

DOCTORAL THESIS

**URBAN CEMETERY BIOPHILIC INTEGRATION FOR HUMAN WELL-BEING
(AN APPLIED CASE STUDY OF TEHRAN, IRAN)**

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A Framework

A Model

A Proposal

Mahsa Mirbagheri, PhD Thesis, 2021

*I have cried in a bright private with you
For the living ones
And I have sang with you in a dark cemetery
The best songs
Cause, the victims of this year
Were the most lover in survivors*

"Ahmad Shamlou"

در خلوت روشن با تو گریسته ام
برای خاطر زنده گان
و در کورستان تاریک با تو خوانده ام
زیباترین سرودها را
زیرا که مرده گان این سال
عاشق ترین زنده گان بوده اند.

"احمد شاملو"

*This thesis is dedicated to my father, mother and brother.
For their endless love, support and encouragement.*

ABSTRACT

Cemeteries are an ancient reality, and while their basic function has not changed, their physical layout as well as the symbolic and emotional role within our societies has undergone profound transformations over time. The Oxford dictionary literally defines cemetery as “A large burial ground”. The meaning in the American heritage dictionary is similar: “A place for burying the dead.” The definitions of the cemetery in both dictionaries significantly mention the dead and dark side of these spaces. Not only these definitions but also modern zoning legislation on cemeteries deny their role as urban open public green spaces and their potential to contribute to human well-being. Decisions about cemeteries segregation follow two-dimensional land-use urban planning, without considering their relationships with other urban spaces and without a real understanding of human behavior. The usual process of urban development treats cemeteries as isolated singular function urban spaces, not as part of larger urban fabrics. This vision leads to the appearance of urban spaces without any urban design qualities.

This research was conceived to investigate the main process of urban cemeteries integration with cities and human daily life by biophilic approaches (based on Iran as a case study). It has the potential to make an important contribution to both academic research and planning decisions on the roles of urban cemeteries in cities and their response to human well-being. The thesis is based on two literature review parts concerning urban design assessment and biophilic applied methods. It highlights the necessity of intervention at different scales (urban planning, urban design, architecture, and landscape design) in order to develop an integration process of cemeteries. The case study of Tehran and references to international cases lead to address the general strategies and guides of this process in detail.

Keywords: Urban cemetery, Biophilic design, Urban planning, Urban design, Landscape design, Architecture design, Wellbeing

RESUMEN

Los cementerios son una realidad antigua, y aunque su función básica no ha cambiado, su configuración física, así como su papel simbólico y emocional, ha sufrido profundas transformaciones a lo largo del tiempo. El diccionario de Oxford define literalmente cementerio como “un amplio espacio de entierros”. El significado en el diccionario Americano es similar: “Un lugar para enterrar los muertos”. Estas definiciones de cementerio en ambos diccionarios mencionan de forma significativa los muertos y su lado más sombrío. No sólo estas definiciones, sino también la zonificación urbanística moderna de los cementerios, niegan su papel como espacios públicos abiertos verdes y su potencial para contribuir al bienestar humano. La segregación de cementerios responde a planeamientos urbanísticos en dos dimensiones, sin tener en consideración sus relaciones con otros espacios urbanos y sin una comprensión real de los comportamientos humanos. El proceso habitual de desarrollo urbano trata los cementerios como espacios urbanos con una función singular aislada, no como parte de tejidos urbanos más amplios. Esta visión conduce a la aparición de espacios urbanos sin ninguna calidad de diseño.

La presente investigación ha sido concebida para ahondar en el proceso de integración de los cementerios urbanos con las ciudades y la vida cotidiana de los ciudadanos siguiendo un enfoque biofílico (a través del caso de estudio de Irán). Este estudio puede contribuir tanto a la investigación académica como a la toma de decisiones de planeamiento en relación con el papel de los cementerios urbanos en las ciudades y su respuesta al bienestar humano. La tesis se basa en dos partes de revisión bibliográfica relativas a la evaluación de cementerios existentes en términos de diseño urbano y a la aplicación de métodos aplicados biofílicos. Pone de manifiesto la necesidad de intervenir a diferentes escalas (planeamiento, diseño urbano, arquitectura y paisajismo) con el fin de desarrollar el proceso de integración de los cementerios. El caso de estudio de Teherán y las referencias a casos internacionales conducen a formular estrategias generales y pautas para detallar este proceso.

Palabras clave: Cementerio urbano, Diseño biofílico, Planeamiento urbano, Diseño urbano, Arquitectura del paisaje, Bienestar

ACKNOWLEDGMENT

During my life, I have always been impressed by cemeteries and other places where the deceased are evoked or remembered. I became professionally interested in the cemetery subject in 2014, after the last design project with the title of designing a Music House next to the cemetery in my architectural studies. Following that, my motivation followed in urban design master and the subject started off as a professional work on urban studies and developed into a sustained personal interest in my P.h.D research.

I would like to express my sincere appreciation and gratitude to my advisors, Professors Dr. Cristina Pardo March and Dr. Estanislau Roca Blanch, who have trusted me in this study and who have been fundamental in the creation of this thesis with their guidelines. I would like to thank Dr. Miquel Martí Casanova for his useful instructions and his advice in step of my endeavor.

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*"Cemeteries are places where meetings of the
past and the future come to the fore".*

(Bender, 1974)

CHAPTER 1

INTRODUCTION

1.1 Topic and Context (Urban Cemetery Evolution)

The human race has ritualized death for thousands of years. The need for a specific place for burials arose as man moved from hunting and gathering to agriculture, which also led to the creation of religions with notions of life after death. Each culture considered provisions for the afterlife, similar to those found in the burials of the earliest days. The location and arrangement of the body of the deceased and his or her possessions in these places were indicative of their social position and value within the society. In addition to the physical arrangement of the deceased, the physical location of a body (i.e., being buried in monuments or religiously significant natural or man-made structures) is essential when considering a community's emphasis on the place where the dead are buried. Since burial customs and positioning are regarded as the point of contact between this world and the next, many cultures have concentrated on the precise location of burials. (Alekshin, 1983)

In the course of history, since burial practices vary in every culture and rely on their particular religious values and customs, several different burial sites have been located within the limits of the cities. Many debates among archeologists locate early deliberate human burials in southwestern Eurasia during the Middle Paleolithic Period, more than 100,000 years ago. Burial grounds, such as the Skhul Cave in Israel, present burial ceremonies that are similar to those carried out over the centuries to the present. Archeologists have identified parallels with body positions that reflect rising and setting sun and moon cycles, body paint, pit, and mound burial structures and grave goods such as jewelry, food, water, tools, and everyday items (Smirnov, 1989 as cited in (Faith Higgins, 2010)). Remains of rituals in earthen mounds and pits have been widespread throughout Western Europe and the Americas by permanent settlements. Viking tumuli (burial mounds)



Fig.1: Viking tumuli (burial mounds), Prehistoric ritual area of burial

are found in Sweden, Norway, Britain, Finland, and mainland Europe from the eighth to the twelfth centuries. (Fig.1). Similar systems of pre-Columbian Native Americans in North America from the thirty-fourth century BC to the fifteenth century BC can also be found in the United States, spread across the Midwest and the South. Pharaohs and the prosperous throughout ancient Egypt constructed mounds of stone called stabas, which later became true pyramids. (Fig.2) (Faith Higgins, 2010). Mayans and some Native American tribes employed caves or carved tombs in the mountains and hillsides. Other cultures also established their landscapes for the deceased horizontally instead of vertically. Etruscans built elaborate necropolis with streets sunk into the earth like trenches and large buildings resembling houses with many rooms with stone beds. Like the Etruscans, the ancient Greeks often established a necropolis with a group of tombs, but later



Fig.2: The Great Pyramid and the Great Western Cemetery, Giza Necropolis

the custom changed to an individual graves. Ancient civilizations of Athens and ancient Rome mostly performed cremation before shifting to individual graves as well. Tombs were found outside the city, often along highways, since these ancient communities often feared proximity to the dead. In fact, the ancient Roman Law of the Twelve Tables states that "*no dead body [was allowed] to be buried or cremated inside the city*" (Sloane, 1991 as cited in (Faith Higgins, 2010)). (Fig.3, Fig.4)

In the early Christian age of burial (1 CE – 1400 CE) bodies were usually buried directly in the earth or crypt, resting on a mausoleum; later Jews and Christians adopt a coffin. A simplification of the ceremony took place with this. Bodies were buried in plain wooden caskets on consecrated land. These consecrated (or sanctified) grounds were mostly situated in the Church's area, and while studies did not



Fig.3: Tombs along the street Appia, Rome

provide definitive proof of when Christians started to use consecrated grounds for cemeteries, this practice has been prevalent in Christian Europe for two millennia.(Faith Higgins, 2010)

In the early 19th century, with the rapid increase in urban populations due to the Industrial Revolution, urban cemeteries such as old church burial grounds were beginning to be seen as inadequate, dangerous, crowded, expensive to maintain, and as carriers of diseases. Therefore, they became unhealthy (Greenfield, 2011). The rural cemeteries established afterwards began to reflect a unique style of burial that represented a shift in society's views of death and the idea of the cemetery as a public space.



Fig.4: Cemeteries and tombs lined extra-urban roads throughout the Roman world so that the mere act of exiting or entering a city brought one into immediate and direct contact with the world of the dead

The first cemetery outside the city – the Père Lachaise Cemetery – was established in Paris in 1804. Since this cemetery was on the outskirts of the city (where the land was abundant and cheap), the concept it defined was an open public space, where people could walk through a landscape surrounded by the monuments of the deceased. The Père Lachaise cemetery combined the three principle concepts of the Romantic movement of that period: the beautiful, the picturesque, and the sublime¹ (Sloane, 1991). The design of this cemetery, which employed an attractive park-like atmosphere in a new type of burial ground on a grand scale, its architectural design, and careful planting was inspired by the garden movement in England (PHMC, 2015). To distinguish this new design from older, antiquated graveyards, the term “cemetery” was adopted to mirror the contemporary religious view that regarded the grave as a holding chamber for sleepers awaiting the glory of resurrection² (McVicker, 1989). For more than a century, the Père-Lachaise was considered to be the most prominent urban cemetery in the world, and the idea for such cemeteries was quickly spread throughout the world. (Fig.5, Fig.6, Fig.7, Fig.8)

¹ “The first two represent nature as a comforting source of physical and spiritual sustenance. The last, as articulated by Edmund Burke in his “Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful” (1757), refers to the thrill and danger of confronting untamed nature and its overwhelming forces, including thunderstorms and deep chasms. While the beautiful and picturesque reference mankind’s capability to control the nature, the sublime is a humbling reminder that humanity is not all-powerful”. (Lauren Rabb, 2010)

² This cemetery, like other urban cemeteries was urbanized too quickly. In 1805, only 14 tombstones were built the cemetery, while almost 2,000 graves were constructed in the following decade. Afterwards, demand rose significantly, and by 1830, there were 33,000 tombs in this cemetery. Between 1824 and 1850, the cemetery was extended six times, bringing it to its current surface area of 44 hectares. The total number of tombs now stands at 70,000. Today, this cemetery is located in eastern Paris (in the 20th arrondissement of Paris) and is still a functional cemetery that accepts new burials. It is the city’s most prestigious and most widely-visited heritage. Today, one million people are buried there, and is visited by more than two million people annually. (Anon., 2015)



Fig.5: Pere Lachaise cemetery with walkable paths designed as a walkable urban open public green space, 2017 by author



Fig.6: Today cemetery has many visitors from around the world, 2017, by author

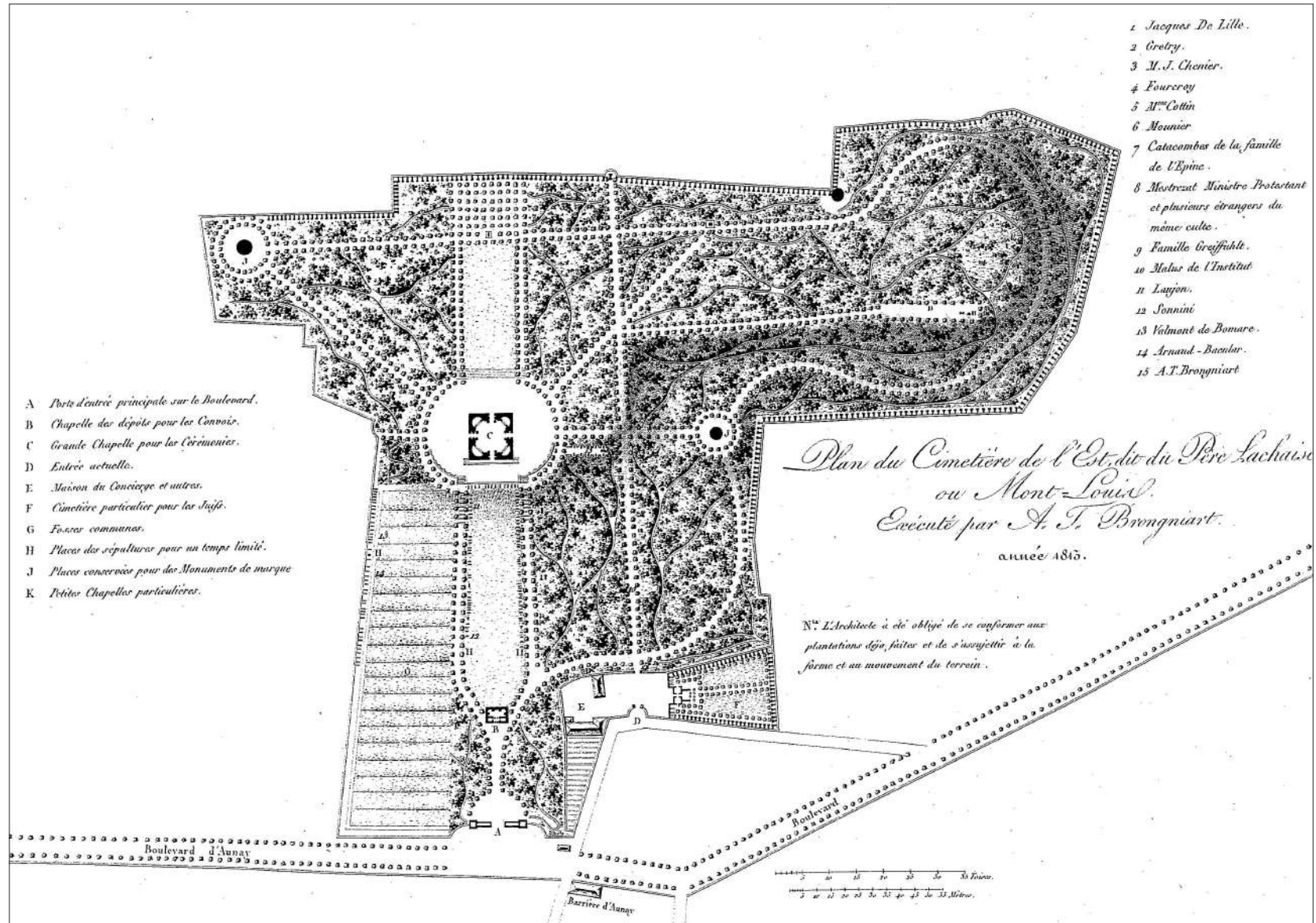


Fig.7: The first outside cemetery with urban open public space function, Pere Lachaise cemetery Brongniart map, 1813



Fig.8: The cemetery has developed with city extension and linked neighborhood area with different entries for pedestrian, Map of the Pere Lachaise cemetery

The trend was preceded by the garden or rural cemeteries, followed by the first rural, woodland and lawn cemeteries movement in the United States¹. During this era, the rural or garden cemetery was a burial ground style that employs landscaping in a park-like setting with a new focus on remembrance (Johansen, 2019). The design of the cemeteries integrated the nature into the beautification of the final resting place, in an attempt to improve the “interaction” between the deceased and the living, while turning the cemetery from a shunned place of fear into an enchanting place of redemption. Johansen (2019) remarks that: *“the first great rural cemeteries were built at a time when there weren’t public parks or botanical gardens in American cities. They were America’s first parks. Families would make a day of it, visiting the dearly departed, picnicking and enjoying a day in the fresh air”*.

The Mount Auburn Cemetery (near Boston, Massachusetts), was founded as a rural cemetery by the Massachusetts Horticultural Society in 1831. This cemetery was inspired by Pere Lachaise in design and location. The cemetery brought public attentions on par with its European counterpart. Thousands people gathered to enjoy the serene oasis of this garden of stone and memory, and to experience *“a programmed sequence of sensory experiences”* intended to provoke a sense of melancholy and the sublime (Linden-Ward, 1989). Once it was established, hundreds of other “rural” cemeteries were constructed outside the city limits, and became common public spaces rest, walk, and recreation in the West. (Johansen, 2019). (Fig.9) In those cemeteries, arrangements were created via emulating the scheming of their neighboring cities. Nature and grid pattern became

¹ Types of cemetery in European and Western cultures: Graveyards, Memorial Cemetery, Park Cemetery, Rural or Garden Cemetery, Woodland Cemetery, Lawn Cemetery, Church Cemetery, Natural Cemetery. “Typically, lawn cemeteries comprise of a number of graves in a lawn setting with trees and gardens on the perimeter. The first lawn cemetery was introduced by Adolph Strauch in 1855, who was the Spring Grove Cemetery manager in Cincinnati.” (Sears, 1989)

the dominant layouts for rural-urban cemeteries until recently. (Francaviglia, 1971 as cited in (Miller & Rivera, 2006)). Worpole (2003) remarked that: *“These rural Elysium quickly coming to resemble the built-up town or city that the visitor encounters today”*. Eggener (2010) points out that those cemeteries were open public green spaces, where people gathered and play out their lives among the graves of the past; a place where people could be remembered in life. The sheer nature elevation over man-made structures created an atmosphere in which tourists were able to dive into nature.



Fig.9: Rural Mount Auburn Cemetery design with the incorporation of nature became to the common open public green space in the West

In Iran, religion initiated with the pre-Zoroastrian or proto-Indo-Iranian in the first period. Then, it came the era of Zoroastrian and finally, it was the era of Islam. According to (Grenet, 2000) “*the burial practices in pre-Islamic Iran are known partly from archeological evidence, partly from the Zoroastrian scriptures (the Avesta), and later from Pahlavi and Persian literature*”.

Therefore, in the search for the cemeteries across the history of Iranian civilization, the oldest examples date back to the fifth millennium BC. During this era, the cemeteries were constructed in a specific spacious form. Individuals were buried wrapped on the floor in rooms and houses. This specific ritual was probably derived from the beliefs of Persian civilization in that era, which indicated the necessity to prepare gifts for the dead, so that their soul could feed with their families. During the fourth millennium BC, people were still buried under the

floors of the houses (Ghirshman, 1986). Over the next millennia, even though people were still buried in a manner similar to their ancestors, another ritual for dealing with the dead was emerging in other areas of Iran, which could perhaps be named as the initiation of cemeteries as are known today.

In Shahr-e Sukhteh - Burnt City or current Zabol city, a place near the current borders of Pakistan, Afghanistan and Iran, food, water, dishes, flowers, and other quotidian objects were discovered buried among nearly 250 graves during the Neolithic era. It is believed that these artifacts were supplies in preparation for each body's Resurrection Day. The Cemetery of the city with an area of approximately 25 hectares was set between two large settlement areas of the city, revealing a distinct separation between the space of the living and the dead, while still maintaining a close proximity (Sajjadi, et al., 2003) (Fig.10, Fig.11)



Fig.10: The ancient cemetery of Shahr-e Sukhteh - Burnt City or current Zabol city



Fig.11: Buried bodies with artifacts supplies for Resurrection Day Preparation

Another example is the Shahdad cemetery, (East of Kerman), which dates back to the middle era of the third millennium BC, and is approximately ten thousand square meters.

However, in the second half of the second millennium BC, cemeteries across Iran formed an entity according to their modern definition. A number of such cemeteries in Iran are as follows:

- I. The Sialk cemetery (Kashan): This cemetery was a dead city with a distance of a few hundred meters from city. In this city, dead people were buried along with several different tools (Ghirshman, 1986). The graves in this city were covered using heavy stones or baked clay tablets. These tablets were placed to resemble a shape of a facade and roof. (Fig.12)
- II. Marlik cemetery (on Qazvin-Rasht road): This cemetery is placed on a hill with a similar name, overlooking Goharood valley. This cemetery, as cemetery from the middle period of the second millennium BC, has a series of 53 graves, located next to each other with no specific order.
- III. The Choghazanbil cemetery (Near Khuzestan Hafttape): This cemetery belongs to the late half of the second millennium BC. In the archaeological excavations, no public cemetery is discovered for this city yet. The only cemetery discovered here is the Royal cemetery, built under the ground. The construction of this cemetery is considerably huge and substantial. Construction materials such as big bricks and mortar are not natural, in order to insulate completely against moisture. The inner surface was also plastering and was built on the floors of every tomb for putting bodies in them.

There are very few available documents indicates that cemeteries were established as past in the first millennium BC, before the advent of Archaemenid lineage and median civilization and during median civilization era cemeteries were established separately from buildings. Graves are often pitting with cobblestones and always covered with large stone tablets. Often, they were marked soils of graves by a circle on those stones (Ghirshman, 1986)

During the Achaemenid Empire Iranians followed Zoroastrian beliefs, a tradition dating back to over 3,000 years. Due to the direct relationship between burial rites, rituals, and religious beliefs, burial customs originated from Zoroastrian religious principles. During this period, burial customs had significant differences from their current forms and the customs of Islam.

The Zoroastrian funeral was based on this belief that the corpse was not clean and corpse could contaminants the environment. Therefore, the dead were not buried. According to the traditions of that time the corpse were first washed in a special ceremony. Then, it was set on a high construction or tower called “Dakhmeh” (in Persian) or the “Tower of Silence.”¹In the Funeral Ceremonies of the Zoroastrian Parsees, bodies were arranged on the towers in three concentric circles. Men were placed in the outer circle, women in the middle, and children in the inner-most ring. The towers were built upon hills or low mountains in desert locations, with a certain distance from population centers.² (Fig.13, Fig.14)

1 The original meaning of the Old Iranian (AVESTAN) word daxma was most probably “grave”. (Grenet, 2000)

2 In the early twentieth century, the Iranian Zoroastrians gradually discontinued their traditions and favored burials or cremation. Since the 1970s, the use of Dakhmeh has been illegal in Iran, and orthodox Zoroastrians were enforced to adopt new burial methods. Many in the Zoroastrian community have moved to burying the bodies beneath concrete to keep out all contaminants. Although the towers are no longer used in ceremonies, they can still be visited along with a number of the ossuaries in the area.

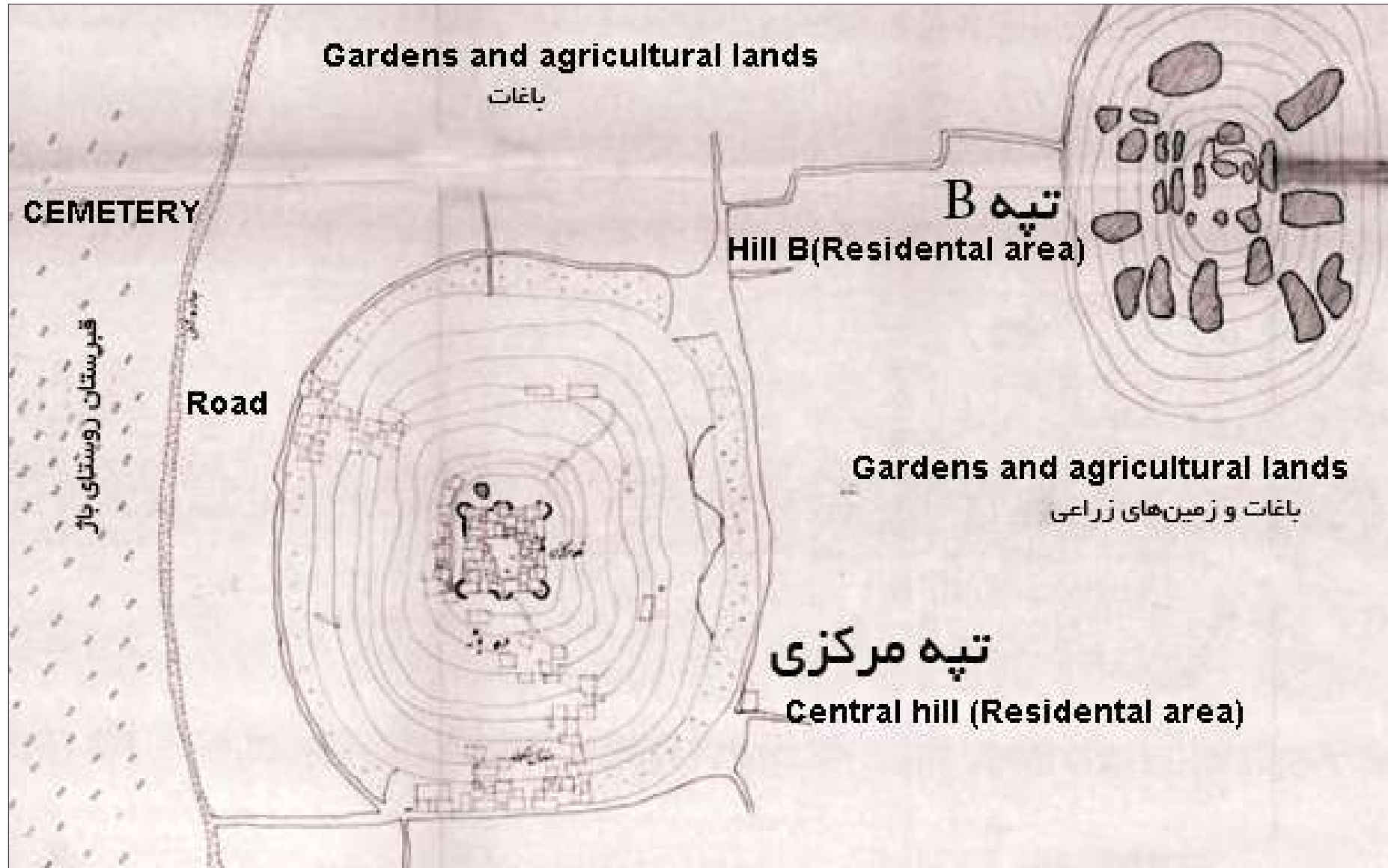


Fig.12: Sialk city with a cemetery area close to the city border and main road, 5500 BC, Kashan, Iran

TOWER OF SILENCE.

View of the Interior.

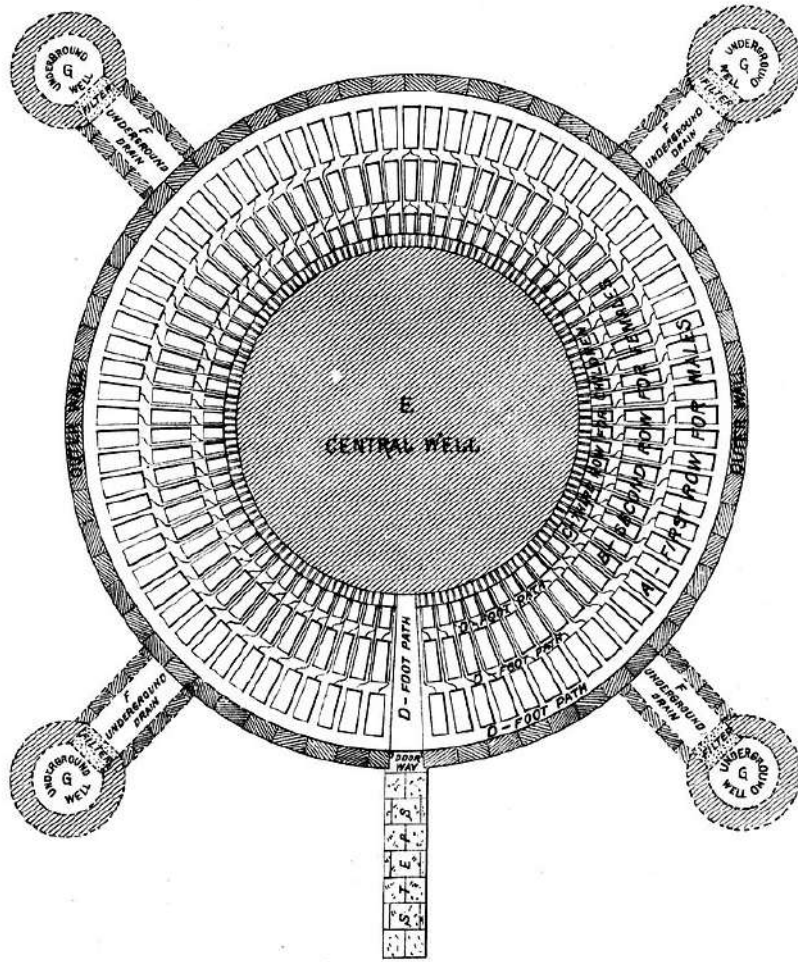


Fig.13: Tower of silence plan

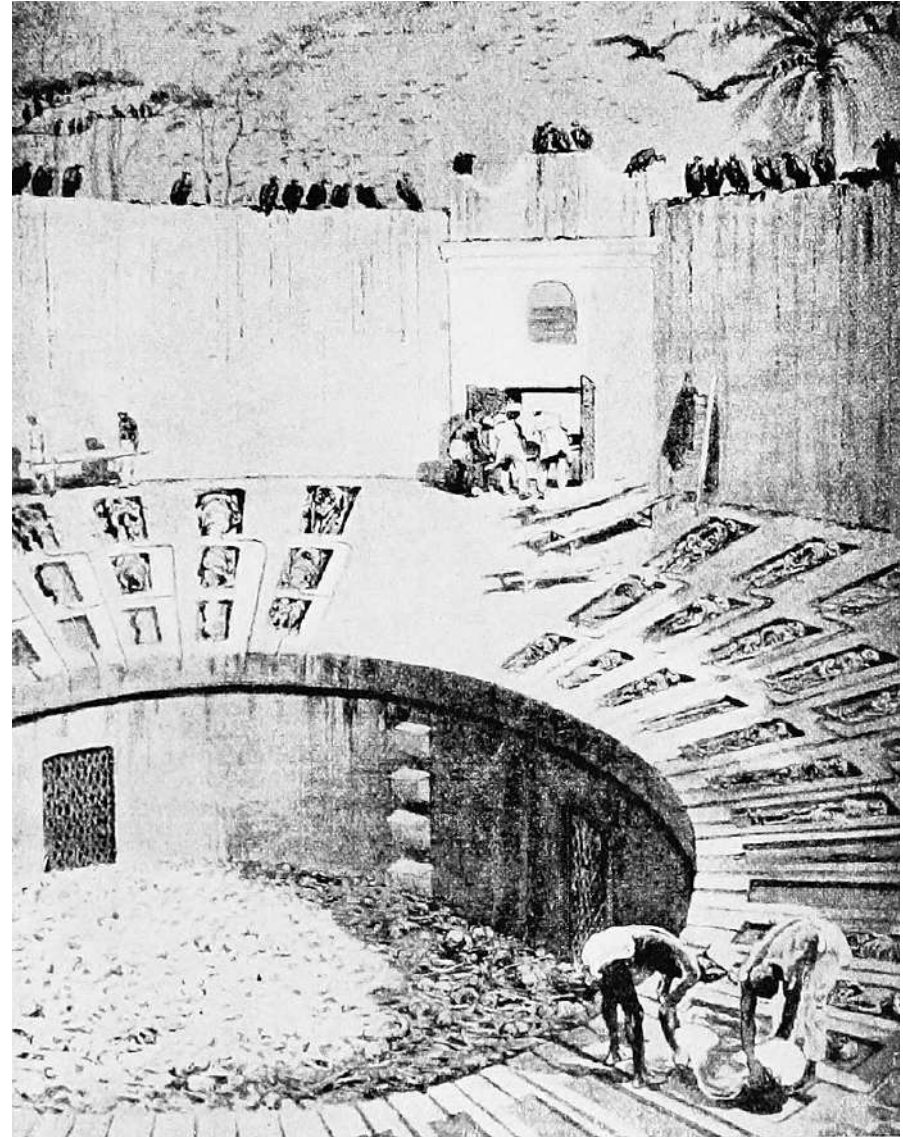


Fig.14: Funeral Ceremonies of the Zoroastrian Parsees, bodies were arranged on the towers in three concentric circles.

Therefore, the cemeteries of the Achaemenid Empire mainly included crypts and were chosen outside villages and in the deserts. Plus, they were constructed in shape of a circular tower with no doors. Hence, people used iron ladder to climb up these towers. The corpses were placed in ossuaries and were left for necrophagous birds. As Iranian civilizations developed and urbanized, the Towers of Silence or Dakhmeh moved closer to city limits. (Eduljee, 2017) (Fig.15)

In the Islamic era, the Holy Quran became a significant political and religious figure of the 7th century CE in Iran. Based on Islamic beliefs, the spirit is the highest order of the matters that transcends beyond the material world due to its higher evolution.

Thus, in Islam it is believed that the deceased must be treated with the same respect as the living (Hunter, 2016). According to Persian beliefs, the bodies of the dead should be buried in their home towns, while cremation is prohibited¹. Instead, the dead body is ablated, cleansed, covered in a white shroud, prayed for forgiveness, and finally buried on earth. For burial, the body must be laid on the right side of the dug soil, facing the Qibla, towards Mecca (Dodge, 2009). This final constraint indicates that all Islamic graveyards are arranged in the same direction. (Fig.16)

Since the Shias believe that the holy Imams can intercede for dead as well as for the living to mediate its blessing, the early urban cemeteries, Qabrestan, Gurestan or Aramestan according to Persian folklore, have been located adjacent to holy shrines or “Imamzadeh” (Descendants of Imams) (Stausberg, 2004). (Fig.17)

¹ There is only one situation in which cremation may be allowed in Islam. If a large number of people are killed by a disease that can be spread due to burial, then cremation may be permitted. Prior to cremation, the potential spread of disease through traditional burial must be proven (Huner, 2007)

Frequently, by population increasing, new cemeteries with merely cemetery function were constructed inside and outside cities and villages.

These early cemeteries mostly were the burial places of famous poets or social, cultural, or political leaders, became monumental to Iranian cities and served as gathering and recreational places and tourist attractions, along with the traditional shrines (Kheirabadi, 2000, translated from Persian). (Fig.18, Fig.19). These cemeteries still were not surrounded by walls and were crossed by roads and open-water channels. For many years, urban cemeteries were used as public spaces for cultural, political, religious, and social purposes in Iran. . (Polak, 1989)



Fig.15: Achaemenid Empire tower within mountains, Kermanshah, Iran, 2016, by author



Fig.16: Islamic cemeteries arranged in the same direction of the Qibla, Abdol Azim shrine cemetery, Rey, Tehran, Iran



Fig.17: Early cemetery of Toti garden shaped in the yard of Abdol Azim Shrine, Rey, Tehran, Iran, 2019, by author



Fig.18: Saleh shrine during the time, Tehran, Qajar era



Fig.19: Saleh shrine, 2019, by author

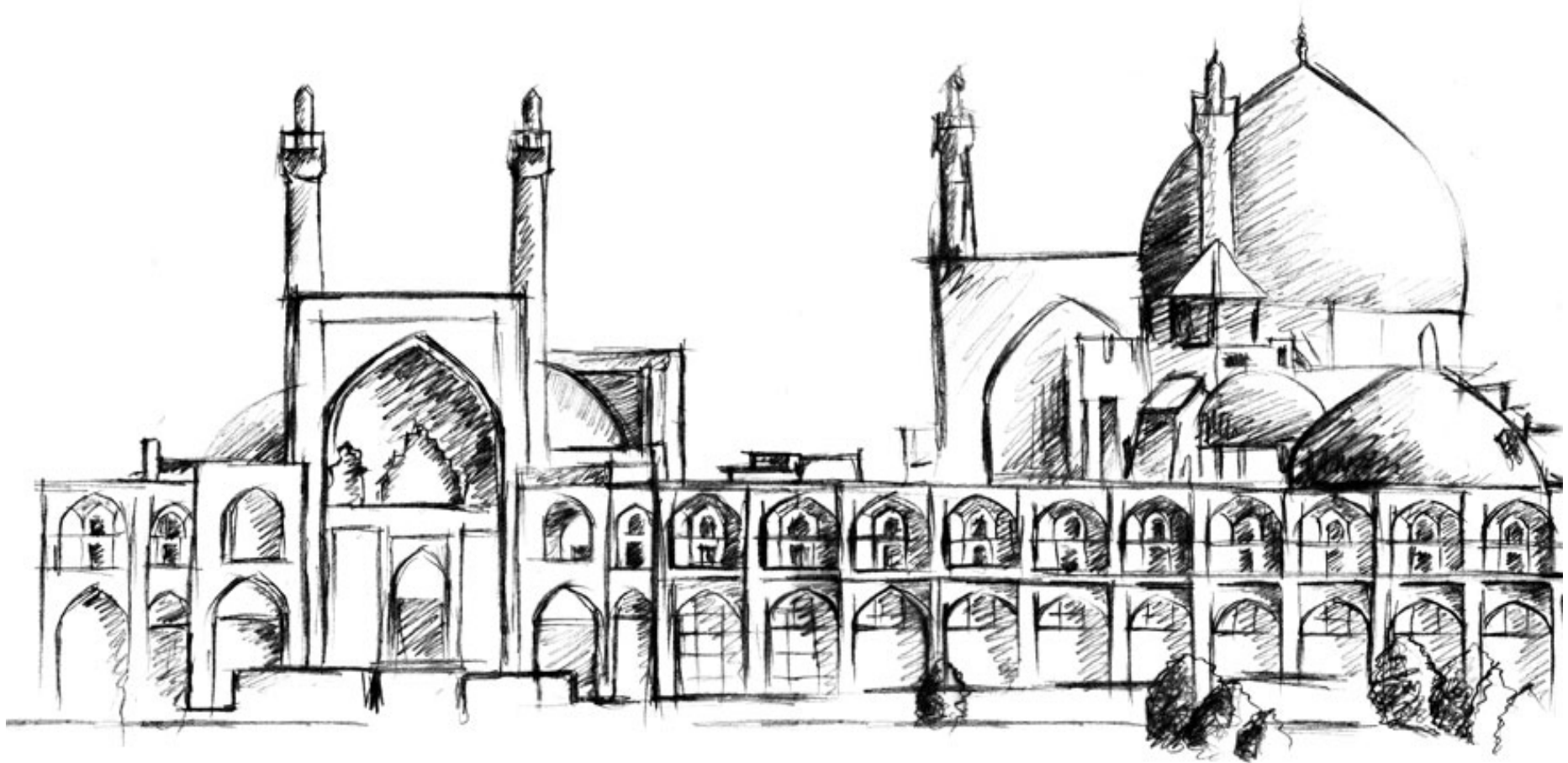


Fig.20: Cemeteries located in the yard of shrines are serving as gathering and recreational places and tourist attractions within Iranian cities, Abdol Azim Shrine, Rey, Tehran

1.1.1 Urban Cemeteries Transformation in Tehran metropolitan area

The history of Tehran follows the history of the City of Rey. Before its destruction by Mongols in 1220 A.D (617 AH), Rey was considered one of the most ancient cities in the world. The name Tehran was coined by Yaqūt Hemawi, the famous historian, for the village located north of the present-day Rey. This village was unique in terms of dwelling units that were constructed underground. In 1404 A.D., during the Timurids period for the first time, Tehran was cited by Clavijo, a Spanish traveler, as a city (Ciudad). In the early days of the Safavid Dynasty, urban lifestyle initiated in Tehran. Nowadays, Tehran has been the capital of Iran for more than 200 years (Fig.21). Today, Tehran, with a total area of approximately 730 square kilometers, is the Capital of Iran and the capital city of Tehran province. According to the Census of Population and Housing in 2016, Tehran has currently a population of 8,737,510, and is divided into 22 districts and 374 neighborhoods (SCI, 2016).

The city is located on the southern plains of the Alborz Mountains, surrounding the city from the north and northeast. Consequently, the geographical environment and climate of Tehran is relatively closed (Saeidnia, 1989). Due to its boundaries from north and northeast, the city has physically developed in other directions. The southern parts of the city have grown towards a wide and flat desert and vast public urban facilities such as main cemetery, International airport and the main exhibition of Tehran are located there.

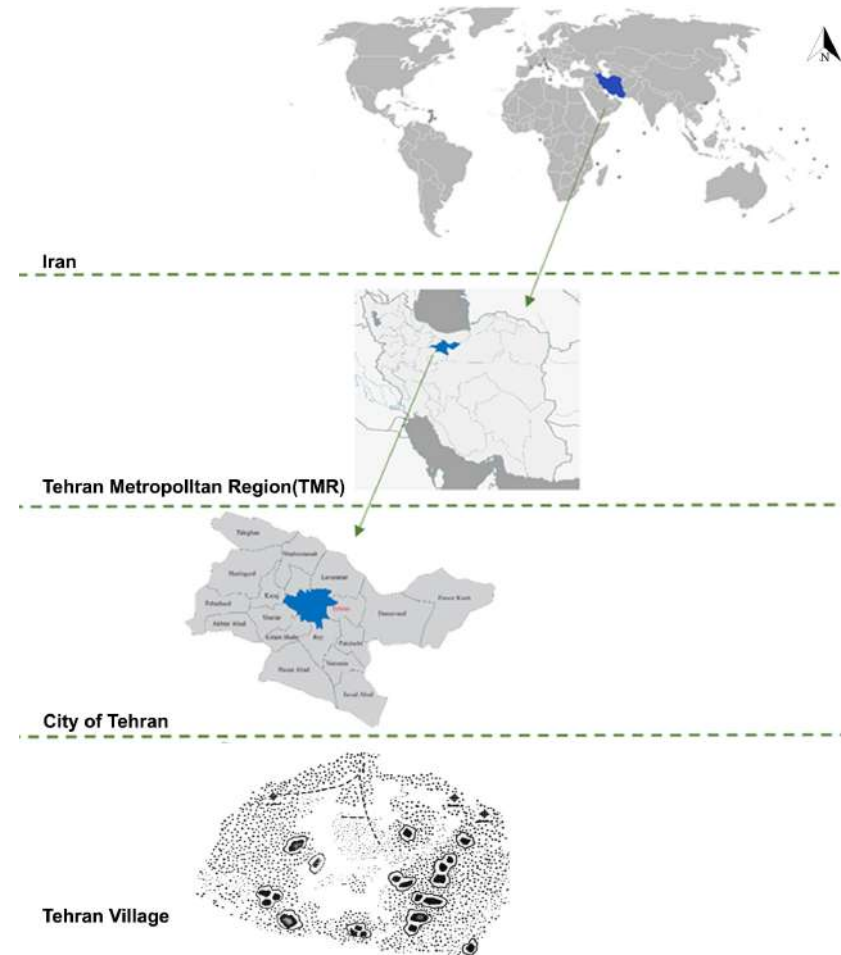
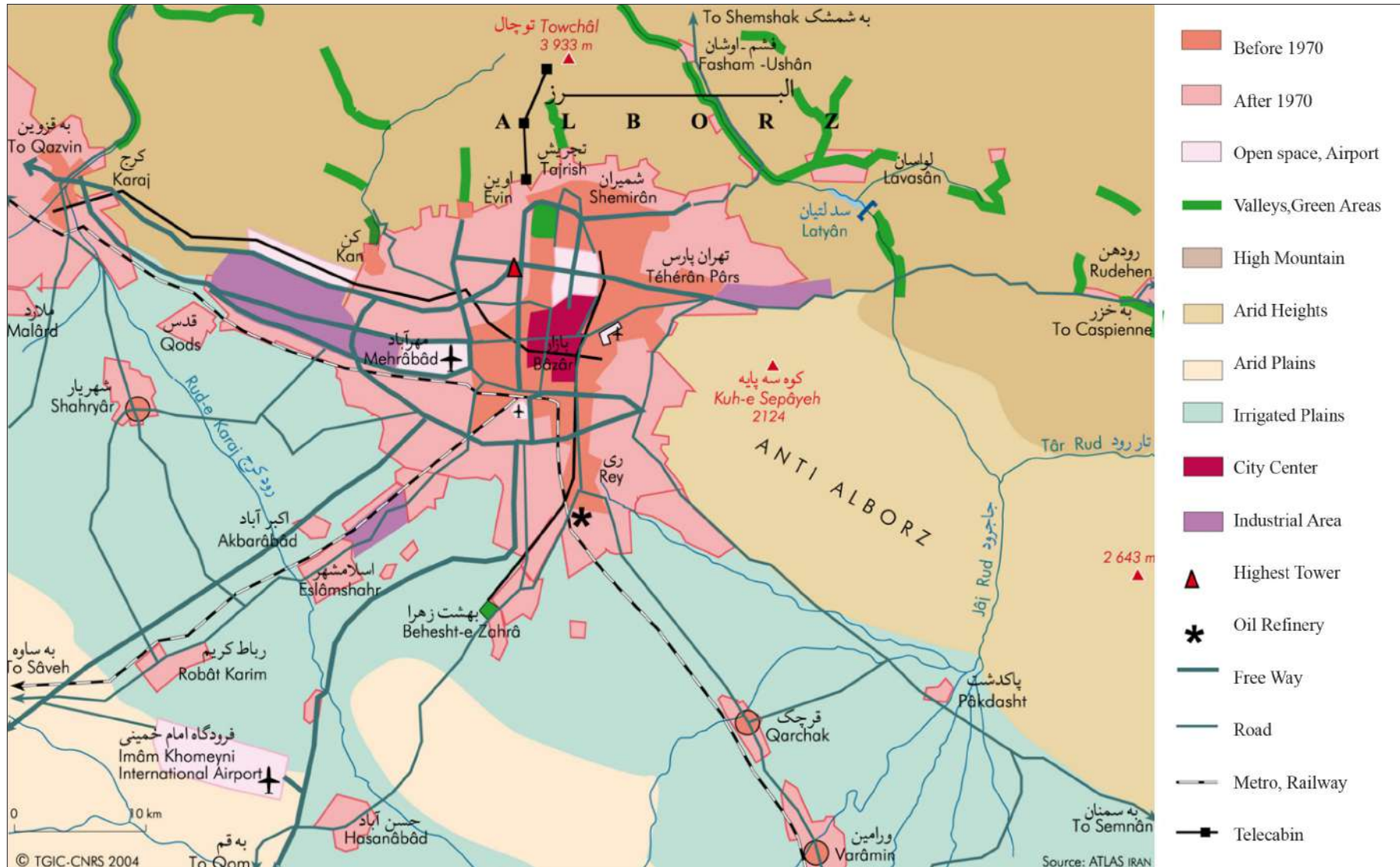


Fig.21: Underground houses during early Tehran, and status of the metropolitan area current era

Tehran Metropolitan area Plan



1.1.1.1 The First Half of the 19th Century

In 1841, during Shah (King) Tahmasp reign, Tehran's first fortification had four gates and four neighborhoods called Bazar, Sangelaj, Udlajan, and ChalMeidan. During this time, cemeteries were depended on shrines in the Old Tehran's urban fabric area, where most were located in the yards of the holy shrines. During the late years of this era, a new shrine cemetery was constructed in the yard of the Friday Prayer leader's tomb (Sar E Qabr E Aqa) outside city fortifications, which later became a pilgrimage attraction for many years. The cemetery was 7.5 acre, which included some Imamzadeh tombs, and was used as a public burial place. At the time, these cemeteries successfully responded to the population of Tehran. (Mirbagheri, 2015) (Fig.22)

In the second map of Tehran drawn by Kerziz in 1857, cemeteries were related to critical urban functions. According to this plan, there were seven distinguishable lots allotted to cemeteries in the southern part of the city, which were expanded from east to west. Among these seven cemeteries, five were located next to Imamzadehs, including Imamzadeh Seyyed Nasrosdin, Seyyed Vali, Seyyed Esmail, Yahya, and Zeid. The other two cemeteries are in the vicinity of Imamzadeh Esmail, in places called Hasirbafha (mat-braiders) Square, and Daravish Square. Imamzadeh Seyyed Nasrodin in the Sanglaj neighborhood, and Imamzadeh Yahya in Meidan Chal neighborhood were both residential areas, and were among the largest cemeteries of the time. There was no arid land inside the city fortification for cemeteries development anymore.

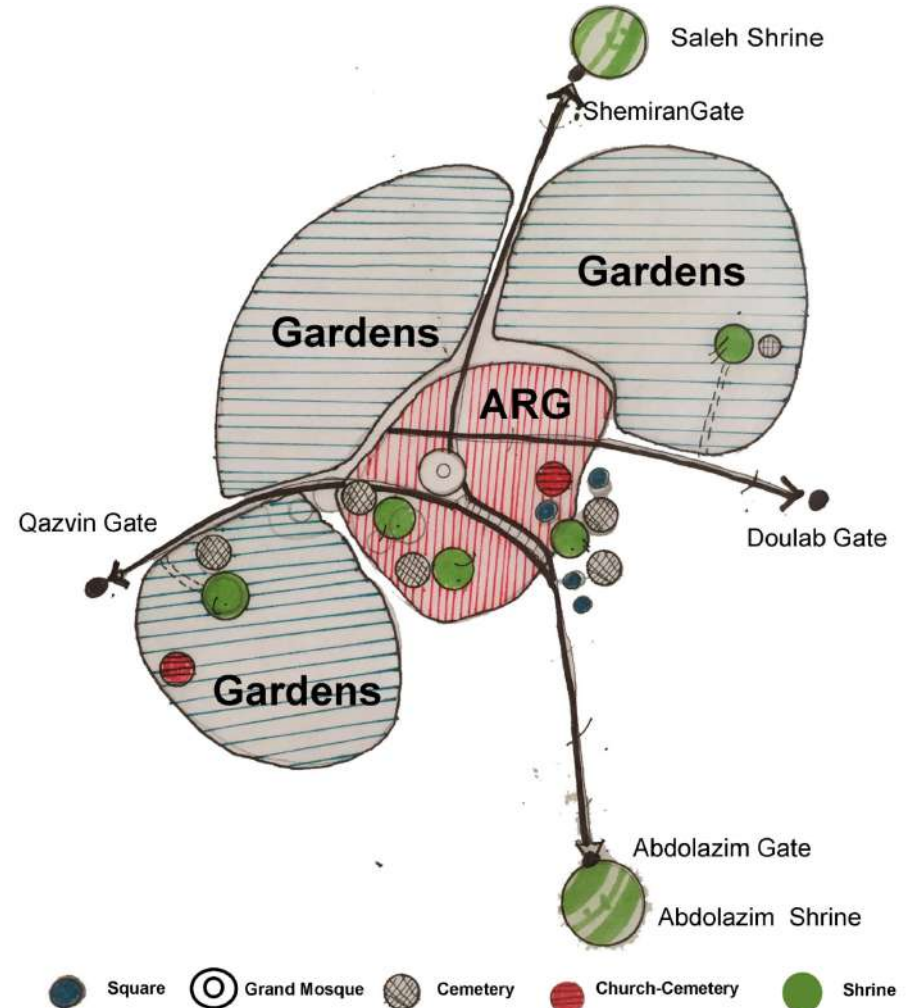
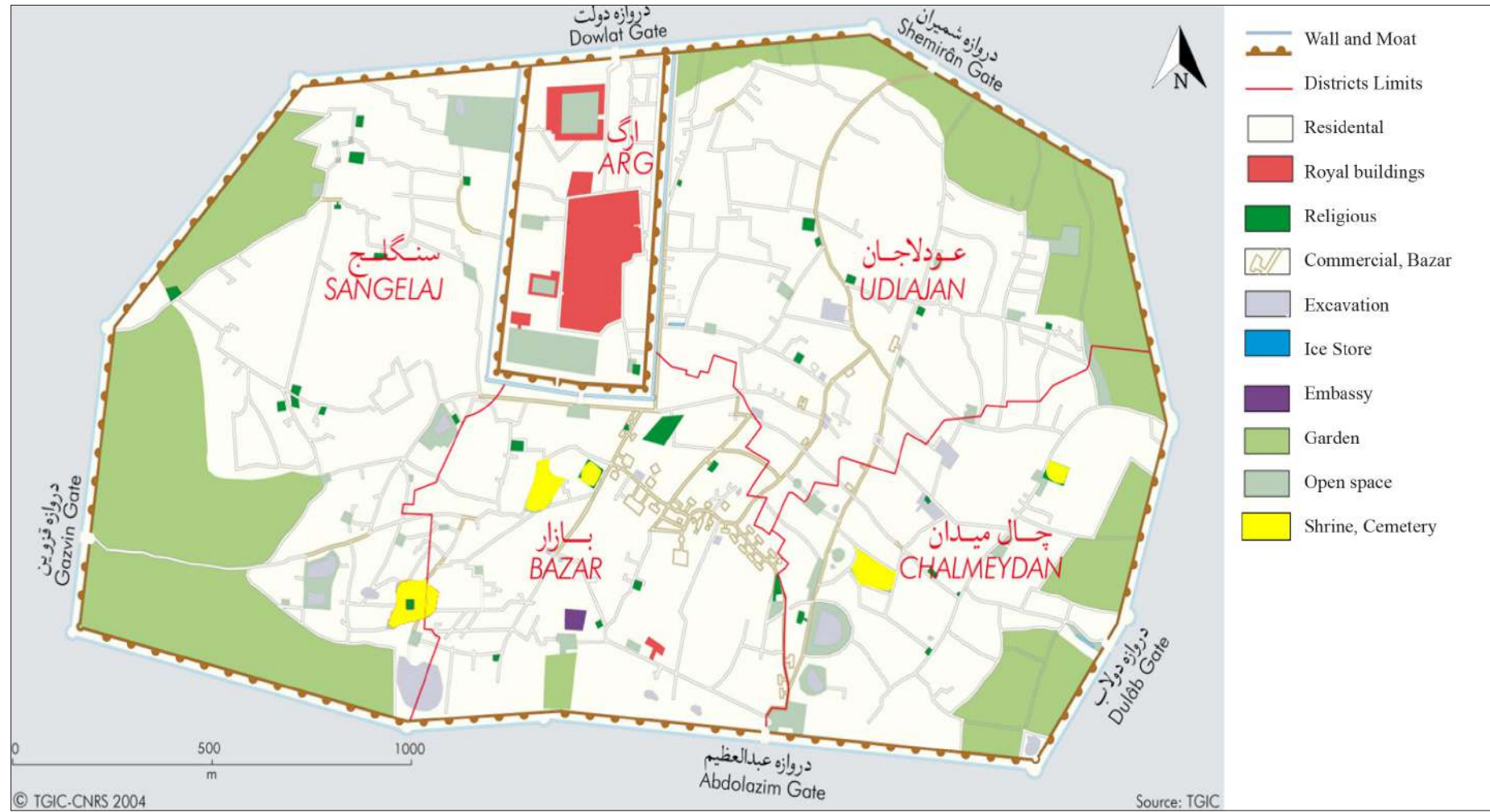


Fig.22: Diagram location of the cemeteries in Tehran, The first half of the 19th century, by author

Tehran Berezin Map, 1841



Later, a new cemetery (Sarcheshme) was constructed in Northeast of Tehran, outside the city fortifications, near the Shemiran gate. However, no separate cemeteries were considered for religious minorities (Christians) in Tehran, and their burials were usually at the site of the old churches. The oldest church in Tehran where burials used to take place was “Sourep Georg”, dating back to 1831, located next to Qavam al-Doleh Bazar. The Tadaus Barto Timous Holy Church was constructed in 1845. Due to the vastness of the compound of the church and since it was the only proper burial place for religious minorities, it was used as a Christian cemetery in Tehran. Many notable foreign individuals are buried inside the church (Vazirizadeh, 2009, translated from Persian). Moreover, there existed a minority of Jews in Tehran who had a low quality of life. This group lived in a neighborhood called “Jews Neighborhood”, which was part of the Udlajan neighborhood. Jews buried their dead outside city fortification.

