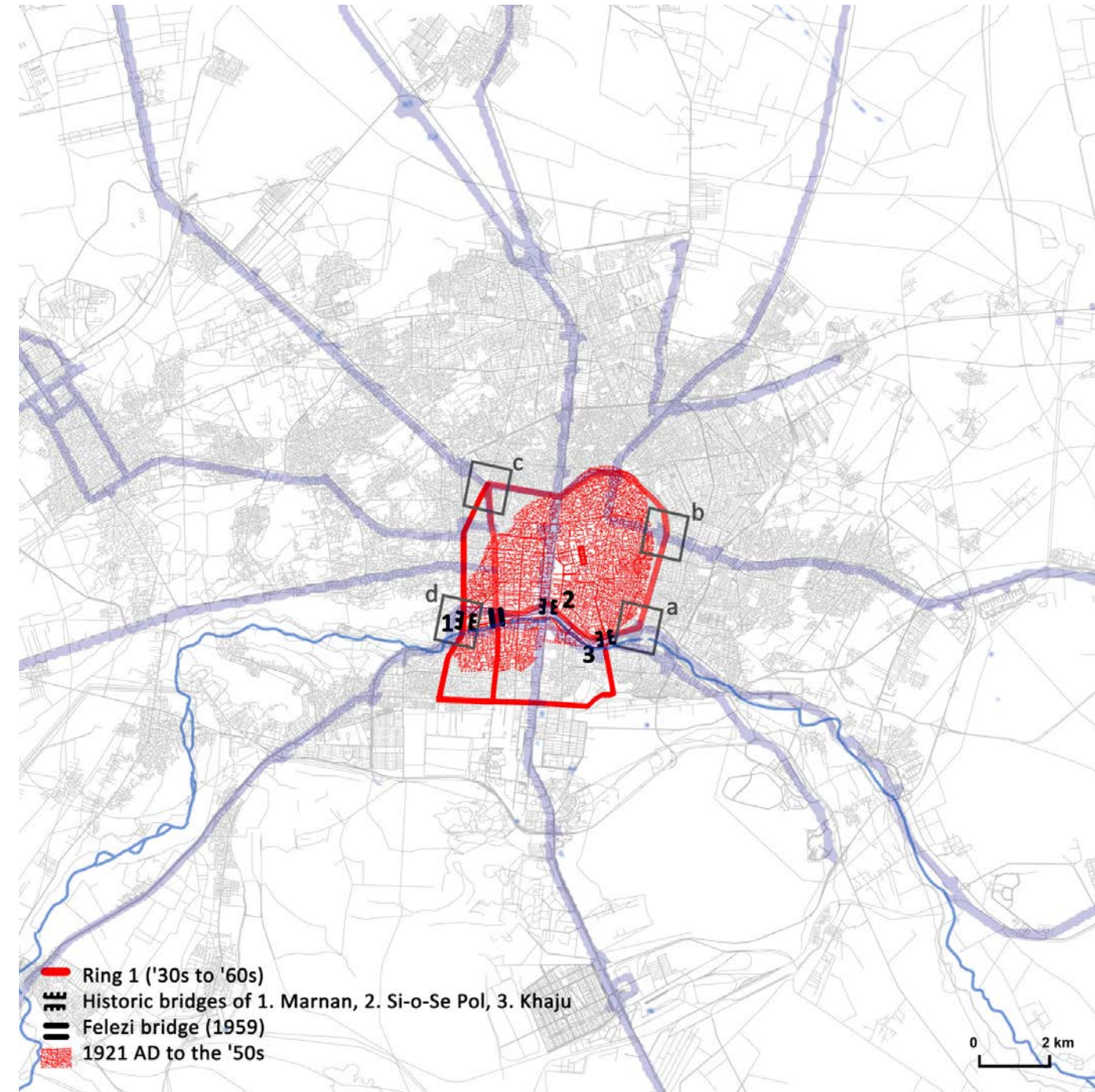
The construction of this street started in the same year between Si-o-Se Pol and Marnan Bridge, and with a 14-meter width that was generally believed to be insufficient and to dismiss the next ten years' needs. Eventually, in 1930, along with the preparation and approval of the first city street map by the Ministry of the Interior, it was proposed to build a forty-meter wide street parallel and along the river (at north side) between Marnan and Khaju Bridge.

The demolition and widening of this street began from its eastern part (Khiaban-e-Kamal Ismail) (1) between the Si-o-Se Pol and the Khaju bridge and was completed almost six months later, in December 1930. The western part (Khiaban-e-Pahlavi) (2) began two months later, between the Si-o-Se-Pol and the Marnan bridges, through the demolition of the portals and the adjacent walls of the gardens from the north of Si-o-Se Pol to the west (Fig. 198).

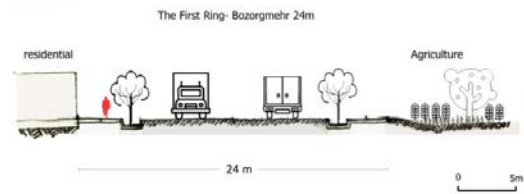


**Fig. 198.** Esfahan First Ring, 1930-1940. (1) Kamal Ismail Street, (2) Pahlavi Street, (3) Ahmad-Abad roundabout, (a) Madi-e-Niaserm, (b) Madi-e-Farshadi, (c) Cheshmeh Bagher Khan, (d) Cheshmeh Raran, (e) Cheshmeh Pol Anjiri, (f) Madi-e-Fadan, (g) Madi-e-Tiran-va-Ahangaran. Source: author

In April 1931, the completion of Khiaban-e-Pahlavi with a width of thirty-four meters terminated the whole section (from Marnan to Khaju bridge). As a result, the heavy trucks, which were traveling to and from the east (Yazd and Kerman), and to the south and southwest directions (Shiraz, Chaharmahal and Bakhtiari and Khuzestan) were able to pass through this street and the Marnan Bridge and avoided crossing over and damaging Khaju and Si-o-Se Pol bridges. To prevent the river water from entering the street during floods, it was decided to construct a dike along the river between Khaju and Marnan bridges as high as minimum eighty centimeters above the street level.



**Fig. 199.** Four new selective gates on the First Ring, linked with following zoom-in aerial photos. Source: author



**Fig. 200.** Transversal typical section of the First Ring (Bozorgmehr street) in the fifties. Source: author.

Apart from the riverfront street, which practically was acting as the initial part of the First Ring, the idea of building a new street around the city was discussed in March 1934. The construction of the First Ring had different reasons like defining a new edge for the city and making a distance between the city and the surrounding villages; to determine the extent of the engagement of the municipality for cleanliness and lighting, and also it could help the Malieh<sup>23</sup> and Baladieh Offices to control and collect city taxes and prevent smuggling more efficiently.

Despite the construction of new streets within the historic city, which required the removal of the historical fabric, building the First Ring was much easier, it crossed over undeveloped areas or agricultural lands parallel with the last place of the city walls. Being decided its construction in March of 1934, the works started in October of the same year, from the head of the central-eastern regional corridor, at Ahmad-Abad roundabout (frame b).

The ring is almost twenty kilometers long, and it was twenty-four meters wide: fourteen meters for the passing vehicles, two meters for sided planters, and eight meters devoted to the two-sided pedestrian lanes (Figs. 199 & 200). Nowadays it includes some principal streets of Saadat-Abad, Sajad, Bozorgmehr, Soroush, Modares, Foroughi, and Khoram, all of which are surrounded by new residential fabrics.

The construction of the First Ring road outside the residential limit provided public access to

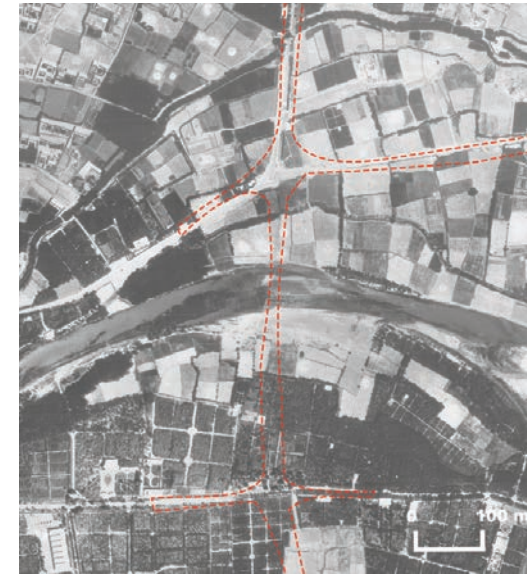
<sup>23</sup> Malieh: Tax office

the city's outskirts' lush greenery, covered with fields, gardens, and plenty of water. The scenes' beauty and the air's freshness turned this street into a city dwellers' promenade up until the 1960s when the new urban development and new residential fabrics reached and were built on the former agricultural lands and gardens. Its eastern part (Khiaban-e-Bozorgmehr) crossed at a certain distance with the previous place of eastern city walls. It required constructing some bridges at the intersection points of this street with Niaserm (a), and Farshadi (b) Madies, and Bagher Khan (c), and Raran Springs (d). The northern part of the First Ring adapts to the streams of Cheshmeh Pol Anjiri (spring) (e) and the main branch of Madi-e-Fadan (f), conforming to the earlier city wall.

Similar to the eastern part, other sections of the First Ring, such as Foroughi and Khorram streets, also required the construction of various bridges at the intersection points with Madi canals. Completing the western part of the street between the Tehran road to the Marnan Bridge led to the light and heavy vehicles passing along this axis and crossing over the Marnan Bridge, moving towards the southwest and southern provinces. The movement of cars and trucks over the historic bridge of Marnan was causing a great deal of damage to this bridge and overtime has required numerous reinforcement and repair projects for the bridge.

Fig. 199 presents the First Ring in relevance to the city borders. The First Ring's intersection points with the different radial regional corridors defined the new form of city gates for the "Asphalt" city, there are four selective frames shown in figures 201 to 204, which present the position of these representative critical points on the 1956 and 1964 aerial photos.

The aerial photos of 1956 show that the city did not extend over the First Ring yet (Fig. 201). The major physical interventions seen in this period were the division of gardens and farmlands to expand the surrounding urban fabric and develop new streets and the regular grid of asphalt roads.



**Fig. 201.** Frame a, the eastern part of the First Ring in 1956, the First Ring was adjusted through the Bozorgmehr Bridge's construction in the 1970s.



**Fig. 202.** Frame b, the image shows the north-eastern part of the First Ring, Falake-ye-Ahmadabad (roundabout). The construction of Khiaban-e-Valiasr with a length of 1490 meters and the division of gardens and farmlands to expand the surrounding urban fabric were the major physical interventions in this period. The aerial photo belongs to the year 1964



**Fig. 203.** Frame c, Tehran gate in 1964. The expansion of new urban fabric at the place of agricultural lands and gardens.



**Fig. 204.** Frame d, the western part of the First Ring in 1964, cars and trucks were crossing the river using the historic bridge of Marnan.

### 4.1.3.2. The Second Ring Road, The Primary Highways Composition

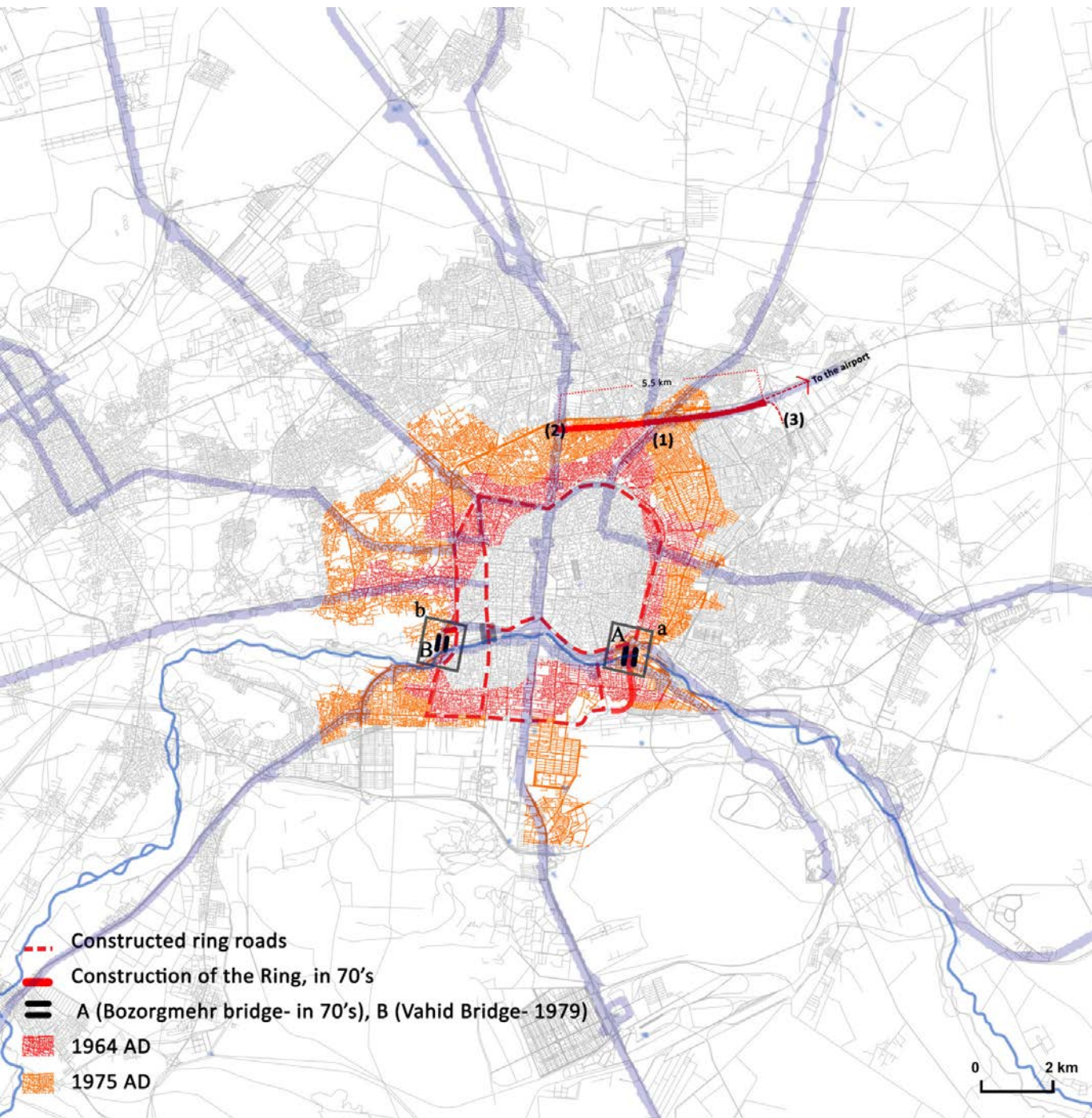


Fig. 205. The city growth and partial projects concerning the "Asphalt" rings, from the '60s to '70s.

The Second Ring construction with a length of less than 40 kilometers lasted almost four decades to complete its various highways sections.

The initial section of the Second Ring (1) was constructed in the 1970s with a length of more than 5.5 kilometers from the intersection of Chamran boulevard (Kaveh boulevard) (2), to Aghababaiee highway (3) towards the east and in the direction of the new airport<sup>24</sup> (Fig. 205).

The two frames in Fig. 205 show the Bozorgmehr and Vahid bridges, constructed at this time to justify the First Ring and free the old bridges from passing automobiles and heavy trucks. Although in the following years (early 21st century), and due to the increasingly growing population of the city and the urban expansion, these bridges were widened to raise their capacity for passing traffic (Figs. 207 & 208).

Fig. 207 shows the eastern part of the First Ring, Khiaban-e-Bozorgmehr and Bozorgmehr bridge in 1986. The comparison of this frame with figure 201 (1956) demonstrates how the new urban fabrics were replaced with the primary agricultural lands except for the two strips in the river's two fronts, which fortunately decided to keep free of new constructions to turn into a long public river park.

<sup>24</sup> The Organic master plan (the second city master plan) determined the airport location by E. E. Beaudouin & Organic, 1969-1971 (Tarh-e-Jame Aval). In the next part of the present chapter, the comprehensive urban plans between the 1960s and 2000s will be mentioned, and the first prepared master plan for Esfahan will be examined.



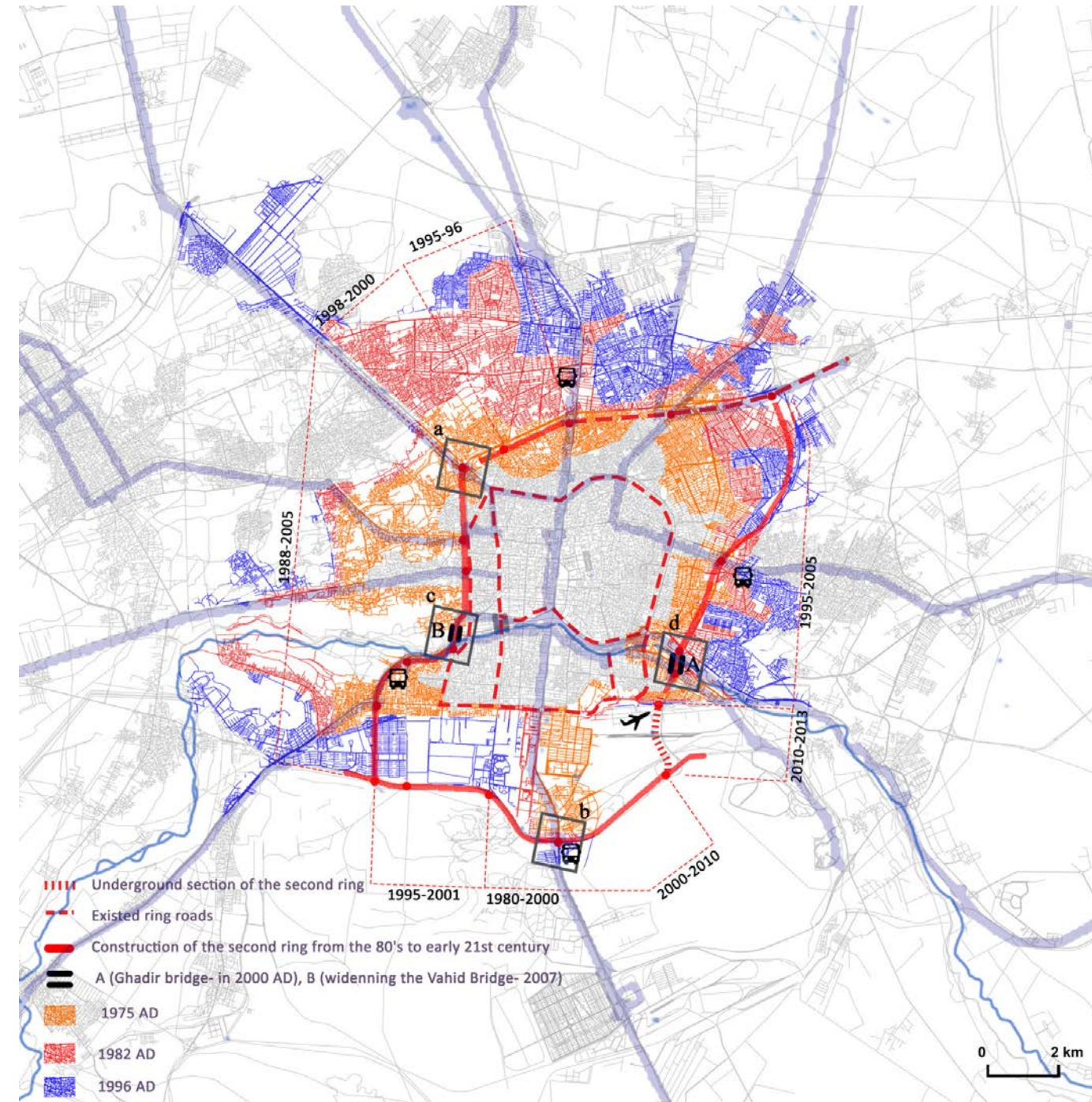
**Fig. 206.** Around eighteen kilometer-long airport expressway built in the seventies to Connect the new airport to the city through the the connection of the initial section of the Second Ring with the northern extension of the central axis of Chahar-Bagh.



**Fig. 207.** Frame a, the Justification of the First Ring was placed through the construction of Bozorgmehr bridge and Sajad boulevard in the 1970s



**Fig. 208.** Frame b, in 1979, the Vahid bridge was constructed in less than three hundred meters from the western edge of the Marnan bridge.



**Fig. 209.** The city growth during the '80s to '90s. Four different corners on the Second Ring of the Esfahan.



**Fig. 210.** Frame a, the Second Ring, multi-level intersection of Shahid-Kharazi, 2015. Source: Atlas of Esfahan metropolis, by Esfahan municipality (Tehran way).



**Fig. 211.** Frame b, Sofeh mountain, Maidan-e-Defa-e-Moghadas, the intersection of the Second Ring with Hezar-Jirib avenue and Dastjerdi expressway (Shiraz way).

The intersection of the Second Ring (Shahid Kharazi highway) with the Tehran road (Emam Khomeini-Boulevard) construction was initiated in the late 1980s, simultaneously with the western side of the Second Ring, which nowadays consists of the Radanipour, Kharazi, and Khayam highways (Fig. 210).

The first Esfahan airport (built in the '30s), encountering the south-east section of the Second Ring, led to this stretch to become underground, which caused this section to be the last part of the Second Ring road to be completed.

Rapid urban development based on providing financial resources and utilizing advanced technology in construction, has led to longer distances and therefore, higher speed limits, which has been made possible through widening streets and constructing highways on different levels from the ground.

The exemplary four frames are presented in Fig. 209 concern some multi-level intersections of the city's Second Ring and reveal that these intersections have been generally converted to solely mechanical and traffic nodes for vehicles connection to different directions, which lack the ability to create an appropriate place for activities of the surrounding area's residents and pedestrians.



**Fig. 212.** Frame c, Vahid bridge, the intersection of the Second ring (Khayam expressway) with the river and riverside parks. Source: Atlas of Esfahan metropolis, by Esfahan municipality.



**Fig. 213.** Frame d, the eastern part of the Second Ring, Sayyad Shirazi expressway, 2015. Source: Atlas of Esfahan metropolis, by Esfahan municipality.

## 4.1.3.3. The Third Ring Road of the Metropolis

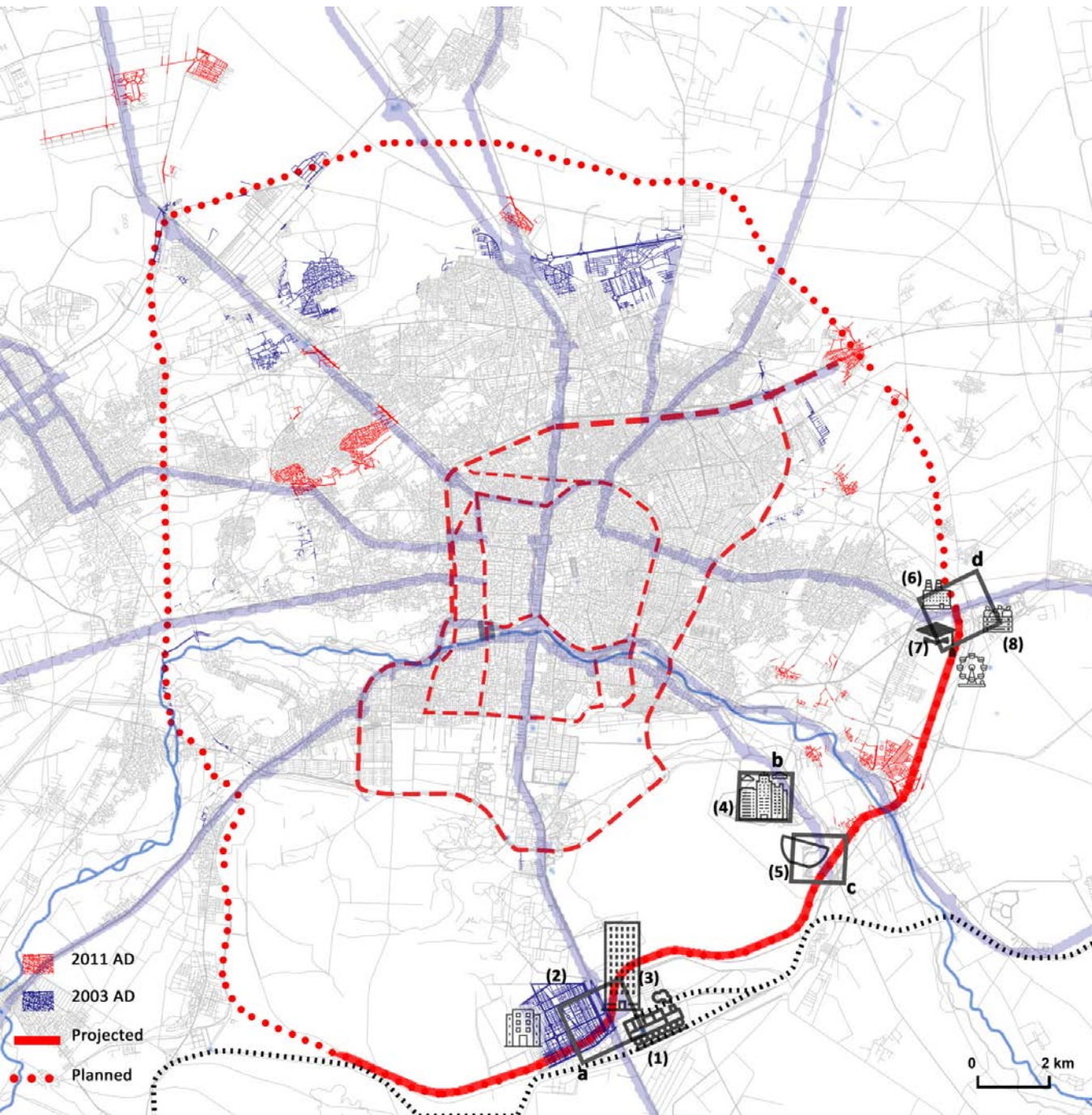


Fig. 214. "The protective ring", Halghe-ye-Hefazati, the Third Ring of Esfahan, and its adjoining urban elements.

Recently, the highway project of the Third Ring of Esfahan metropolis, so-called "Halghe-ye-Hefazati," (the protective ring), has a length of 78 kilometers and a width of 76 meters while passing through six cities of Esfahan, including Dolatabad, Khorzouq, Khomeini Shahr, Dorcheh, and Abrisham city, it also has 40 multi-level intersections and it crosses the Zayandeh River in four sections. The construction of the third traffic ring and conducting other simultaneous projects such as constructing the second metro line including its stations (which will be discussed in the next chapter) are the most prioritized Esfahan city management projects at the present moment (Fig. 214).

Fig. 214 shows the most critical urban and global elements adjacent to the first constructed phase of the Third Ring, with a length of more than 15 kilometers from the south to the east corridors, located mostly at the corners of new highway intersections forming the Third Ring with the regional corridors, including:

In the southern part, different corners of the north-south national highway's intersection with the Third Ring have been coincided by the location of important sites and elements such as the Esfahan railway station (1), the new city of Sepahan-Shahr (2), and the massive complex of the "city center" (3).

At the southeast corner, the Esfahan railway station, one of the oldest railway stations in the country, was inaugurated in 1968 and is located more than 20 kilometers from the historic city center. The station nowadays serves over 1,000 passengers per day on average, and this number is growing every year as more lines and travel destinations are added (Fig. 215).

Sepahan-Shahr is developed in Esfahan's southwest in 1992, designed by Naghsh-e-Jahan Pars Consulting Engineers, and its executive operation began in 1996. Sepahan-Shahr neighborhood is limited to military lands in three directions: north, west, and south. It is adjacent to the railway and the Vahid Dastjerdi highway, respectfully from the south and east. This area has housed forty-five thousand people in about 400 hectares and recently it is considered as the fifth district among Esfahan Metropolis's fifteen districts (Fig. 216).



Fig. 215. Frame a, The Esfahan railway station hall, built in the 1960s. Source: <https://www.samtik.com/mag/wp-content/uploads/2019/04/image-6-min-7.jpg>



Fig. 216. Frame a, aerial photo of Sepahan-Shahr new town began to be built in 1996. Source: Esfahan municipality



Fig. 217. Frame a, the City Center complex, located in an area of 65 hectares, opened in 2012. Source: Esfahan municipality.





**Fig. 218.** Frame b, Shahrak-e-Shahid Keshvari, located along the south-eastern corridor. Photo by Mohammad Moshtaghian



**Fig. 219.** Frame b, Boostan avenue, Shahid Keshvari new town, in 2018. Source: author



**Fig. 220.** Frame c, the International Conference Center of Esfahan. Source: Mohammad Reza Sharif.

On the opposite front of Vahid Dastjerdi Highway (eastern front), the City Center complex, one of the most extensive commercial, cultural, recreational, and tourism centers in the country, is located in an area of 65 hectares. Its shopping center was opened in 2012, and now the final phases that include its hotel, office, and residential towers are in progress. The maximum height of this complex is related to the hotel building with twenty-nine stories. The commercial, cultural, recreational, and tourism section of this complex is designed and built as 7 floors. Its two underground parking garages have a capacity of 5,500 cars. The first three floors include a hypermarket, shops, restaurants, and coffee shops. The third and fourth floors also include a cinema complex, an international conference center, restaurants, a museum, an amusement park, a university complex, and service centers (Fig. 217).

The Shahid Keshvari new town (4) and the international conference hall of Esfahan (5) have been founded around the middle part of the constructed section of the Third Ring relating to the south-eastern regional corridor of Shahid Keshvari Highway.

The new town of Shahid Keshvari, located on the southern side of the Shahid Keshvari highway has been under construction between the second and Third Rings since the beginning of the 21st century. The project aimed to prepare more than 11,000 residential units in seven executive phases, and covered nearly 130 hectares of the lands belonging to the region 6 of the city. The lack of services and poverty of access and communication with other parts of the city are the most critical demands of this area's residents (Figs. 218 & 219).

Esfahan International Conference Center's construction began in 2010 in an area of 30 hectares, next to the Keshvari new town, and in the western corner of the intersection of the Third Ring with the south-eastern regional corridor (Fig. 220).



**Fig. 221.** Frame d, multilevel intersection of the third Ring Road with the eastern regional corridor, June 2021. Source: Esfahan Municipality



**Fig. 222.** Frame d, the vegetable and fruit market (opened in 1994) in an area of 198 hectare. Source: IRIB News Agency

In the eastern part of the ring, a four-level intersection of the new east entrance of Esfahan metropolis is currently under construction, which has such essential buildings of the sugar factory (built-in 1960) (6), the Islamic Azad University of Khorasgan (opened in 1987) (7), and the vegetable and fruit market (opened in 1994) (8) around at its different corners (Figs. 214 & 221 & 222).

According to Esfahan's urban and civil development news, more than 40% of the Third Ring has been completed, and the process of freeing up the required land and the construction of other parts is being processed.

## 4.2. THE ECHOS OF THE "ASPHALT" CITY APPROACHES ON THE FIRST MASTER PLAN OF KOCKS, 1958-1961

### 4.2.0. Introduction

Esfahan has had several comprehensive plans in different decades, responding to changing paradigms and influencing the physical structure of the city. Constant changes have moved to continuous revisions by the City's Government and its planning commission reflecting changes in its character. The list of the main plans is:

1. The Kocks's master plan, 1959-1961.
2. The Organic master plan, 1969 - 1971 (Tarh-e-Jame Aval)
3. The Organic detailed plan, 1975-78 (Tarhe-Tafzilie-Tarhe Jame Aval )
4. Organic master plan revision, 1988 (Tarh-e-Jame Dovom), prepared by the General Department of Housing and Urban Development of Esfahan Province (Edare-ye-Kol-e-Maskan va Shahr-sazi).
5. The detail plan of Organic master plan revision, 1992-1996 (Tarhe-Tafzilie-Tarhe-Jame Dovom), was proposed by Naqsh-e-Jahan Pars Consulting Engineers.
6. The revision plan of the second detailed plan, 2002-2006 (Tarhe-Baznegarie-Tarhe-Jame Dovom), arranged by Esfahan municipality, deputy of architecture and urban planning, and still is on the agenda (Shafaghi, 2002, p. 359). This project was prepared with the cooperation of consulting engineers of "Naghsh-e-Jahan Pars," as the consulting engineer coordinating the project with other consulting engineers.

### 4.2.1. Regional Infrastructures and Large Facilities

The main aim of this section is to approach the first Esfahan master plan of Kocks as it was the real turning point in the way of looking at the city by considering three inter-related scales: the region, the city, and the neighborhood. Paradoxically, the valuable maps and reports of the plan have not been analyzed properly, so the aim of this section is to figure out the relation between the construction of the "Asphalt" city and the decisions made in Kocks's first master plan to organize new constructions and the extension of the city concerning the three interrelating scales.

The Ministry of the Interior and the Iranian Municipal Association practiced a Pilot City Project in Esfahan in early 1958 with the United States Operations Mission's assistance, as an essential part of a comprehensive program to improve the municipal government in Iran. The project's objective was to develop realistic management and organizational strategies to strengthen the government in cities across Iran and establish a training center for municipal workers.

The program had a triple objective:

- Creation of a Master Plan for Esfahan, which could also be used as a reference plan for other cities and a teaching plan for urban planning;
- Training urban planners on practical planning aspects;
- Establish a municipal planning department to implement the Esfahan Master Plan and serve as an example to other municipalities.

In this regard, the City of Esfahan and the Plan Organization signed a contract with F. H. Kocks, K.G., Consulting Engineers in April 1958 for preparing a Master Plan for the city's development for its next twenty-five years and to train a staff of Iranian planners. The Kocks Company appointed two skilled planners for the project<sup>25</sup>.

At the same time, the United States Operations Mission assigned a city planner to Esfahan to advise the City Council, the Mayor, and the Planning Commission on planning policies and develop the appropriate legislation to enact the program. The completed Master Plan was submitted to the Esfahan City Council on June 3 of 1959, which consisted of approximately forty plans and maps (Kocks, Pefil, & Von Bohr, 1961, p. 2).

Less than a decade after the Master Plan was presented, the second Organic Master Plan was presented and the former plan lost its legal validity without having enough time to be applied. However, the Plan has left its definite effects on the city's physical order, directly and indirectly, and respectfully through implementing particular proposals and influencing its following ideas and plans for succeeding projects. Nowadays, beyond 60 years of the Plan's presentation to the city council, it is still seen that some of the plan proposals, particularly in the field of construction of new streets or modification of the existing streets, are followed within the framework of its subsequent plans.

This plan's general aspects have been considered in the following parts concerning three different scales and previously discussed approaches in constructing the "Asphalt" city.

<sup>25</sup> Kocks Engineers founded in 1946 in Germany and provides engineering services in all public and private infrastructure fields. They specialize in the environment, civil engineering, and transport and have had many projects worldwide, in four continents of Asia, Europe, Africa, and South America.

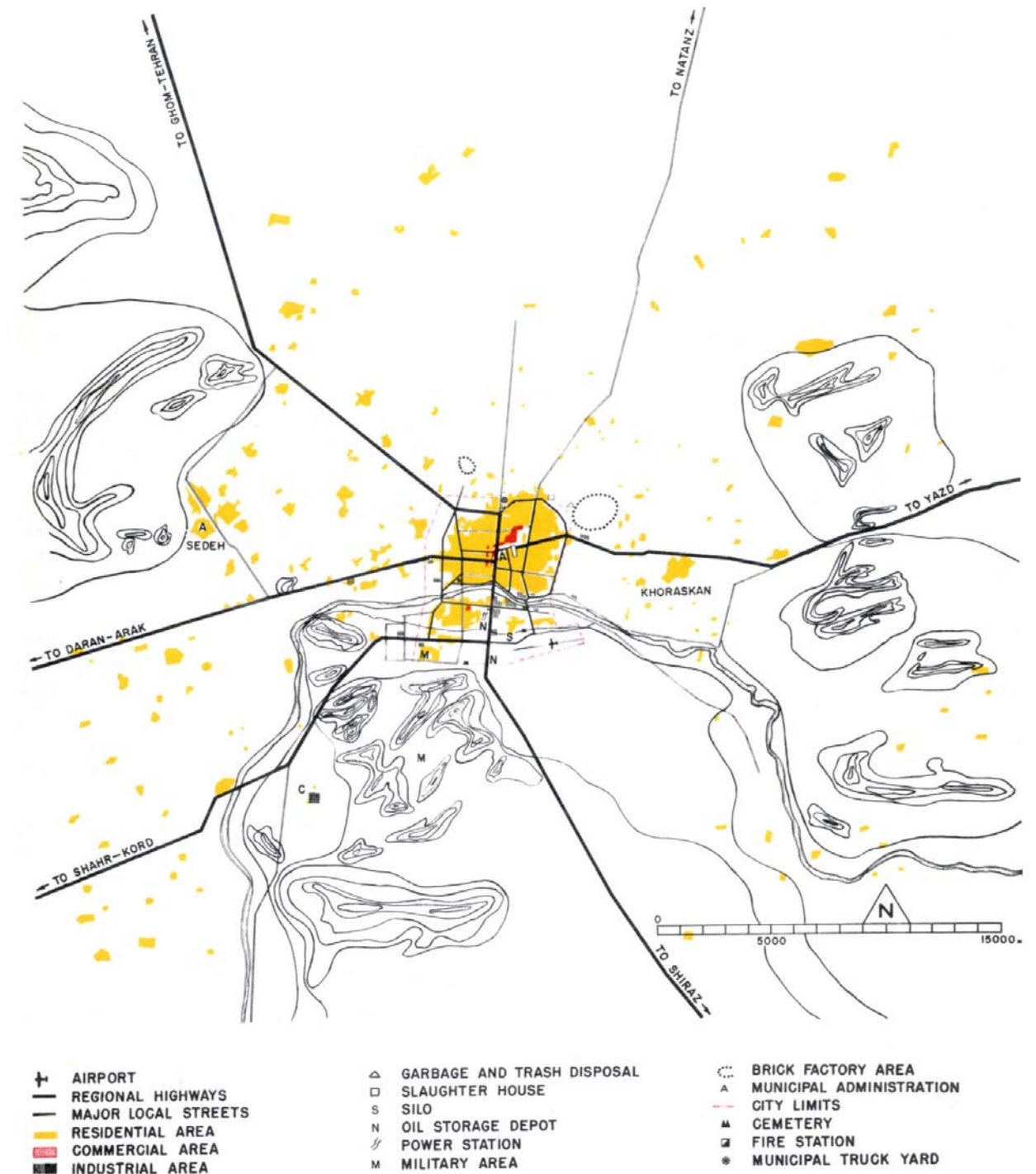


Fig. 223. Actual territorial organization of the major facilities, 1961. source: the report of Esfahan Kocks master plan.

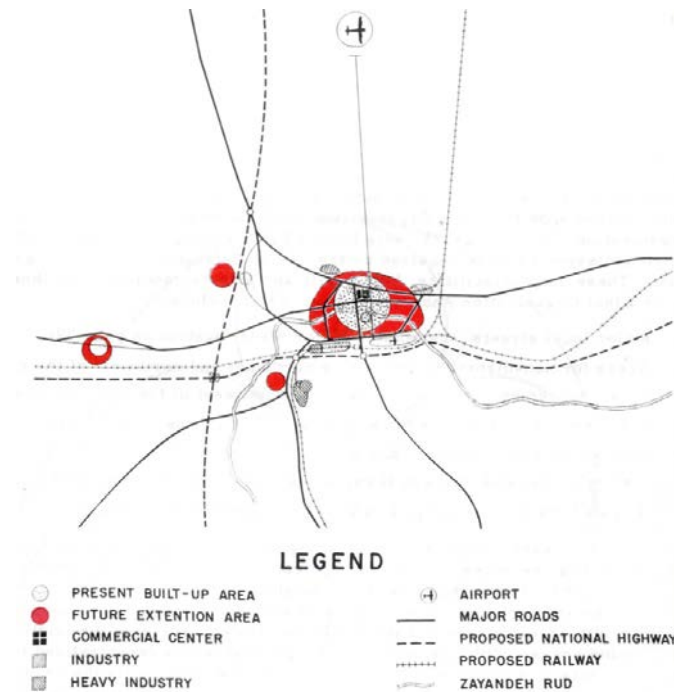


Fig. 224. Final Proposal of the general organization plan. source: the report of Esfahan Kocks master plan.

One of the remarkable features of the Kocks master plan was that for the first time it considered the current organization of the region's significant equipment buildings, and it offered new recommendations regarding the appropriate location for other major facilities in the Esfahan territory.

According to Figure 223, at the beginning of the 1960s, the present organization of the region's significant facilities showed:

1. The real growth of the city was uncontrolled in all directions.
2. Industrial areas were built on the southern edge of the river and mixed with residential areas.
3. The airport was located on the southern edge of the city, on the southeast corner of the First Ring road, and too close to the mountains.
4. Highways and railway stations did not exist.

Four alternative plans were prepared and analyzed to determine the most desirable location of the various significant infrastructure and facilities, such as highways, railroads, industrial and

commercial areas that would best serve the entire community's interests. In the final scheme (Fig. 224), the principal features and locations were listed:

1. Railway lines would only reach the city on the southwest corner of the First Ring in the area where it was recommended for the heavy industry to be located. The railway station was recommended to be located in the south and conveniently close to the city center.
2. The railway and highway lines' location would leave free areas west and east along the river into which the city can expand.
3. The heavy industry area would be located in the southern section, where water, electricity, and sanitation facilities could be economically built so that the prevailing east-west winds could carry displeasing dirt, smoke, and smells away from the city. Moreover, government land in this area could control speculation and attract industry by providing building sites at reasonable costs.

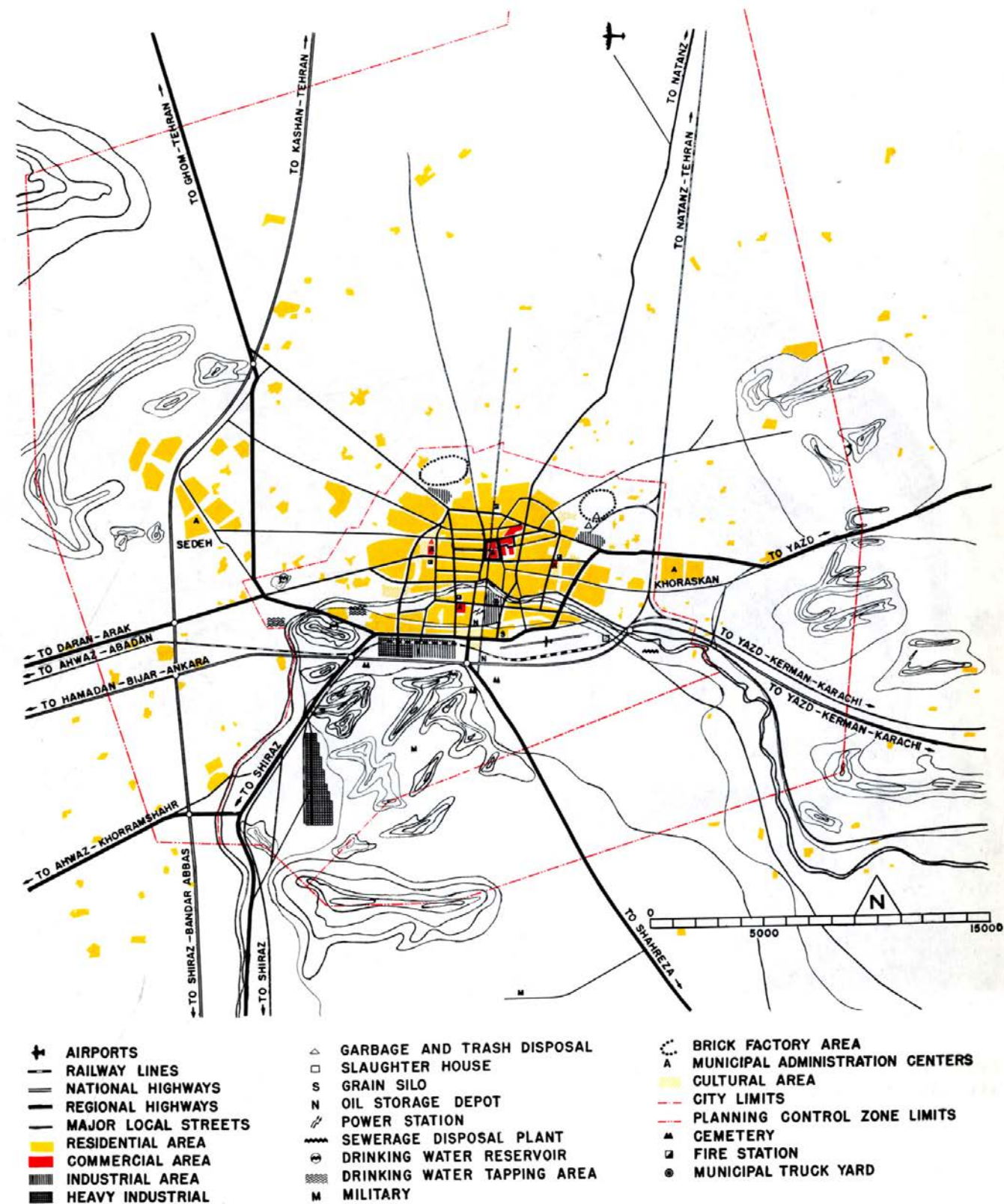


Fig. 225. Proposal master general organization plan, territorial scale. source: the report of Esfahan Kocks master plan.