In general, most mosques, religious centers, squares, bazaars, and public bathrooms were located in the southern part of the city and cemeteries were usually placed outside these places in close vicinity. The utmost northern part of the town was the royal citadel and included large houses for foreign ambassadors, Qajar descendants, and people close to the royal court.(Mirbagheri, 2015) (Fig.23)

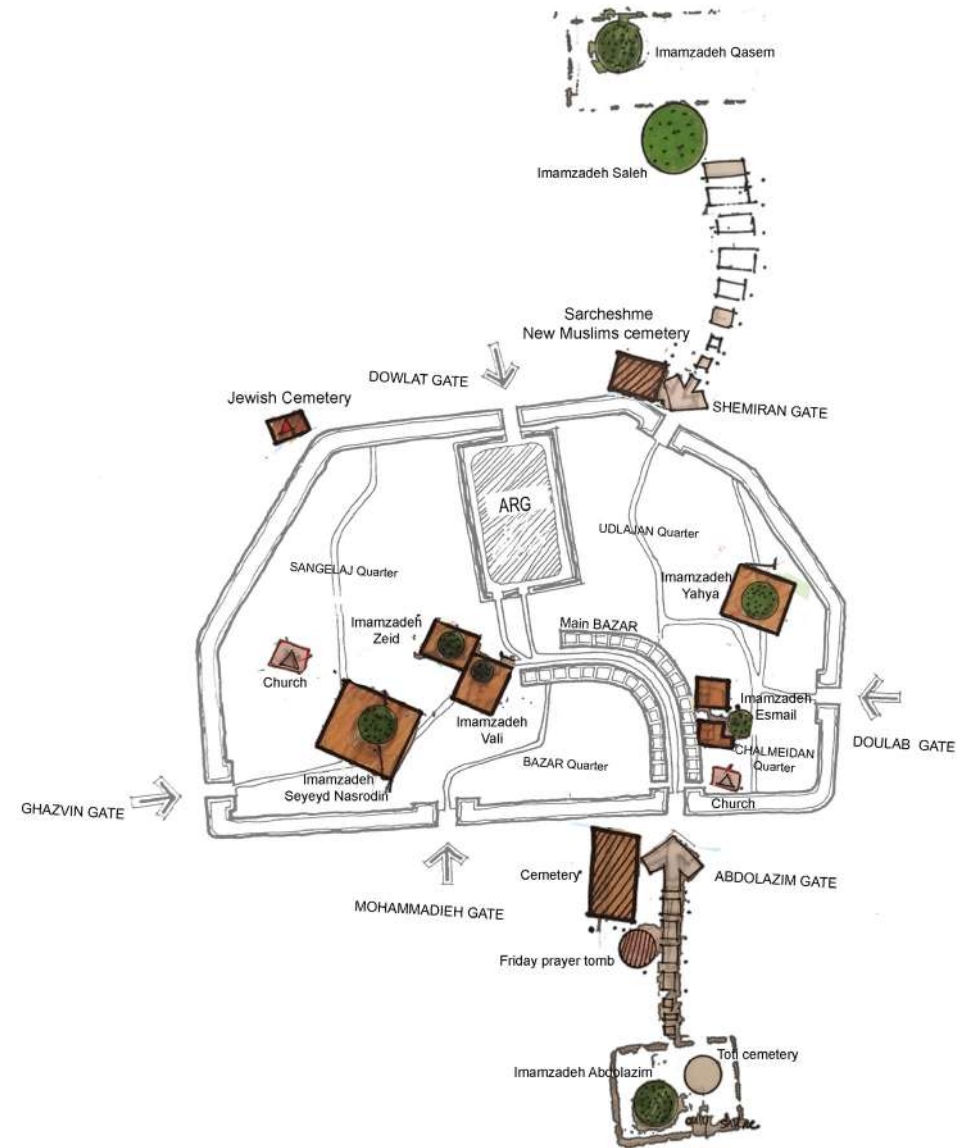
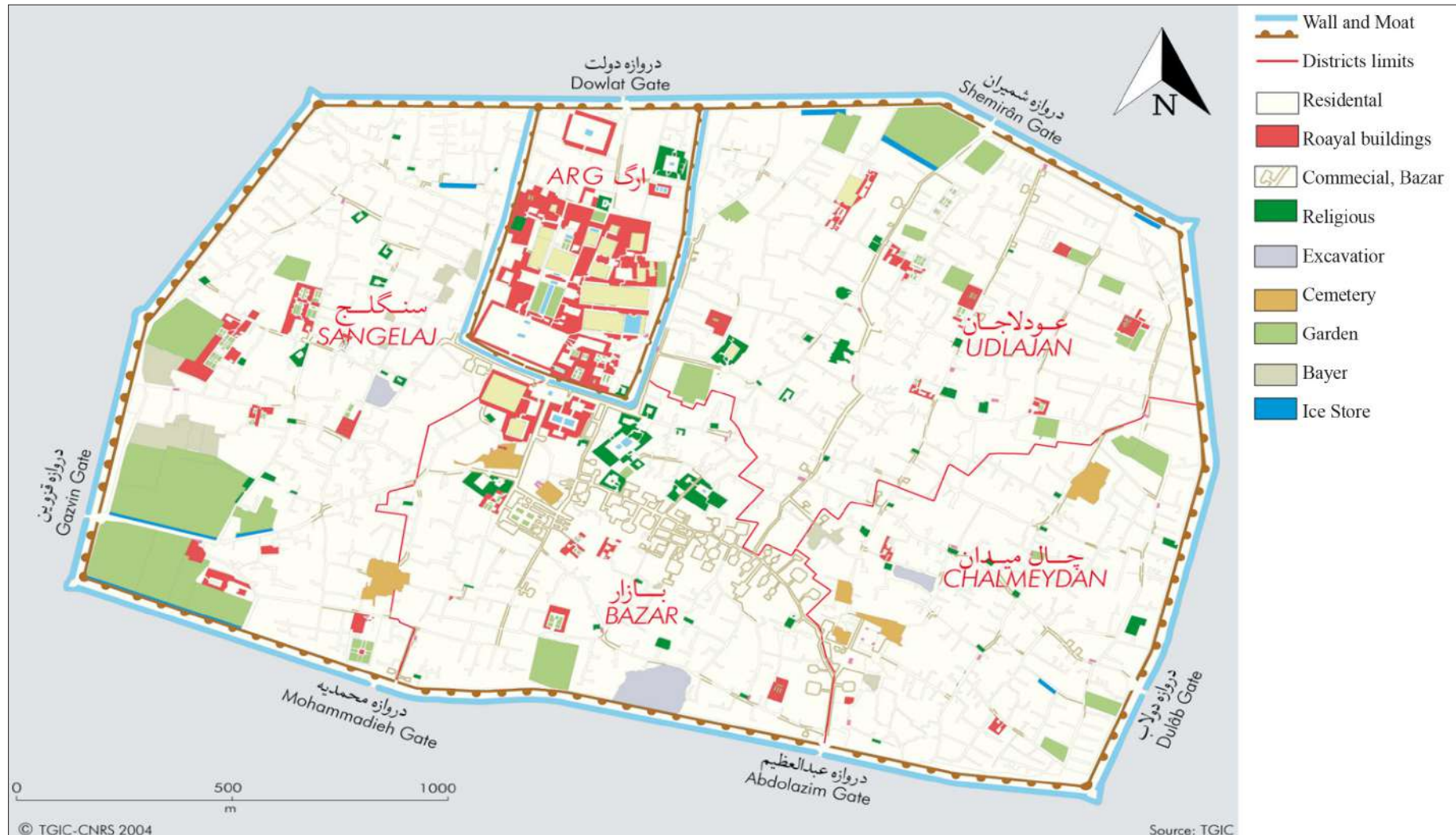


Fig.23: Shrine cemeteries were usually constructed outside the gate and close to main functions of city, by author

Tehran Kerziz Map, 1857



1.1.1.2 The Extension of the Old Tehran - New Walls:

During the Naserodin Shah reign in 1890, and the second fortification of Tehran, old cemeteries constructed in the outskirts were integrated into the urban fabric. The second plan, revised by Abd-ol-ghafar, illustrated that Tehran was expanding with a fast pace and is beginning to have a high population. Gradually, the tower and buttresses of Shah Tahmasp were torn down, and new boundaries were allocated to the “Nasiri Caliphate”. The old fortifications were demolished, and new streets were constructed. After approximately 10-12 years, new fortifications were constructed in the form of octagons, and 12 gates surrounded the city. (Mirbagheri, 2015) After this time, Tehran territory had developed from four sides to these boundaries:

- From north: Enqelab Eslami street (from Enqelab square to Emam Hossein square)
- From west: Kargar street (from Enqelab street to Railway square)
- From East: 17 Shahrivar street (from Shoush to Emam Hossein square)
- From South: (from Railway to Shoush Square) (Vazirizadeh, 2009, translated from Persian).

In this map, in addition to old shrine cemeteries which were located in the center and next to the main Bazar, the five new cemeteries converted inside the urban fabric and they were completely attached to the old fortifications.

These five new cemeteries included the Cemetery of the Friday Prayer leader’s tomb in the south, the Old Cemetery next to it with a large area, and three cemeteries in Northwest, Northeast and West, with smaller areas outside the city and urban areas has formed next to them. The cemeteries in the south of Tehran were using as recreational places by citizens and had the same function as parks in the west (Najmī, p. 443 in (Omidssalar, 1990)). (Fig.24)

The Old Cemetery was constructed next to the Friday Prayers Tomb in the south, next to the agricultural lands. At this time, central cemeteries in the towns were Imamzadeh Seyyed Nasroodin, Seyyed Esmail, and Yahya. In addition to these cemeteries, a cemetery was constructed in the Baq Ferdows neighborhood in Moulavi Street. The remains of these cemeteries were respected for long, especially in the case of Seyyed Esmail, where it was still one of the main burial places in Tehran up until 50 years ago. However, Imamzadeh Seyyed Vali and Imamzadeh Zeid did not possess the designated sign of a cemetery on this map; probably because they had less burials since they were located inside the Bazar district. (Mansouri, 2017, translated from Persian).

Officially, the first cemetery for religious minorities was established in Vanak village, in the lands granted to Armenians by Mostofi- al Mamalek. As for a cemetery for Zoroastrian community, their first cemetery was constructed next to the Ghasr Firouzeh Palace (the summer mansion of the King) neighborhood. (Mirbagheri, 2015)

During Naserodin Shah monarchy, the new Tehran had many arid lands located inside the city, many allocated for the construction of large houses, royal palaces, gardens, ornamental gardens, embassies, and mansions for people in high places. During that time, the large area of the old cemeteries seemed sufficient for the population of Tehran.

As the relations between Tehran and its two neighboring cities, namely Rey and Shemiran, expanded, Saleh and Qasem shrines (in Shemiran) were used as burial places. In addition, Rey city from the southern part has been the burial place for a number of Imamzadehshas and served as a pilgrim destination for Tehran citizens since Islam. By the end of the Qajar dynasty, when the fortifications of the city expanded, areas next to the shrine's compounds of Rey became the main cemeteries of the city (Vazirizadeh, 2009, translated from Persian). The main cemeteries in Rey included Ibn Babawayh, Mashaalah Mosque, Imamzadeh Abdollah, Imamzadeh Bibi Zobeide, and Toti Garden (next to Abdolazim compound). (Fig.24)

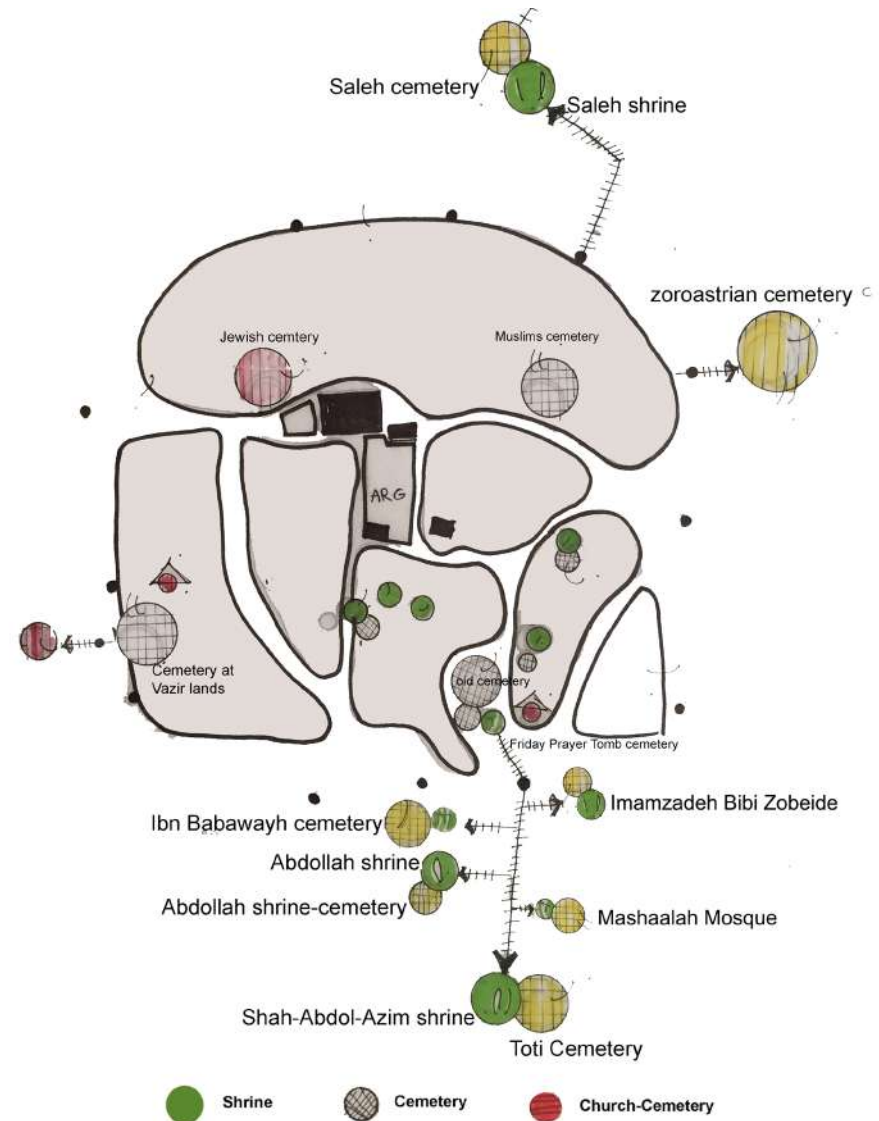


Fig.24: Diagram location of the cemeteries in Tehran, The second half of the 19th century, by author

Tehran Abdol-ol-Ghfar Map, 1890

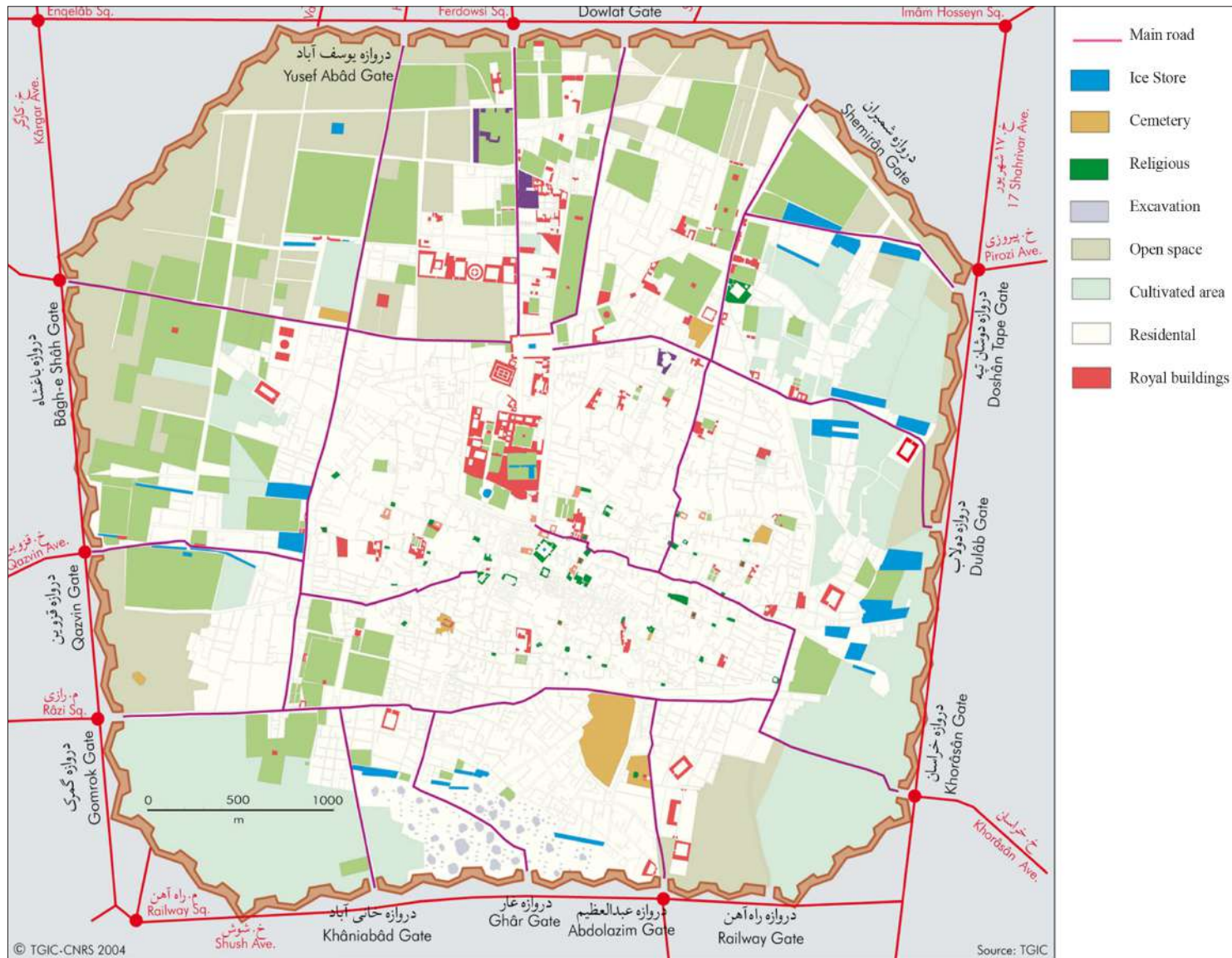
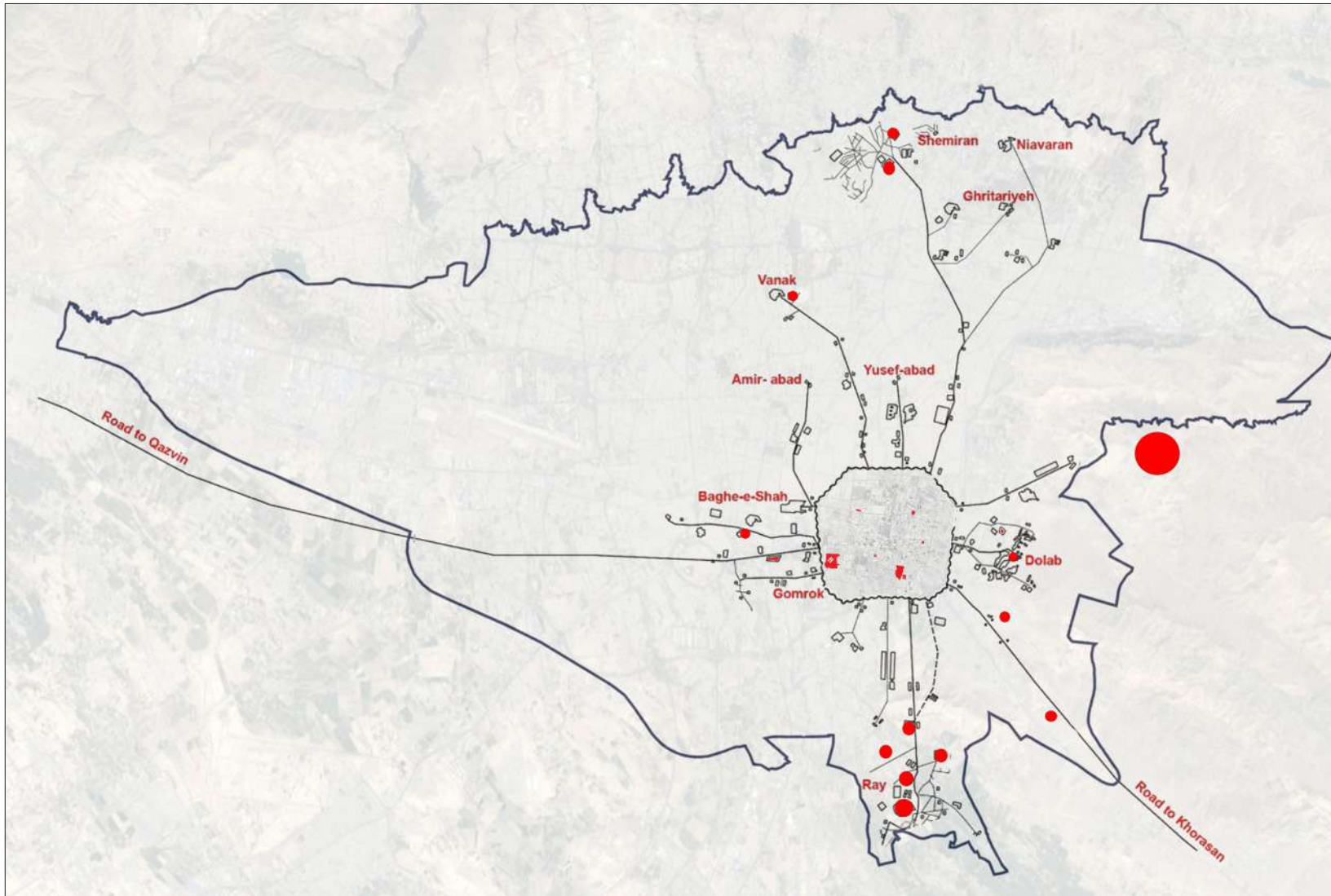




Fig.25: Abdolazim Shrine, Qajar era

Tehran's Neighborhoods area and Cemeteries Dispersion during late Qajar Monarchy



1.1.1.3 Modernization of the Old Tehran

During the modernization of Tehran in 1937, the reconstruction plan was implemented with a grid scheme, which changed the structure of the city entirely. During the First Pahlavi (Reza) reign, numerous changes took place in the city. The old fortifications were torn down and new streets such as Enqelab, Kargar, Shoush, and 17 Shahrivar were constructed instead. (Mirbagheri, 2015) By the end of Reza Shah's reign, the new territories of Tehran were :

- From north: Shah Reza (Enqelab)
- From east: Shabaz Street (17 Shahrivar) or Kharkhane Jadid-e Barq
- From south: Railway Station or Shoush Street
- From west: Baqshah or Si Metri Street (Kargar).

Incidentally, there was no room for cemeteries in this new grid scheme. The old cemeteries were demolished. Some of the cemeteries were replaced with residential and commercial functions and some converted to public gardens. At this time, the cemeteries in Shemiran and Rey were generally utilized as burial places and the new cemetery of Tehran (Mesgar Abad cemetery) was constructed outside the town. Besides, the Zahirodoleh garden in Shemiran was served as a new cemetery outside the city in the northern part of Tehran. (Fig.26, Fig.27)

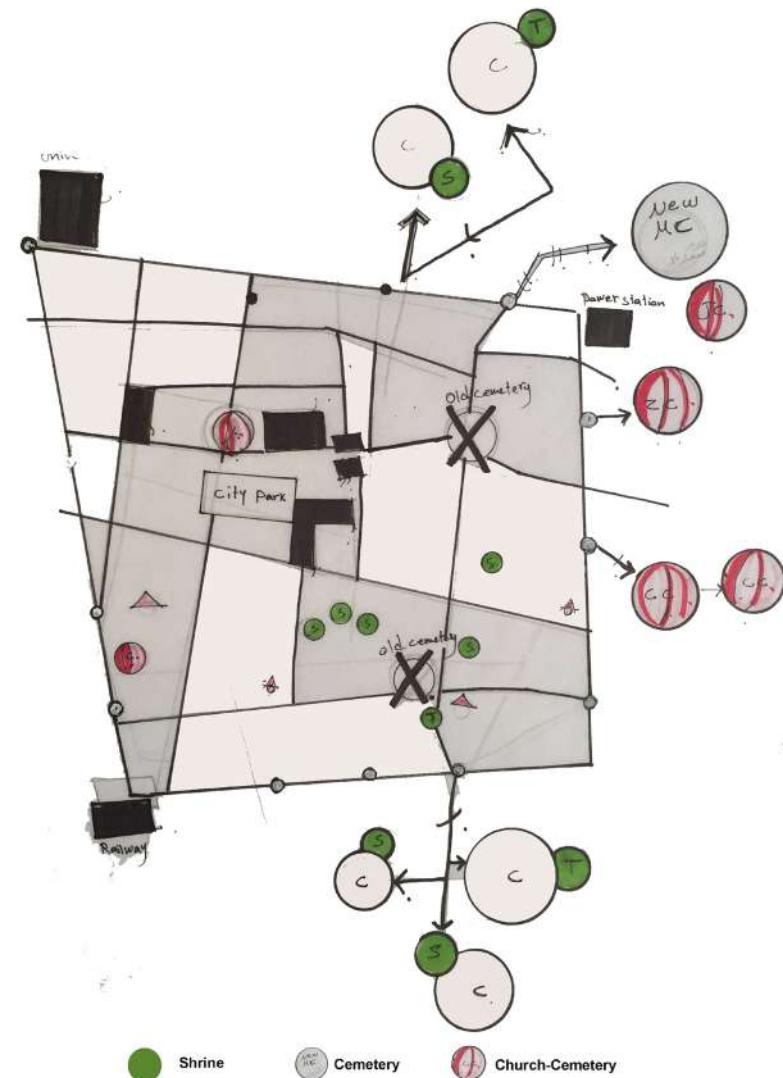


Fig.26: Diagram location of the cemeteries in Tehran, First Pahlavi reign, by author

Tehran Plan of New Avenues, 1937

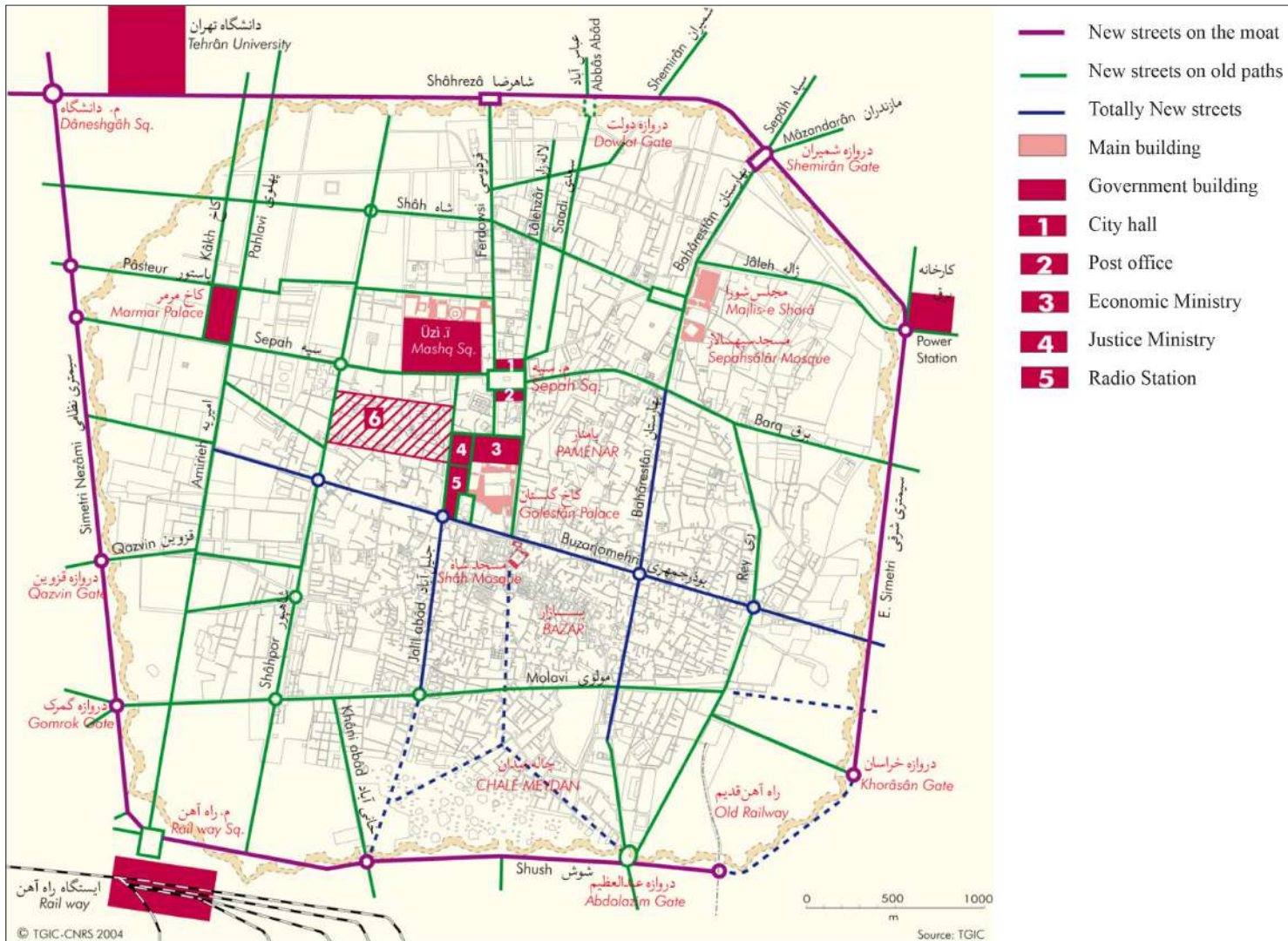




Fig.27: Mesgarabad cemetery situation during Reza shah Pahlavi reign



Fig.28: Mesgarabad cemetery replaced by the public park during Reza shah monarchy, Khavaran Park, 2019, by author

During this era, a number of cemeteries in Tehran were dedicated to religious minorities cemeteries include cemeteries for Armenians, Jews, Hindus, Christians (affiliated to the British Embassy, located in Gholhak Garden, Tehran, inside the British Embassy residential compound), Assyrians, and Russians (in Vosouq street). The French embassy owned its private cemetery, obtained by France and Italy embassies and Catholics of Iran. Later, the Polish purchased the cemetery for the embassy of Poland in 1943. The total area of the Polish cemetery was 75,000 square meters, of which 44000 belonged to Armenians, 14200 was dedicated to Catholics, 3700 to orthodoxies, and the rest to Assyrians. Many famous people are buried in this cemetery. Today, all these cemeteries are named forbidden cemeteries and have specific security and required visit clearance.

The new cemetery for Jews also constructed next to Mesgar Abad old cemetery. (Mansouri, 2017, translated from Persian) The conditions

and characteristics of cemeteries in Tehran at the end of the third period were as follows:

- There were approximately 60 cemeteries in Tehran (within the official boundaries of Tehran at the time), where approximately 23 cemeteries (almost 20%) were abandoned.
- Only 43% of the cemeteries were officially functional. 57% of the cemeteries were destructed.
- Almost 25% of the cemeteries were located next to an Imamzadeh, while 20% were located near the gravesites of religious people and Grand Ayatollahs.
- About 5% of the cemeteries were family-owned.
- Nearly 25% of the cemeteries were dedicated to religious minorities. (Mashayekhi, 1968, Translated from Persian) (Fig.29, Fig.30, Fig.31)



Fig.29: Minorities Cemetery situation, Zoroastrian cemetery, 2019, by author



Fig.30: Doulab cemetery the only Orthodox and Catholic cemetery of Tehran, 2019, by author



Fig.31: Graves on Polish part of Doulab (Forbidden) Cemetery, Tehran, 2019, by author

1.1.1.4 Creation of the Metropolitan Area / First Master Plan

As mentioned earlier, Tehran's southern limit was not developed for many years. In 1968, during the reign of Mohammad Reza Pahlavi, the first masterplan for Tehran was being developed. Tehran's expansion was enabled by constructions over its surrounding farming lands. In addition, villages far from the city had gradually grown into towns and townships by integrating their surrounding villages. (Mirbagheri, 2015) (Fig.32)

In this master plan, Tehran territories became:

- From north: Amir Abad, Abas Abad, Heshmatiye (and the emergence of Yousef Abad neighborhood)
- From east: Doushan Tapeh, Doulab, and the emergence of Chaharsad Dastgah neighborhood, Tehran-e No, and Narmak
- From south: Firouz Abad Stream, Koureha, southern holes, and the emergence of Javadiye neighborhood and Nazi Abad
- From west: Tarasht, Jey, Beryanak, Imamzadeh Hassan, and the emergence of some small neighborhoods

This plan designated the legal limits and the expansion area of the city. The terms of the plan also considered future developments based on functionalism¹. In general, environmental and health concerns sought to provide buffers between the living and the dead during the 19th century. (Rugg, 2000, 1998; Fiedler et al., 2012). Therefore, this impulse in the world led to the segregation of cemeteries into discrete zones to clear the ground, sanitize, and promote human welfare.

Consequently, at the end of this decade, the new vast cemetery of the Tehran (Behesht Zahra) was constructed in the southern legal bounds of the city. This was the first time that the "city of the dead" had been separated from the "city of the living". The relocation of the cemetery to the outside of the city was unprecedented, something that encountered the customs of modernism era. (Haeri, 2009, Translated from Persian). Today, Behesht Zahra cemetery occupies 534 hectares and includes 1,600,000 graves. The cemetery is one of the authorities' concerns for the future Tehran metropolitan area development. (Beheshtzahra, 2019). (Fig.33)

¹ According to John Gehl the main reason was proving higher hygienic standards for citizens in cities. "The basis for functionalism was primarily the medical knowledge. This new and extensive medical knowledge was the background for a number of criteria for healthy and physiologically suitable architecture." (Gehl, 2011)

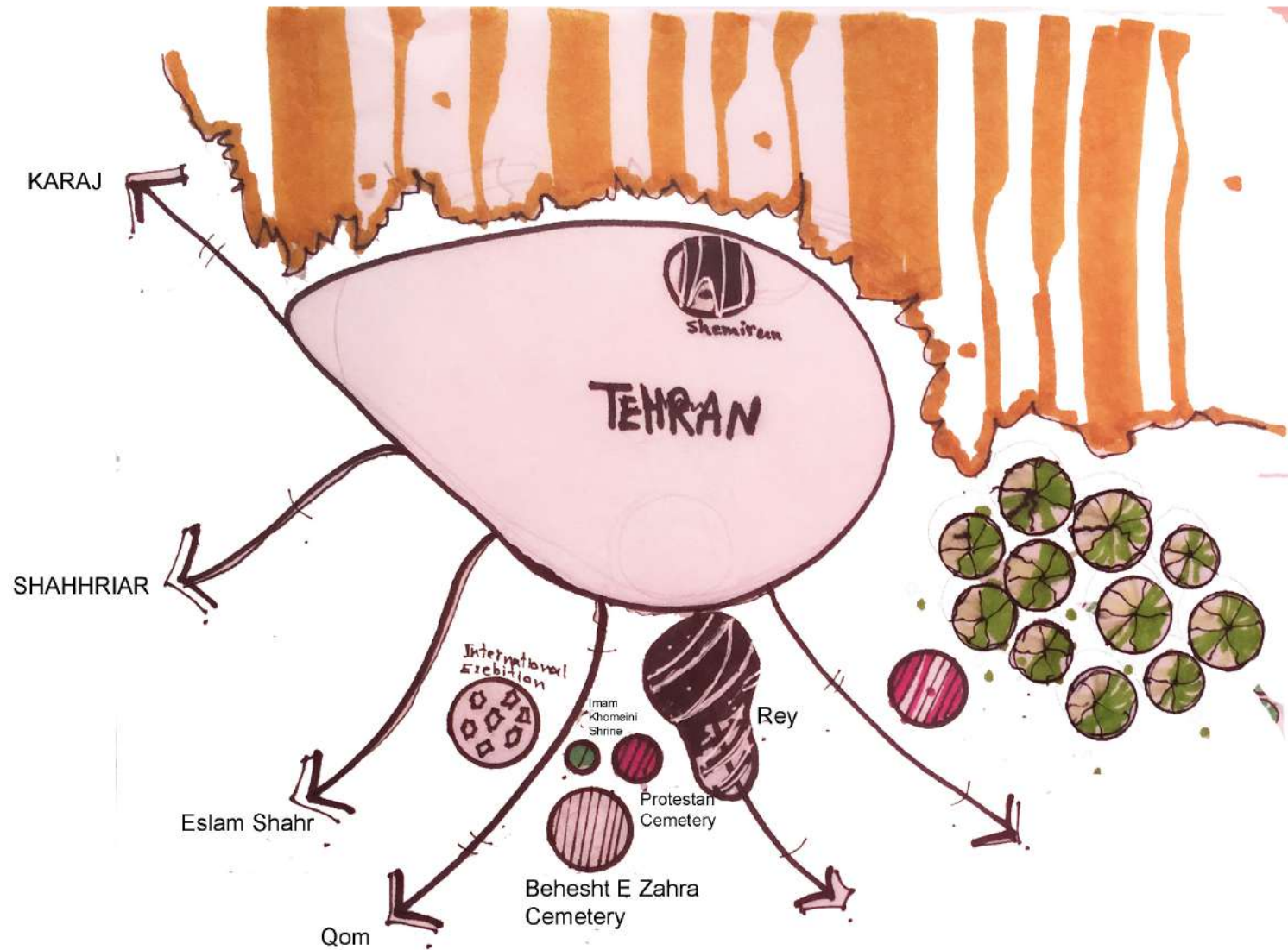


Fig.32: Diagram location of main outside cemetery in Tehran metropolitan area , First master plan, by author

The First Master Plan of Tehran, 1968

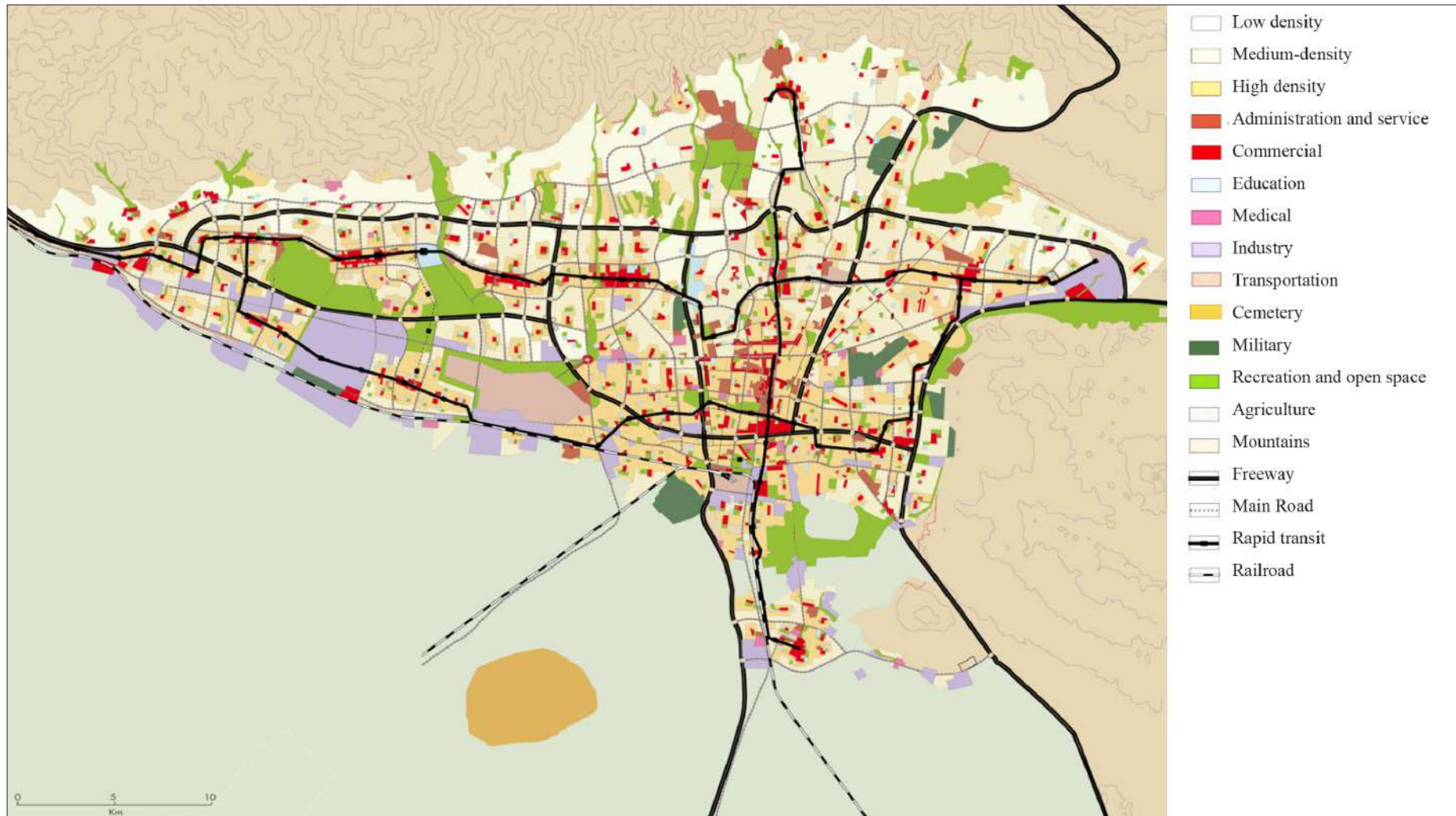




Fig.33: The main cemetery of the metropolitan area occupies 534 hectares, and includes 1,600,000 graves, Behesht-e Zahra cemetery, Tehran, 2018

After the construction of Behesht-e Zahra and banning the burials in cemeteries inside the city, each has had a different destiny, divided into the following groups:

- The cemeteries that have been demolished in a way that there are no remains of its graves and have been converted to parks or other public buildings such as hospitals. Some of these cemeteries are now occupied as mosques or Imamzadeh compounds.
- Cemeteries where burials are banned with no new burials for many years, while the old graves are still visible. These cemeteries are still functional for religious rituals during special occasions. Some of these cemeteries were renovated as local cultural centers. The proximity of some of these cemeteries to religious shrines has provided a spiritual atmosphere for them. (Fig.34)
- Cemeteries with constant and limited burials. These cemeteries are usually small cemeteries, where the area is not fully merged into the urban area and the people have conserved their customs, or ones that belong to the Endowment Organization (mostly located near Imamzadeh shrines). The cemetery atmosphere of these places are in contrast with the surrounding urban neighborhoods.
- Cemeteries where notable individuals are buried, and are designated as historical landmarks. Some of the graves in these cemeteries date back to long time ago, and are reminiscent of the contemporary history of Iran. The main factor leading to the conservation of such places is the existence of the graves of the notable individuals. Usually, there are historical buildings inside these places.

- Cemeteries for religious minorities, mostly located along the Khavaran Road, except for Armenian cemeteries that are scattered inside the city. Many of these cemeteries are still officially operational.

Studies shows that at present, there is no active cemetery in the central sector of the city. All active cemeteries are located in northern, southern or southeastern parts of the city. (Omran, 2013, translated from Persian) To sum up, the seven period of formation of urban cemeteries in Tehran and their changes are as follows:

- **First period:** 1553 - 1849 AD - Early Qajar - First enclosure with 4 gates
- **Second period:** 1850 – 1890 AD - Qajar - Second enclosure with 6 gates
- **Third period:** 1891 – 1924 AD - Late Qajar - Second enclosure with 12 gates
- **Fourth period:** 1925 – 1941 AD - Early Pahlavi I – renovation of Tehran - repurposing the most important cemetery of the time and constructing a new cemetery outside the city
- **Fifth period:** 1942 – 1953 AD – Late Pahlavi I - The plan to organize the cemeteries in the Capital is presented - the transformation of old cemeteries into local parks
- **Sixth period:** 1968 – 1979 AD - Pahlavi II - The first master plan - the construction of Behesht Zahra
- **Seventh period:** 1991 – 2020 – Post Islamic Revolution - revising the old master plan: new cemeteries were constructed next to shrines and local cemeteries in urban fabric areas were redesigned for martyrs. There is no plans for 140 historical cemeteries within the urban fabrics and future cemetery of Tehran metropolitan area.



Fig.34: Abandoned and deactivate urban cemetery in the northern part of the city with the residential neighborhood, Zahirololah cemetery, Shemiran, Tehran, 2019, by author

1.2 Statement of the problem

“Adapting the role of the cemeteries to the city in ways which are respectful to traditions, cultural and religious beliefs, while being employed as multifunctional places responding to both the living and the dead, and reconnecting these two worlds is a necessity.” (Iskan, M.Y., Steyn, M., 2013).

As mentioned earlier, human societies have utilized various types of cemeteries. All types of burial grounds, such as cemeteries, shrine cemeteries, rural cemeteries, lawn cemeteries, memorial cemeteries, and natural cemeteries represent similar urban, open public spaces within different cultures. All these cemeteries are necessary functions within urban areas. They typically occupy large horizontal spaces in urban areas and influence the well-being of the community significantly. In many cultures, these past burial sites are entirely different from modern urban cemeteries. (G. Bennett, 2015)

As we mentioned in chapter one, cemeteries and shrines have always played a significant role in the formation and evolution of ancient Iranian cities. By city development, shrine cemeteries in cities gradually became urban complexes connected to the main structure of the bazaar. In modern times, shrines spaces still possess a profound significance and prestige in cities, but the structural significance of cemeteries has decreased considerably. (Vazirizadeh, 2009, translated from Persian). Cemeteries are less visited and become less integral to the daily activities of society. The loss of urban integration, recreation, and collective sense has altered the citizen’s attitude towards the use of urban cemetery space.

Therefore, in Iranian culture, acceptance and prominence of death has shifted radically. They are mostly dead horizontal lands. Having regular visitors is uncommon for urban cemeteries in Iran.

Tehran as the capital of Iran with a high population and different facilities, which made it the biggest city in the Middle East, has faced many problems in terms of low-quality urban cemeteries. These problems emerged by divining urban cemeteries function as a service function in urban planning of the city and the ignorance of their designing by the designers and planners. These problems are intensified by suspending burial permits in cemeteries inside cities according to a letter from the Ministry of the Interior in 1994 and unplanned and superficial interventions to these urban spaces (Mirshahzadeh, 2009, translated from Persian) (Fig.35)

Since, today, strategic guidelines available are decades old and rarely reflect the urban cemeteries within the city, these spaces without any environmental qualities are known as lost and undesirable spaces within the city. They impose a negative impact on the quality of the urban context in which they are located and provide no positive contributions to the well-being of the citizens. Countless problems have emerged as the result of a complex confrontation between a cemetery, its immediate, intermediate, and territorial areas. Most residents who lived near cemeteries have migrated today. Moreover, the quality of the land around cemeteries has deteriorated drastically, turning these areas into hotspots for crime.



Fig.35: Behesht E zahra cemetery, Tehran, Iran, 2020, by author

Cemeteries Dispersion within Tehran metropolitan urban area



1.3 Background:

In recent years, discussions regarding treatment, maintenance, and re-integration of urban cemeteries, along with the shortage of burial spaces became a topic of interest to Iran and Tehran Municipality. City officials have realized the necessity of novel solutions for the treatment with these burial spaces and vitality of their urban context. The first survey on the recognition of historical, abandoned, and holy cemeteries of Tehran was carried out by the Tehran services management organization in 2005, under the supervision of Behesht Zahra cemetery. This study initiated the first discovery of cemetery crisis in Tehran, and provided the necessary foundations for the next projects. The result of this study was published in eighty books. In each book, the crisis of each urban cemetery in Tehran metropolitan area was described. In 2016, another investigation entitled “The plan for identifying and organizing the historical cemeteries of Tehran” was performed under the supervision of Tehran Municipality - Management of historical monuments and urban fabric of Tehran. This study has been carried out by Abadshahr Tadbir Consulting Engineers and was funded by the Department of Urban Planning and Architecture of Tehran. The goal of the project was to study the conservation of historical cemeteries in Tehran, and identified several values in Tehran’s historical urban cemeteries. The theoretical framework of this research was based on cultural heritage of the cemeteries. A similar study by Mirbagheri (2015), analyzed the position and conditions of current cemeteries, along with their negative effect on urban environment, and explored interaction of these spaces with their respective urban fabrics. According to them efforts to revitalize Iranian historic urban

cemeteries have gained new momentum. Several interrelated factors at the national, regional, and local levels contributed to change the conditions or structures of urban cemeteries, which provided a basis for the development of a new approach to reintegration of historic urban cemeteries in Tehran. The results of this study illustrated the necessity of exploring cemeteries re-integration process, and how they require specialist vision in urbanism, urban, urban planning, urban design, landscape architecture, and architectural perspective. The following thesis will be carried out based on the previous researches. The ultimate intention of this study is to aid city officials in re-integrating current cemeteries with neighborhoods, regions, and cities and provide strategies and guidelines for the future design of urban cemeteries in the Tehran metropolitan area.

1.4 Research Aims and Objectives

This research aims to provide an in-depth insight and develop a broad understanding of approaches to the urban cemeteries integration in Iran and Tehran. Therefore, to achieve this aim, it is necessary to:

- **Study necessities of human well-being in urban spaces**
- **Explore and identify the components and indicators of qualitative urban design that advantageous in increasing well-being**
- **Assess the outcomes and impacts of indicators**
- **Interpret and explain principles of biophilic design to enhance qualities of the built environment**
- **Evaluate the biophilic design application**

In specific, applied interventions are as follows:

- **To design an analysis model to evaluate urban design qualities of urban cemeteries environment**
- **To implement biophilic strategies in architectural and urban design, along with their integration into urban planning, regional structure, and neighborhoods to improve the attitude of citizens towards cemeteries in Tehran.**

1.5 Hypothesis and Question

It is believed that proper definition of the research question is an essential step in a research study. The form of questions raised provides significant clues regarding the appropriate research strategy ((Mason, 2002); (Yin, 2003)). According to Blaikie (2002), research questions can be grouped into four main types: “what” questions, “why” questions, “how” questions, and a combination of all three types. (Blaikie, 2000) In this study, we have introduced the subject with the “What” and “Why” and following those questions research is looking for a way to reach the ”How” question. Mainly what we are aim to achieve is to bring about change, while providing practical outcomes and interventions based on the conceptual framework of the study.

Main Question:

- **How can be the urban cemetery reintegration process (as an open public green space) so as to promote human physical, mental and social well-being?**

In addition Hypotheses are tentative answers to certain types of research questions that employ certain research strategies, and are often defined as a particular connection between two concepts (Blaikie, 2000). The Question and hypothesis of this research are likely to be the most essential statements of the research: (Fig.36)

Hypothesis:

- **Applying Biophilic design and biophilic urban acupuncture to the design of cemeteries, their surrounding areas, and the urban planning of their regions can improve the environment and the quality of life in the city and promote human physical, mental and social well-being.**

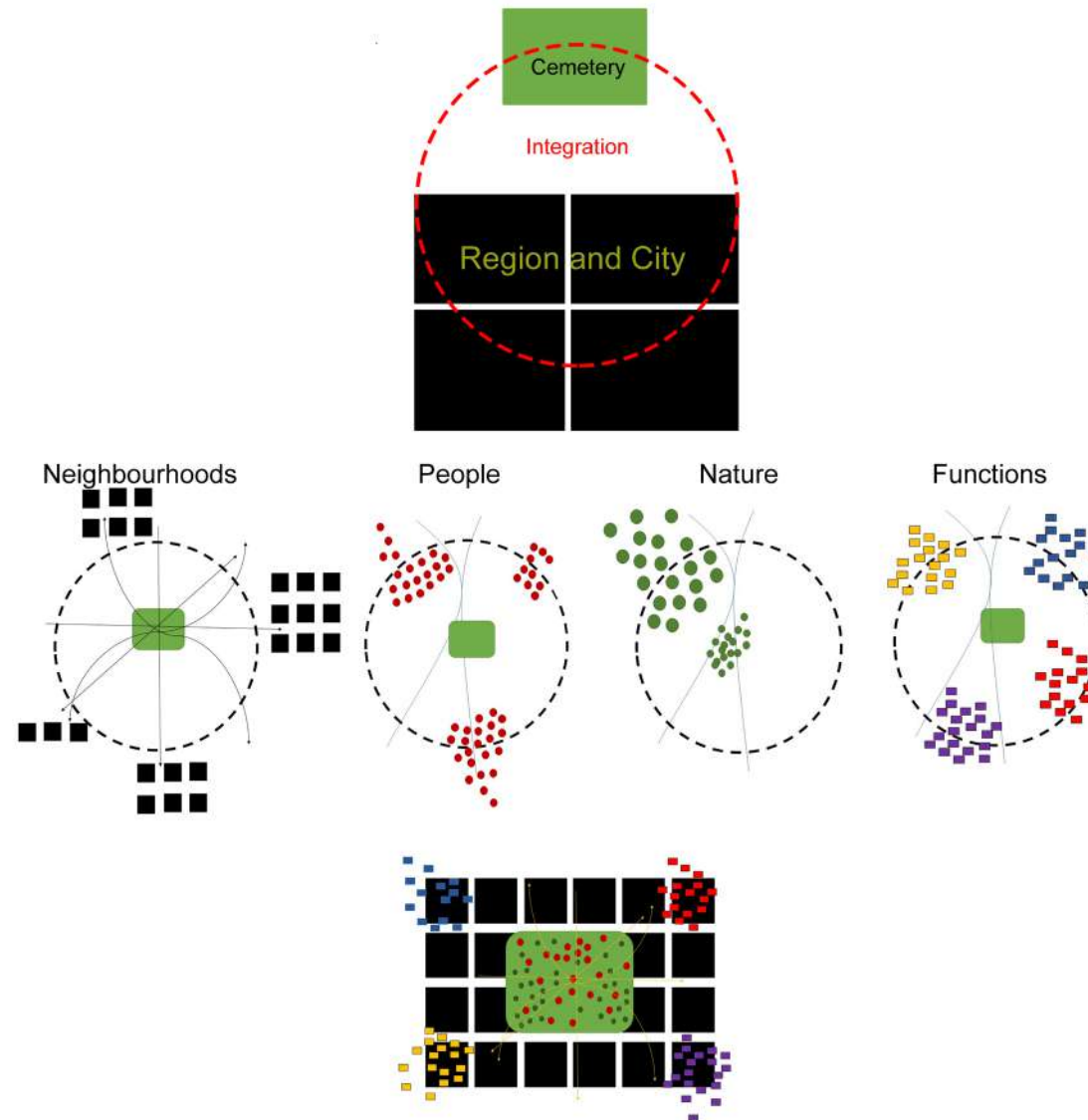


Fig.36: Question and Hypothesis diagram, by author

1.6 Methodology

“Good architecture and urban design ensure proper interaction between public space and public life. However, while architects and urban planners have been dealing with space, the other side of the coin (i.e., life) has often remained overlooked. Perhaps this is because it is considerably easier to work with and to communicate on form and space, while life is ephemeral and, therefore, difficult to describe. One of the most important factor is how public life can be studied simply and cheaply”. (Gehl, 2013)

According to Gehl, the process of designing or renovating urban spaces is an interaction between the physical and psychological dimensions of the place. The following section, as the main body of the research methodology, introduces a logical plan for the research, identifies an appropriate method for conducting the study, and justifies the case study selection, the scale, and the level of investigation. It is, therefore, subdivided into five areas: ‘the research design,’ ‘the case study strategy’, ‘the case study selection’, ‘source of information’, and finally ‘data analysis model’.

1.6.1 Research Design

A research design, as defined by (Yin, 2003), is the logical sequence that connects the key elements of the research. It connects the generated empirical data to the initial research objectives and ultimately to the conclusions: *“a logical plan for getting from here to there, where here may be defined as the initial set of question to be answered and hypothesis to be proven, and there are some sets of conclusions”*.

According to (Blaikie, 2000) research can be designed to explore, describe, explain, understand, predict, change, and evaluate impacts. A research project can pursue only one of these objectives or, probably, a number of them in sequence. According to the research question, the following applied research includes some of these “basic” purposes, such as explore, describe, and explain. However, it is particularly concerned with change. Therefore, the first phase of the research includes exploration and explanation of urban design principals to establish the structure and the framework for the rest of the research. The second phase of this research includes an application method for change and intervention. (Fig.37)

1. The first chapter (Introduction) states the topic, defines the research problem, and describes the background. Subsequently, it proceeds to set the goals of the study and provide the research question, its hypothesis and the methodology of the research.

2. Since the study hypothesis requires a great deal of theoretical work (Blaikie, 2000), chapter two, as the theoretical section of this thesis, reviews literature and describes, interprets, and explains the visions of the specialists in the field of designing urban open public green spaces (UOPGS) in two steps. The first step of this chapter defines and searches for urban open green public space definitions in different theories to find a new vision for cemeteries in urban planning of Tehran. The second step primarily investigates human well-being and their principle needs in the built environment through behavioral science. Following that this section searches for fundamental urban design qualitative environmental qualities of the UOPGS that emerged from the fundamental requirements of human well-being.
 3. In Chapter three, a model is proposed for the next steps via integrating concepts and ideas of chapter two. Furthermore, in this chapter, by developing a coherent theoretical framework, an urban design analysis model is proposed to assess environmental qualities of urban cemeteries.
 4. The case study and the empirical results are combined in Chapter four. This part examines the case study according to the analysis model derived in chapter 3, in three different scales. The assessment in this chapter explores the strengths and weaknesses and identifies the opportunities along with the threats that the case study is faced with in immediate, intermediate, and territorial area.
 5. In the second phase, Chapter 5, the intervention requirements of the hypothesis are established through a second literature review. The factors and principles will be adjusted through biophilic design and urban acupuncture theories. The primary function of this phase is proposing the theoretical and applied intervention framework that enables the selection of the best intervention strategies and guidelines for the integration process of urban cemeteries.
 6. Chapter 6 investigates experiences in international urban cemeteries with different scales of biophilic design interventions to provide a clear image of how biophilic design can be applied to practice in urban cemeteries.
 7. In Chapter 7, the general applied intervention strategies and the proposed guidelines is demonstrated for the comprehensive urban planning of the Tehran metropolitan area, urban and architectural design implementation for the urban cemetery's neighborhood, and ultimately, for the urban, landscape and architectural design implementation of the urban cemetery in general. Following that, a number of detailed guidelines are provided to be applied to the case study for the region, intermediate, and immediate areas.
- Finally, Chapter 8 aims summarize the discusses the main findings of the research and the conclusions, followed by the bibliography.

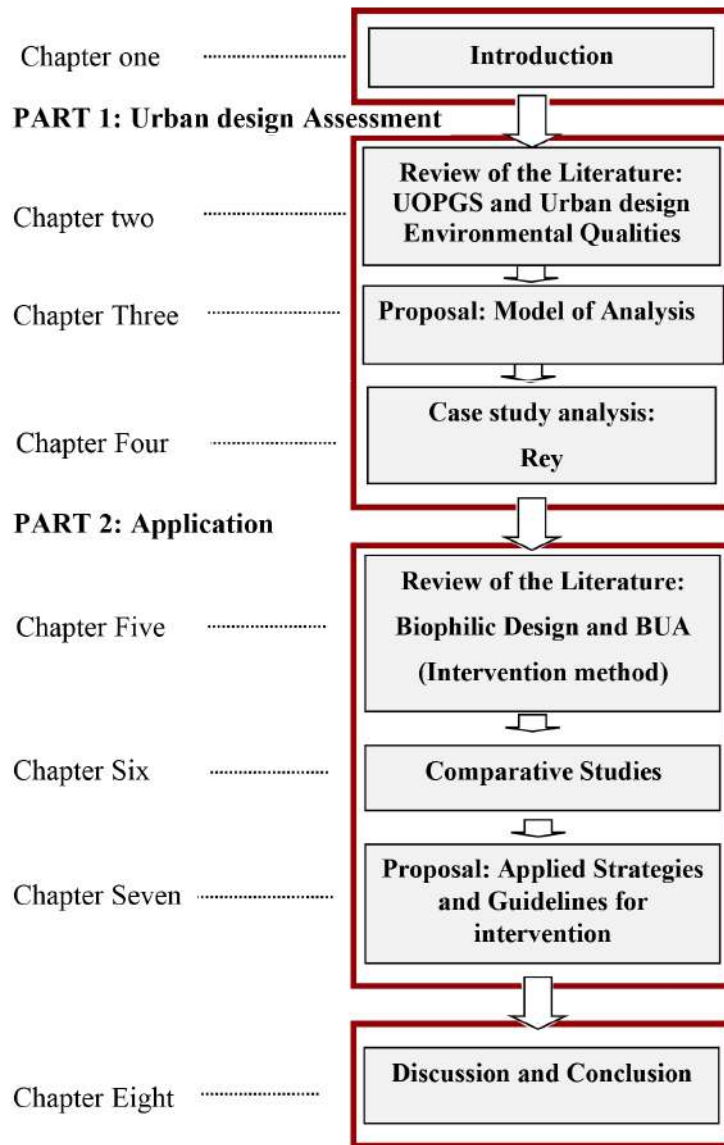


Fig.37: Research design framework

1.6.2 The Case Study Strategy

In (Yin, 2003), it is quoted that “*case studies are the preferred strategy when ‘how’ or ‘why’ questions are being posed*”, and “*when the focus is on a contemporary phenomenon within a real-life context*”, where “*the investigator has little control over the events*”.

The case study strategy is generally employed for three purposes - exploration, description, and explanation ((Groat, 2002); (Yin, 2003)). A case study is an appropriate strategy for the exploratory phase of this investigation. Our proposed strategy tries to illuminate strengths, weaknesses, threats, and open opportunities for urban cemeteries. Hence, the empirical core of this research rests in the case study, since it provides greater depth and quality for the material. Although research for this thesis considers one case study in Tehran urban area, what we are aiming obtain here is proposing an integration process for all Iranian cemeteries to bring life into these urban spaces and optimize their appeal to meet the needs of all those involved in future.

1.6.3 Selecting the Case Study

“A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2003).

According to the quote, the developed conceptual framework is applied to the study of one case, which represents a crisis in urban cemeteries in Tehran during the last decades. The case study considers part of the historic core of Rey, south of the Tehran metropolitan area. Using a number of different selection criteria, this section provides the basis for selecting the case. The criteria were applied to ensure that the case is reasonably representative of the intervention approaches (biophilic design) selected for the investigation. In specific, the case has been selected based on the following criteria:

- The case should represent values of different types of urban cemeteries, including holy shrines, family cemeteries, churches, religious minorities' cemeteries, and arid cemeteries
- The study area should be responsible for the analysis model in terms of size, functional, perceptual and ecological problems in the scale of city, region, neighborhood, and surrounding area.
- The availability of information (i.e., access to resources and the region) has also been considered as an essential factor for the case study selection.

1.6.4 Sources of Information

This investigation primarily employs qualitative data sources; although some quantitative data are also utilized. However, statistical analysis is not explicitly used. Consequently, the research employs qualitative data collection and analysis. The study relies on multiple sources of evidence, which substantially improves the validity and reliability of the research. By studying every aspect of the problem from as many angles as possible, and by utilizing various sources of evidence, case study research strategy can potentially be a powerful tool in the hands of a researcher. (Stake, 1995)The information utilized in this thesis are distinguished as primary and secondary evidence. Primary evidences are first-hand or original sources, including direct observation of the events and circumstances of the case, original documents, maps, and photographs. Secondary sources represent information already processed or interpreted, including published and unpublished materials on the case or on Tehran in general. The secondary sources of information include descriptive and quantitative, as well as analytical and qualitative materials, published by the government, the consultants of projects, and other private institutions both in Persian and in English. In the empirical section, secondary documents are used as supplements for the primary information. The other source of information was the author's personal knowledge from the process of urban design and architecture in general. This source of information has primarily been applied to support the information and data obtained from other sources. This source of information is required; particularly where other sources fail to provide the necessary information. Most of the data, including the statistics data, official records, reports, documents

prepared by the consultants (Master and detailed plans at different levels for the city, regions, and neighborhoods), the evidence obtained from direct observation of the sites (pictures and sketches), published books, brochures, newspapers, and journals were collected between 2016 and 2020. Secondary sources of evidence, including reports, conference proceedings, published PhD theses, published books, and other articles relevant to the subject of the study in general were also collected either from sources in Barcelona, or Internet resources, or were collected directly from research institutions and libraries. While some secondary sources could be studied as literature review in two phases, it is rather hoped that the combining the materials from the primary data and these sources helps in providing a clear picture of future urban cemeteries integration process.

The implementation of fieldwork and data collection also faced a range of restrictions due to the lack of available, up-to-date and accurate data (includes maps and google earth limitations in Iran), other prior work on hand, interview issues and time limitations. The main disadvantage of this restriction was the long period for data collection, as the author had to find other ways of collecting data (further interviews, direct observation, and data collection). There was also a further limitation of the database on the participation and support of residents during the data collection and interview process. This was mainly due to the negative image of the people created by multiple demolition and renovation, which placed pressure on residents to leave, planning restrictions, and many other problems caused by previous interventions, which ignored the position and requirements of the residents and worsened poor living conditions in the case study area.

1.6.5 Data Analysis Strategy

One practical difficulty in the analysis of case study evidence is dealing with the amount and the variety of data collected. These difficulties can be reduced if the research has a general model for analyzing the data. This will indicate what to analyze and why, and will ensure that the data collection activities are appropriate and support the ways in which the evidence is to be analyzed.

Data analysis primarily focuses on discovering regularities or patterns within literature reviews. The first task is, therefore, to categorize and index the information according to the research question and hypothesis. The collected information is categorized into five main areas:

1. The data concerning Urban Open Public Green Spaces (UOPGS),
2. Human well-being requirements in cities and urban public spaces,
3. Environmental quality indicators and components of the built environment within urban design theories,
4. Biophilic design and urban acupuncture (requirements, policies and approaches)
5. The data related to the national and international case studies

After data organization, content analysis is used to match the information with the aims and research questions developed based on the methodological approach of the study.

CHAPTER 2

LITERATURE REVIEW

URBAN DESIGN ASSESSMENT

This chapter provides a review on relevant literature and outlines the theoretical framework of the study. The chapter is comprised of two main parts. In the first part, the study approach will be endorsed through reviewing the literature on definitions and concepts of urban open public green spaces. In the second part, the study concentrates on the human well-being requirements in built environments and the environmental qualities of UOPGS (built environment) in the urban design framework.

To establish a clear understanding of the interaction between human and the built environment (in other words, between “urban cemeteries” and “users”), it is necessary to investigate the environmental qualities of urban cemeteries as part of the broader context of human behavior process.

To this end, the first section of the second part reviews a range of conceptual models of the human well-being process as a wider context,

where different dimensions of this complex process can be identified. In the second section, the environmental qualities of UOPGS are presented to answer human well-being requirements and their fundamental needs. It is an attempt to delineate various prerequisites, indicators, and components of urban design that create UOPGS and affect the process and product of current urban cemeteries.

Finally, this part will allow a set of frameworks of qualitative urban design model for urban cemetery assessment. By identifying the qualities of urban cemeteries some key design and SWOT conclusion can be outlined.

2.1 Urban Open Public Green Space (UOPGS)

Historical changes experienced in cities are reflected in the urban spaces such as urban cemeteries, which often leads to gradual extinction of these spaces in the urban structure. Madanipour declares that “*urban space is typified by what is called a “city”; a city is a collection of people and institutional structures that promote the efficient interaction between persons and places. Urban spaces, therefore, are not created by impersonal processes, whereby no one is responsible for making choices and altering the processes of creating them. They are not created by individuals working alone, out of context and beyond their social and historical disposition*”. (Madanipour, 2005).

Accordingly, by increasing urbanization, Tehran lost the concept and position of its urban cemeteries as an urban space or more precisely as a UOPGS in urban planning, whereas they need to be considered as an integral approach in the scope of urban planning and design.

In the following, we explain and discuss different theories about definitions of open space, public space, and green space, along with their main urban features. Through this section, we define the first and primary necessities of the urban cemeteries integration process within Tehran's urban development.

2.1.1 Open Space

It is generally believed that the word “open space” was first used in 1833 by the "public road" committee in London (Maruani & Amit-Cohen, 2007). However, another definition appeared in the "Metropolitan Open Space Act" in London, England, in 1877 and then in 1906, which described open space as any land, less than 5% of which is occupied by buildings. (Groat & D, 2002) (Rakhshandehroo & Yusof, 2017). Open space is often defined as any undeveloped piece of land with no structures (Stiles, 2011). On the other hand, open space includes not only land but also water sources such as lakes, canals, reservoirs, and rivers. Open space defines as a place that enhances visual amenities, and leisure and sporting opportunities ((Doyle, 2012); (Patrick, 2008)). This definition includes any open area under the authorization of a government body or association with vacant lots and brownfields that could be redeveloped into leisure areas.

Regardless of this viewpoint, one thing is clear: open space is a dynamic aspect in urbanization; particularly valuable when they are part of an urban environmental system/network that integrates eco-compatible activities (walking, biking, and cycling) with natural environments and ecosystems (Garau, 2018). The urban Taskforce concept (2002) introduces open space as “*a combination of public (or civic) and green spaces, where public spaces are often 'hard' spaces.*” (Swanwick, C.; Dunnett, N. and Woolley, H., 2003) (Pauleit, 2003)

2.1.2 Green Space

The roots for the term “green space” can be traced back to the urban nature conservation movement and European ideas on green space planning initiated in the United Kingdom. Green space is literally defined as a land consisting mainly of unsealed, permeable, “soft” surfaces such as dirt, grass, shrubs and trees. It is a general term for all these regions, whether or not they are publicly accessible or controlled. (Swanwick, C.; Dunnett, N. and Woolley, H., 2003). Green space can include public or private open spaces in urban areas, typically filled with plants (natural or artificial-planted) such as trees, shrubs, and grasses (Fam, et al., 2008), available for use either directly or indirectly (Mensah, 2010), and are found primarily in semi-natural areas (Jim & Chen, 2006) (Rakhshandehroo & Yusof, 2017)

Therefore, it is a piece of land with water and geographical features that were colonized by plants either naturally or artificially, and is accessible to masses. (Nicol, C. & Blake, R., 2000).

Green spaces should usually be open to public. Although in some cases, they may be owned privately. Such sites can include campuses for higher education, institutional or company areas. Although the general public does not have full access to these green areas, they provide many benefits, such as esthetic and psychological relief from urbanization. (Springgate, 2008). As mentioned by Enger: “*Green spaces play a significant role in the lives of all people, regardless of age, lifestyle, or ethnicity*” (Enger, 2005).

Therefore, there exist two alternate interpretations of green space that both fail to provide a clear picture of what green space is within disciplines that can be more useful when definition is provided.

According to the first popular definition, green space refers to bodies of water or landscape-vegetation areas, including forests, natural ecosystems, street trees, gardens, backyards, geological systems, farms, coastal regions, and food crops. This description is a general reference to **ecosystem and the concept of natural environment**. (McIntyre, 2000). However, the second most popular definition includes **land use and urban open green areas**, which resembles recreation areas, parks, squares, highways, urban forests, cemeteries, and such constructions. This term can be defined as part of a broader concept of green space that is restricted to city and open space. (Taylor, Lucy; Hochuli, Dieter F., 2017)

Taskforce describes green spaces somewhat opaquely as being generally interpreted to mean green areas in the broader context of open space. As mentioned in notes, green spaces include: “*a) Urban parks and gardens, (b) Play areas (Natural playgrounds, inclusive playground, and adventure playgrounds), c) Natural green spaces (urban wildlife and ecological and woodland areas), (d) Amenity green spaces (residential squares and public spaces surrounding buildings), (e) Functional green spaces (public cemeteries, community gardens, sports fields, public school grounds, churchyards, and urban farms), (f) Green corridors (river banks, canals, and waterfronts), g) Greening of empty and unused urban lands, and (h) Private green spaces that benefit the public*” (Taskforce, 2002).

2.1.3 Public Space

Centuries after the management of the Greek Agora and the Roman Forum, public spaces are a key concern for urban planners. The definition of the public sphere is linked to the growth of democracy, as Leighninger denoted in 2013 (Leighninger, 2013). These areas were the people's 'common areas;' financial, social, and cultural centers (Wilson, 2012). Some old central sites were the meeting place people, as best demonstrated by the old agora. The city's small size made it possible to fulfill political, economic, and cultural needs at the same time as being an assembly site, a market place, and a place of rituals and ceremonies. (Madanipour, 2004). According to the nature and purpose of public space, it is usually a green place that provides free of charge access and interaction, unconstrained by the control of commercial or state forces. Moreover, it is a space for particular defined purposes, subject to behavioral norms and control over those who are allowed to enter (Carmona, 2010). Madanipour claimed that "*From another point of view, public space, in general, is characterized as meeting or gathering places that exist outside homes and the place that are generally accessible to members of the public and promote interaction between residents and provide opportunities for contact and proximity.*" This definition implies a greater degree of social participation and does not regard collective ownership and management; it is merely about public engagement. Public space is a place where all people feel safe and cared for, regardless of revenue and personal circumstances. (Madanipour, 2014).

Public space is a place we share with those who are neither relatives, family friends nor colleagues. Public open space is usually categorized into a hierarchy of neighborhood, district, and regional open space, and can be used for either passive or active recreation (Australian Government Department of Health and Ageing, 2009). Sports, culture, business, and politics all take place in public spaces and they are environments for peaceful coexistence and impersonal meetings. The character of such places should reflect and form our public and civic culture. (Woolley, 2003). It can therefore be defined as an open space for all, owned by everyone, and used by the public. (Rakhshandehroo & Yusof, 2017). In any case, local authorities own most public open spaces, including public lands, and responsibilities may fall between different departments, such as parks, cemeteries, highways, etc.

2.2 Human Well-Being as the Basis for Improving Qualities of the Built Environment (UOPGS)

The built environment, (be it a square or a cemetery, an alley or a highway) and specifically UOPGS, play their role and make their impact on citizen's lives. Accumulation of these spaces create a city; a place fundamentally built for people. These spaces establish flow through the city and deliver amenity value to citizens. Being within the built environment and access these UOPGS of different types and for varying purposes has been shown the great significance of wellbeing and health of individuals. (C. Kondo, et al., 2018)

The latest Habitat III Agenda (United Nations, 2016), places the promotion of human health and well-being as a core urban target for the 21st century. The emphasis in this agenda is to incorporate health factors with plans and programs that focus on well-being of citizens and their needs. The European Healthy Cities Network (promoted by the World Health Organization) aims to support *'policies and actions for health and sustainable development at the local level and across the European Region, with an emphasis on the determinants of health, people in poverty, and the needs of vulnerable groups. Moreover, its goal is to strengthen the standing of Healthy Cities in countries'* (Who, 2008). Therefore, understanding the human well-being and needs (i.e., 'Society') in the built environment (UOPGS) is essential in the urban and architectural design (Moughtin, et al., 2009). So designing UOPGS must be based on believing in the high quality built environment that influences people's ultimate experience of that space. In the next part of the chapter, the discussion is structured around three key concepts of an integrated approach to the balance between human needs, built environment and urban design environmental qualities.

2.2.1 Definitions and Concepts

Environment: The word environment can take on different meanings. In the Oxford English Dictionary, it is defined as: *'the conditions or influences under which any person or living thing lives or is developed.'* The American Heritage Dictionary's definition of the environment(2005) has a slightly different emphasis: *'Surroundings; the total circumstances surrounding an organism or group of organisms.'* Robert Cowan, in the Urbanism dictionary, defined "Environment" as *"physical surroundings, including land, air, and water, in which people, plants and animals live."* From the viewpoint of planners, architects, and urban designers, environment is divided into *"the built environment and the natural environment."*

Quality: The term "Quality" is an affirmative or negative character in a logical proposition of being, and is known as a phenomenon that affects the emotions and intellects of individuals (Adams, 2014). Cowan (2005) denotes that "Quality" is a degree of excellence.

Environmental Quality: Environmental quality is the evaluation of the environment in relation to the requirements of one or more factors, or to the needs or demands of each human being. According to Porteous, environmental quality is defined as *"a complex issue involving subjective perceptions, attitudes, and values that vary among groups and individuals."* (Streimikiene, 2015)

Well-Being and Health: Oxford English Dictionary describes well-being as: *“the state of being or doing well in life; happy, healthy, or prosperous condition; welfare.”* The definition provided in the American Heritage Dictionary is very similar: *“The state of being healthy, happy, or prosperous; welfare.”* However, the definition of health in the English dictionary of Oxford is limited: *“Soundness of body; that condition in which its functions are duly discharged. The general condition of the body.”* The American dictionary is more comprehensive in its interpretation of health: *“The state of an organism with respect to functioning, disease, and abnormality at any given time and any state of optimal functioning, well-being or progress.”* WHO described “health” as the definition of well-being. A health definition was briefly presented by the World Health Organization in 1946: *“a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”* (Who, 2006). (Fig.38)

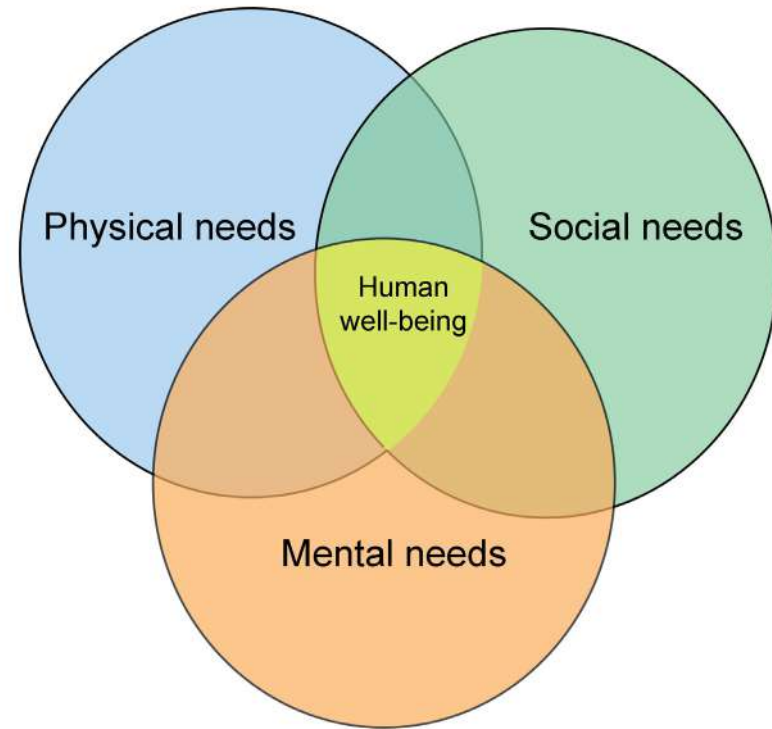


Fig.38: Human wellbeing requirements according to the World Health Organization

2.2.2 Human Well-Being Principles in the Built Environment UOPGS According to Behavioral Sciences

The definitions of well-being encompass three general dimensions of human well-being: physical, mental and social. Accordingly, designing the built environment (UOPGS) should serve **physical, psychological and social well-being** of human. This UOPGS should provide a healthier lifestyle, establish positive human behavior patterns, increase their quality of life, and respond to individual's needs. Since the built environment and the natural environment are both shifted, the behavior is changed, and the outcome has become dependent on who uses it. According to Madanipour (Madanipour, 2014), *“the built environment provides expression, meaning, and identity to the entire sweep of forces involved in people's relation to their surroundings. It provides cues for all kinds of human behavior. People are not passive; however, they influence and change the environment, as it influences and changes them. It is, therefore, a two-way process.”* Designers need to be sensitive towards environments and demand one that fulfills not only “general human needs” but also the “specific needs of people.” (Carmona & Tiesdell, 2007)

Over the years, many sociologists and psychologists have attempted to study design issues of interest in terms of different factors, the level of human needs, and their well-being through behavioral science. In 1954, Abraham Maslow proposed a hypothetical model of human behavior in his book entitled *“Motivation and Personality”* (Maslow, 1987). He presented six fundamental needs, namely **physiology, safety, belonging and love, esteem, self-actualization, and self-transcendence**, implemented to describe the patterns that human motivations generally move through. (Fig.39)

Maslow classified hierarchy of needs from the most essential and immediate needs (i.e., physiological or survival needs) to the most mystical in the hierarchy of prepotency. The most basic physiological needs must be fulfilled so that progress can be made towards higher ones. However, while there is a hierarchy, various needs are connected to a dynamic set of interlinked relationships. In other words, through their mental and physical actions, human beings make their ideas into something permanent and thereby become aware of their possession of mind. McLeod described that *“through having their actions recognized by others, people are able to enjoy some factors of mental well-being such as self-esteem, love, and so on.”* (McLeod, 2007). Honneth denotes that *“self-identity depends on developing self-confidence, self-respect, and self-esteem. Achieving these requires the recognition of others who share common concerns within a mutually supportive community”*. (Honneth, 1995) Ultimately, the Maslow's model holds up **as the best comprehensive view** in behavioral sciences. It is a holistic concept that acknowledges the existence of a strong connection between the well-being of people, the health of their communities, and the health of the built and natural environment in which they live (Moughtin, et al., 2009)

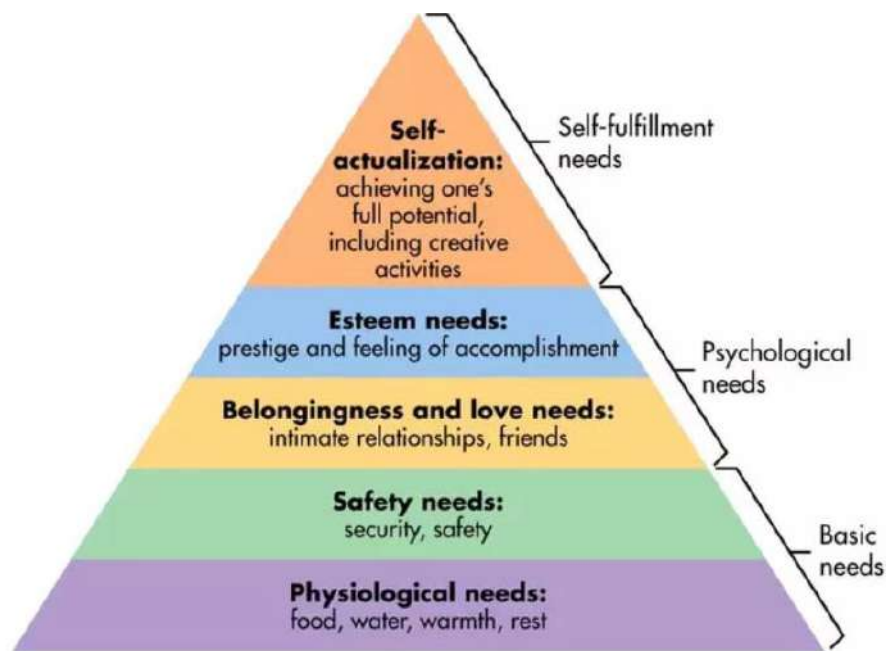


Fig.39: Maslow's hierarchy of human needs

In regards with human well-being within built environment, urban policymakers are constantly investigating the connection between human needs within the urban design, urban planning, and architecture. In part, these efforts represent the emergence of modern urban planning in late 19th and the early 20th centuries, and have definitely recognized the necessity of a model of human needs for guidance. The Radiant City of Le Corbusier (1934) is focused on the human need for light, sunshine and clean open air access, along with the provision of certain facilities such as shopping, childcare, and leisure. Significant as these roles are, it is mainly an organism model of the human being. Issues such as territoriality, privacy, safety, social action, and symbolic aesthetics are beyond the scope of a model as simple as this. Le Corbusier (1923) considered that all men have the same organisms, functions, and needs. (Carmona, 2003)

Many theorists have revitalized this movement by theorizing a more human scale approach to the concept of open public spaces. Bentley introduced an urban design concept in 1985. As Responsive Environments, he argued that they are: A manual for urban designers. The approach stressed the necessity for more democratic and enriching environments that maximize the degree of choice available to users. (Carmona & Tiesdell, 2007) Later in 1987, Jon T. Lang, in his book entitled "Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design", defined qualities of urban spaces according to human needs. He divided human needs into five categories: "*Qualities that meet the physiological needs, Qualities that meet the dignity and respect needs, Qualities that meet the dependency and belonging needs, Qualities*

that meet the self-actualization needs, and Qualities that meet the perception and beauty needs”. (Lang, 1987)

In the first urban design article of “Toward: an urban design Manifesto”, Allan Jacobs and Donald Appleyard suggested six human needs ‘essential for the future of a good urban environment’ as: “*Livability, identity and control, access to opportunities, imagination and joy (authenticity and meaning), community and public life, and an environment for all*” (Jacobs & Appleyard, 1987) In 1987, through his architectural practice in public space architecture and urban regeneration projects, Jan Gehl proposed public spaces need to have a combination of “Spaces for Walking” and “Places for Staying”, so that they can be lively and successful. (Gehl, 1971) He focused on static activities and physical elements that will make people not only stop but also spend time in the space. According to Gehl, it is necessary to reconfigure public spaces into the environment and they all should be: “*urban meeting places and places for social cohesion and interaction.*” (Gehl, 2010)

Within all aspects of theoretical and design practice, which included architecture, graphic design, urban planning, and exhibition, Pallasmaa Juhani introduced urban spaces as a place of “memory and imagination”. He had a significant focus on “*the importance of identity, sensorial experience, and tactility side of human needs in the built environment.*” As he pointed out: “*The sense of self, strengthened by art and architecture, allows us to engage fully in the mental dimensions of dream, imagination, and desire. Buildings and cities provide the horizon for the understanding and confronting of the*

human existential condition. Instead of creating mere objects of visual seduction, the architecture relates, mediates, and brings meaning to projects. The ultimate meaning of any building is beyond architecture; it directs our consciousness back to the world and towards our own sense of self and being. Significant architecture makes us experience ourselves as complete embodied and spiritual beings”. (Pallasmaa, 2010). Ultimately, in 2007, Carmona demonstrated that designing urban spaces should consider the five factors of human well-being: “comfort, relaxation, passive engagement, active engagement, and discovery”. (Carmona & Tiesdell, 2007). Hence, the quality of the built environment is the main factor that influences human needs and well-being through a varying degree and in many different ways, therefore in the next section, the study is searching for urban design qualities which would respond to human needs within UOPGS.

2.2.3 Components and Indicators of Qualitative Urban Design

It has already been mentioned that the quality of the environment is a subset of the quality of life. The quality of life affects qualitative aspects, and does not make sense without the quality of the environment in which we live. Therefore, the quality of the environment is admittedly a part of the quality of life, and includes all factors that each provides satisfaction for human beings. (Romice, et al., 2016) As Gehl states: *“It can be found that the quality of public spaces plays a dominant role in the character and the volume of people’s activities”*. (Gehl, 2004) Manuel de Solà-Morales states that *“in Material urbanity, the category of “public space” is too often used without taking into account the requirement of real urban quality that the term entails. This urbanity is the quality of significant places of collective and political content in their very material form.”* (Solà-Morales, 2008) Hence, in 2006 the concept of quality in UOPGS alongside the well-being of humanity is illustrated by its *“thematic strategy on the urban environment”* with a primary aim to *“improve the environmental performance and quality of urban areas to secure a healthy living environment for Europe’s urban citizens”* (CEC, 2006). The connection between an built environment and its environmental qualities, health of residents, and utilization of such urban open public spaces was recorded by the Architects and the Built Environment Commission (CABE). As Adam denoted (2014), a sustainable planning strategy that takes account of the environmental effect of space on health is an urgently needed strategy: *“Evidence increasingly suggests that wider environment can reduce stress, encourage exercise, and promote good health”* (CABE, 2009). In addition, Lansing & Marans stated that

“an environment conveys a sense of well-being and satisfaction to its population through qualities”. (Lansing & Marans, 1969)

Since, the urban design qualities of the built environment (UOPGS) should be evaluated via different factors, **including components, indicators, and prerequisites**, the different urban design theories are outline to find the main components of UOPGS and to explore indicators of each component.

Urban planners have long investigated issues of components of UOPGS, including (Alexander, 1967), (Relph, 1976), (Canter, 1977), (Golkar, 2001), (Carmona, 2003), and others. Each study had provided its specific conceptual perspective to the subject.

According to Cristopher Alexander, the **apparent and physical structure** are not the only essential components of an urban environment. Rather, the **occurring event** is the most critical factor (Alexander, 1967). Ralph (1976) presented three components of a place as: **physical setting, activities, and meaning**. According to this study, the definition of a physical environment is a product of human interaction and experiences within the place. (Ralph, 1976). Later in 1977, Canter identified a theoretical model capable of describing the components of the urban design standard. According to him, the urban environment is a “place” based on a model (known as the place type), consisting of three entangled dimensions of **“form”, “activities”, and “imagination.”** (Canter, 1977) (Fig.40). In 1991 Punter located the components of a sense of place within urban design thought. The physical aspects of his model improve the **meaning and activities** of human beings and fulfill their **biological** needs. (Punter, 1991). (Fig.41)

In 2001 Golkar offers the model entitled ‘Permanent Locations’ which leads towards the completion of Canter’s Model. In this model Golkar added another component of urban places as an “**ecosystem**” in addition to Canter’s three components of **form, activities and imagination** (Golkar, 2001). He argued that Components of Qualitative Urban Design’ are resultant of three functional, environmental, aesthetic and experiential forces. (Fig.42)

In 2003 Carmona proposed his model as a ‘sustainable design concept’ with six components as follow: (Carmona, 2003)

*“**Morphological** - resource consumption and pollution (particularly through movement) is strongly influenced by the configuration of the urban pattern.*

***Perceptual** - the psychological welfare of people is intimately related to the social stability of places, and how they are valued and looked after.*

***Social** - patterns of living can both reinforce and undermine environmental well-being.*

***Functional** - mixing uses, building at higher densities and coping with the local environment all impact on energy usage.*

***Visual** - diversity in the built and natural environment is a key sustainable principle, while concern for aesthetic fulfilment indicates a willingness to invest in sustainable quality.*

***Temporal** - the pursuit of sustainable development is a long-term goal accomplished through many small-scale interventions.”*

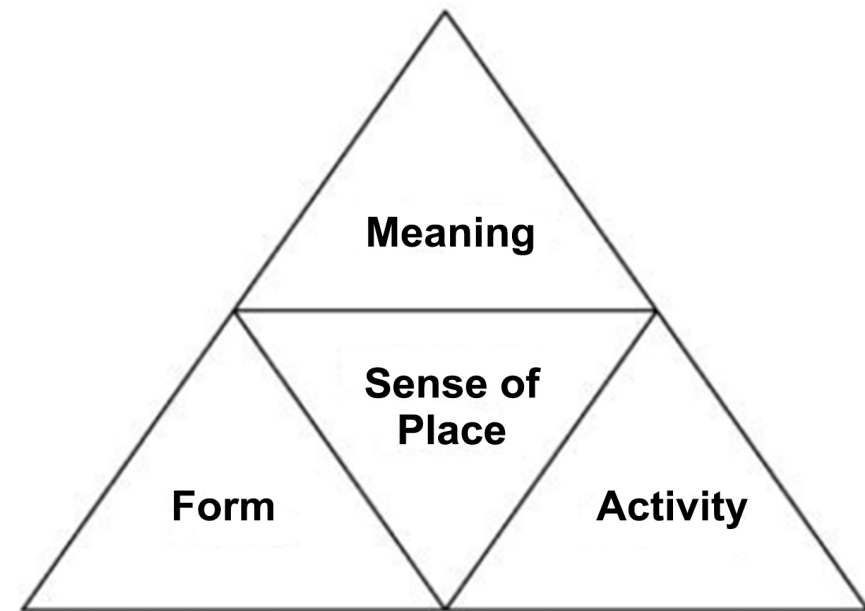


Fig.40: Canter model - Urban design components of UOPS, 1977

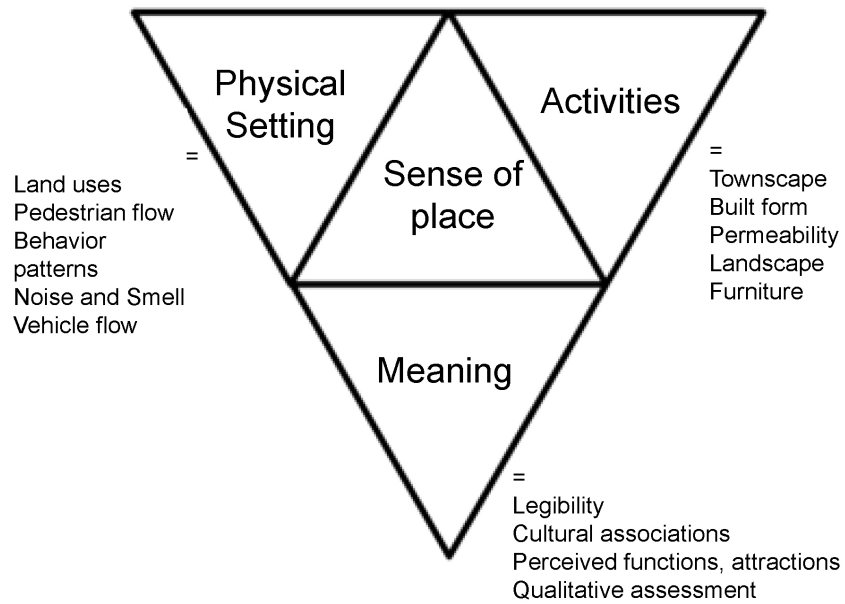


Fig.41: The diagram shows how urban design indicators can enhance the quality of different components of the place

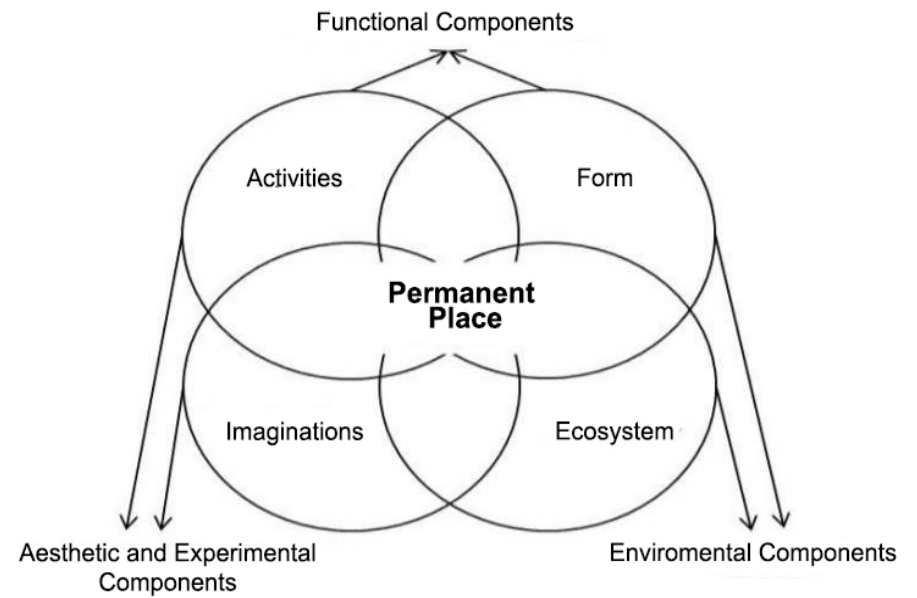


Fig.42: Urban design components of UOPS, Golkar model

But, indicators of environmental qualities were first cited in 1961 by Jane Jacobs in the book entitled “the Death and Life of Great American cities”, which concentrated on the socio functional qualities indicators of city structures. The same detailed observation informed subsequent work in this tradition: “*Keeping **suitable activities** before paying attention to the visual arrangement of the environment. The conditions for city **diversity** are: Mixed-uses functions and buildings with different antiquity and social diversity, **permeability** and access to urban area sidewalks and streets and the uses of sidewalks, and **flexibility** of urban spaces*” (Jacobs, 1961). In “Life between buildings”, Gehl employed stability theory and offered that “*open urban spaces, located between buildings, should be **open, assembling, inviting, and integrating**, rather than having segregation between events and individuals*”. (Gehl, 1971). In “cities for people” he once again suggested cities with “*human dimensions, sense, and scale. A **lively, safe, sustainable, and healthy** city; a clear city with space **hierarchy** and urban areas with **mixed functions**.*”

In his book “The good form of the city,” Kevin Lynch mentioned five indicators and two super indicators to achieve high-quality urban design and consequently improving the quality of urban open public spaces (Lynch, 1981). He identified five performance indicators for a high-quality urban design: “***Vitality**: the degree to which the form of places supports the functions, biological requirements, and capabilities of human beings; **Sense**: the degree to which places can be perceived and structured in time and space by users; **Fit**: the degree to which the form and capacity of spaces matches the pattern of behaviors that people engage in or want to engage in; **Access**: the ability to reach*

*other spaces activities, resources, services, information, or places, including the quantity and diversity of elements that can be reached; **Control**: the degree of places to which those who use, work, or reside in can create and manage access to spaces and activities*”. The five indicators were based on two meta-criteria: “*those of **efficiency**: relating to the costs of creating and maintaining a place for any given level of attainment of the dimensions, and of **justice**: relating to how environmental benefits were distributed.*”

Bentley pointed out the need for qualitative and human oriented environments in his book entitled “Responsive environments,” where people can have different options. (Bentley, 1985). The proposed approach was based on seven key issues to enhance responsiveness of places: “***permeability, variety, legibility, robustness, visual appropriateness, richness, and personalization.***” Later, it was proposed that resource **efficiency, cleanliness, and biotic** support should also be added to these seven key issues to cover the ecological effects of urban forms and patterns of activity. In addition, in 1994, he stated that four qualities out of these were fundamental: “***permeability, variety (vitality, proximity, and concentration), legibility, and robustness (resilience).***”

Allan Jacobs and Donald Appleyard suggested five physical characteristics or indicators of a high-quality urban environment in their paper “Towards an Urban Design Manifesto” as: “***Livable streets and neighborhoods; a minimum density of residential development and intensity of land use; integrated activities** - living, working, shopping - in reasonable proximity to one other; a man-made environment that defines public space, particularly by its buildings (as opposed to*

buildings that mostly sit in space); many separate, distinct buildings with complex arrangements and relationships (as opposed to a few large buildings)” (Appleyard, D. & Jacobs, A., 1987).

Francis Tibbalds proposed a framework for architectural design to His Royal Highness, the Prince of Wales, in 1989, which sparked a significant debate. In response, the ten indicators of urban design framework were established by the “President of the Royal Town Planning Institute and founder of the UK-based Urban Design Group” of the time, Francis Tibbalds as: “**Safety, security, comfort, stress, aesthetic, perception, meaning, control, participation, and natural ecology.**” (Tibbalds, 1989)

Following a set of ideas appeared in the USA during the second half of the 1980s and early 1990s, the Congress for New Urbanism (CNU, 2018) recommended environment, including “*common preferences for mixed uses; environmental sensitivity; an internally consistent hierarchy of architectural, building and street types; legible edges and centers; walkability.*”

The Department of Transport, Environment and the Regions (DTER, previously the DoE) and the Commission for Architecture and the Built Environment (CABE, formerly the Royal Fine Art Commission) provided a more comprehensive definition, identifying urban design as the “art of making places for people” (DETR/CABE). The guide identified seven indicators of urban design, each relating to the concept of place: “**Character:** *A place with its own identity;* **Continuity and Enclosure:** *A place where public and private spaces are clearly distinguished;* **Quality of the Public Realm:** *A place with*

attractive and successful outdoor areas; **Ease of Movement:** *A place that is easy to get to and move through;* **Legibility:** *A place that has a clear image and is easy to understand;* **Adaptability:** *A place that can change easily;* **Diversity:** *A place with variety and choice;* **Physical Environment as a Factor:** *a factor that influences the activities to a varying degree and in many different ways.” (Telford, 2001)*

Project for Public Spaces (PPS), as a nonprofit planning, design, and educational organization, dedicated itself to helping people create UOPGS with high environmental qualities that serve human well-being (PPS, 2009). In evaluating thousands of public spaces around the world, PPS has found that successful projects shared the following four qualities: “*they are accessible, people are engaged in activities there, the space is comfortable and has a good image, and it is a sociable place; one where people meet each other and take people when they come to visit.*” PPS developed Place Diagram as a tool to help people in judging any place with good quality or bad. (Fig.43)

In 2013, other indicators, namely “*linkage and permeability, perceptions of safety, distinction between public and private, robust and adaptable, comfort, relaxation, sense of belonging, neighborliness, vitality affordances for young people, inclusivity, health, sustainability, sensory experience, sense of ownership, and care and maintenance*”, were outlined by Carmona and Wunderlich to reinforce and expand the ideas presented by others. These indicators have been explored through the study on the public open spaces of London (Carmona, M. & Wunderlich, F. M., 2013) to analyze public open spaces of this city and evaluate their quality indicators.

WHAT MAKES A GREAT PLACE?

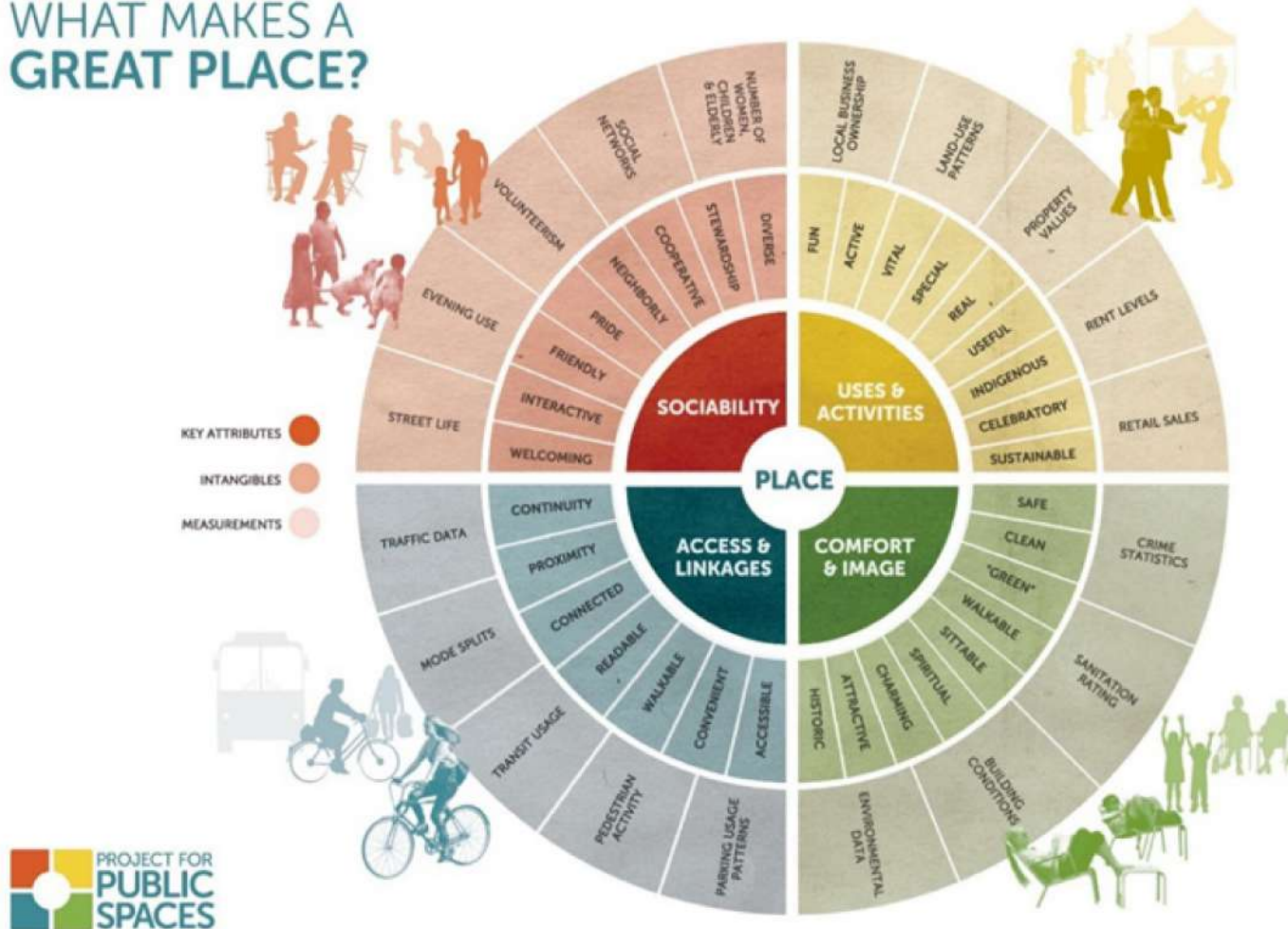


Fig.43: UOPGS/Place with high environmental qualities, Project for Public Spaces (PPS), 2009

2.3 Partial Conclusion

In this section, we have performed a thematic review on the literature regarding the definitions on UOPGS, human well-being requirements, and environmental qualities of UOPGS approaches. Moreover, in this section, the conceptual basis of the study was introduced.

The first part of this chapter provided a detailed account of open space, green space, and public space within urban design theories. As demonstrated in this part, open space is defined as a part of the urban area that **contributes to its amenity**, either visually or by contributing positively to the urban environment. Green spaces are defined as either **natural areas** or **land uses** that provide natural services for the citizens. Moreover, public space is defined as open space, both green spaces and hard ‘civic’ spaces, to which there is **public access**, even though the land may not necessarily be in public ownership. Therefore, all types of urban open public green spaces are integrated to the **spatial, recreational, natural, and social aspects of the environment**.