4. Regional highways would bypass the central business and residential districts with interchange connections to the national highway ring in the peripheral areas.

5. The international airport would be 20 kilometers towards the north with a direct access road to the city (Kocks et al., 1961, pp. 85, 89).

Based on the final proposal alternative (Fig. 224), the regional Master Plan (Fig. 225), offered the necessary arrangements of all essential facilities to be required by the city of Esfahan over the next 25 years.

Actually, important facilities and infrastructure were conveniently located following the Kocks' regional master plan, including:

1) Water source and reservoir sites were placed southwest of the city, near the patrimonial site of Ateshgah.

2) Sewage treatment plant was located at the southeast corner of the city, near the river.

3) Electrical power station in the south-central area, on the western front of Khiaban-e-Chahar-Bagh-e-Bala.

4) A slaughterhouse in the southeast, south of the river, along the Shahrestan Bridge.

5) Municipal vehicle compound situated in the south bank of the river and west of the Zayandeh-Rud textile Factory.

6) Cemeteries at the south of the railroad on either side of the Shiraz route.

7) The Brick factory in the north.

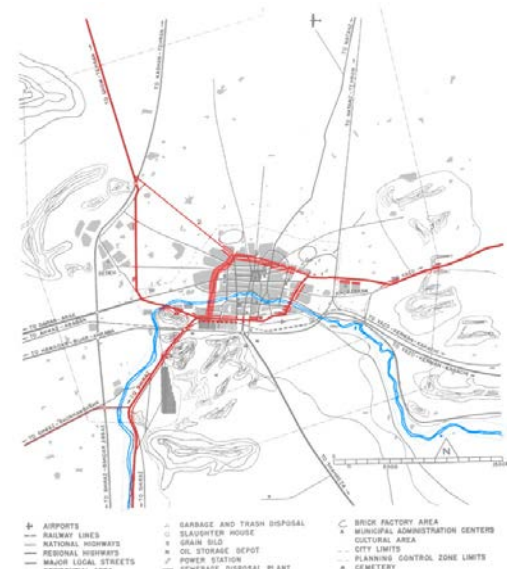
8) Grain silos and oil storage facilities in the south-central area, which had access to the First Ring.

9) The military cantonment area was relocated 12 kilometers towards the south (artillery range to remain at its present location).

10) Defining new Municipal District Administration Centers (Kocks et al., 1961, p. 90).



**Fig. 226.** National ring proposal connection with the national corridors, source: adapted from Kocks proposal Master Plan, 1958-1961.



**Fig. 227.** Second city ring proposal in connection to national corridors, source: adapted from Kocks proposal Master Plan, 1958-1961.

The previously mentioned discussion on the Ring road construction methods also was adopted as a key proposal of the Kocks master plan for building the future planned city. New proposal rings could extend and define a new city limit, prevent vehicles from bypassing within the city, and connect vital industrial areas, various national and regional corridors, and other critical features.

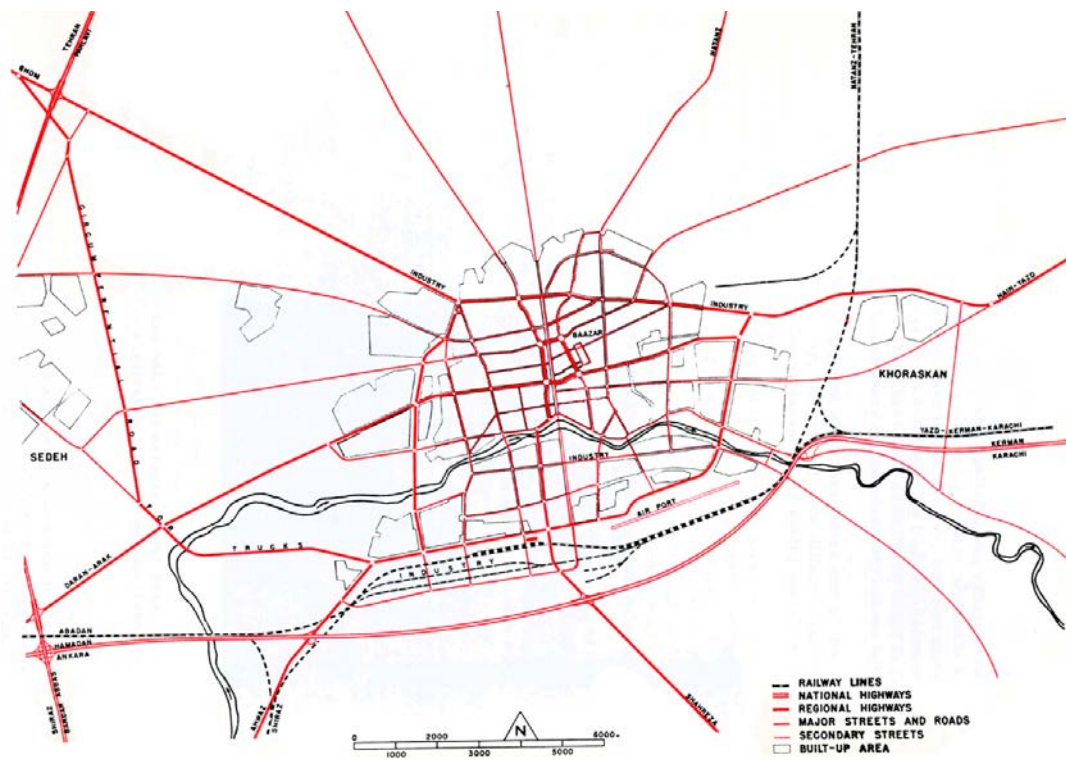
Two national ring roads were considered as a north-south and east-west highway shown with a blue color in figure 226. The north-south highway was supposed to pass through the west of Sedeh town (a) going north towards Kashan and Tehran, and the south through the Zayandeh-Rud Valley towards Shiraz. Furthermore, an east-west ring highway was proposed to pass through the south of the suggested railway lines and the heavy industrial area, the actual city's airport, and would continue east toward Nain – Yazd. In the opposite west direction, this highway would extend toward the cities of Hamedan, Bojnurd, and western parts of the country.

The second proposal for the ring highway, has different sections. As observed in figures 227 & 229, from the northwest corner, this ring connects to the Tehran Road, and it turns to the east direction through crossing by the eastern edge of Sede Town in the north-south direction merging with the southern part of the existing First Ring, and continues to the city's eastern edge finally leading to Yazd road (1).

Another never-built highway (2) proposed as the second western ring would have linked the light industry's suggested site in Darvaze-Tehran Square's corner to the heavy industrial district's planned site in the southwest city corner<sup>26</sup> (Shafaghi, 2002, p. 89) (Fig. 229).

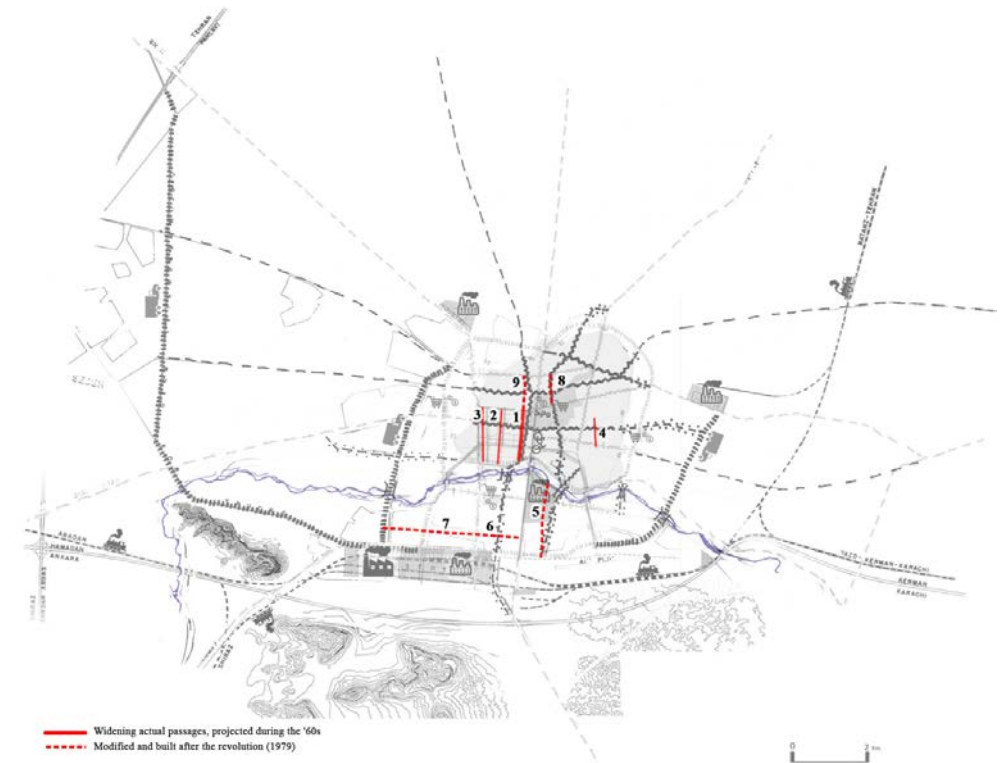
Separating the regional and the city scale may not be easy. Many regional elements such as highways and new streets cross through the historic city domain and traditional neighborhoods where sidewalks and their porous fronts integrate them with smaller scales.

<sup>26</sup> The light industry has four separate areas of construction. Major roads connected four areas, and two of them also served by rail, two in the north and two in the south of the river. The heavy industry planned to be located between the suggested railway line and the National Highway. The extra heavy industry purposed to be located behind the south's mountains, which would also receive services by rail.



**Fig. 228.** The actual and proposed streets and roads network according to the Kocks master plan. Source: Source: the report of Esfahan Kocks master plan

### 4.2.2. Historical City Domain and City Center



**Fig. 230.** The widening projected and modified passages '60s to '80s on the base of the Kocks master plan. (1) Shamsabadi, (2) Azar, (3) Ordibehesht, (4) Malek, (5) Sheikh Sadoogh, (6) Shariati, (7) Daghighi, (8) Hakim, (9) Tayeb, Source: the report of Esfahan Kocks master plan reproduced by the author

Only four streets were constructed by widening the previous and existing passages during only one decade; meanwhile, the plan was valid. (Fig. 230). Three of them belonged to Abbas-Abad and Shams-Abad neighborhoods, mentioned in (4.1.1.): Khiaban-e-Shahnaz (Shamsabadi) (1), Khiaban-e-Azar (2), Khiaban-e-Ordibehesht (3), in parallel with Chahar-Bagh Avenue.

Khiaban-e-Malek-al-Tojar (4) was another vertical and historical passage that had been widened during the same time is located between the castle's pre-existing site (Qale Tabarak) and Khiaban-e-Neshat. The new street stretched for less than eight hundred meters from Kuy-e-Pa Qale in the north to Malek's three-way intersection on Khiaban-e-Shah Abbas (Sharif Vaghefi) in the south.

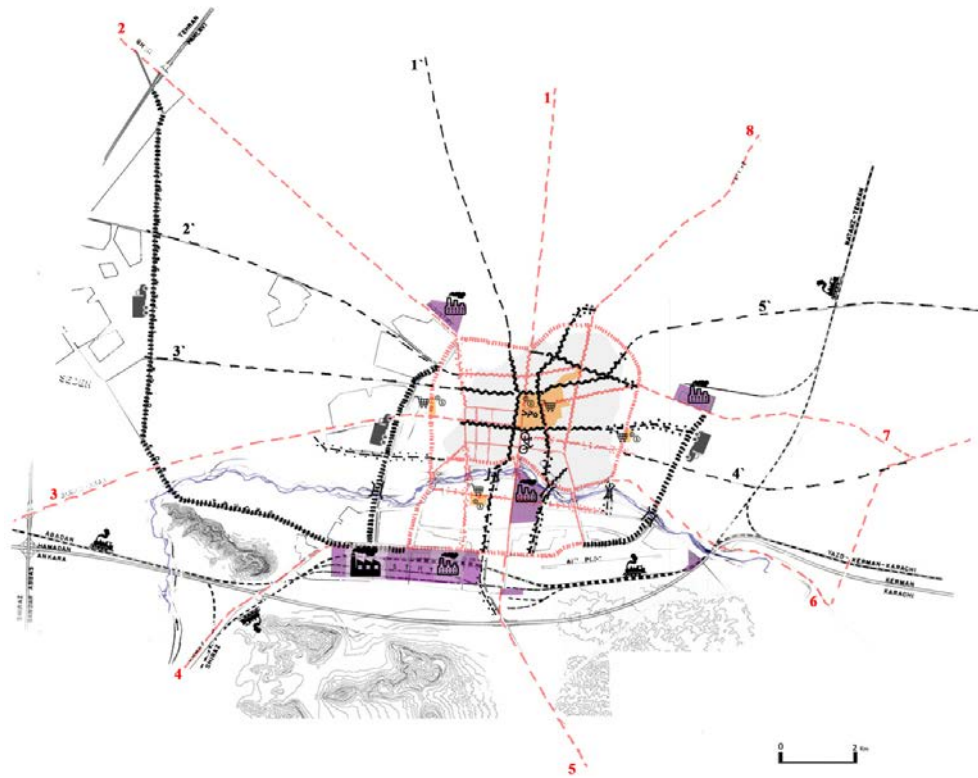
Khiaban-e-Sheikh Sadough (5), Khiaban-e-Shariati (6), Khiaban-e-Daqiqi (7), the northern extensions

of Khiaban-e-Ostandari (Hakim) (8), and Khiaban-e-Shamsabadi (Tayeb) (9) were built, not in an exact way but on the base of the Kocks master plan, during the years after the Islamic revolution (1979) (Samimi, 1998b, p. 62) (Fig. 230).

A substantial extension of the city and territorial facilities such as the refinery, sewage, slaughterhouse, brick factories, oil reserves, and military areas were constructed based on the Kocks Master Plan recommendations. On the contrary, many of the land-use proposals in the Plan were not executed, such as the proposed site for heavy and super-heavy industries, the railway station, and the suggested east-west direction for urban development. None of the Plan's goals were achieved regarding the central administrative district and the proposed community unit (Samimi, 1998b, pp. 62, 63).



**Fig. 229.** Differentiating the actual and proposed rings on the Kocks master plan. Source: author



**Fig. 231.** Interpretation of different proposed approaches in developing the Kocks Master Plan. source: the report of Esfahan Kocks master plan reproduced by the author.

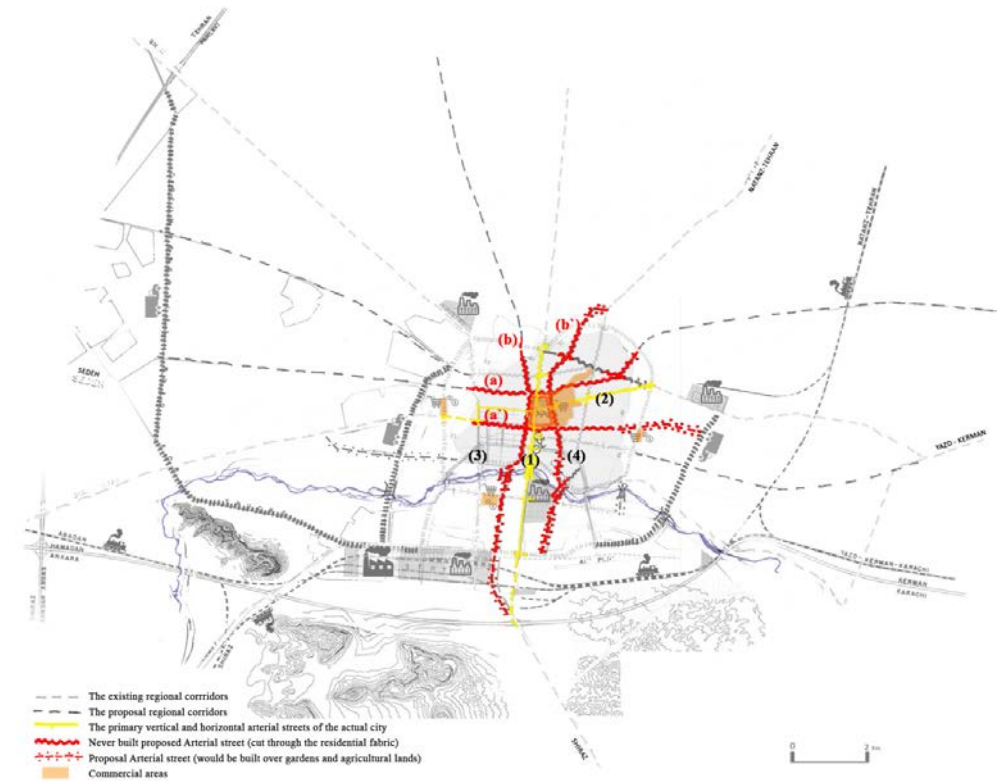
The Primary Street Network Master Plan was a proposed model for orientating the addition of new arterial and transversal streets, bridges, national and regional corridors, rings, and highways. At the same time, it would be accompanied by some recommended improvements and modifications to the existing facilities and road network (Samimi, 1998b, p. 60).

Fig. 231 shows the existing and the Kocks proposal of Major Streets and highways network, including proposed central and industrial sites and activities. The actual and proposed streets and highways are shown in different colors for better interpretation and differentiation. The Pink color shows the network of existing asphalt streets previously examined about their connectivity with the eight regional corridors, which were

constructed through different approaches between the 1920s and the 1960s.

On the other hand, the proposed street and highway projects have been shown in black color in different types of lines. It is considered that the Kocks Master Plan continued to use the previous approaches in proposing new interventions regarding the construction of the forthcoming planned city, which is summarized in the two following items:

- Approving the city's street network by widening the existing historical passages and building new arterial streets and highways to raise the car's penetration into the old fabrics and connectivity of the central areas to the regional corridors, which clearly could cause great damage to the historic fabric and cut through many primary historical passages and local access roads.



**Fig. 232.** The proposal of doubling the most central north-south and east-west streets by Kocks master plan. Source: author

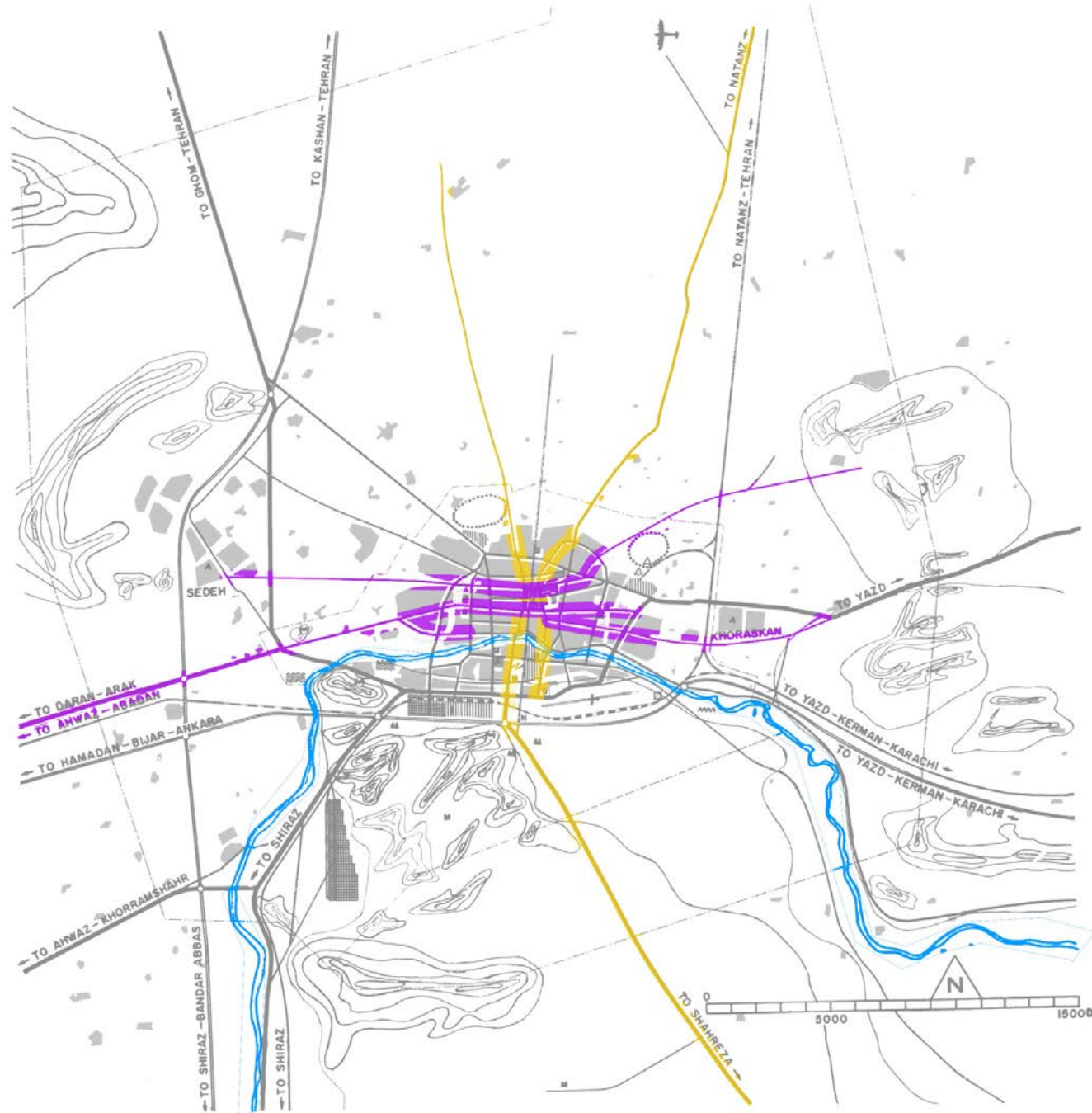
- Building new rings and highways that pass through the peripheral areas, prevents vehicles from passing through the city, and connects to important proposal industrial areas, the proposal central railroad station, the existing airport, and other essential features.

Four never-built Arterial streets (Figs. 232 & 233) were proposed to be built, two vertical ones and two horizontal streets being 36 to 45 meters wide. Each pair of these streets would double the most central existing north-south and east-west corridors by parallely passing on both sides traversing the city. The east-west proposal arterial streets, mainly purposed to carry both the traffic between the city center and quarters, while the proposal north-south directions aimed to reinforce the connectivity between living quarters and workplaces (textile factories set along the

southern section of Chahar-Bagh Avenue and mainly in the south side of the river).

Besides doubling the most central north-south and east-west streets, these four primary arterial streets would frame the proposed city center as the following.

The northern horizontal arterial street (a) was proposed to begin from the Sedeh town's southern edge to towards east. This proposed arterial street would cross the existing ring, and enter the city's historical domain, passing through the historic fabrics and the grand traditional bazaar, and it would change its direction toward the northeast to the present location of Esfahan main airport (planned in 1970). As this street passes the city center, it would form the central frame's northern edge defining the proposed city center.



**Fig. 233.** Improving the existing "Asphalt" network by adding new Arterial Streets, source: adapted from Kocks proposal Master Plan, 1958-1961.

The second proposal was the east-west arterial street (a'), which affirmed Khiaban-e-Sheikh-Bahaie. It was proposed to be built through the widening of Khiaban-e-Sheikh Bahaie, creating the southern edge of the city center frame and moving toward the Khorasgan village in the east direction until crossing the new proposed ring connected with the eastern regional corridors.

From left to right (on Figs. 232 & 233), it is the first north-south arterial street (b) proposed to pass in between Khiaban Shahpur (3) and Chahar-Bagh Avenue (1). The proposed regional corridor would begin in the north near the satellite small towns of Dastgird, Khurzug. The recommended arterial street would approach Chahar-Bagh within 150 meters and follow Khiaban Shahnaz toward the riverfront. This street forms the west limit of the proposed central frame holding the city center. In the southern parts of this street, a new bridge was offered to be built to cross the river, connect with the south section of the actual ring, the proposed railroads, the predicted national ring highway, and finally join the Shiraz road.

The second north-south arterial street (b') was considered to affirm the existing Khiaban-e-Sur-e-Esrafil (4), which recommended extending toward the north and northeast to the Natanz road. However, like the other arterial streets, connecting the administrative and business central parts to the radial and regional corridors, the northern extension of Khiaban Sur-e-Esrafil, needed to cut through and demolish the historic and existed fabrics<sup>27</sup>.

In the southern part, by reaching Khiaban-e-Sur-e-Esrafil to the riverfront, the street would meet with a new planned street (branch off from the northern head of Khiaban Chahar-Bagh Sadr) at the place of another proposed bridge. The new bridge was recommended to be constructed beside the historic bridge of Pol-e-Joui, crossing the Zayandeh-Rud beside the Vatan Factory and deflecting south to connect to the existing, and proposed regional and national rings, and highways. The new bridges could pass the heavy traffic of big trucks passing the riverfront street to go over Felezi and Marnan bridges, and avoid more damage to historic bridges (Kocks et al., 1961).

<sup>27</sup> Khiaban-e-Hakim's construction affirmed the proposal Kocks Master Plan, terminated by Khosro Agha Hamam's deconstruction in April 1995. The extension of Khiaban-e-Ostandari (Khiaban-e-Hakim) was delayed because of the Hammam location. Since 1980, when a bomb exploded in the Hammam, it caused many damages. The city planning supreme council resisted the new street construction because of its need for Hammam's removal. Finally, on 12 April 1995, the Khosro Agha Hammam was wrecked down completely.



Fig. 234. The actual city center in the early '60s versus the planned city center. source: the report of Esfahan Kocks master plan.

As the province's capital, Esfahan had several government departments, so in addition to commercial use, the city center had been designated for administrative purposes with a relatively large area. It would become the municipal and provincial governments' headquarters and the banking, distribution, marketing, and cultural center for the entire area. The area extends from the City Hall (1) to the Chehel-Sotun Gardens (2) and the eastern side of Maidan Shah (9). Since most of this area was public land, this objective could be achievable by providing the proper setting for public purposes (Kocks et al., 1961, pp. 90, 104) (Figs. 234 & 235).

buildings, and turn the entire area including the square facing the municipality into an attractive urban center by redesigning and landscaping. Adequate off-street parking was considered to be provided for the offices.

- An area east of Chahar-Bagh and north of Khiaban-e-Sepah was proposed for office buildings up to 8 floors high (16).

- It was recommended that the lands around the southern part of the Chehel-Sotun garden be purchased and reserved for the public use, and to build hotels and consulates adjacent to the governmental buildings.

- Another area for public buildings was proposed in the immediate east of Shah Square to construct the post and telegraph offices, theatre building (13), and the central bus terminal (14).

According to the Plan, the existence of such prominent monuments and architectures such as gardens and palaces of Chehel-Sotun and Hasht Behesht (2, 3), Teymouri Hall (4), Ali Qapu (5), Qaisaria gate (8), Shah Square (9), Sheikh Lotfollah Mosque (10), and the grand bazaar provides an excellent potential for the area to become a major cultural and tourism destination throughout the whole Middle East (Fig. 235). In this regard, the Kocks Master Plan had envisaged various aspects for the realization of this issue, which were:

- The central part would be surrounded from all four sides by the main traffic arteries (Fig. 234). These streets could make it possible to give services to the central part by framing the city center. In the northern part, the bazaar axis would be cut off by one of these streets, and the possibility of constructing a pedestrian crossing tunnel had been considered in terms of continuing the bazaar. The other proposed arterial street was a 45-meter wide street recommended to pass through the Garden of Hasht-Behesht and the front of its palace as the southern edge of the planned central area.

According to the plan, Chahar-Bagh Avenue, as the most prominent street in the city, including the shops on both sides, would turn into a promenade, and all motor vehicle traffic would be banned. The actual north-south traffic load that Chahar-Bagh directed would transfer and carry by the new proposed 36-meter axes parallel with Chahar-Bagh. New predicted parking lots cooperating with these proposal arterial streets would relate the car mobility with lively pedestrian activities along the sidewalks and more prominent equipment.

In the early 1960s, Chahar-Bagh Avenue was entirely turned into the city's main shopping center, which attracted and concentrated a lot of traffic. All long-distance highways from Tehran, Yazd, Shiraz, and Arak, through significant arteries, merged into the central Chahar-Bagh Avenue. Shops could only receive deliveries from the front streets. Many busses and shipping services had their offices along this street, and often parked busses caused severe traffic bottlenecks.

- The area around the municipal building was recommended to be saved for the city's future

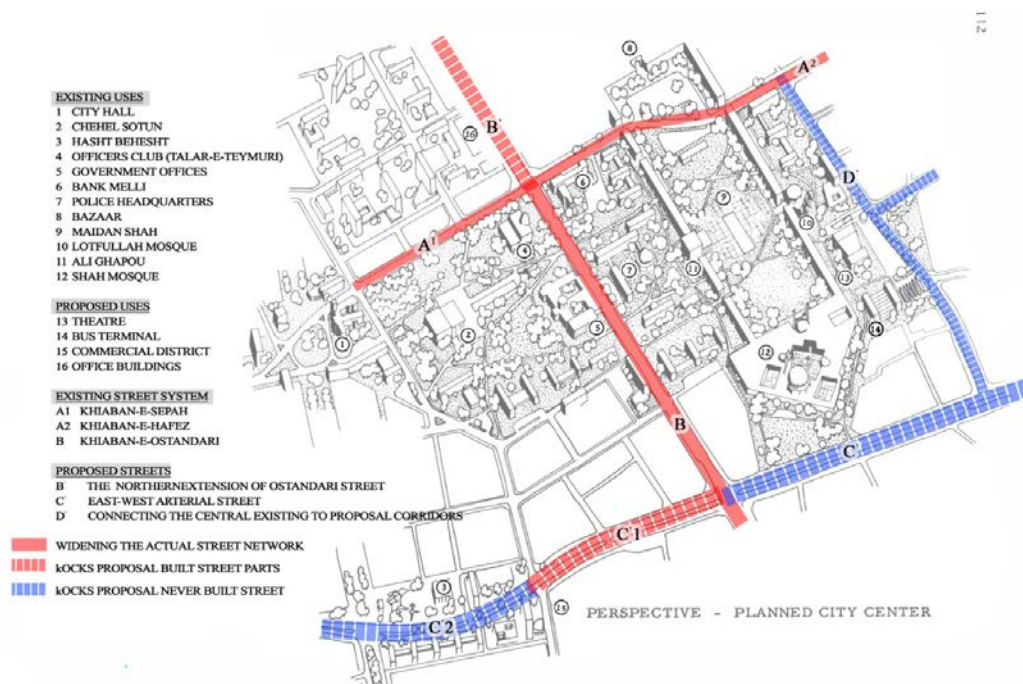


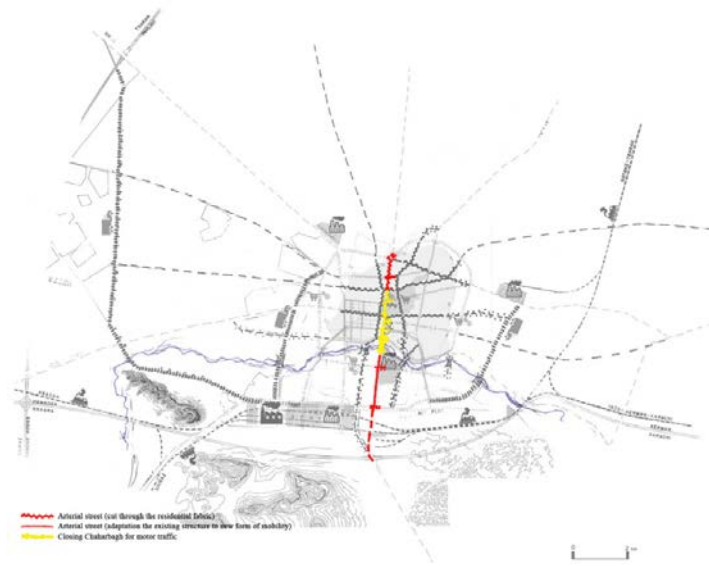
Fig. 235. The bird eye view of the planned city center. source: the report of Esfahan Kocks master plan.



The plan recommended closing Chahar-Bagh Avenue for motor traffic between the northern boundary of the proposed city center and the southern head of the Si-o-Se-Pol bridge and the riverfront. Freeing this section from car traffic could be used as a shopping promenade for pedestrians and passing bicycles, which was considered as a forward-thinking idea in the 1960s. For turning the Chahar-Bagh Avenue into a promenade passage, the actual north-south traffic load of the Chahar-Bagh had to be transferred to the two new proposed 36-meter axes parallel with Chahar-Bagh. New predicted parking lots cooperating with these proposed arterial streets would associate the car mobility with lively pedestrian activities along the sidewalks and inside the more prominent equipment (Kocks et al., n.d., pp. 49, 85).

At the end of this chapter, a closer look will be taken at Chahar-Bagh Avenue and its transformations by the arrival of motor vehicles up to the recent years, which it finally transformed into a pedestrian passage in 2018.

It should be clarified that Kocks Master Plan objectives concerning the central administrative areas or the urban center and planned neighborhood unit (which will be mentioned in the following section) were never performed. Nowadays, after more than six decades, the plan's strategies can be traced in different cases, such as changing Chahar-Bagh into a pedestrian passage or constructing the Agha Najafi axis east of Naghsh-e-Jahan Square by the widening and demolishing interventional approaches<sup>28</sup>.



**Fig. 236.** Proposal of devoting Khiaban-e-Chahar-Bagh-e-Abbasi to pedestrian. Source: the report of Esfahan Kocks master plan reproduced by the author.



**Fig. 237.** Improvement of the existing and adding new structures, extension of Chahar-Bagh toward the north direction, source: adapted from Kocks proposal Master Plan, 1958-1961

<sup>28</sup> The new street partially merged Agha Najafi historical passageway needed to be accomplished by demolishing residential houses and the historical fabric of this area, which caused considerable resistance by the locals and experts to the extent that the project has been stopped for reconsideration at the actual moment.

### 4.2.3. Planned Neighborhoods

According to the Kocks report of Master Plan, planning for the future of Esfahan city must give residential areas equal attention as other sections of the city.

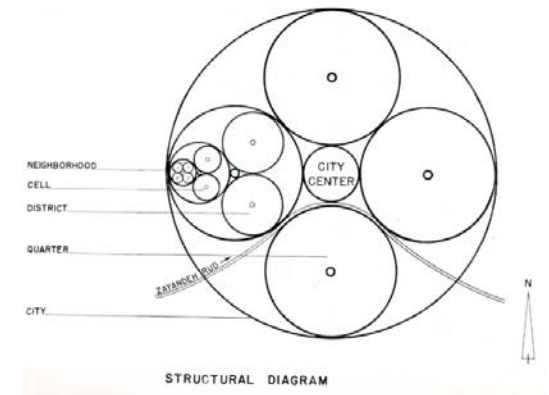
Equilibrium and integration were central ideas of the Plan regarding the distribution of new functions, businesses, and municipal services to offer adequate services to all areas of the city.

The plan tried to reflect on the demands of modern life in older residential areas through decentralizing adequate services and facilities to all areas of the city to provide optimum convenience for the residents of every neighborhood and give a new identity within their particular community section.

In this respect, Esfahan's planned organizational structure was divided into four quarters, each with a separate unit for municipal administration, secondary business, services, recreation, and cultural activities. All quarters would be further divided into districts, cells, and neighborhoods, each with its respective level of function and service (Kocks et al., 1961, pp. 90, 91) (Fig. 238).

Regarding the planned neighborhoods, the Kocks Master Plan report recognized some critical features for developing the planned residential areas:

1. Residential areas were divided into four quarters; each would include three districts, with approximately 150,000 inhabitants. All quarters needed to constitute a municipal government branch office, a police station, a fire station, a secondary shopping center, a library, a post office, and recreational facilities.
2. The district would have three cells and a population of approximately 50,000. In addition, each district center would contain high schools, sports fields, shopping centers, and other forms of service facilities.
3. A cell would hold four neighborhoods with approximately 16,000 inhabitants. Each cell would contain more services, a postal and police station, secondary school, household services, and stores for goods needed less frequently than those provided by the neighborhood shops.



**Fig. 238.** The structural diagram of the planned organization. source: the report of Esfahan Kocks master plan.

4. Finally, each neighborhood would have about 4,000 inhabitants and was supposed to be the primary community unit, including all the services needed for daily living, such as primary school and kindergarten, a small group of shops, bathhouses, and mosques. Due to the neighborhood's limited size, each neighborhood's central service area would be within a convenient distance to all of its residents. The standard used for this matter was a fifteen-minute walking distance from the primary school.

5. It was believed that the inadequacy of the present "Kutche" network in residential districts to handle the increasing numbers of family cars was perhaps the clearest example of a modern development that would create ever-greater problems for the residents and municipal government. The new proposed Neighborhood divisions would serve by complementary streets (26 meters wide) that needed to be staggered to discourage fast traffic. New streets serving neighborhoods would follow existing Kutches, and wherever possible, would be widened to a width of sixteen meters. (Kocks et al., 1961, p. 115).

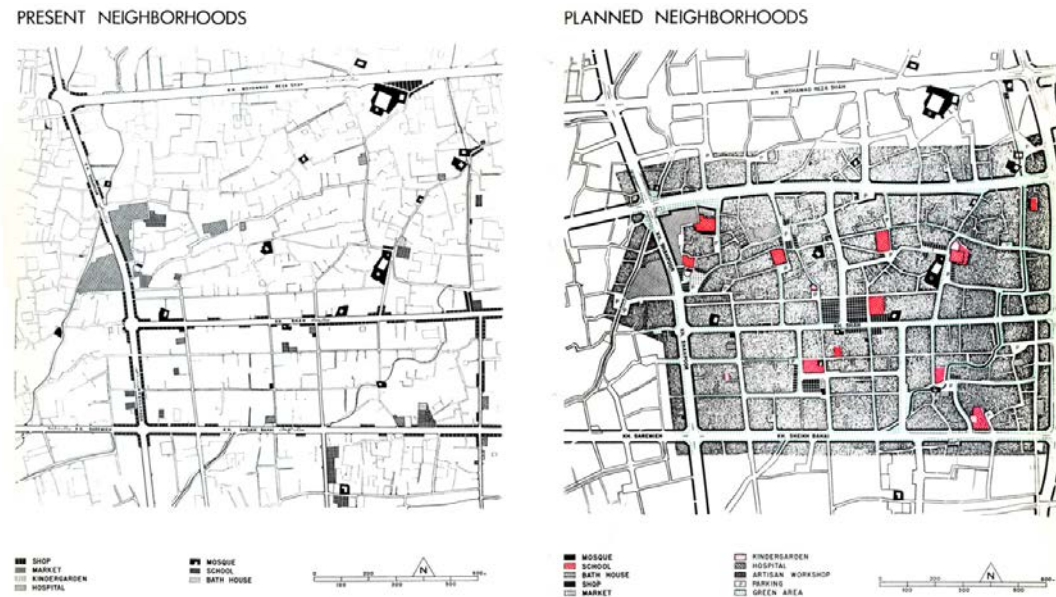


Fig. 239. The actual and planned neighborhoods presented by Kocks Consulting Engineers.

The Kocks Master Plan report presented a case study to clarify an older residential area's modification to the new form of mobility and to meet modern living requirements. The report exemplified how a “cell” consisting of the neighborhoods of Abbas-Abad, Shams-Abad, Mahale-No, Shish, and Darbe Kushk could be redeveloped based on enforcing a new mobility mode in a historical city context (Fig. 239).

Comparing the existing situation and the proposal shows that the aforementioned “Asphalt” City approaches are continued to be taken from the Kocks Master Plan.

The proposed arterial streets would link the city center to the regional corridors through demolishing historical city fabrics and structures. The construction of new streets would accompany by building new commercial fronts and sidewalks as new linear forms of centralities.

Below, some of the important features of the plan for redevelopment of the city's old western residential areas are listed:

1. Widening the Khiaban-e-Sheikh-Bahaie to be 45 meters wide, which would form the southern edge of the framed central area.

2. Constructing a new regional corridor and the northern horizontal arterial street (45 meters wide) connecting Sede town, into the west, to Khorasgan village, into the east sides of the city by cutting through historical fabrics of Shish and Darbe-Kushk neighborhoods and form the northern limit of the planned city center.

3. Building a new north-south 45-meter wide arterial street parallel with Chahar-Bagh, which would form the western limit of the central planned area.

4. Widening the Khiaban-e-Shahpour to 36 meters by demolishing properties and row stores on the two fronts.

5. Widening narrow Kuches that are connected to the main streets to 16 meters wide.

6. Adding new commercial centers, retail stores, parking places, schools, and green areas distributed in various locations and in convenient distance for local residents.