In the second part of this section, we mentioned that people always consider some criteria for their living place and their well-being. Therefore, meeting the needs of the citizens and adapting to their well-being is a **key objective of a high quality urban open public green space**. In other words, a **more appropriate design of the built environment or UOPGS must satisfy more needs of the people**.

As a result, we can conclude after reading design issues, most city planners and architects, who are concerned with the individual needs approach to design, have obtained some interpretation of the Maslow’s human needs hierarchy.

- Physiological needs: having rest and comfort;
- Safety and security needs: to feel safe from harm;
- Affiliation needs: to belong to a community;
- Esteem needs: to feel valued by others;
- Self-actualization needs: to have artistic expression and feel fulfillment.

Moreover, we see that the searching for components and indicators of qualitative urban Design for UOPGS quality has been one of the focal points in urban design research. Most efforts in studies aimed to create an UOPGS that could satisfy the needs of citizens. Hence, different terms have been proposed as main components and indicators of qualitative urban design, which influence the quality of the UOPGS. Due to this division, all types of urban open public green spaces should possess component and indicators of qualitative urban design to fulfill citizen’s well-being.



CHAPTER 3

INTEGRATING CONCEPTS TO DEVELOP A COHERENT THEORETICAL ANALYSIS MODEL

This chapter developed a model for the qualitative urban design analysis of urban cemeteries for policy and practice. This will be achieved in three major sections:

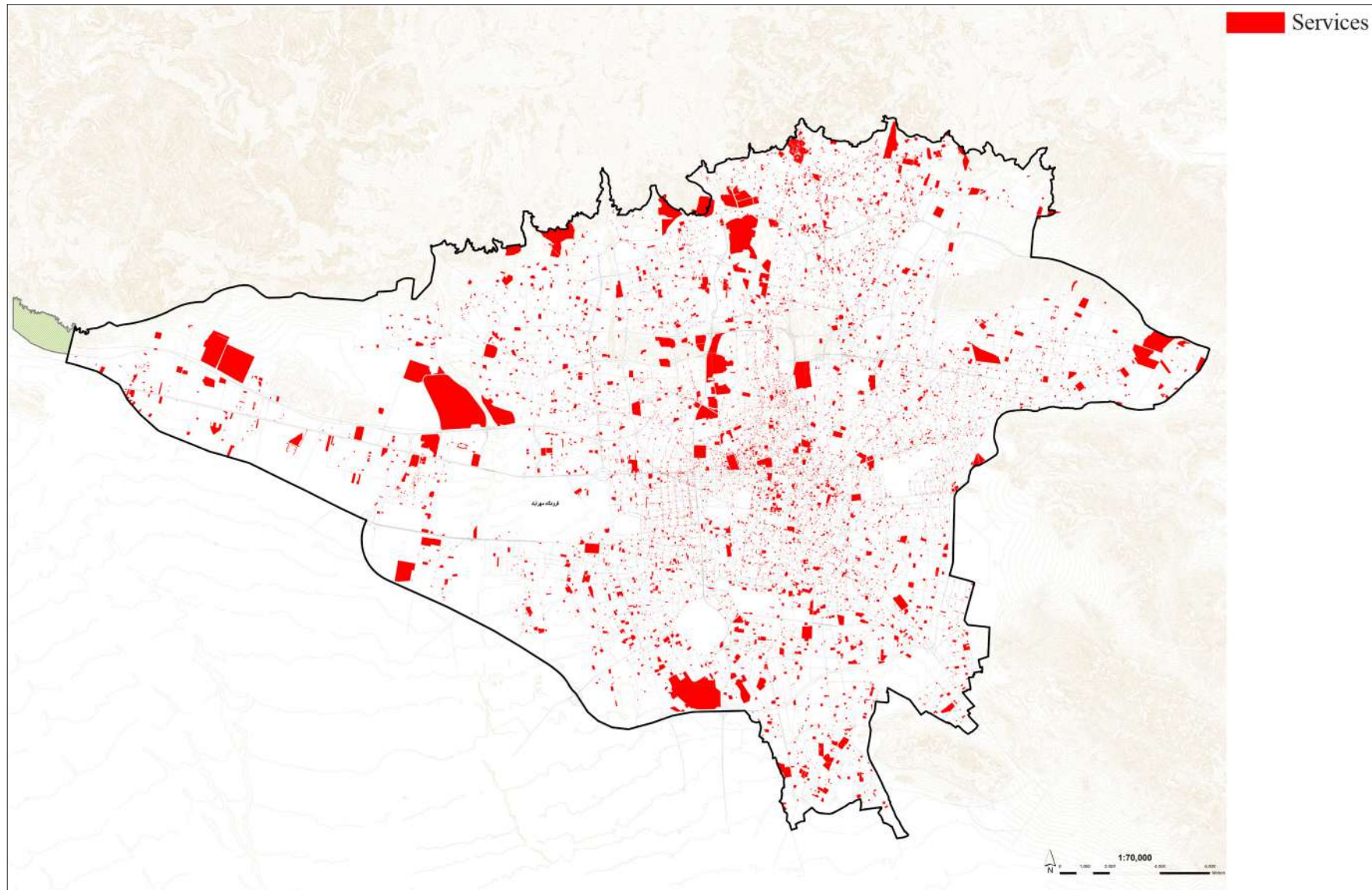
- From service function to urban open public green space,
- Modelling human well-being requirements in urban cemetery,
- A qualitative urban design model for urban cemeteries assessment

3.1 From Service Function to Urban Open Public Green Space

In chapter one we discussed that the function of urban cemeteries, as a UOPGS, has been neglected in urban policies of Iranian cities for centuries and how urban cemetery function and land use in urban planning has involved in the segregation of these spaces. In chapter two the finding UOPGS literature reviews shows the main concepts and features of urban, open, public, and green spaces within cities. This part indicates that the concept of UOPGS together is relating to the **spatial structure, amenity, ecological and social aspects of spaces** regardless of their private or public ownerships. In terms of these definitions, despite the current function of cemeteries as a service in most urban planning of cities, significantly urban cemeteries must be identified as urban open public green spaces. Urban planners should treat with urban cemeteries same as other public spaces within cities. These spaces as a UOPGS must be integrated with other open public green spaces in urban areas and provide opportunities respond to human well-being in urban areas, especially where there exists a severe lack of suitable open public green spaces. Hence, Peter Harnik (2010) defined cemeteries similar to park spaces and divided park spaces of cities into different open green spaces such as community gardens, old landfills, wetlands and storm water storages, rail, rooftops, sharing schoolyards, covering reservoirs, river and stream corridors, cemeteries, boulevards and parkway.

In regard to this function of urban cemeteries, in the next section, the thesis proposes a comprehensive and integrated qualitative urban design model based on a theoretical framework to develop a more precise and operational approach to assess urban cemeteries environment.

Tehran Master Plan, 2008



3.2 Human Well-Being Requirements in the Urban Cemetery

Through chapter two, we discussed that people's daily life occurs in UOPGS in a complex set of forms and functions, therefore, these spaces must be capable of **responding human well-being and needs**. Accordingly, designers should consider social, mental, and physical factors of well-being in the UOPGS. In addition, we found that the **built environment and its qualities** in the city modulate **our interaction with others and with the environment as a whole**, and **trigger emotional, cognitive, affective, and behavioral processes on a personal and group level**. Regarding this, we studied human needs within urban spaces through different urban design and planning theories and we found out four common principals of human needs in UOPGS and urban cemetery in specific, such as **Relaxation and Comfort, Passive Engagement, Active Engagement and Sensory Experiment**. (Fig.44)

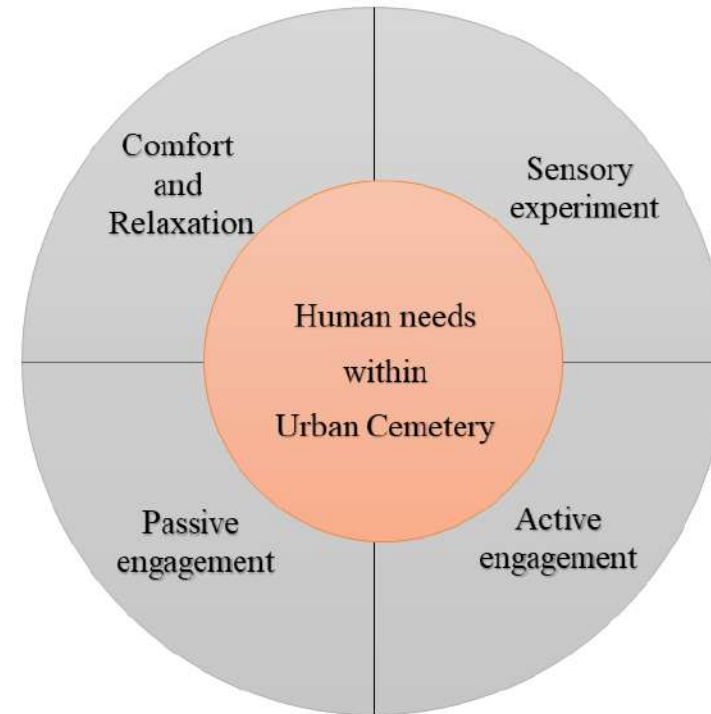


Fig.44: Human needs in urban cemetery environment, by author

Urban open public green spaces, particularly cemeteries, traditionally have been viewed in the world as places of relaxation and restorative place for people who lost his loved ones. But comfort can be considered as a combination of comfortable seating, walking, solar access and protection from climate changes.

Passive engagement is another important attraction of these spaces. It is the opportunity to observe others activities. Another type of passive engagement that concerns the physical and aesthetic qualities of a site. This category includes the frequently observed interest and enjoyment people derive from watching the passing scene. This kind of encounter is indirect or passive, because it involves looking rather than talking or doing. (Carmona, 2003)

But active engagement is a need in urban cemetery that play a crucial role as a setting for socializing with relatives, neighbors, acquaintances, and friends. According to Gehl (2010) social activities are all activities that depend on the presence of others in public spaces. It includes children at play, greetings and conversations, communal activities of various kinds. These activities could also be termed “resultant” activities, because in nearly all instances they evolve from activities linked to the other two activity categories. They develop in connection with the other activities because people are in the same space, meet, pass by one another, or are merely within view. Social activities occur spontaneously, as a direct consequence of people moving about and being in the same spaces. Therefore, the urban cemetery could play

the most important social function in as a UOPGS in neighborhoods, especially in many older and low-income neighborhoods.

Sensory experiment refers to human sensory systems reacting to environmental stimuli. The four most valuable senses in interpreting and sensing the environment are vision, hearing, smell and touch (Carmona, 2003). Pallasma (2010) discussed that “*The Body is in the Centre. I confront the city with my body; my legs measure the length of the arcade and the width of the square; my gaze unconsciously projects my body onto the facade of the cathedral, where it roams over the moldings and contours, sensing the size of recesses and projections; my body weight meets the mass of the cathedral door, and my hand grasps the door pull as I enter the dark void behind. I experience myself in the city, and the city exists through my embodied experience. The city and my body supplement and define each other. I dwell in the city and the city dwells in me*”. Sight isn’t the only sense that shapes the identity of a place. Users are also influenced by sounds, smells and touch under hand and foot. The creation of urban cemeteries that stimulate all the senses requires that we ask: Touch: how does it feel? Sound: what sounds can help create character? Smell: what scents can be added? Therefore, urban cemetery should not be an isolated and self-sufficient artifact; it must directs our attention and existential experience to wider horizons. (Pallasma, 2010)

3.3 A Qualitative Urban Design Model for Urban Cemeteries Assessment

According to the Gehl (2010) activities within UOPGS can be divided into necessary activities, optional activities, and social activities and when outdoor areas are of poor quality, only strictly necessary activities occur. *“Necessary activities include those that are more or less compulsory, in other words, all activities in which those involved are to a greater or lesser degree required to participate. These activities will take place throughout the year, under nearly all conditions, and are more or less independent of the exterior environment. The participants have no choice.”* Since the problems of lack of urban design quality in urban cemeteries today lead to only the necessary activities taking place in, we followed our research to find the key constituent components and indicators of qualitative urban design for UOPGS (urban cemeteries).

Over the literature review, we discussed about the components and indicators of qualitative urban design for UOPGS which have become dominant in making places for people. In general, Christopher Alexander and Edward Relph were the earliest works drawing on the psychological and experiential components of place. Relph argued that *“because what ‘the world’ reflects is a feature of our own subjective creation of it”*. For Relph, places were basically centering of meaning created from a lived experience. By imbuing them with meaning, individuals, groups, or societies transform ‘spaces’ to ‘places’. The ‘sense of place’ by any individual will have its own variation of the components of Relph. For him the importance of the physicality of places is most often exaggerated *“in creating a sense of place, events*

and meanings can be as, or more, significant”. In regard with Relph, Canter considered places as ‘activities’, physical attributes’ and ‘conceptions’ features. The stress on people and how they interpret, appreciate, derive meaning from and add meaning to the urban environment is the value of this conception of urban places. Thus, just as messages are ‘sent’, they are also ‘received’ and interpreted: it is for individual users to decide whether or not a place is genuine, and the quality and sense of their experience there (Carmona, 2003)

According to different components of qualitative urban design theories and in line with Golkar’s model, the thesis proposes the **functional, perceptual, and ecological components as a comprehensive framework of qualitative Urban Design** for urban cemeteries. This indicates that the analysis of urban design components of urban cemetery (functional, perceptual, and ecological) would be essential in order to improve the quality of the physical structure, form, appearance, activity, event, imagination, meaning, and ecosystem of the place. (Fig.45)

Following that, we continued our study to identify indicators of qualitative components urban design that advantageous in increasing quality of the UOPGS. In chapter two, theories that recognize the different indicators of design in achieving environmental quality were already well established. (Table 1)

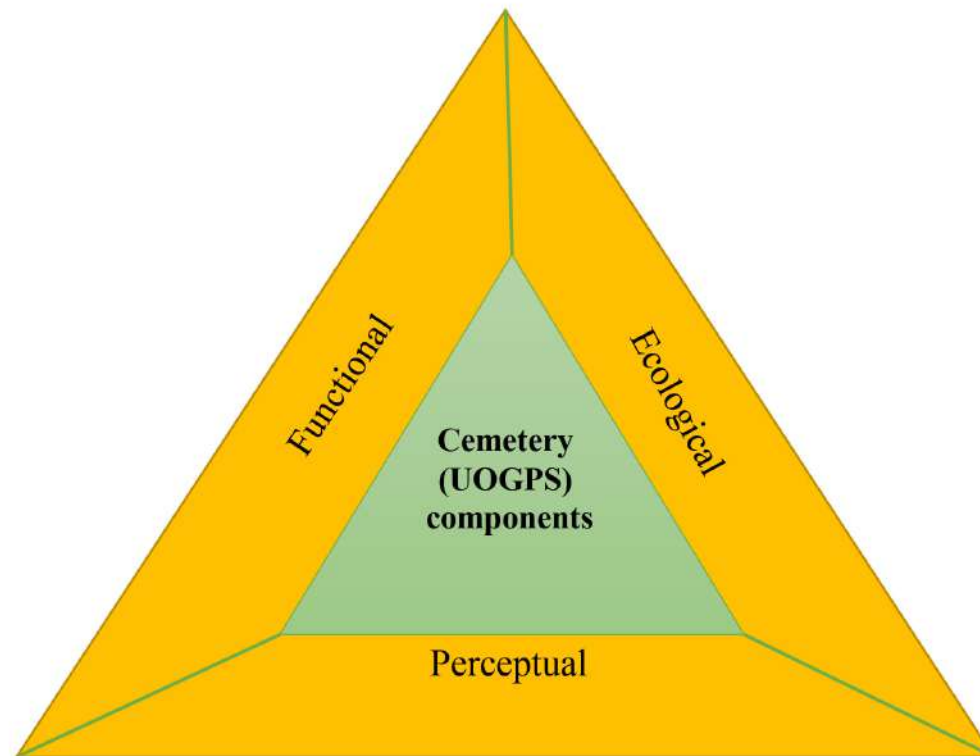


Fig.45: Components of urban cemeteries, by author

Table1: Indicators of high-quality urban open public green space

Theorist, Year	Indicators
<i>Jane Jacobs, 1961</i>	Diversity (Social and functional) Flexibility Permeability
<i>Jan Gehl, 1971, 2010</i>	To be open up To invite To integrate To assemble To be safe Healthy Mixed functions Space hierarchy
<i>Kevin Lynch, 1981</i>	Fit, sense, access, vitality, control, efficiency, justice
<i>Bentley, 1985, 1990</i>	Permeability, variety, legibility, robustness, visual appropriateness, richness, personalization, relation with ecosystem, Efficiency of energy consumption, hygiene (minimize contamination and pollution)
<i>Allan Jacobs and Donald Appleyard, 1987</i>	Livable streets and neighborhoods A minimum density of residential development and intensity of land use Integrated activities A man-made environment that defines public space Distinct buildings with complex arrangements and relationships

<i>Francis Tibbalds, 1989</i>	Safety, security, comfort, stress, aesthetic, perception, meaning, control, participation, natural ecology
<i>The Congress for New Urbanism, 1993, 1999</i>	Preferences for mixed uses: Environmental sensitivity; an internally consistent hierarchy of architectural, building and street types; legible edges and centers; walkability;
<i>The Department of Transport, Environment and the Regions (DTER) By Design, 2001</i>	Character, Continuity and enclosure Quality of the public realm Ease of movement Legibility Adaptability Diversity The physical environment
<i>Project for Public Spaces (PPS), 2009</i>	Accessible, sustainable uses and activities comfortable, good image
<i>Carmona and Wunderlich, 2013</i>	Linkage and permeability, perceptions of safety, distinction between public and private, robust and adaptable, comfort, relaxation, sense of belonging, neighborliness, vitality affordable for young people, inclusivity, health, sustainability, sensory experience, sense of ownership, care and maintenance.

By adapting different indicators within theories, ultimately indicators of qualitative components urban design for urban cemeteries are proposed as **flexibility, compatibility, diversity, and permeability factors**.

Each indicator has a strong and predictable effect on the qualitative components of urban cemetery environment and meanwhile has a different degree of prescription regarding desirable features of the urban cemeteries context. In addition, since, general changes in the urban fabric are gradual, allowing successive generations to derive from their physical environments a sense of continuity and stability.

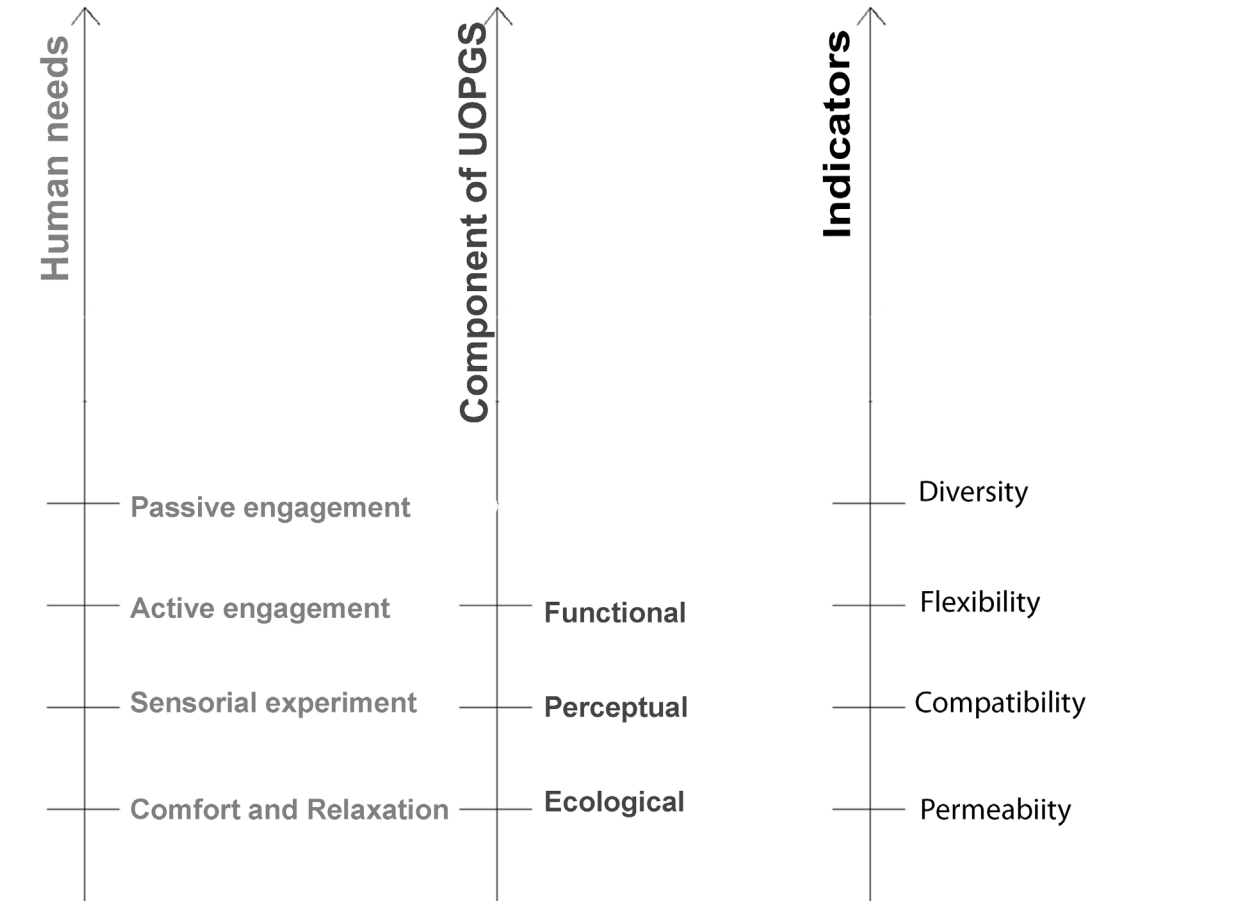
According to Carmona *“where urban design action involves a development project, the context can be considered to include the site plus the area immediately outside its boundaries. All acts of urban design are therefore contributions to a greater whole”*. Buchanan (1988) argued that *“context’was not just the ‘immediate surroundings’, but the ‘whole city and perhaps its surrounding region’. It was not ‘narrowly formal’, but included ‘patterns of land use and land value, topography and microclimate, history and symbolic significance and other socio-cultural realities”*. This can be displayed by causing the environmental footprint of the development. (Carmona, 2003)

Therefore, people relaxation and comfort, passive engagement, active engagement, and sensory experiment within urban cemeteries are largely the product following analysis models not only for place

scale but also its context in different scales such as territorial area, intermediate area and immediate. (Fig.46, Fig.47)

In order to test the comprehensiveness of the model proposed in this study, in the following, an attempt has been made to identify the various indicators and components that different theorists have mentioned and measure its effectiveness in terms of pervasiveness. The result shows that the model generally has the necessary comprehensiveness to cover the existence of various complex phenomena of the quality of urban design and is able to cover a wide range of different qualitative components and indicators. (Table2)

In the chapter four, the proposed model will be evaluated for the case study of the thesis. The conclusion for each scale will be accomplished by SWOT analysis which will be able to evaluate the strengths, weaknesses, opportunities, and threats that each urban cemetery involved. The SWOT will determine the implementation opportunities for biophilic and UBA intervention methods.



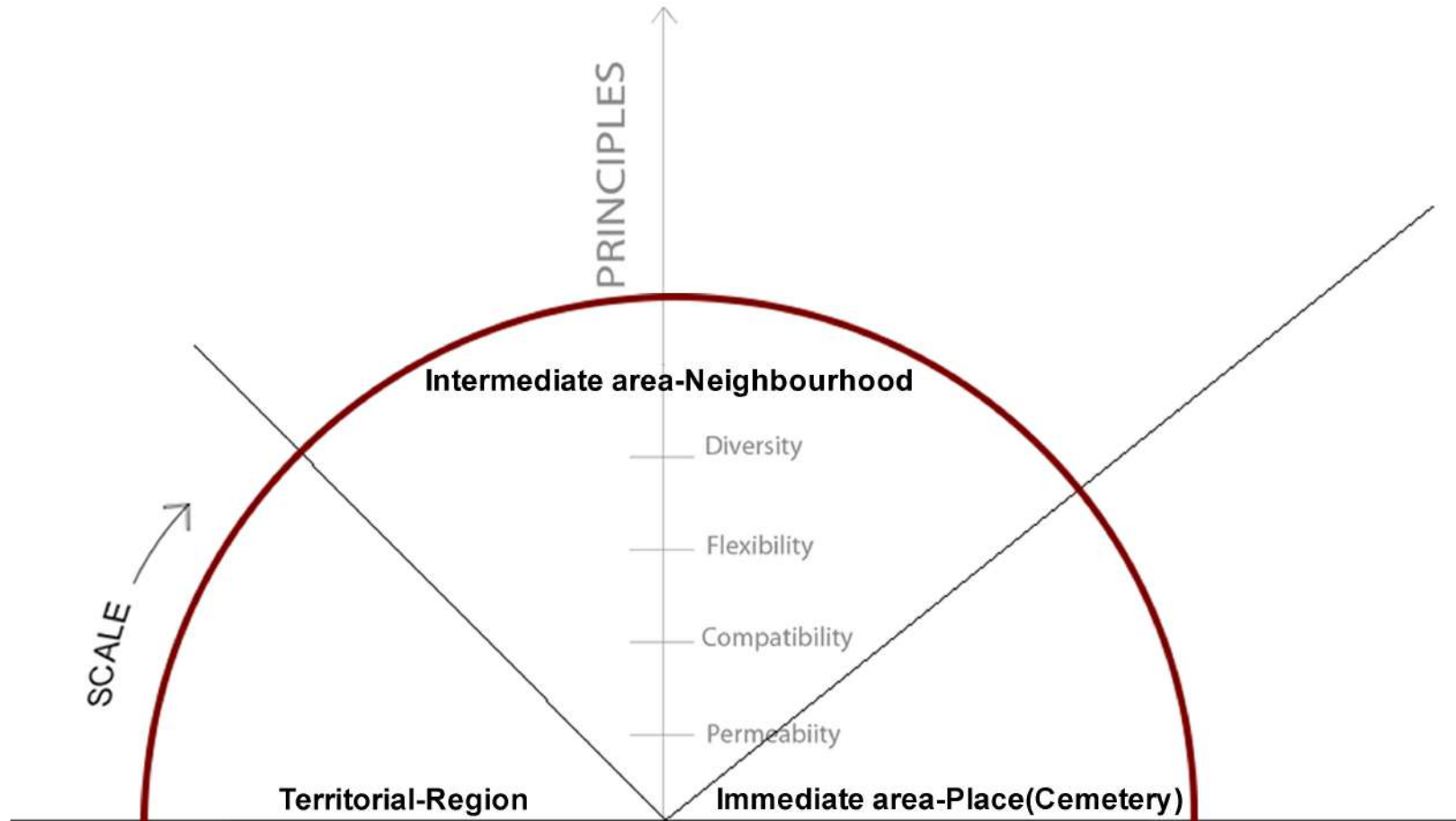


Fig.46: Qualitative Indicators through scales by author

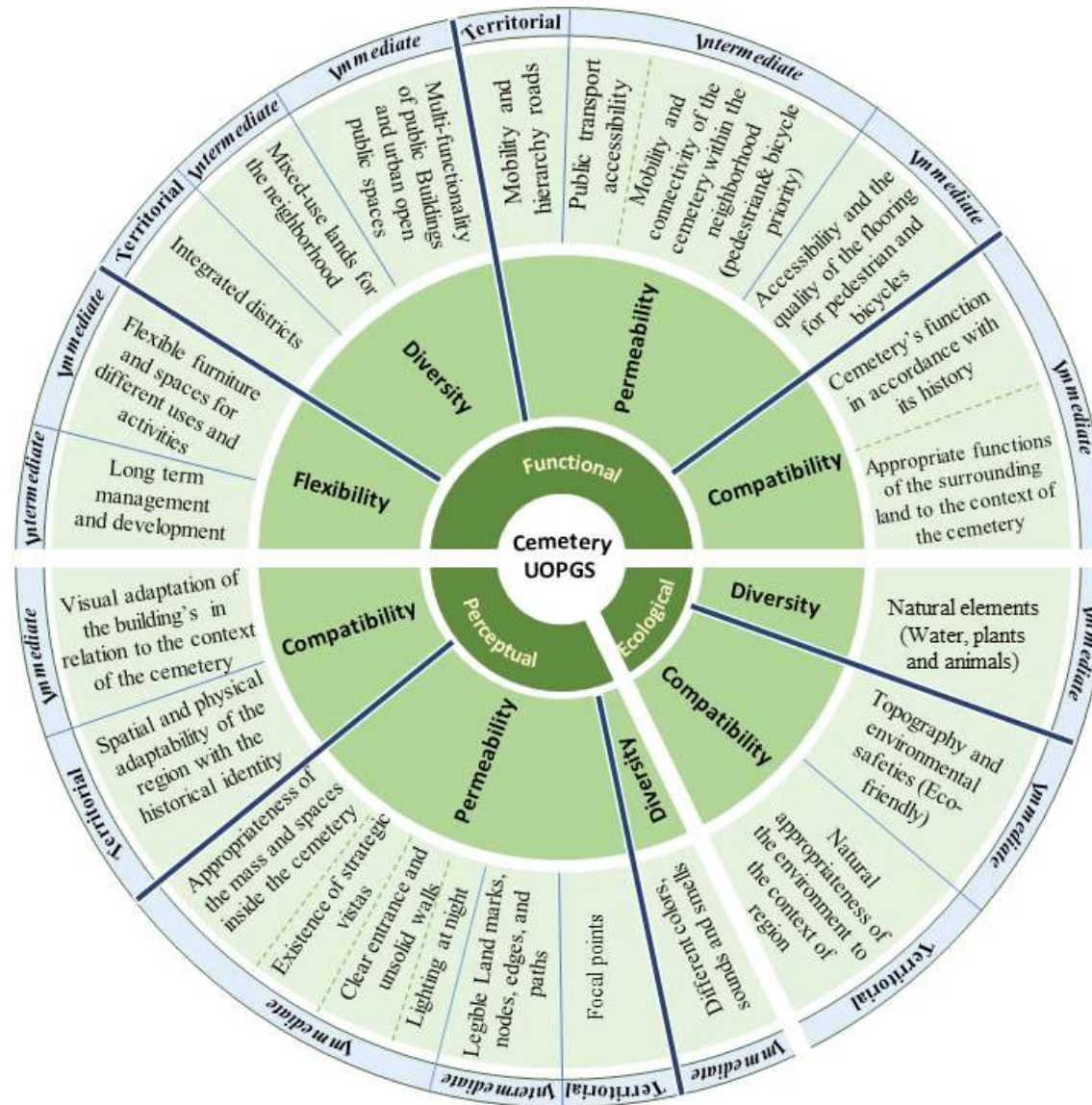


Fig.47: Theoretical urban design assessment model for analyzing environmental qualities of urban cemeteries, by author

Table2 :The proposed framework of high-quality Urban Cemetery according to different theories

Functional and Perceptual Compatibility	Meaning, character, useful, cooperative, sense of belonging, fit, visual appropriateness, richness, personalization, aesthetic, perception, safety, control, security, perception of safety, vitality, attractive, charming, spiritual, indigenous, historic, sense, stress
Ecological Compatibility	Efficiency of energy consumption, natural ecology, relation with ecosystem, hygiene
Functional and Perceptual Permeability	To be open up, inviting, legibility, readable, continuity, connected, accessible, connectivity walkable, linkage, ease of movement, walkability, legible edges and centers
Functional and Perceptual Diversity	Integrate and assemble, mix- used, mix functions, different events and individuals, variety, participations sociability, interactive, celebratory diverse, justice
Ecological Diversity	Green, environmental sensitivity, biodiversity
Functional Flexibility	Robustness, adaptable, sustainable uses and activities



CHAPTER 4

**CASE STUDY ANALYSIS
IBN BABAWAYH CEMETERY
REY, TEHRAN, IRAN**

This chapter evaluates a case study according to the proposed model of qualitative urban design. The analysis is performed at three levels of the comprehensive domain, namely the territorial area, intermediate area, and the immediate area and the cemetery place.

In this chapter, the data derived from the performed studies under the supervision of the Urban fabric consulting engineers, and considered previous studies, including Tehran master plan (1968), Tehran context appraisal plan (1974), Tehran organization master plan (1991), Tehran comprehensive strategic plan (1996 to 2001), urban design planning of Tehran and surrounding towns (2001) and Tehran comprehensive plan (2008). The surveys considered the urban development of Tehran and its urban areas in terms of land utilization, spatial organization, transport and traffic, population, environment, and cultural, economic,

4.1 Ibn Babawayh Case study Urban Cemetery analysis

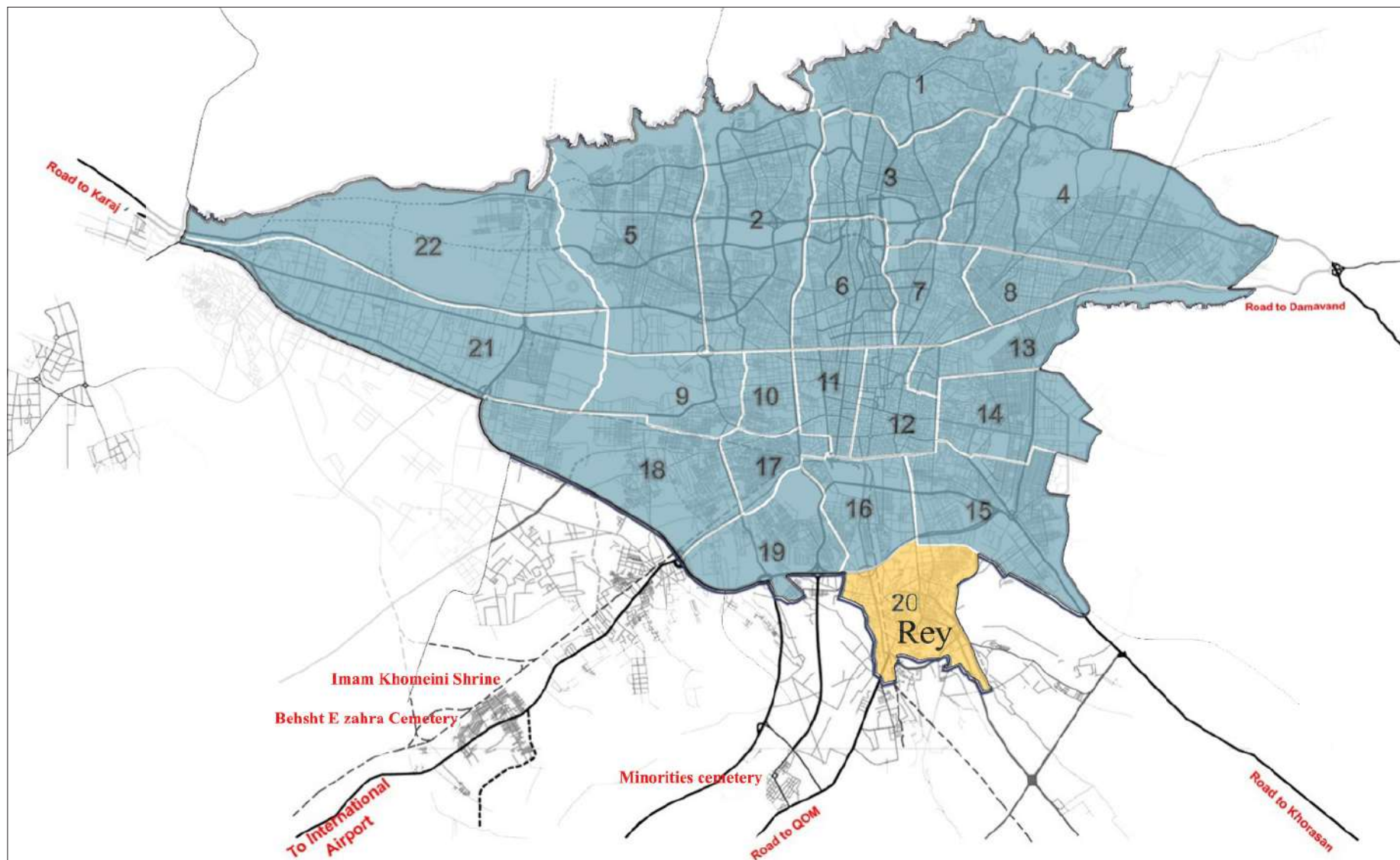
Rey or Ray (Šahr-e Rey, “City of Rey”, literal meaning: “Royal City”) is one of the oldest cities in Iran. Settlement in Rey dates back to 6,000 BC, as part of the Central Plateau Culture. The settlement in Rey was used as the capital by the Arsacids (called Rhaga). In Classical Greco-Roman geography, this city was called Rhagae (Greek: Ῥάγαι). The name of this city dates back to pre-Median period. According to the Avesta (primary collection of religious texts of Zoroastrianism), Rey is the thirteenth city constructed in the world. Moreover, it was the capital of “Rey County” in Tehran Province, Iran, during the Seljuq Empire in the 11th century, and the oldest existing city in the province. In the 13th century, following the Mongol conquest, Rey was demolished, and eventually lost its significance in the presence of Tehran. (Reymunicipality, 2019, Translated from Persian)

Today, Rey is located in the southern part of Tehran Province, as one of Tehran's region, with an area of 27 square kilometers. It is considered as the 20th region of the Tehran metropolitan area. Nowadays, its population is approximately one million. The geographical, cultural, economic, and social significance of Shahr-e-Rey is increased by its vicinity to Imam Khomeini holy Shrine, Tehran International Airport, and Tehran main cemetery of Behsht E zahra. Moreover, due to its religious values and the existence of many shrines in Rey, it is still significant within Tehran metropolitan area.

Ibn Babawayh cemetery (in Rey) is the second largest cemetery in Tehran, following Behesht-e-Zahra, and the first historical cemetery of Tehran. This cemetery is located south-east of Tehran, in Shahr-e-Rey. It has 12 Hectare area, and it is currently under management of the Endowment Organization. It is the burial site for many famous and great scientists, Ayatollahs, writers, poets, politicians, cultural figures, and Iranian athletes, and is still active. According to the results of the survey by Abadshahr Tadbir Consulting (2016), this cemetery possesses a national function and provides a wide range of values within Tehran metropolitan area such as historical, religious, social, cultural, architectural, artistic, symbolism, ethology, archeology and scientific, landscape, economic, vegetation and animal. The cemetery is named after Muhammad-Ibn-Babawayh, known as Sheikh Saduq, a Shia Faqih and scholar, whose tomb has been proclaimed to be located in this place.

In the next section, based on the analysis model derived in the previous chapter, we identify and examine qualitative components and indicators of the case study cemetery in territorial, intermediate, immediate and place scales.

Rey location within Tehran metropolitan area



4.2 Territorial Analysis

4.2.1 P1: Spatial and physical adaptability of the region with the historical identity (Pre-Islamic Era, Early Islamic Era , Late Islamic Era and Industrial era)

According to Persian history, early organized religions were introduced with the arrival of the Aryans (around 1700 BC) in the Plateaus of Iran. The introduced religions merged and replaced religions practiced by the natives of the plateau. According to religious beliefs in ancient Iran, natural elements such as water hold special sanctity and regard². They believed that water is an expression of life and innocence. Therefore, the god of water was highly respected and many temples and statues were constructed in her name. In many religious ceremonies, water played an important role (Nikravesht & Aminzadeh, 2001).

Accordingly, when Zoroaster religion introduced Zoroastrianism to Iranian, the city of Rey and its urban spaces were reshaped according to natural elements and religious beliefs.³ Hence, the primary core of Rey, before civilization, were built in the name of the goddess of water

and fertility (Anahita mountain). The mountain and temple were located south of Rey, while the northern parts were open, which protected the city against possible harms.⁴ According to the Zoroastrian tradition, a dead body was considered unclean and stained. Following that, the first place with the function of a cemetery was constructed in Rey, next to the Anahita Mountain.

In addition, according to Ker Porter, the old Rey city was close to Surin Spring (Cheshmeh Ali) and other springs and Qanats with fresh water and air (Ker Porter, 1821). Consequently, first civilizations were emerged close to these places, which were allocated by the king and princes. Surin Spring, and its small prehistoric village of Cheshmeh Ali, were located within the enormous medieval city of Rey and the first core of the civilized Shahr-e-Rey was formed around Cheshmeh Ali. (Fig.48)

² Many pre-civilization temples of Rey were constructed for the triple deities, namely Ahura Mazda (the god of fire), Mehr or Mithra (the god of light) and Anahita. Anahita, Anahid or Nahid (Venus) (Persian word, meaning away from pollution) is the name of the goddess of water, rain, and productivity (Alemohammad & Gharari, 2010).

³ Zoroastrian religion worshiped Ahura Mazda (the God of Light), who was in an eternal battle with Ahriman (the God of Darkness). The basic message of salvation relayed by the Prophet Zoroaster was the three major acts of faith: good deeds (kirdiir-i nik), good (pure) thoughts (pandiir-i nik), and good dialog (guftiir-i nik). (Cristian, 2017)

⁴ Following the emergence of Islam, the name of the temple was changed to Bibi Shahrbanu Shrine commemorate Princess Shahr Banu, the eldest daughter of the last ruler of the Sassanid Empire. She gave birth to Ali ibn Husayn Zayn al-Abidin, the fourth holy Imam of the Shia faith. A nearby mountain is also named after her. (Amir-Moezzi, 2005)

First pre-Islamic core of Rey

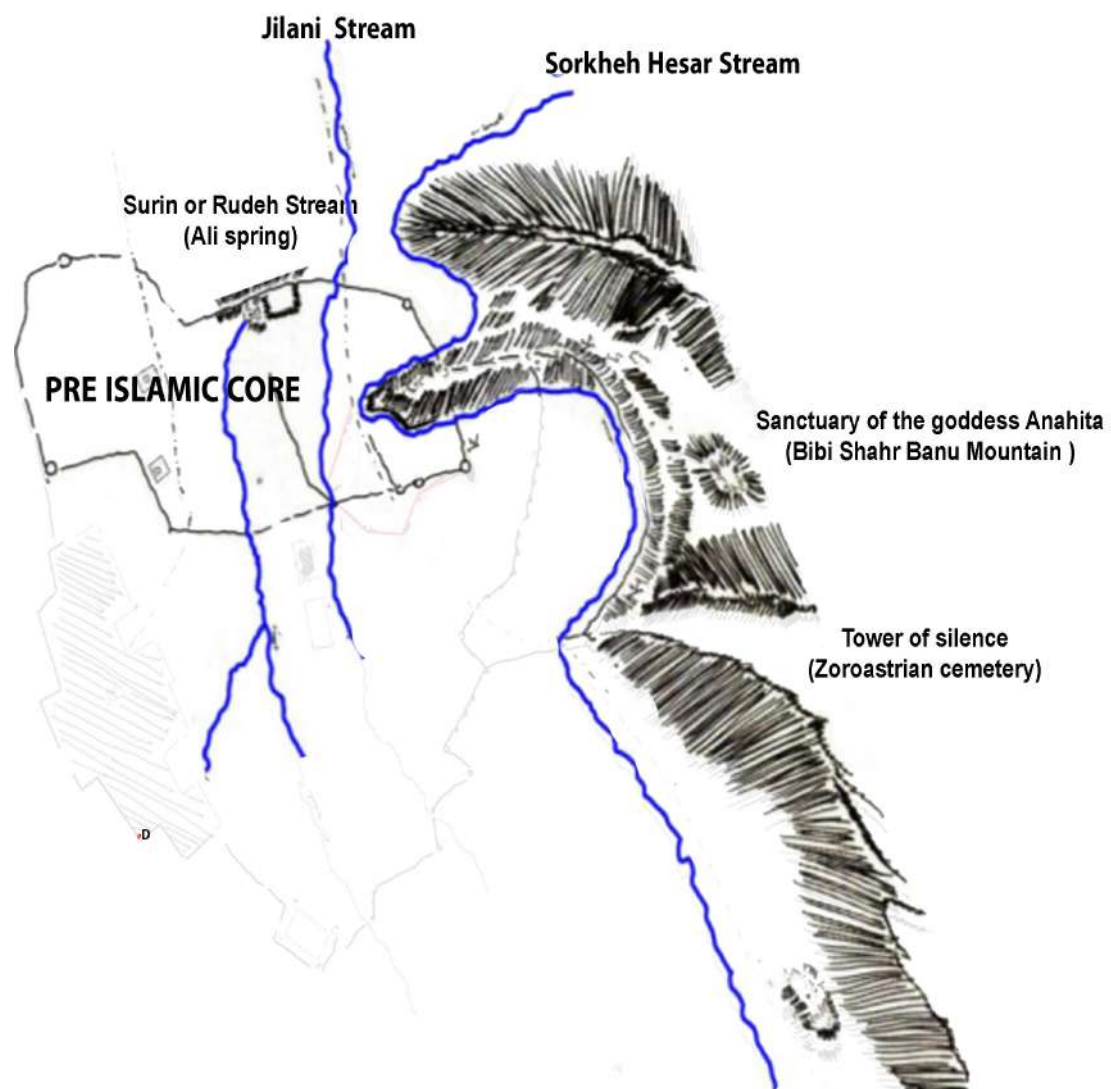


Fig.48: Map of Rey by Robert Ker Porter (1820); edited by author (Source: Ker Porter: Travels in Georgia, Persia, Armenia, and Ancient Babylonia)

After a while, fortifications were constructed around Surin Spring (for protection), while the remaining parts were surrounded by a trench. Fortifications on the north and east of this spring were constructed over the heights. Consequently, the city of Rey took advantage of those heights and was built in accordance to the natural elements (such as qanats, mountains, and agricultural lands) for the safety of the city, and the well-being of its citizens. (Fig.49)

As we mentioned before, arrival of Islam (in the seventh century), and particularly its Shi'ite faith, has had a significant impact on the development of traditional Iranian cities. Since then, Imamzadeh became a significant aspect of Iranian cities. In many instances, they were the main reasons for initial establishment or developments of cities in Iran. (Fig.50)

The city of Rey maintained its features by taking advantage of its existing holy shrines, including Hazrat Abdol Azim, Imam Zadeh Abdullah, and Bibi Shahrbanu. Due to the presence of such features, the first commercial and trade center for the main East and West business route (the Silk Road) appeared there during the Buyid and Seljuq dynasties.

During Safavid, Shia became the official religion of Iran. Therefore, Rey was developed around Abdol Azim Shrine, while its main bazar was constructed at the Rey's central core. During this era, as well as in modern eras, the main religious buildings were mosques, madrasahs

(religious schools), Imamzadehs, husayniyyih (buildings for religious mourning), and mazars and pirs (culturally respective shrines). Therefore, various urban open public spaces with shrine or cemetery functioning had been constructed on tombs of notable individuals and endowed properties, according to the bazar axis. Neighborhoods, alleys, and bazars were formed in Rey and each neighborhoods had its own urban public facilities. The city was surrounded by farms, gardens, single constructions, and village castles. In addition, outside the city, west of the mountains, the main new cemeteries with merely cemetery function had shaped (lower cemetery and upper cemetery). (Fig.51, Fig.52)

During the mid-19th century, Agha Mohammad Khan Qajar monarchy, Tehran was appointed the capital. The only settlement close to Abdol Azim shrine was identified, and the shrine was the only significant pilgrimage site near the Royal court of the newly appointed capital of Tehran. In this era, Rey was visited as a place of worship, a hunting ground, and a place of recreation for the king, princes, and citizens of Tehran.

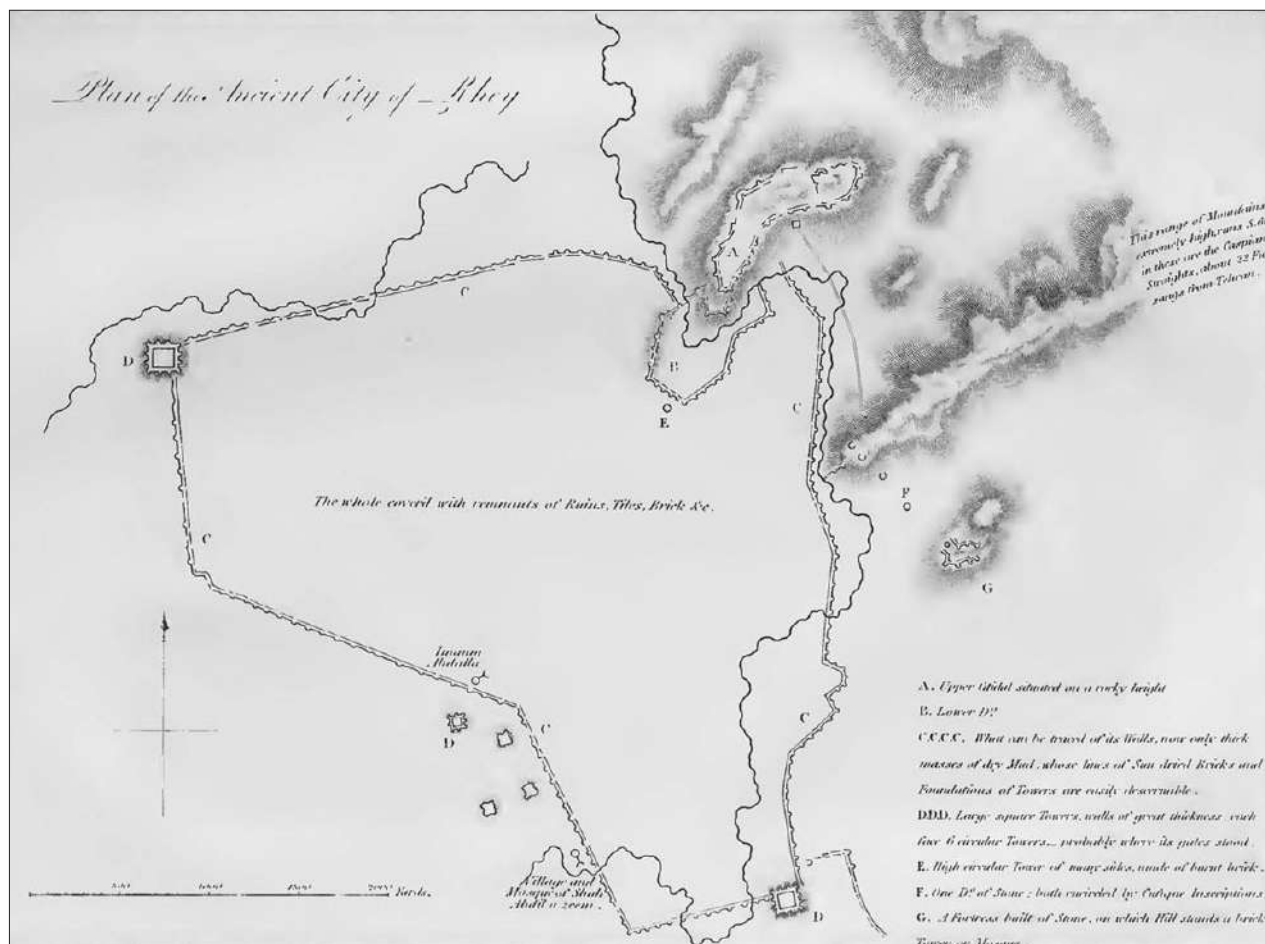


Fig.49: Map of the Rey, by Pascal Coste (1840), (Source: Rante: "The Topography of Rey during the Early Islamic Period")

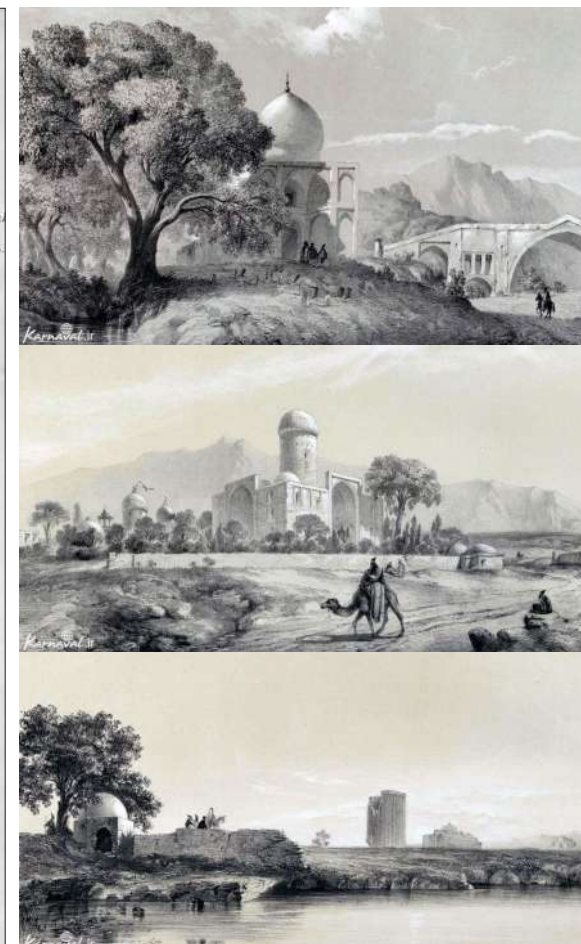


Fig.50: Rey during early Islamic period, 7th century

Rey early Islamic era

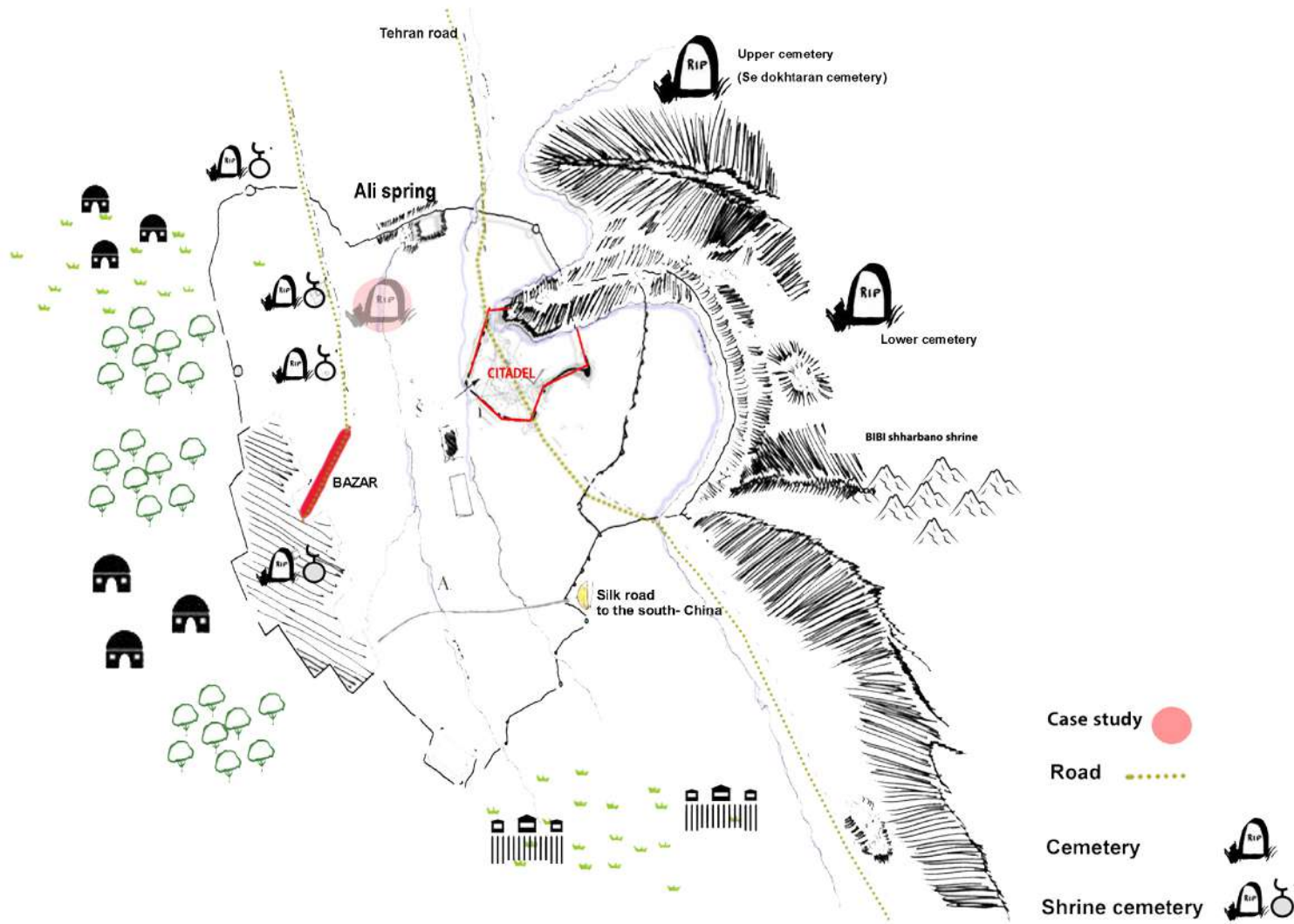


Fig.51: Map of the Rey Early Islamic Period, by author

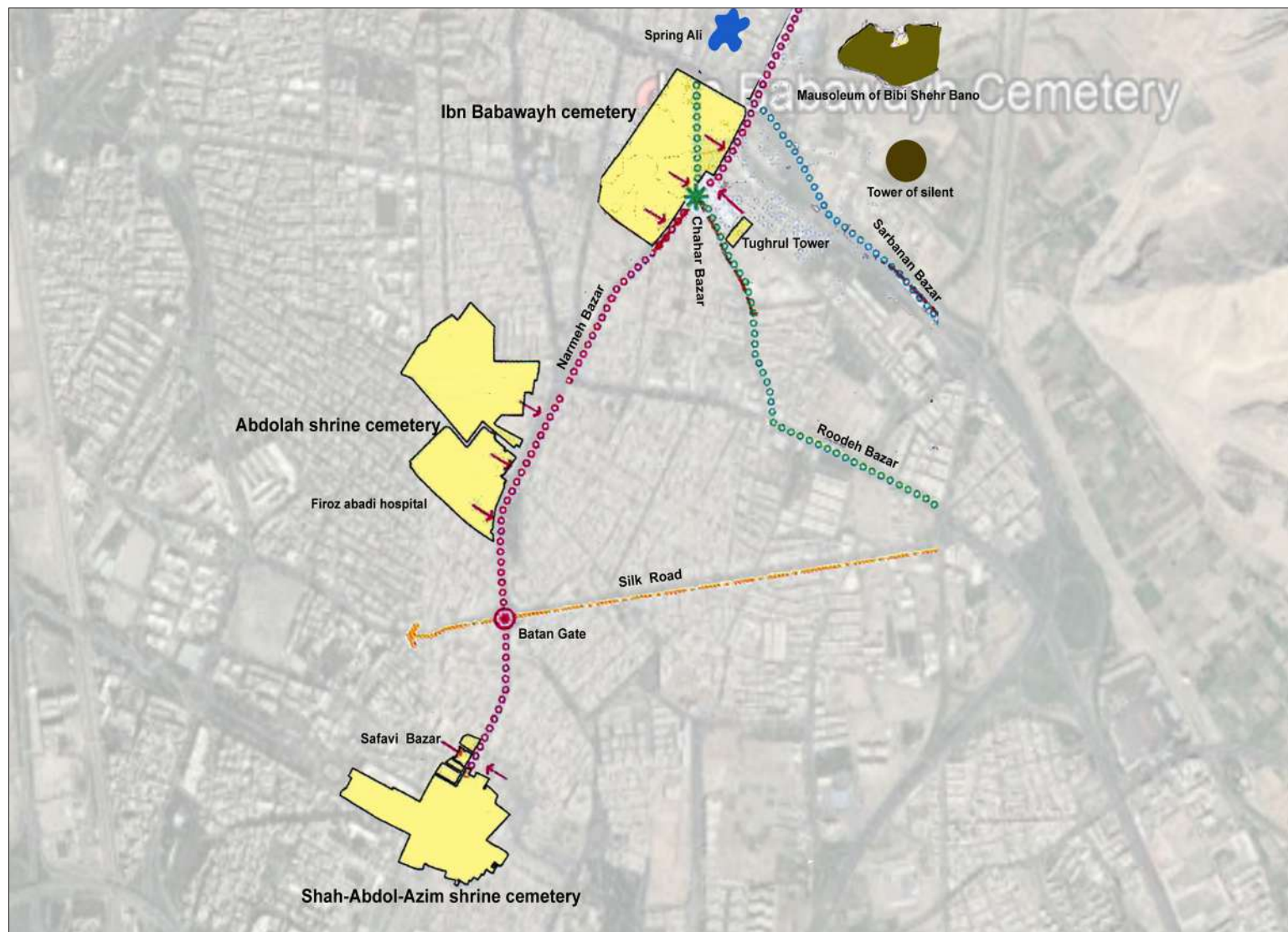


Fig.52: Old commercial routes of Rey according to the current streets of Rey, by author

Although Tehran was initially regarded as Rey's lands, the two cities substituted their political positions in this era. Tehran and Rey were connected via Rey Road (Fadaiyan Islam Street), which connected Shah Abdul Azim Gate (from the old fortifications of Tehran) to Mehran Gate (from old fortifications of Rey). On that time, the distance between the center of Old Tehran and the center of Shahr-e-Rey was approximately 9 kilometers. (Fig.53).

In 1888, major restoration of Rey was funded, and as a result, it became the first Iranian city connected to capital via railroad. (Saedi, 1955).¹ (Fig.54) During the monarchy of Qajar, the city and its urban spaces did not receive proper attention and its historical places were mostly demolished.

After the Islamic Revolution, and during the global modernism era, various cultural, recreational, and social centers were constructed, and neighborhoods were connected via modern streets, highways, overpasses, and underpasses. Ever since vehicle gained priority in cities, historical spatial and physical structure of the urban area and architectural context of Rey was revolutionized.

¹ It was the first tram line in Tehran, with two stations: The first one was by the Darvazeh Khorasan Street (now Ghiam Square and Kowsar Park), while the second one was adjacent to Shah Abdul Azim Shrine. The stations were called 'gare,' a French word meaning 'station.'

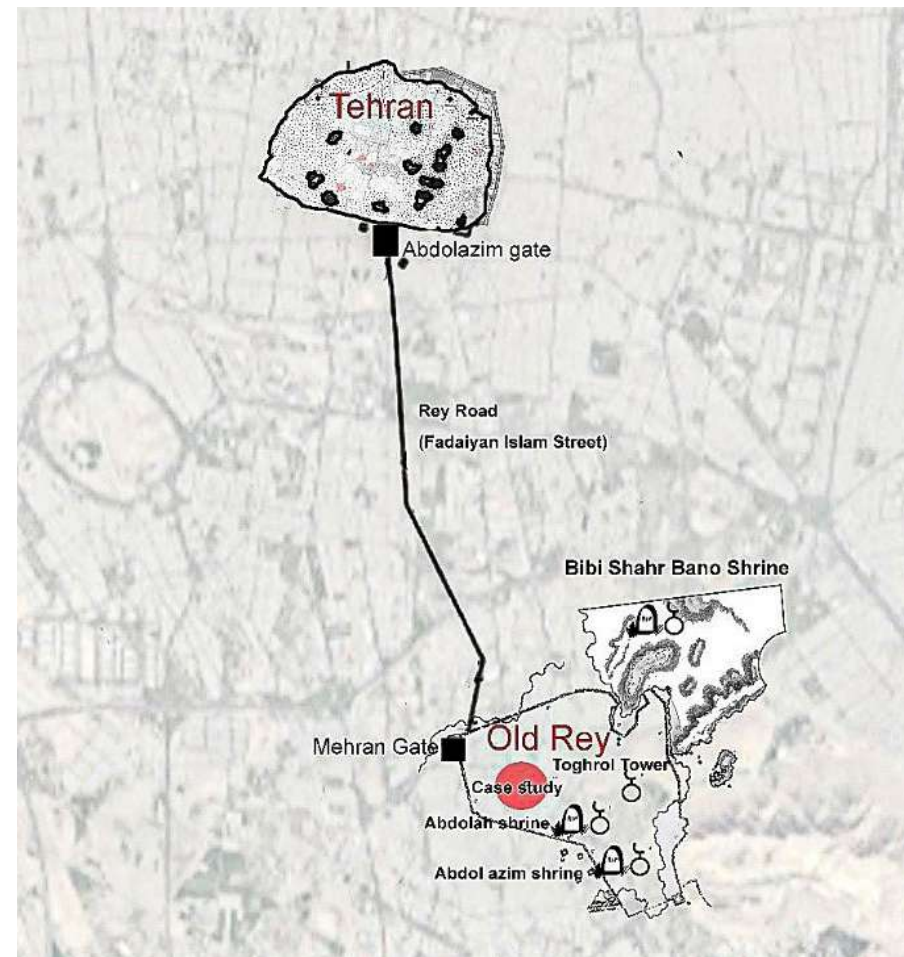


Fig.53: The historical Fadaiyan Islam road connected Rey to the old Tehran, by author

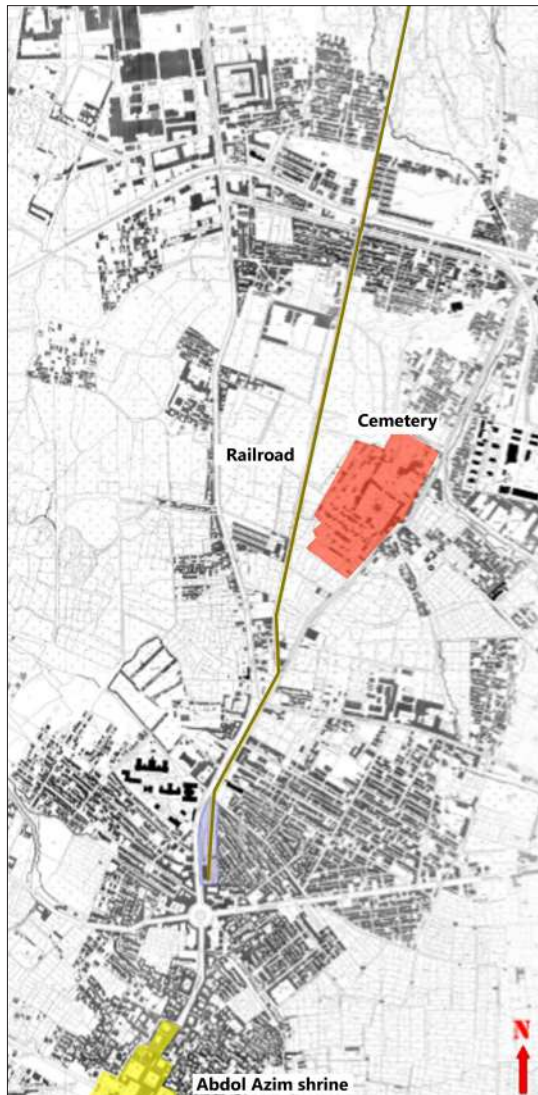


Fig.54: Rey connected to Tehran with first Railroad

In a general classification, spatial and physical development of Rey after modernism is divided into:

- Prior to 1300 AH (1921 AD): Shahr-e-Rey and Shemiran were developed separately and insignificantly. There was a small residential urban area near Abdol Azim Shrine, towards the main square of Shahr-e-Rey.
- From 1343 to 1355AH (1964-1976AD): The physical development of Tehran and its surrounding area was rapid. Consequently, Rey and Shemiran were integrated with Tehran. Tehran was integrated with Shemiran through growth in residential urban fabric, while its integration with Rey was mainly through the establishment of industrial units and workshops.
- From 1355 to 1375 AH (1976-1996 AD): During this time, Tehran was developed in different directions, particularly from the west and north. In Rey, in addition to an insignificant development in the context surrounding the Shrine, there are small industrial units in the north of the area. Among these industrial units, Rey Cement Factory and Rey Glycerin Factory are among the notables. (Fig.55)
- After 1375AH (1996AD): The physical development of Tehran was accelerated, particularly in the southern parts, due to growth in immigration. In addition to the growth of residential-peripheral context, many industrial storehouses and workshops were established in Rey. As a result, Shahr-e-Rey is today an industrial/residential district.

To sum up, in the Pre-Islamic era, the effects of natural environment on city construction are more evident, as the access to water was a primary and an influential factor in distribution patterns of settlements and the intensity of human activity in Rey.

Beside During Zoroastrian, religious beliefs in Rey (as in any other city) were started to be second influential factors in all aspects of spatial and physical urban form of settlements.

On the other hand, following the introduction of Islam, religious became a major source of influence in Islamic societies of Rey, and Islam in general, and Shia faith, in particular, left a huge functional imprint on the town through the construction of buildings and urban public spaces such as mosques, Imamzadeh, husayniyyihs, and cemeteries within shrines.

During early Islamic era, Rey was a prosperous city with impressive buildings ornamented by various decorative designs and thriving bazars. Rey city, to a great extent, was a cultural, historical, and religious city. Commercial elements such as ancient trade routes (such as Silk Road) and religious monuments were the main factors that shaped its characteristics.

During the late Islamic era, not only urban open public spaces but also the city structure faced significant transformations. The city's physical and spatial patterns have gradually developed to respond to industrial and transportation needs of the populations. The urban fabric of Rey,

and its urban public spaces, had long been treated in contemporary era by industrial development, without any consideration for its historical context.

Physical Development of Rey, after Modernism

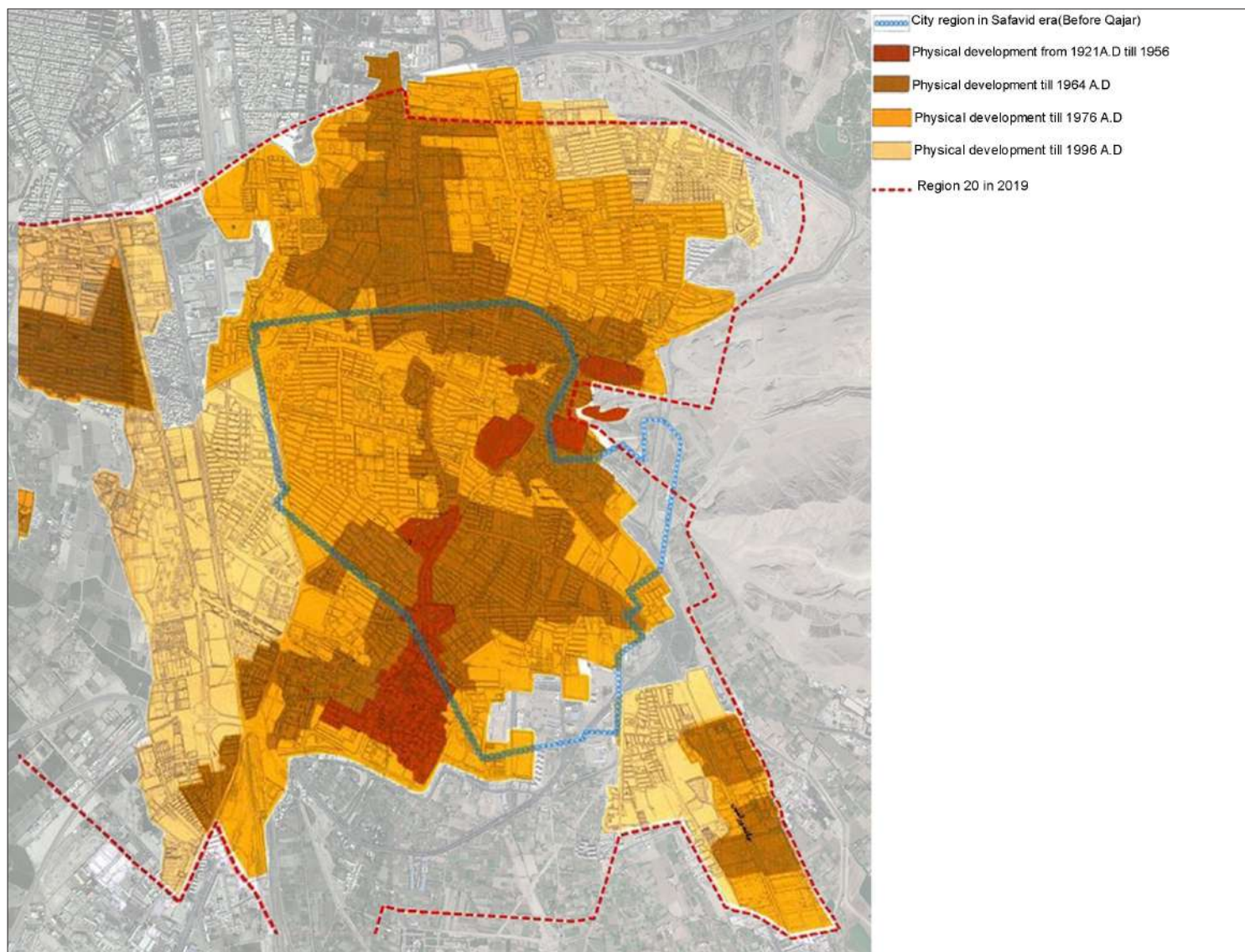




Fig.55: Industrialization of Rey during modernism era, Rey cement factory, 2020



Fig.56: Religious and Commercial Elements as Influential Factors of Development in Rey during Islamic era, Abdol Azim shrine and its cemetery within urban fabric area of, Rey, Tehran

Religious and Historical Buildings (Public spaces) in Rey



4.2.2 P2: Focal Points

This indicator should be investigated by a trained observer or extracted according to the cognitive maps of users. According to this indicator, designing of any urban public space in the area should contribute to the legibility of its surroundings, while being legible in itself. Accordingly, three focal points exist in the region that are responsible for creating subjective pictures in minds: **Nodes** as any place where paths meet; either sociable or traffic, **edges** or distinct limits to areas with different patterns of use or visual character, any strong linear barriers and **landmarks** as any publicly-relevant activities, either in buildings or in outdoor spaces.

In terms of this, there are nine major traffic nodes in the area. Currently, the main square of Share-Rey has social and traffic function in the area. Safaiyeh Square is known as the entrance to the north of the area, with many public open spaces formed in its vicinity. In addition, some vendor markets are established next to this square. Therefore, this node plays traffic and functional role. (Fig.57, Fig.58). The other seven nodes in this area are merely traffic nodes, and are being utilized as a square for vehicles in their context.

Shahr-e-Rey is surrounded by various edges with different characters and scales. In this area, the three main edges are Shahr-e-Rey ring road (in the north and south), Sorkheh Hesar stream (in the east), and Tehran-Qom highway (in the west). The eastern border of the area is the Sorkheh Hesar stream, which indicates suitable coordination with the vast and natural area to the east. However, considering the

undesirable conditions of the stream, it is not spatially significant and requires more linking access roads with the area.

In Rey, the historical urban open public spaces and places are extremely significant, and all can be mentioned as legible elements. Many significant historical, natural, cultural, and religious public spaces exist in the area. All these spaces are known as landmarks for this region and they could be categorized into two groups, both of which date back to the ancient Rey. The first group includes populous spaces, which were used as open public spaces in the past, and are still popular as cultural and religious centers, including religious-related places where religious notables were buried. Among the most notable places in this group, we can mention Abdol Azim shrine, Imamzadeh Hamzeh, Imamzadeh Taher, Imamzadeh Abdullah, Bibi Shahrbanu, Ibn Babawayh, Javanmard Ghassab, Bibi Zobeyde, and Abolfath Razi. The second group includes desolated buildings or places. Among the most significant open spaces in this group, we can name the remains of Rey Fire Temple (a rampart surrounding the ancient Rey), Naghareh Khaneh Tower, and Gabr and Tabrak Castle. All these historical and cultural open public spaces, in all parts of Rey, have affected each other in different ways because of their historical and conceptual relationships and adjacency. (Fig.59) (For more information, please refer to Index)

Focal points of the Region(Territorial scale)

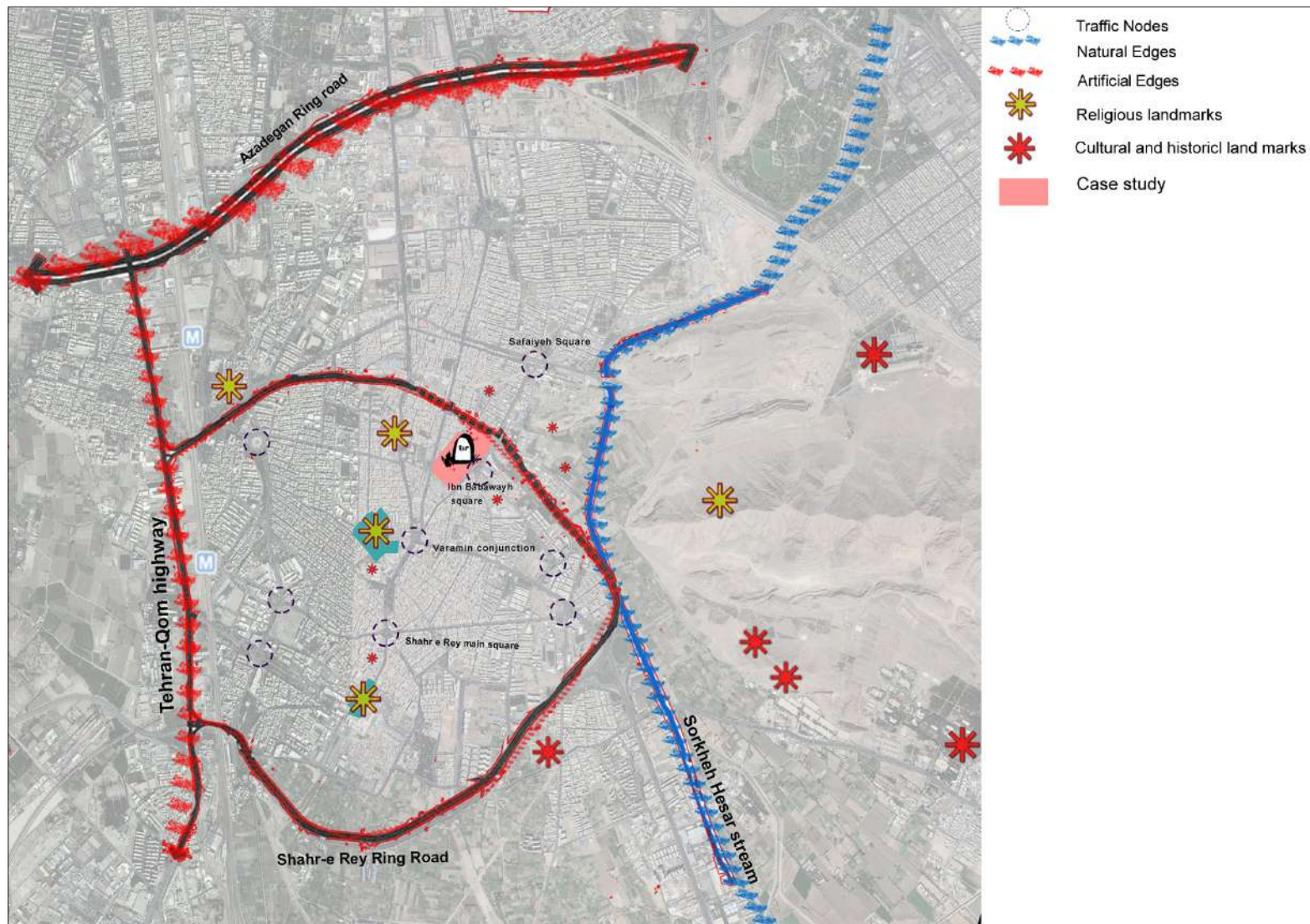




Fig.57: Safaiyeh Square is known as the entrance to the north of the area, 2019



Fig.58: The main square of Share-Rey has social and traffic function, 2019

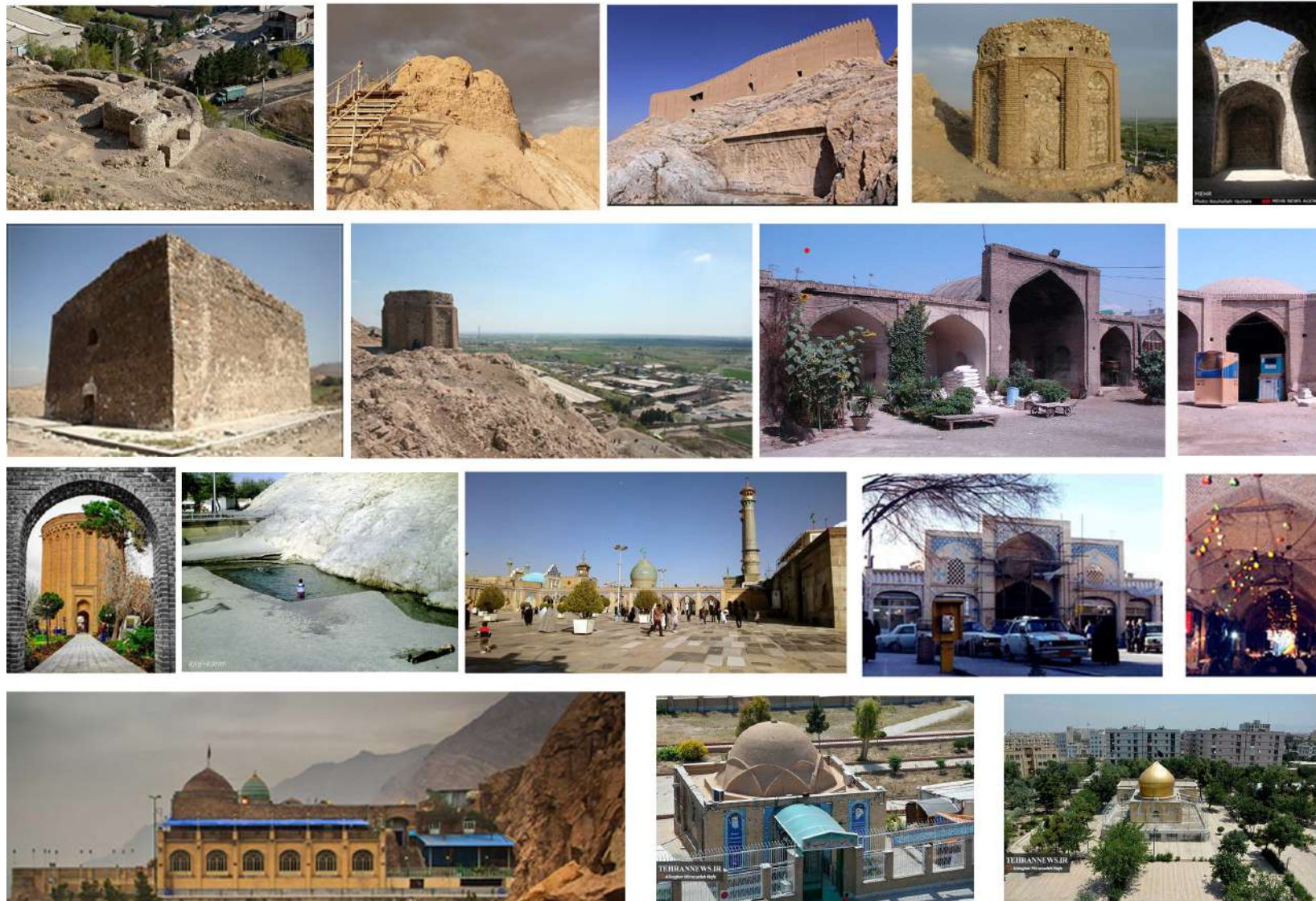


Fig.59: Rey historical nodes

4.2.3 F2: Region Mobility

To evaluate functional permeability in the territorial area, we need to consider the arrangement and connection between the main urban areas (hierarchy of roads). Considering the role of corridors in the area, they can be divided into different levels: Some provide local access, some act as the main and border corridors (separate the area from the peripheral environment), and others are main connecting and relating sections of intercity and intra-city urban areas and form the general structure of the urban fabric.



Fig.60: Shahr-e-Rey Ring Road, passing through the urban fabric, 2019

According to the hierarchy of road, the main streets and paths providing access for vehicles and pedestrian towards the cemetery are: Shahr-e-Rey Ring Road, Fadaiyan-e-Islam Street, Safaye Street, Emam Hasan Boulevard, Ghayuri Street, and Ibn Babawayh Street. All these corridors provide expected mobility for vehicles through this region. (Fig.60, Fig.61, Fig.62, Fig.63)



Fig.61: South Fadayne Islam street, 2019

4.2.4 E1: Natural Appropriateness (Green Lands, Green Corridors, Blue Corridors, Hills, and Mountains)

Natural areas in Rey include mountains, hilltops, blue, and green corridors. Urban green and blue areas are lands, strips and corridors with a high presence of outstanding plants. As can be seen in the map, green streets, green nodes, parks, and agricultural lands, which are mostly located in the southern and western parts of Rey, are as green corridors of the region. In addition, the vast natural area of Bibi Shahrbanou Mountain is located east of Rey. Soresoreh and Tabark hills, with less height and slopes, are located in the southern and north parts of Bibi Shahrbanou, along the cement factory. (Fig.64)

In this region, water was supplied by reservoirs, streams, and qanats in the past. Today, most of the blue corridors still exist in this area. The important streams are Sorkheh Hesar Stream, Surin or Rudeh Stream (now called Cheshmeh Ali), and the Jilani or Gilani Stream. Sorkheh Hesar channel is the only open water channel in Rey running from the northern mountains of eastern Tehran, and is located on the eastern edges of Rey. (Fig.65) The other channels inside Rey, are covered.

Qanats also were methods for developing and supplying groundwater. They are generally consist of a gentle-sloped tunnel cut through alluvial material, which led water upwards by gravity flow from beneath the water table, at its upper end, to the surface outlet and irrigation canal at its lower end. (Alemohammad & Gharari, 2010)² Historical Qanats in Rey include Aminabad, Shahi or Shaahi, Nasrabad, and Qarshi Qanat. All Qanats in the area, ancient and present, have originated from the northwest of Rey and run towards the southeast and east to supply water to Rey. Today, they supply water to the gardens and farms in the area. Today, the land slope in Shahr-e-Rey continues from the northwest to the southeast, and all Qanats are along this direction. Since the main part of the city did not have access to water or designated Qanat, it is thought that the source of water flowing to the city was from the northwest. Consequently, the wealthy citizens and noble families resided and built their palaces in the parts with fresh and healthy water and air. Therefore, the northwestern parts of Rey used to be allocated to the patricians and notables, while the other neighborhoods were occupied by common people. Nowadays, many of these Qanats still exist. (Fig.66, Fig.67, Fig.68, Fig.69)

² Qanats are constructed by the hand-labor of skilled workers known as muqannis. The techniques employed in digging Qanats have altered very little since such constructions began. The initial stage of construction consists of sinking of a shaft to prove the presence and depth of the ground-water table. Once a satisfactory source of water has been discovered, a gently-sloping tunnel is constructed in an upslope direction (from the Qanat's outlet). To provide ventilation for the workers in the tunnel, and to facilitate the removal of spoils, a series of vertical shafts are constructed along the tunnel.()

Natural area of the Region (Territorial scale)

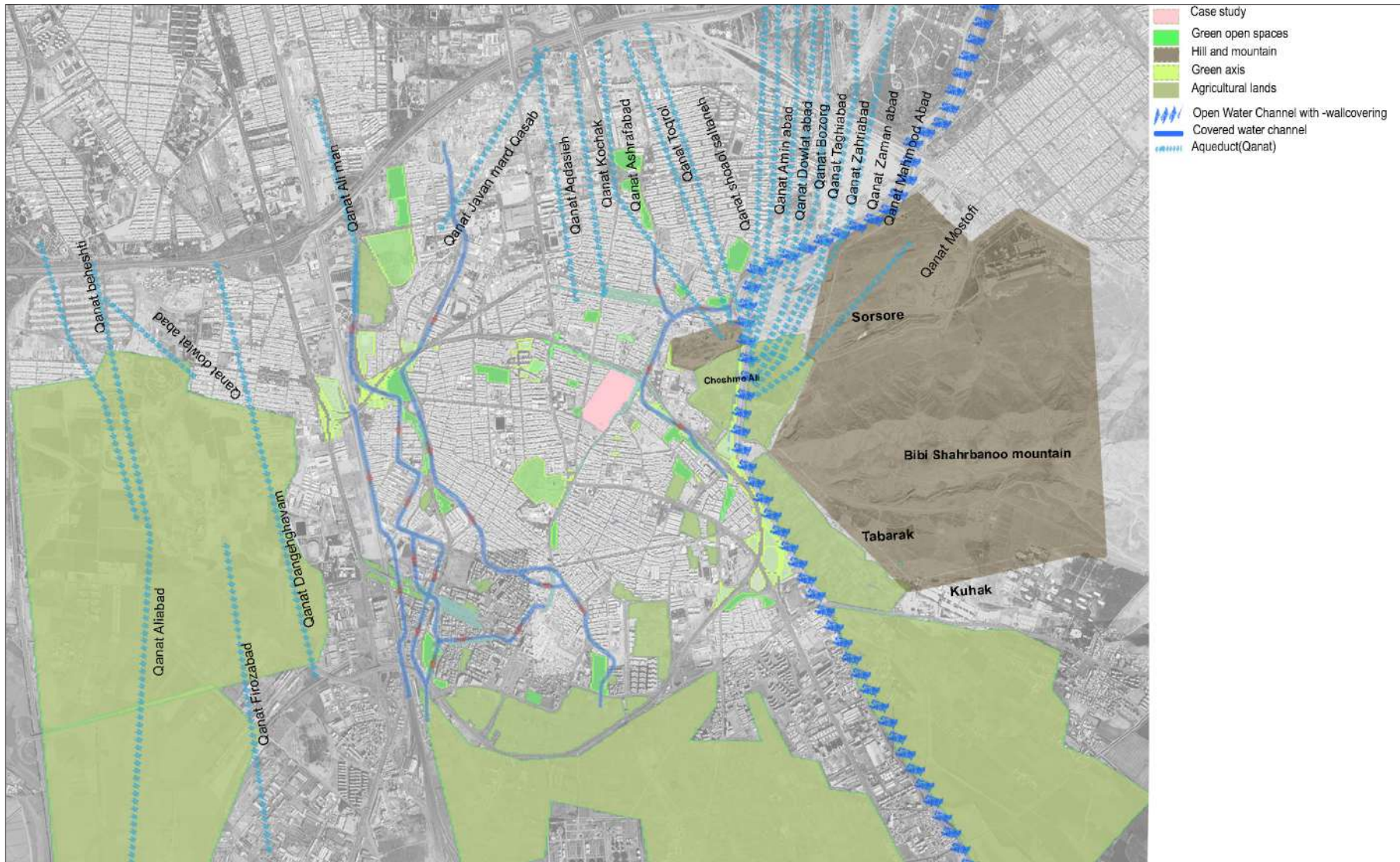




Fig.64: Agricultural land next to the hillside of the mountains, 2017



Fig.66: Ali spring of Rey historical blue corridor of Rey, Qajar era



Fig.65: Sorkheh Hesar stream of Rey, 2018



Fig.67: Ali spring is using as a recreational space for children today, 2017

Historical Qanats of the Rey

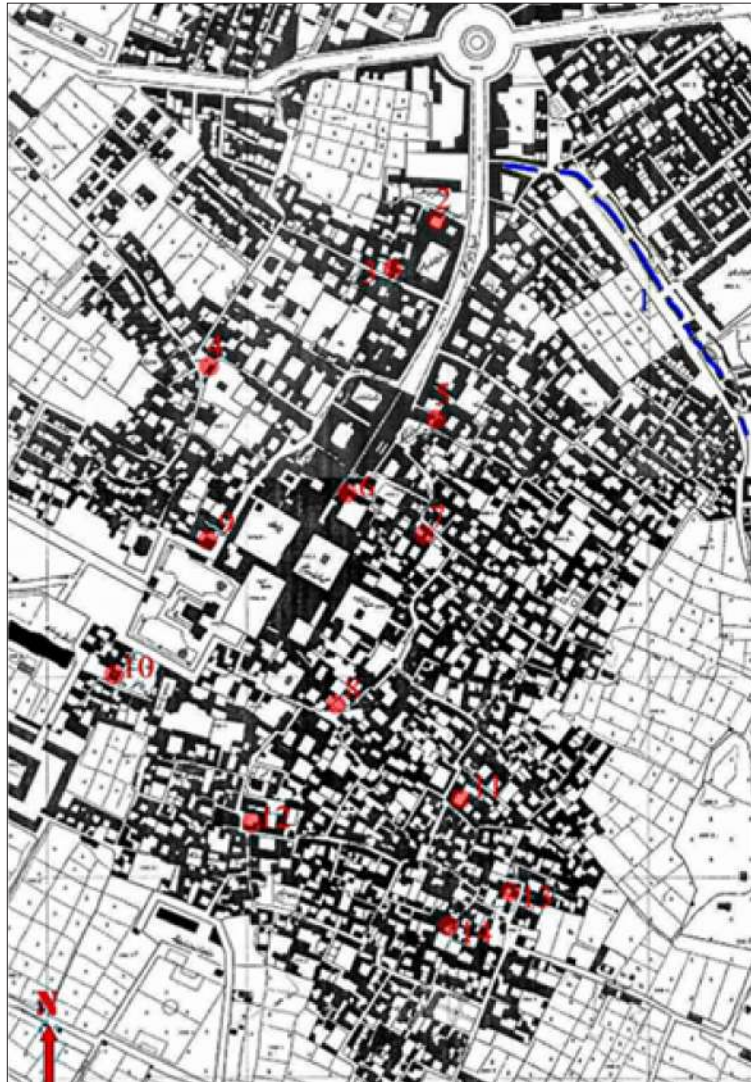


Fig.68: Shaahi Qanat in Rey

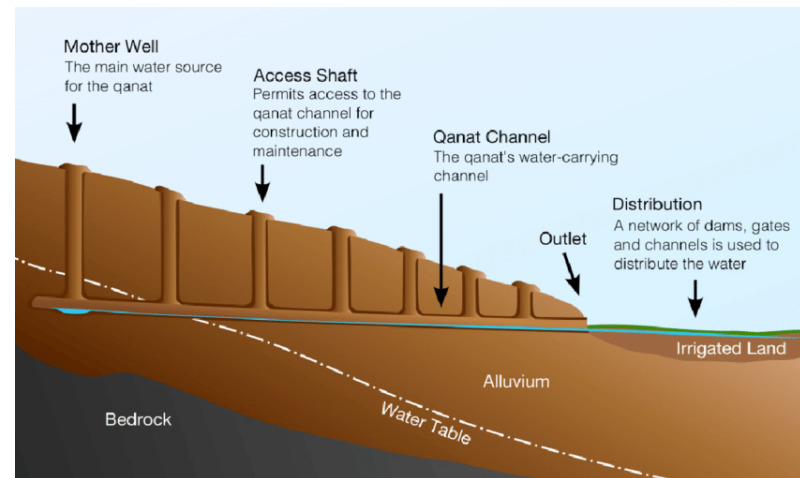


Fig.69: Qanat structure, a methods for developing and supplying groundwater in Rey

4.2.5 F3: Integrated Districts

According to the map, Rey can be divided into the following three major districts:

A. Industrial district: The industrial district in the area is formed between the natural and residential districts, considering the location of industrial factories and workshops east of Ibn Babawayh Street. (Fig.70)



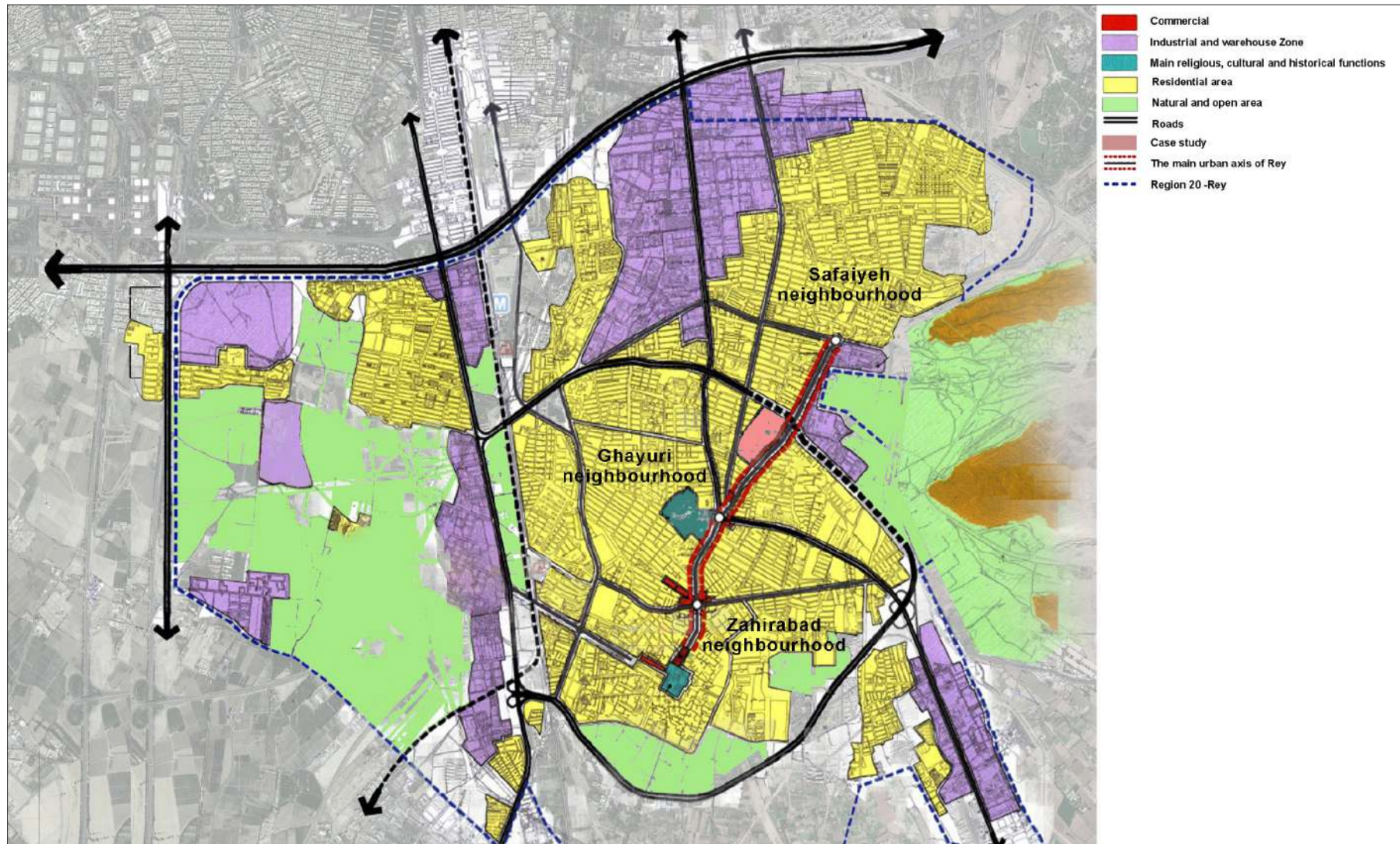
Fig.70: The residential area developed around the industrial building of Rey and today the industrial district of Rey is disconnected from the natural area from the residential district.

B. Residential district: A significant part of the area is allocated to the residential district. Regarding its subjective and objective features, this macro-region is divided into various subsets.

C. Open and natural district: This district forms the major part of the eastern Rey. It is stretched along the natural regions of Bibi Shahrbanu heights and includes farms, open fields, and Rashkan Hill.



Districts of the Region (Territorial scale)



4.3 Partial Conclusion (SWOT)

Strengths:

- Religious belief and natural elements were influential factors in shaping the ancient Rey.
- Existence of Shahr-e-Rey main square in the south of region as a sociable node.
- Ease of traffic movement through urban areas with proper hierarchy of roads.
- Existence of various cultural, religious and historical urban public spaces in this area.
- Existence of various types of blue and green corridors within the area.

Weaknesses:

- The elimination of the vast natural environment from citizen's daily life during the Islamic era.
- Territorial area of the cemetery is surrounded by Shahr-e-Rey ring road, and Tehran-Qom highway.
- The industrial district leads to separation of natural and residential areas.
- There is no connection between natural areas for pedestrian benefits.

Opportunities:

- Expanding the structure into new centers to regard religious, cultural, and commercial needs, while responding to natural surrounding elements to increase compatibility of the region.
- The main square of Shar-e-Rey and Safaiyeh Square plays social and functional roles in the region. They are the final points of the Ibn Babawayh corridor in the north and south, and the best places to organize important urban open public spaces. Therefore, their organization could promote the permeability of the region.
- Sorkkeh Hesar stream provided a suitable opportunity for as a blue corridor connections and the permeability of the region.
- The connection among urban public spaces could create an effective structure more legible in different physical and spatial layouts
- The most important and major physical corridors, namely Fadaiyan-e-Islam and Ibn Babawayh in the north-south direction, and the Shahr-e-Rey Ring Road in the east-west direction, can be regarded as connectors that link urban functions and activities with each other and with the cemetery.
- In this region, Ali Spring, Sorkkeh Hesar River, green paths within the area, Bibi Shahrbanou Mountain, Soresoreh hill, and Tabark hill are the green and blue corridors in the area, which can be used for pedestrians and bicycles continuity.

Threats:

- Industrialization of the city in the last two centuries led to elimination of many natural elements, from physical and spatial structure of Rey, during late Islamic and modern era, and transformed this region into a car-centric region.
- The issue of traffic in the nodes of this region is more functional than social (Fig.71)
- Separation of cemetery with Rey northern part by the Shahr-e-Rey Ring Road
- Lack of pedestrian and bicycle priority of movement in most streets
- Construction in open and agricultural lands
- Separation of residential area and natural area by industrial district



Fig.71: Issue of traffic in the nodes of this region is more functional than social, 2019

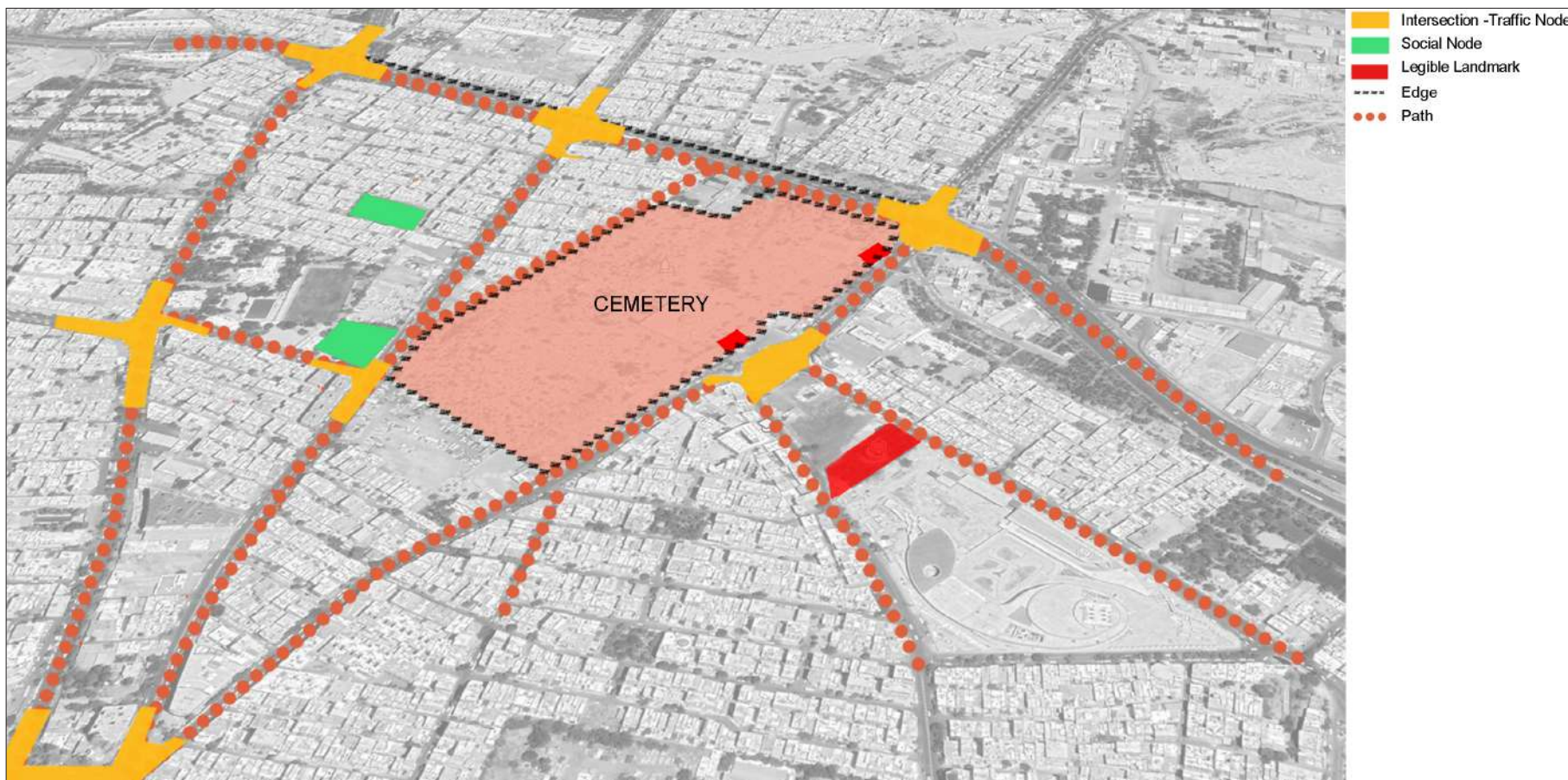
4.4 Intermediate Area

4.4.1 P2: Legible Landmarks, Nodes, Edges, and Paths

Ibn Babawayh cemetery has a significant position in the perceptual organization of the intermediate area, since the identity of this area is taken from this cemetery. As we mentioned before, designing of any urban public space in the area should contribute to the legibility of its surroundings, while being legible in itself. According to this, in this section, the perceptual permeability elements are examined based on Lynch's theory. In this regard, it is essential to address any parts in the area that can be used as directions to the neighbourhood. (Lynch, 1981). Therefore, we start by identifying the existing legible elements of the intermediate area, including:

- **Nodes:** Seven intersections (nodes) with traffic function exist in this neighborhood. The most important node in this area with traffic function is Varamin junction (at the intersection of the main road). Besides, there are two small parks in this neighborhood, which can be regarded as social nodes.
- **Landmarks:** The most important landmarks in the area are the two main entrances of the cemetery, and the Tugrul Tower, which is in the vicinity of the area under study. Other parts of the neighborhood do not have any elements with the quality of a landmark.
- **Edges or any strong linear barriers:** In this neighborhood, there are two edges that limit the access and views to the cemetery. One is the fences surrounding the cemetery, and the other is the Shahr-e-Rey ring road north of the cemetery.
- **Paths:** They are the channels which the observer moves. In this area, the pedestrian areas with more legibility for the observer are the sidewalks of the main streets (with vehicle priority).