7. Widening the existing Madi's network to a width of 8 meters on both sides.

### 4.3. TWO STUDY CASES OF “ASPHALT” CITY

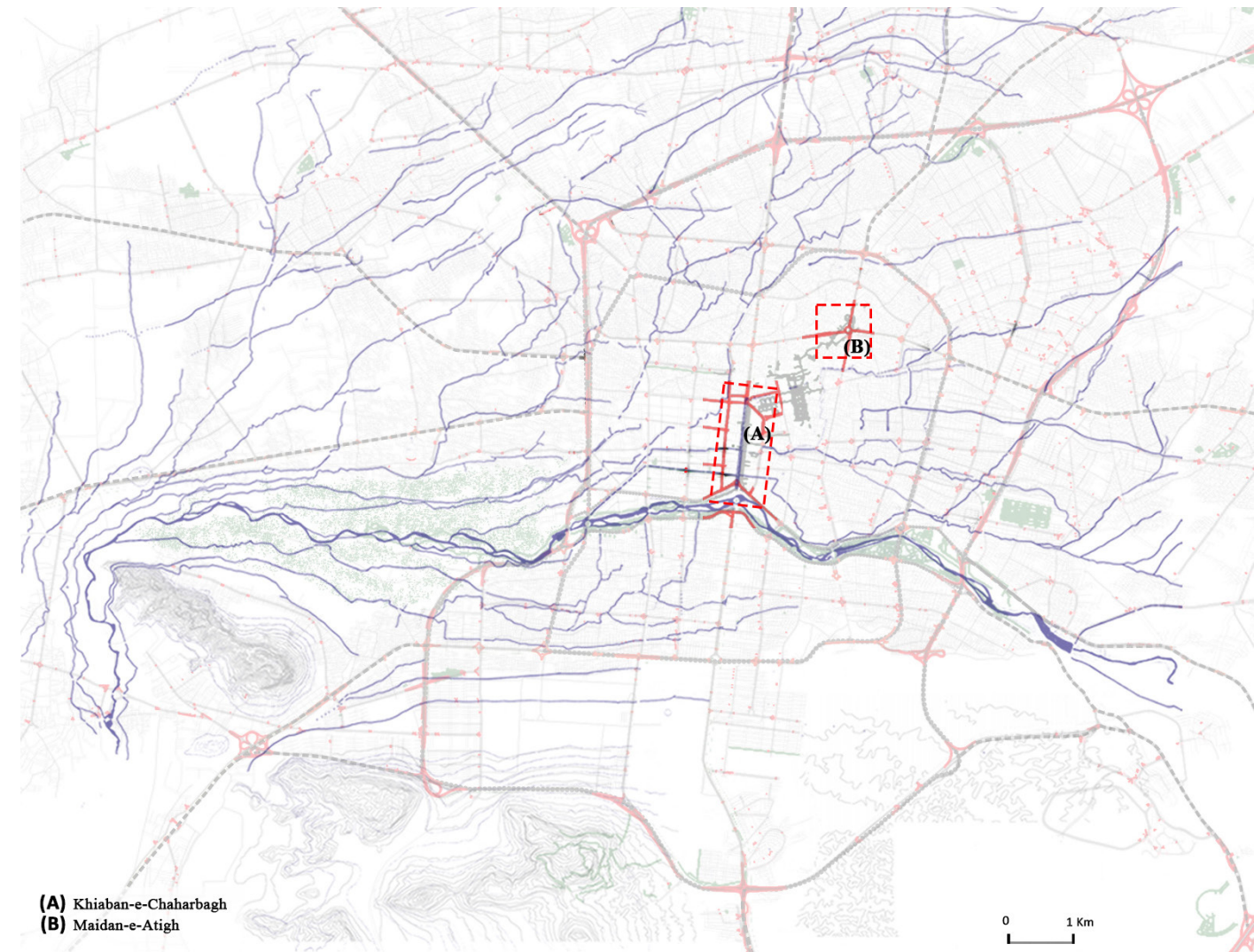


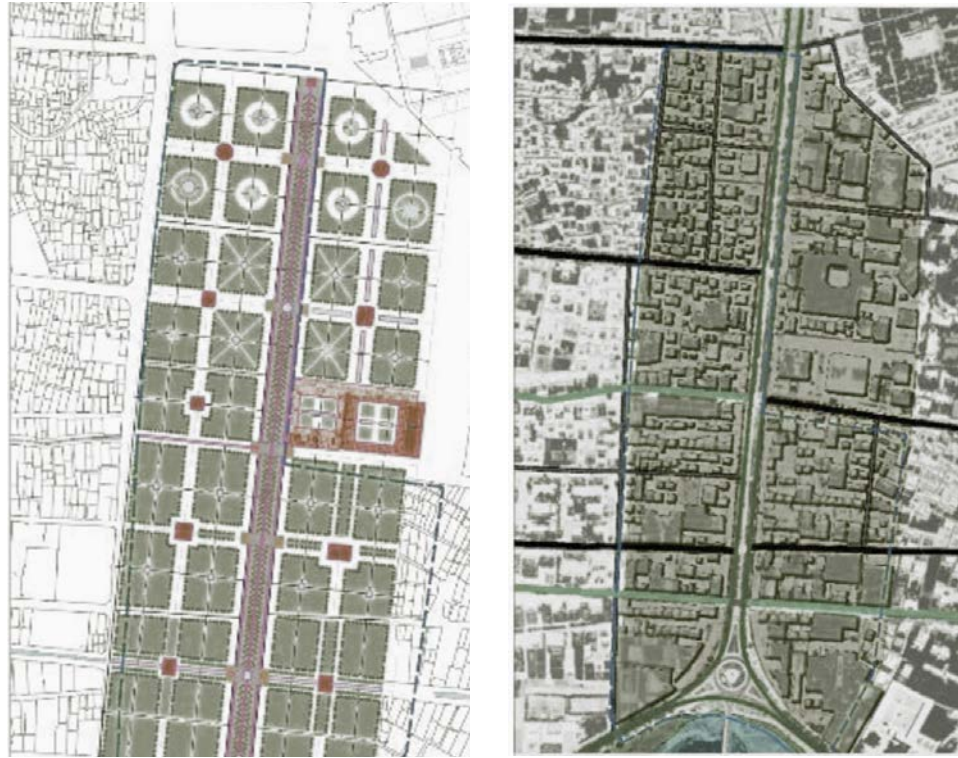
Fig. 240. Three cases of the “Asphalt” City. Source: author

Up to this point, the new age of industry and technology changing the city form through applying different approaches in the construction of “Asphalt” City by depending on cars and the new network of asphalt streets were discussed.

In this section, a complementary view of the new “Asphalt” system's performance is addressed

through an in-depth explanation of some of the representative case studies (red frames) that illustrate the described changes and the interaction of the network of new streets with the historical structure of the city (Fig. 240).

### 4.3.1. Chahar-Bagh Avenue: From a Ludic Hall to the Most Influential City Center



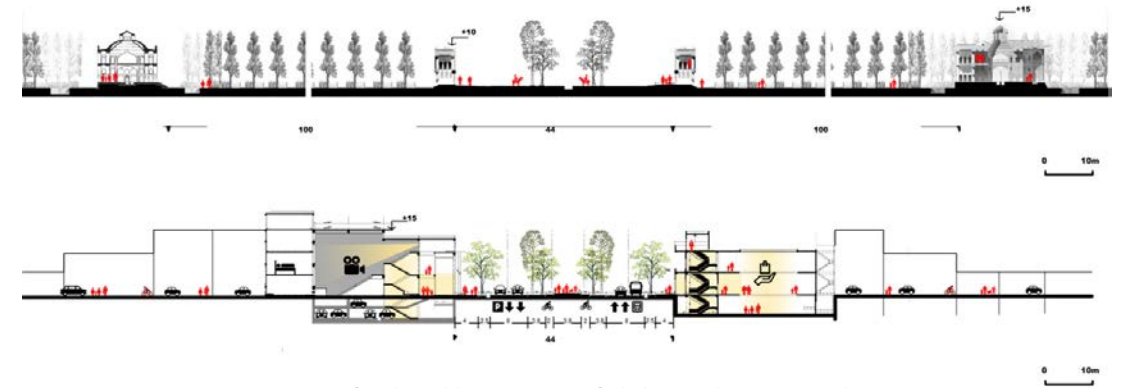
**Fig. 241.** Decrease the size of the parcels and reduce greenery and public areas, Chahar-Bagh in Safavid & Pahlavi moment. Source: Bavand Consultants – Architects, Planners & Urban Designers.

Since the late 16th century, the construction of this crucial structural axis has undergone various adjustments of adapting to continuous changes and becoming increasingly complex over time. The case of Chahar-Bagh Avenue is an excellent example illustrating a progressive adaptation of a former passage to the new form of mobility. If Chahar-Bagh was a more representative and ludic hall (in the 17th century), outside the city, surrounded by various gardens and intersecting transversal passages and water canals, then by the arrival of cars and the new form of mobility (20th century) turned into the most influential center of the entire city, based on its commercial, porous and permeable front edges accompanied with the sidewalks.

As mentioned in the third chapter, Chahar-Bagh was initially built to show off the Safavid empire's

glory and at the same time to develop the city towards the south. The construction of Chahar-Bagh began in 1598 and continued until 1616. Four parallel lanes divided by two rows of plane trees formed the typical Chahar-Bagh section with an overall width of 48 meters and a length of approximately 4 kilometers. According to Pietro Della Valle, who visited Esfahan between the year 1617 to 1622, Chahar-Bagh was a promenade outside the city, and there were no houses located next to it.

Since the late Qajar period (the early 20th century), Chahar-Bagh gradually changed through the division of grand size gardens to the smaller parcels. Using trucks as new vehicles of the current form of transportation, the physical dimension of Chahar-Bagh, its regularity, and ease of communication, and receiving deliveries



**Fig. 242.** Comparative common Safavid & Pahlavi sections of Chahar-Bagh. Source: author



**Fig. 243.** The new shopping development opposite to the hotel with dome and minarets of the Madrasah in background. Source: The Architectural Review, May 1976.



**Fig. 244.** Late Qajar or primary Pahlavi buildings (hotel Jahan). Source: The Architectural Review, May 1976.

from the two fronts, led Chahar-Bagh to play a prominent role in the economic activities.

In the '20s, the middle section of Chahar-Bagh, which was devoted to the pedestrian, including a water canal running in the middle intersected at intervals by other waterways or widened into pools, were filled up and leveled for car traffic. According to the Akhgar newspaper, in December 1929 it was decided to level the sides of the middle section to create two streets for vehicle traffic, which reallocated the middle section to the pedestrians. The previous format of divided lanes and the tree rows matched the new traffic format very well.

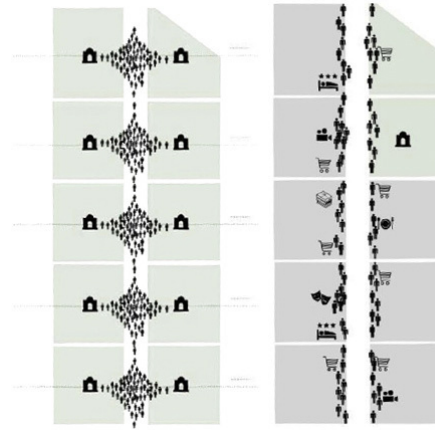
In the 1930s, the projects for asphaltting the two-way car lines and later, the middle line and sidewalks, accelerated the prementioned trend of changing the two fronts of Chahar-Bagh

Avenue. The municipality also put some building ordinances to control the construction of new commercial fronts at that time (Abdol Mehdi, 2008). In May 1936, the Akhgar newspaper published the municipality's call to the owners of those properties on both fronts of Chahar-Bagh Avenue to follow the five plans available to rebuild their stores' facades.

In this respect, in the 1970s, Kenneth Browne, an architect and for many years the townscape editor of the Architectural Review wrote: "the middle section is still reserved for pedestrians, but the water channels have been filled in, and the side lanes asphalted for vehicular traffic. The pavilions and their gardens have disappeared with no trace, and the two sides of the avenue are lined with shops, cinemas, and offices. The great processional route of Shah Abbas and the Safavid

court's gardens have become an architecturally undistinguished but lively commercial street".

Fig. 245 presents a comparative diagram showing Chahar-Bagh's spatial structure during the Safavid and Pahlavi periods. As seen in the first period, Chahar-Bagh was flanked by the regular format of some royal and individual gardens, pavilions, and meeting points in the gardens' entrances (based on the travel logs of foreign travelers and ambassadors). In contrast, in the Pahlavi period, the Chahar-Bagh changed to the "Asphalt" City's central street, forming linear sidewalks that linked different activities from two fronts, easily accessible to the passing cars of middle lines. Successive decisions and interventions that were taken to adapt the Chahar-Bagh axis to vehicles' passage, completely changed this street's spatial structure.



**Fig. 245.** Comparative diagrams of spatial organization of Chahar-Bagh in two periods of Safavid and Pahlavi. Source: Mohamad Arab.

Fig. 246 illustrates this Avenue plan extended more than 1.3 kilometers from Darvazeh-Dolat on the right side (the north direction) to the Maidan-e-Mojasameh (Statue roundabout) on the northern head of Si-o-Se Pol bridge, in the 1960s. The diagram shows the various land uses in different dimensions located at two fronts of the Chahar-Bagh at that time, including:

- Fourteen movie theaters were accessible either from the Chahar-Bagh Avenue and the transversal passages and streets,
- Six hotels, including Abbasi hotel, which was described in the third chapter (behind the Chahar-Bagh school), and the Jahan Hotel on the western front of the avenue,
- Agencies of numerous companies such as Homa Airlines, Vatan factory's office, Mihan Tour Bus Garage,
- Libraries, bookstores, and other commercial uses such as jewelry, craft workshops, photography studio, restaurant cafes, tailoring and fabric stores, and clothing stores.

By filling the two Chahar-Bagh front edges with small shops in the 1950s, the construction of the

two street fronts extended more in depth in forms of twenty shopping centers mainly dedicated to the textile and clothing markets. Most of these passages are accessed through various entrances to the front of Chahar-Bagh or other perpendicular streets connecting to the outside or other areas (Figs. 247 & 248).

The case of Chahar-Bagh avenue showed us how the superimposition of a historic passage with an asphalt road became associated with permeable facades and the activities behind them (gardens, residential neighborhoods, and central areas), and transformed this axis into the city's most dominant meeting space. Permeability of the front edges and porosity of the buildings on the ground floor of the city have fed this longitudinal element through its transversality.

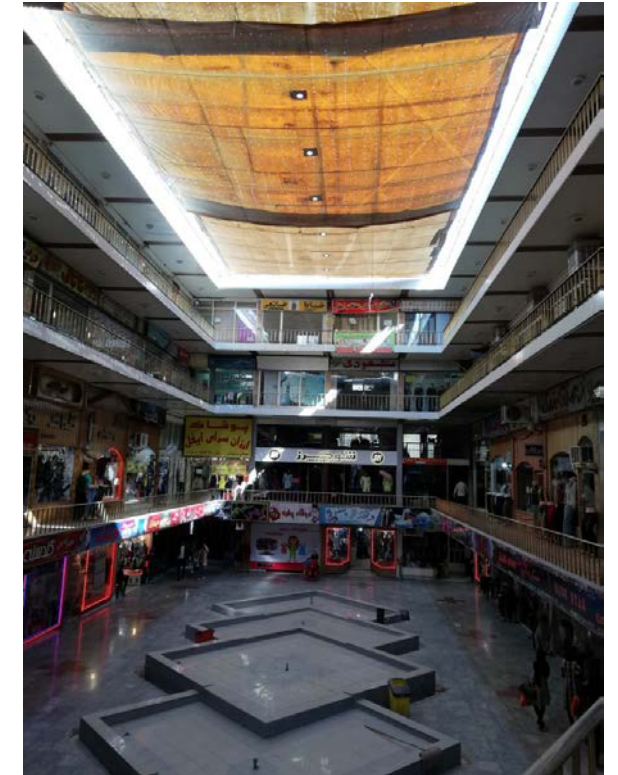
Nowadays, thanks to the parallel streets with the Chahar-Bagh and metro line project (which will be discussed in the following chapter), this avenue has been turned into a pedestrian axis, around sixty years after the recommendations of the first master plan for the city.



**Fig. 246.** Land use plan of Chahar-Bagh in the sixties, Source: Esfahan municipality, edited by the author.

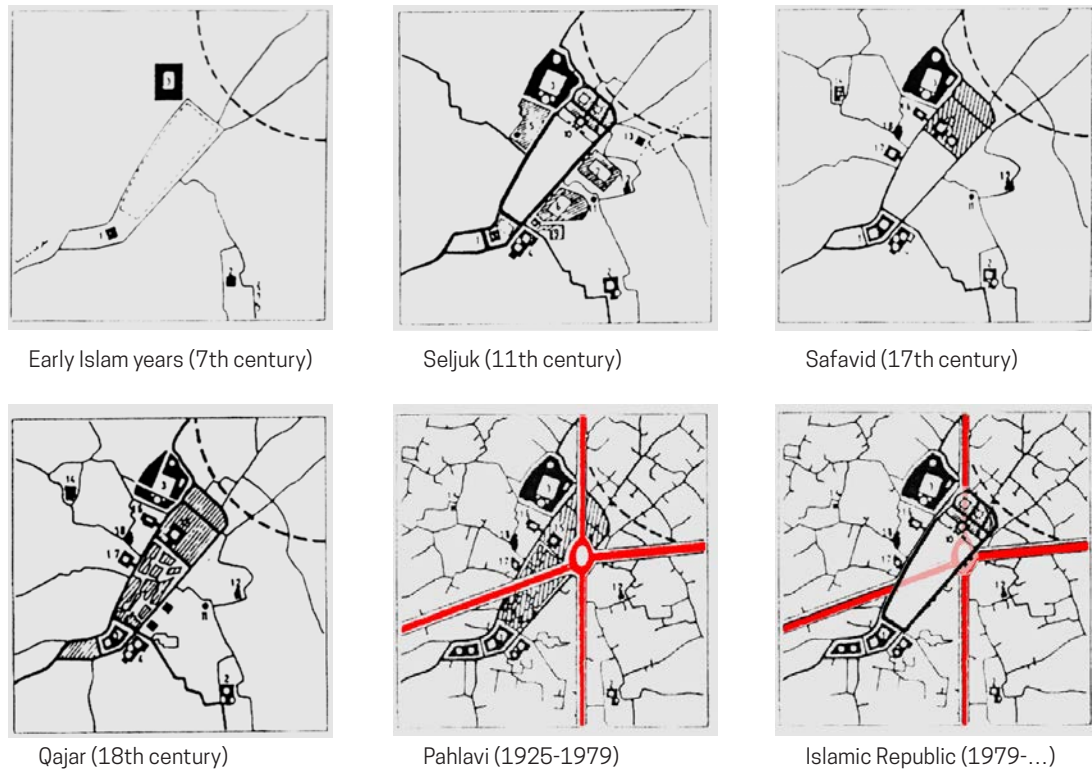


**Fig. 247.** Chahar-Bagh, commercial street front's cooperation with the sidewalk, 2018. Source: Majid Eslamdost



**Fig. 248.** Inside Takht-e-Jamshid Passage, March 2019. source: Source: author

### 4.3.2. Atigh Square: Doubling the Ground Level



**Fig. 249.** The transformation of the old square complex and the Jame mosque in different periods. (Shafaghi, 2016, edited by author)

In terms of structure and function, Atigh square<sup>29</sup> and the Jame Mosque of Esfahan are the oldest, leading, and most essential elements of the city's cultural-historical axis. According to historical evidence and as mentioned in the third Chapter, this square has been the city's heart for centuries. Along with its surrounding centers of residential districts, it is constituted of the oldest central nodes in Esfahan. The square was the encounter point of various radial and arterial passages, which were connecting the city center (the bazaar and the square) to the more local neighborhood's centers, gates and long distance trade roads.

The Maidan has undergone many changes since its creation around the early Islamic period to the

present. Fig. 249 shows the transformation of the Atigh square from the early Islamic period to the present. As explained in the third chapter, the Safavid dynasty's advent and the construction of the new square of Shah Abbas significantly diminished the Old Square's importance.

In the late Qajar period (19th to 20th century), various factors like the anarchy and urban mismanagement, the growing importance of commerce, and the proximity of the old Square to Esfahan Grand Bazaar, tempted the sellers to gradually convert into fixed commercial units (shops) that occupied the space of the square.

<sup>29</sup>The square has been called by various terms of Maidan-e-Kohne, Maidan-e-Atigh, Sabze Maidan, and recently after completing the interventional project, named Maidan-e-Emam Ali.

The continuity of new arterial streets such as the north-south Hatef (in the early 1930s), the east-west Abdolrazaq (in the 1940s), and Valiasr (in the 1960s), connected the original center of the old city to the new entrances and regional corridors. The construction of these arterial streets, intersecting historical transversal passages damaged and disabled the traditional functioning system, and have also caused disintegration, separation, and distance for the existing surrounding neighborhoods.

The interplay of different scales concerning the network of asphalt streets and car-dependent services with the historic and pedestrian-based communication systems has created many problems for locals and the traditional systems.

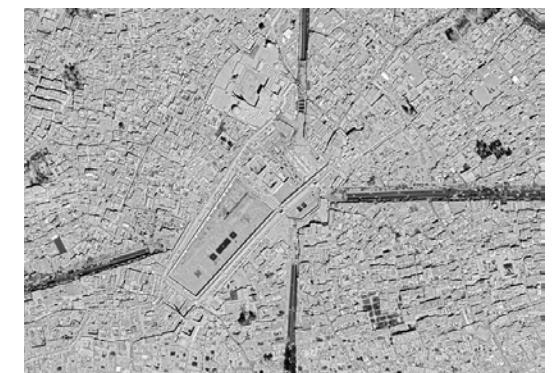
The modernization of cities, including the construction of new quarters and amenities, has also led to changes in urban centers' social and economic structures. Wealthy people moved out of the old city center and settled in new and more spacious quarters with modern amenities and new and fast communication systems. The exhaustion of residential buildings in the older districts, the migration of the original inhabitants and being replaced by low-income immigrants from the rural and neighboring countries involved with the war, loss of historic neighborhood centers' significance, and the increasing penetration of private cars into old neighborhoods are other challenges that the central and historical parts of the city have faced.



**Fig. 250.** The construction of Hatef street at the thirtieth, the aerial photo of the square taken in 1956



**Fig. 251.** The construction of Sabzeh-Maidan roundabout, Abdolrazaq and Valiasr street in the fifties, the aerial photo of the square taken in 1963



**Fig. 252.** Reconstruction and rehabilitation of Atigh Square on the ground level and moving the vehicle traffic from the underpass of the new Maidan since 2010, Aerial photo 2019



**Fig. 253.** Pre-existed informal activities at the place of Atigh square, daily second-hand markets, 2008, Source: Esfahan municipality



**Fig. 254.** Atigh square's actual ground floor, 2015. Source: author

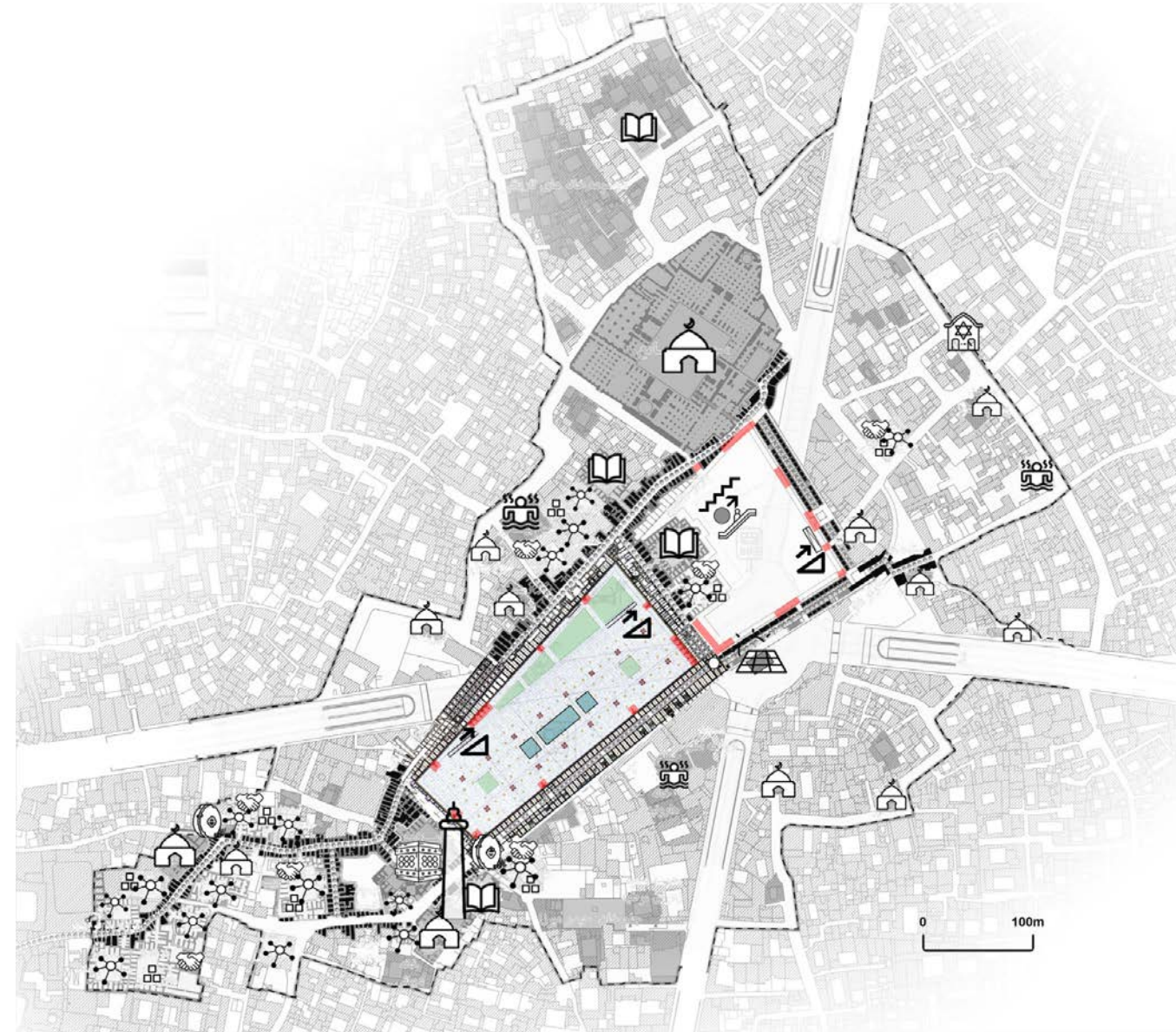


**Fig. 255.** Perspective of the Atigh Square from the top of Jame Mosque's minaret, 2016. Source: Esfahan municipality.

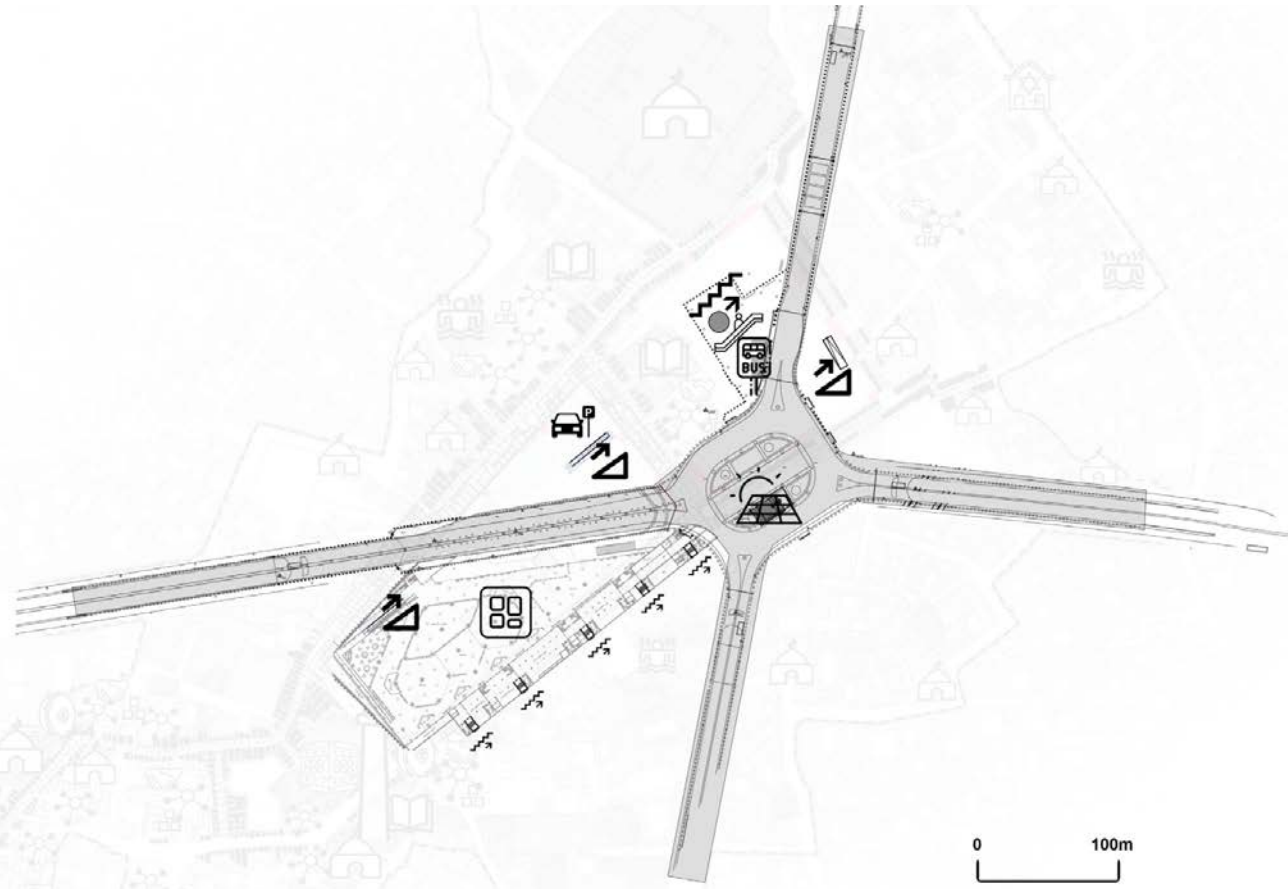
Numerous research and design projects have been conducted to address the aforementioned problematic issues. As the most notable example, in the early 1990s, based on the request made by the Ministry of Housing and Urban Development and Esfahan municipality, the city signed a contract with Naghsh-e-Jahan Pars consulting engineers on Maidan-e-Atigh (Maidan-e-Emam Ali) and its surrounding neighborhoods. The most important design objective was to revitalize the Maidan's historical-cultural identity, including its surrounding and constructive elements, to maintain its historical character and respond to

today's modern requirements and the surrounding urban fabrics.

The shape of Emam Ali Square (Atigh Square) is a trapezoid bounded to the west by the Grand Bazaar, to the east by the Harunieh Passage to the south of Harunieh Bazaar, and in the north by the Bazaar-e-Ghaz (Goose Market). As mentioned in the third chapter, and based on historical observations, current remarks and analyses, the Maidan was kept its original shape. A new square (Maidan-e-Pishkhan) was established in front of the Jame Mosque's main entrance in the northern part.



**Fig. 256.** Ground floor plan of Emam Ali Square. Source: author



**Fig. 257.** Under ground floor plan of Emam Ali Square. Source: author

The idea of designing the Atigh Square complex was based on two important aspects:

First, the restoration and reconstruction of the old square through the devotion of its ground surface to the pedestrian, accompanied by the Bazaar's extension in the sense of framing the square through the restoration and building new Rasteh-Bazaar. This matter has helped the square's connection to the historic radial routes previously linked to the surrounding neighborhoods and the former city gates.

The second important aspect was to properly relate the pedestrian mode at the square's ground plan to the underground traffic roundabout and its intersecting arterial streets, which are accompanied by the underground tunnels, the traffic circle under the main square, parking garages, and bus stations under the Maidan-e-Jelokhan.



**Fig. 258.** Atigh square's underground tourist bus station and parking entrance, 2019. Source: Hasan Kharaji.



**Fig. 259.** Atigh square's underground city bus station, 2019. Source: Hasan Kharaji.



**Fig. 260.** Atigh square's underground Refah supermarket, April 2022. Source: author



**Fig. 261.** Center of the underground Atigh roundabout, entering the natural skylight and greenery, 2019. Source: Hasan Kharaji.



## CHAPTER 5: “IRON” CITY

- 5.0. INTRODUCTION
- 5.1. ESFAHAN RAILWAY PROJECTS, A REVIEW SINCE 1969
- 5.2. TERRITORIAL RAILWAY LINES: THE REGIONAL DIMENSION OF THE METROPOLIS
  - 5.2.1. Three suburban railway lines: a sequence of territorial incidences
- 5.3. ESSENTIAL FEATURES IN THE CONFIGURATION OF ESFAHAN’S METRO SYSTEM
  - 5.3.1. Metro Line 1, the most critical Esfahan metro line
  - 5.3.2. Metro Line 2, linking the west and northeast regional corridors to the city center
  - 5.3.3. Metro line 3, the first provisional metro ring line
- 5.4. THREE CASES OF METRO STATIONS: SITES AND PROXIMITIES
  - 5.4.1. Emam Hossein station
  - 5.4.2. Takhti station
  - 5.4.3. Shohada station



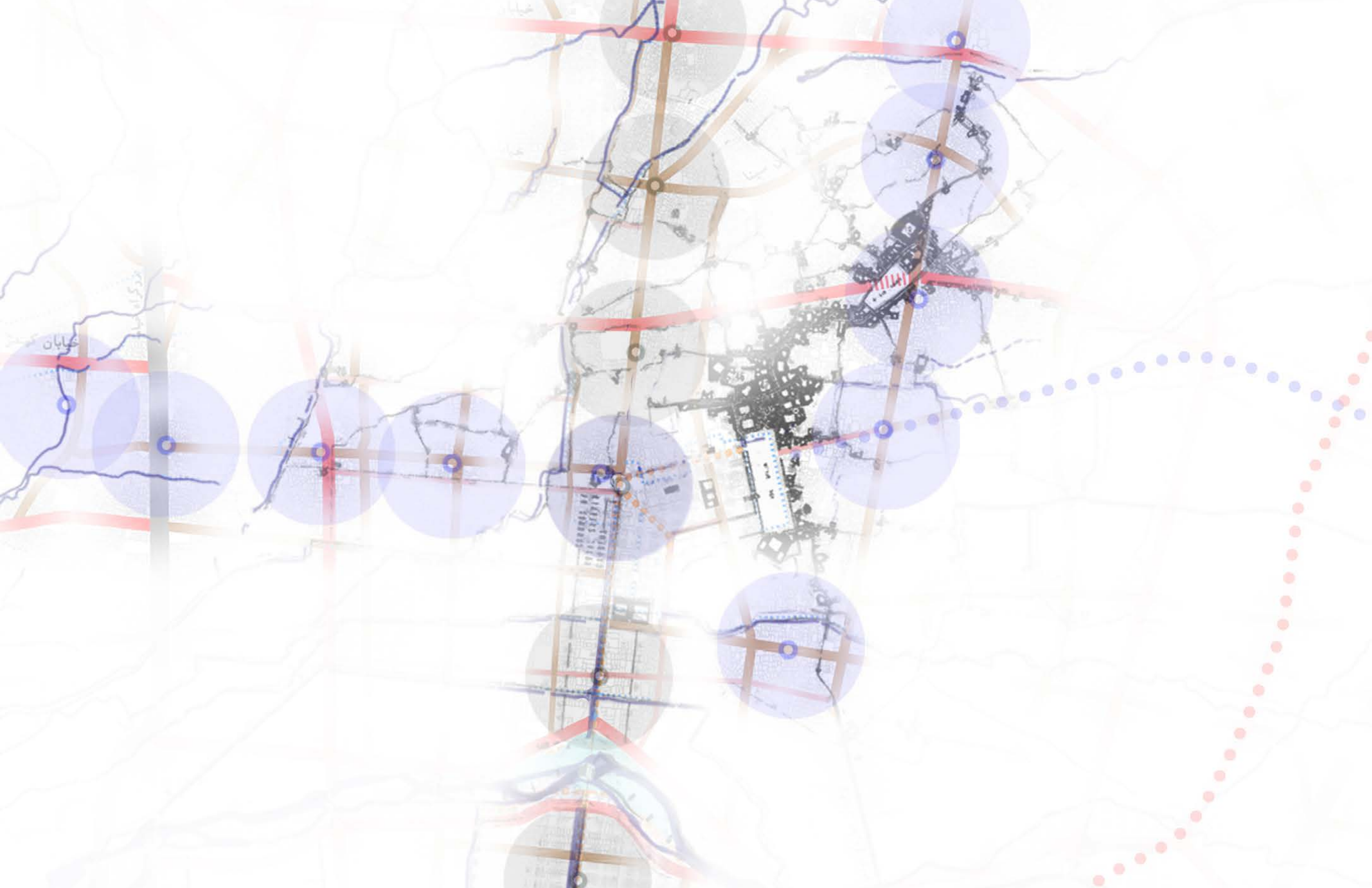




Fig. 262. Under-construction Azadi Metro Station, February 2016. Source: author

## 5.0. INTRODUCTION

The consistent development and intensification of the network of asphalt streets, rings, highways, and bridges linking the central city areas to surrounding territories have never met the growing numbers of private cars and demand for further mobility, which has created many problems for the city, such as heavy car traffic, increasing pollutants<sup>1</sup>, reduced safety and lack of calmness in many places.

In contrast to the construction of the "Asphalt" city's street network, which in many cases provoke conflicts with the traditional system of "Ground" and "Water" city by disrupting pedestrian activities and the function of historic central nodes, the construction of the subterranean subway rail lines does not cause similar problems.

Comprehending the city constructional process through the lens of urban intersections, metro stations are the most recent territorial and urban nodes that have emerged since the completion of Metro Line 1 in 2018<sup>2</sup>. Actually, Metro stations are the foundations of a new metropolitan system that can integrate local and territorial scales in concern with other former historical and contemporary networks of urban nodes and intersections. Nevertheless, in contrast to the short distance between historic urban centers, metro stations are located at greater distances (the average distance around 1,000 meters) from each other, which depicts a constellation of fewer nodes.

Up to the present (2021), the city's metro line network consists of three lines with a total length of approximately 54 km and 55 stations. Among these three metro lines, only Metro Line 1 (with its 20 stations) has been fully implemented and is operating. The other metro lines that are lines 2 and 3 are either under construction or are in the study and design phases (Fig. 263).

"The metro is the highest derivative of a city, capable of being an essential tool to articulate different territories and make cities with different civilizations viable" (Rubert de Ventós & Parcerisa, 2001, p. 11). At the same time, according with the main references in the metro systems and cities, it offers comparative advantages to the "Asphalt" system in various terms such as energy consumption and environmental quality, including:

(a) The possibility of further penetration into the existing urban fabric without the need for extensive destruction, (b) avoidance of land acquisition problems, (c) leaving more space for pedestrians on the ground surface by keeping traffic off the streets are among the other positive features of underground metro lines, which give it a more appropriate reflection in public and media opinion (Ibid.).

<sup>1</sup>(a) The geographic location of Esfahan being in the lowland lands surrounded by mountains, (b) the lack of proper distribution and establishment and concentration of a significant part of the industry in only 8% of the province, (c) the production of approximately 70% of iron and steel, and more than 50% of the country's bricks, (d) the formation and rapid growth of surrounding industrial towns, (e) consecutive river droughts in recent years, (f) exhaustion of cargo and passenger transport fleet, are some of the most important reasons for Esfahan to be ranked first for having the most unhealthy polluted days among the whole country's metropolises, in 2020.

<sup>2</sup> Currently (September 2021), Esfahan Metro is operating in only one line, which according to development plans, Esfahan Metro lines are to be increased to 3 lines. The actual length of the running metro line 1 is 20.2 km with 20 stations. The number of active wagons in the Esfahan metro is 60 wagons, equaling to 12 trains, which as its highest record, it has reached a transportation of around 130000 passengers daily.

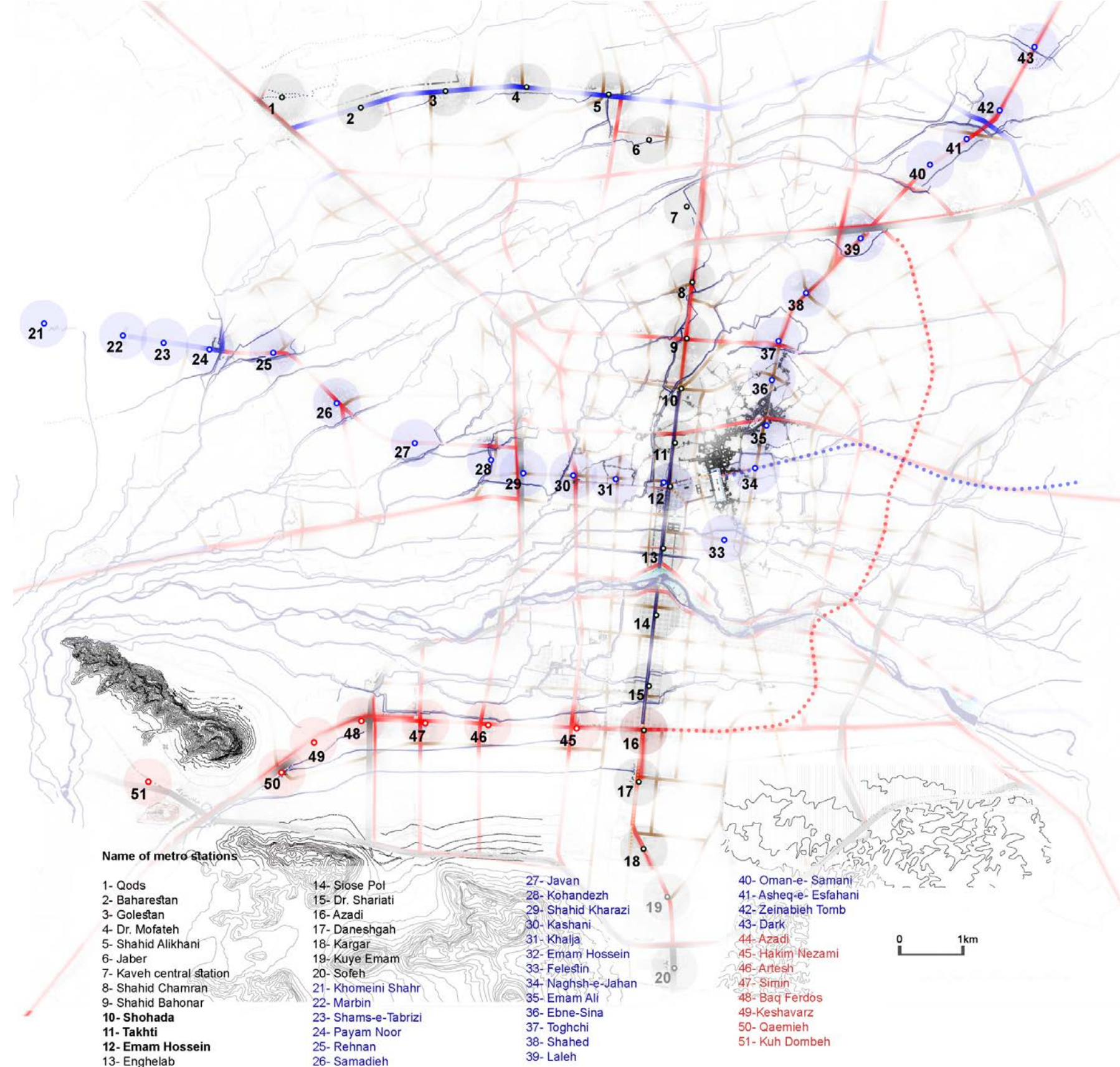


Fig. 263. The network of three metro lines and the locations of stations connected with the suburban railway lines in Esfahan. Source: author

Today, it seems that underground urban travel has become more practical for the city's mobility demand and an antidote to pollution and the greenhouse effect, which is one of the primary causes of the severe environmental crisis we are experiencing. The significance of the subway among the urban public transport systems and its potential for creating one of the necessary (although not sufficient) conditions to increase access to quality urban services and resources is evident. The subway station is, in fact, a hub, a crossroads, an access gate, a place of interchange, an advanced energy hub, and the metropolitan square, which in the contemporary city is gradually expanding, and continuing to play a particularly significant role in representing an urban identity (Grillet-Aubert & Criconia, 2021).

The city seems to be unknown from down in the Metro's tunnels for having no shape, climate, topography, or sky. The underground rail network and the city's outline are different realities linked through the metro stations. Furthermore, they can be understood as the cornerstones of this new "urban system" that can integrate the local scale of each specific place at the stations' vicinity, where the underground metro flourishes to the ground surface, linking differing territories and destinations.

The crucial point about Metro is that it is not an exclusive metropolitan mobility system, which offers a new way of mass transportation for a specific number of passengers at a particular time and distance. However, the metro stations also offer opportunities to improve the urban condition of their surrounding areas (Manuel de Solà, 2006, p. 8).

In many megacities, metro stations are directly connected to shops, cultural or recreational spaces, hotels, offices, train stations and form complex and exciting urban systems that the French architect and urbanist David Mangin called "urban mangroves."<sup>3</sup>

The concept of the Metro-city conveys this idea of forming a galaxy of stations' that become absolute protagonists by creating exceptional areas of accessibility along various lines and directions (Fig. 263). The diagram of stations reduces the metro system's complexity to a hierarchical universe of nodes, a series of privileged urban places, which in certain areas offer access to various mobility systems of "Ground" and "Asphalt" network, connections, and other incidences at the ground surface (Rubert de Ventós & Parcerisa, 2001, p. 21).

In regards urban design and city performance, the stations are more decisive than tunnels. Each circle with a radius of approximately 500 meters represents the stations' influential service zones, which generally correspond to the most significant activity and production areas in proximity to the city center.

Nowadays, due to the increasing need for mobility and the limited capacity of existing streets and highways, the Metro can effectively increase movement capacity by moving large groups of people below the ground level, and consequently, reduce or balance the traffic load on the ground level. Following the structure of metro lines, along with the placement of its stations concerning the former city structures, indicates that depending on population growth, technological advances, and new social needs, the city's infrastructure is something that is built, multiplied, or diversified over time.

However, the subterranean metro lines do not always follow the logic of urban routes. The Metro looks for density, and at the same time, it can cause and force it. The Metro's construction responds to geographical, infrastructure, and, above all, population and activity circumstances. Rich or poor neighborhoods, commercial areas, historical and administrative centers, neutral areas, hospitals, or universities are among many other destinations that can easily be accessible by likely erratic metro lines and through strategic points of stations (Manuel de Solà, 2006).

<sup>3</sup> See the book "Mangroves Urbaines, Du métro à la ville : Paris, Montréal, Singapour" by Mangin, David; Girodo, Marion; Avec Seura Architects, 2016, pp.6-9. "An urban mangrove is an urban and architectural system allowing its users to go directly, from a transport platform in the basement to various spaces, underground or aerial. Each urban mangrove comprises three types of spaces, forming a unique whole. The first are places of underground public transport (metro, RER), and the second are places of destination (such as shopping centers, museums, offices), either placed in underground, overhead, or between two, which are often the submerged part of the urban ensemble. Finally, interface locations (as well as corridors, squares, underground streets, overhead walkways, elevators) connect transport and destination locations."

## 5.1. ESFAHAN RAILWAY PROJECTS, A REVIEW SINCE 1969

Since the metro construction in Esfahan is still an ongoing project, it's worth understanding the background of the city of "Iron" and the Iranian context. The history of construction and operation of the first railway in Iran dates back to 1848 AD (during the reign of Nasser al-Din Shah) with the construction of a railway line between Bandar Anzali and Rasht (southern shores of the Caspian Sea) approximately 40 km, which was dismantled in the middle of the Pahlavi I period (around the 1930s). Among the other railway lines built during this period, a 149-kilometer-long railway line connecting Tabriz and Julfa cities must be mentioned, which still operates today. The construction of this line was financed through a 1912 agreement between the Iranian government and Tsarist Russia and was completed during World War I (Wikipedia, 2021).

Later, there were some proposals to construct the country's main north-south and east-west rail routes until the end of the Qajar period (1925) and before the Reza Khan's coup. The proposed routes were based on the national and historical trade routes associated with major cities, yet they were never implemented.<sup>4</sup>

The construction of a national railway in Iran was considered one of the great national objectives, which despite the nearly half a century of efforts of some authorities in this crucial matter, it was not realized until the 1920s. In 1927, by order of Reza Shah Pahlavi, a national 1,394 km-long railway started to be built on three sides north, south, and center (current location of Tehran railway station), which was budgeted from the government's revenue from sugar, and tea tax, and it ended eleven years later on August 18, 1938.

This national railway connected Shahpour port (Emam Khomeini port) along the Persian Gulf, in the south of the country to Shah port in the north, on the Caspian Sea's southeast corner. Historical evidence shows that from Tehran to the Persian Gulf, or the southern section of this railway line was determined based on political and military considerations regarding the central government's control over some autonomous and western nomadic areas. Apart from the capital, this line did not connect to other major Iranian cities, such as Esfahan, Shiraz, and Bandar-Abbas.

During the World War II, this railway was devoted to the US and British governments for five years to assist the Soviet government in the war against Germany. With the help of Iran's national railway, allied forces easily could transport 5.5 million tons of goods (weapons, ammunition, chemicals, and food) from the port of Shapur (Emam Khomeini) to the Caspian coast.

Nevertheless, the connection of the Esfahan railway to the country's rail transportation network dates back to the late 1960s and the early 1970s when the Esfahan railway station was located approximately 20 kilometers south of the city center and in an area of 6,700 square meters. The station was launched in 1980<sup>5</sup> as a terminal station, which means that it is the end of the railway line and is the train's final destination.

In the following section, projects that are related to Esfahan's railway lines from 1960 to the present have been studied to better understand the city's current metro system as an alternative of public transportation.

<sup>4</sup> During the Qajar period, for instance, the Iranian North-South railway line proposal was supposed to run from Bandar Abbas (south) to Bandar Anzali (north), the country's most important commercial ports at the time, and connect to important cities of Shiraz, Esfahan, and Tehran.

<sup>5</sup> News-site of the Ministry of Roads and Urban Development, "Esfahan Railway Station; A modern interpretation of the traditional architecture of Esfahan," March 11, 2020, <http://news.mrud.ir/news/79111>

## The 1960s

As said, the first thought of establishing the territorial rail lines in Esfahan dates back to the 1960s when the steel company was being constructed. A Russian consulting company proposed a project to connect the newly built international Esfahan airport, almost 20 kilometers away from the city center towards the North-East to the new Fuladshahr company town and the steel company located 40 kilometers away from the city center in the South-West direction. Although this proposal was never implemented, it introduced a new discussion about different possibilities and opportunities that could be realized by connecting the city and the existing and future essential territorial elements through railroads rather than asphalt highways.

An interesting point in comparing the planning and implementation of the railway lines between Esfahan and the country's capital (Tehran) is that due to the location of the large steel industry in Esfahan the studies related to the suburban rail transportation occurred earlier<sup>6</sup>.

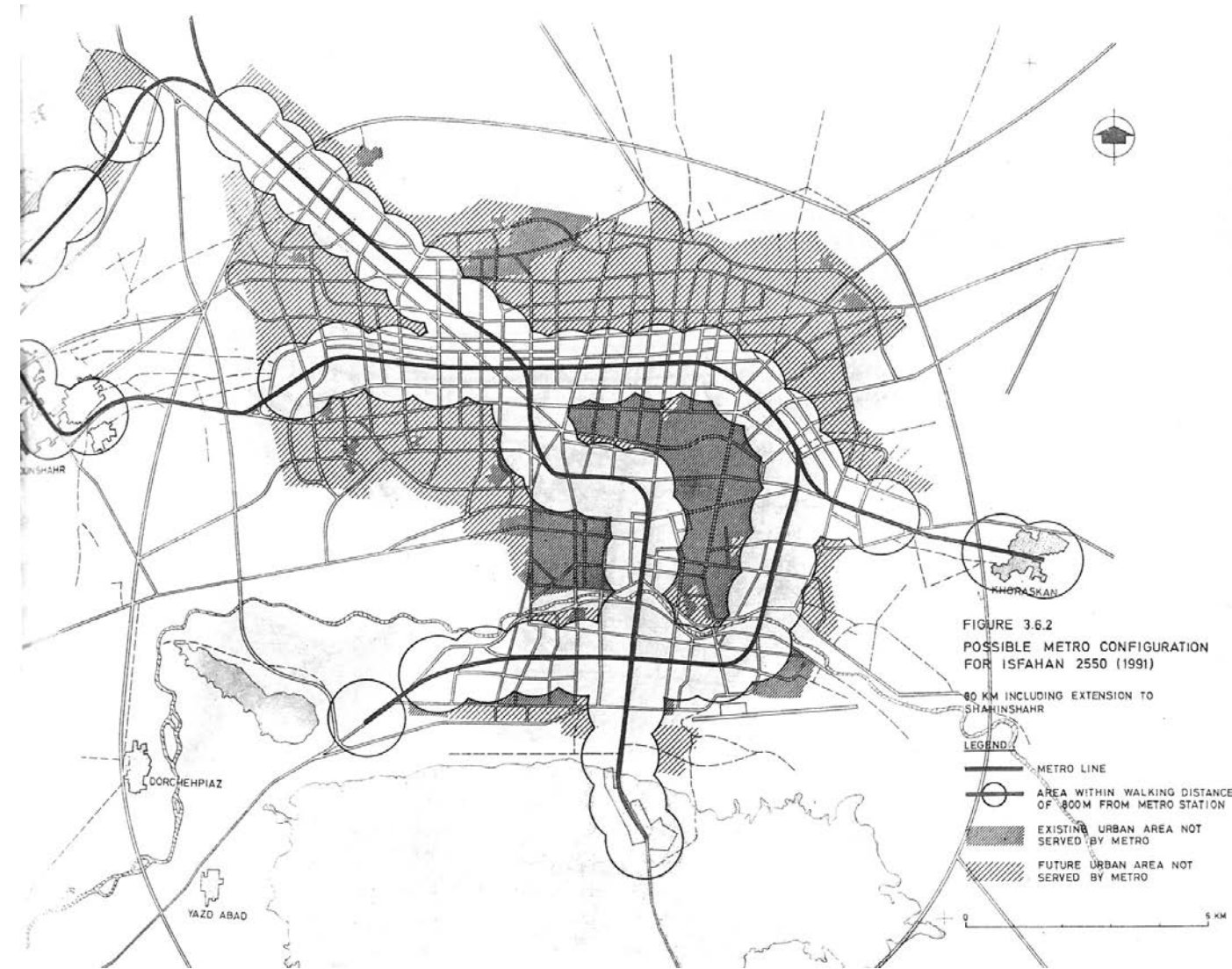
<sup>6</sup> Comparing Esfahan to the capital, the first plans for the Tehran subterranean metro lines were made during Gholamreza Nikpey's mayoralty in 1971 (5 years before Volvo's comprehensive transport plan for Esfahan). In October 1974, foreign consulting firms, including Soferto, conducted studies to solve the Tehran traffic issues by proposing a new network of seven metro lines. In 1977, French companies began their work on Tehran's Metro Line 1. Due to the Islamic Revolution (1979) and the ensuing Iran-Iraq war, foreign consultants were forced to abandon the project. Currently, the Tehran Metro is operating in seven main lines inside and outside the city, which according to development plans, the Tehran Metro lines are to be increased to 11 lines. As of June 2021, the length of the operating metro lines is 253.7 km with 142 stations. The number of active wagons in the Tehran metro is 1514 wagons, equal to 217 trains that transport an average of more than 2.5 million passengers daily.

## The 1970s

In 1976, the Swedish Volvo consulting engineers conducted the initial study of urban transport in Esfahan. The study considered four alternative public transportation systems: metro, tramway, grouped rapid transit (GRT), i.e., automatic vehicles on mainly elevated guideways, and integrated bus lines and stations, in three different levels of the underground, street, and elevated levels, which were never implemented (AB Volvo, 1976, pp. VIII, 55).

The proposal plan considered two metro lines crossing at two northwest and south points of the city. The design of the metro lines was based on the Organic proposal of Esfahan's Master plan (1969-1971), illustrated in Fig. 264. The two proposed metro lines including their additional branches considered to connect with the five, east, north, west, southwest, and the south regional corridors linking their essential territorial elements and destinations. The total length of this network was 80 km (double track), and it contained about 65 stations (AB Volvo, 1976, p. 54).

A supplementary bus system coordinated with the tramway, using the same route and connecting to the metro system, would link to regional bus terminals and territorial corridors at the ends of their lines.



**Fig. 264.** Possible metro configuration for Esfahan 2550 (1991). Source: the report of the initial study for Esfahan urban transport by Volvo, 1976.

The 1980s

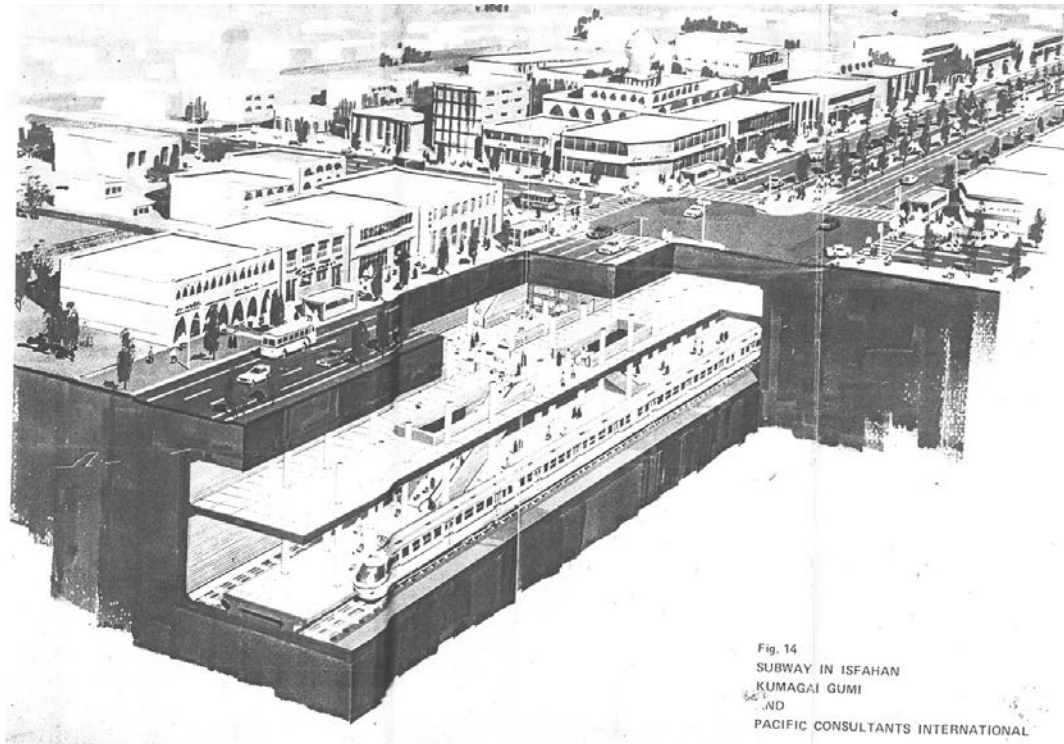


Fig. 265. A perspective- section of a proposal Subway station in Esfahan by Kumagai Gumi and Pacific Consultants, 1984.

A decade later, in 1984, at the request of the Deputy Governor-General of Esfahan Province, the Islamic Republic of Iran, and the Japanese company of Kumagai Gumi and Pacific consultants, concluded a contract for conducting a preliminary survey through a Comprehensive Urban Transport Study in the Esfahan metropolitan. This study formulated a master plan for the urban transport system in the Esfahan metropolitan region, including urban renewal planning for Esfahan's central district (Kumagai Gumi, 1984, p. 1.1).

As a result of the preliminary survey, some recommendations regarding the present and future transportation system in the Esfahan urban and metropolitan areas were presented.

The study stated that as traffic increased between the central city areas and suburban

industrial zones, new towns, and the city outskirts, public transportation would become even more necessary to connect the city center and bus terminals on the city edges. It also admitted that the metro could provide the best solution for transporting great numbers of people without disrupting street-level traffic. At the same time, it would not irritate the beautiful Esfahan city's view, including many patrimonial low height buildings, particularly in the city's historic central area (Kumagai Gumi, 1984, pp. 5.8, 7.5, 7.6).

Finally, the two metro lines were planned according to the north-south and east-west corridors. As the central part of the city was expanding along Chahar-Bagh Street to the north and south directions, metro line 1 was proposed following this axis, connecting the city center to

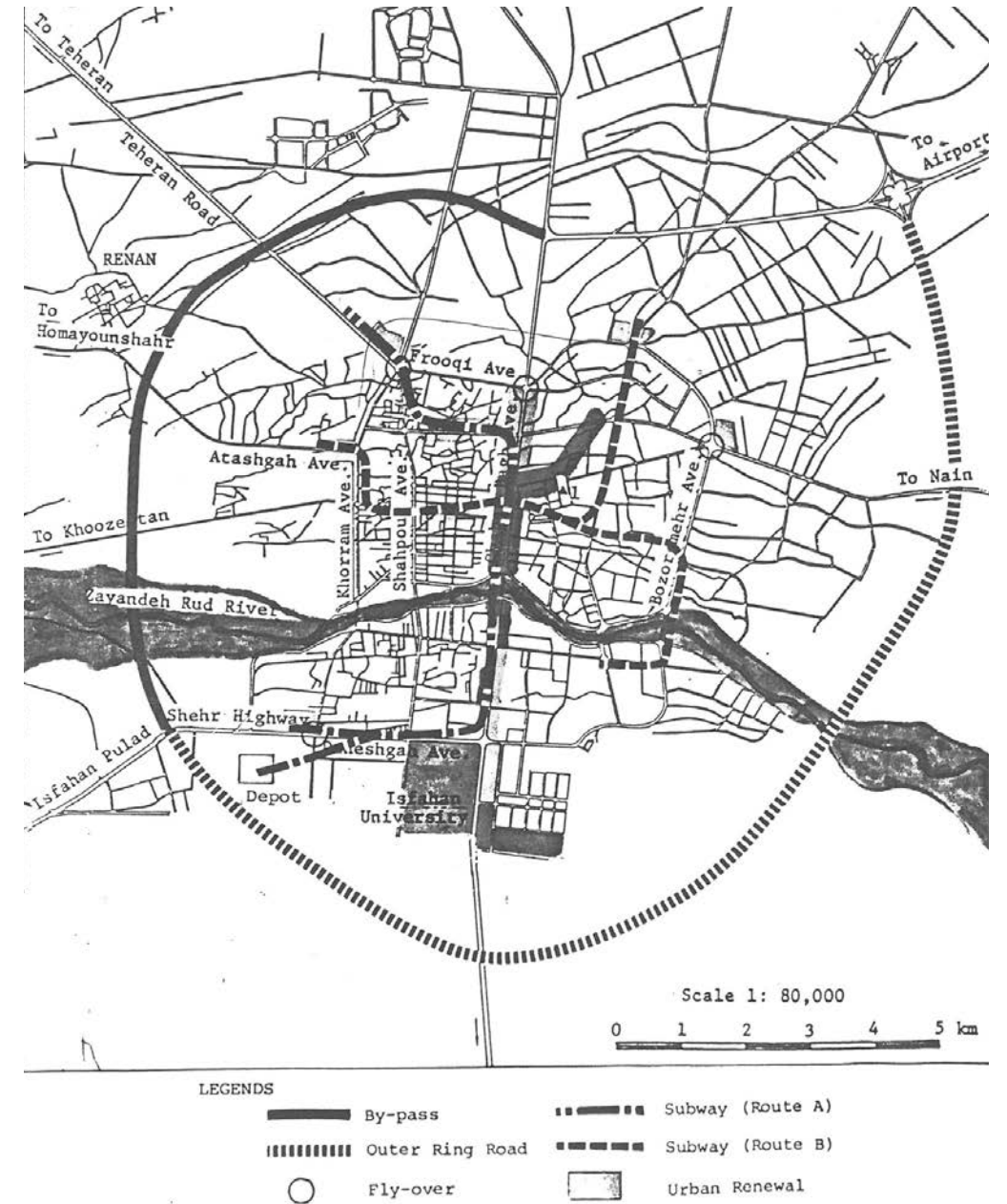


Fig. 266. Location map of the recommended projects, including Subway metro lines. Source: Preliminary survey report and technical proposal for the Esfahan metropolitan area's comprehensive urban transport study by Kumagai Gumi & Pacific Consultants, 1984.

the north and the south-western bus terminals and regional corridors. Future extensions could be made to the north and south, where residential areas were developing at the time (Kumagai Gumi, 1984, pp. 7.9, 7.10) (Fig. 266).

Metro line 2 was planned to be introduced from the city center and Bazaar connected to the western regional corridor and suburban areas like Sedeh (Homayounshahr town) on one side, and the north-eastern regional corridor, on the other side. A branch line was also predicted to extend to the newly built residential area at that time and along the eastern section of the First Ring road (Bozorgmehr Avenue) (Kumagai Gumi, 1984, p. 7.12).

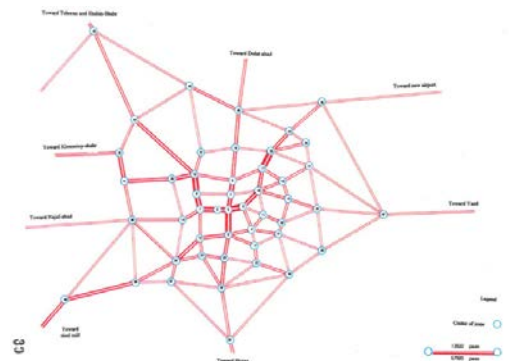
Apart from the two metro lines, the final scheme (Fig. 266) also considered a new ring road, which was never built in the same way, but it shows the multidisciplinary approach of the plan to the development and growth of the city.

**The 1990s**

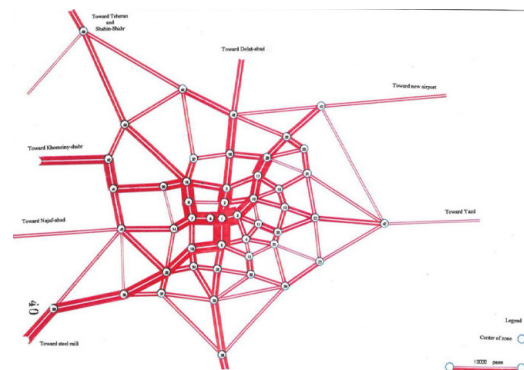
On November 23, 1992, the Esfahan Regional Metro Company (ERMC), later converted to the Esfahan Urban Railway Organization (EURO), and the International French consultants of SOFRETU signed a contract to carry out a "Prefeasibility and Feasibility Study" of the "Esfahan Mass Rapid Transit System," presented in March 1995. The study was based on various features, including different urban development scenarios, socioeconomic data collection, traffic data, present, and future traffic demands, selection of corridors, construction technologies, and preliminary cost evaluation.

Later, in November 1996, Sydney Australia's PPK Environment & Infrastructure also signed a contract to conduct a complete feasibility analysis on introducing the Mass Rapid Transit System for Esfahan and the region and the preliminary design

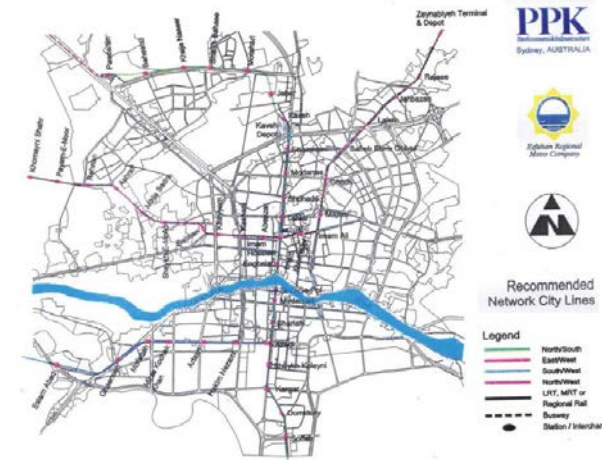
of a priority metro line for the City and a railway line for the region. In less than a year, in July 1997, an interim report was presented to distinguish the feasibility study results and recommend the form and arrangement of the priority lines and future network. This study was approved in August of the same year. Since then, despite subsequent revisions and changes to some of the lines carried out by the Esfahan Regional Metro Company, the final plan for the existing metro line 1's construction was submitted in September 1998.



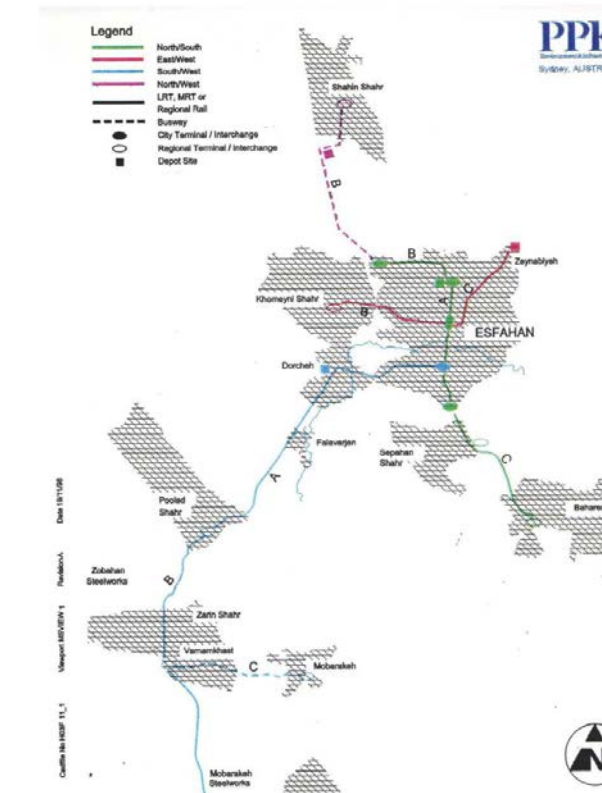
**Fig. 267.** Traffic assignment of the present network (passenger/day) 1988, by Sofretu Co.



**Fig. 268.** Traffic assignment of future network (passenger/day) 2007, by Sofretu Co.



**Fig. 269.** Verified planned Esfahan metro lines Recommended by PPK Co, 1998.



**Fig. 270.** Verified planned Esfahan regional railway lines Recommended by PPK Co, 1998.

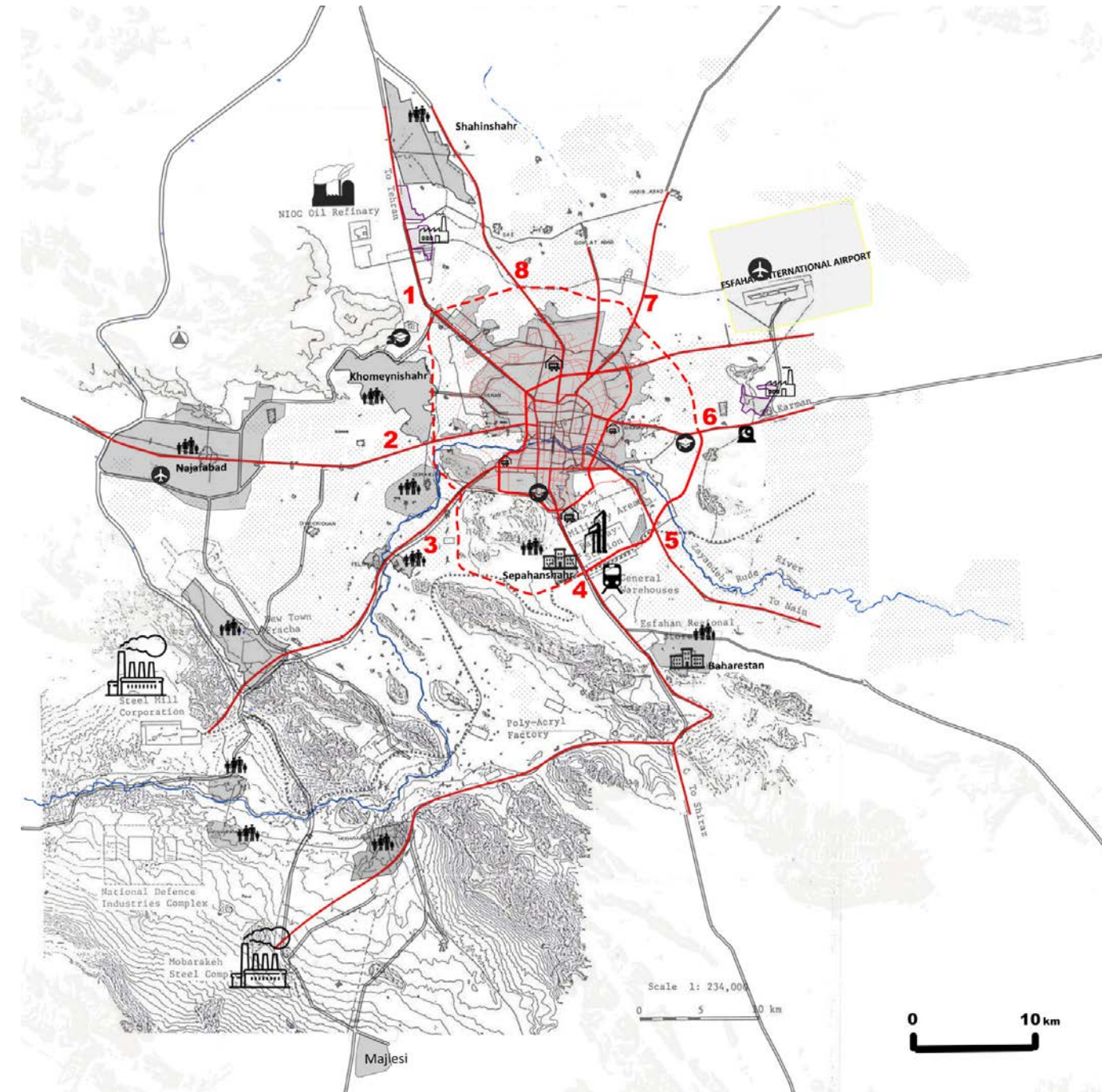




## 5.2. TERRITORIAL RAILWAY LINES: THE REGIONAL DIMENSION OF THE METROPOLIS

Beyond the metro design within the city, the construction of the city of "Iron" is also linked with Esfahan's regional scale. In the previous chapters, connectivity and partnership between the city and its surrounding villages have been considered critical. In the third Chapter (3.1.1), the significance of communication and commercialization were discussed in the city's growth and development. It also mentioned the critical role of governments in developing and monitoring the safety of commercial roads, considering eight territorial and global ancient trade routes reaching the thirteen gates in the Safavid Period connected to the central city's nodes.

Subsequently, in the 20th century with the arrival of cars and the ability to access longer distances, the area around the city rapidly changed. Important signs of these changes have been the construction of large industries, formation of new company-towns in short distances from large industrial factories, expansion, and transformation of rural population centers into growing municipalities, location and construction of the airport and train station, universities, and large complex shopping malls and centers outside the city. These changes significantly increased the demand for movement and transportation between the city center and the suburbs and were simultaneously accompanied by widening, asphaltting, and eventually replacing broad highways with previous regional routes (Fig. 275).



**Fig. 275.** The actual Esfahan regional plan, radial corridors, rings and their associated territorial elements, based on Organic Master Plan of 1968, plan of Esfahan region existing and proposed development. Source: author

### 5.2.1. Three Suburban Railway Lines: Chaining a Sequence of Territorial Incidences

Due to the divergence of these regional corridors (highways) and the growing travel demand and traffic capacity, a new suburban railway line system is on the agenda to support the existing "Asphalt" infrastructures. The overlap of the new regional railway lines with the metro lines and stations can integrate longer-distance destinations such as the large industries and the satellite cities to the local places within the cities.

Unfortunately, up to this moment (2021), no territorial railway lines have been entirely built or are being used. However, as mentioned earlier, various projects have been considered since the 1960s, primarily the first city's proposal Kocks Master plan, which considered the regional railway lines in the development and construction of the city.

Apart from the west and north-east road corridors, which the second metro line will cover<sup>7</sup>, three other suburban railway lines have been planned for the region:

- The Southwest Corridor, toward Fouladshar,
- The South Corridor, toward Baharestan,
- The Northwest Corridor, toward the Shahin Shar.

The total length of these suburban railways is estimated to be 156 kilometers, designed by the P.P.K Consulting company (in the late 1990s) and became more accurate and advanced by the Sistra Consultant (in 2016). Two of these three regional

<sup>7</sup>The under-construction metro line 2 will be a territorial metro line as it supports the northeast and western corridor and will directly connect Khomeinishahr town (b) on the west to the Zeynabieh quarter in the northeast of the city (without changing lines) (Fig. 276).

railway lines are partially under construction. They will link to the urban metro lines by connecting to Metro Line 1's two heads and the proposed Metro Line 3's western head.

However, it seems very interesting that all proposed territorial railway and metro lines will be attending the existing regional roads and their existing essential and cooperating elements. Some of these significant territorial settlements are illustrated in figure 276.

Among the most prominent industrial sites<sup>8</sup> that will be linked with the provisional territorial railway lines are:

The Aria-Mehr Steel Industries<sup>9</sup> (1), the Esfahan Mobarakeh Steel Company<sup>10</sup> (2), and the Esfahan Oil Refining Company<sup>11</sup> (3) will be linked to the three regional railway lines in different directions. The Jey industrial site (4) and the Esfahan's international airport (5), are located respectively at a distance of 15 and 20 kilometers towards the east of the city center are yet not considered to support by railway lines in the east direction.

Considering the surrounding satellite towns in the Esfahan metropolitan area, some have historical roots with a rural origin and are dependent on agriculture production like Najafabad (a) and Khomeinishahr (b), located in the city's west direction. In contrast, some others have been built to settle the overpopulation of Esfahan city, such as Baharestan (c) and Sepahan-Shahr (d). Finally,

<sup>8</sup>The initial idea of designing the Esfahan city railways was related to the Aria-Mehr (Zobahan) Steel Industrial company (having 16000 present employees) in the '60s, which was enforced by adding up Mobarakeh Steel company (12900 current employees) in the 90s. The relocation of the employees of these large companies pays a high daily fee to transport their employees, who often live in Esfahan.

<sup>9</sup>The Aria-Mehr Steel Industries was founded in the '60s as the first steel plant in the country being renamed the Esfahan Steel Plant after the Islamic Revolution, 40 kilometers southwest Esfahan.

<sup>10</sup>The Esfahan Mobarakeh Steel Company was established in 1992 and is now one of the largest industrial units and the country's largest steel production complex. The company is located on a land area of 35 square kilometers close to Mobarakeh city and 75 kilometers southwest of Esfahan.

<sup>11</sup>The Esfahan Oil Refining Company has been operating since 1979 and now produces about 23% of the whole country's petroleum products. This company is located on a 340-hectare area adjacent to Esfahan's northwest corridor.

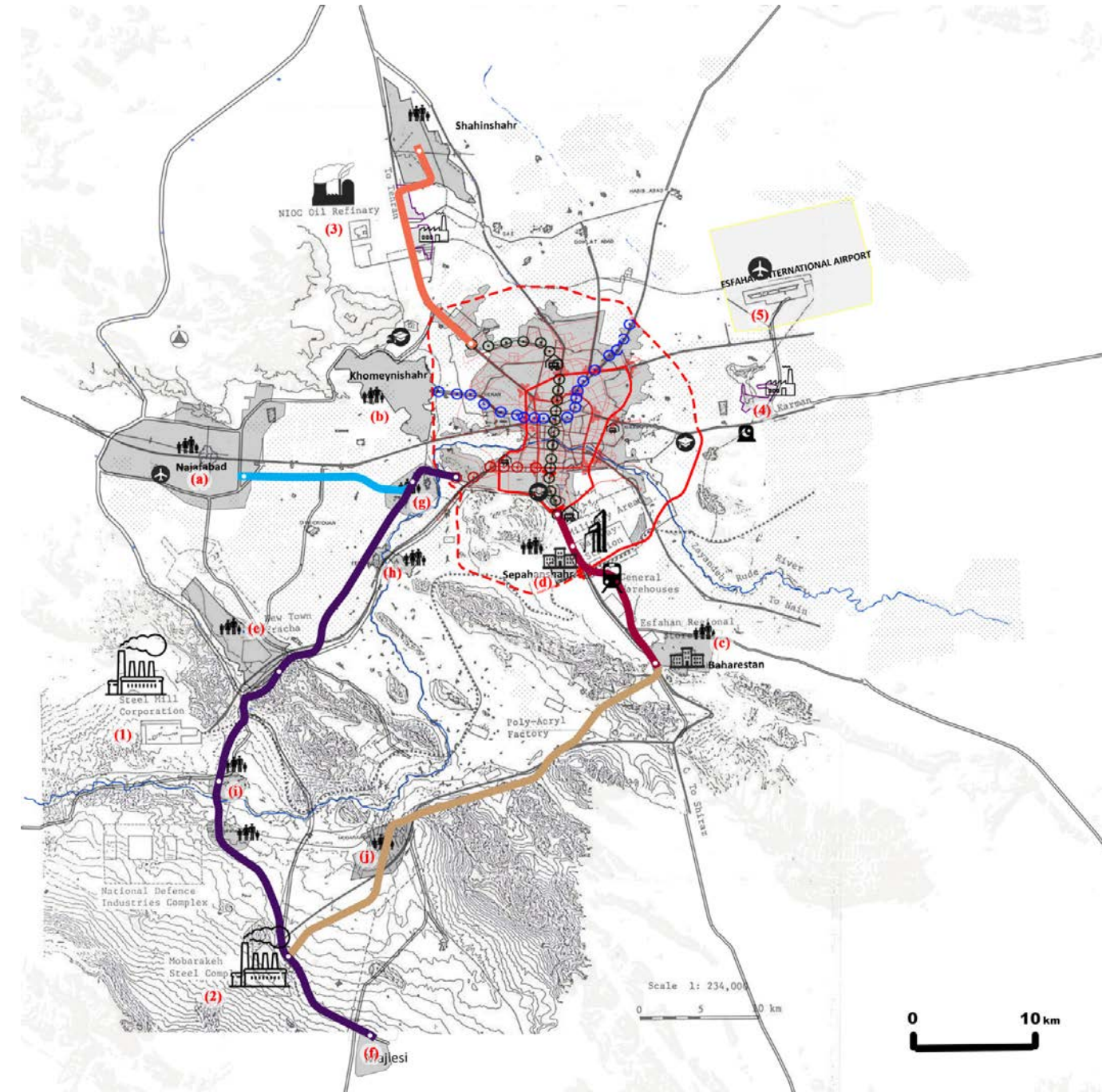


Fig. 276. Logics of proposal territorial suburban railway lines, Source: author

some industrial towns were also constructed to place the significant workforce of industrial companies at a short distance from these factories, such as Foulad-Shahr (e), and Majlesi towns (f). The three proposal regional railway lines have been considered and will link all these different forms of population hubs surrounding Esfahan city.

**The southwest territorial railway line** is the most strategic line of the region, which transmits the most demanded traffic movements concerning the necessities of big industrial factories, and the surrounding satellite towns and villages are set along the Zayandeh Rud Valley. At present, the Zobahan Highway is in charge of carrying the entire traffic of this corridor. Massive traffic of private cars, buses, and minibusses are seen in the mornings and afternoons and during peak hours when transporting the workforces between the big steel industries and Esfahan through this highway.

The provisioned south-west railway line, including its seven stations, will be 70 kilometers long from Darvazeh-Shiraz (the intersection of the first and the third metro lines), adjacent to the Esfahan University, to the Mobarakeh Steel factory and Majlesi city, and linked Esfahan to the different towns of Flavarjan (~16 kilometers) (h), Fouladshahr (~30 km) (e), Zarinshahr (~40 km) (i), Mobarakeh (~60 km) (j), and Majlesi (~70 km).

Another suggested extension, presented in blue color (Fig. 276), will branch from the southwest suburban railway lines at Dorche city (g). This recommended line is under design and study, to connect Najafabad city (30 kilometers west of Esfahan with a 200,000 population) to the third metro line and the city of Esfahan.

**The southern suburban railway line** will have two main sections; the first part will be the extension of the metro line 1 and will overlap the Qods station the last station of this line, in front of the Sofeh intercity bus terminal and extended for around 16 kilometers towards Baharestan city (with an 80,000 population) in the South. The line has been under construction since 2015 and will have four stations.

The second section of this line will be extended toward the southwest with a length of 41.5 kilometers. The proposed railway line will pass through the town of Mobarakeh with a population of less than 100,000 and will cross the southwest railway line at the station of Foulad Mobarakeh, adjacent to the Foulad Mobarakeh Steel factory.

**The northwest suburban railway line** (Esfahan-Shahin Shahr) is 20 kilometers long, and its construction started in 2020. Only 5.5 kilometers of the line is located in Esfahan, including five stations terminating at the Esfahan University of Technology station. The four other stations of the line include Bakhtiar-Dasht, Esfahan refinery, Shahid Montazeri power plant, and Valiasr square in the south of Shahinshahr city with a population of around 180,000.

Concerning the territorial railway lines, the stations get placed in more irregular and longer distances according to various crossing things on their ways, such as population centers and dominant industrial factories. Actually, it is known that the railway stations have a more selective and distant distribution, covering a much larger influential area in comparison to the metro.

## 5.3. ESSENTIAL FEATURES IN THE CONFIGURATION OF ESFAHAN'S METRO SYSTEM

### 5.3.1. Metro Line 1: The Most Critical Esfahan Metro Line

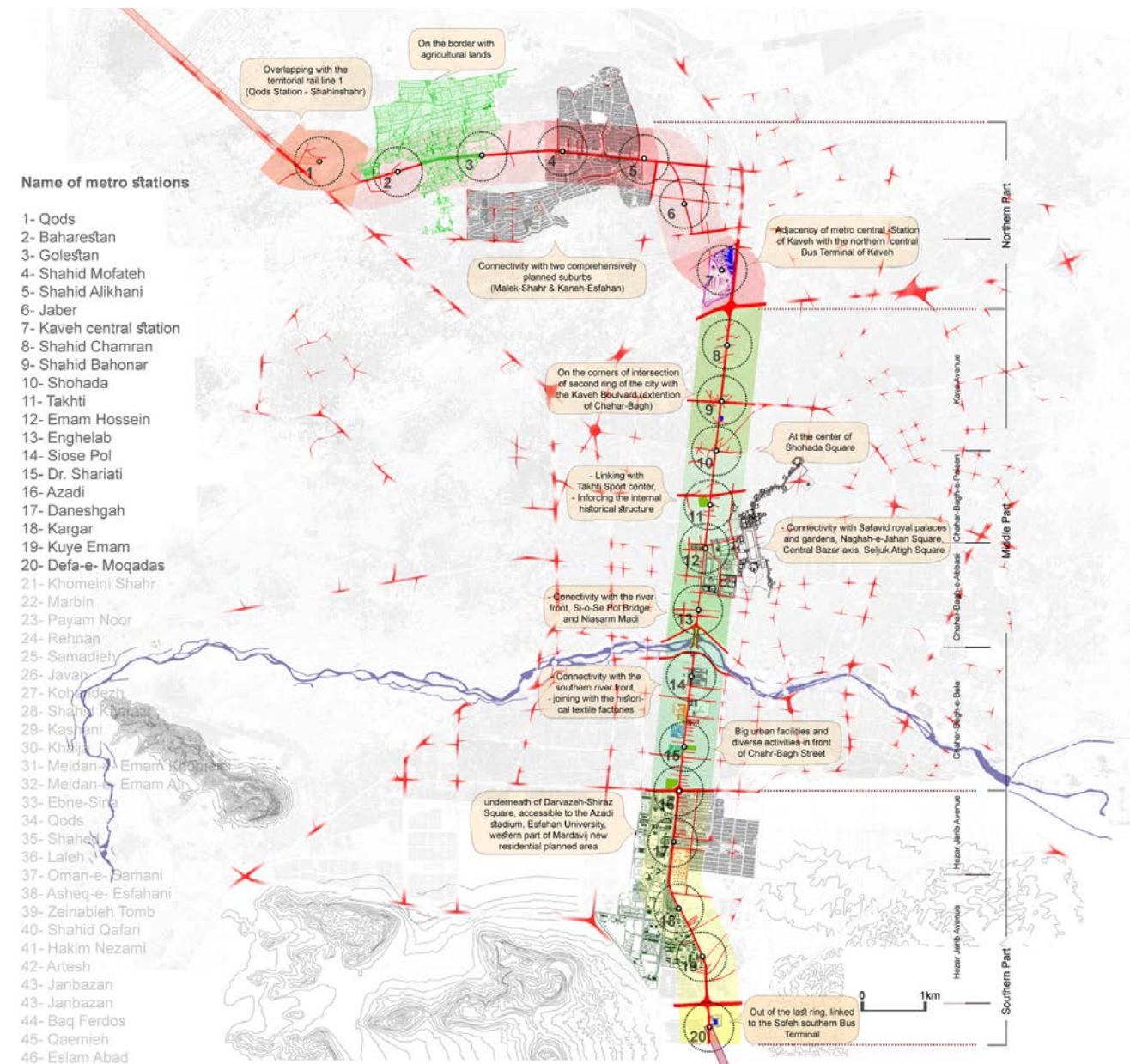


Fig. 277. The form of the metro line 1 and the stations' locations concerning the contextual elements. Source: author

### 5.3.1.1. The Northern Part, Overlap with the Northwest Territorial Railway Line

Esfahan Metro Line 1 has been the most critical since it crosses from under the historical Chahar Bagh Avenue, which took nearly 20 years to be completed. The line is 20.2 kilometers long and consists of 20 stations, and connects the northwest of Esfahan to the south. From the north to the south direction, the line will be, respectfully, linked with the Esfahan-Shahinshahr territorial railway line (at its northwest head), the metro line 2 (at the central Emam Hossein station), and finally, the Metro line 3 and the south regional railway (at its southern head).