Legible elements of the Neighborhood (Intermediate scale)



4.4.2 F2: Pedestrian Mobility , Connectivity and Accessibility to the Public Transport

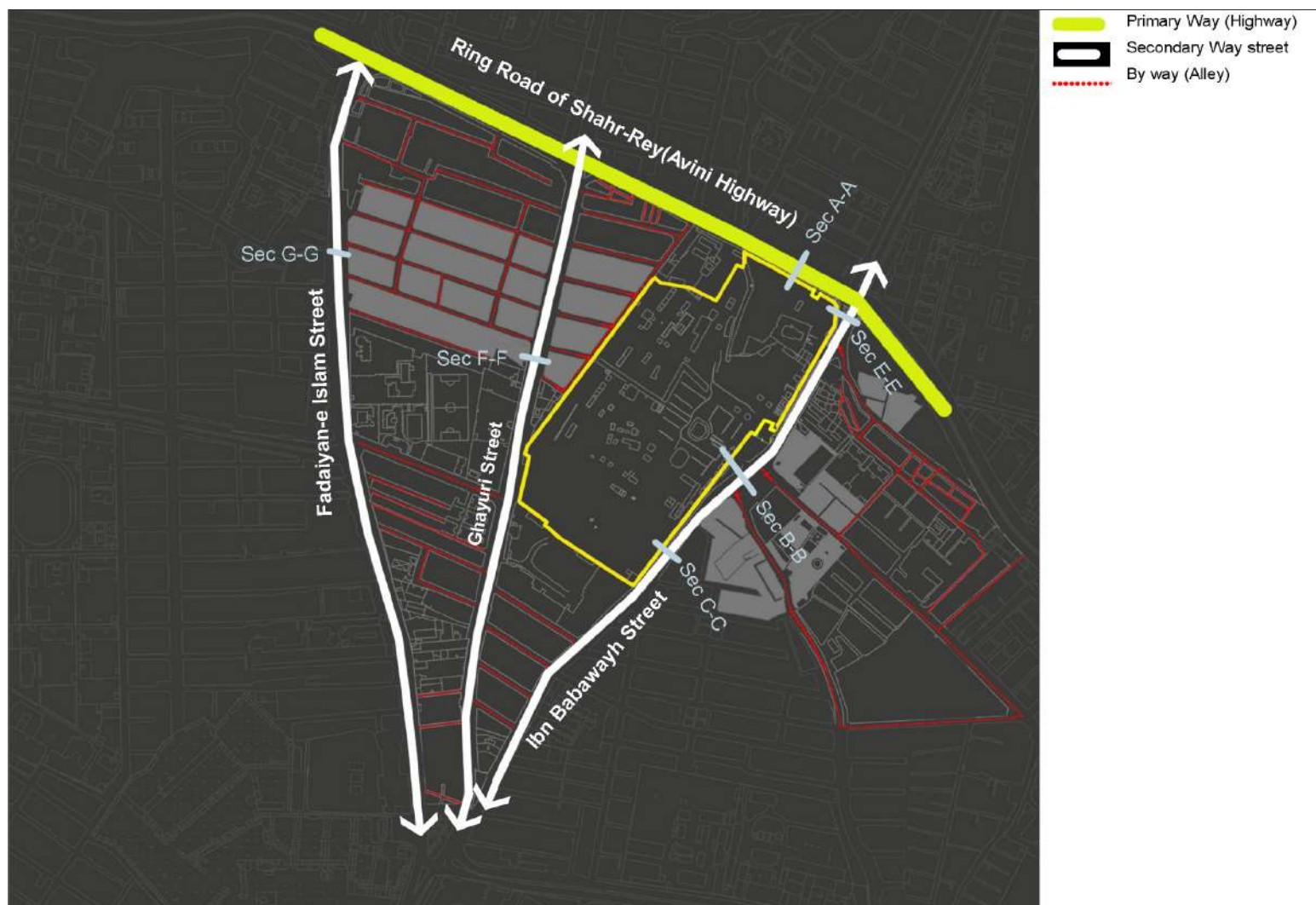
The pedestrian mobility network can be considered as the vital arteries of the neighborhood area. Hence, any access to the context of the cemetery, which connected paths that facilitates access, can be considered as a functional permeability indicator. Moreover, pedestrian sidewalks have great significance in the context of a cemetery. The pedestrian role of the streets can be measured in terms of its degree of separation. Easier pedestrian access signifies the importance of that street. Wider streets where traffic volume is higher and vehicle's speed are more, have less opportunity for pedestrian traffic. Considering these items, classification of passageways are shown in the following map.

Shahr-e-Rey Ring Road, Fadaiyan Islam Street, Ghayouri Street, and Ibn Babawayh Street are the main corridors in the spatial organization of this neighborhood. Shahr-e-Rey Ring Road, 45-meter wide corridor, is in an east-west direction which is located in the north of the cemetery, provides a proper separation of the vehicle road and the sidewalk. However, considering its traffic specifications, it has divided the project area into the northern and southern parts, and is therefore, a serious threat for pedestrian access. Ibn Babawayh street is a corridor connecting important elements in the area, and plays the most significant role in forming the framework of the area. The northern and the southern side of this street shows the lack of proper sidewalk and connectivity to urban area. (Fig.73, Fig.74, Fig.76)

Fadayan Islam and Ghayuri streets in the west, have less priority for pedestrians as well. On the other hand, the speed of vehicles on other streets are higher, which undermines the possibility of and passing through with bicycle or on foot. On the contrary, even though local paths and alleys have less traffic which facilitates bicycle and pedestrian traffic, but they have lack of quality in design and implementations. (Fig.75, Fig.77, Fig.78)

In addition to providing mobility in the urban area, the role of public transport is significant. On the one hand, people should be able to easily commute from the city to urban cemeteries. On the other hand, the lack of an appropriate public transportation network increases the number of private cars, which consequently increases the urban traffic in the area and decreases the quality of air around the urban space that reduces the number of pedestrians. In terms of public transportation system, buses are the only means of transportation in the Ibn Babawayh neighborhood. Bus lines are seen on all major corridors adjacent to the cemetery, with a bus stop in each passageway. Therefore, Ibn Babawayh cemetery is in desirable condition in terms of proper bus service.

Pedestrian paths through Neighborhood area (Intermediate scale)



Bus stations and routes in the Neighborhood area



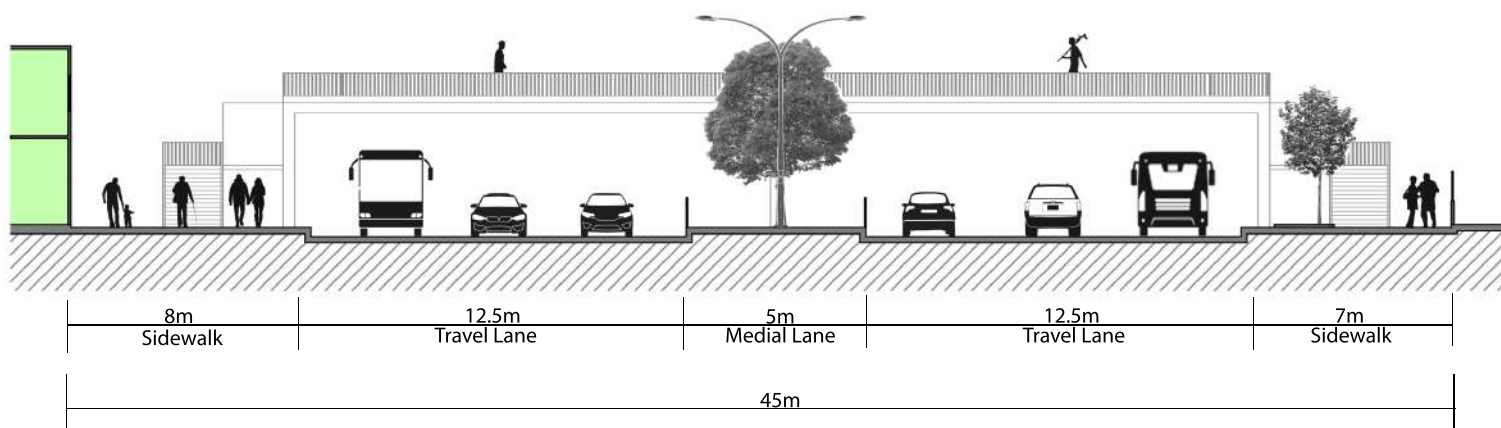


Fig.72: Rey Ring Road, provides a proper sidewalk and connectivity
Section A-A by author

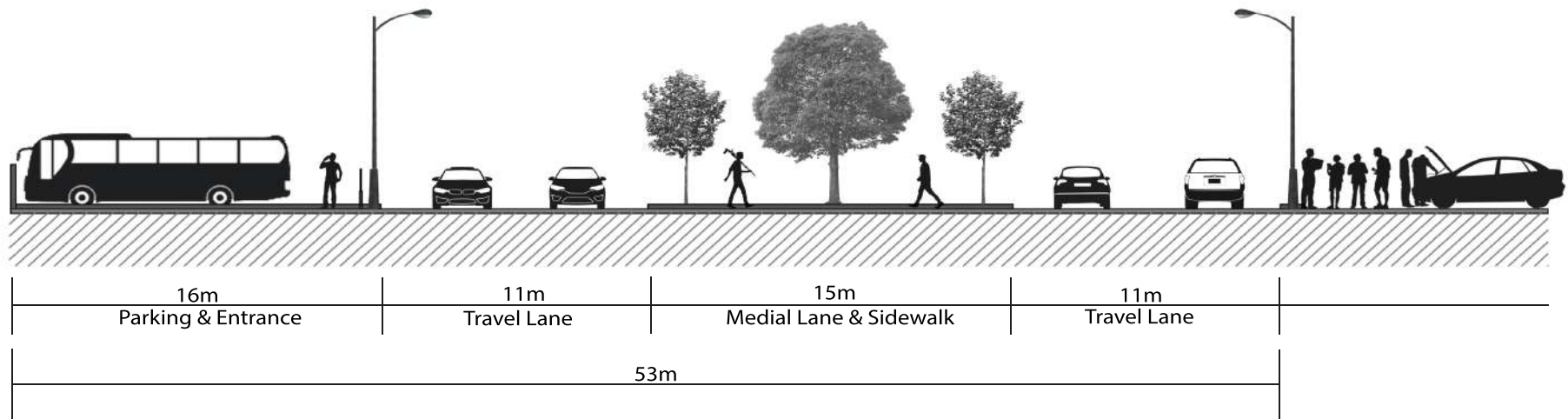


Fig.73: Ibn Babawayh Street, Northern side of Ibn Babawayh Street provides a proper sidewalk and connectivity Section B-B, by author

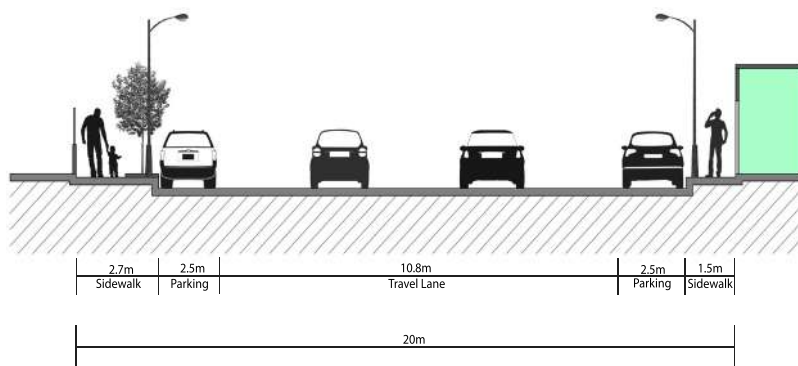


Fig.74: Southern side of Ibn Babawayh Street with no suitable sidewalk and connectivity Section C-C, by author

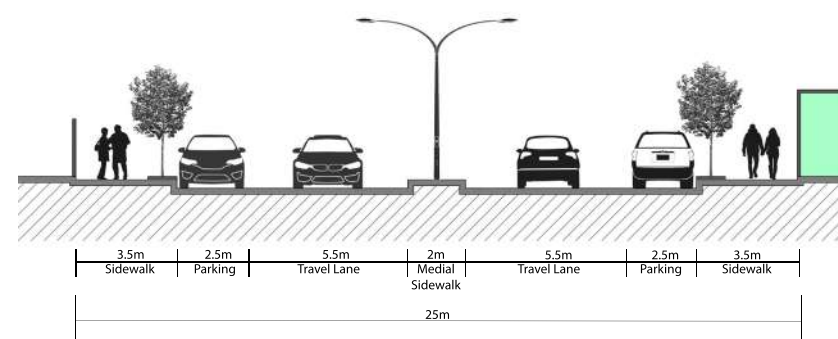


Fig.75: Ghayuri Street dedicated more priority to pedestrians in its design and implementation Section F-F, by author

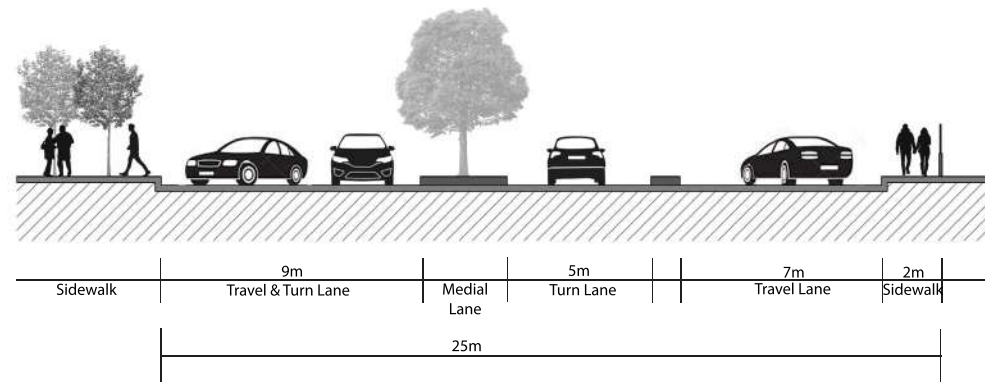


Fig.76: Entrance to the local area from Rey Ring Road to Ibn Babawayh Street, No wide and comfortable sidewalk on the right-side
Section E-E, by author

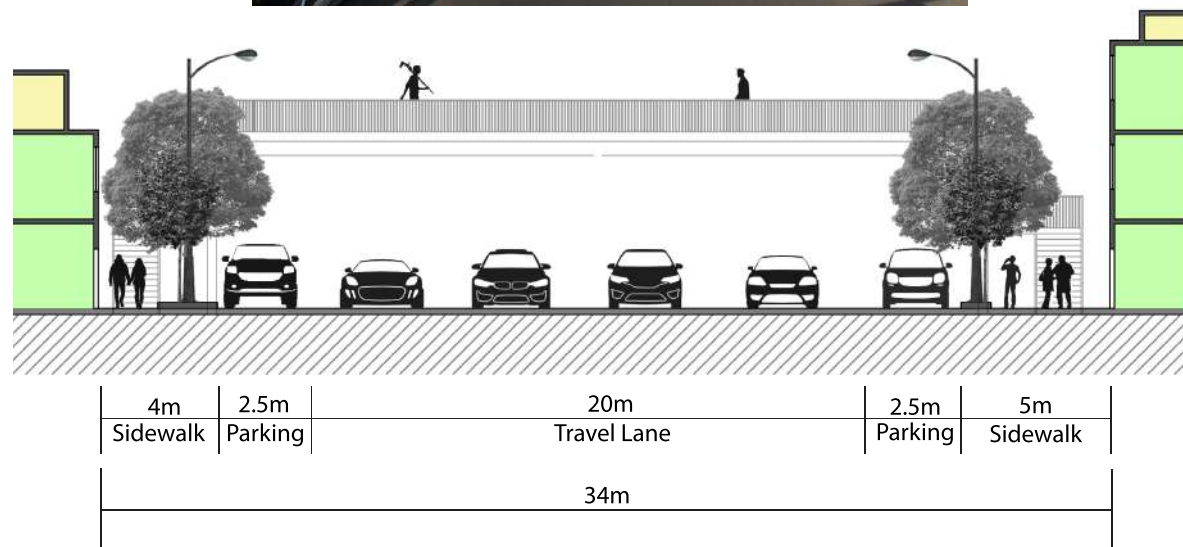


Fig.77: Fadayan-e-Islam Street (west of the area) dedicated more priority to pedestrians in its design and implementation. However, high speed of vehicles in this street is evident
Section G-G, by author



Fig.78: Alleys status in the regional area, 2019

4.4.3 F3: Mixed Land Using

According to the map, the IbnBabawayh cemetery covers roughly 33% of the neighborhood. The intermediate area of the cemetery has mostly residential function (with approximately similar size to the cemetery area at 33.5% of the neighborhood), along with some service functions (parking). Cultural, religious, and commercial areas occupy the rest of the neighborhood. The remainder of the region is devoted to combining residential and industrial functions and uses. Some other parts of the Ibn- Babawayh cemetery are occupied by empty lands.

In addition, there are gardens and green spaces in this neighborhood, with a total area of 5552 square meters, equivalent to 1.72% of the neighborhood. The green space per capita of this neighborhood is less than one, which is much lower than the desired and standard amount. (Fig.79, Fig.80)

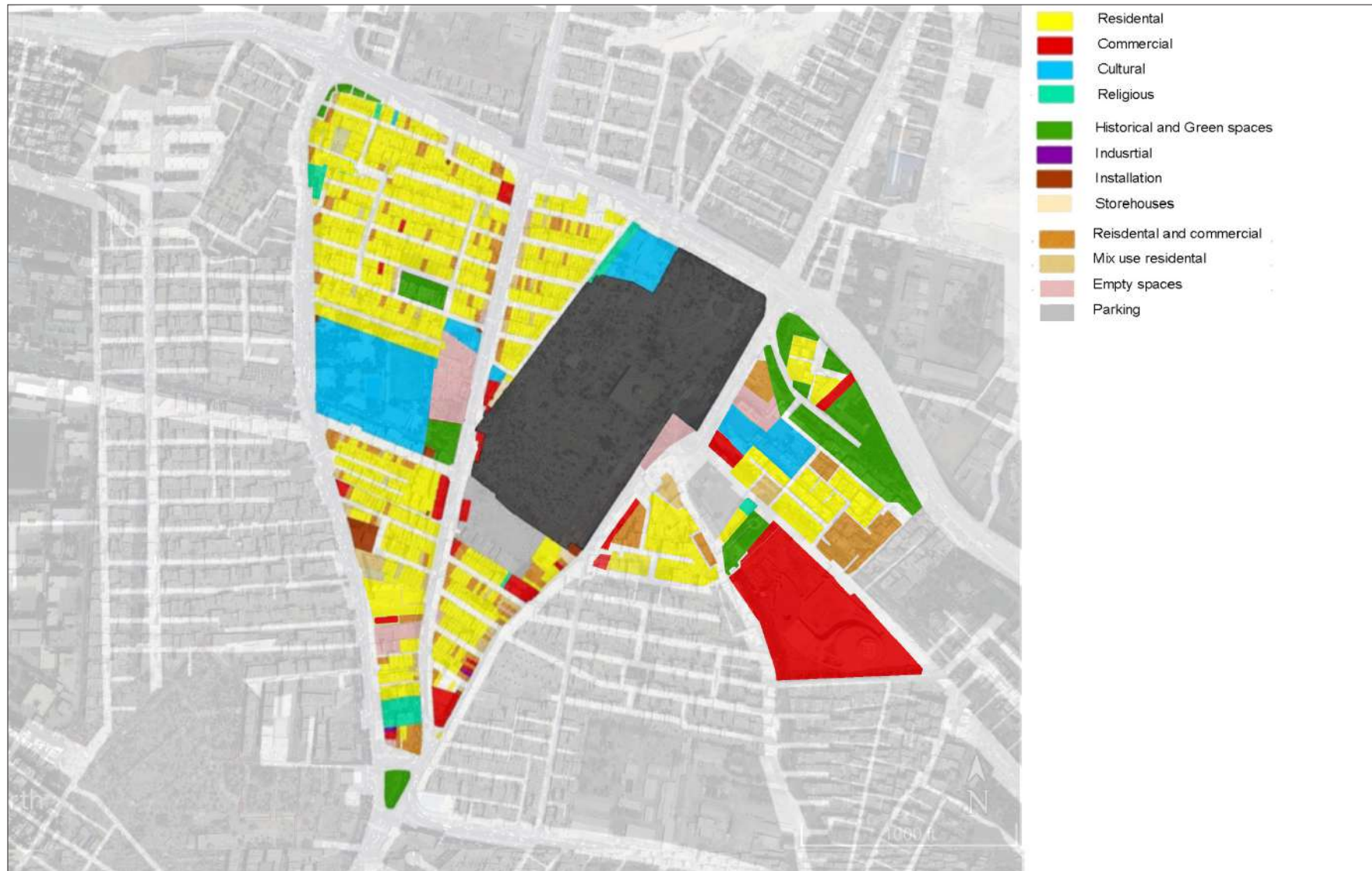


Fig.79: Empty space in the neighbourhood area without any function mostly use as a parking area, 2019



Fig.80: Low-quality open spaces between buildings in the neighborhood area of the cemetery, 2019

Land use of the Neighborhood area



4.4.4 F4: Long Term Management and Development

According to historical photos and maps, the cemetery was initially located in the north of its current land, with a size less than one-third of its present size. By 1969, the area of the cemetery was gradually expanded to approximately eight hectares. Following this initial expansion, the cemetery developed more expansions to roughly fourteen hectares due to the increasing demand for burials. Before the development of Tehran's main cemetery (today with 110 hectares), Ibn Babawayh had a few burials as well.

After a while, the burial was removed from this cemetery and all related ceremonies and facilities were transferred. On the one hand, following the developments in Tehran and Rey, all the lands around the cemetery were considered for residential, commercial, industrial construction. Since today there is no more land in this area for the future development of the cemetery. (Fig.79, Fig.80)

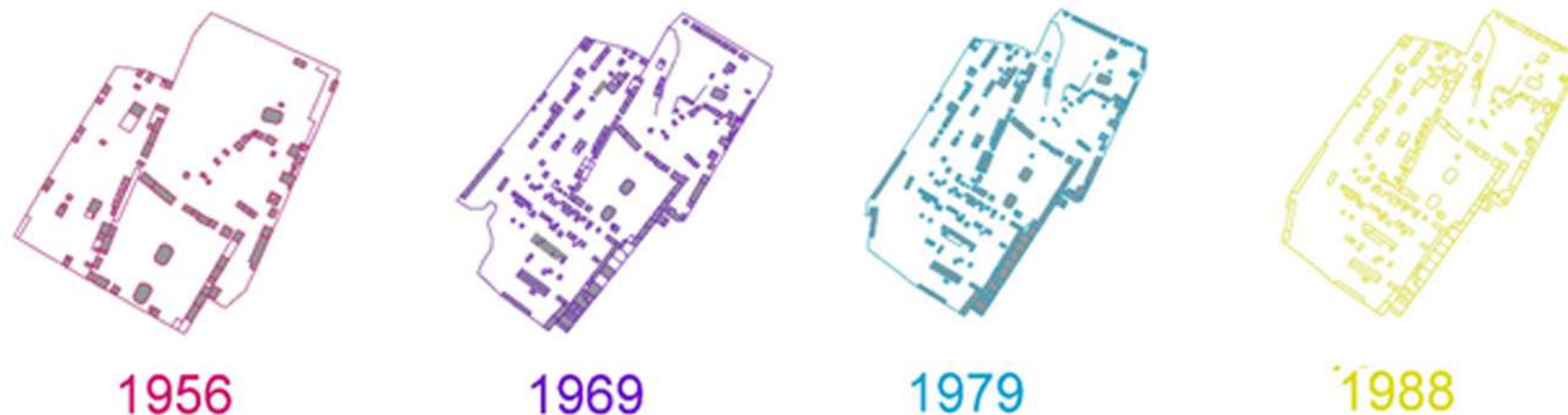


Fig.81: Physical development of the cemetery

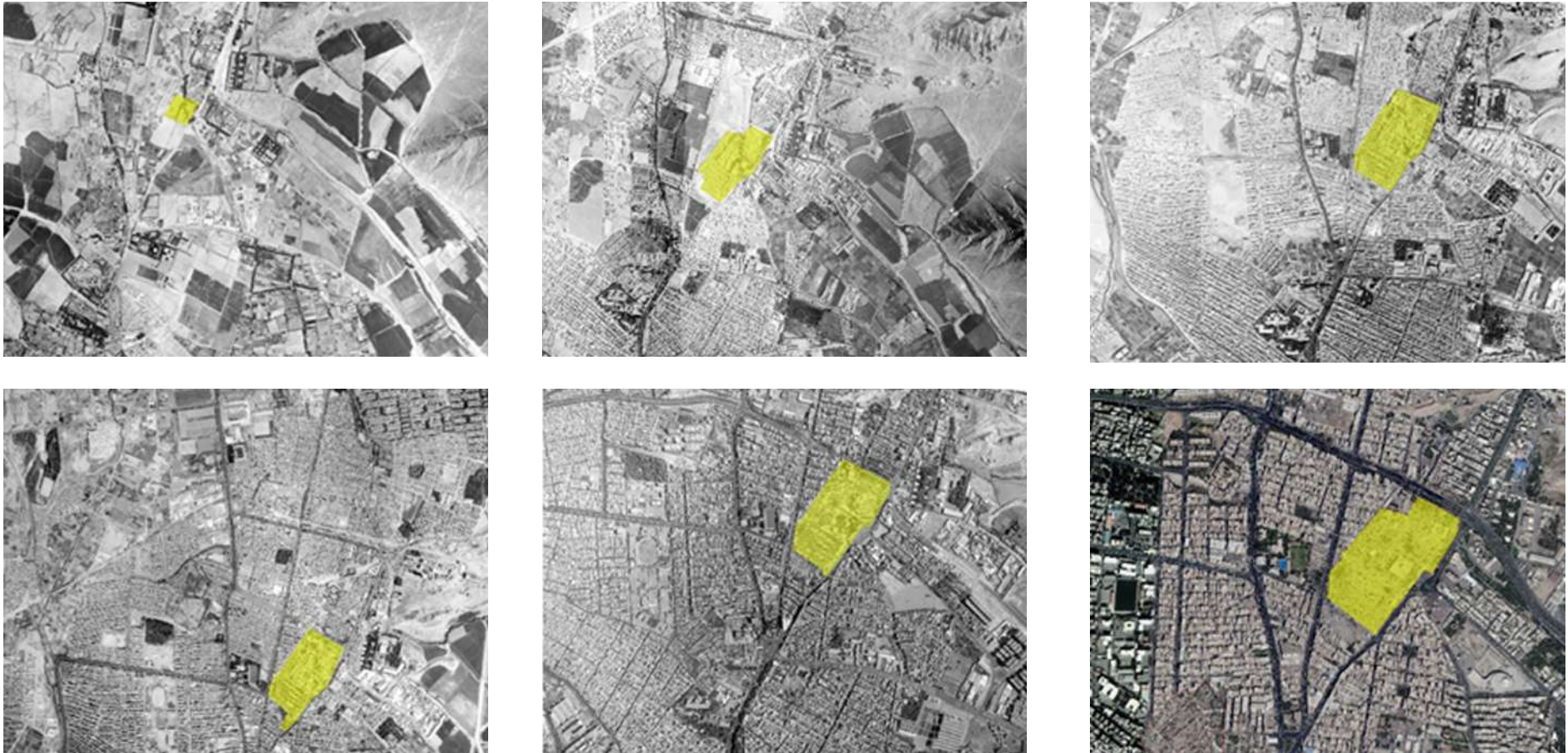


Fig.82: Physical development of the cemetery and Spatial development of neighborhood area

On the other hand, achieving proper maintenance of a place depends on strong partnerships and effective governance/decision-making. However, incapable management system and lack of protection management (or long-term management) are among the most important reasons leading to the current situation of the cemetery. In specific, lack of prioritizing in maintenance, or long-term management of urban cemeteries has resulted in neglecting the position of the cemetery in the city, destroying them, disturbing the order and the general layout of the cemetery, and adding contemporary monuments and residents that decreased the safety of the neighborhood, which became unused in favor of the cemeteries.



In 1992, the Cultural Heritage Ministry of Iran issued a circular letter to related organization (i.e., municipality and the governorate of Rey), to prohibit burials in this area, with the aim of maintaining and protecting this cemetery. Following this prohibition, the municipality of Rey presented many renovations plans for the cemetery. Eventually, during the implementation of a development project entitled “construction of the garden of celebrities,” approximately 400 private and family graves, with beautiful architectures depicting symbols of Iranian art and long history were demolished. Currently, the Endowment Organization is responsible for the management of this cemetery, which limited cemetery to the official employees of this organization. (Fig.83)



Fig.83: Lack of protection management (long-term management) is the most important reason for the current situation of the cemetery, 2017

4.5 Partial Conclusion (SWOT)

Strengths

- The main Entrances to the cemetery and the Tugrul Tower are known as landmarks in the neighborhood
- The neighborhood has desirable condition in terms of public bus service network
- Cemetery occupies approximately 33% of the neighborhood

Weaknesses

- The lands occupied by the green spaces are considerably lower than standard amount
- Lack of empty lands for cemetery development
- Connectivity of local street with cemetery environment is so weak
- Lack of long-term management leads to the destruction of many historical graves during the last decades

Opportunities

- Intersections and especially the Varamin junction (at the intersection of the main road) can play a significant social role in the area
- Linking Shahr-e-Rey Ring Road, Fadaiyan Islam Street, Ghayouri Street, and Ibn Babawayh street, with priority on pedestrian and bicycle could improve functional permeability of the neighborhood
- Low quality Parking lots, old buildings, and abandoned schemes could provide new functions to the cemetery context.

Threats

- Most intersection and nodes in this neighborhood have traffic function
- Shahr-e-Rey Ring Road divided the area under study into the northern and southern parts and therefore, is a serious threat to the connectivity of pedestrian
- Undesirable sidewalks and pathways for pedestrian and bicycles
- Existence of empty, abandoned, and desolated lands in the neighborhood

4.6 Immediate Area and the Cemetery

4.6.1 F1: Appropriate Functions and Usages

Nowadays, there are various functions within the main enclosing walls of the cemetery. The immediate functions and land usages of this cemetery are not developed and consistent with the functions of this cemetery. In the immediate area of Ibn Babawayh Cemetery, functions are mostly service uses with a local scale that meets the daily needs of residents. There is no urban public space with a collective function in this area. Although this neighborhood possesses a strong historical and cultural background that provides the potential to become a cultural and tourist destination. (Fig.84)

Ibn Babawayh Square mostly plays a temporary functional role. The open space at the main entrance of the Ibn Babawayh cemetery was created by the destruction and possession of some buildings in eastern part of the cemetery. Inappropriate design and lack of spaces with proper equipment to adopt the activities, has made this space ill-shaped and unprotectable. Due to its physical features and activity conditions, it has been used as a parking lot. (Fig.85)



Fig.84: Inappropriate functions in the the immediate area, 2019

Land use (Immediate area)

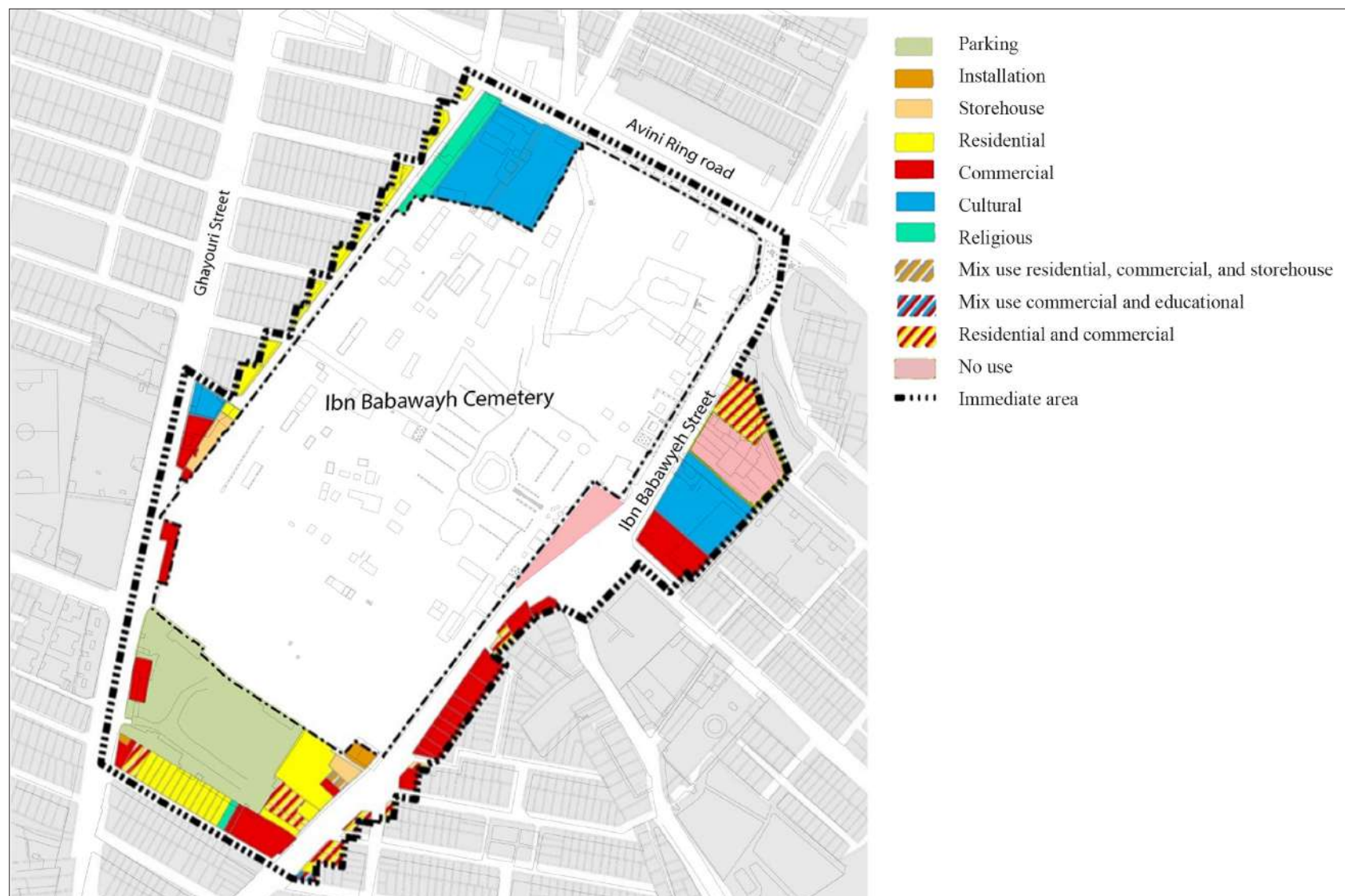




Fig.85: Undesigned space in front of the cemetery is using as a parking and daily vendor market, 2020



4.6.1.1 Utilization of the Cemetery Appropriate to its Historical Elements

Ibn Babawayh cemetery has a urban scale land use and has a significant reputation due to its history. Occasionally, it welcomes people from other parts of the city. Many notable celebrities of culture and art, literati, philosophers, and athletes were buried in this cemetery. In addition, this place possesses priceless cemetery-related cultural symbols. These significant features demonstrate the high potential of this cemetery in attracting audiences and visitors. The four historic layers in this cemetery are:

1. historic water routs originating from the Cheshmeh Ali Stream that crossed the cemetery in the past,
2. historic botanical plants over the shore of the stream,
3. its usage as a public and open green space in the past,
4. historical monuments and tombs all over the cemetery. (Fig.86)

Today, except a few remaining private family tombstones, the rest of this cemetery is public. Prior to the destruction projects in 1992, family tombs, with diverse architectural and decorative patterns, had covered a large area of the cemetery and reflected many different periods of construction and development in the cemetery. Most of the existing tombs date back to the Pahlavi era.

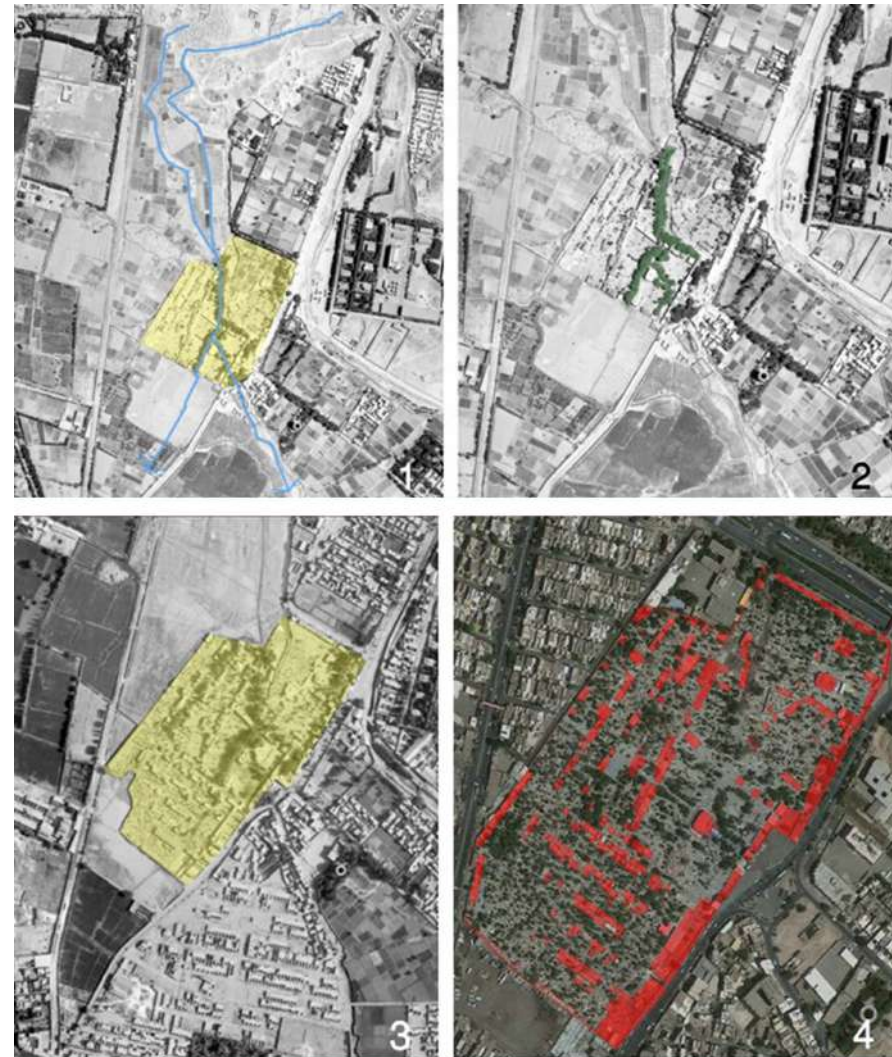


Fig.86: Historical elements of the cemetery

4.6.2 P1: Visual Adaption of the Buildings in Relation to the Context of the Cemetery (Quality, Height, and Material)

Currently, Ibn Babawayh cemetery is surrounded by two educational centers from the north. Due to the recent destruction of the tombs, this part of the cemetery has lost its uniform facade. (Fig.87) To the east, the cemetery is separated from residential constructions by the north-south Ibn-Babawayh Street. This street is the main communication corridor of access to the cemetery (either on foot or using a vehicle). The two main entrances of the cemetery are located on the east side, while the main building of Imamzadeh inside the cemetery is located at the end of this corridor. (Fig.88, Fig.90)

Most buildings on the western side of the cemetery are one or two-floored with low qualities. The Difference in the height of the buildings in the east and west of the immediate area demonstrate the physical difference between these two neighborhoods. (Fig.89, Fig.91)

The southern side of the cemetery is in the vicinity of several repair shops. Therefore, it does not have a physical connection with the urban fabric and is separated using long low-quality solid walls. (Fig.92)



Fig.87: Facade - Northern part of the cemetery, 2020



Fig.88: Facade - Eastern part of the cemetery, 2020



Fig.89: Facade - Western part of the cemetery, 2020



Fig.91: Facade - Western part of the cemetery, 2020

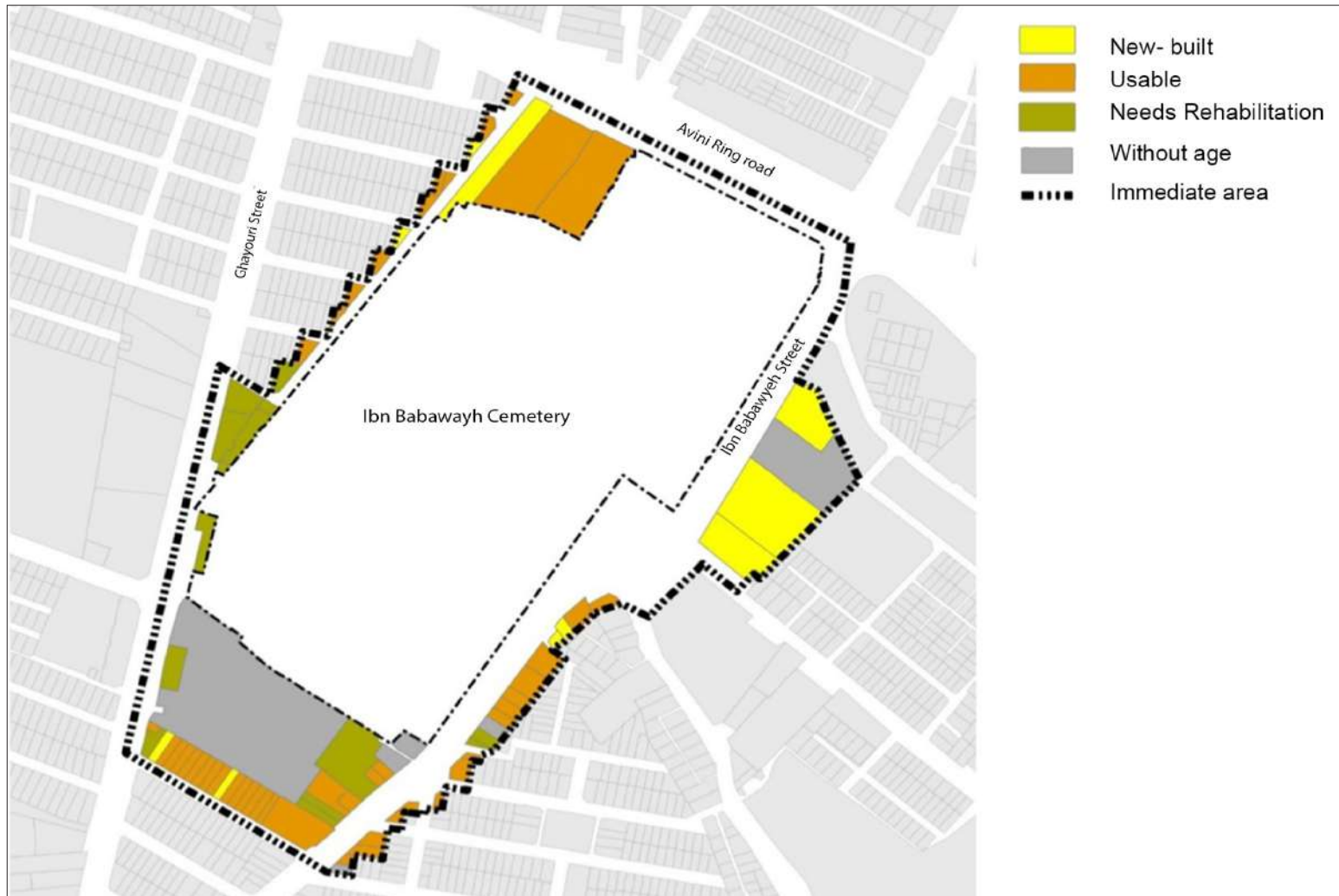


Fig.90: Facade - Eastern part of the cemetery, 2020



Fig.92: Facade - Southern part of the cemetery, 2020

Building Age (Immediate area)



Nowadays, there are graves in the cemetery with two or even three names written on one gravestone, indicating the existence of two or three levels of graves underneath. Most multi-level graves are buried recently, over the remaining of people who died more than 30 years before the time of new burial. In the past, constructing multi-level graves was not a common practice. A family would normally purchase a part of the cemetery as a family tomb. These family tombs were usually private and fortified, and the graves inside were placed side by side. There are no instances of multi-level burials in the past. (Fig.93, Fig.94)



Fig.93: Old Garves, 2020



Fig.94: New Graves, 2020

According to the survey, a variety of materials were employed in the construction of the cemetery's exteriors, and particularly, in the facade.

Thirty to forty years old buildings in the neighborhood employed a wide range of stones in their facade, from marble rocks to granite. However, recent constructions usually employ travertine stones with gray, white, creamy, and in some cases gray and black spectacles. In addition to stones, bricks are also common in constructions facades.

The tendency towards using bricks has often expanded due to the variety of color schemes in new buildings and proper combination of bricks with other materials such as stones. In some cases, cement facade can also be seen in older structures in the neighborhood. (Fig.95)

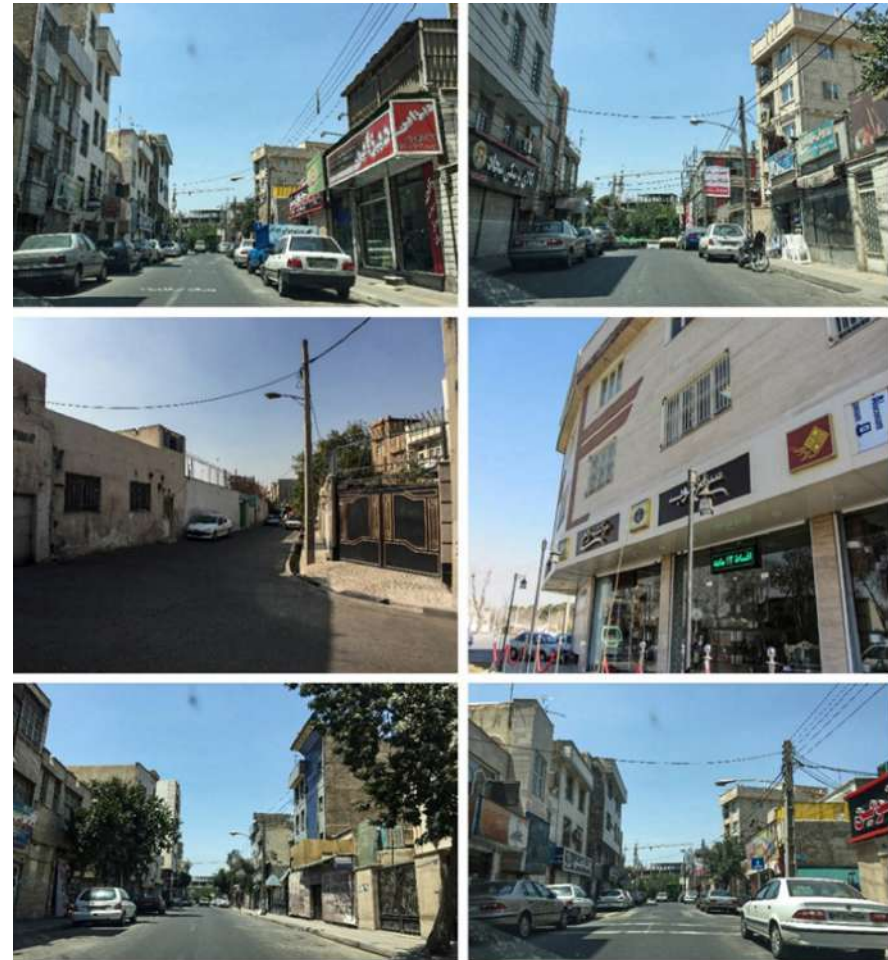


Fig.95: Different materials are used in the construction of neighborhood without regarding perceptual appropriateness to the materials in the cemetery, 2019

Building's material (Immediate area)



Constructions inside the cemetery can be divided into two categories:
1) old-fashioned buildings that belong to family tombs. The main material utilized in these constructions is brick.
2) In some modern buildings inside the cemetery, bricks are utilized with specific techniques for facade. In these buildings, decorations used in facade are mainly bricks and Persian blue stones. (Fig.96, Fig.97)

Most of the stones employed for the gravestones in this cemetery are marble and granite, which has led to a variety of colors and qualities in gravestones. Old gravestones are relatively smaller than newer ones, while the area around them is covered by bricks. Despite the variety in gravestones, the surrounding brickworks follow a single and unique method that ensure the uniformity of the graves.

The size of the graves are relatively the same, while the size of the gravestones vary. In specific, old graves were often constructed in small dimensions (40x40cm or 40x50cm and 40 height) with brick surroundings, while new graves are approximately 50x120cm. However, some old graves have larger dimensions. The graves are in various shapes and are decorated using diverse designs and patterns such as animals, plants, human patterns, and geometric patterns. These symbols are mainly employed in the form of memorials to imply the concepts of life and death. (Fig.98)



Fig.96: Modern brick building, 2020



Fig.97: Main shrine of the cemetery with Persian blue stone facade, 2020



Fig.98: Oldest graves of the cemetery, 2020

4.6.3 P2: Mass and Space, Entrances and Walls, Lighting and Strategic Vistas and Views

4.6.3.1 Appropriateness of the Mass and Space inside the Cemetery

The Ibn Babawayh cemetery, with 12 hectares area, currently includes two main shrines and a few family tombs. In the past, there were more family tombs, but most of its cultural and historical heritage were destructed. What is left is only a few scattered buildings on the site. Therefore, the proportion of space is more than mass in the cemetery area.

4.6.3.2 Clear Multiple Entrances and unsolid Walls

Ibn Babawayh cemetery is divided from its surrounding neighborhood via a few main and secondary entrances. However, some of these entrances are abandoned elements that split the cemetery from its immediate area. In practice, there is no relation between the spatial organization of the cemetery and its neighborhood. In the past, the cemetery did not have any walls. But recently, some limitations to access and connectivity, mostly through using low-quality metal fences and rails, are provided to separate the cemetery from other urban spaces and reduce its social vulnerability and increase the safety of its immediate area.

On the other hand, construction of numerous entries and secondary accesses to the cemetery have undermined their organization and design. Today, the cemetery has five entrances, two of which are main entrances and the other three are sub-entries. The two main entrance in the Ibn Babawayh Street have doorways with unique identity compared to others. The height of the main entrances made it more legible. As a result, citizens easily notice the entrances as they approach them from a few hundred meters. Entrance and exiting the cemetery is mainly through those entrances. The doorway upper entrance has an Islamic architectural design, named after a notable person, Sheikh Sadugh. However, this entrance has more of a decorative function for the cemetery, and is not used as an entrance. (Fig.99, Fig.100)

The first sub entrance located on the northern face of the cemetery and opens to Rey ring road. Today this entrance is closed and there is no connection with the surrounding area through this door. (Fig.102)

The second sub-entrance is on Nasr Street, to the west of the cemetery, with no special design or physical form, and is open. This entrance provides access to Ghoryouri Street from the Nasr alleyway Route. (Fig.101) Finally, the third sub-entrance is located south of Ibn Babawayh Street and has no doorways. (Fig.103)



Fig.99: Main Entrance, Ibn Babawayh Street , 2020



Fig.100: Northern entrance, Ibn Babawayh street, 2020



Fig.101: Second sub-entrance, Nasr Street, 2020



Fig.103: Third sub-entrance, south of Ibn Babawayh Street, 2020



Fig.102: First sub entrance, Rey ring road, 2020

4.6.3.3 Lighting

The sidewalks in the immediate area generally have lighting at nights. Conversely, lack of lighting, or ineffective lighting system, is one of the other shortcomings of the buildings inside this cemetery, which is justified by the fact that cemeteries do not have functions at nights. However, a review of the Behesht Zahra organization confirms that general lighting of the cemeteries has an inverse relationship with rate of delinquency and social misconduct. Although a few proper lightings are available in the central and main parts of Ibn Babawayh Cemetery, most areas and facilities lack proper lighting. (Fig.104)



Fig.104: Low quality lighting system , 2020



Mass and Space, Entrances, Lighting of the cemetery



4.6.3.4 Strategic Views, Vistas, Skyline, and Landscape:

Strategic vistas and views in the urban spaces increase the legibility of the environment and facilitate navigation. Strategic vistas and views can provide a corridor view or an extensive one. As we mentioned before, the city of Rey is one of the three main historical zones in Tehran province. Therefore, many valuable historical sites and constructions exist in this area. Providing view to these buildings and sites can be considered as strategic landscape as well. In the region surrounding the Ibn Babawayh cemetery, Bibi Shahrbanoo Mountain and Rashkan hill are the most important strategic landscapes. Bibi Shahrbanoo Mountain is located east of Rey and is considered as the natural symbol of this area, which can be seen from any place within the cemetery. The Tugrul Tower is located east of Ibn Babawayh cemetery. Although the walls and fences of the cemetery prevent view to this tower, it can still be seen from a number of spaces within the cemetery. (Fig.105)

The interior skyline of Ibn Babawayh Cemetery is cut off by several single-floor buildings inside the cemetery. The dome (the cemetery's main building) is the most important element in the skyline of this cemetery. The interior space of the cemetery has organic blocks, which are generally strengthened according to the slope in the ground. However, different levels of platforms inside the cemetery created a stepped access, which affects the landscape structure of the cemetery and its uniformity. In general, poor urban landscape management is evident in the area of the cemetery. Lack of attention to the identity of urban elements in the urban landscape, along with discontinuity in the sky line created by the lack of balance and coordination with neighboring buildings and the unbalanced construction are the main damages to the urban landscape in the cemetery.



Fig.105: Bibi Shahrbanoo Mountain, Tugrul Tower, and Rashkan hill are visible from inside the cemetery

Interior and exterior Skylines



4.6.4 F2: Accessibility and the Quality of the Flooring for Pedestrian

The immediate pedestrian routes of this cemetery have a good quality of flooring in the north and some parts in the west side. On the other hand, pedestrian walks in the east, south, and some area in the west have narrow and low-quality flooring (Fig.106, Fig.107, Fig.108, Fig.109).

Due to the shape and form of this cemetery, cemetery itself, despite its extensive area, does not have any internal vehicle streets, Hence, public transportation vehicles cannot enter the cemetery. The tombs in the northern part of the cemetery are more dispersal, compared to

oother parts, which provides a suitable flooring for pedestrian. Other parts of the cemetery have higher grave density (Fig.110).