According to principles such as form, direction, and supporting existing infrastructure elements, metro line 1 can be divided into three sections shown in figure. 277. Due to differences in each segment, each of these parts comprises smaller divisions, which are briefly explained herein.

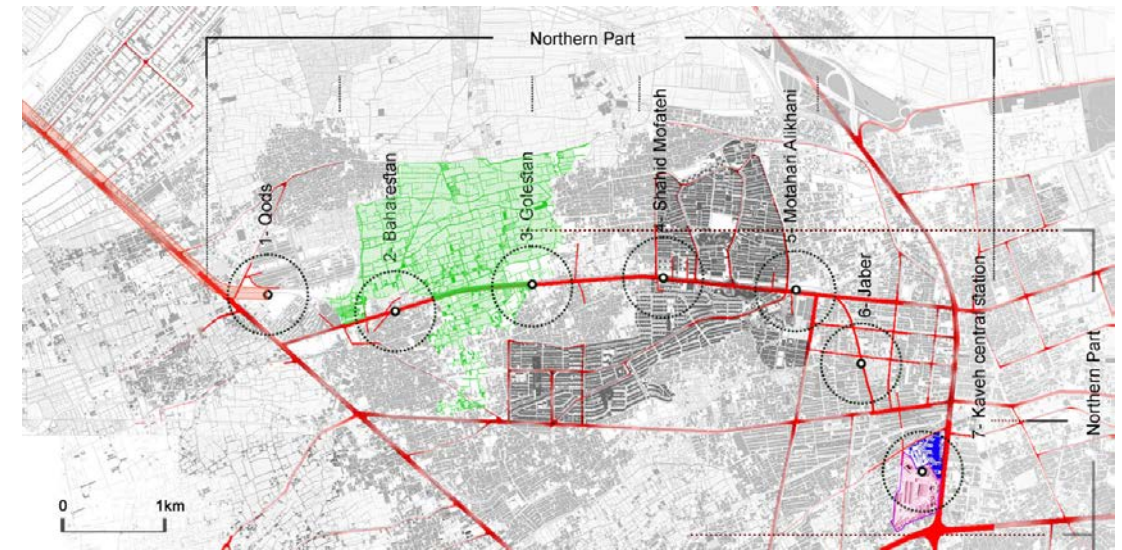


Fig. 278. Logics of metro line one, Northern Part, Source: author

The northern line section extends 7.8 kilometers in the west-east direction between Qods (1) and Kaveh stations (7), having seven stations. Considering the technical and engineering standards, a pretty fixed distance among the stations (approximately one minute) makes different inevitable situations depending on the varying contexts of the station emergence places and form smaller sectors.

Most of the stations' locations have followed the existing main street trajectories of Jaber Street and Kaveh boulevard and gave them a new dimension and added value.

Among the most important stations site features of the north part of the metro line 1's, it can be seen:

(A) Overlap with the north-west regional railway line at Qods Station (completed in October 2015) (Figs. 278-280),

(B) the intermediary character of some stations, as well as, Baharestan (2), Golestan (3), and Jaber (6) stations surrounded by a low density of buildings, due to the fact that they are located at the edge of the agricultural lands or do not support any essential or primary structural or monumental elements (Figs. 278 - 282),

(C) the connection of Mofateh (4) and Motahhari (5) stations with the contemporary Khaneh-Esfahan, and Malekshahr residential neighborhoods,

(D) the linkage of the Kaveh station (completed in 2015) to the northern inter-city Kaveh bus terminal (Figs. 283 & 284).



Fig. 279. Qods metro station, 2018. Source: Mohsen Esmaili

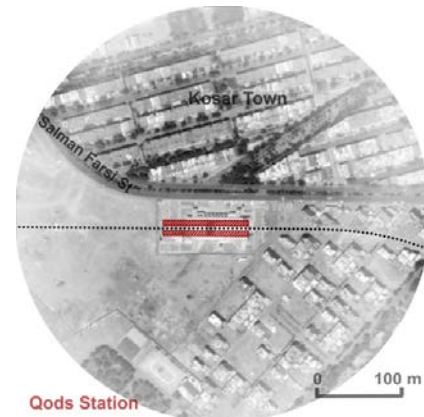


Fig. 280. Metro Line 1, location of Qods Metro station on aerial photo of 2012.

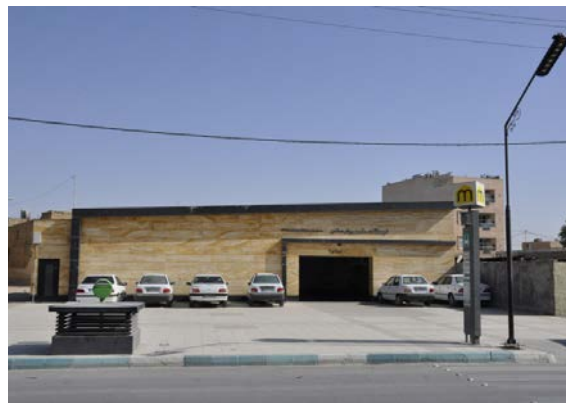


Fig. 281. Golestan metro station, June 2022. source: Hasan Kharaji



Fig. 282. Metro Line 1, location of Golestan Metro station on aerial photo of 2012.



Fig. 283. Kaveh metro station, 2018. Source: Atieh Joveireh

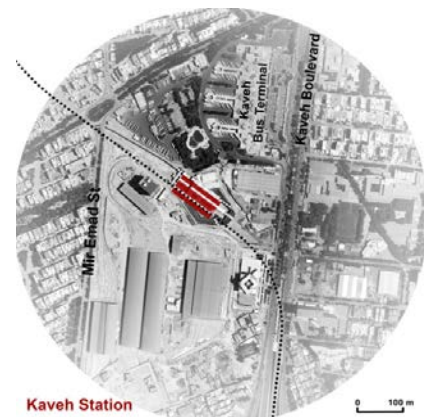


Fig. 284. Metro Line 1, location of Kaveh Metro station on aerial photo of 2012.

5.3.1.2. The Middle Part, Supporting the Primary North-South Extension of Chahar-Bagh

Metro line 1's central section includes nine stations, extending almost 9.3 kilometers (an average distance of more than 1000 meters between stations) and supports the north-south extensions of Chahar Bagh Avenue and Kaveh boulevard as the most central city axis, which runs between Kaveh and Azadi stations.

Regardless of Chamran (8) and Bahonar (9) station's entrances, set on the front edges of Kaveh boulevard and between the first and the Second Ring roads, the rest of the stations are located inside the First Ring and the city's historical domain.

As the metro stations approach the city center, the distance between the metro stations reduces because of the higher population density, variety of uses, concentrated activities at the street's front edges, and increased number of historical monuments and community centers. The multiple accesses, different historical and modern elements distributed around the stations affect the position and importance of each station.

The three stations of Shohada (10), Takhti (11), and Emam Hossein (12) have an average of 800 meters from each other and are located between the Shohada square (the intersection of the First Ring road with Chahar Bagh Paieen street) and Darvazeh Dolat or Emam Hossein square (at the north head of Abbasid Chahar-Bagh street). These three stations with very different features, are surrounded by various networks of encounter places and will be deeply analyzed as the three station case studies in the last part of this chapter.

The most central part of the metro line 1 has been laid under the Safavid Chahar-Bagh Abbasi street, which is limited in between Darvazeh Dolat square, Emam Hossein station, and the north head of Si-o-Se-Pol bridge, Enghelab station (13), in a distance of more than a 1000 meters away from one another. These stations have the most commercial, cultural, and tourism attractions due to the fabulous permeable fronts of Chahar-Bagh street and proximity to the most central monuments and historical city areas.

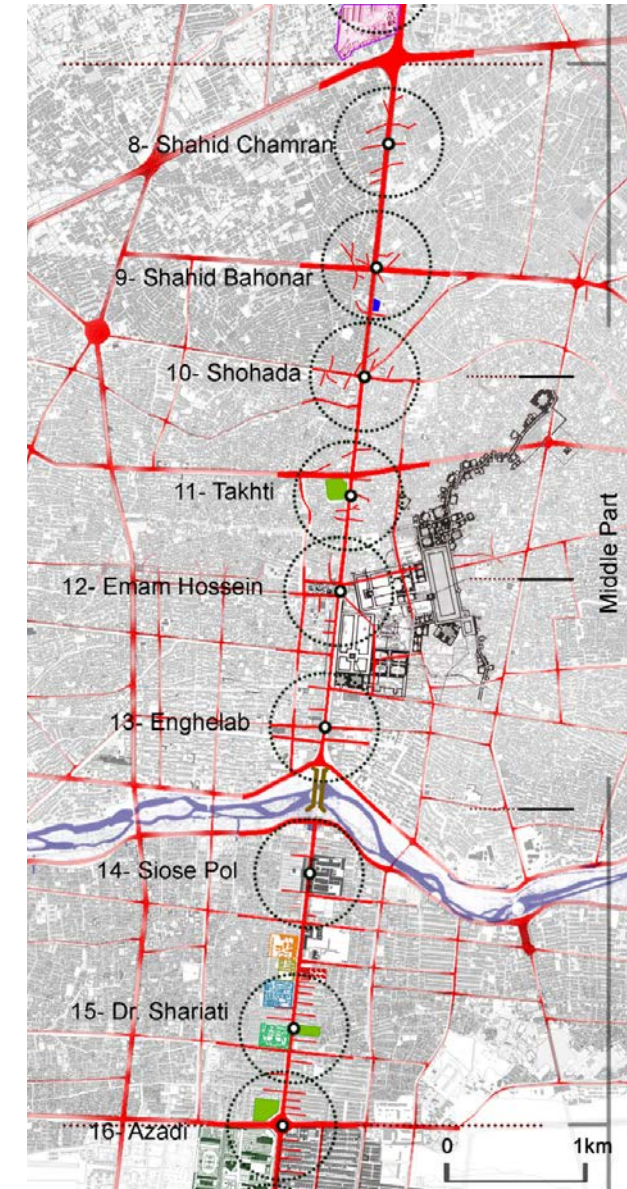
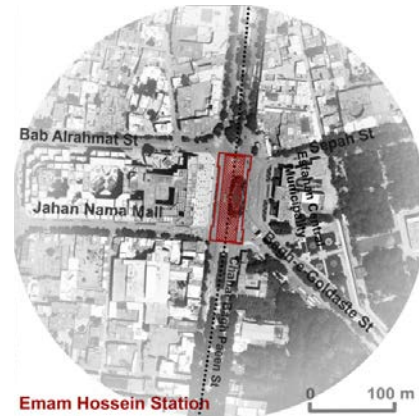


Fig. 285. Logics of metro line one, Central Part, Source: author



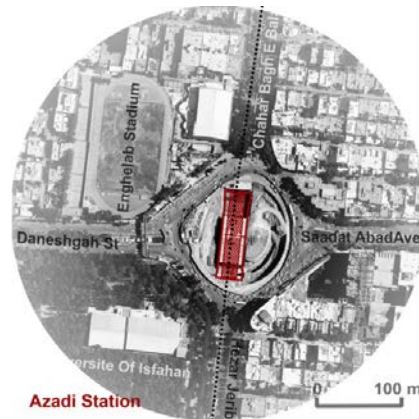
**Fig. 286.** Emam Hossein metro entrance, October 2020, Source: Farzad Beygi



**Fig. 287.** Metro Line 1, location of Emam Hossein Metro station on aerial photo of 2012.



**Fig. 288.** Azadi metro entrance, April 2022, Source: author



**Fig. 289.** Metro Line 1, location of Azadi Metro station on aerial photo of 2012.

On the south side of the river, and from Si-o-Se-Pol bridge to Azadi Square (the intersection of the First Ring road with Chahar-Bagh street), three stations are located at an average distance of the distance approximately 1000 meters. Among the essential features surrounding these stations we can point to the vicinity and attachment of (A) Si-o-Se-Pol station (14) to the patrimonial Risbaf textile factory and the Central City Council Building, (B) Shariati station (15) to the Shariati

hospital, and the intersection of Chahar-Bagh with Shariati streets, and (C) Azadi stations (16) to the Esfahan University and Azadi sports camp.

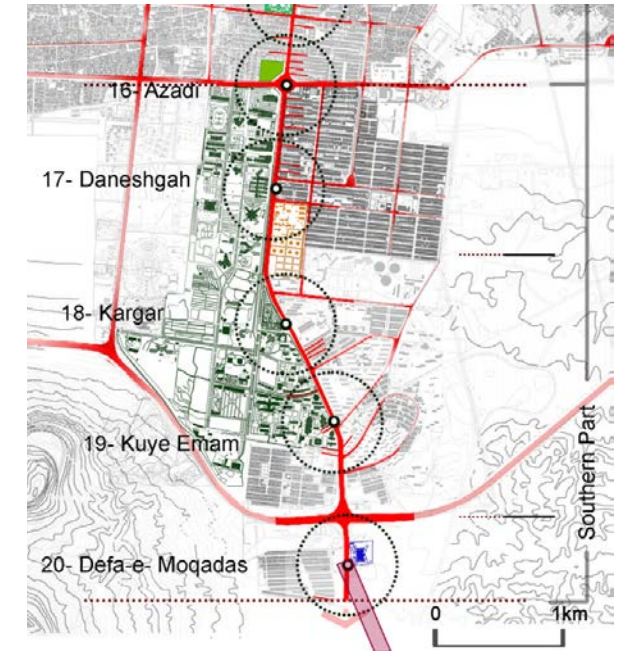
The two stations of Emam-Hosseini and Azadi located at the north and south heads of the central section of metro line 1 are the transitional stations as they will be interchanging points of Metro Line 1 with the other two Lines 2 and 3.

### 5.3.1.3. The Southern Part, Joining the South Regional Railway Line

The four stations of Daneshgah (17), Kargar (18), Kuye Emam (19), and Defa-e-Moqadas (20) are consolidating the southern section of metro line 1, at an average distance of approximately 1000 meters.

Due to the large size (300 hectares) of Esfahan university located at the western edge of this part of metro line 1, the three stations of Daneshgah, Kargar, and Kuye Emam are mostly associated with educational and academic faculties, dormitories on their west and rich residential districts (up to 7-8 floors) government and administrative buildings, and Esfahan oil resources on the east side.

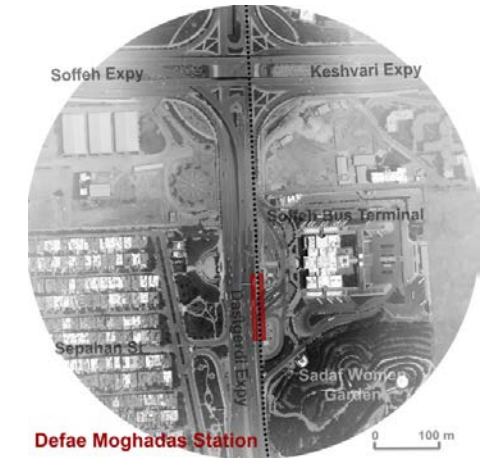
Finally, Defae-Moqadas station, similar to Kaveh station, has a more intermodal character by being located at the front of the Sofeh bus terminal a short distance beyond the Second Ring. This station is considered the last station of metro line 1, where it will join the south and north-west territorial railway lines will not happen in its ordinary way by changing trains, but through only shifting the lines to the ground or upper surfaces.



**Fig. 290.** Logics of metro line one, Southern Part, Source: author



**Fig. 291.** Defae Moqadas metro station Entrance in front of Kaveh Bus terminal, April 2022. Source: author



**Fig. 292.** Metro Line 1, location of Defae Moghadas Metro station on aerial photo of 2012.

### 5.3.2. Metro Line 2, Linking the West and Northeast Regional Corridors to the City Center

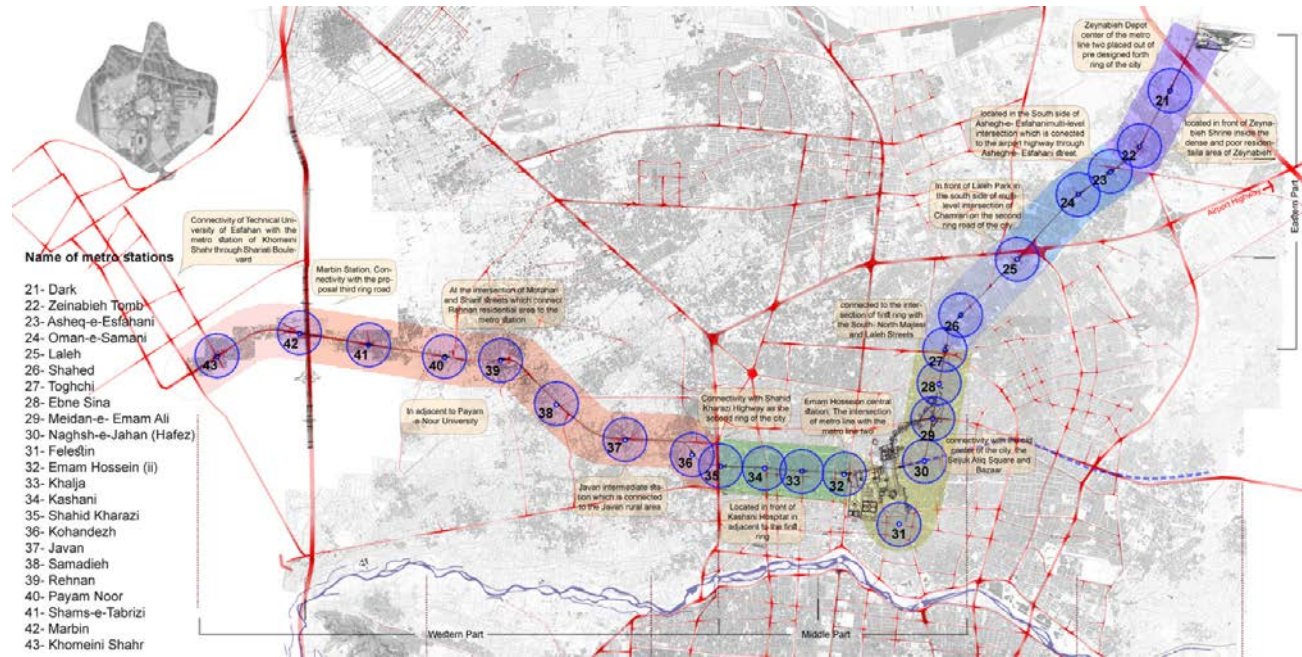


Fig. 293. Logics of metro line two, Source: author

The construction of Esfahan Metro Line 2 began immediately after the completion of Line 1. The line will be 24.4 kilometers long and will consist of 23 stations. As mentioned earlier, in 2016, metro line 2, designed by Systra, Pazhohesh, and Metra companies, started being built from its north-east head. The experience of constructing metro line 1, which lasted 17 years, has led to faster and more accurate construction of line 2. However, due to the lack of sufficient financial resources and the fluctuating project progress rate, predicting the completion time of the entire line is not feasible<sup>12</sup>.

Metro line 2 will be the first with a regional character since it connects to one of the neighboring towns, Khomeini Shahr (with a

<sup>12</sup> According to the report of the interview with Mr. M.B. Hashemi, in September 2021, the present CEO of Esfahan Urban Railway Organization (EURO), the overall physical progress of the Metro Line 2 has reached 32% in the construction phase, which is expected to be completed by 2025.

population of 250,000) located west of the Esfahan metropolis. The line will support the high travel demand in the north-east and the west territorial roadways and will link various population centers set along these corridors to the most commercial, cultural, and touristic central city squares, including the Bazaar, the two primary city squares, and Darvazeh Dolat (Emam Hossein Square) (Fig. 293).

The study has divided metro line 2 into three main sections and smaller fragments, as recognized and illustrated in different colors in Fig. 293, to simplify the explanation of each part of the line and station's various features and specifications.

#### 5.3.2.1. The North-Eastern Part, Serving the Northeast Segregated Communities

The construction of metro line 2 began from the northeast city edge being one of the most underprivileged and densely populated areas of Esfahan.

The north-eastern metro line 2's division extends under the northeast territorial corridor at a length of more than 6.5 kilometers. The stretch includes six stations: Dark (21), Zeinabieh (22), Ashegh-e-Esfahani (23), Oman-e-Samani (24), Laleh (25), and Shahed (26), which will give convenient access to the low-income residential areas located at the city's periphery.

This section's completion process, including its stations, has had the most advance as its construction completion stages are approaching their final stages.

Among the three notable stations' essential features of this section of Line 2 are: (A) the attachment of Zeinabieh station to the commercial center and Hazrat-e-Zeinab's shrine, (B) the proximity of Laleh station to the intersection of the Second Ring road with the north-east regional corridor and the future possibility of interchanging with the extension of Metro line 3, (D) the future possibility of overlapping with the proposed express railway line of Esfahan-Tehran at Dark station.

Most of these stations connect to more deprived neighborhoods in which having economic access to the city center and other territories is one of the major concerns for the residents.



Fig. 294. Metro Line 2 under construction, 2019. Source: Mashreghnews.ir, Mohammad Reza Sharif.



Fig. 295. Metro Line 2, location of proposal Zeinabieh Metro station on aerial photo of 2012.



Fig. 296. Metro Line 2, location of proposal Laleh Metro station on aerial photo of 2012.

### 5.3.2.2. The Central Part, Integration with the Historical City Center

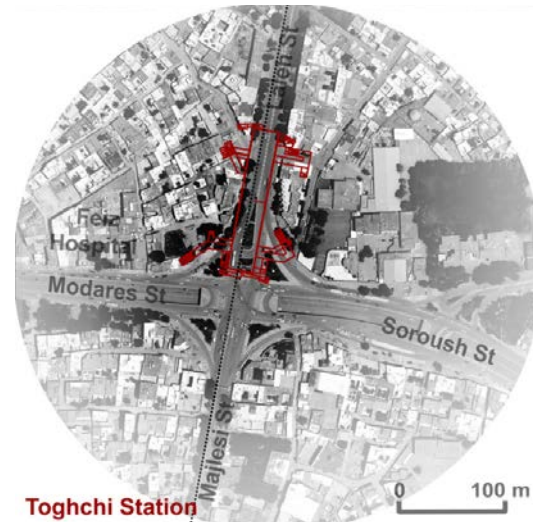
The central section of the metro line 2, which is less than 8 kilometers long, will include nine stations with an average distance of approximately 900 meters between them. This stretch is limited from Toghchi (Qods) (27) station, placed adjacent to the Toghchi square at the city's historical edge (the intersection of the First Ring with the north-east regional corridor), and Shahid Kharazi station (35), in touch with the intersection of Shahid Kharazi highway (the Second Ring road) with Kashani street.

The middle section of metro line 2 can be divided into the three following distinct sections:

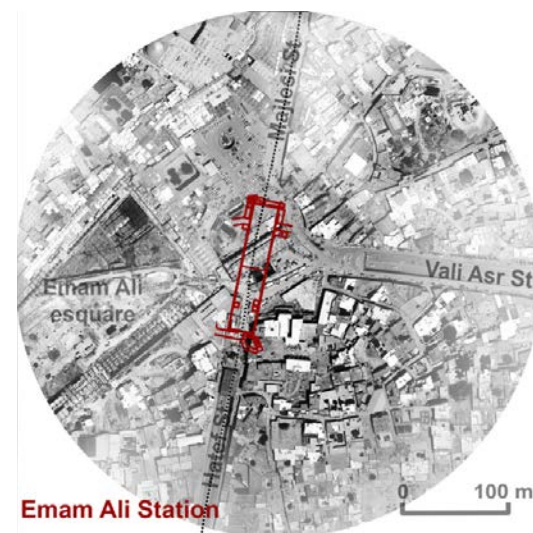
- The eastern part of the central section has extended for more than 2 kilometers, laid under the direct extension of Majlesi, Hafez, and Neshat streets (explained in Chapter 4), and will include the four stations of Toghchi, Ebne Sina (28), Emam Ali (29), and Hafez (Naghsh-e-Jahan) (30), with an average distance of 700 meters between them.

Among all Esfahan metro stations, Atigh station, which will be laid under the surface of Atigh square<sup>13</sup> as the original and the primary city center of the city, would have a very exceptional and central character. At the same time, plans for adding an extra line branched eastward from Hafez station to Khorasgan, and the airport direction will add to the worthiness of this station.

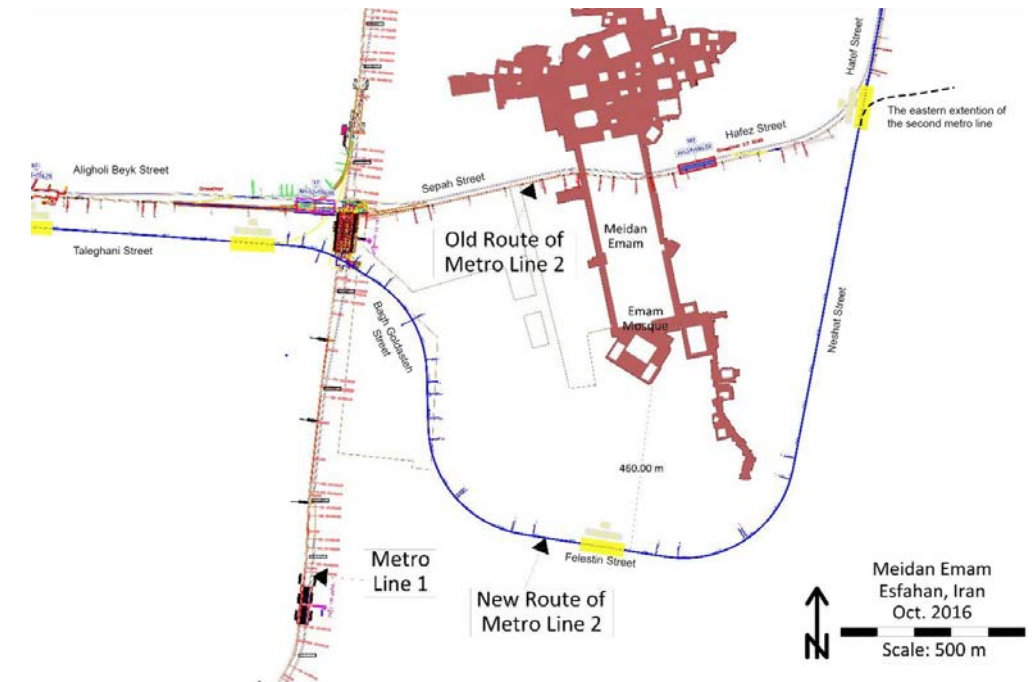
- Considering crossing the middle part of metro line 2 from beneath the city's central historical areas and the proximity to the most central spaces, including historical fabrics, the royal Safavid gardens and palaces, the Shah Abbas square (Naghsh-e-Jahan square), and the Grand Bazaar, the stations of this part will also have a high central and touristic character.



**Fig. 297.** Metro Line 2, location of proposal Toghchi Metro station on aerial photo of 2012.



**Fig. 298.** Metro Line 2, location of proposal Emam Ali Metro station on aerial photo of 2012.



**Fig. 299.** The old and new routes of the middle part of the second metro line, Source: State of Conservation report of Meidan Emam Esfahan World Heritage Site, Iranian Cultural Heritage, Handicrafts & Tourism Organization.

The central stretch of Metro line 2, like Line 1, faced historical challenges that eventually changed the line course. At first, the middle part of the Metro Line 2 was set to pass under Hafez street, the grand Safavid Naqsh-e-Jahan Square, and Sepah street to reach the central station of Emam Hossein (32). Due to the great sensitivity and risk of tunneling under this historical square, several proposals were provided by the Esfahan Metro Company. In response to the World Heritage Committee's concerns, a decision was made in 2016 that resulted in a shift in Metro line 2 location (Figs. 293 & 299).

As a result, metro line 2's middle section was confirmed to cross under Neshat street and bypass Naghsh-e-Jahan square, in 350 meters' distance, reach Emam Hossein (ii) station through passing by Felestin station (31) and crossing beneath Felestin and Bagh Goldasteh streets (ICHHTO, 2016, pp. 3, 4).

- The western section of the central part of line 2 is from the central Emam Hossein station to

the Shahid Kharazi station. This line is almost 3 kilometers long, and currently (2021), its four stations Emam Hossein, Khalja (33), Kashani (34), and Shahid Kharazi (35), are under construction with an average distance of 750 meters from each other. It is expected for these stations to be completed and launched within the next two years.

Among the prominent features of this part's stations will be easy access to Taleghani Street's commercial fronts (one of the oldest streets in Esfahan, which is described in Chapter 4), as well as proximity to Khalaja, Maheleh-No, and Abbas Abad's old residential neighborhoods at the western edge of historical city domain.

The second Emam Hossein Station, located on line 2 and beneath Taleghani Street, adjacent to Emam Hossein Square will be linked to the actual station of the same name on Metro Line 1, allowing people to transfer from one station to the other without having to leave the station or reach the ground level.

<sup>13</sup> The newly built Emam Ali Maydan project, founded on the original square place that officially opened in 2013, was studied as one of the study cases in chapter 4.



### 5.3.2.3. The Western Part, Reaching the Khomeini Shahr Town

The western extension of the second metro line will be approximately 10 kilometers, including eight stations being 1250 meters away from each other. The line will run from Kohandezh station (36), outside the west part of the city's second actual ring road, to Emam Khomeini Station (43), underneath the Emam Khomeini square in Khomeini Shahr, beyond the third proposed ring road of the city.

Linking Esfahan and Khomeini Shahr cities through the western part of metro line 2, other than benefiting the city by stimulating different developing projects around its various stations, will also give a territorial character to this line. However, due to the lack of sufficient financial resources, this part of Metro Line 2's construction is not a priority and has been postponed until after the completion of this line's central and eastern parts.

### 5.3.3. Metro Line 3, the First Provisional Metro Ring Line

Esfahan Metro Line 3 remains in the design stage. At the same time, the city has begun purchasing and releasing the necessary land for constructing this line and stations. The line has two approved and provisional parts. The western approved part section is located in the southwestern part of Esfahan, but its eastern extension is still not confirmed.

The western extension of Metro line 3 is 8.8 kilometers long and consists of 7 stations, with an average distance of 1250 meters. The line will start from Azadi station and run beneath the southwest regional corridor along Daneshgah and Artesh boulevards (the southern part of the actual first "Asphalt" ring).

The southwest head of the line will connect to the southwest regional railway line (Esfahan Falavarjan-Fooladshahr-Zarrinshahr) at its last station. In addition, due to the approved project plan of displacing the southwest bus terminal adjacent to Dombeh Mountain, the line will also connect to the new terminal at its last Kuh Dombeh station, becoming an intermodal node.

The eastern provisional line's extension follows Saadatabad and Sajjad streets as the southeast part of the first city ring. According to the proposed plan, the line will change its direction by crossing to the other side of the river, from beneath the First Ring to around 700 meters towards the east, following Hamzeh, Lahur, Parvin Streets parallel to the First Ring. The line will link to Metro Line 2 at its northeast head in Laleh station.

Concerning the recommended eastern extension, the overall length of the line is expected to be more than 20 kilometers and will consist of at least 15 stations.

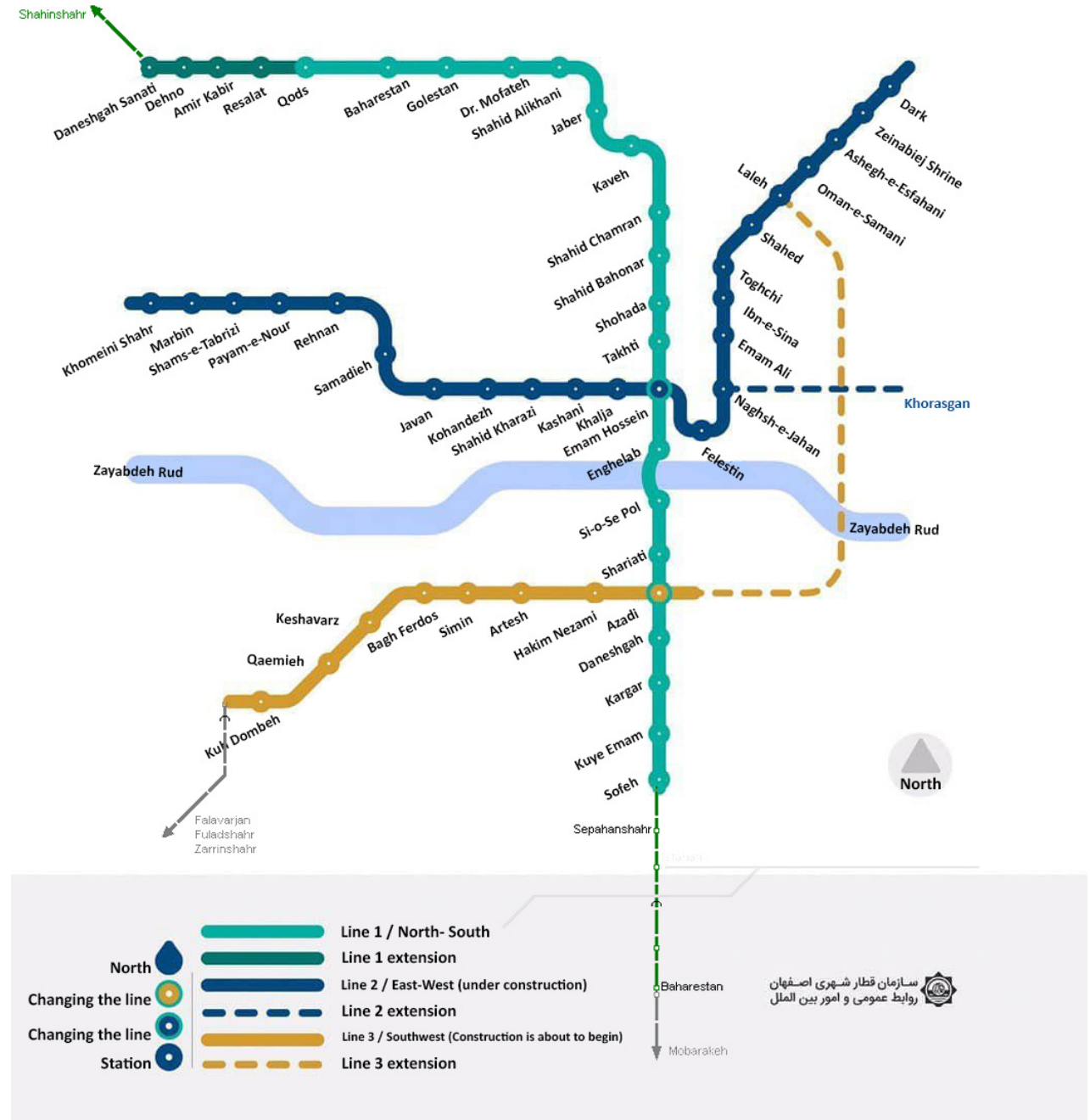


Fig. 300. The network of three metro lines and the locations of stations connected with the suburban railway lines of Esfahan. Source: Esfahan railway organization

#### 5.4. THREE CASES OF METRO STATIONS: SITES AND PROXIMITIES

In the primary part of this chapter, the three Esfahan Metro Lines' logics were discussed concerning the connectivity of the regional railway lines and their associated territorial elements to the historical and central parts of the city. In the last part of this chapter, three stations from the central part of Metro Line 1, which is the only operating metro line in Esfahan, will be discussed in detail.

Regarding the emerging places where the subway platforms are connected to the street or the ground surface, numerous situations can happen depending on the nature of the station's surrounding areas. Therefore, each station can be appropriately studied in its proper place and concerning its unique surrounding urban elements.

In this section, each case study is approached by presenting the architectural and technical features of the station, emphasizing the vertical connectivity of the station's entrances to the ticket hall and metro platform, as well as the aspects of natural light entry and ventilation of each station. The nature of each station is not only limited to its physical form and architectural characteristics, including its interior spaces' connection and arrangement in a singular form but also understood through the proximities and relationship with the constituent environmental factors around each station. Hence, their connectivity to the city or the outside world on an intermediate scale is essential to better understand each station's character.

Aside of fysical importance of each station, the quality and value of places around each station can interact with their importance and strength. In other words, increasing the urban quality of areas around the station will increase the credibility and value of the station. Therefore, a metro station is at the same time, a reference point and a means for reaching other destinations around.

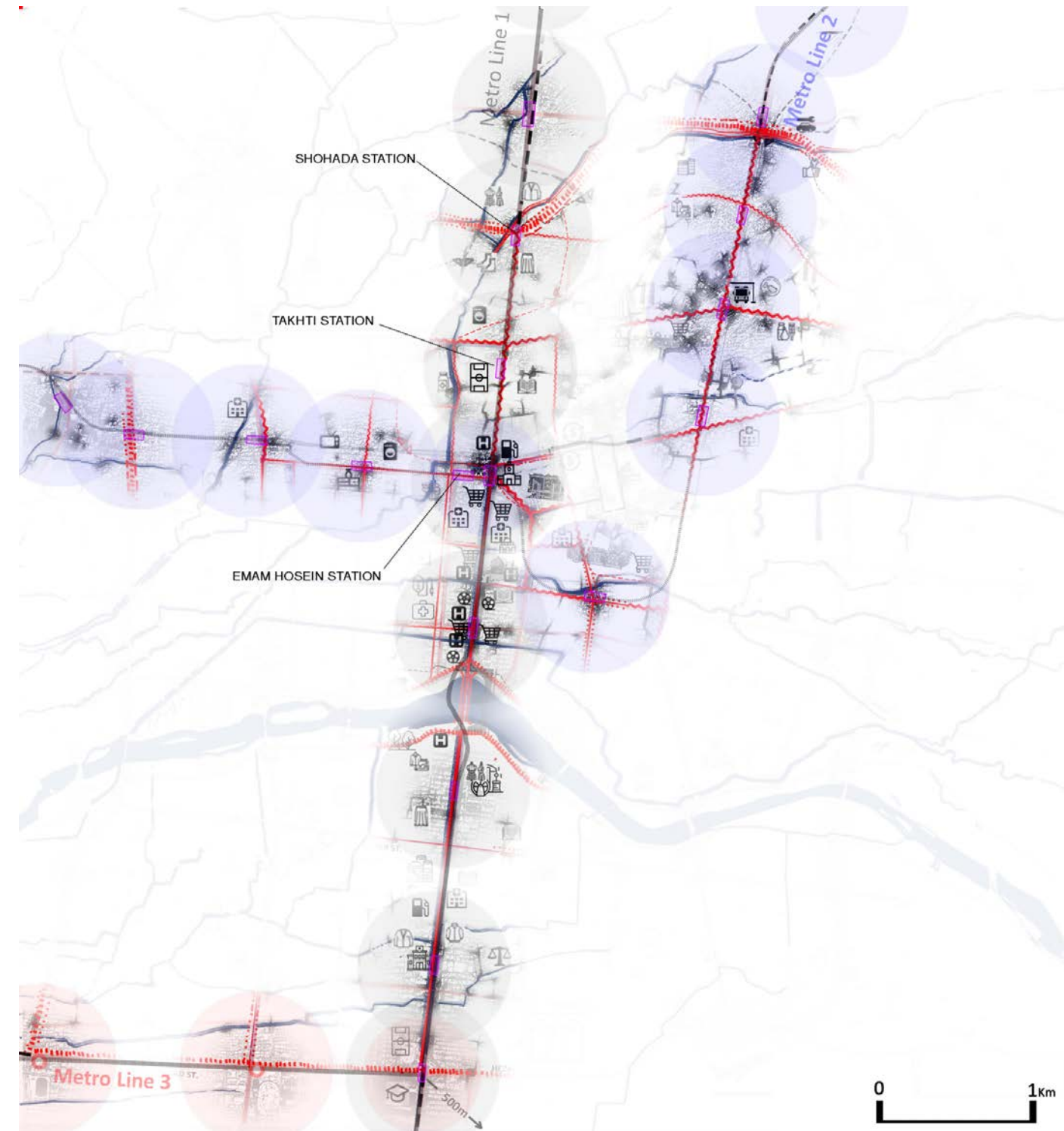


Fig. 301. The city of "Iron" within the historical city domain. Source: author

### 5.4.1. Emam Hossein Station

Emam Hossein Metro Station is the most central station on line 1, which is located approximately 700 meters from its previous station (Takhti Station in the north direction) and approximately 1,000 meters from its next station (Enghelab Station towards the south).

The station is a central and will be an exchange station between Metro Line 1 with Line 2, which is located beneath Maydan- e - Darvazeh Dolat (Emam Hossein Square). The geographical significance of the station and its specific central location in the city gives it substantial value and potential. However, the station only overlaps and feeds the former central square of Darvazeh Dolat and does not create a new form of center.

Six distinct streets connect this central square to the surrounding areas and other territories (Fig. 302). Apart from the primary north-south corridor (including Abbasi Chahar-Bagh and Chahar-Baghe-Paien avenues) and the east-west corridor (including Taleghani and Sepah streets), the two other streets of Baghe-Goldasteh (towards the southeast), and the east-west Bab-Al Rahmat and Ali Qoli Beyk streets axis, respectively, connect this central point to the riverfront and the western part of the First Ring.

As the most central metro station, Emam Hossein Station has a high capacity for transferring and moving passengers, covering a relatively large area of more than 19,000 square meters divided into the two levels of the ticket hall and central platform. The three main entrances connect the underground station's inner parts to the ground surface, located at the station's northeast, southeast, and west sides, associated with the sidewalks around the square.

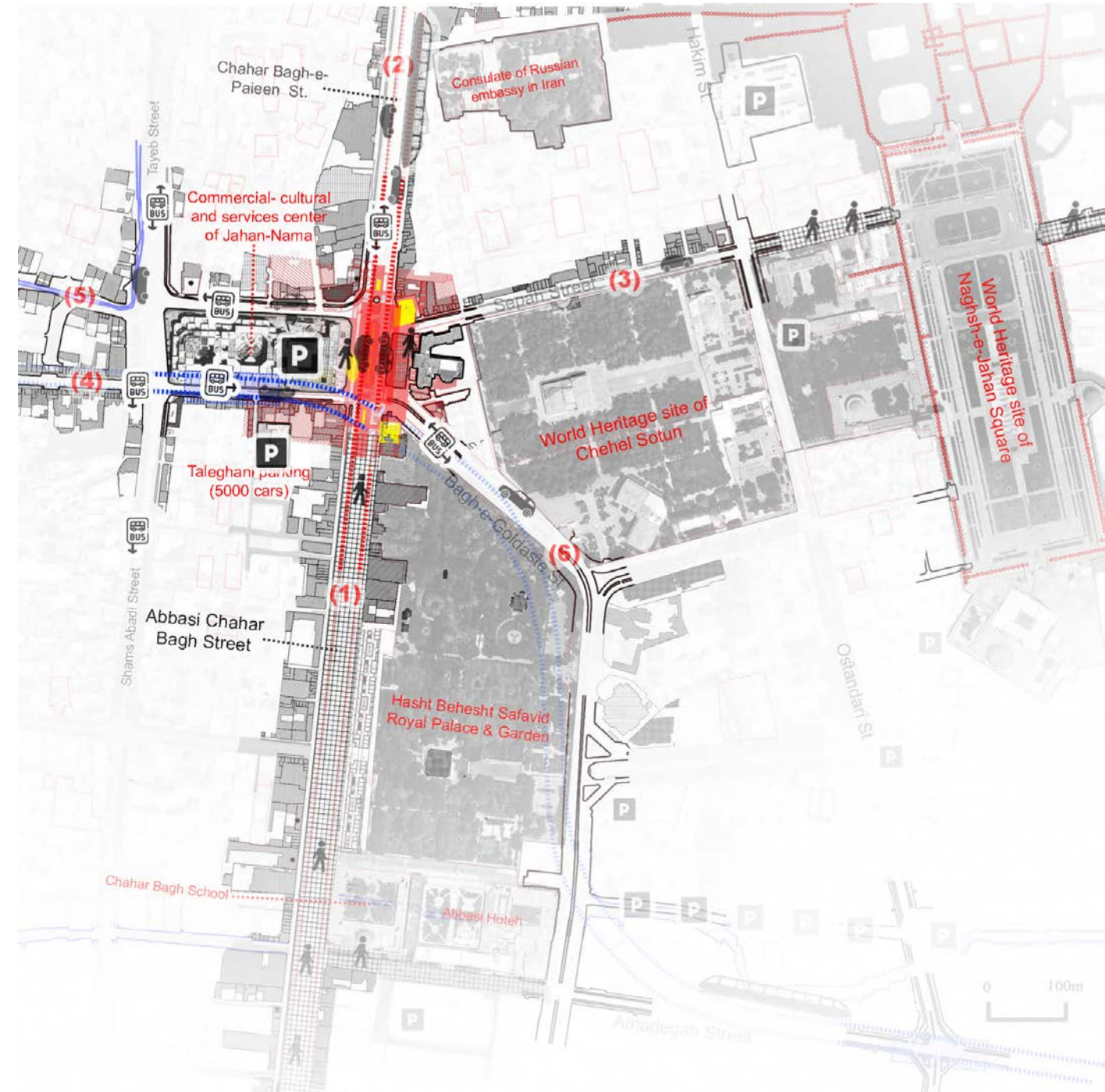
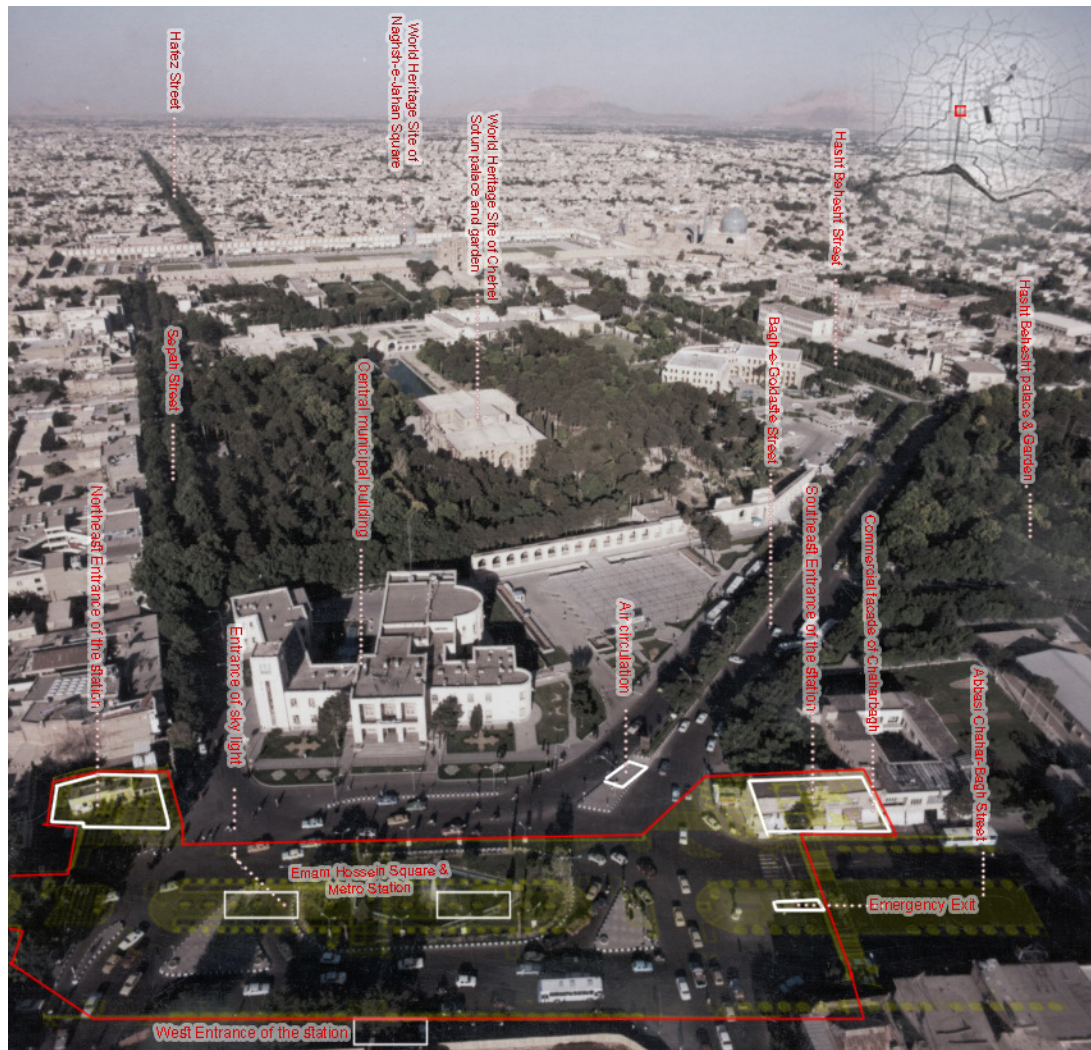


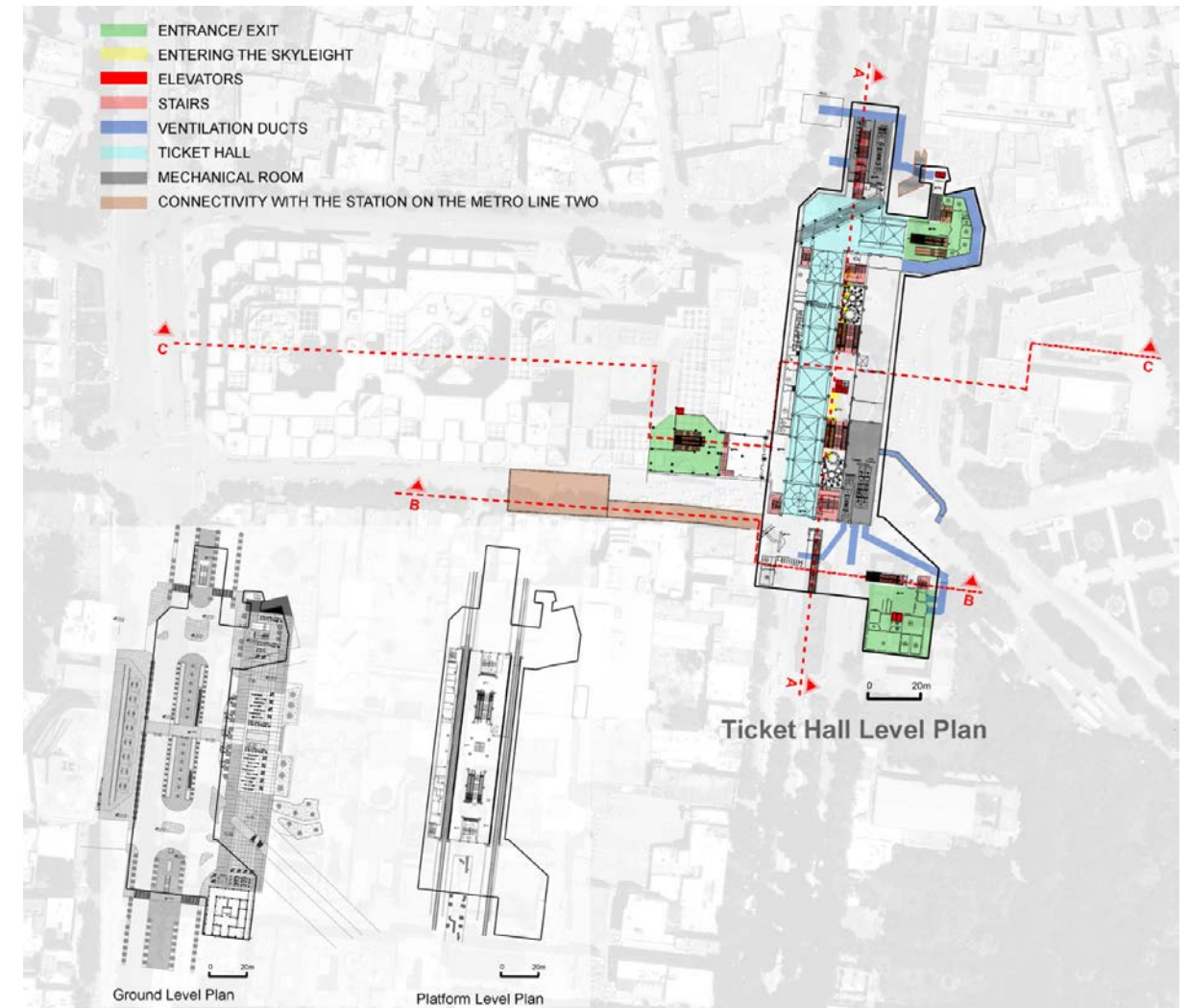
Fig. 302. Esfahan, Emam Hossein metro station, in relation with its surrounding environmental factors. Source: author



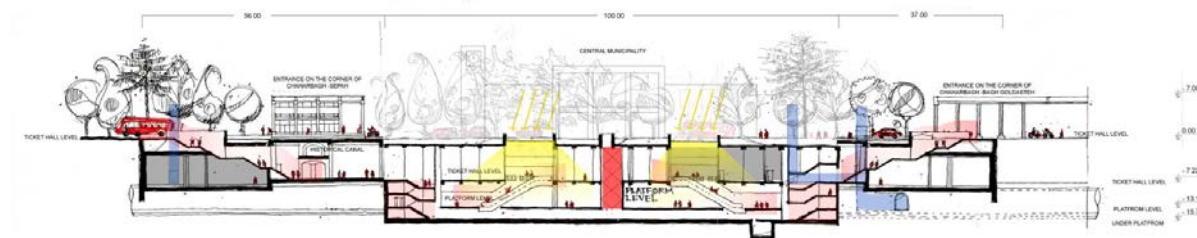
**Fig. 303.** Eastward bird view from the top of Emam Hossein Square in the '90s. Source: archive of Maskan Sazan Architecture and urban development company, edited by the author

The northeastern station's entrance is located in the previous place of one of the oldest city gas stations since the 1930s (Figs. 302 - 304). As seen in the station's plans and sections, the western station entrance was first placed in the southeast corner and inside the Jahan-Nama building and the Square's western edge.

between decision-makers and the decline in the execution process concerning the need for more technical considerations inside the complex caused the dislocation of this entrance to the sidewalks at the eastern front of the Jahan Nama building and the Square's western edge.



**Fig. 304.** Three level plans of the Emam Hossein station. Source: Esfahan Urban Railway Organization, edited by the author



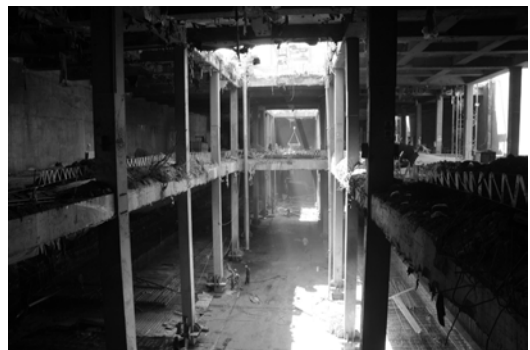
**Fig. 305.** The longitude section (A-A) is crossing on the central axis of Chaharbagh. Source: Esfahan Urban Railway Organization, redrawn by the author.



**Fig. 306.** Maidan-e-Darvazeh Dolat, Construction of the metro entrance at the place of the city's first gas station, February 2016. Source: author



**Fig. 307.** Emam hossein metro Station, connectivity to the ticket hall from the northeast entrance, October 2020. Source: Farzad Beygi



**Fig. 308.** The central part of the station of the ticket hall level, 2016. Source: author

Finally, the third entrance, located at the corner of Bagh-Goldaste and Chahar-Bagh Abbasi Streets and the southeast corner of Emam Hossein Square, was opened lately to the public (2022).<sup>14</sup>

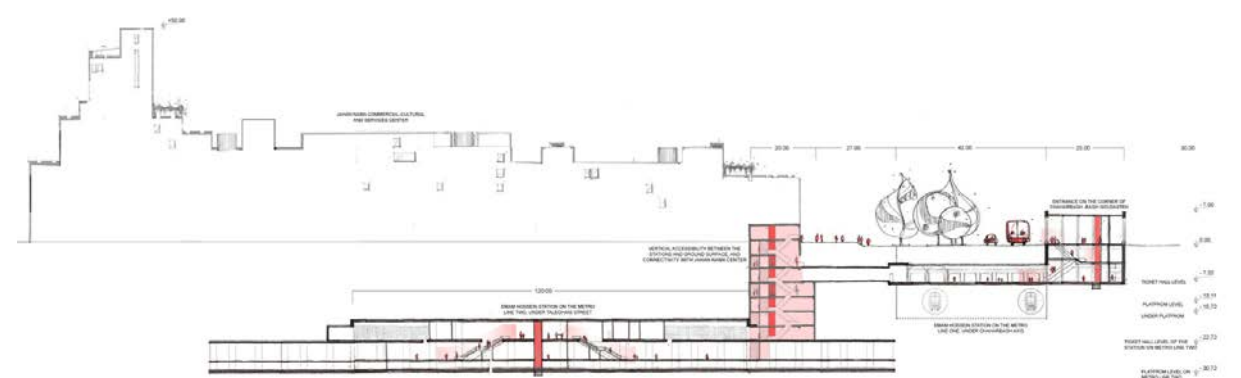
The three entrances reach the passengers to the first underground level of the station, encompassing three main parts of the west, central and east sections. In the west part, there is a large ticket hall, including the metro's internal gates.

The station has two mechanical rooms set on the eastern (the opposite side of the internal gates) and the northern sides of the ticket hall level (under the north emergency exit stairs), which are shown in grey color on the station's ticket hall plan and section A-A. The mechanical engines and installations circulate the exhaust air and draw in fresh air through ventilation ducts connecting the ground surface shown in dark blue color (Figs. 304 & 305).

Among other outstanding features and characteristics of this station are:

(a) Installing two central voids in the roof of the station, opened on the Emam Hossein Square's surface to enter the natural skylight to the ticket hall and the central platform (Figs. 308), (b) granting an easy and convenient vertical connection among the station's internal and sequential spaces of the central platform, ticket hall, and entrances through providing various forms of regular and mechanical stairs and elevators, considering the elderly, and the disabled people, (c) direct connection of the middle and pedestrian axis of Chahar-Bagh Street to both heads of the platform and the ticket hall for quick evacuation of the station's interior spaces in case of an emergency (Figs. 305), (d) the future possibility of the station's extension from its southern part to below Taleghani Street surface and connectivity to the under-construction station located on metro line 2, which is hypothetically shown in the plan and transversal sections of the station (Figs. 304 & 309 & 310).

<sup>14</sup> The lack of financial resources and the difficulty liberating and acquiring the required land to place this entrance in the eastern commercial front of Chahar-Bagh has led to a delay in completion of this entrance.



**Fig. 309.** Connectivity of the two metro lines from the underground level. Source: Esfahan Urban Railway Organization, redrawn by the author.



**Fig. 310.** Connectivity of the western entrance of the Emam Hossein station with Jahan Nama complex, and the second metro line. Source: Esfahan Urban Railway Organization, redrawn by the author.



**Fig. 311.** Increasing the pedestrian share in the current paving of Emam Hossein Square, Oct 2020. Source: Farzad Beigi



**Fig. 312.** Esfahan city hall at the eastern front of Emam Hossein Square, October 2020. Source: Farzad Beigi



**Fig. 313.** View from the top of city hall to Maidan-e-Emam Hossein, and Jahan Nama center, February 2016. Source: author

#### 5.4.1.1. Proximity and Association with Surrounding Environmental Factors

Among the essential elements adjacent to the station, the central municipality building and the Jahan Nama commercial complex are located on both sides of Emam Hossein Square. The City Hall of Esfahan is located at the eastern front of Darvazeh Dolat square (east side of the station), at the northwestern corner of the Safavid Garden, and the palace of Chahel Sotun. This Building was founded during the first Pahlavi era (from 1940 to 1946) and was inspired by German architectural designs during the Hitler era in a L-shaped plan format (Figs. 311 - 313).

On the opposite side of the city hall building, the Naghsh-e-Jahan Nama multi-purpose complex is located on the western edge of the station's building (beneath Emam Hossein square). This complex consists of various commercial uses, such as handicraft workshops and commercial offices, cultural uses, including three cinema saloons, art galleries, permanent exhibitions, and service elements such as hotel restaurants and parking for 240 cars, was built in 1996 in an area of approximately 1,700 square meters<sup>15</sup> (Figs. 314 & 315).

The project's height has followed the adjacent buildings' canon, with a maximum of 4 floors for its three fronts. It is only in the area attached to Shamsabadi Street's front (west side), the building's height was gradually raised to fifty meters as a sign of the Jahan Nama project<sup>16</sup>.



**Fig. 314.** View to the Jahan Nama tower building from the river side. Source: unknown



**Fig. 315.** At the ground floor, inside the patio of Jahan Nama complex center, February 2016. Source: author

<sup>15</sup> In 1976, to revitalize the city center of that time, Chahar-Bagh Abbasi and the Darvazeh Dolat area, the Esfahan Municipality decided to build a complex building in less than 2 hectares encompassing various cultural, commercial, and service uses. In this regard, they offered to the famous American architect Philip Johnson and his joint Iranian partner, Organic consulting engineers, to design a sustainable project. According to the evidence, the first phase study and a 3D model were submitted to the Esfahan Municipality for review. The Islamic Revolution of 1978 put an end to these actions; although the municipality had purchased most of the buildings and land, the rest of the area remained semi-ruined.

<sup>16</sup> Although after the project's completion, because the upper floors of the project could be seen from the eastern front of Naghsh-e-Jahan Square, UNESCO threats regarding the removal of this square from the organization's list led to the deconstruction of its last two floors.

Considering the historical site's characteristics, the construction of the station faced critical heritage challenges. In the archeological excavations performed during the station's construction, a section of the historical Fadan Madi<sup>17</sup> and the Jahan-Nama historical palace's foundation<sup>18</sup> were discovered, respectively, to the north and south of the station.

Nowadays, the found Madi's section is well supported by the armed concrete columns and mesh in the north part of the ticket hall station, although it is still buried under the ground surface and has no reflection on the ground floor (Fig. 316). On the other side, the Jahan-Nama palace's foundation has been framed with a glass partition and exposed to the pedestrian passing through the middle section of Chahar-Bagh (Fig. 318).

Its also remarkable the proximity of the staiton to essential and spectacular historical parts of the city, such as the two world heritage sites of Naghsh Jahan Square (Shah Abbas sq.) and Chehel Sotun Palace, besides other fabulous elements of Bazaar, Hasht Behesht palace & garden, and Chahar-Bagh street (Figs. 319 & 320).

The districts of Mahale-No, Shams-Abad, Abbas-Abad, Lonban on the west, and the Safavid royal district of Dolat-Khaneh on the eastern side of the Abbasi Chahar-Bagh, are some of the neighborhoods surrounding this central station.

Finally, the station provides convenient access to the Chahar-Bagh central commercial and cultural axis (studied in chapter 4), which recently (2018) has been converted into a central pedestrian axis, involving more diverse lively pedestrian-like activities, such as coffee bars and restaurants with outdoor terraces, street music performances, and festivals or religious and cultural ceremonies (Figs. 321 - 324).

<sup>17</sup> From Darvazeh Dolat to Si-o-Se Pol bridge, Various Madi branches of Fadan, Juy-Shah, Farshadi, and Niasarm passed close to or crossed the middle section of Chahar-Bagh, irrigating Safavid gardens and other the neighboring residential districts. Except for Niasarm and Farshadi Madi streams closer to the river, which water can still pass through, the Juy-Shah and Fadan Madies were filled and covered in the 1930s and during Chahar-Bagh's reformation and construction of its northern extension.

<sup>18</sup> Jahan-Nama palace was a symbolic building tower located at Darvazeh Dolat, as the Chahar-Bagh's north entrance, with three floors and a height of 17 meters. The palace provided a great view of Chahar-Bagh avenue and its surrounding royal Dolat district, gardens, and palaces in the 17th century.



**Fig. 316.** A branch of Fadan Madi was discovered on the northern side of Imam Hossein metro station, 2017. source: author



**Fig. 317.** The pre-existed Jahan-Nama palace, 1890's. Source: Sarre Friedrich



**Fig. 318.** Jahan-Nama palace's foundation is framed with protective glass screen, in the background of the statue, March 2022. Source: author



**Fig. 319.** View of Naghsh Jahan Square from above the Qeysarieh entrance of Bazaar, April 2018. Source: author



**Fig. 320.** Chehel Sotun Safavid Pavilion inherited from the 17th century, registered World Heritage Sites under the name of the Persian Garden, Source: Esfahan municipality



**Fig. 321.** Chaharbagh, Ashura noon prayer ceremony, August 2020. Source: hawzahnews.com



**Fig. 322.** Side programs of the Children and Adolescents Film Festival in Chaharbagh Abbasi, 2018. Source: Mohsen Heiatian



**Fig. 323.** Further entry of Chaharbagh commercial fronts through the arrangement of terraces at the street surface, April 2022. Source: author



**Fig. 324.** Chaharbagh, the reallocation of the street surface to pedestrians, April 2019. Source: author

## 5.4.2. Takhti Station



**Fig. 325.** Location of Takhti metro station in the area of the historic city walls. Source: author



**Fig. 326.** Takhti station, intermediate scale, connectivity with the surrounding elements. Neighborhoods' centers: Bab-Homayun (1), Darb-e-Kushk (2), Bid-Abad (3), Aligholi-Agha (4) Qare-Kia / Arbab (5), Masjed Hakim (6), Sine-Paieni (7), Tal-e-Asheghan (8), Darvazeh-No (9), Shater-Bashi (no.10). Gozars: Posht-Baru (a), Sheykh-Al-Islam (b), and Aghajan Beyk (c). Source: author

Takhti Metro Station is located on the first Esfahan metro line, about 880 meters away from its previous station (Shohada Station to the north direction) and approximately 720 meters away from its next station (Emam Hossein Station to the south).

Like Emam Hossein station, neither Takhti Station introduce a new center to the city. However, its location attached to the south side of the Takhti intersection<sup>19</sup>, in the front of the same name

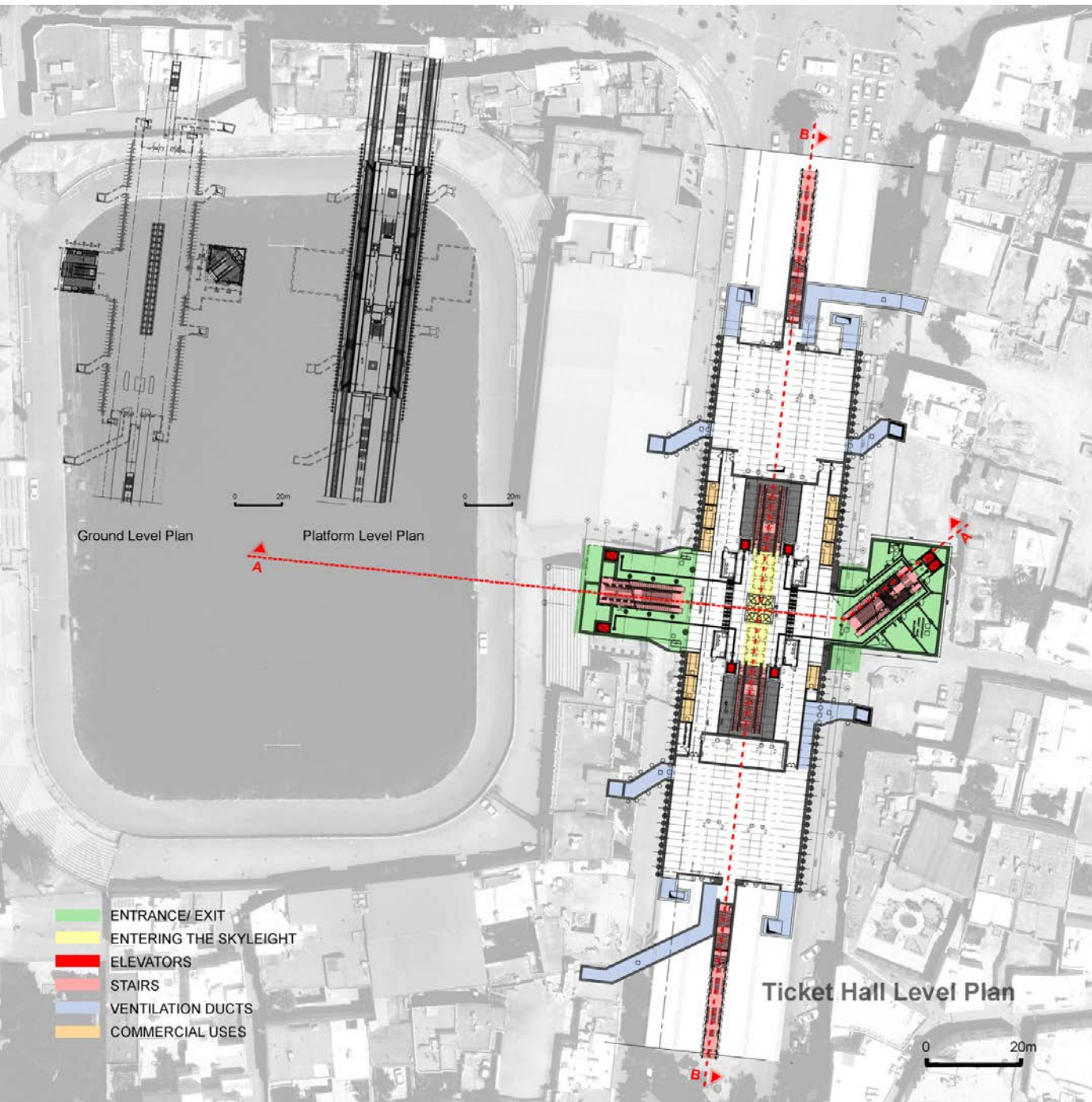
stadium, gives this area, including the commercial streets' fronts, surrounding residential fabric, and historic local centers, a new dimension and value. The station is located in the dense historic city domain within the former walls of Seljuk city. It is attached to the ancient routes' network linking with many monumental buildings and various surrounding historical neighborhood centers, as illustrated in Fig. 326.

Among the primary aspects of the station is feeding the commercial and porous fronts of Chahar-Bagh and its other surrounding streets.<sup>20</sup> The commercial fronts of Chahar-Bagh, Masjed-Seyed, and Abdolrazaq streets encountering at Takhti intersection, mainly devoted to larger scales and attract many private cars' journeys to reach this central area, which cause heavy car traffic and a parking problem.

<sup>19</sup> The intersection is formed by crossing the northern extension of Abbasi Chahar-Bagh, built in the 1930s, which is connected to the north and south regional corridors, as well as Masjed-Seyed and Abdolrazaq streets (1950s - 1960s), which are connected to the city center (Atiq square and Bazaar) with east and west regional corridors.

<sup>20</sup> Commercial and service offices, tourist facilities such as several inns, hotels, and restaurants, sports equipment stores are the dominant uses that form the Chahar-Bagh fronts, close to the Metro station. In contrast, Abdol Razzaq Street, with its businesses, restaurants, and other facilities on both sides, is best known for its nursery shops and glass and crystal stores.

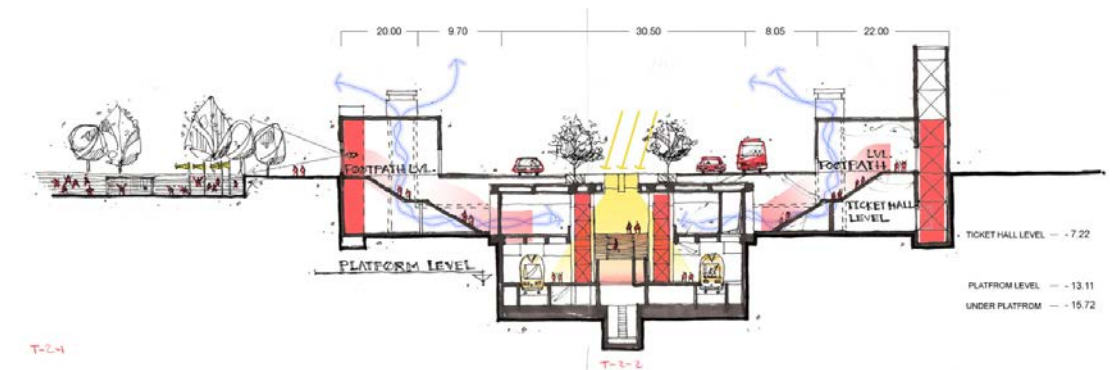




**Fig. 327.** Three-level plans of the Takhti station. Source: Esfahan Urban Railway Organization, edited by the author.



**Fig. 328.** Two main entrances of Takhti station, February 2016. Source: author



**Fig. 329.** Transversal section of the Takhti station from the main entrances and its beyond stadium. Source: author

The station is 12,000 square meters in area, with two levels of hall ticket and platform levels, having a 14 meters height from the rail lines to the ground surface. The two cubic entrance buildings of the station are set on the two Chahar-Bagh Street fronts (Figs. 327 - 329).

The western entrance of this station, as it is illustrated in the transversal section (Fig. 329), is attached to the eastern edge of Takhti Stadium<sup>21</sup> and has been designed in a way to provide a great view of the stadium's ground field and platforms to the people coming up from the ticket hall to the entrance level (Figs. 330 & 332).

The second entrance of the station is located at the intersection corner of Aghajan Beyk's perpendicular historical route with Chahar-Bagh-e-Paieen street. A symbolic clock tower on top of the eastern entrance building marks the station and reminds us of Islamic architecture's traditional wind catcher tower (Fig. 331).

The first underground station level is composed of public, administrative, service, mechanical, and electrical installation divisions, which are efficiently adjusted and shown on the station's ticket hall plan (Fig. 327).

<sup>21</sup> Takhti Stadium (A) is located southwest corner of the intersection and at the front Chahar-Bagh-e-Paieen avenue. The station has a capacity of 20,000 seats, was built in the 1930s (on the site of an ancient garden of Bagh-Haji/ Bagh-Homayun) is located adjacent to the western entrance of the metro station



**Fig. 330.** The view from the western entrance to the stadium, February 2016. Source: author



**Fig. 331.** View to the clock tower from the eastern entrance, February 2016. Source: author



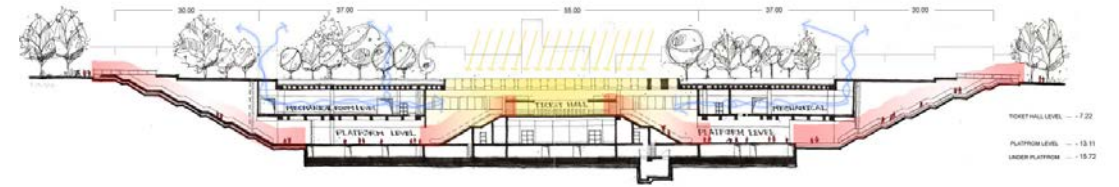
**Fig. 332.** Takhti Stadium play ground behind the western station entrance, 2016. Source: author



**Fig. 333.** Takhti Station ticket hall, 2016. Source: author



**Fig. 334.** Takhti metro station circulating towers at the eastern front of the Chahar-Bagh-e-Paieen street, February 2016. Source: author



**Fig. 335.** The longitude section (A) is crossing on the central axis of Chaharbagh. Source: Esfahan Urban Railway Organization, redrawn by the author



**Fig. 336.** The under construction eastern side of central platform, February 2016. Source: author



**Fig. 337.** Light enters the interior of the station through an opening in the middle of the street, February 2016. Source: author



**Fig. 338.** The Takhti station's southern emergency exit, February 2016, Source: author



**Fig. 339.** Takhti stadium at the west side of the metro station. Source: <https://www.persianleague.com/>

The station has a small ticket hall (7m×14m), which is located in the center of the station, although the opening to the skylight makes the space seem much larger. Entering the skylight through a linear central void covered with glass tiles enters the skylight then into the ticket hall and platforms level, where there is vertical accessibility between ticket hall and platform levels (Fig. 333).

The sustainability, natural light, and cross ventilation terms are appreciated in the station's design and lessen the dependency on artificial light and heating and cooling systems.

The mechanical rooms located on the ticket hall level, including the ventilation and air conditioning systems, are responsible for freshening the air and maintaining the temperature of internal parts in the station. Some circulating air towers are provided on the opposite side of Chahar-Bagh's facades, linked to the two mechanical rooms located at the station's heads (north and south) (Figs. 327 & 334).

Finally, among the other essential aspects of the station, the fair connectivity of the three different levels of the ground level (entrances), the ticket hall's intermediate space, and the central platform's level through providing different forms of mechanical and regular stairs and four sets of elevators can be mentioned. At the same time, setting the two emergency exits is considered to provide direct vertical connectivity between the central platform and the middle pedestrian section of the Chahar-Bagh axis (Figs. 338 & 339).

### 5.4.3. Shohada Station

Shohada Station is located below the Shohada square more than 800 meters from Bahonar and Takhti stations.

The station is located in the middle of a site formed by the accumulation of different traditional and modern mobility systems superimposed on each other. The historical network of primary Guzars, linked with centers of traditional neighborhoods, surrounding residential clusters, and courtyard houses, on the one hand, and the contemporary network of streets encountered at Shohada square, on the other hand, present various urban and structural forms and considered as the essential features of the station's site.

The station is established on the previous location of Ab-bakhshan<sup>22</sup> cemetery<sup>23</sup>, which was later replaced by Pahlavi (current Shohada) square<sup>24</sup>, in the 1950s. The station is located at the center of the intersection point of five streets, including the First Ring road, consisting of the Modares and Foroughi streets, with the most demanding north-south Chahar-Bagh axis, including Chahar-Baghe-Paieen Avenue and Kaveh Boulevard, and finally, the eastward Ibn-e-Sina street connected to the city center.

<sup>22</sup> Ab Bakhshan is an ancient term and "refers to the meaning of water, as this place was considered as a natural reservoir of water. According to the news published in June 2017 from the newspaper "Nesfe Jahan," this area had a very high water level until four years ago. However, the continuous dryness of the river in recent years has undoubtedly greatly affected this water level.

<sup>23</sup> The cemetery was located outside of Darvazeh-no (the former Seljuk city gate, 10th-11th century) and adjacent to Darvazeh Tehran (the Safavid gate, 16th-18th) and was existed until the mid-1930s until it was destroyed during Chahar-Bagh Paieen, Foroughi, and Modarres Ibn-e-Sina streets construction. The Pahlavi square was built on this intersection point (Shohada sq. having almost 55-meter diameter) in the 1950s.

<sup>24</sup> Traffic circle or roundabout, a circular intersection as a product from the city of "Asphalt" to improve cars traffic flows.



**Fig. 340.** Shohada station, A palimpsest of different city's identity, intermediate scale, connectivity with the surrounding elements, Source: author. Surrounding historical local centers: Abu-Masoud (1), Aligholi-Agha (2), Masjid-e-Panahi (3), Darvazeh-No (4). Surrounding historical monuments: Ab-bakhshan mosque, (Shohada mosque) (a), Sheikh-Abu-Masoud tomb (b), Haj Rasouliha traditional courtyard house (c), a residential cluster of traditional (d). Surrounding contemporary supportive elements: Amin hospital (A), Tabriz Primary School (B), Health Center (C), Girls' Art School (D).



Fig. 341. Location of Takhti metro station in the area of the historic city walls. Source: author



Fig. 342. View from the top of Parto Commercial building to the metro station at the center of Shohada square and the station's entrance at the Square's southwest corner. February 2016. Source: author



Fig. 343. The View over the Shohada square and the northeastern station's entrance. February 2016. Source: author

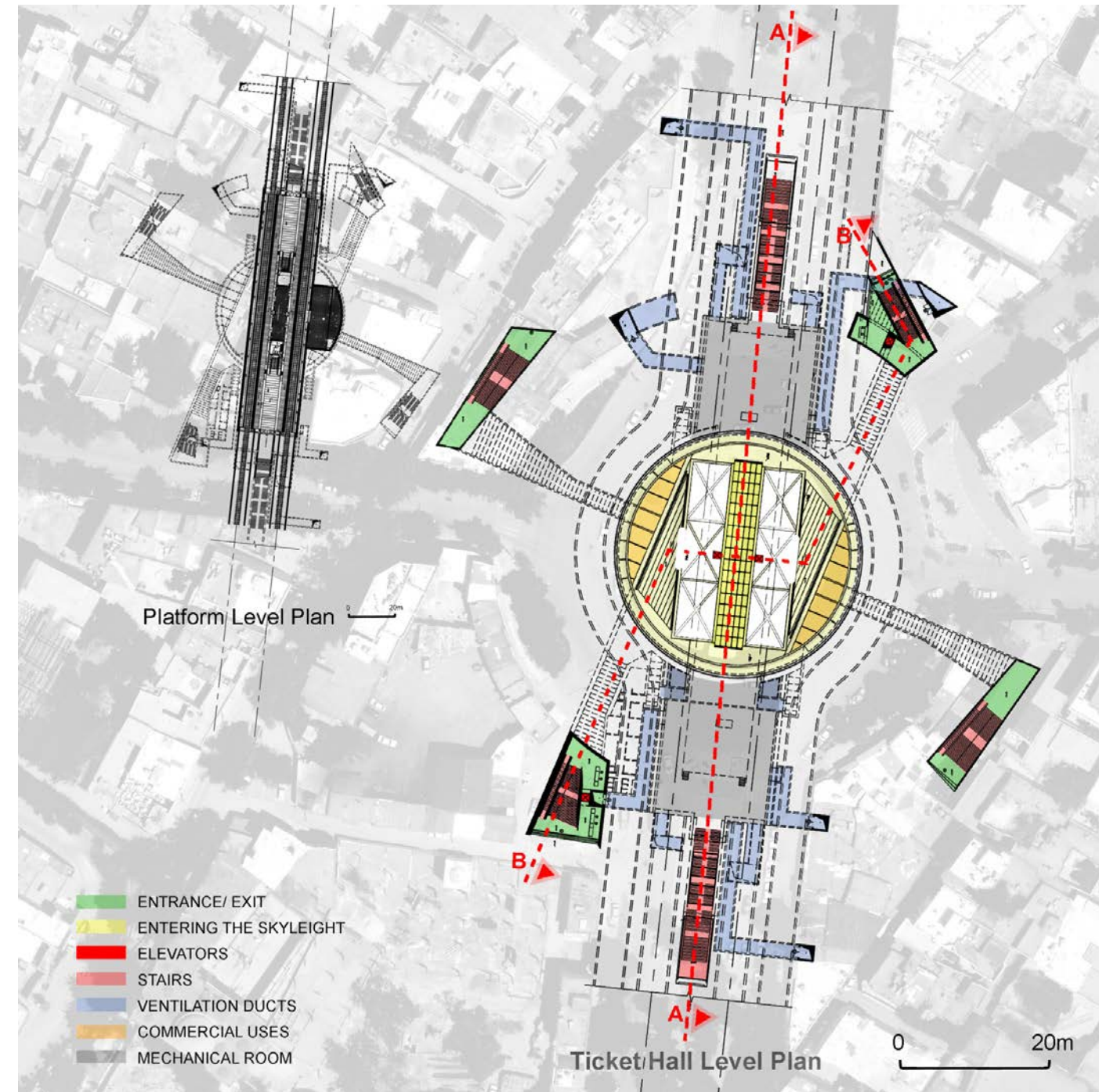


Fig. 344. Two-level plans of the Shohada station. Source: Esfahan Urban Railway Organization, edited by the author



**Fig. 345.** The view from the center of Shohada square at the southwestern entrance of the metro station, February 2016. Source: author



**Fig. 346.** Northeast entrance of the Shohada metro station, Multi optional vertical accessibility, February 2016. Source: author



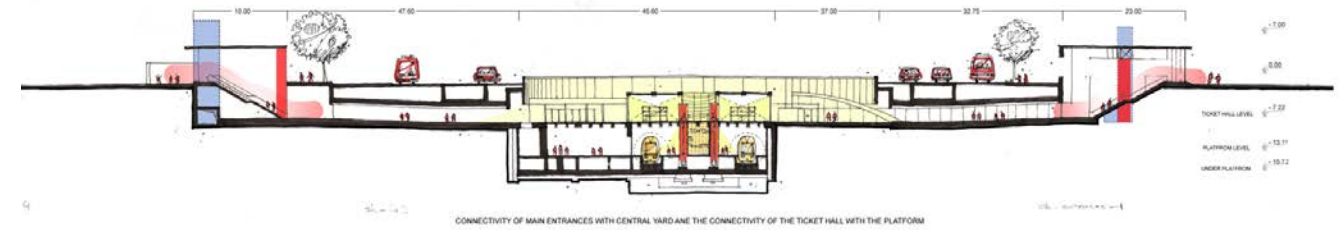
**Fig. 347.** The Underground corridors connect the entrances to the ticket hall at the center of Shohada square, February 2016. Source: author

Since Kaveh, Chahar-Bagh, Foroughi, Ibn Sina, and Modarres streets all lead to Shohada Square, the station's location under the square (according to the proposal of Sistra Consulting Engineers) has provided very convenient access to the station. The station has occupied 11,700 square meters area and has two levels with an overall height of 14 meters from the rail lines to the ground surface. Although four main entrances have been predicted by the project's designer company, Naghsh-e-Jahan Pars consulting engineers, only two entrances have been built. The other two entrances have been envisioned for the station's future expansion (Figs. 342 - 345).