Therefore, walking along the path of the cemetery is relatively harder. Nevertheless, the material employed for the construction of the flooring is different in each part of the cemetery. In specific, various types of regular and irregular paving are employed with. Only in the middle section of the cemetery, around Sheikh Saduq and Imamzadeh Hadi, the paths are floored with stone, which was a recent project with the aim of improving the surrounding area of these shrines.



Fig.106: The sidewalk - North side of the cemetery 2019



Fig.107: The sidewalk - East side of the cemetery, 2019



Fig.108: The sidewalk - North -West side of the cemetery, 2019



Fig.109: The sidewalk - South-West side of the cemetery , 2019

Pedestrian paths (Inside the cemetery and Immediate area)

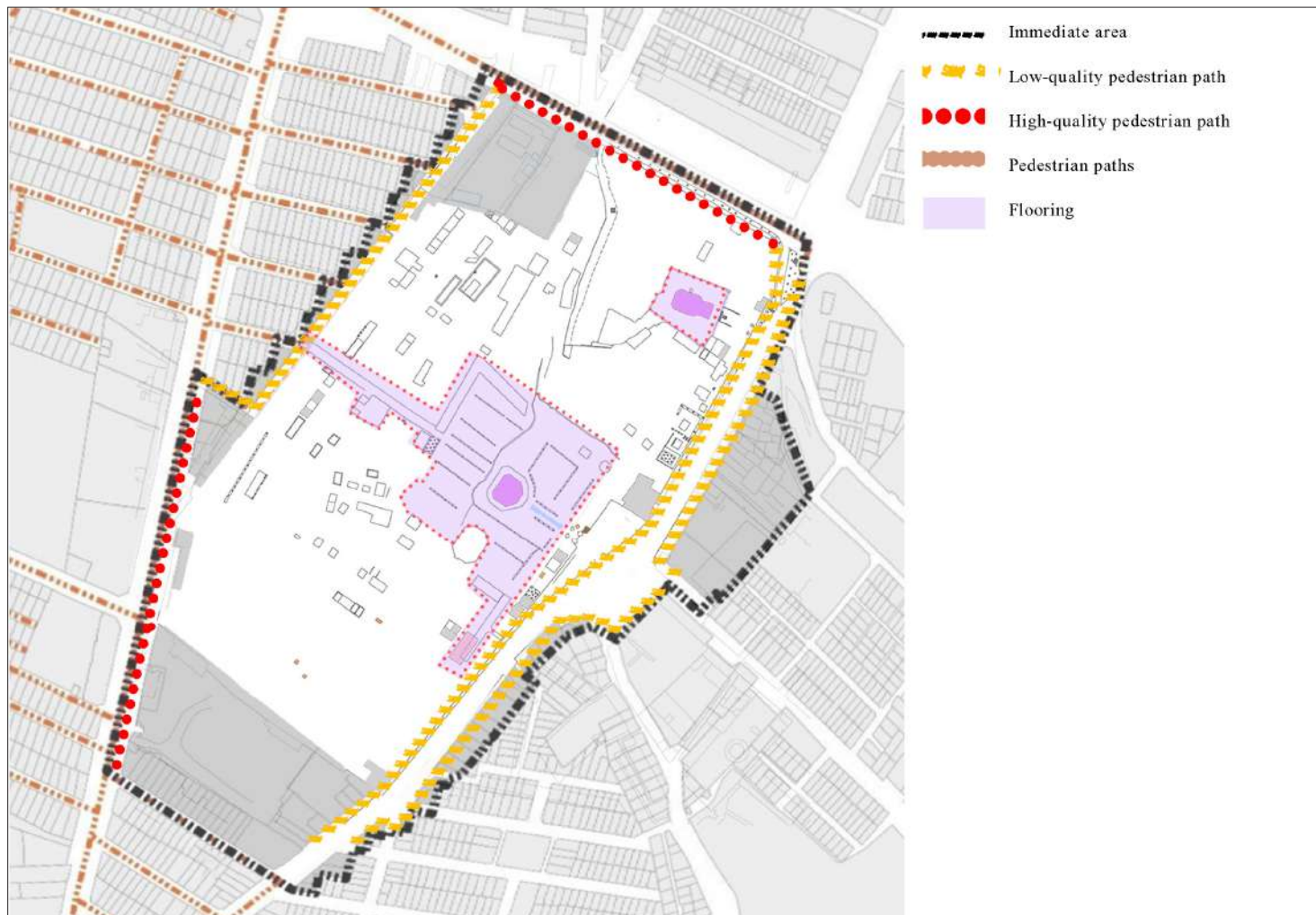




Fig.110: The middle section of the cemetery is floored with low quality material, 2019

4.6.5 F4: Flexible Furniture and Spaces for Different Events And Ceremonies

Ibn Babawayh cemetery offers a large open space as a burial site. The main entrance of this cemetery is connected to the funeral area through a spacious space. The first entrance provides access to the prayer rooms and bathrooms and the Sheikh Sadugh tomb. Imamzadeh Hadi and a number of family tombs are located at the second entrance. (Fig.111) However, all spaces were constructed permanently and with no flexibility or movability for different ceremonies and events. Also, according to the survey, a few furniture just is provided by the owner of the family graves. Other than these, no convenient furniture is provided for public. (Fig.112, Fig.113)

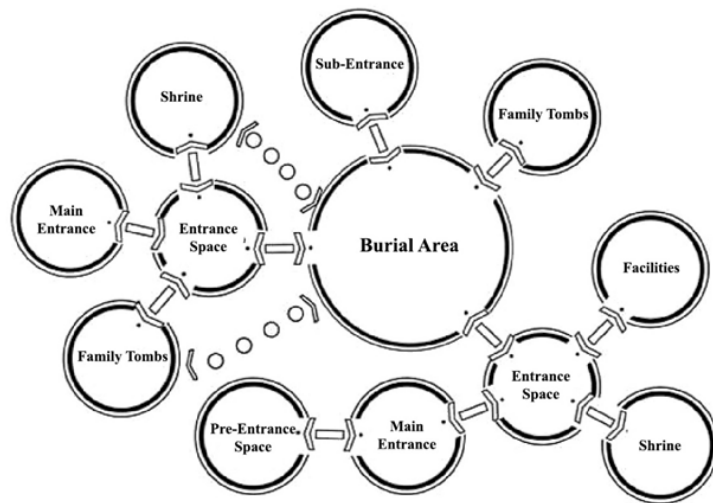


Fig.111: Spatial Diagram - Inside the cemetery



Fig.112: No specific area for ceremonies and events inside the cemetery, 2019



Cemetery land use plan



Fig.113: Low-quality furniture inside the cemetery, 2019

4.6.6 P3: Different Colors

In the cemetery's immediate area, similar to most parts of Tehran, the basic and main color palette is a combination of creamy, white, and gray, ranging from bright to dark colors. The color palette of the surrounding area does not provide a special and distinctive characteristics compared to other neighborhoods of Tehran.

Inside the cemetery, the dominant color of the stones is gray. In the middle of this spectrum of colors, the color of the trees (green) and the color of the tiles (blue) creates a contrast with gray. (Fig.114)



Fig.114: Color palette - inside the cemetery

4.6.7 E1: Topography and Environmental Safeties (Eco-Friendly)

Ibn Babawayh Cemetery has a slope of 1% from the north-south axis, and is located 1067 to 1072 meters above the sea level. The study by the Jakarta Gestra divided Tehran into five topographic units: mountains, hills, old alluvial cones, new alluvial cones, and alluvial fields. Ibn Babawayh Cemetery is located in the alluvial field. The ground of the cemetery has a relatively steady slope from north to south, except for the southwest and west part of the mosque (sometimes with a height difference of 2.5 meters).

By looking at the cemetery, it is obvious that the burial site is not flat. The disharmony in altitude changes can be observed in different parts of the cemetery. Overall, there is an 8-meter difference between the highest and lowest points of the cemetery. The desolation of family tombs eliminated a considerable part of the historical heritage of the city and created an inappropriate platform for massive waste and other environmental damages inside the cemetery and sustainable energy does not exist inside the cemetery. (Fig.116, Fig.115)



Fig.116: Stairs made by graves make connect the highest and lowest points of the cemetery, 2019



Fig.115: Environmental damages inside the cemetery, 2019

4.6.8 E3: Natural Elements (Water, Plants, and Animals)

The entrance of the Ibn Babawayh Cemetery is surrounded with an area of trees planted in a specific order during a particular period. Except for this part, trees in other parts of the cemetery did not receive proper attention in planting order, time, and type. Studies indicate that most of old vegetation in cemetery are remaining from Qajar dynasty. The majority of the trees inside the cemetery (with the exception of those in front of the buildings and in the main courtyard) does not have regular irrigation system. Most of the trees are planted by the relatives of the deceased to create some form of shadow for the grave. Therefore, there are no specific pattern and type for planting the trees in this part.

Vegetation coverage of the Ibn Babawayh cemetery has a good variety in terms of old and new. However, compared to the size of the cemetery, the amount of vegetation is relatively small. The quality and diversity of vegetation is not desirable. Due to the lack of green spaces and plants, ecological functioning of this cemetery is very poor. There are no signs of seasonal changes. Most of the plants inside the cemetery are Maple, Elm, Asparagus, Tehrani Pine, Chamomile, Acacia, and Berry. Lack of proper volume of vegetation in the burial grounds is significant. Consequently, there is not enough shadow to increase the environmental comfort of the visitors. (Fig.117)

According to the historical pictures of the cemetery, Cheshmeh Ali Stream passed through this cemetery prior to 1956. This water was employed to irrigate the plants, bathe the corpses, and wash the graves. However, the main view of the cemetery is changed by altering the direction of the stream and transferring it through underground channel. In any case, the most significant natural damage is the destruction of the waterway and water channels in the Ibn Babawayh Cemetery, due to a lack of proper management (Mansouri, 2017, translated from Persian). To wash the graves and other local traditions and ceremonies, a few low-quality ponds and canals were created in the cemetery. (Fig.118)

Vegetation volume inside cemetery

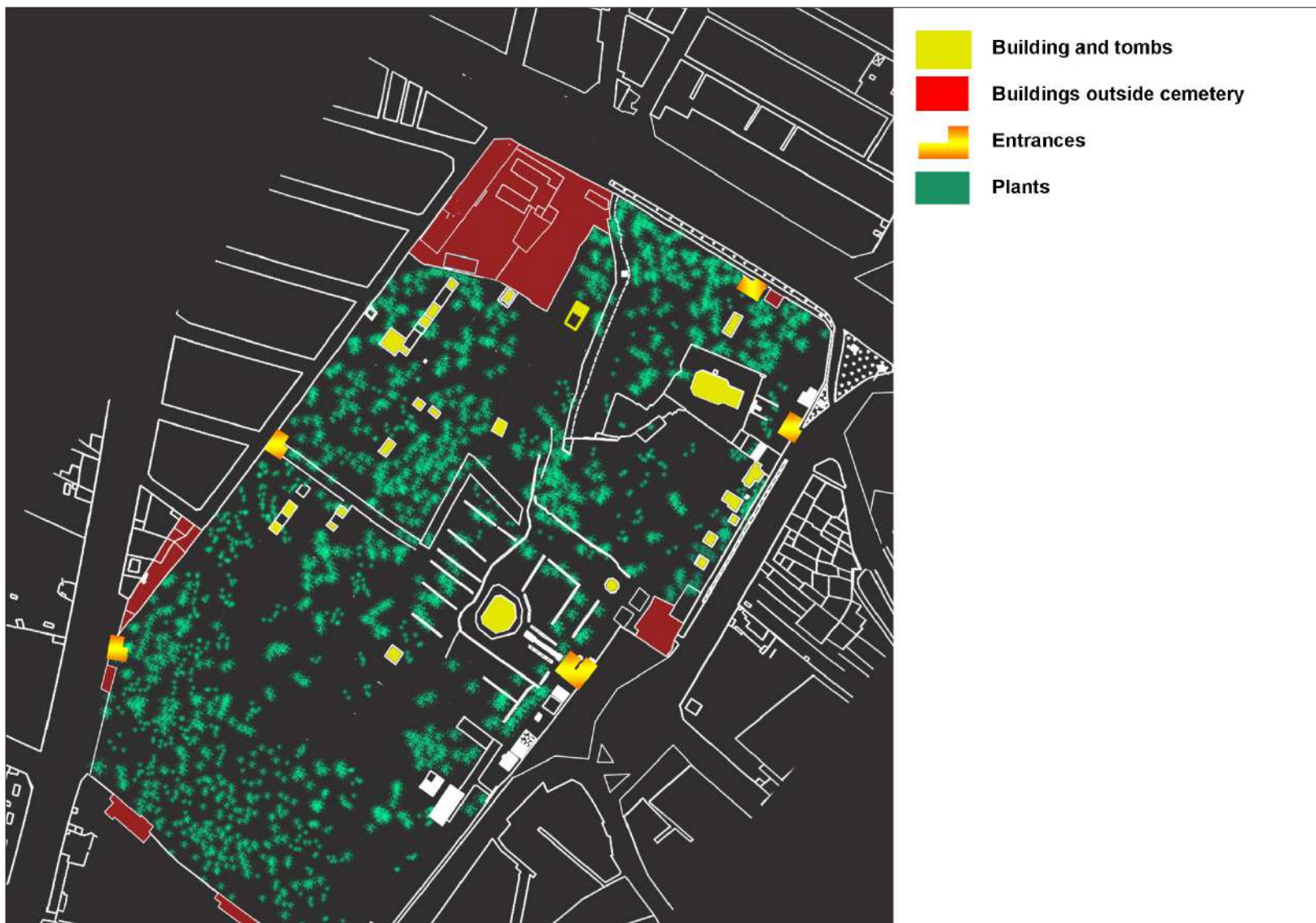




Fig.117: There are no regular irrigation system, 2019

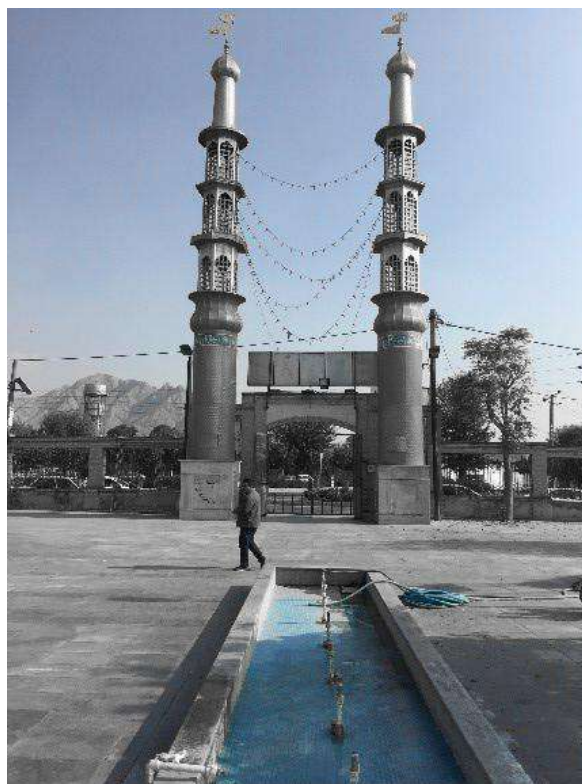


Fig.118: Low-quality ponds inside the cemetery , 2019

4.7 Partial Conclusion (SWOT)

Strengths:

- The graves inside the cemetery have a wide range of shapes with natural elements
- Buildings on the east of cemetery have proper facade
- Many cultural and artistic celebrities, literati, philosophers, and athletes are buried inside this cemetery
- The proportion of space is more than the mass in the cemetery area
- Bibi Shahrbanoo mountain, Toghrol tower, and Rashaan hill, are created strategic views and vistas inside cemetery
- Cemetery has numerous entries and subsidiaries
- Vegetation coverage in the cemetery has a good variety in terms of old and new

Weaknesses:

- There is no urban open public green space in the immediate area
- A wide range of materials and colors is employed in the cemetery and its surrounding area
- Inside the cemetery, the higher grave density in terms of graves location leads to the difficulty of walking and moving along the path of the cemetery for the pedestrian
- Three of the five entrances have lack of proper design and legibility
- All constructions within the cemetery are permanent with no flexibility or durability
- The color of the cemetery has no variety or any special and distinctive character
- Sustainable energy is not utilized in the cemetery
- The quality and diversity of vegetation is not desirable
- The lack of vegetation cover volumes in burial areas
- Discontinuity in the skyline due to lack of balance and coordination of the buildings with the neighboring area

Opportunities:

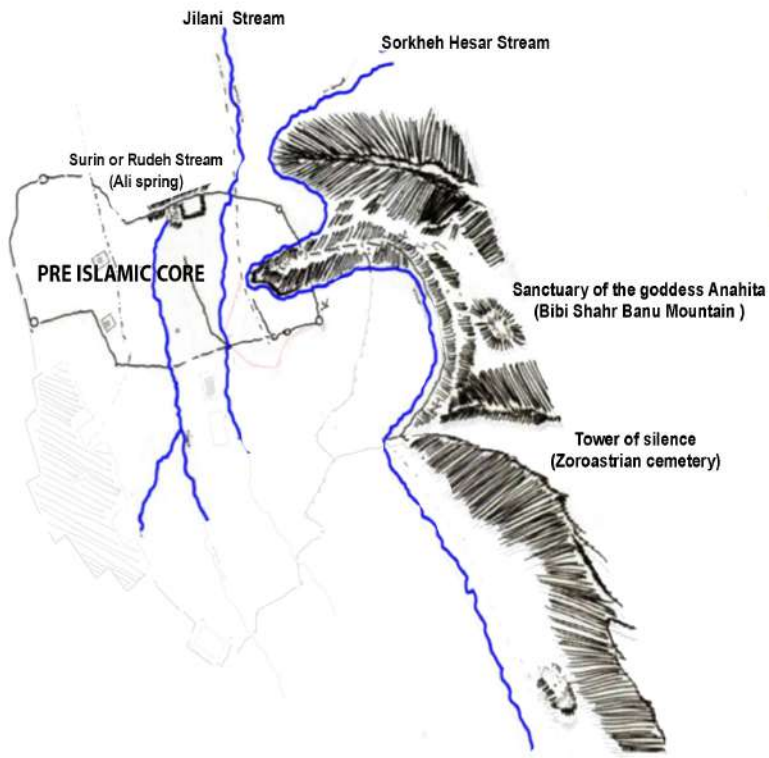
- Destruction of low-quality buildings and organizing current building's facade around the cemetery
- Defining a suitable interior facade and unique material for the cemetery
- The spatial opening in front of the cemetery has the potential to become a collective space
- Improving the relationship between the cemetery and its surrounding context through eliminating incompatible functions and land uses in the immediate area and creating appropriate open public spaces according to the context of the cemetery
- Restoring Cheshmeh Ali waterway through this cemetery and create high-quality ponds
- Creating unique and well-defined grids for the tombs
- Organizing exterior skyline in the immediate area of a cemetery
- Activate all entrances and changing material of wall into permeable material
- Defining integrated floorings inside the cemetery
- Improving light system for graves area at night
- Defining flexible areas and furniture for ceremonies and events

Threats:

- Northern and southern parts of the cemetery lack a uniform facade
- Low-quality Buildings surround western parts of the cemetery
- Inappropriate design of the space in front of the main entrance resulted an ill-shaped space
- Existence of inappropriate and incompatible functions in the immediate area of the cemetery
- Destruction of waterways as historical layers inside the cemetery and construction of Low-quality ponds for daily using, lack of proper volumes of plants and diversity, cutting the grown vegetation and extinction of animal species inside the cemetery are the main ecological damages.
- Limited access to the cemetery due to low-quality fencing
- The different types of flooring material used in the cemetery created regular and irregular paving in each part.
- Sidewalks are narrower on the south and west side of the cemetery
- Lack of furniture and comfortable rest area for visitors
- There is not any specific guidelines and patterns for planting inside the cemetery
- Lack of organization in the urban elements and landscapes of the cemetery
- Insufficient lighting facilities for the most parts of the cemetery, with few proper lightings in the central and main parts

P1 : Spatial and physical adaptability of the region with the historical identity (Pre-Islamic Era ,Early Islamic Era ,Late Islamic Era and Industrial era)

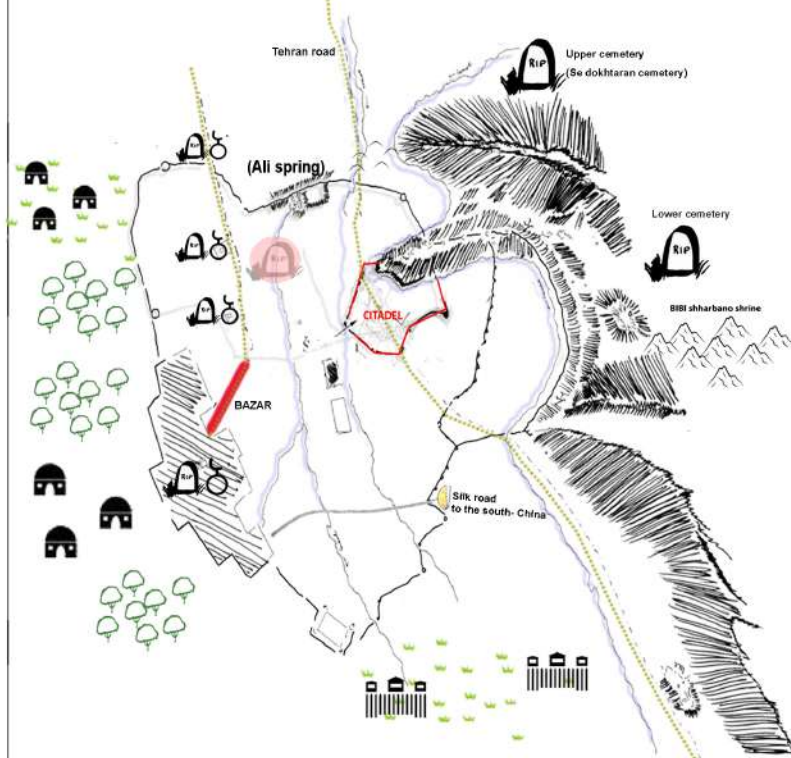
Pre-Islamic era: Religious and Natural Elements as Influential Factors in Formation of Rey



The first core of Shahr-e Rey was formed around Cheshmeh Ali(Spring). After a while, for the protection of spring, a huge fortification was built around this spring and the rest parts were surrounded by a trench. Fortifications were built by using the heights in its north and east. City took advantage of those heights and was built according to the natural environment for the safety of the city against attacks and enemies.

According to the Zoroastrian tradition, they consider a dead body unclean and polluted. Therefore, during this time, in Rey city corpses demon were placed atop a tower(Tower of silence) in the mountain and so were exposed to the sun and to scavenging birds. Following that, for the first time, the first place with the function of the cemetery had shaped in Rey next to Anahita mountain (Bibi Shahr Banu mountain).

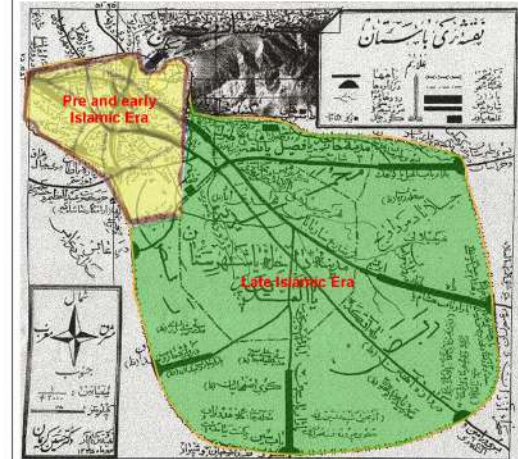
Islamic era: Religious and Commercial Elements as Influential Factors of Development in Rey



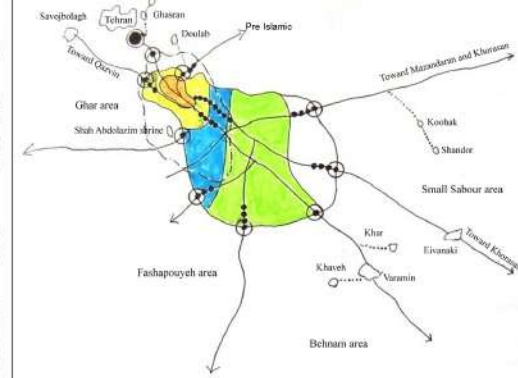
The arrival of Islam in the seventh century Islam, and particularly its Shi'ite branch, has had a significant impact on the development of the form of traditional Iranian cities developments. Imamzadih (holy shrine) was so important in Iran. In many cases, they were the main reasons for the initial establishment or future development of cities.

When the official religion of Iran was Shi'ite, Rey developed around Abdol Azim Shrine and its main bazar at Rey's central core. During this era, as well as in modern ones, the main religious buildings were mosques, madrasahs (madrasas or religious schools), imiimziidihs (shrines of Shi'ite Imam descendants), husayniyyih s (buildings for religious mourning), and mazairs and pirs (culturally respected shrines). Therefore many various shrines had been built on notable people's tombs and endowed properties according to the bazar axis for pilgrims. During this time addition to other holy burial spaces within city, two main Muslim's cemeteries had shaped within a natural and open area close to mountains.

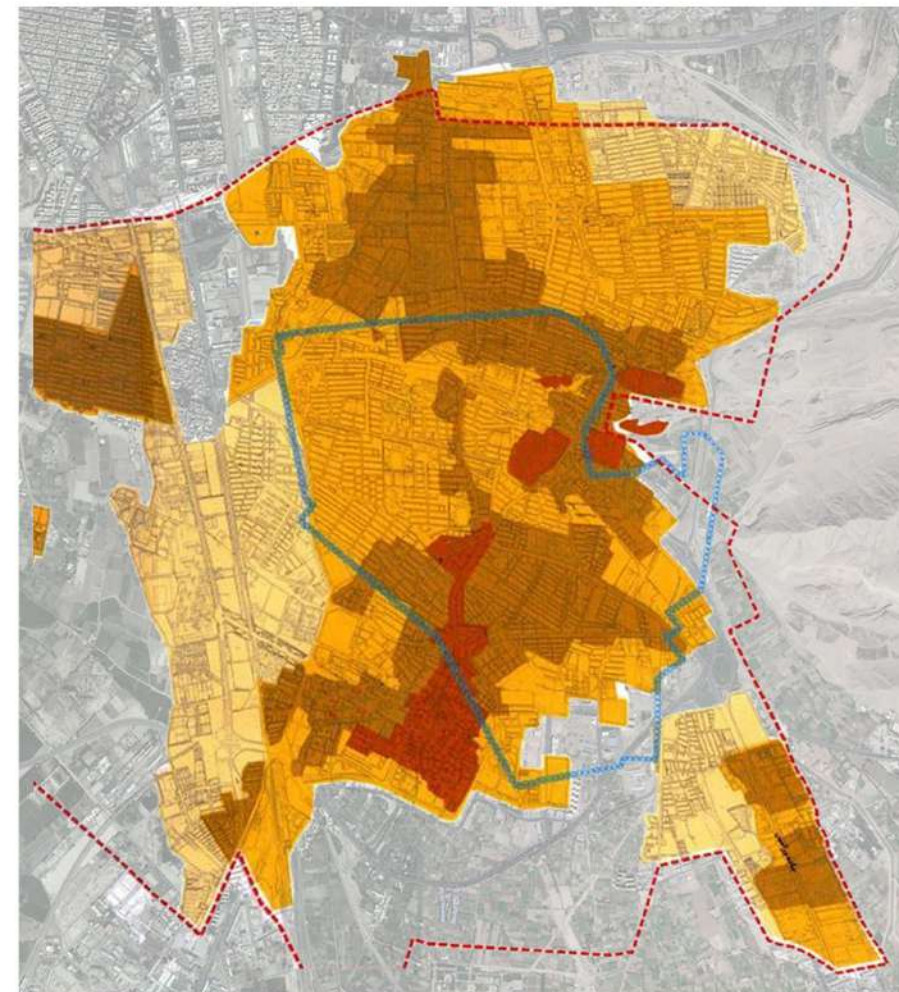
Rey city core during Pre and early Islamic era untill late Islamic era



Rey Spatial developmnet steps during early and late Islamic era



Physical Development of Rey, after Modernism: Industry and Street as Influential Factors



After 1976 AD, the physical development of Tehran, particularly in the southern parts accelerated because of immigration growth. Rey, in addition to the growth of residential-peripheral context, a lot of industrial storehouses and workshops were established. So today Shahr-e Rey became an industrial-residential district .



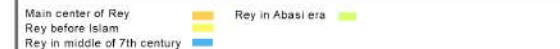
Indicator P1 - Perceptual Compatability

Spatial and physical adaptability of the region with the historical identity (Pre-Islamic Era, Early Islamic Era ,Late Islamic Era and Industrial era)

Legend:



Legend:



Legend:



Strength

- Religious belief and natural elements were influential factors in shaping the ancient Rey

Weakness

- The elimination of the vast area of natural environment from citizen's daily life during Islamic era

Opportunity

- Expanding the structure into new centers to regard religious, cultural, and commercial needs, while responding to natural surrounding elements

Threat

- Industrialization of the city in the last two centuries led to elimination of many natural elements, from physical and spatial structure of Rey, during late Islamic and modern era, and transformed this region into a car-centric region.



Industrial era, Remains of early Pre Islamic cemetery, Tower of silnce



Early Islamic era, Abdol Azim Shrine



Late Islamic era, Abdol Azim Shrine, main core of city



Early Islamic era, Cheshmeh ali Spring



Late Islamic Era- Ali spring and disappiring of its natural context



Recreational usage of Ali spring



Industrial era-First factory of Tehran , Cemet Factroy of Rey





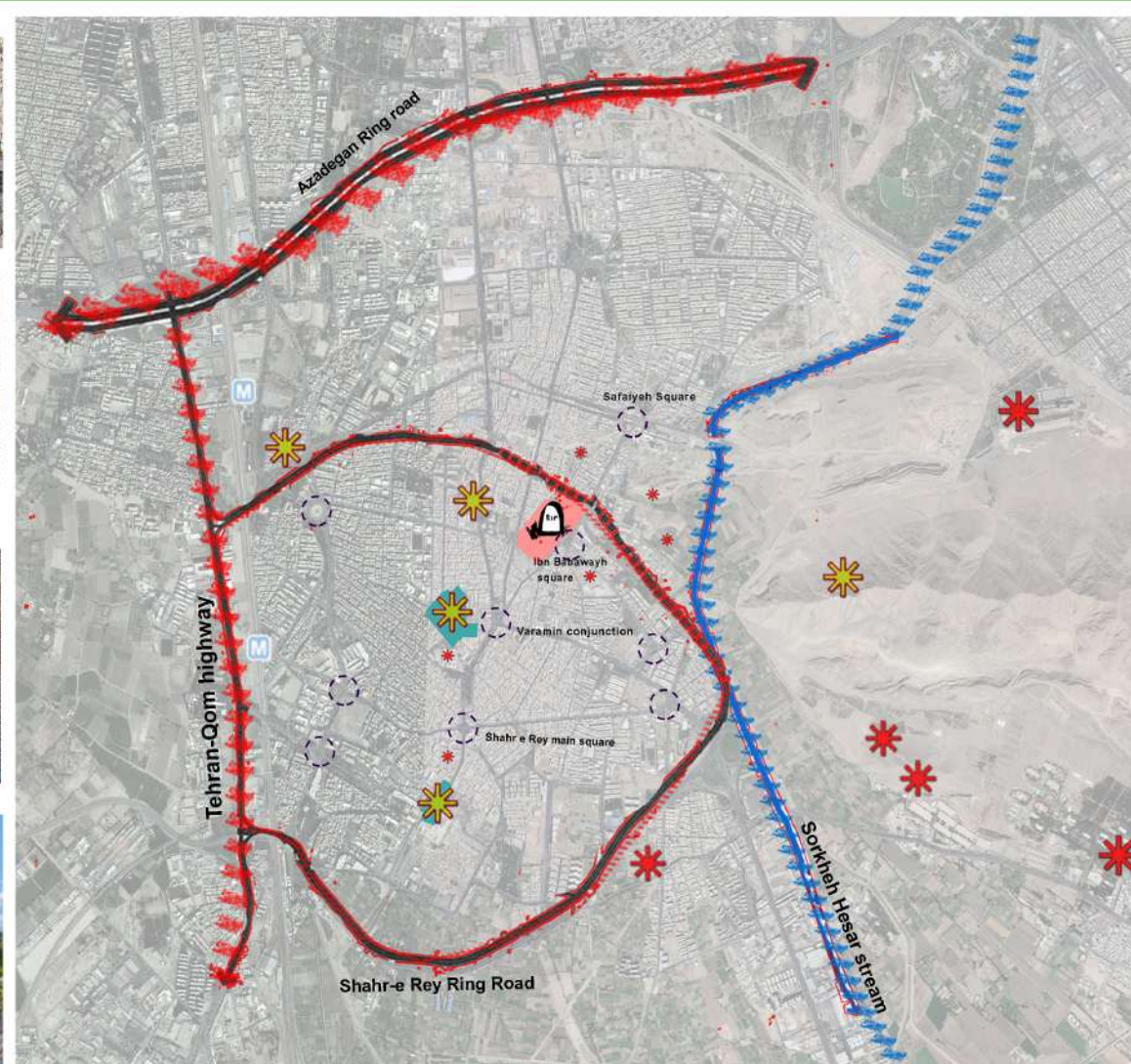
In order to find existence of this permeability indicator in the territorial area, paying attention to the way of arranging and connection between the main urban areas (hierarchy of roads). Considering the role of axes in the area, they can be divided into different levels. So some provide access to the area, some act as the main and border axes (separate the area from the peripheral environment), some play their roles as the main sections in connecting and relating the different internal and external urban areas and forming the general structure of the urban fabric.

The accessing paths to the urban cemetery area are: Shahr-e Rey Ring Road and Imam Hasan boulevard which passing through the middle of the urban fabric, Fadaiyan-e Islam, Shahid Ghayuri and Safaye Streets that leads the movement flow from north to the area and vice versa, and the southern part of Ibn Babawayh Street that leads the access flow from the south towards the area.

Nodes:

Land marks:

Edges:



• Nodes as any place where paths meet; either sociable or traffic: There are ten major traffic nodes in the territorial area which are active on different scales.

• Landmarks as any publicly-relevant activities, either in buildings or in outdoor spaces: In the Rey, the historical urban open public spaces and places are the most considerable ones and can be mentioned as a legible elements.

• Edges or distinct limits to areas with different patterns of use or visual character, any strong linear barriers: Considerably, Shahr-e Rey are surrounded by different edges with different characters and scales. In this area the 3 main edges are Shahr-e Rey ring road in the north and south, Sorkheh Hesar stream in the east and Tehran Qom highway in the west.



Indicator F2 - Functional Permeability

Mobility through urban area

Indicator P2 - Perceptual Permeability

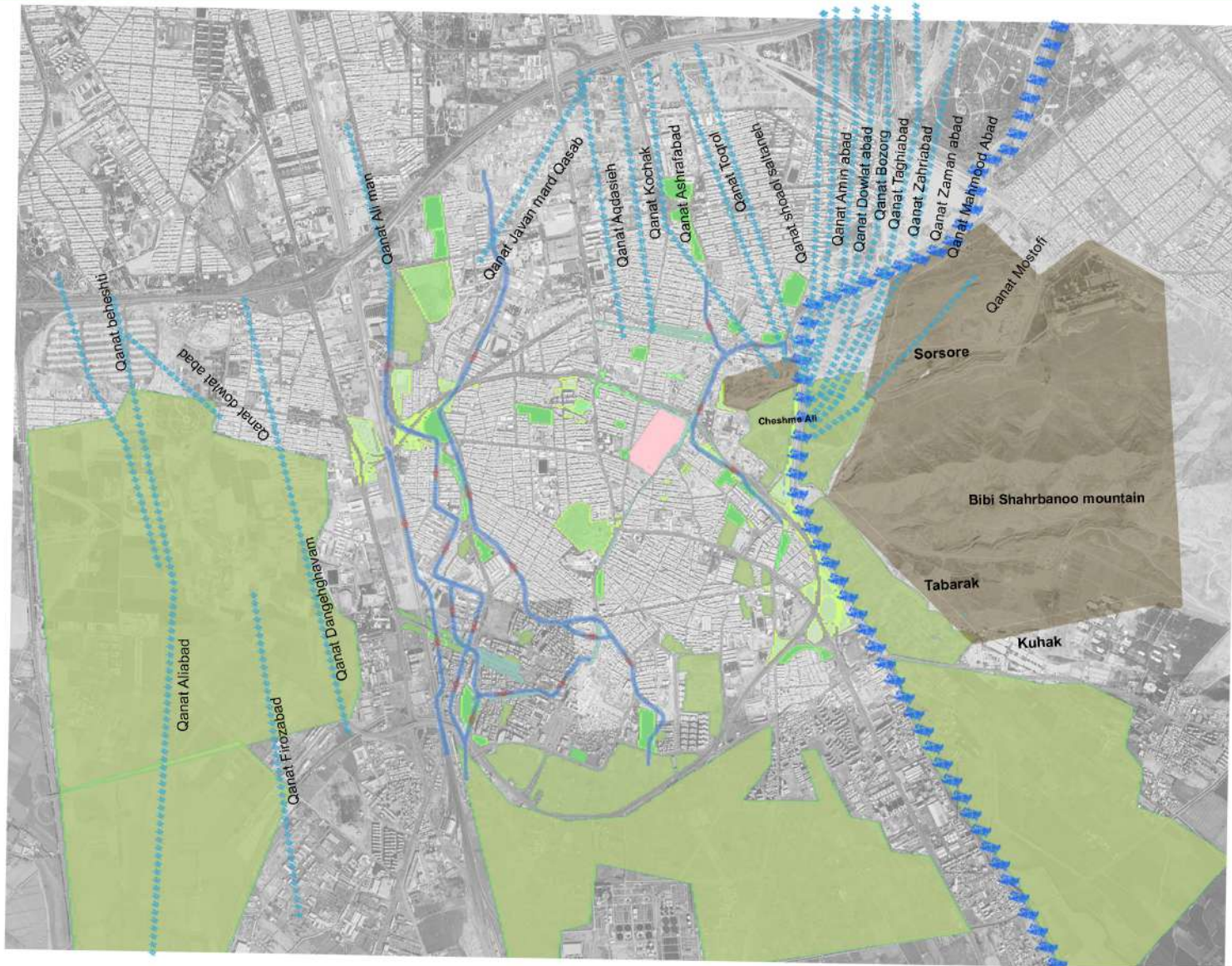
Focal points

Legend:

- Traffic Nodes
- Natural Edges
- Artificial Edges
- Religious landmarks
- Cultural and historical land marks
- Case study

SWOT

- Strength**
- Existence of Shahr-e-Rey main square in the south of region as a sociable node
 - Ease of traffic movement through urban areas with proper hierarchy of roads
- Weakness**
- Territorial area of the cemetery is surrounded by Shahr-e-Rey ring road, and Tehran-Qom highway
- Opportunity**
- The main square of Shar-e-Rey and Safaiyeh Square plays social and functional roles in the region. They are the final points of the Ibn Babawayh corridor in the north and south, and the best places to organize important urban open public spaces.
 - Sorkheh Hesar stream provided a suitable opportunity for corridor connections and the permeability of the region
- Threat**
- The issue of traffic in the nodes of this region is more functional than social
 - Separation of cemetery with Rey northern part by the Shahr-e-Rey Ring Road
 - Lack of pedestrian and bicycle priority of movement in most



A. Green corridors: According to the map, Rey region totally has covered many green corridors within itself. These green corridors in this area includes green streets, green nodes, parks and agricultural land, which mostly has located in the southern and western part of Rey.



Pedestrian path



Park



Squares as green nodes

B. Blue corridors (Streams, Qantas and Reservoir): In the past, water was supplied by reservoirs, streams and Qanats. The important streams are the Sorkheh hesar stream, Surin or Rudeh Stream (now, it is called Cheshmeh Ali), and The Jilani or Gilani Stream. The Sorkheh hesar channel is the only open water channel of Rey and the others channels inside Rey city are covered. Qanats inculeds (Aminabad qanat), Shahi or Shaahi Qanat, Nasrabad Qanat and Qarshi Qanat.



Ali spring



Sorkheh hesar stream, current era



Sorkheh hesar river , early ismaic era

C. Heights and Mountains: The vast area of Bibi Shahrbanou Mountain with highest height are located in the east part of Rey city. Most hills and lower heights with less slopes are found on the Rashkan hilltop, the cement factory and the Cheshme Ali River.



Bibi shahrbanoo mountain range



Sorsore mountain



Tabark mountain



Indicator E1 -Ecological compatability

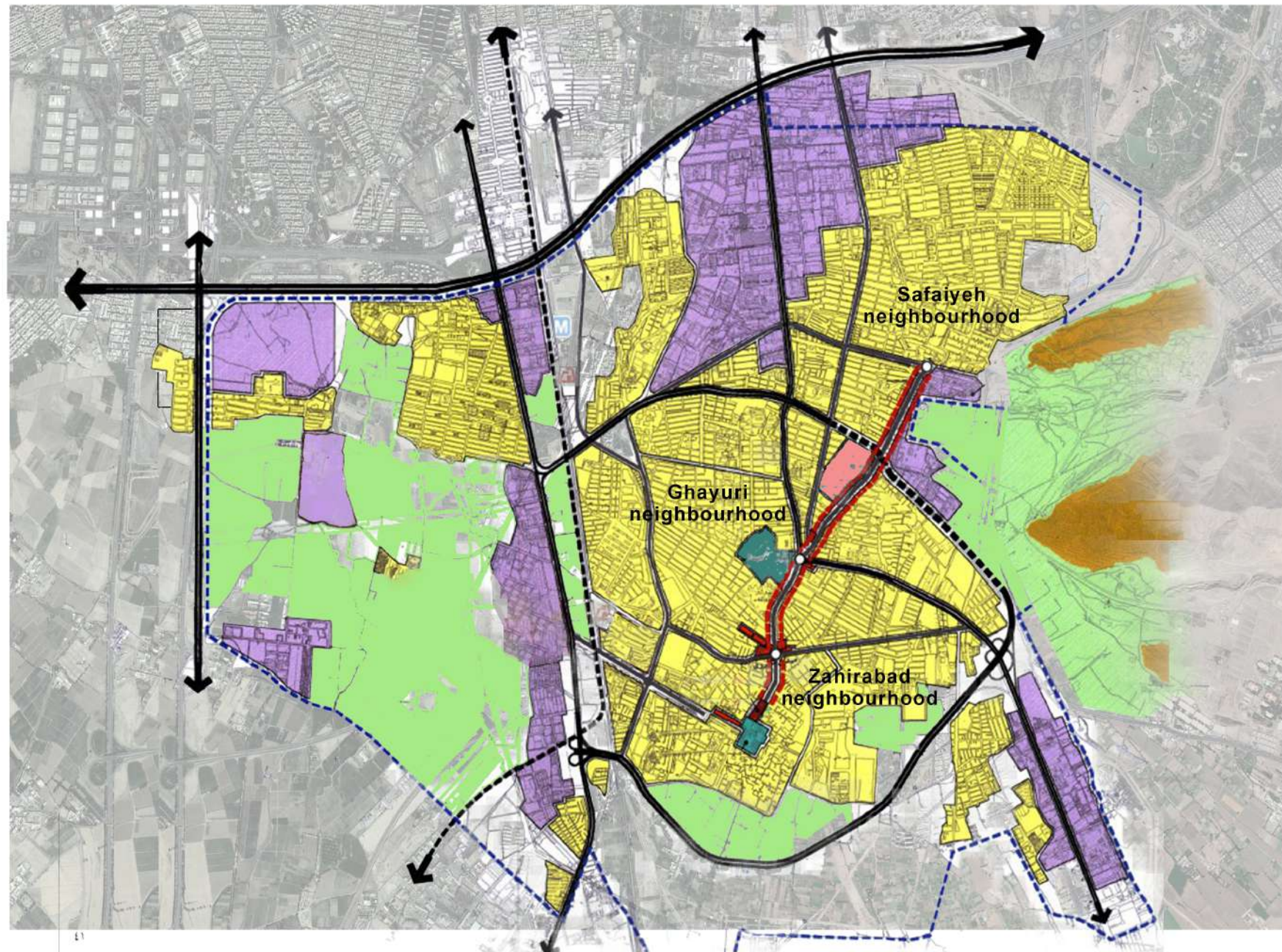
Ecological appropriateness of environment to the context (Natural areas (Green corridors, Blue corridors, Mountains)

Legend:

Case study	
Green open spaces	
Hill and mountain	
Green axis	
Agricultural lands	
Open Water Channel with -wallcovering	
Covered water channel	
Aqueduct(Qanat)	

SWOT

- Strength**
- Existence of various types of blue and green corridors within the area
- Weakness**
- No connection between natural areas and blue and green corridors for pedestrian benefits
- Opportunity**
- Using from open and natural urban open pubic spaces includes farms, open fields, and hills
 - In this region, Ali Spring, Sorkheh Hesar River, green paths within the area, Bibi Shahrbanou Mountain, Sorsoreh hill, and Tabark hill are the green and blue corridors in the area, which can be used by pedestrians and bicycles engagement.
- Threat**
- Construction in open and agricultural lands



- A. Open and natural district: this district forms a major part of the east of the area. It stretches along the natural expanse of Bibi Shahrbanu heights
- B. Industrial district: considering the location of industrial factories and workshops in the east of Ibn Babawayh Street, the industrial district in the area has been formed between the natural and residential districts.
- C. Residential district: a significant part of the area is allocated to the residential district. Regarding its subjective and objective features, this macro-expanse is dividable into some subsets. The most effective feature of separating these sets is the separation of neighborhoods. Therefore, the residential district in the area can be divided into the residential neighborhoods called Safaiyeh, Ghayuri, and Zahirabad.

Open and natural area of Rey



Industrial area of Rey



Indicator F3 - Functional Diversity

Land use

Legend:

Commercial	Case study	
Industrial and warehouse Zone	The main urban axis of Rey	
Main religious, cultural and historical functions	Region 20 - Rey	
Residential area		
Natural and open area		
Roads		



SWOT

Strength

- Existence of various cultural, religious and historical urban public spaces in this area

Weakness

- The industrial district leads to separation of natural and residential areas

Opportunity

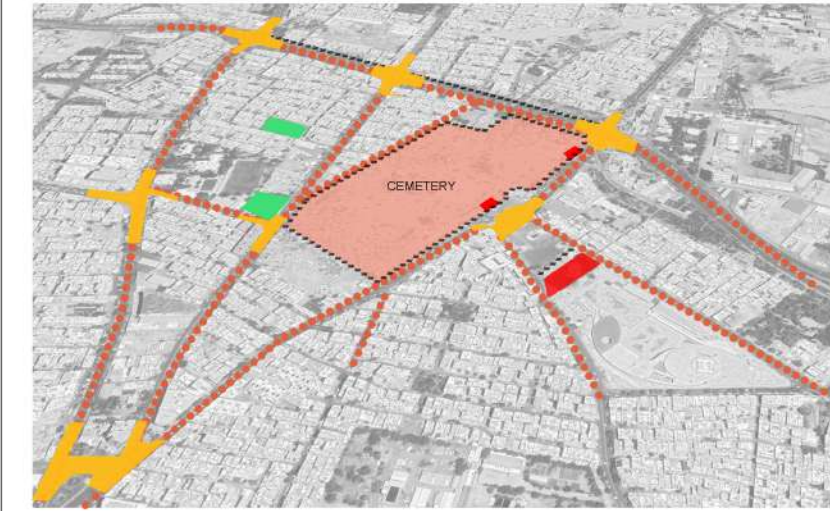
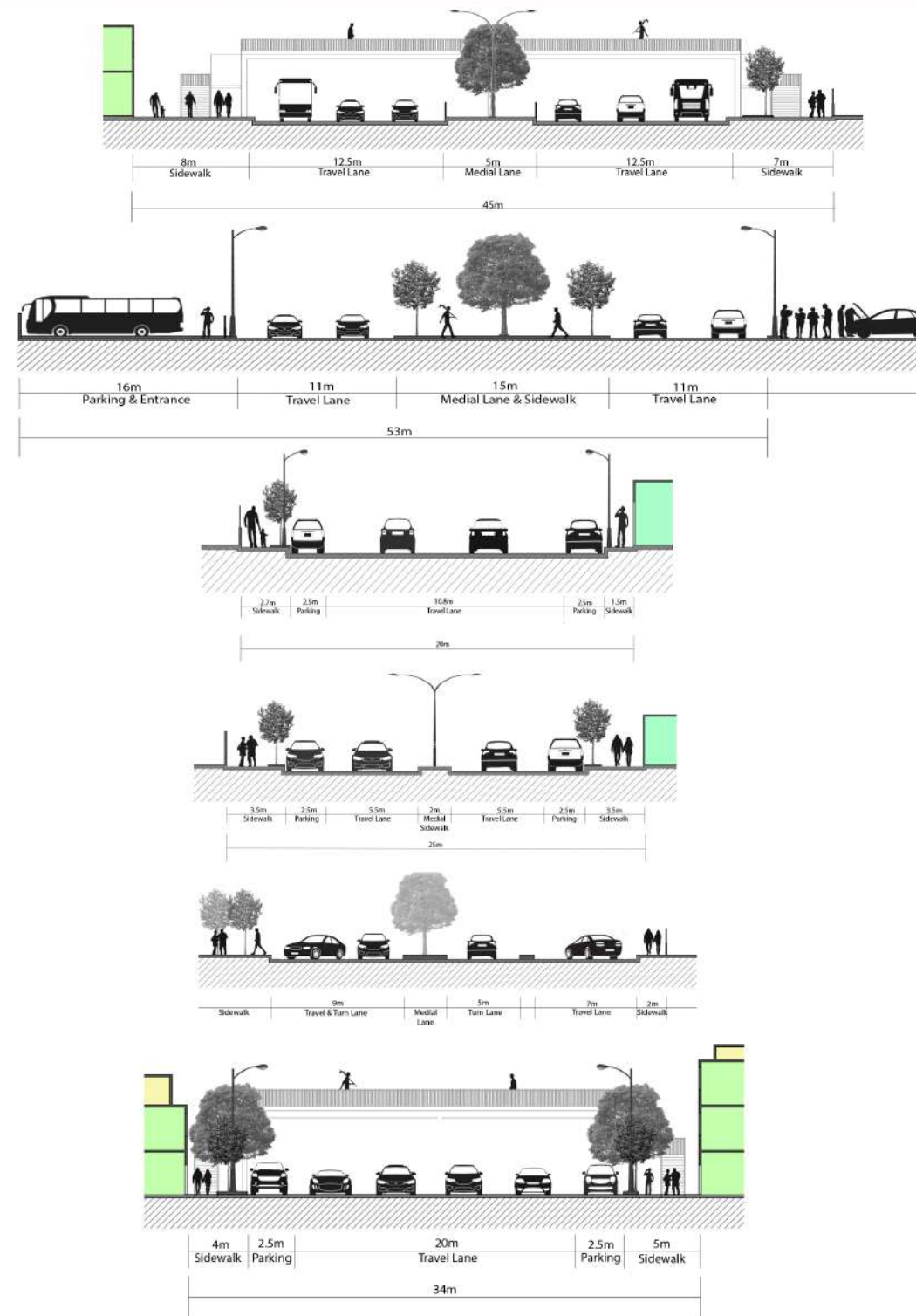
- The connection among urban public spaces could create an effective structure more legible in different physical and spatial layouts

Threat

- Separation of residential area and natural area by Industrial district



The pedestrian mobility network can be considered as the vital arteries of the neighborhood area. Hence, any access to the context of the cemetery, which connected paths that facilitates access, can be considered as a functional permeability indicator. Moreover, pedestrian sidewalks have great significance in the context of a cemetery. The pedestrian role of the streets can be measured in terms of its degree of separation. Easier pedestrian access signifies the importance of that street. Wider streets where traffic volume is higher and vehicle's speed are more, have less opportunity for pedestrian traffic. Considering these items, classification of passageways are shown in the following map.



Investigating the perceptual organization must be carried out by a trained observer or be extracted based on the cognitive maps of space users. In this section, the elements of the perceptual organizations are examined.

Land marks: The most important land marks in the studied area are the two entrances of cemetery and Tugrul Tower, which is located close the cemetery area. Other parts of the neighborhood do not have any element with the quality of the land mark.

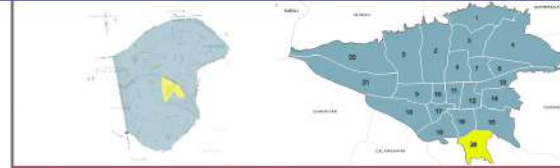
Nodes: The most important nodes with traffic and activity function are Ibn Babawayh Square, Varamin conjunction and street intersections of Shahr E Rey ring road mostly play a temporary functional role.



Main and subentrances of cemetery as legible land marks



Tugrul tower as a land mark in the intermediate era



Indicator F2 - Functional Permeability

Pedestrian Mobility and Connectivity and Accessibility to the Public Transport



Indicator P2 - Perceptual permeability

Legible Landmarks, Nodes, Edges, and Paths



SWOT

Strength

- The neighborhood has desirable condition in terms of public bus service network

- The main Entrances to the cemetery and the Tugrul Tower are known as landmarks in the neighborhood

Weakness

- Connectivity of local street with cemetery environment is so weak.