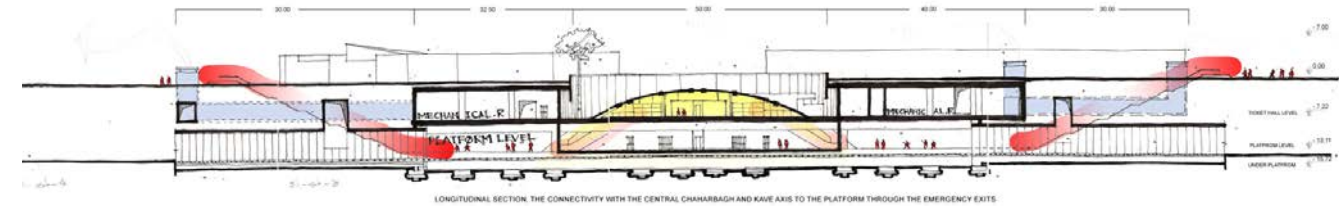
The two main entrances are built as separate and enclosed buildings at the northeastern

and southwestern corners of the square. The northeastern entrance has an almost 300 square meters area and is located at the corner of Modarres street and Kaveh Boulevard at the square's front. The other same size entrance is located at the opposite front of the square in front of Tabrizi school and the corner of the intersecting point of the Johary alley with Chahar-Bagh-e-Paieen Avenue.

The large opening frames on the building's fronts of each entrance brighten the inner space and integrate it with pedestrian sidewalks. The entrances are well-connected to the ticket hall level in terms of providing various forms of vertical displacement, including mechanical and regular stairs and elevators (Figs. 345 & 346).



**Fig. 348.** Connectivity of the main entrances with the central yard and platforms, Source: author



**Fig. 349.** Longitudinal section of Shohada station, following Chahar-Bagh axis. Source: author

On the first underground level, two corridors connect the two entrances to the metro station's ticket hall at Shohada Square's center and are 7 meters below the ground level (Fig. 347).

Some small commercial units are set around this circular central yard; however, they never have been used so far. The central circle, which is open to the air, recreates the traditional architectural form of Godal-Baghche<sup>25</sup>, although the lack of shade, water, vegetation, and the application of stone materials makes it very hot and non-resistible during summer days (Figs. 344 & 350).

The inner spaces of the station can be divided into three general categories: public spaces,

office-service spaces, and spaces of electrical and mechanical installations.

Different control systems provide various features to the spaces. The public spaces of the station can be divided into two main categories controlled and uncontrolled.

Uncontrolled public spaces start from the station entrances, vertically connected through regular and mechanical stairs to corridors, linked with the open central yard at the same plan as the ticket hall (7 meters below ground level).

The station's mechanical rooms are located at the north and south of the central yard work as station lungs, inhaling fresh air into the station and exhaling the polluted air into the open air. Access to these areas is from inside the central courtyard (Figs. 344 & 349).

<sup>25</sup> In traditional Iranian architecture, Godal-Baghche was a proper construction technic for many reasons, such as ecological and economic matters. It used to get built in the central courtyard and dragged the house to the lower ground level. Samples of this space can be seen more in arid desert climates, including Kashan, Naïen, and Yazd cities. Besides providing the soil needed for the building bricks, this architectural technique could also facilitate accessing the aqueduct (Qanat) water. The smaller and lower surface of Godal-Baghche, using the ground coolness added with the plants and underground water moisture, could form a more convenient microclimate than a flat central yard.



**Fig. 350.** Commercial units set around the circular central yard, February 2016. Source: author



**Fig. 351.** The ticket hall, including the gates, elevators, and stairs covered by an architectural metal and crystal arch form, February 2016. Source: author



**Fig. 352.** The arched glass roof enters the skylight to the ticket hall and the central platform levels, February 2016. Source: author



**Fig. 353.** The central platform in direct connection with trains, February 2016. Source: author

Passengers enter the controlled public spaces of the station after passing through the control gates. An arched concrete and glass roof covers internal gates, the station manager's room, ticket salesrooms, ticket control rooms, and firefighters' rooms. Alike the two previous stations, Shohada station can also enter the skylight through a glass roof to the central part of the station and lighten the ticket hall, central stairs, and the central platform (Figs. 351 - 353).

Four elevators are used for up and down goods and passengers, including disabled, kids, and older adults, among different station levels; two elevators in the entrances and the other two in the ticket hall.

Similar to the two previous station cases, the emergency and rapid evacuation of the platforms has been considered by providing direct vertical connectivity of the two heads of the platform to the ground surface and into the central pedestrian lane of Chahar-Bagh and Kaveh Boulevards.

### 5.4.3.1. Immediate Features Surrounding the Station



**Fig. 354.** Commercial northwest front of Shohada square, 2016. Source: author



**Fig. 355.** The garage entrance at the western front of the square, February 2016. Source: author



**Fig. 356.** Interior garage's space at the western edge of the Shohada square, February 2016. Source: author

Among interesting essential features spread around in short distances can point to:

(1) The accumulation of activities at the corners of five encountering streets attract and serve the locals and outsiders by hosting a variety of markets. The commercial fronts of the streets, complementing other uses of banks, hotels, restaurants, and grocery stores, stimulate the intensity of cars' and people's flows.

(2) On the west front of the square, an old garage is built alongside Pahlavi Square, dating back to the 1950s, and the city of "Asphalt." The garage has a distinctive and beautiful gate and still works on an area of approximately 1500 square meters. The garage's location between the southwest entrance building of the metro station, the commercial front of the square, and passing the Madi-Fidan from its backside gives it added value.



**Fig. 357.** Parto Commercial-Office Complex, located in the eastern front of the square, 2016. Source: Autor



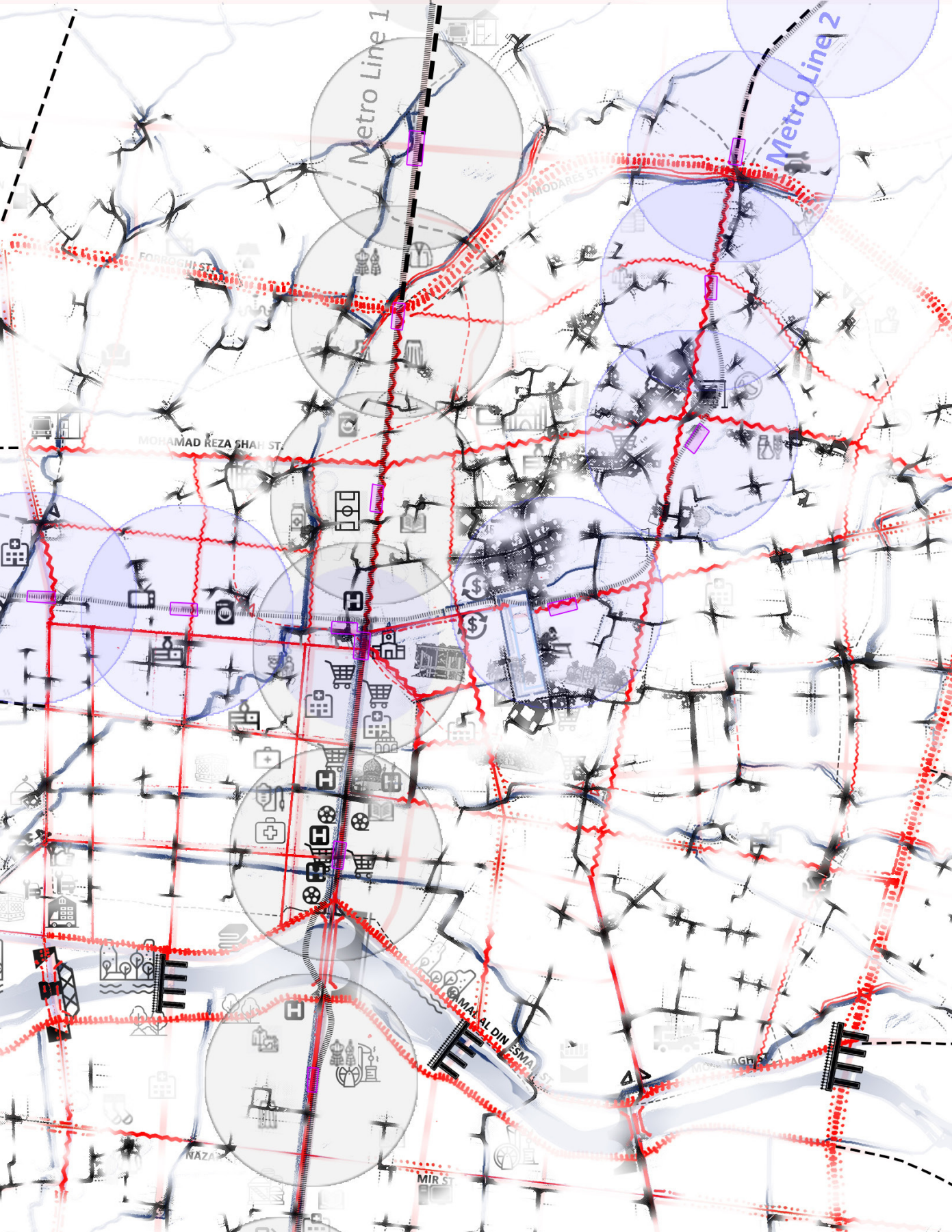
**Fig. 358.** Intermodal character of Shohada station through the existence of Surrounding Taxi and Bus stations

(3) Likewise, Takhti station, the area surrounding this station also has a notable low height and density as far as the tallest building (Parto Commercial-Office Complex) has only four floors (around 20 meters in height) is distinguished and located on the eastern front of the square, between Modares and Ibn Sina streets.

(4) As well as the two previous metro stations, the existence of various taxi and bus stations around this square, attached to the heads of five radial streets, give an Intermodal character to this station and link it to the city and its surrounding bus terminals.

Finally, the three presented cases of metro stations show that the metro does not introduce a new central node in these cases, but it supports and reinforces the previous forms of urban nodes and networks. The other characteristics of the three stations' cases are the general low building height and density and the pending quality issues of their surrounding buildings and public spaces.

Due to the short elapsed time since the completion of Metro Line 1 in 2018, it still needs more time to witness the three studied stations' influence on their surrounding areas. It is expected that, in the near future, stations will become real nodes able to transform their surrounding area without removing the identity and memory of these sites.



## CHAPTER 6: CONCLUSIONS

- 6.1. A NEW FORM OF THE CITY'S IDENTITY
  - 6.2. THE CURRENT RELATION OF THE THREE CITY IMAGES, CHALLENGES AND OPPORTUNITIES
  - 6.3. THREE INTERWEAVING CITY PROJECTS IN PROGRESS
    - 6.3.1. Atigh (Emam Ali) Square: the Transition Space as Key Element
    - 6.3.2. Chahar-Bagh Avenue: Metro Stations Polarity and Central Area Pedestrianization
    - 6.3.3. Four Simple Steps in the Integration of Takhti Station to its Surrounding Area
- Final Note



## 6.1. A NEW FORM OF THE CITY'S IDENTITY

Hitherto, the in-depth study of the three essential periods in the city construction depicts three forms of networks, mobilities, urban nodes, and intersections engaged in the three local, intermediate, and territorial scales.

The three central chapters discussed the three structural urban forms that have built the city in certain moments, giving different characters to the actual city and the territory. The "Ground" and "Water" city (pedestrian-based city), the "Asphalt" city (wheel-based city), and the "Iron" city (metro-rail-based city) respond to varying forms of mobility and exchange<sup>1</sup>, configuring the three networks of central nodes<sup>2</sup> and intersections.

At last, it is the combination of urban nodes and their connecting network, which have presented diverse city images in each period. The future of Esfahan is not only about developing new networks of urban nodes, but the opportunity is also about reinforcing the relation of diverse networks. Optimizing and creating a relationship between the existing and future networks of encounter places is a real opportunity to enhance its efficiency. Therefore, the idea of intermediate and transitional spaces can play a significant role in articulating and increasing the synergy among different systems and improving the quality of the city's public and collective spaces. In other words, the new image of city identity must be set on the cooperation of sequential logics and orientations in time rather than on weakening, negating, and destroying its previously established structures.

Below, two general forms of urban design approaches are pointed out that allow putting the three city models in relation.

The first is a 2-dimensional project approach that focuses on the ground plan and insists on reconfiguring and activating the city ground floor. In this regard, the design of public space, emphasis on sidewalks and their relationship with

<sup>1</sup> Chapter 1, Section 1.6. A Matter of Identity and Exchange.

<sup>2</sup> Nodes and intersections are not more than the most concrete public spaces and different people's meeting points, where various mobility forms get concentrated, places for various exchange models or passing from one form to another, a transitional place or a point of encounter.

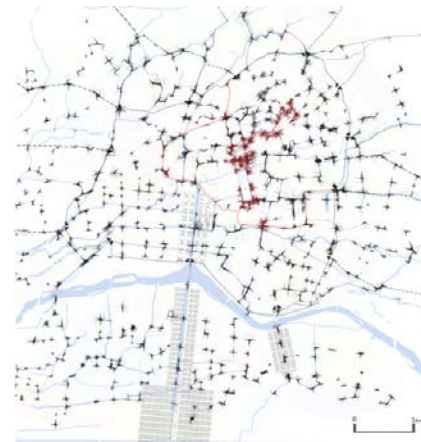


Fig. 359. The network of the "Ground" and "Water" City, Source: author

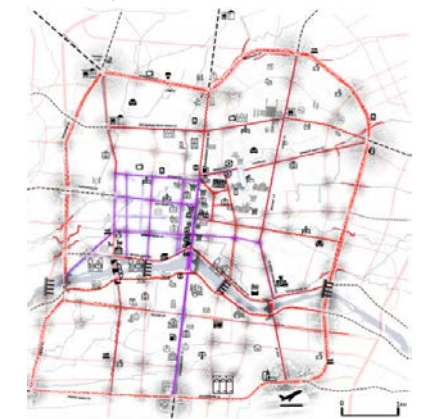


Fig. 360. The network of the "Asphalt" City, Source: author

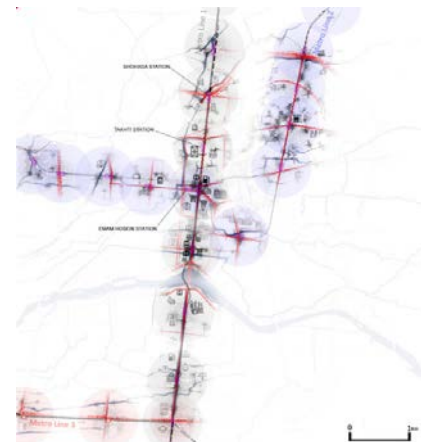


Fig. 361. The network of the "Iron" City, Source: author

buildings and architecture, permeability among different elements, porosity of the front buildings, and the concept of mixed-use and simultaneity are among the key issues to be considered.

Many architects and urban planners have discussed the improvement of urban quality by projecting the urban ground level shared by more buildings that cannot be reduced to a pure technical space via the multiplication and quality of relations between different things, materials, and people<sup>3</sup>.

The second is a 3-dimensional approach that seeks the city ground level's extension into multi-levels, using the "urban cross-section" as a design tool that makes articulation and interaction easier among the intersecting systems. The cross-section tool is often used in contemporary city design since the city is where different parts, structural forms, accessibilities, and networks have been overlapped. Although, the traditional city's experiences of using the cross-section in terms of practicing "underground urbanism"<sup>5</sup> or the creation of vertical city form offer some interesting examples which were introduced in the first part of this study (chapters 2 & 3).

The underground irrigation "Qanat" system, the case of using "Godal-Baghche" in the forms of residential and public buildings, and the case of the Khaju bridge represent some valuable resources for providing additional space hosting complex uses and activities, extracting geomaterials for construction, responding to the harsh climate condition, providing the shade and the use of geothermal energy, and the theme of water management.

The technological advances of the twentieth century and the increased need for greater urban comfort have led to intensive building both above and below ground level in a manner that expresses a greater verticality for the city. This constitutes a radical change in the way we understand cities today.

Depending on the conditions, problems, and capacities in each location, it is worth using one or both tools in order to strengthen the relationship between two or three urban systems, either at the ground level plan or by adding additional levels.

<sup>3</sup> Bernardo Secchi's notion of the ground project, "Progetto di suolo," defines the articulation between the technical networks, the project of the open space, and the design of the public space on the city scale. In 1986, he pointed out the loss of the fundamental qualities of continuity, connectivity, and identity of the ground within an urban project. He wrote: "To me, the theme appears different and more general; it seems to revolve around the issue of the design of the ground. It acquires a "sense" inside a wider social project, and acquires a "value" through the project of architecture. This project necessitates its own specific conceptual categories, which must become constitutive elements. It must simultaneously intervene on different scales." Manuel de Solà-Morales is another architect who discussed the value of the projection of the ground level in letting a building be urban or related to the city. He argues in his article, "La urbanitat de l'arquitectura," (The Urbanity of the Architecture) published in 2009: "The ground-floor level is the common plan, it is not only external, from the city, but also from the very same buildings". "The ground floor is the most penetrable place: the shops, the porches, the entrance through the hallway. Hallways are extremely important, these are the spaces that make houses become a part of the street. Therefore, permeability, the quality of a building of being accessible and of allowing us to enter it and be a part of it, is an essential quality for the urbanity of the buildings."

<sup>4</sup> De Solà-Morales, M. (2008) 'De cosas urbanas.' Edited by H. Ibelsings and K. Frampton. Barcelona: Gustavo Gili, pp.140 - 141.

<sup>5</sup> Edouard Utudjian (1905-1975), The architect and French-Armenian engineer, who was the founder of GECUS, Group for the study and coordination of underground town planning in 1933, is commonly seen as the father of "underground urbanism." In 1952 he published "L'urbanisme souterrain" (Paris: Presses Universitaires de France), a thorough study of the possibilities for developing underground space in Paris. Around this time, many other well-known projects and works were founded and published on that topic, including "Underground Space Design" by R. Sterling and J. Carmody (1993); "L'urbanisme souterrain: Étude comparée exploratoire" by S. S. Barles Jardel (2005); "Underground Spaces Unveiled: Planning and Creating the Cities of the Future" by Admiraal Han and Antonia Cornaro (2018); "Projet Deep City: Ressources Du Sous-Sol Et Développement Durable Des Espaces Urbains" by Parriaux Aurèle (2010). All of these investigations will emphasize the importance of reassessing the underground space in the city's overall planning and the approach to the specific attributes that enhance its quality (Clua Uceda, 2017).

## 6.2. THE CURRENT RELATION OF THE THREE CITY IMAGES, CHALLENGES AND OPPORTUNITIES

The quality of interaction among the three city images shows different results for an urban encounter place.

On the one hand, since the metro lines run underground and their connection with the ground level is punctual in each station, the relationship with its previous city structures may be set in a complementary mode. This complementary character, which generally adds to its previous systems, allows the metro to be more than a new exclusive metropolitan mobility system.

On the other hand, the construction of the new street network had a considerable impact on the city's preexisting elements, such as the ground passages and the city's water and green structure. In this case, the city's history has mostly been suppressed and ignored by the modern identity; in other words, the birth of a modern identity in most cases meant the death or weakening of its precedent. Actually, the continuity of contemporary arterial streets devoted to automobiles' traffic cost the discontinuity of historical arterial long-distance water streams (Madi) and ground passages. These break points (intersections) caused segregation in their relevant and surrounding associated buildings and residential neighborhoods.

When it comes to the idea of exchange among diverse elements, satisfying all the parties is not always easy. For instance, in many cases, the priority of car movement excludes the possibility of a civic experience of public space<sup>6</sup>.

The lack of a constructive dialogue at certain encountering places led to the emergence of a network of intersection places not well balanced as reference points for their surrounding communities, and unable to interlink varying facing logics. The extremist points of the conflict, which often occur in numerous urban junctions or intersections, result in a much larger urban problem within a network and decline the city overall efficiency.

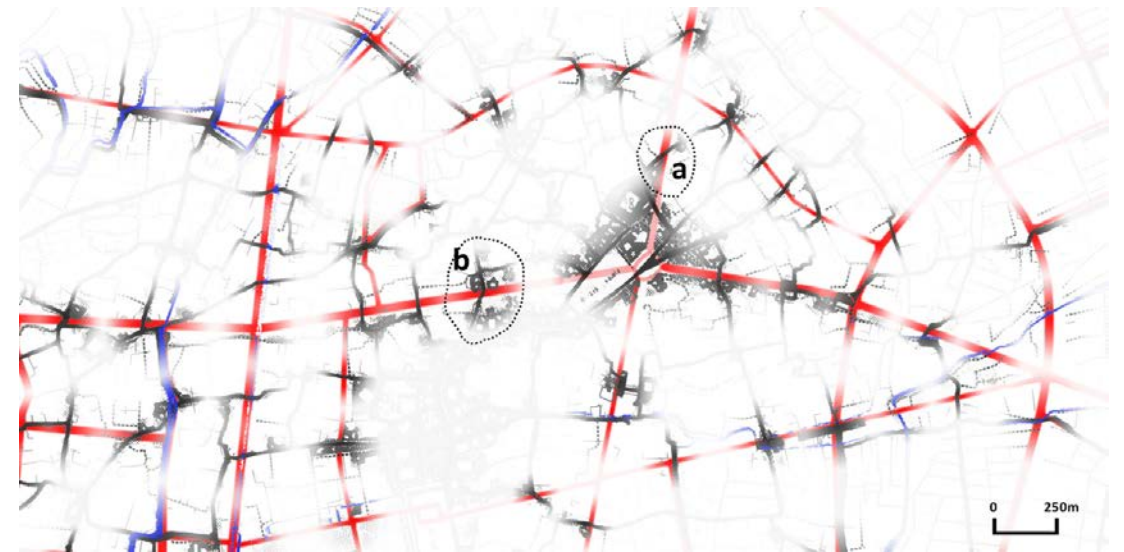
The following two examples of (a) Majlesi, and (b) Haj-Mohammad-Jafar intersections, have been selected among the contemporary network of new intersection points to illustrate the lack of proper exchange between different forms of mobility and urban structures.

These two examples represent the condition of the so-called by Richard Sennett "boundary edges<sup>7</sup>," where there is an opportunity to address their current conflicts and turn them into a chance to stabilize these nodes and improve their performance and services to citizens.

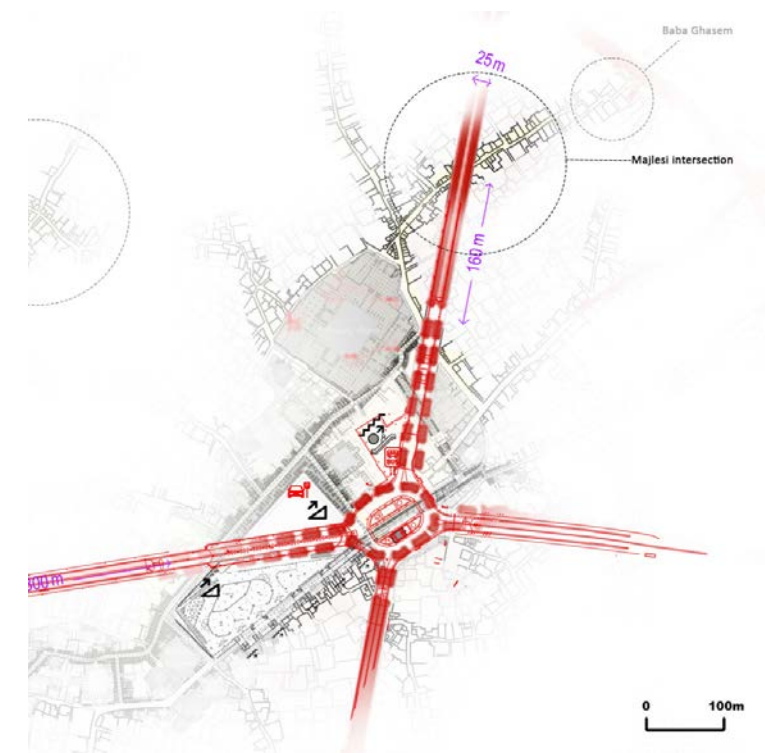
For instance, in the Majlesi intersection, due to the short distance (160 meters) from the emerging point of underground traffic tunnel to the surface and the narrow width of the street (25 meters), there is no space at the same ground; to integrate Majlesi Bazaar with Hatef street. Nowadays, a 2 meters high metal fence in the middle of the street forbids the transversal movement for pedestrian safety or higher capacity of car movements. However, it can be seen that sometimes people dangerously cross over the fence and pass through fast-moving cars to reach the other side of the street.

<sup>6</sup> Manuel de Solà-Morales, 2004, "Cities, corners": in the section "no corners" the author stated: "Strictly as road intersections, many urban junctions constitute central, monumental corners, but the predominance of traffic circulation, which instead of providing a service creates separation and distance, can effectively undermine or negate their condition as corners." "Major urban extensions that depend on a single obligatory linear infrastructure are anti-corners. Anti-corners occur where there is uniformity without admixture, monotony without difference, density without interchange (in places that are focal points for speculation, for example). Anti-corners are also generated where there is movement without contact, as is the case for freeways and interchanges. Where there is extension without reference: these are non-corners -- the anti-city." (p. 18).

<sup>7</sup> Richard Sennett, the open city, boundary edge condition, discussed in the introduction chapter, section 1.6.



**Fig. 363.** Esfahan, the critical intersecting conditions of Asphalt street network with historical ground passages and Madi canals, (a) Majlesi intersection, (b) Nimavard intersection. Source: author



**Fig. 362.** Majlesi intersection on the intermediate scale. Source: author



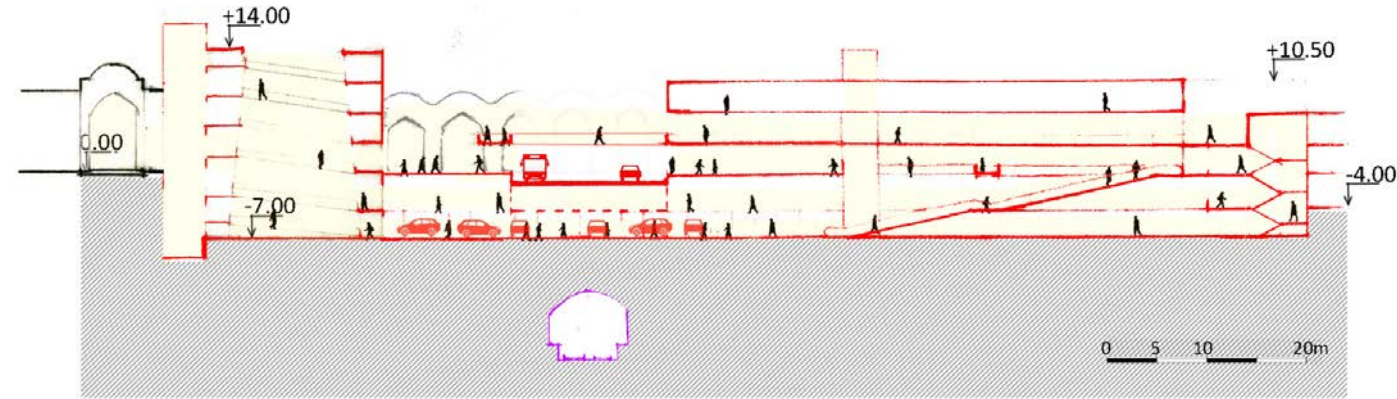
**Fig. 364.** The intersection of Majlesi Bazaar with Hatef street, April 2015, source: author



**Fig. 365.** Difference height level in between Hatef street and the ground level, 2015, source: author



**Fig. 366.** The heavy pedestrian and car traffic, March 2015, Source: author



**Fig. 367.** A possible section for intervening on Majlesi intersection, 1. Parking as an Intermediate space, 2. Vertical Accessibility, 3. Transversal accessibility; Passing from over the street, 4. Transversal accessibility; Passing from under the street, 5. Connectivity & accessibility; Connected to the subway system, 6. Allameh Majlesi Street, 7. New uses and activities, Hotel and restaurant at the top 8. New uses and activities, Supermarket in the uderground 9. Accessibility to and from the bazaar Source: author

The continuity of Hatef street completely blocked the primary extension of Bazaar, which caused separation and distance instead of preexisting proximity, contiguity, and permeability for surrounding residential neighbors and local multinodal centers.

In this case, there is no possibility for resolving different mobility forms at the same ground surface, a possibility can be trying to put in value settling the actual conflict by readjustment of one of the crossing structures and simultaneously improving their link. The aim that can be reachable through revising or designing this encounter point through applying the section design approach or adding new elements into multi-levels of city's ground instead of giving up one or another (Fig. 367).

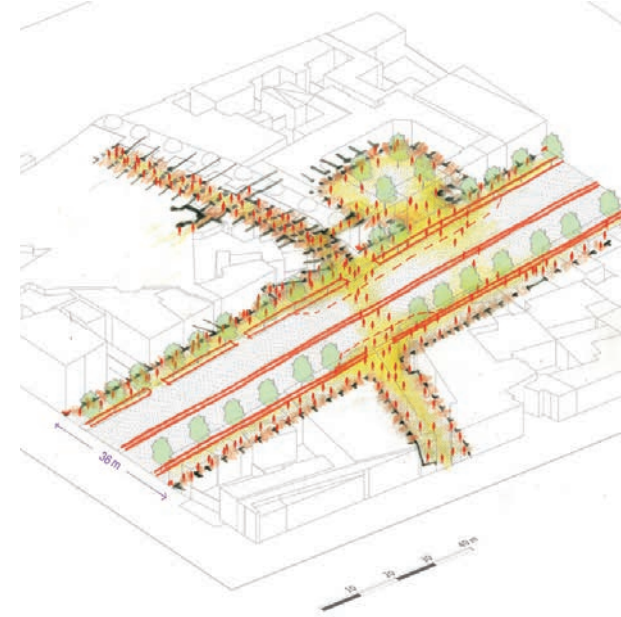


**Fig. 368.** Intersection point of Majlesi Bazaar with Hatef street, source: author

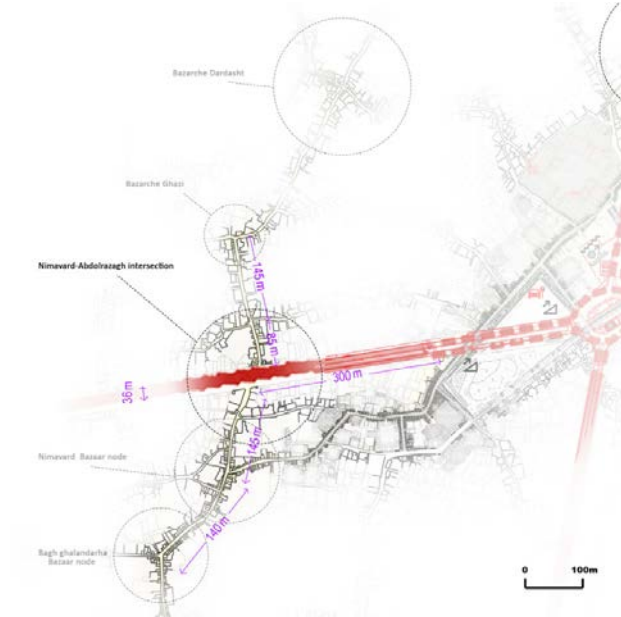
At the same time, there are many other intersecting points where it is unnecessary to intervene through the section. However, the intervention could be more delicate by leveling and flooring the ground, expanding the sidewalks, and encouraging transversal movement by removing or reducing excessive and longitudinal edges.

For example, the intersection of Haj Mohammad Jafar Bazarche as the extension of Nimavard Rasteh with Abdolrazagh Street is another case. The broader width of 36 meters Abdolrazagh street compared to Hatef width of 25 meters, and the longer 300 meters distance of this intersection from the entrance of the tunnel under the square, rather than 160 meters distance of Majlisi from it, makes it possible to improve the interchange of pedestrians and cars at the same ground level and the place of this intersection.

Examination of the width of the lanes allocated to sidewalks, green space, parking, and car traffic shows that the total 44.5% shared by pedestrians (about 28%) and green space (about 16.5%) is smaller than the space used by cars, which can get balanced at the intersection by widening the sidewalk. In addition, it can be helpful to limit the space of the gardens, which now occupy about 6 meters wide, by bordering the trees and removing or reducing the rows of boxwoods at the intersection.



**Fig. 369.** Intersection point of Haj-Mohammad-Jafar Bazarche with Abdolrazagh street, source: author



**Fig. 370.** Haj-Mohammad-Jafar intersection on the intermediate scale, Source: author



**Fig. 371.** Transitional view of Abdolrazagh 36 meters wide street at the point of intersection with Haj-Mohammad-Jafar Bazaar, 2015, source: author

### 6.3. THREE INTERWEAVING CITY PROJECTS IN PROGRESS

Finally, the three following examples of the current urban projects of Atiq Square, Chahar Bagh Street, and Takhti Metro Station have been chosen to demonstrate that these projects have been able to interweave different cities' networks by using former design approaches at a particular point of encounter (an intermediate-transitional hall or a metro station). Although, there is still room for improvement of the urban condition of their surrounding influential areas, it is of note the value of some of the design strategies implemented.

#### 6.3.1. Atigh (Emam Ali) Square: The Transition Space as Key Element

Emam Ali square represents an intervention project (approximately covering a thirty-two-hectare area) in the original center of the city. The project has recovered the Maidan's great surface (more than three hectares) to pedestrians as the meeting point of ancient centripetal long-distance ground passages.

The project approves that it is possible putting in relation the two networks of the "Asphalt" and the "Ground" city, through the extension of the square level to the underground and setting a transition hall related to the intermediate places of parking and bus station.

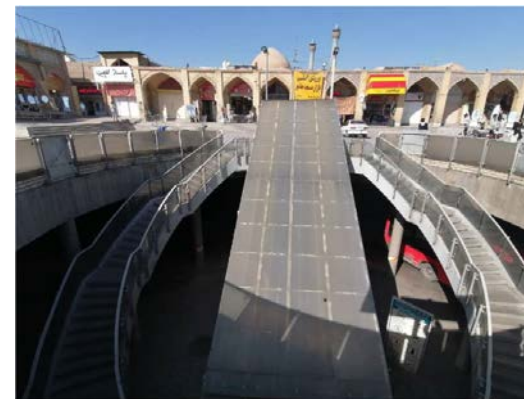
The Atigh square is the original central node of the city, which is connected to its surrounding areas and other territories through different structural forms, including:

- Historical primary and radial roads that used to carry the caravans from the outside to the city's center, which still connect the surrounding local centers and residential neighborhoods to the square,
- The contemporary network of arterial streets connects the Bazaar and old city center to the regional and national roads,
- According to Esfahan Urban Railway Organization, the location of Emam Ali metro station on metro line 2 has been determined to be set below the square surface and the underground traffic circle.

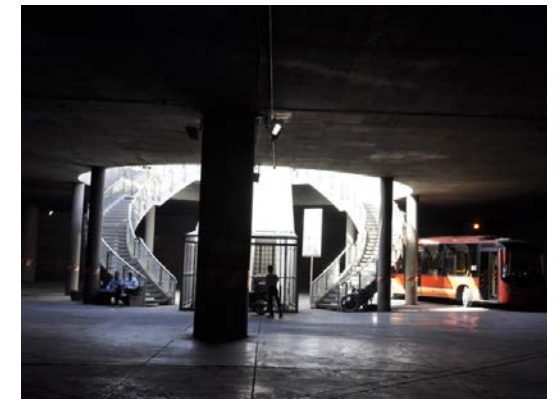
The idea of integration between infrastructures and the city becomes the fundamental concept for the square project. At present, the square works in two levels, belonging to pedestrians (on the ground surface) and car traffic (on the underground level). In the next few years, the square will be extended to two more underground levels to link the square, and the underground tunnel surfaces with the metro ticket hall and platform through the construction of the Emam Ali metro station.



**Fig. 372.** Atigh square, encountering three systems in the construction of single place. Source: (Shafaghi, 2016, edited by author)



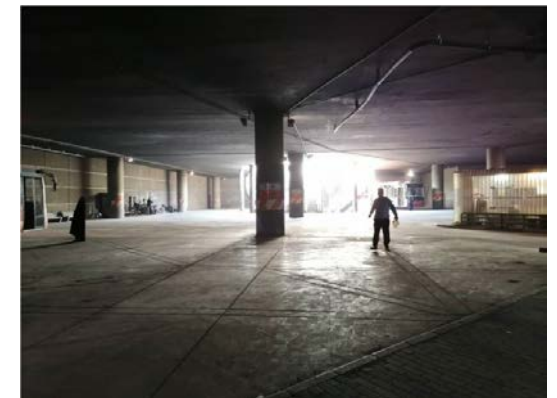
**Fig. 373.** looking to the circle void from JeloKhan ground surface, December, 2021. Source: Farzad Beigi



**Fig. 375.** Atigh square underground bus station, "in-between" embarkment and disembarkment space, vertical connectivity with the ground surface is built by a pair of regular and mechanical stairs. Source: H. Kharaji, October 2019



**Fig. 374.** Buses circulate around the central void to get parked or arranged in the line, December 2021, source: Farzad Beigi



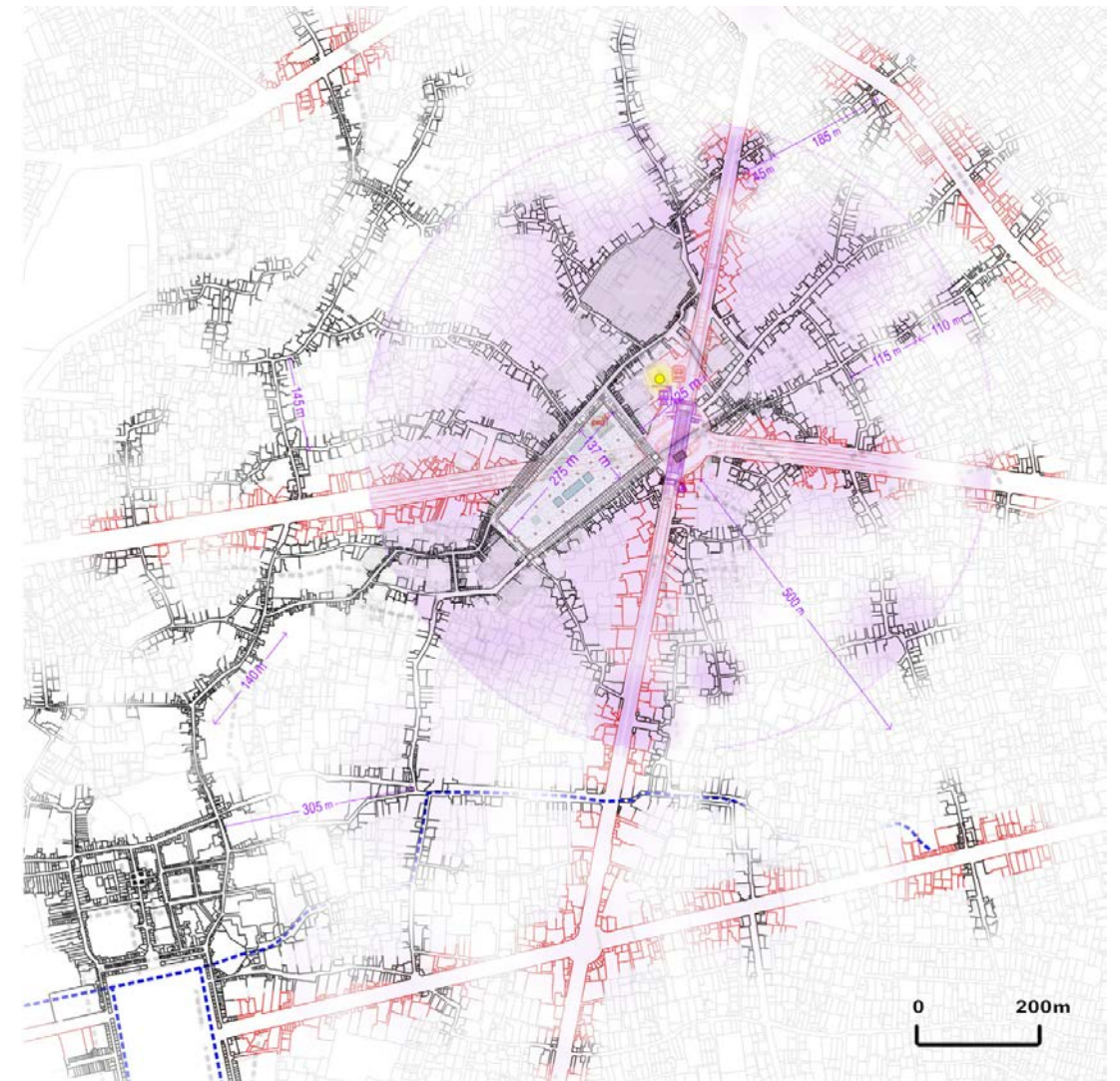
**Fig. 376.** The underground transitional place of Pishkhan Square, December 2021, Source: Farzad Beigi

The capacity of accessibility to Atigh square is not measured by the number of vehicles or people but rather by relating different means, speeds, and scales of movements. The efficiency of the Atigh square will be shown by its ability to relate different means through put emphasis on intermodal and transitional places including embarkment and disembarkment activities. It is the interscalarity and intermodality of the intermediate and transitional places, which let the connectivity between diverse users who travel the metropolis in very different ways. Depending on their origins, people come to this central metropolitan place for many various purposes by walking, riding bikes, driving cars or buses, or in near future, by metro.

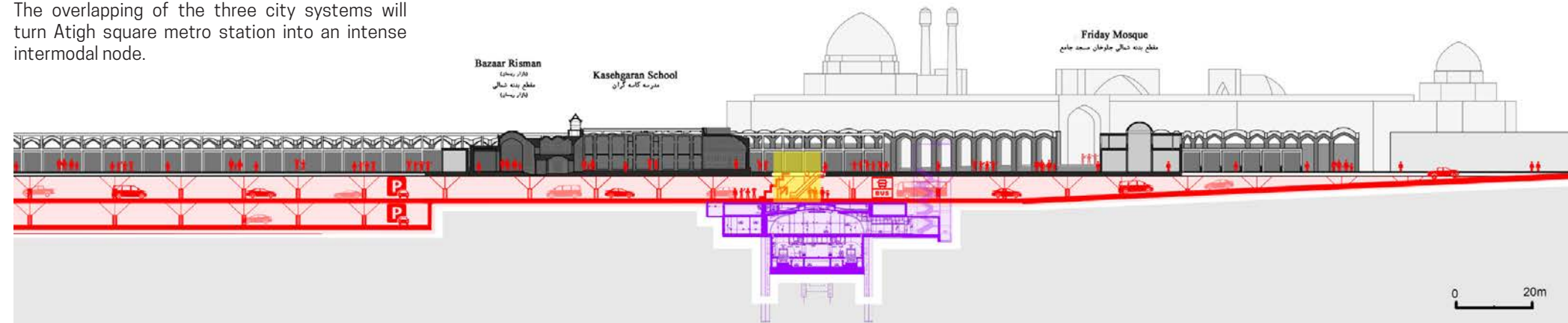
From this perspective, the hall is a point of encounter and a transition space between the structures of the three city models.

The 3,000 m<sup>2</sup> area hall, underground of Pishkhan square, built upon 6 meters height concrete roof sitting on a square modular grid of circular concrete columns (1.25-meter diameter) with a distance of more than 14 meters from one another, is in charge of interchanging between the “Ground” and “Asphalt” systems which is affirmed by the place of a bus station. This intermediate place emerges in the corner of Pishkhan square through a void circle with a radius of around 7 meters (yellow circle on Fig. 377), holding two sets of regular and mechanical stairs, which lets the buses turn around this central void to park or get into line.

Recently the selection of this void as one of the main entrances of the new metro station place will even add more importance to this particular place and the underground levels of the square. The overlapping of the three city systems will turn Atigh square metro station into an intense intermodal node.



**Fig. 377.** The Encountering Point of the Three Esfahan Images through circular void in Pishkhan square, source: author



**Fig. 378.** Emam Ali square, configuration of Atigh square through the urban section, vertical permeability in which the new mobility infrastructures have emerged from the underground. source: author

### 6.3.2. Chahar-Bagh Avenue: Metro Stations Polarity and Central Area Pedestrianization

Chahar-Bagh Street is another interesting example that, like Atiq Square, intervenes, both at the ground and underground levels, to link different urban systems and improve the quality of public space.

The intense transformation of Chahar-Bagh, with the beginning of the modern era (twentieth century), from a structural representative and ludic place at the edge of the city to the most dominant center of the “Asphalt” city, witnesses the flexibility and the high capacity of this street responding to the new forms of mobility.

The case of Chahar-Bagh Street is one of the most notable and attractive points in Esfahan that shows how the three main city structures have been accumulated in different times and complement and cohabit each other at the present. The Chahar-Bagh reality results from the combination of three city images, inheriting some essential aspects of the previous periods.

(1) Permeability of the street front edges to the transversal elements inherited from the “Ground” and “Water” City; (2) the porosity at the ground level buildings and the street fronts which host mixed-use, from the “Asphalt” city; (3) have recently been associated with the polarity of the metro stations at the two extremes of this axis.

The recent overall stone pavement and the reallocation of the street surface to pedestrians (2018), on the one hand, and the construction of the two Drvazeh Dolat and Enghelab metro stations, roughly separate 1,000 meters (2016), on the other hand, have been reinforced the efficiency of this axis.

The combination of all these features has created a distinctive spatial quality for this street. In other words, the urban quality of Chahar-Bagh Street arises from incorporating the three forms of city construction that together shape the current identity of the street. The case of Chahar-Bagh demonstrates how the city could reach a higher space quality by both approaching the ground plan and the cross section in supporting different logics and creating synergies in rebuilding city life’s complexity and intensity.



Fig. 379. Actual Chahar-Bagh, the combination of three systems in building a unique place. Source: author

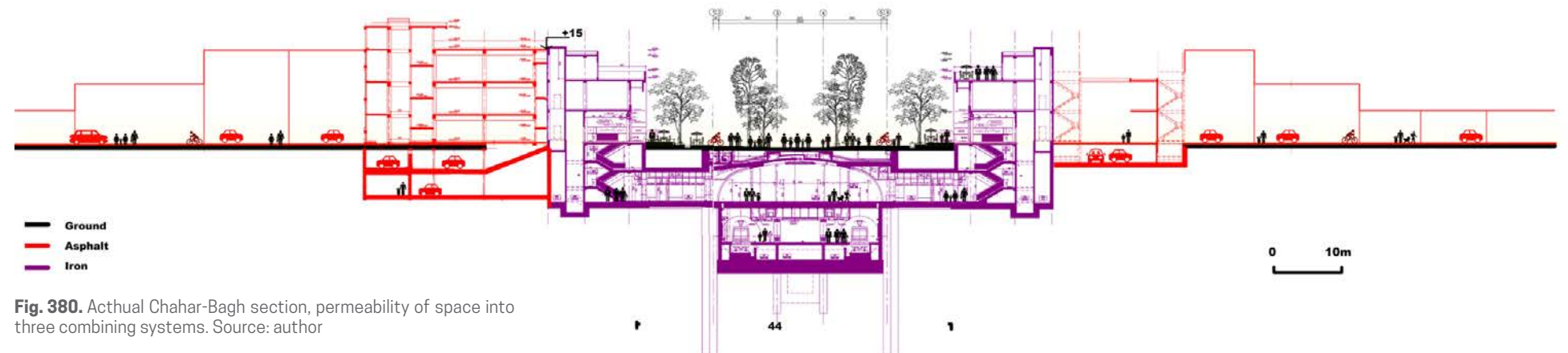


Fig. 380. Actual Chahar-Bagh section, permeability of space into three combining systems. Source: author

### 6.3.3. Four Simple Steps in the Integration of Takhti Station to its Surrounding Area

Alike the previous two examples of Atigh square and Chahar-Bagh street, Takhti Metro Station is another sample that illustrates the interrelation of the three city structures through a cross section project which put the ground to the underground surfaces of the city.

Similar to the case of Chahar-Bagh, the station is linked and surrounded by many elements and various aspects, which are inherited from different periods and are belonged to the two different images of “Ground” and “Water”, and “Asphalt” cities.

Concerning the first image, related to the city of the “Ground” and “Water,” the station is related to a network of multi-central historical nodes, including various neighborhoods centers, Bazaar nodes, and Atigh Square, linked by primary Gozar’s and Kuche’s (Fig. 381).

About the second image of the “Asphalt” city, the station is located underneath Chahar-Bagh Pa’in Street and on the south side of the Thakhti intersection, more than one kilometer distance from the Atigh square. In regards the most important potential of the metro entrances are their links with the permeable and porous borders of the street, which hold many diverse forms of simultaneous uses and activities, like the stadium, hotels, retail stores, and offices.

Finally, regarding the third complementary city image, the Takhti station has been converted into an urban project through interweaving and considering its surrounding historical and contemporary elements. The station of Takhti is an appropriate example that illustrates how an encounter point in the form of a metro station can be extended and relate to various places and different systems through taking essential decisions and tools, such as:

1- Expanding the public space through the cross section design by adding a new form of vertical permeability, connecting the street or the ground level to the platform level, which is located underneath “Chahar-Bagh Pa’in Street,”



**Fig. 381.** The “Ground” and “Water” city, considering Takhti metro station, multi-central historic nodes: Bab-Homayun (no. 1), Darb-e-Kushk (no. 2), Bid-Abad (no. 3), Shaterbashi (no. 4), Aligholi-Agha (no. 5), Qare-Kia (no. 6), Masjed Hakim (no. 7), Sine-Paieni (no. 8), Tal-e-Asheghan (no. 9), and Darvazeh-No (no. 10), historical primary routes: Posht-Baru (letter. a), Sheykh-Al-Islam (letter. b), and Aghajan Beyk (letter. c) Source: author



**Fig. 382.** The “Asphalt” city system, considering the Takhti Metro station. Source:author



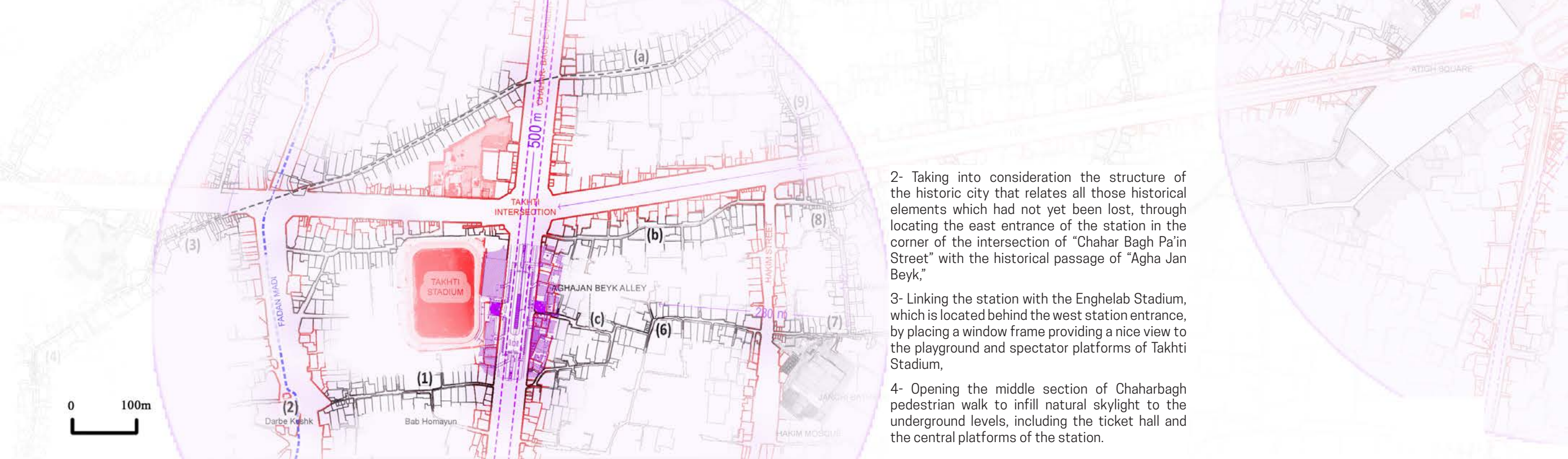


Fig. 383. Takhti station, interchanging the three city lectures. Source: author

2- Taking into consideration the structure of the historic city that relates all those historical elements which had not yet been lost, through locating the east entrance of the station in the corner of the intersection of "Chahar Bagh Pa'in Street" with the historical passage of "Agha Jan Beyk,"

3- Linking the station with the Enghelab Stadium, which is located behind the west station entrance, by placing a window frame providing a nice view to the playground and spectator platforms of Takhti Stadium,

4- Opening the middle section of Chaharbagh pedestrian walk to infill natural skylight to the underground levels, including the ticket hall and the central platforms of the station.

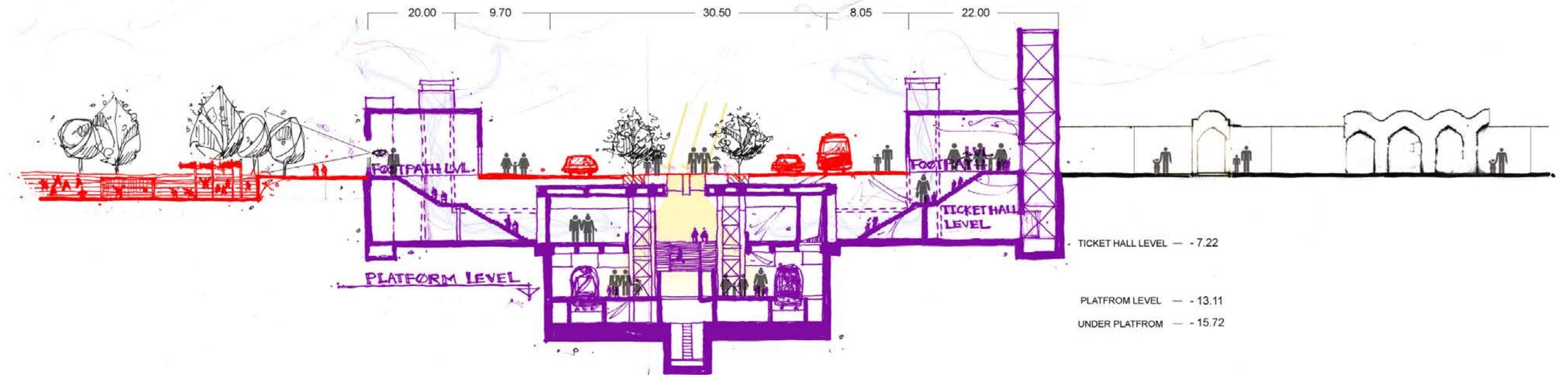


Fig. 384. The actual section of the Takhti station, interchange of three city logics. Source: author

The three former paradigmatic examples of the recent urban projects show how establishing a linkage between the various logics of the city can effectively improve the quality of urban life and service at certain encounter places. However, there is still room for improvement of these urban nodes in their extension beyond the encounter point and positively increasing the urban condition of their surrounding areas.

By introducing, recognizing, and narrating the three constructive images of Esfahan, this study considers the proximity and relationship between the three logics of the city as the golden and key opportunity for building the city's future.

Gazing at different potential intersection points or some paradigmatic current urban projects in progress showed us that considering various

practical approaches and uses of specific design tools can make it possible to improve the urban condition through establishing a proper exchange between the different urban systems, which in multiple numbers and in relation to one another can balance and enhance the efficiency of the entire city.

Nowadays, there is the opportunity to set strong relationships between the three forms of city construction and integrate them in favor of higher urban quality. It is a matter of looking for opportunities to transform solitude into exchange and ignorance into progress, a new form of identity that emphasizes not giving up or ignoring the previous urban systems and based on taking advantage of cooperation and synergy of all possible elements we already have at each specific site.

## BIBLIOGRAPHY

### 1. Literature on Esfahan - Iranian Cities

- Abdol Mehdi, R. (2008) 'Urban changes and management of Esfahan in the Pahlavi I Period.' Esfahan Municipality Cultural and Recreational Organization.
- Ahari, Z. (2001) 'Maktab-i Isfahan dar Shahr sazi (Isfahan School of Urban Design).' Art University - Danishgah-e-Honar.
- Ameli Najafabadi, R. (2015) 'Traditional Architecture of Iran's Influence on Modern Architecture Case study; Influence of Persian Bazaar on works of Jørn Utzon.' Universitat Politècnica de Catalunya (UPC).
- Amir Shahkarami, S. A. (2016) 'Khajou Bridge Engineering Review.' Golestan Honar, (6), pp. 81-94.
- Ardakani, E. (2013) 'Sitting on the Ground as an Important Factor in Formation of Traditional Houses in Hot Arid Region of Iran.' Eastern Mediterranean University, Gazimağusa, North Cyprus.
- Ardalan, N. and Bakhtiar, L. (1975) 'The Sense of Unity.' Chicago: University of Chicago Press.
- Arefian, Fatemeh (Farnaz) , Moeini, S. H. (ed.) (2012) 'Urban Change in Iran.' University College London, UCL.
- Arsiya, A. R. and Mehrabani Golzar, M. R. (2018) 'A Model for Urban Development Based on Natural Infrastructure Case Study: Ditches (Mādi) of Isfahan and its value added.' The Scientific Journal of NAZAR research center (Nrc) for Art, Architecture & Urbanism, pp. 25-36. doi: 10.22034/bagh.2018.66283.
- Bakhtiar, A. (1974) 'The royal bazaar of Isfahan.' Iranian Studies, 7(1-2), pp. 320-347. doi: 10.1080/00210867408701469.
- Bavar, C. (1983) 'Urban form as physical expression of social structure in arid zones of Iran, in Gideon, G. (ed.) Design for arid regions.' New York: Van Nostrand Reinhold.
- Bonine, M. E. (1979) 'The Morphogenesis of Iranian Cities.' Annals of the Association of American Geographers, 69, pp. 208-224. Available at: <http://www.jstor.org/stable/2563066>.
- Browne, K. (1976) 'Life line 1: Bazaar route\_ Friday Mosque to the Maidan.' The Architectural review, 951.
- Cantacuzino, S. (1976) 'Life Line 2: Chaharbagh\_Main Street.' The Architectural review, 951.
- Chamber Society (2001-2022) 'History of Iran: Constitutional Revolution.' Iran Chamber Society. Available at: [http://www.iranchamber.com/history/constitutional\\_revolution/constitutional\\_revolution.php](http://www.iranchamber.com/history/constitutional_revolution/constitutional_revolution.php) (Accessed: 29 January 2020).
- Diba, D. (2012) 'Different meanings and functions of the house, in Maisons d'Isfahan.' Esfahan: Hafez, pp. 111-141.
- Ehlers, E. and Floor, W. (1993) 'Urban change in iran, 1920-1941.' Iranian Studies, 26(3-4), pp. 251-275. doi: 10.1080/00210869308701802.
- Faghih, N. (1976) 'Houses.' The Architectural review, volume clix.
- (1976) 'Rehabilitation in Dardasht.' The Architectural review, p. 75.
- Falahat, S. (2014) 'Re-imagining the City.' Wiesbaden: Springer Fachmedien Wiesbaden. doi: 10.1007/978-3-658-04596-8.
- Falahat, S. and Shirazi, M. R. (2012) 'New urban developments in Safavid Isfahan continuity or disjuncture?' Planning Perspectives. doi: 10.1080/02665433.2012.709695.
- (2015) 'Spatial fragmentation and bottom-up appropriations: the case of Safavid Isfahan.' Urban history. Cambridge, UK: Cambridge University Press, 42(1), pp. 3-21. doi: 10.1017/S0963926814000133.
- Farzin, A. A. and Ayvazian, S. (2012) 'The main components of the house, in Maisons d'Isfahan.' pp. 141-161.

- Gaube, H. (1979) 'Iranian Cities.' New York: New York University Press.
- Ghasemi Sichani, M. (2005) 'An introduction to the contemporary architecture of Esfahan.' *Daneshe Nama*, (124–125), pp. 11–30.
- Ghasemi Sichani, M. et al. (2012) 'Maisons d'Ispahan.' Esfahan: Hafez. doi: 728/09559332.
- Gholipour, S. and Mahdinejad, J. (2017) 'Narrative of maps from Chaharbagh Street of Isfahan.' *Manzar*, (39).
- Golombek, L. (1974) 'Urban patterns in pre-Safavid Isfahan.' *Iranian Studies*, 7(1–2), pp. 18–44. doi: 10.1080/00210867408701454.
- Habibi, R. and De Meulder, B. (2015) 'Architecture without Architects: Modernization of Iranian housing and the birth of a new urban form Narmak (Tehran, 1952).' *Cities*. Elsevier Ltd, 45, pp. 29–40. doi: 10.1016/j.cities.2015.03.005.
- Habibi, R., De Meulder, B. and Habibi, S. M. (2016) 'Re-visiting Three Neighbourhoods of Modern Tehran: Chaharsad-Dastgah, Narmak and Nazi-Abad.' in, pp. 31–46. doi: 10.1007/978-3-319-26115-7\_4.
- Habibi, seyed M. (1999) 'Az Shar ta Shahr: Tahlili tarikhi az mafhume shahr va simaye kalbodidean, tafakor va tasvor (De La Cite a La Ville-Analyse Historique De La Conception Urbaine Et Son Aspect Physique).' Tehran: Tehran University.
- Habibi, S. M., Ahari, Z. and Emami (2010) 'From demolishing fortifications to thoughts of highways: history of urban design in Tehran from 1930 till 1966.' *Soffeh Journal*, 20, pp. 85–102.
- Haeri Mazandarani, M. R. (2016) 'House, Culture, Nature in Iranian Architecture.' Center for Architectural and Urban Studies and Research.
- Haji-Qassemi, K. (no date) 'Ganjnameh : cyclopaedia of Iranian Islamic architecture,' volume Contents: 2. Mosques of Esfahan, 4. Mansions of Esfahan, 5. Madrasas, 9. Bazaar buildings.' Shahid Beheshti University, Faculty of Architecture and Urban Planning, Documentation and Research Center : Cultural Environment Development Company (CEDCO).
- Hedayat, S. (2004) 'Isfahan Nesfe Jahan.' 2ND editio. Negah.
- Homaei, J. (2011) 'Tarikh-e-Isfahan: Abnieh va Emarat (Isfahan history: Buildings and Mansions).' Edited by M. Homaei. Tehran: Institute of Humanities and Cultural Studies.
- (2019) 'Tarikh-e-Isfahan: Geography.' Edited by M. Homaei. Tehran: Institute of Humanities and Cultural Studies.
- Honarfar, L. (1971) 'A treasure of historical monuments of Isfahan: ancient monuments, historical tablets and inscriptions in the Isfahan province.' Isfahan.
- Hossaini Abari, H. (2000) 'Zayandeh rud: as Sarcheshmeh ta mordab (from source to the moor).' 1st edn. Edited by H. Allah Entekhabi. Esfahan: Entesharat-e-Golha (Golha Publications).
- International Affairs Dept of Esfahan Municipality (2015) 'Atlas-e Kalanshahr-e Esfahan.' Esfahan: Hamseda.
- Izadi, M. (2008) 'A Study on City Centre Regeneration: A comparative analysis of two different approaches to the revitalisation of historic city centres in Iran.' dissertation. Newcastle University.
- Jaberi Ansari, M. H. K. (1999) 'Tarikh-e-Esfahan (History of Esfahan).' Edited by J. Mazaheri. Esfahan: Mashal.
- Jamalzadeh, M. A. (1974) 'Goftegu-e-Khanevadegi darbareh-ye-Esfahan (Family conversation about Isfahan).' Tehran: Bongah-e-Trjomeh va Nashre Ketab.
- Jenab Esfahani, A. (1886) 'Al-Esfahan.' Tehran University.
- Karimi, K. (1997) 'The Spatial Logic of Organic Cities in Iran and The United Kingdom.' First International Space Syntax Symposium.
- (1998) 'Continuity and Change in Old Cities; An Analytical Investigation of the Spatial Structure in Iranian and English Historic Cities Before and After Modernisation.' University of London.
- Karimi, K. and Motamed, N. (2003) 'The tale of two cities: Urban planning of the city Isfahan in the past and present.' 4th International Space Syntax Symposium. doi: 10.4324/9780429486470-37.
- Kheirabadi, M. (2000) 'Iranian cities: formation and development.' 1st edition. Syracuse University Press. Mashal.
- Lambton, A. K. S. (1959) Donald N. Wilber: 'Iran past present.' Fourth edition, xi, 312 pp., 12 plates. Princeton, N.J.: Princeton University Press, 1958. (Distributed in G.B. by Oxford University Press. 40s.)', *Bulletin of the School of Oriental and African Studies*, 22(3), pp. 589–590. doi: 10.1017/S0041977X00065733.
- Ministry of Culture and Arts of Iran (1976) 'Isfahan city of light.' Esfahan. Iran
- Mirmoghtadaee, M. (2009) 'Process of housing transformation in Iran.' *Journal of Construction in Developing Countries*, 14.
- Mollazadeh, K. and Mohammadi, M. (2003) 'Encyclopedia of Iranian historical monuments, schools and religious buildings.' Tehran: Surah Mehr.
- Moravej Torbati, K. and Pournaderi, H. (2013) 'Studying the continuity of valid traditions in the formation of Khajoo Bridge, based on a comparative study of historic bridges in Isfahan.' *Bagh Nazar*, (27), pp. 61–70.
- Nafisi, A. A. (1939) 'Farhang-e-Nafisi' (Farsi). Tehran.
- Namdarian, A. A., Behzadfar, M. and Khani, S. (2016) 'The role of the Madi networks in the transformation of Esfahan's spatial organization from the beginning to the end of the Safavid period.' *Journal of Iranian Architecture Studies*, (10).
- Pahlavanzadeh, L. (2013) 'The heritage of Iranian industrial architecture: Esfahan province' (Farsi). Esfahan.
- Pakseresht, S. (2018) 'The modernization of an Iranian city: the case study of Kermanshah.' dissertation. Universitat Politècnica de Catalunya.
- Proudlove, J. A. (1969) 'The influence of town planning proposals on the cultural monuments in the historic cities of Tabriz, Qasvin, Isfahan and Shiraz.' Paris.
- Rainer, R. (1977) 'Anonymes Bauen Im Iran / Traditional Building in Iran.' Graz: Verlag Sanstalt.
- Rajaei, A. M. (2013) 'From Caravanserai to Guest House; History of Abbasi Hotel, local history of Iran.' Available at: [http://www.localhistory.ir/article/abbasi\\_hotle/](http://www.localhistory.ir/article/abbasi_hotle/).
- Samimi, G. (1998) 'Nazhvan grove.' *Architecture and urbanism*, 7(42–43), pp. 65–73.
- (1998) 'The Lasting Effects of the Kocks Master Plan on Physical order of Esfahan city.' *Architecture and urbanism*, 7(42–43), pp. 57–63.
- Shafaghi, S. (2002) 'Esfahan Geography.' 2nd edn. Edited by P. Rashidi. Esfahan: Isfahan University.
- (2006) 'Bazaar-e-Bozorg-e-Esfahan (Esfahan Grand Bazaar).' Esfahan: Esfahan Municipality Cultural and Recreational Organization.
- (2016) 'An Introduction to the Recognition of The Islamic-Iranian City (Volume 1).' Esfahan Municipality Cultural and Entertainment Organization.
- (2016) 'An Introduction to the Recognition of The Islamic-Iranian City (Volume 2).' Esfahan.
- Shahidi Marnani, N. (2016) 'Tracing Isfahan Saadatabad Garden in Golzar Saadat's Masnavi.' *Iranian Architectural Studies*, (9).
- Shirazi, M. R. (2018) 'Contemporary Architecture and Urbanism in Iran.' Available at: <http://link.springer.com/10.1007/978-3-319-72185-9>.
- Siroux, M. (1978) 'The ancient roads of the Isfahan area and their associated buildings.' translated by Mashayekhi. Tehran: Iranian National Ancient Monument Preservation Organization.
- Tavasoli, M. (2002) 'Sakht-e-Shahr va Memari dar Eghlim Garm va khoshk-e-Iran (Urban structure and architecture in the hot arid zone of Iran).' Tehran.
- Wilber, D. N. (2000) 'Architecture VII. Pahlavi, before World War II.' *Encyclopaedia Iranica*. New York, Bibliotheca Persica Press.
- Yılmaz Çakmak, B. and Khaleghimoghaddam, N. (2016) 'Spatial Analysis of Khaju Bridge as an Urban Element, In The Context of Space Perception Through Senses.' *IOSR Journal Of Humanities And Social Science (IOSR-JHSS)*, 21(4), pp. 66–75. doi: 10.9790/0837-2104076675.

## 2. General Bibliography

- Admiraal, H. and Cornaro, A. (2018) 'Underground Spaces Unveiled : Planning and Creating the Cities of the Future.' London: ICE Publishing.
- Alexander, C. (1966) 'A City is Not a Tree.' Design Magazine, p. Section 4.
- Appleyard, D. (1964) 'The View from the Road.' Edited by K. Lynch, J. R. Myer, and M. Cooper. Cambridge, [MA: The MIT Press.
- Bacon, E. N. (1978) 'Design of cities.' London: Thames and Hudson Ltd.
- Barles, S. and Jardel, S. (2005) 'L'urbanisme souterrain: Étude comparée exploratoire.' [https://www.researchgate.net/publication/279254556\\_L'urbanisme\\_souterrain\\_etude\\_comparee\\_exploratoire](https://www.researchgate.net/publication/279254556_L'urbanisme_souterrain_etude_comparee_exploratoire)
- Busquets, J. and Correa, F. (eds) (2006) 'Cities, X lines: a new lens for the urbanistic project = Ciudades, X formas : una nueva mirada hacia proyecto urbanístico.' [Cambridge, MA], Harvard University, Graduate School of Design.
- Clua Uceda, Á. (2017) "Underground urbanity: from the carrefour à étages multiples to the 'inner street' ". VLC arquitectura, Vol. 4, Issue 1, 61-95. <https://doi.org/10.4995/vlc.2016.6963>
- (2017) 'La condición intersticial en los proyectos de articulación urbana : del Slussen al Estocolmo de Tage William-Olsson en cuatro tiempos.' dissertation. Universitat Politècnica de Catalunya.
- Corboz, A. and Marot, S. (2001) 'Le territoire comme palimpseste et autres essais.' Paris: Besançon, L'Imprimeur.
- Criconia, A. and Grillet-Aubert, A. (2021) 'Reti e stazioni della metropolitana tra funzionalità e architettura.' Journal of 'Trasporti & Cultura' n°57.
- Crosas Armengol, C. (2009) 'Variaciones sobre la regularidad: el proyecto de el Vedado en la formación de la Habana metropolitana.' dissertation. Universitat Politècnica de Catalunya.
- De Solà-Morales, M. (1992) 'Public and Collective Space: The Urbanization of the Private Domain as a New Challenge.' La Vanguardia.
- (1992) 'Periphery as a project.' Urbanism, (9-10).
- (1997) 'Las Formas de crecimiento urbano.' Barcelona: UPC (Col·lecció d'arquitectura ; 10).
- (1999) 'Progettare città = Designing cities.' Edited by M. Zardini. Milano: Electa (Lotus Quaderni Documents ; 23).
- (2004) 'Ciudades, esquinas = Cities, corners.' Barcelona: Lunwerg.
- (2006) 'Cuando lo subterráneo aflora,' in La ciudad minuto a minuto. General State Administration: <http://publicacionesoficial.boe.es>.
- (2008) 'De cosas urbanas.' Edited by H. Ibelings and K. Frampton. Barcelona: Gustavo Gili.
- (2008) 'Diez lecciones sobre Barcelona : los episodios urbanísticos que han hecho la ciudad moderna = Ten lessons on Barcelona : urbanistic episodes that have made the modern city.' Barcelona: Col·legi d'Arquitectes de Catalunya.
- (2009) 'The urbanity of architecture.' Barcelona.
- (2010) 'La piel de las ciudades.' Laboratori d'Urbanisme de Barcelona.
- Fausch, D. (2012) 'Complexity and Contradiction in Architecture.' Journal of architectural education (1984). Taylor & Francis Group, 66(1), pp. 31-32. doi: 10.1080/10464883.2012.714912.
- Frampton, K. (1985) 'Towards a critical regionalism: Six points for an architecture of resistance.' Postmodern culture, pp. 16-30.
- (2010) 'Megaform as urban landscape.' Ann Arbor, Mich: University of Illinois at Urbana Champaign, School of Architecture.
- Galindo, J. (2003) 'Cornelis van Eesteren : la experiencia de Amsterdam 1929-1958.' Barcelona: Fundación Caja de Arquitectos (Colección Arquithesis ; 14).
- Gehl, J. (2010) 'Cities for people.' Washington, DC: Island Press.
- (2011) 'Life between buildings : using public space.' Washington, DC: Island Press.
- Habraken, N. J. and Teicher, J. (1998) 'The Structure of the ordinary: form and control in the built environment.' Cambridge (Mass): The MIT Press.
- Hakim, B. S. (2001) 'Urban Form in the Arab World: Past and Present.' Cities, 18(6), pp. 426-427. doi: 10.1016/S0264-2751(01)00036-1.
- Hidalgo Cepeda, N. R. (2013) 'Las estaciones que fundaron el metro en Santiago de Chile.' Laboratori d'Urbanisme de Barcelona.
- Hénard, E. (1982) 'Etudes sur les transformations de Paris et autres écrits sur l'urbanisme.' Edited by J.-L. Cohen. Paris: L'Equerre (Formes Urbaines).
- Koolhaas, R. et al. (1998) 'Small, medium, large, extra-large: Office for Metropolitan Architecture.' New York: Monacelli Press.
- Kostof, S. (1991) 'The city shaped: urban patterns and meanings through history.' London: Thames and Hudson Ltd.
- Kostof, S. (1992) 'The city assembled: the elements of urban form through history.' Thames and London.
- Jacobs, J. (1961) 'The Death and life of great american cities.' New York: Random House.
- Madanipour, A. (2003) 'Public and Private Spaces of the City.' Routledge. doi: 10.4324/9780203402856.
- Mangin, D. (2004) 'La ville franchisée: formes et structures de la ville contemporaine.' Villette. Paris.
- Mangin, D. and Girodo, M. and Avec. (2016) 'Mangroves urbaines. Du métro à la ville : Paris, Montréal, Singapour', La Découverte, 2016
- Moreno Sanz, J. (2014) 'Esquinas territoriales. Movilidad y planificación territorial, un modelo de integración : el Randstad-Holland = Urban corners in territory : An integrated land use-transport model : the Randstad-Holland.' dissertation. Universitat Politècnica de Catalunya.
- Mumford, L., 1979. 'The City in history: its origins, its transformations, and its prospects.' Harmondsworth (G. B.): Penguin Books. ISBN 0140207473.
- Parcerisa, J. (1990) 'La Forma urbis : cinc ciutats sota sospita.' Edited by M. de Solà-Morales. dissertation. UPC. Escola Tècnica Superior d'Arquitectura de Barcelona, 1990.
- (2000) 'La Ciudad no es una hoja en blanco : hechos del urbanismo.' Edited by M. Rubert de
- Ventós. Santiago de Chile: Ediciones ARQ (Arquitectura. Teoría y obra ; 3).
- Parcerisa, J. and Crosas Armengol, C. (2013) 'Barcelona / enllaços = Barcelona / enlaces = Barcelona / links.' Edited by J. Parcerisa and C. Crosas Armengol. Barcelona: Laboratori d'Urbanisme de Barcelona.
- Parriaux, A. (2010) 'Projet Deep City : Ressources Du Sous-Sol Et Développement Durable Des Espaces Urbains : Rapport De Recherche Pnr 54.' Zürich: VDF Hochschulverlag.
- Ricoeur, P. (2007) 'Universal civilization and national culture, in Architectural Regionalism: Collected Writings on Place, Identity, Modernity, and Tradition.' Princeton Architectural Press, pp. 42-53.
- Roca Blanch, E., Aquilué Junyent, I. and Mendonça Espinheira Gomes, R. de (2016) 'Caminar la ciudad: Barcelona como experiencia de innovación docente.' Universitat Politècnica de València.
- Roca Blanch, E. and Martí Casanovas, M. (2013) 'Editorial.' QRU: Quaderns de Recerca en Urbanisme, (1). doi: 10.5821/qru.9537.
- Rossini, F., Roca, E. and Harris, S. (2018) 'La noción de suelo : una definición de permeabilidad urbana en Hong Kong y Barcelona.' ACE Architecture City and Environment. doi: 10.5821/ace.13.38.5432.
- Rubert de Ventós, M. and Parcerisa, J. (2001) 'Metro, Galaxias metropolitanas.' UPC.
- Saarinen, E. (1945) 'The City, Its Growth, Its Decay, Its Future. second.' New York: Reinhold Publishing Corporation.
- Sabaté Bel, J. (1999) 'El Proyecto de la calle sin nombre : los reglamentos urbanos de la edificación París-Barcelona.' Barcelona: Caja de Arquitectos, Fundación (Arquithesis ; 4).
- Sanz Palau, H. and Galindo González, J. (2013) 'Interaccions vs transicions metropolitanas.' QRU: Quaderns de Recerca en Urbanisme, (2). doi: 10.5821/qru.9549.
- Scheerlinck, K. (2011) 'Depth Configurations and Privacy. Proximity, Permeability and Territorial Boundaries in Urban Projects.' Helsinki.

- (2011) 'Privacy and depth configurations proximity, permeability and territorial boundaries in urban projects.' 45, pp. 167-187.
- Secchi, B. (1986) 'Progetto di suolo.' Journal of Casabella n°520-521.
- Sennett, R. (1996) 'Flesh and stone : the body and the city in western civilization.' London [etc: Faber and Faber.
- (2006) 'The open city.' Urban age, newspaper essay, Berlin.
- Sterling, R. and Carmody, J. and University of Minnesota. (1993) 'Underground Space Design.' New York: Van Nostrand Reinhold.
- Utudjian, É. (1952) 'L' Urbanisme Souterrain.' Paris: Presses Universitaires de France.
- Vinyes, R. (2015) 'Barcelona oculta: la rellevància del subsòl en una gran ciutat contemporània.' dissertation. Universitat Politècnica de Catalunya.

### 3. Official Documents and Reports

- Kocks's master plan (1959-1961). The first urban development plan prepared for Esfahan at the request of the Interior Ministry's technical office and by German consultant company of Kocks.
- Organic master plan\_Tarhe-Jame Aval (1969 - 1971). The second Esfahan masterplan produced by E. Beaudouin and Organic Consultants. The plan counts as the first official comprehensive plan of Esfahan.
- Organic detailed plan\_Tarhe-Tafzilie-Tarhe Jame Aval (1975-78). The third development master plan arranged by Organic Consultant company which is called as the first official detailed plan of the city.
- Organic master plan revision\_Tarhe-Jame Dovom (1988). The fourth urban development plan of Esfahan was a review of the Organic master plan accomplished by the General Department of Housing and Urban Development of Esfahan province, and approved by Iran Supreme Council of Urban Planning and Architecture.
- The detail plan of Organic master plan revision\_Tarhe-Tafzilie-Tarhe-Jame Dovom (1992-1996). The fifth Esfahan development plan was projected by Naqsh-e-Jahan Pars Consulting Engineers, and considered as the second comprehensive detailed plan.
- The revision plan of the second detailed plan \_Tarhe-Baznegarie-Tarhe-Jame Dovom (2002-2006). The sixth urban development plan, or the third detailed plan, has been prepared for the first time by Esfahan municipality, deputy of architecture and urban planning, and still is on the agenda.
- Historical Esfahan development plan, zones 1 and 3 (2003) produced by Bavand consulting engineers at the request of the Municipality.
  - The Study and design report of the second detailed plan (2014) Naghshe Jahan Pars Consulting Engineers.

### Archive of Municipality, Deputy of Traffic and Urban Transport

- Volvo's study on Isfahan urban transport (1976) Initial study has been performed by AB Volvo of Gothenburg, Sweden, on behalf of the Plan and Budget Organization of the Imperial Government of Iran for the purpose of devising efficient urban transport solutions for Esfahan.
- Kumagai Gumi and Pacific consultants' study (1984) Preliminary survey report and technical proposal for the comprehensive urban transport study of Isfahan metropolitan area.
- SOFRETU (International French consultants), ERMIC (Esfahan Regional Metro Company) (1993) 'Esfahan Mass Rapid Transit System, Pre-Feasibility and Feasibility Study,' inception report.
- (1995) Interim Report Pre-Feasibility Study Annexes.
- PPK Environment & Infrastructure Pty Ltd (1996) 'Mass Rapid Transit System for Esfahan and the Region and the preliminary design of a priority metro line in the City and a railway line in the Region.' Esfahan Regional Metro Company, United Nations Development Program.
- (1997) 'The interim report,' The feasibility analysis results and recommendations for the mode and alignments for the priority lines and future network.
  - (1998) 'The final report, vol. I'. Esfahan Mass Rapid Transit System-Feasibility Study, Executive Summary.
- EURO (Esfahan urban railway organization) (1998) additional surveys and geological investigations on the preliminary design of the priority lines.

### Archive of EURO\_ Esfahan Urban Railway Organization

- Spatial Master Plan of Metro Stations's surrounding areas (2003) at the request of Esfahan Municipality and ERMIC, and accomplished by Naghshe Jahan Pars Consulting Engineers.
- (2004) Detailed plan report of Emam Hossein station's surrounding areas. The first edition.
  - (2004) Detailed plan report of Takhti station's surrounding areas. The first edition.
  - (2004) Detailed plan report of Shohada station's surrounding areas. The first edition.
  - (2004) Shohada Square Station Plan. Architectural and Structural Studies Report, First Stage - Part 2 (Final Edition).
- Emam Hussein and Enghelab stations study (2016) A report was produced at the request of Esfahan Municipality and ERMIC by Bavand Consulting Engineers on analyzing the two station sites and surrounding areas.

### Other Official Reports

- ABFA (1974) Technical maps and drawings. Source: Technical Engineering Unit of Esfahan Water and Sewerage Department.
- Naghsh-e-Jahan Pars Consulting Engineers (1991) Improvement and modernization plan of the complex of Maidan-e-Kohneh and Atiq Jame mosque. Available at: <http://aoapedia.ir/>.
- (2008) Atiq Square Rehabilitation Project.
- Naghsh-e-Jahan Pars Consulting Engineers, Esfahan Renovation and Improvement Organization (2012) 'Summary of the process of studies, plan preparation and implementation of the revival project of Imam Ali Square.' Esfahan.
- Esfahan Maskan Sazan Company (2006) Organizing the historical axis of Joybareh.
- ICHHTO - Iranian Cultural Heritage, Handicrafts & Tourism Organization (2016) State of Conservation report of Meidan Emam Esfahan World Heritage Site, UNESCO, World Heritage Convention, Tehran.

## CARTOGRAPHY AND VISUAL RECORDS

### Historical and Primary Visual Sources

Adam Olearius (1656) 'View on Esfahan, Vermehrte Neue Beschreibung Der Muscovitischen und Persischen Reyse.' Schleswig, Germany. Source: Voyages très-curieux & très renommez faits en Moscovie, Tartarie, et Perse : Olearius, Adam, 1603-1671 : Free Download, Borrow, and Streaming : Internet Archive

Jean Chardin (1670s) 'Voyages de Mr. Le Chevalier Chardin en Perse et autres lieux de l'Orient.'

Kaempfer, Engelbert (1651-1716) Esfahan's architectural views and drawings. Source: Amoenitatum exoticarum politico-physico-mediarum fasciculi v. Lemgoviae, Typis & impensis Henrici Wilhelmi Meyeri, aulae Lippiacae typographi, 1712.

Pascal Coste and Eugène Flandin (1851) Paintings and plots of Voyage en Perse, avec Flandin, éd. Gide et Baudry. Source: [https://en.wikipedia.org/wiki/List\\_of\\_paintings\\_and\\_plots\\_by\\_Pascal\\_Coste\\_and\\_Eug%C3%A8ne\\_Flandin](https://en.wikipedia.org/wiki/List_of_paintings_and_plots_by_Pascal_Coste_and_Eug%C3%A8ne_Flandin)

Colonel Cherikov (1851) Map of Safavid's Isfahan. Source: The book of "Visual documents of Iranian cities of Qajar period", Mohammad Mehryar and others, Shahid Beheshti University and Cultural Heritage Organization, 1999.

Ernst Holtzer (1871-98) Scripts and Photo collection on Isfahan and surrounding areas. Source: Iran dar 113 Sale Pish (Farsi, German) (1976) Ministry of Culture and Arts, Tehran.

Henry Viollet, (1912-1914) Photographic Documentation of Iranian historical monuments.

Sultan Seyyed Reza Khan Map, 1920-1923. Source: The archive of Makansazan architecture and urban development company.

### Contemporary and Primary Visual Records

Abbas Shahab (1953) The maps of Esfahan region and the city. Source: Sahab geographic & drafting institute, founded on 1936.

Shafaghi, Sirus (1973) Maps of:

- Esfahan historical formation process (no. 38)
- City's neighborhoods (no. 40)
- Esfahan Safavid era development plan (no. 41)
- Esfahan Safavid era and its structural form of the Safavid city (no. 42)
- The location of the ultra-neighborhoods, according to the main routes, old gates and the bazaar (no. 46). Source: Esfahan Geography. 2nd edn. Edited by P. Rashidi. Esfahan: Isfahan University. (2002)

Nader ardalani and Laleh Bakhtiar (1973) the maps of:

- cumulative realization of harmonic order-making (Plan), 1:50000
- Isfahan movement system. Source: The Sense of Unity. Chicago: University of Chicago Press.

Golombek, Lisa (1974). The map of "Isfahan in the Sasanian and early islamic period". Source: "Urban Patterns in Pre-Safavid Isfahan." Iranian Studies 7, no. 1/2: 18-44. <http://www.jstor.org/stable/4310152>.

Heinz Gaube, and Eugen Wirth (1976) the map of Esfahan Bazaar (Iran) Tübingen Atlas of the Middle East (TAVO), the University of Tübingen.

Ministry of Culture and Arts of Iran (1976) The aerial views of:

- Dardash Quarter- one of the oldest quarters of Esfahan.
- Jamaleh Quarter and its linear centers of Haj Mohammad Jafar and Wazir Bazaarche. Source: Ministry of Culture and Arts of Iran, 1976.

Hadi Mirmiran (1986) Status of neighborhood centers, districts and regions. Source: Organic master plan revision \_ Tarhe-Jame Dovom (1988).

Mahvash Alami (1998) redrawn map of Esfahan in Safavid period. Source: Journal of Architecture and Urban Planning, No. 42, 43.

### Esfahan Aerial Photos

Walter Mittelholzer (1924-1925) Cities from the air: the aerial photographs, Tehran Photograph: ETH-Bibliothek, Zürich, Bildarch. Source: <https://www.theguardian.com/cities/gallery/2017/jul/05/1930s-cities-from-the-air-aerial-photographs-walter-mittelholzer-in-pictures>

Erich F. Schmidt (1934) The aerial photographs published in 'Flights over the ancient cities of Iran.' University Chicago Press, 1940.

Geographical unit of the army headquarters (1944) The aerial photo of Esfahan. Source: Kocks Master Plan, p. 84.

Geographical Organization of Iran Armed Forces (1946). The map of Esfahan, Iran, Army Headquarters Printing House.

US military geographical unit (1956) The first series of the national aerial photos (Iran), including the city of Esfahan were taken under a contract between the Iranian and US armies.

National mapping Organization of Iran (1964) The second national aerial photography of Iran.

- (1991-2005) The third national aerial photography of Iran.

- (2010- 2020) The forth national aerial photography of Iran.

Google aerial view series.