Opportunity

- Linking Shahr-e-Rey Ring Road, Fadaian Islam Street, Ghayouri Street, and Ibn Babawayh street, with priority on pedestrian and bicycle could improve functional permeability of the neighborhood

- Intersections and especially the Varamin junction (at the intersection of the main road) can play a significant social role in the area

Threat

- Most intersection and nodes in this neighborhood have traffic function
- Shahr-e-Rey Ring Road divided the area under study into the northern and southern parts and therefore, is a serious threat to the connectivity of pedestrian.
- Undesirable sidewalks and pathways for pedestrian and bicycles



Ibn- Babawayh cemetery has urban scale land use in its intermediate areas. The intermediate functions and land uses of this cemetery are not developed and use of these areas are not consistent with the function of this cemetery. While, this neighborhood has a strong historical and cultural background, which gave it the potential to become a cultural and natural destination for the citizen. Most functions in intermediate area are services and they have a local scale function and meet the daily needs of residents.

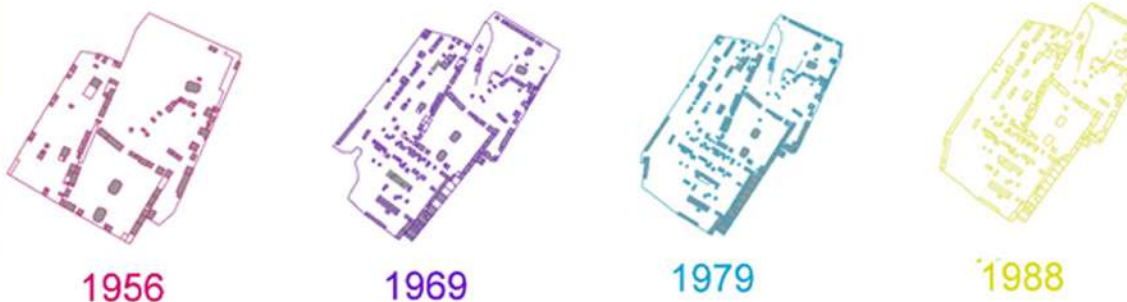
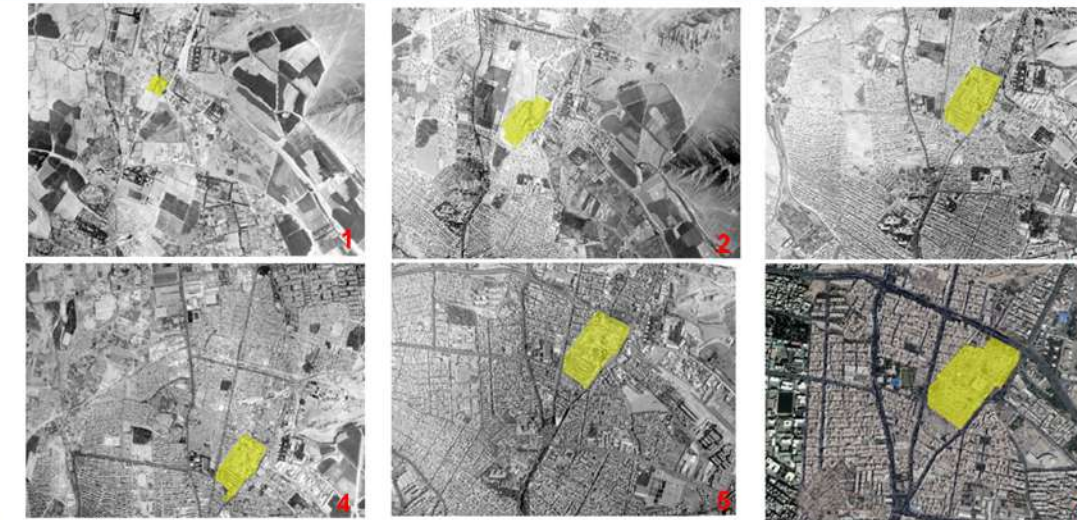
Accordingly, the Ibn- Babawayh cemetery covers about 33% of the neighborhood area. The land use of intermediate area of the cemetery mostly occupied by residential functions and some services for them. The size of the residential area is as much as cemetery area and about 33/5%. Other area are occupied by cultural and specifically more educational, commercial and combination of residential and commercial functions and uses. Some part of the Ibn- Babawayh cemetery is also covered by other service utilities such as religious and empty plots. There are few gardens and green spaces in this neighborhood with a total area of 5552 square meters, which is equivalent to 1.72% of the neighborhood.



Open public green space function ,Tugrul tower in front of cemetery



Current Green open public spaces in the intermediate area or neighborhood, and places with the opportunities to be public open space



According to the historical photos and documents, at first, the cemetery was located in the northern part of current land and its size was less than one-third of the present size. The cemetery area was gradually expanded to about 8 hectares by 1961. After that, the cemetery was re-expanded to about 14 hectares due to the high demand for Burial in this cemetery. Before establishment of main cemetery of Tehran with 110 hectares and transferring of mortuary ceremonies to this cemetery, Ibn- Babouyeh had mortuary as well. But after transforming, the mortuary was removed from this cemetery and all related ceremonies and facilities were transferred to the new cemetery of the city(Dead-city of Tehran).



Distraction of Tombs and cemetery space in the modern era

Achieving place-keeping depends on strong partnerships and effective governance/decision-making. The lack of priority given to the place-keeping, or long-term management of this cemetery lead to neglecting the position of the cemetery in the city, destroying it, disturbing the order and general layout of the cemetery, adding contemporary monuments and finally residents feeling unsafe in these places, which become unused in favor of them. Currently, the management of this cemetery is Endowment Organization and the required employees for managing this cemetery were hired by this organization.



Indicator F3 - Functional Diversity

Mixed Land Using

Legend:

Residential	Historical and Green spaces	Residential and commercial
Commercial	Industrial	Mix use residential
Cultural	Installation	Empty spaces
Religious	Storehouses	Parking

Indicator F4 - Functional Flexibility

Long Term Management and Development



SWOT

Strength

- Cemetery occupies approximately 33% of the neighborhood

Weakness

- The lands occupied by the green spaces are considerably lower than standard amount
- Lack of empty lands for cemetery development

Lack of long-term management leads to the destruction of many historical graves during the last decades

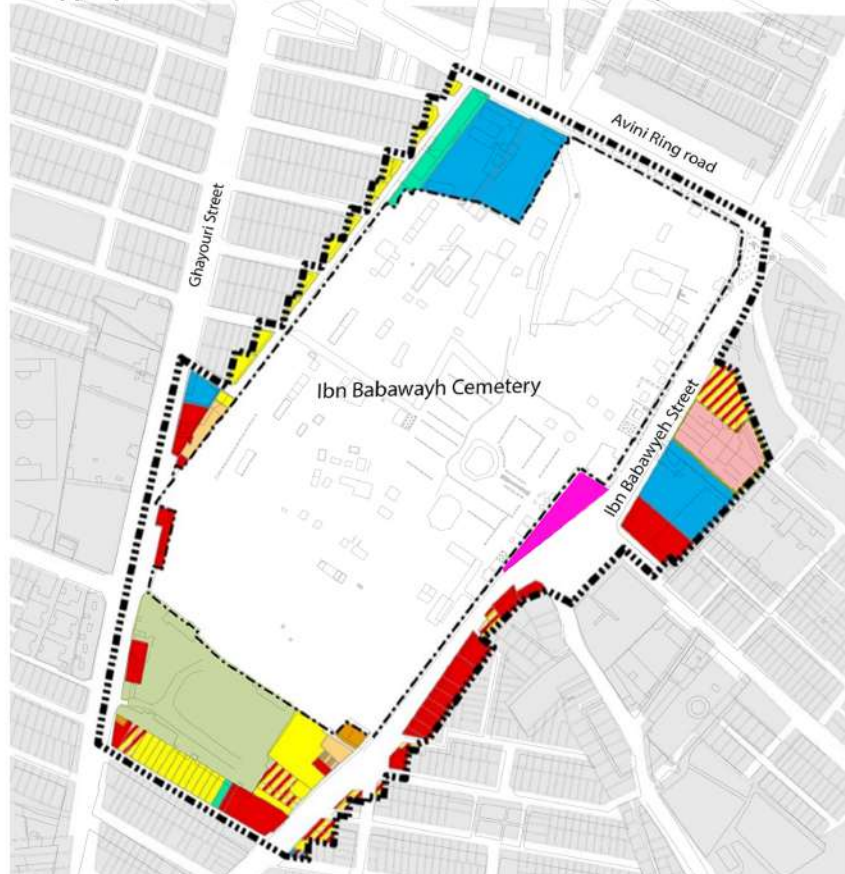
Opportunity

- Low quality Parking lots, old buildings, and abandoned schemes could provide new functions to the cemetery context

Threat

- Existence of empty, abandoned, and desolated lands in the neighborhood

Inappropriate functions in immediate area of cemetery



Modern Tombs inside the cemetery



Indicator F1 - Functional Comptability

Appropriate usage of cemetery to its history
Appropriate functions surrounding of the cemetery

Legend: Land use

Parking	Mix use residential, commercial and storehouse	Installation	Mix use commercial and educational
Installation	Mix use residential, commercial and storehouse	Storehouses	Residential and commercial
Storehouses	Mix use residential, commercial and storehouse	Residential	Residential and commercial
Residential	Mix use residential, commercial and storehouse	Cultural	Residential and commercial
Cultural	Mix use residential, commercial and storehouse	Religious	Residential and commercial
Religious	Mix use residential, commercial and storehouse	No use	Residential and commercial
No use	Mix use residential, commercial and storehouse	Immediate area	Residential and commercial



SWOT

Strength

- Many cultural and artistic celebrities, literati, philosophers, and athletes are buried inside this cemetery.

Weakness

- There is no urban open public green space in the immediate area.

Opportunity

- Improving the relationship between the cemetery and its surrounding context through eliminating incompatible functions and land uses in the immediate area and creating appropriate open public spaces according to the context of the cemetery

- The spatial opening in front of the cemetery has the potential to become a collective space

Threat

- Destruction of waterways as historical layers inside the cemetery and construction of Low-quality ponds for daily using, lack of proper volumes of plants and diversity, and cutting the grown vegetation are the main ecological damages.

- Existence of inappropriate and incompatible functions in the immediate area of the cemetery

- Inappropriate design of the space in front of the main entrance resulted an ill-shaped space

In the immediate area of the cemetery, various functions exist that have often located in the main enclosing walls of the cemetery. In the immediate area of Ibn Babawayh Cemetery, functions are deliberately the service uses. In general, some of these functions such as Car repair shops and open parking plots doesn't have any relation with the context and history of the cemetery. The abandoned open space at the main entrance of the Ibn Babawayh cemetery also has been created through the destruction and possession of some buildings in the eastern part of this cemetery. This square physical features and activity conditions have led it to be used as a parking lot.

Many famous culture and art celebrities, literati, philosophers and athletes were buried inside this cemetery as well. Additionally, this place is treasures of cemetery-related cultural symbols. Apart four historic layers of cemetery are included historic water routs that origin from Cheshmeh ali stream and had been transit across the cemetery in the past, Historic botanical planets beside stream, Cemetery widespread as an public and open green space in the past, Historical monuments and tombs that speared all over the cemetery. Today from a few remaining family tombstones as a private area, the other area of this cemetery is public. Before the destruction of 1995, the family tomb had covered a vast area of the cemetery. These tombs had diverse architectural and decorative patterns, reflecting many different periods of construction and development in the cemetery. Most of the existing tombs belong to the Pahlavi era. The result of destroying the family tombs was losing some part of historical heritage of the city and creation of inappropriate platform for massive waste and other environmental damages.





Currently, Ibn-Babaweyeh cemetery in the north is located next to the educational center and It is separated from its upper urban fabric by Avini Ring road. Due to the recent destruction of the tombs, this part of the cemetery has lost its uniform façade and caused the combination of interior space of the cemetery with the environment of the street.

On the east side, the cemetery is separated from the residential parts by the north-south Ibn-Babaweyeh Street. This street is the main Communication axis of passengers to the cemetery. The main entrance of the cemetery is located on this facade and the main building of Imam-Zadeh (Shrine inside cemetery) is located at the end of this axis.

The southern side of the cemetery has a different situation. This section of the cemetery, in the vicinity to several active workshops (or repair shop), does not have any physical connection with the urban fabric and is separated by long side solid walls.

Some of the buildings on the western side of the cemetery, are one-or two-floored buildings with more than thirty years old and need rehabilitation. Totally the quality of buildings in immediate are of the cemetery indicates the beginning of physical changes in the immediate area.



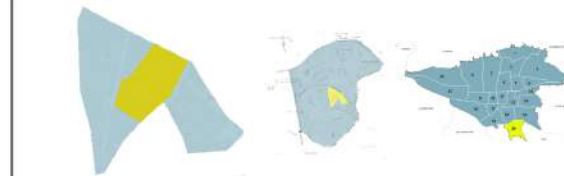
Buildings quality and material in the immediate area

In immediate area of cemeetry buildings with thirty to forty years old have a wide range of stone from marble rocks to granite in the facade . In recent buildings, travertine stones with gray, white and cream and in some cases with gray and black colored spectacles are used. In addition to rocky facades, bricks are also used in a wide range. The tendency to use bricks has often expanded due to the variety of color schemes in new buildings and its combination with other materials such as stone. In some cases cement facade is also seen in the older structure of this area.

The interior buildings of the Cemetery can be divided into two categories: 1) old-fashioned buildings that belong to family tombs. The basic materials used in these buildings are brick. 2) In some modern buildings inside the cemetery bricks are used for façade with typical facade techniques. The decorations used in the facades of this building are bricks and Persian blue stones.



The graves are classified into three separate forms: individual tombs, open family tombs, and burial chambers. The density of the gravestones is very high in the interior part of the cemetery and most individual and single graves adhere to each other without any distance existing between them. Some graves has two or even three names on one gravestone, which shows the existence of two or three floors in these graves. Most multi-level graves are the result of recent year's burials, which buried and placed the dead bodies on top of the remnants of people who died more than 30 years before. In the past, building graves with several floors was not common and peoples of a family would bought part of the cemetery as a family tomb, which usually were enclosed and the graves were placed side by side. There is no example from the past to show burial of corps on top of each other. Most of the stones used to build the gravestones are marble and granite stones. This has led to a variety of color and quality in gravestones. The old gravestones are relatively smaller than newer gravestones. The ground around them is covered by bricks. Despite the variety of gravestones, the brickwork follow a single and identical method, to make sure the grave does not have any contradiction with each other. Considering the burial traditions in Islam, the grave angle is East-West. The size of the graves is almost the same, but the size of the gravestones is varied, so that the old graves are often made with small dimensions (40x40 cm or 40x50x40 cm) and their surrounding areas were decorated by brick, but new graves have the approximate dimensions of 50x 120 cm. However, some of the old graves have larger dimensions as well.



Indicator P1 - Perceptual Compatability

Visual Adaption of the Buildings in Relation to the Context of the Cemetery (Quality, Height, and Material)

Legend:

Building age

- New- built ■
- Usable ■
- Needs Rehabilitation ■
- Without age ■
- Immediate area

Material

- Stone ■
- Concrete ■
- Brick ■
- Aluminum ■
- Stone and concrete ■
- Stone and brick ■



SWOT

Strength

- The graves inside the cemetery have a wide range of shapes with natural elements
- Buildings on the east of cemetery have proper façade

Weakness

- A wide range of materials and colors is employed in the cemetery and its surrounding area

Opportunity

- Destruction of low-quality buildings and organizing current building's façade around the cemetery
- Defining a suitable interior façade and unique material for the cemetery
- Creating unique and well-defined grids for the tombs

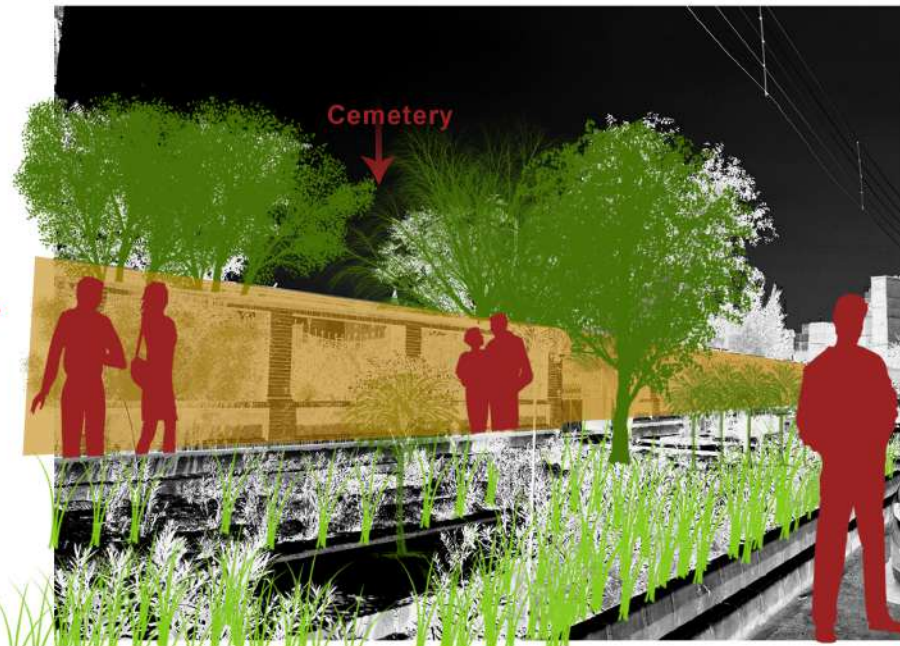
Threat

- Northern and southern parts of the cemetery lack a uniform façade
- Low-quality Buildings surround western parts of the cemetery



The area of Ibn Babawayh cemetery is about 11 hectares. There are currently two main shrine buildings and a few family tombs inside the cemetery. In the past, there have been more family tombs, but due to destructions most of its cultural and historical heritage was destroyed and just is leaving only a few scattered buildings on the site.

Ibn Babawayh cemetery can be considered apart from the neighborhood with the existence of few main and sub entrances. These entrances are seen like an abandoned elements and split cemetery from its immediate area. In practice, there is no relation between the cemetery spatial organization and the neighborhood. The cemetery has five entrances, two of which are main entrances and the other three are sub-entries. The main entrance in the Ibn Babawayh Street have doorways with unique identity compared to others. The height of the main entrances made it more legible. Applying and focusing on numerous entries and subsidiary accesses to the cemeteries have led to the forgetting organization and design of the them.



In the past, the cemetery did not have any wall. But today, cemetery is fenced and surrounded. The more limited access is provided in order to reduce its social vulnerability and increasing the safety of its immediate area. Most often, low quality metal fencing or rails are used to separate the cemetery from other urban spaces.

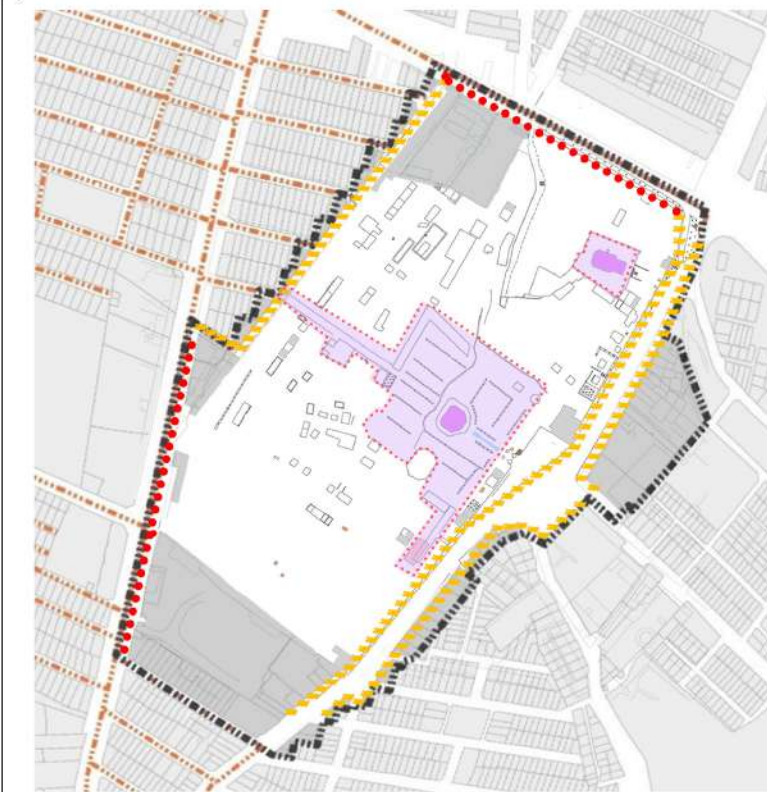


The passages studied in the immediate areas at night have brightness. Conversely, the lack of lighting or ineffective lighting system is one of the other shortcomings of the building inside this cemetery. Although the cemeteries does not have any function at night. But the general lighting of cemeteries during the night has an inverse relationship with rate of delinquency and social misconduct.

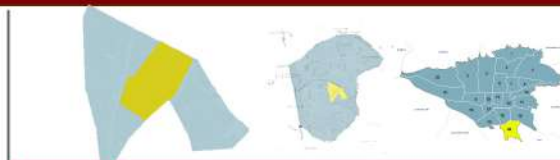
Strategic vistas and views in the urban spaces help the readability of the environment and navigation of the observer. These strategic vistas and views can happen through corridor view or extensive view. Many valuable historical sites and buildings exist in this area which View to them can be considered as strategic views. The Tugrul Tower is located in the eastern part of Ibn Babawayh cemetery, Bibi Shahrbanoo Mountain and Rashaan hill are the most important strategic landscapes in the region of Ibn Babawayh cemetery.

The interior space skyline of Ibn Babawayh Cemetery is only influenced by several single-floored buildings inside of this area. The dome is the main building is the most important element in the skyline of this cemetery.

The interior space of the cemetery has organic blocks, which are generally strengthened due to slope of the ground. The different levels of platforms create a stepped access, which affects the landscape structure of the cemetery and its uniformity.



The immediate pedestrian routes of this cemetery have a good quality of flooring in the north and some parts in the west side. On the other hand, pedestrian walks in the east, south, and some area in the west have narrow and low-quality flooring. Cemetery itself, despite having an extensive area, does not have any internal riding routes. Due to the shape and form of this cemetery, none of public transportation vehicles are able to enter it. Therefore, walking along the path of the cemetery is relatively harder. Nevertheless, the material employed for the construction of the flooring is different in each part of the cemetery. In specific, various types of regular and irregular paving are employed with. Only in the middle section of the cemetery, around Sheikh Saduq and Imamzadeh Hadi, the paths are floored with stone, which was a recent project with the aim of improving the surrounding area of these shrines.



Indicator F2 - Functional Permeability

Accessibility and the Quality of the Flooring for Pedestrian

Legend:
 High quality pedestrian path (Red dotted line)
 Low quality pedestrian path (Yellow dotted line)
 Flooring (Purple area)
 Immediate area (Black dashed line)

Indicator P2 - Perceptual and sensorial Permeability

Appropriateness of mass and spaces inside cemetery
 Clear entrance and unsolid walls
 Strategic vistas and views- landscape and Skyline
 Lightening at night

Legend:
 Mass (Black square)
 Space (White square)
 Lightening (Yellow circle)
 Solid barrier (Red dashed line)
 Entances (Red arrow)

SWOT

Strength

- The proportion of space is more than the mass in the cemetery area.
- Bibi Shahrbanoo mountain, Toghrol tower, and Rashaan hill, are created strategic views and vistas inside cemetery.
- Cemetery has numerous entries and subsidiaries

Weakness

- Inside the cemetery, the higher grave density in terms of graves location leads to the difficulty of walking and moving along the path of the cemetery for the pedestrian.
- Three of the five entrances have lack of proper design and legibility
- Discontinuity in the skyline due to lack of balance and coordination of the buildings with the neighboring area

Opportunity

- Organizing exterior skyline in the immediate area of a cemetery
- Activate all entrances and changing material of wall into permeable material
- Defining integrated floorings inside the cemetery
- Improving light system for graves area at night

Threat

- Limited access to the cemetery due to low-quality fencing
- The different types of flooring material used in the cemetery created regular and irregular paving in each part.
- Sidewalks are narrower on the south and west side of the cemetery
- Lack of organization in the urban elements and landscapes of the cemetery
- Insufficient lighting facilities for the most parts of the cemetery, with few proper lightings in the central and main parts



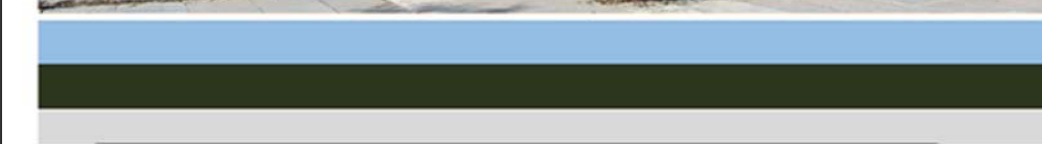
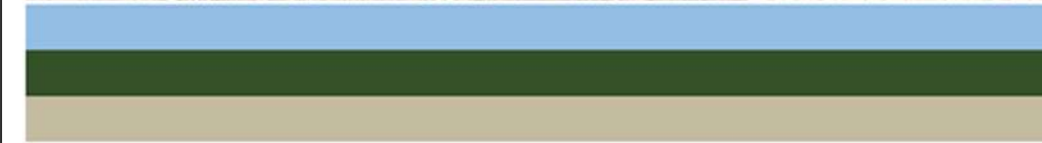
Ibn Babawayh cemetery offers a large open space as a burial site. The main entrance of this cemetery is connected to the funeral area through a spacious space. The first entrance provides access to the prayer rooms and bathrooms and the Sheikh Sadugh tomb. Imamzadeh Hadi and a number of family tombs are located at the second entrance. However, all spaces were constructed permanently and with no flexibility or movability for different ceremonies and events. Also, according to the survey, a few furniture just is provided by the owner of the family graves. Other than these, no convenient furniture is provided for public.



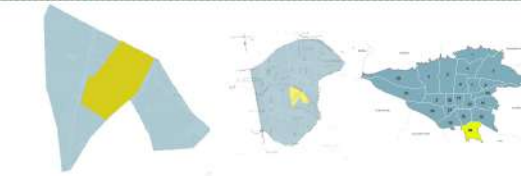
MEHR
Sheikh Sadug tomb , Shrine inside cemetery



Lack of flexible furniture inside cemeetry



In the cemetery's immediate area, similar to most parts of Tehran, the basic and main color palette is a combination of creamy, white, and gray, ranging from bright to dark colors. The color palette of the surrounding area does not provide a special and distinctive characteristics compared to other neighborhoods of Tehran. Inside the cemetery, the dominant color of the stones is gray. In the middle of this spectrum of colors, the color of the trees (green) and the color of the tiles (blue) creates a contrast with gray.



Indicator F4 - Functional Flexibility

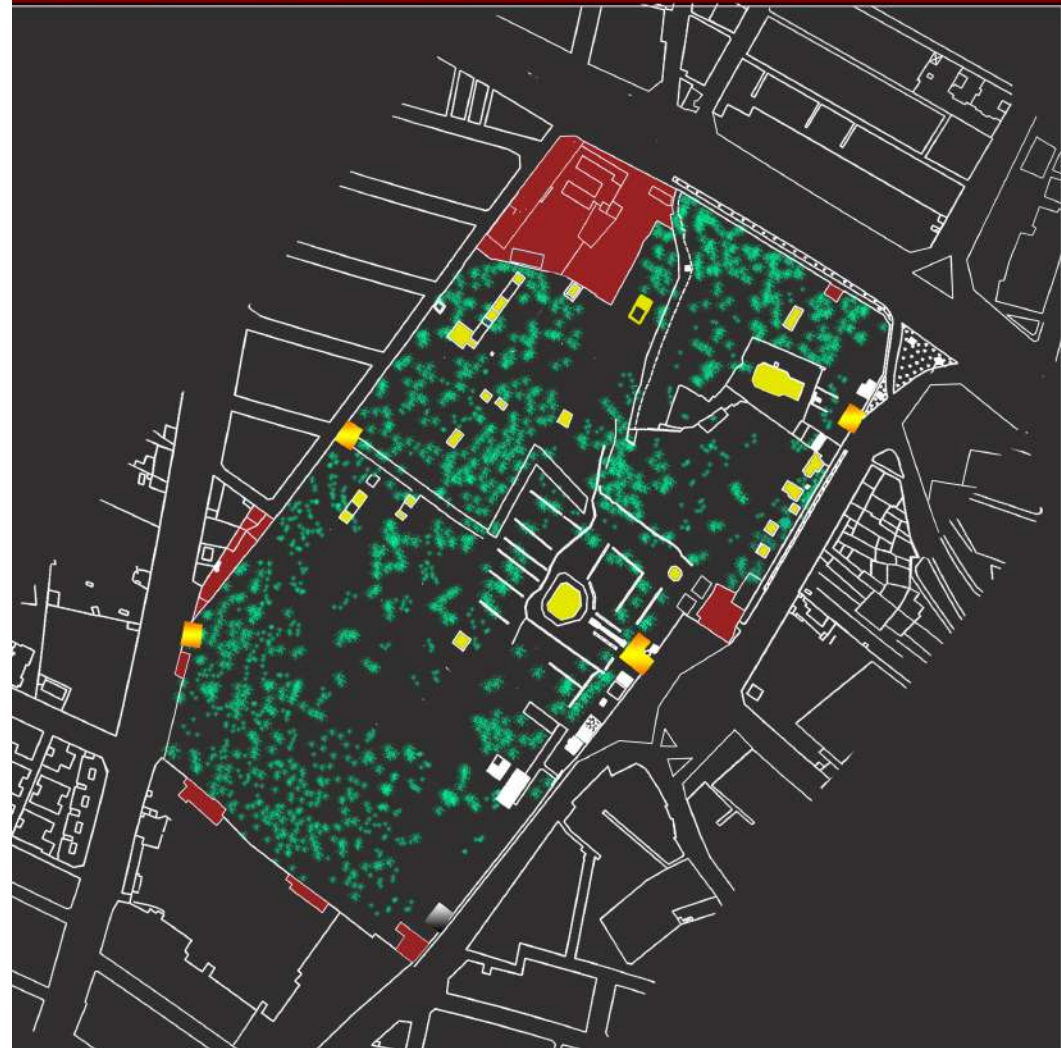
Flexible Spatial structure and furnitures for different event and ceremonies

Legend:

SHRINE		GUARD	
TOMB		LIBRARY	
CAR REPAIR SHOP			
RESIDENTAL COMPLEX			
SCHOOL			
SERVICES			

SWOT

- Strength**
- Weakness**
- All constructions within the cemetery are permanent with no flexibility or durability
 - The color of the cemetery has no variety or any special and distinctive character
- Opportunity**
- Defining flexible areas and furniture for ceremonies and events
- Threat**
- Lack of furniture and comfortable rest area for visitors



By looking the historical pictures taken from the cemetery, it is clear that the Cheshmeh Ali River was passing through this cemetery until 1956. This water was used to irrigate the plants and to wash the corps and the graves. Today, changing the direction of the water and transferring it through the underground channel had been changed the main view of the cemetery. Today due to lack of proper management it is demolished. Due to the tradition and visiting the graves ceremonies, just some ponds and canals were created in the cemetery for accumulation of water and washing of graves.



Vegetation coverage of the Ibn Babawayh cemetery has a good variety in term of old and new vegetation, however the amount of vegetation is relatively small compared to the size of the cemetery. Within the cemetery, due to the lack of green spaces and plants, ecologically, this space is poorly functioning. Most of the trees are planted by the relatives of the deceased in order to create some shadow for the grave. Most of plants planted in this area are Maple, Elm, Asparagus, Pine, Chamomile, Acacia salicina, Berry and etc.



Scattering of plants inside the cemetery



Plants types of cemetery



Ibn Babawayh Cemetery has a slope of 1% from the north-south axis, and is located 1067 to 1072 meters above the sea level. The study by the Jakarta Gestra divided Tehran into five topographic units: mountains, hills, old alluvial cones, new alluvial cones, and alluvial fields. Ibn Babawayh Cemetery is located in the alluvial field. The ground of the cemetery has a relatively steady slope from north to south, except for the southwest and west part of the mosque (sometimes with a height difference of 2.5 meters). By looking at the cemetery, it is obvious that the burial site is not flat. The disharmony in altitude changes can be observed in different parts of the cemetery. Overall, there is an 8-meter difference between the highest and lowest points of the cemetery. The desolation of family tombs eliminated a considerable part of the historical heritage of the city and created an inappropriate platform for massive waste and other environmental damages inside the cemetery.



Indicator E1: Ecological Compatibility

Topography and Environmental Safeties (Eco-Friendly)

Indicator E3 - Ecological Diversity

Natural elements (Water, Plants, and Animals)

Legend:

- Building and tombs INSIDE CEMETERY ■
- Buildings outside cemetery ■
- Entrances ■
- Plants ■

SWOT

Strength

- Vegetation coverage in the cemetery has a good variety in terms of old and new

Weakness

- Sustainable energy is not utilized in the cemetery.
- The quality and diversity of vegetation is not desirable
- The lack of vegetation cover volumes in burial areas.

Opportunity

- Restoring Cheshmeh Ali waterway through this cemetery and create high-quality ponds

Threat

- Destruction of waterways as historical layers inside the cemetery and construction of Low-quality ponds for daily using, lack of proper volumes of plants and diversity, cutting the grown vegetation and extinction of animal species inside the cemetery are the main ecological damages.

CHAPTER 5

LITERATURE REVIEW INTERVENTION METHOD

This chapter provides a review of relevant literature and outlines the theoretical framework of the intervention method. The study approach will be endorsed through reviewing the literature on theoretical theories of biophilic design. In terms of biophilic design principals, the study discusses the applied approaches of biophilic acupuncture and green infrastructure to obtain a base understanding of how biophilic design and biophilic acupuncture design can be involved in the different scales of the built environment in our study, including city and region, intermediate, immediate and place scales.

5.1 Biophilia and Human-Beings

The linguistic origins of the word biophilia determine its meaning: *“it means love of life”*. This term was invented by the social scientist Erich Fromm in the 1970s. In 1984, E. O. Wilson popularized the term “Biophilia” in his book and argued that *“human beings have a natural interest and attraction to nature”* (Wilson, 1984). He stated that we, as humans, have an innate draw and connection to nature and natural processes. As a species that has evolved in nature and became urbanized only in more recent years, our preferences for sensory-rich experiences provided by the nature are still very strong. As humans, we are wired to respond to our environment. Biophilic design is therefore, the response for the necessity of establishing connection with the natural world. More precisely, Wilson explains it as follows: *“Biophilia ... is the innate emotional affiliation of human beings to other living organisms. Innate means hereditary and hence, a part of ultimate human nature.”* He defined the term as *“the connections that human beings subconsciously seek with the rest of life.”* According to Wilson, biophilia, as an environmental attribute, is not a simple impulse, but a complex system of learning regulations that can be controlled and evaluated individually. This attribute has evolved over thousands of years and through human-environment interactions. Kellert defines the concept of biophilia as *“a complex of weak genetic tendencies to value nature that are instrumental in human physical, material, emotional, intellectual, and moral well-being. Because biophilia is rooted in human biology and evolution, it represents an argument for conserving nature based on long-term self-interest.”* (Wilson & Kellert, 1993)

Biophilia theory promotes the idea that *“since mankind has been nourished in close association with nature, and indeed as part of it, people have an attachment to, and are comforted by, the nature”*. As Browning states: *“Biophilia helps understand why crackling fires and roaring waves captivate us; why a view of the garden can stimulate our creativity; why shadows and heights instill curiosity and fear; and why animal companionship and walking through the park have restorative, calming effects. Biophilia may also help understand why certain public parks and buildings are favored over others.”* (Browning, et al., 2014)

5.2 Biophilic design of Urban Spaces

Therefore Biophilia is an attachment of man to nature. So, the design of natural elements and features in buildings, cities, and urban spaces are vital to human sense, performance, and well-being. (Kellert, 2012). According to Beatley, urgent attention must be paid today to incorporating nature and natural systems into urban and architectural design. The biophilic design aims to create high quality habitat for people as a biological organism in the modern built environment. (Tarnay, 2019) Biophilic design is a sensory design. Its characteristics are experienced through an assortment of human senses, including sight, sound, contact, smell and taste. In spite of our inclination to support our visual sense, other sensory responses attained from the nature; hearing the sound of water, touching plants, smelling blossoms, and observing the changes in the weather regularly moves us both emotionally and mentally. (Kellert & Calabrese, 2015)

In some cases, biophilic design should stimulate human sense, or to make the design peaceful and harmonious. It should make some warm and sociable, and others cool and tranquil. (Clancy, 2016)

Kellert, indicated that the basic categories of biophilic design model is based on three forms of experience in nature, which are indeed the essential categories of the biophilic design framework.

According to Kellert, these three forms of natural experience are: *“the direct experience of nature,” “the indirect experience of nature,” and “the experience of place and space.”* The direct experience of nature refers to *“the actual interaction with the environmental features of the built environment.”* Indirect experience of nature refers to *“the interaction with the representation or picture of nature, the*

transformation of nature from its original condition, or the exposure to particular patterns and processes that are characteristic of the natural world”. Finally, the experience of space and place refers to *“spatial features of the natural environment that have advanced human health and wellbeing.”* (Kellert & Calabrese, 2015)

On the other hand, according to the Kellert (2015), efficient implementation of biophilic design in the built environment requires strict adherence to the following basic principles:

- 1 Biophilic design requires a consistent and continuous devotion to nature.
- 2 Biophilic design should draw on human adaptations to the natural world that have improved human health and well-being over the course of evolution.
- 3 Biophilic design should promote emotional connection to specific environments and locations.
- 4 Biophilic design should encourage meaningful connections between people and nature that foster a greater sense of relationship and responsibility for human and natural ecosystems.
- 5 Biophilic design should facilitate mutually supportive, interconnected, and integrated architectural and urban design solutions (Kellert & Calabrese, 2015).

In the Art nouveau building designs of the late 19th Century, inspiration from nature was significant. Biophilic architecture was combining natural structures with artificial structures, including bringing nature into buildings, using natural materials and surfaces, vegetation, and providing natural lighting and ventilation.

European modernists stripped much ornamentation from their buildings. The timeless works of Antoni Gaudí, whose work forms much of what is architecturally distinctive in Barcelona, is also highly biophilic. His designs, including Casa Batlló, Casa Milà, the Sagrada Família, and Parc Güell, utilizes prominent biophilic elements. Often plants and animals are integrated into the designs, as the natural facade. (Beatley, 2011)

Kellert in (2008) divided biophilic design factors into two dimensions, six elements, and seventy attributes. The significance of this work is that it offers an open framework to apply towards a proper design of place and space. (Kellert, et al., 2008). These elements consist of environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human-nature relationships. His proposal also incorporates a comprehensive study of the context that includes historical, geographical, and cultural components that affect an individual's perceptions of the space and therefore the relationship of people with their affiliation to nature. Not all of these biophilic design elements however constitute restorative components, but as they are part of the urban space, they affect to some extent mental restoration. (Fig.121)

Another highly regarded source for biophilic design in place scale is introduced by Terrapin Bright Green, an environmental consulting firm based in New York City in 2014. This firm provided a context for biophilia and the implementation of biophilic design in “14 Biophilic Design Patterns”. A series of design considerations provided there discuss various factors for successful implementation of biophilic design patterns on the place (Terrapin Bright Green, 2014) (Fig.120)

Environmental features	<ul style="list-style-type: none"> Color, water, and air Sunlight Plants and animals Natural materials Views and vistas; façade greening Geology and landscape; habitats and ecosystems Fire
Natural shapes and forms	<ul style="list-style-type: none"> Botanical and animal motifs Tree and columnar supports Shells and spirals, egg, oval, and tubular forms Arches, vaults, and domes Shapes resisting straight lines and right angles Simulation of natural features Biomorphy, geomorphology, and biomimicry
Natural patterns and processes	<ul style="list-style-type: none"> Sensory variability Information richness Age, change, and the patina of time Growth and efflorescence Central focal point Patterned wholes Bounded spaces and transitional spaces Linked series and chains Integration of parts to wholes Complementary contrasts Dynamic balance and tension Fractals Hierarchically organized ratios and scales
Light and space	<ul style="list-style-type: none"> Natural light and shadow Filtered and diffused light; reflected light Light pools, warm light; light as shape and form Spaciousness, space as shape and form Spatial variability and harmony Inside-outside spaces
Place-based relationships	<ul style="list-style-type: none"> Historic, geographical, cultural and ecological connection to place Indigenous materials Landscape orientation and ecology Landscape features that define built form Integration of culture and ecology Spirit of place and avoiding placelessness
Evolved human-nature relationships	<ul style="list-style-type: none"> Prospect and refuge; security and protection Order and complexity; information and cognition Curiosity and enticement; exploration and discovery Change and metamorphosis Mastery and control Affection and attachment; attraction and beauty Fear and awe Reverence and spirituality

Fig.119: Dimensions, elements and attributes of Biophilic design (Kellert et al., 2008)

Beatley in 2011 proposes the applied strategies for the integration of nature into the urban built environment across scales: building, block, street, neighborhood, community, and region. (Beatley, 2011) He argues that both political and social decision-makers should take part in the process of implementation of biophilic cities. This regional-scale focuses on green elements and green urban spaces as principles of a biophilic environment. Other biophilic principles that provide restorative experiences such as diversity of color, daylight, natural water features, and organic structures, are not included in Beatley's proposal. (Fig.121) Although, biophilic design should promote ecologically interrelated design solutions at multiple scales, including distinct interior spaces, the building as a whole entity, the surrounding landscape, region and neighborhood, but in the place scale it should be applied according to the climate, cultural opportunities, limitations, species selection, resource availability, seasonal accessibility, and comfort control of the cases (USGBC, 2015). (Fig.122, Fig.123)



Fig.120: 14 patterns of biophilic design (Terrapin Bright Green, 2014)



Fig.121: Biophilic urban design elements across scales, Beatley, 2011

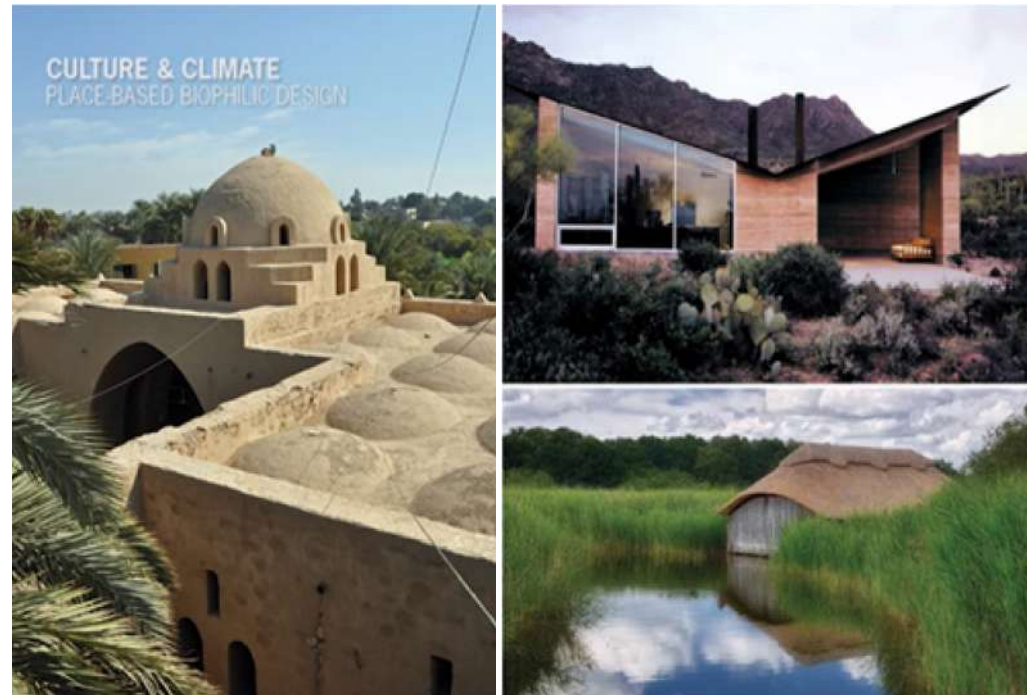


Fig.122: Vernacular biophilic design according to climate and culture

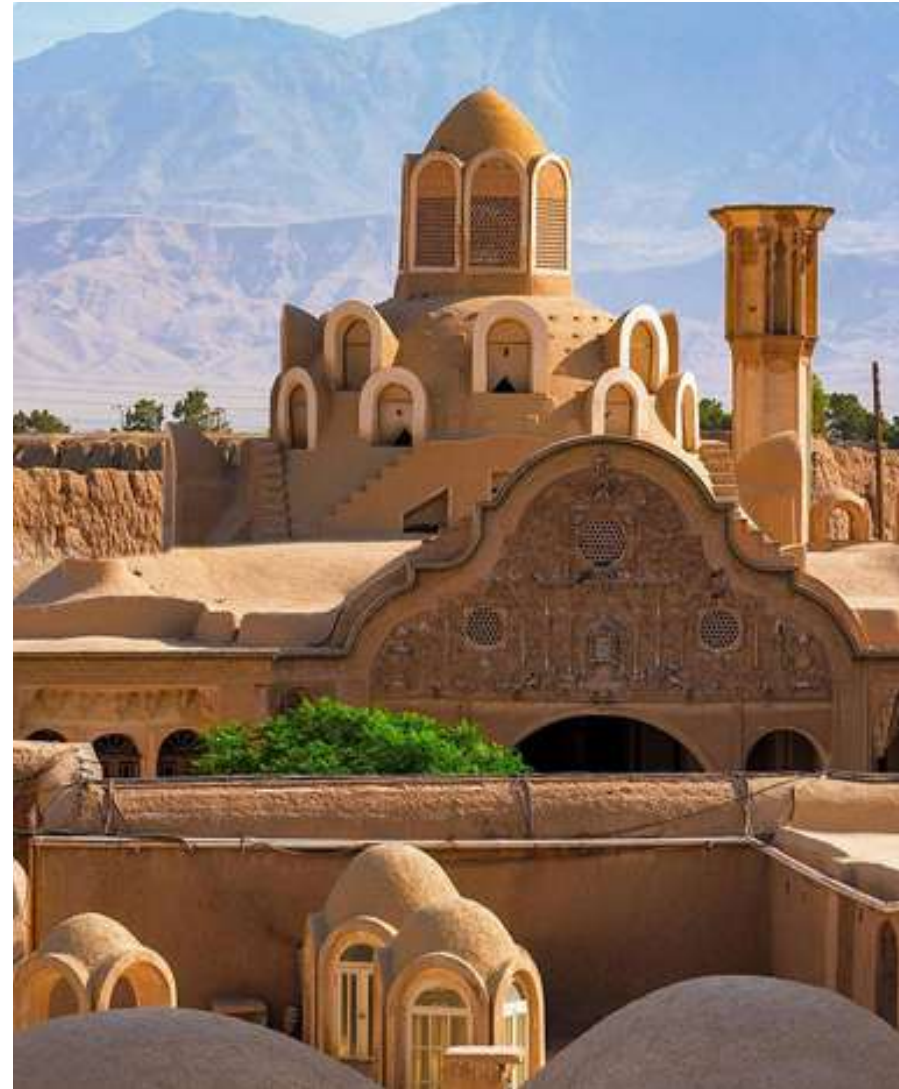


Fig.123: Biophilic design of the old historical houses in Islamic architecture, Ameriha Historical house, Kashan, Iran

5.3. Biophilic Urban Acupuncture

The “urban acupuncture” is a method that can contribute to restoration of neighborhoods through punctual interventions, rather than heavy approaches. Urban acupuncture produces small-scale interventions into the urban fabric, while perceptually, ecologically, and functionally catalytic.

Casagrande states, “*Urban acupuncture is an urban environmentalism theory which combines urban design with traditional Chinese medical theory of acupuncture.*”¹ (Casagrande, 2014)

Urban Acupuncture was first defined by the Barcelonan architect and urban planner Manuel de Sola Morales. The objective here is to recognize vulnerable or sensitive areas in the city that are left neglected or ignored in terms of social, economic, and ecological factors. Such areas are then treated using urban acupuncture by developing small-scale alternatives to help relieve the tension of the area, similar to that of the traditional Chinese acupuncture, and thus imposing a revolutionary impact on a larger urban fabric. In 2008, he stated the theory of urban acupuncture in “A Matter of Things,” and refers to the traditional medicinal acupuncture method. In acupuncture, the

human body is considered to have 361 points of sensitivity. Each point transmits sensory information to the rest of the body through twelve meridians or pathways.² Firstly, to operate on the skin of this city, needles should locate points in urban fabric that carry potential richness. Then, addition, removal, or modification of items should be considered, along with a proper rearrangement. (Solà-Morales, 2008) “*As in therapeutic acupuncture, the location of the sensitive points is the first step in the strategy treatment of the urban skin. It is dexterity in identification of the spots and channels of influence in the fabric that enables us to add new qualities, adequate energy, whether cold or hot, and empower urbanity in its various modes. The energy at these locations is linked to the existing richness and especially potential richness of urban sites*” (Solà-Morales, 2008). The acupuncture considers small-scale “things that matter” in the city. What is more important in urban acupuncture is that these small-scale things are part of an interdependent structure, such that the impact of the intervention is not just on the site concerned, but on the entire urban network. He states: “*It is the urban matter that transmits to us, at its most sensitive points and in its most neutral zones, the qualitative energy that accumulates collective character on certain spaces, charging them with complex significance and cultural references and making them semantic materials and social constructions of intersubjective memory.*”

¹ One example often cited as an illustration of the nature and potential of this approach is the scheme undertaken in Barcelona prior to the 1992 Summer Olympic Games. Faced with the challenge of regenerating a number of dilapidating neighborhoods, the architect and the acting counsellor of urban design, Oriol Bohigas, initiated a redevelopment scheme which emphasized “projects, not planning” (Ellin, P. 124). Of particular note in this scheme, there was the creation of a network of discrete and context-specific public spaces, or “living rooms,” located within each city quarter. These public spaces, each designed by a different design team, and each with an art created by an internationally renowned artist, provided a unique identity for each quarter and offered a mediation between the scales of the neighborhood and the city.

² Manuel de Solà-Morales i Rubio (1939-2012), the Barcelonan architect founded the Laboratori d’Urbanisme de Barcelona (LUB), and created new concepts and introduced innovative practices for transforming urban design in Europe.

Secondly, as Jaime Lerner, the Brazilian architect and urban planner noted in the “Acupuntura Urbana,” the “urban acupuncture” aims to heal energy flows on sick or painful sites by revitalizing such places and their surrounding areas. He views cities as a skinned body that, with a pinch of a needle, it is possible to recover energy at a sick or painful point. Lerner argues that urban planning should also evaluate the responses it attains from the city. Sick or painful sites are found within the urban structure, and the urban acupuncture proposed by Lerner is a fast way to affect these changes. Jaime Lerner believes that intervention is all about revitalization: *“I often ask myself how it is that some cities manage to make important and positive changes. There are scores to answers, but one seems to me to be common in all innovative cities: every city that succeeds has undergone an awakening; a new beginning. This is what makes a city responsive.”* (Lerner, 2016)

Thirdly, Helena Casanova & Jesus Hernandez introduced techniques and approaches to stimulate urban life in a book in 2015 on public space acupuncture. Their vision merged the idea of acupuncture and public space. *“The growing awareness of the importance of public space as a regulation of urban cohabitation has led some cities to look for new ways of understanding its creation, design and management according to what might be called public space acupuncture strategies, born from applying urban acupuncture strategies exclusively to the sphere of public space.”* Here, Jesus Hernandez stressed the urban contexts to use the acupuncture: *“where an increase in social instability has already been detected: in neighborhoods with large, socially excluded immigrant populations, in city centers where public life is disappearing*

from the streets, or in new urban developments, where there is a lack of social cohesion.” (Casanova & Hernandez, 2015)

Finally, a figure who revived the concept of urban acupuncture and provided a new dimension to this theory is the architect Marco Casagrande. His works mainly focus on the integration of biophilic design with the neighborhood area. He sees cities as complex energy organisms, where different overlapping layers of energy flows determine the actions of the citizens as well as the development of the city. Casagrande developed punctual manipulation methods of urban energy flows to create an ecologically sustainable urban development towards the so-called “Third Generation City,” A term used for post-industrial cities.

The theory of third-generation cities consists of a cycle of three steps (or generations) where natural and built environment interact. In the first generation, humans employ modest architecture in nature, while totally depending on the environment and understanding of nature. During the second generation, humans exploited natural resources and to form industrial cities on earth, like a cancer on the skin. Industrialism granted citizens independence from nature. Therefore, in this generation, nature was perceived as an unnecessary affair (Casagrande, 2013). In the third-generation cities however, nature takes over the cities and leaves ruins behind. In this generation, architecture and urban places will become part of the nature, and the city will become an organic machine. Casagrande defines urban acupuncture as: *“Cross-over architectural manipulation of the collective sensuous intellect of a city. The city is viewed as a multi-dimensional sensitive-energy organism,*

a living environment. Urban acupuncture aims to be in touch with this nature and sensitivity to understand the energy flows of the collective chi beneath the visual city and to react on the hot-spots of this chi. Designer is in a position to produce the acupuncture needles for the urban chi. A weed will root into the smallest crack in the asphalt and eventually break the city. Urban acupuncture is the weed and the acupuncture points are the cracks.” (Casagrande, 2014) (Fig.124)

According to urban acupuncture theories, efficiency of biophilic interventions are not necessarily relative to their extensiveness. Biophilic Urban Acupuncture (BUA) is the idea that threads the nodes of biophilic interventions in specific urban areas to improve their qualities and human well-being accordingly. BUA has higher rates of effectiveness in dense areas, such as neighborhoods. The intervention should be placed in a location that attracts maximum users, while being embedded in a daily habitat or in a commuter route. Smaller BUA programs should be considered in a web-like structure in places across the city. BUA can have major impacts on certain sites that are normally abandoned or areas that are mostly ignored. As a result, this intervention is widely understood and accepted by society, regardless of its executive, and will be looked after for years. (Walker, 2015) (Fig.125, Fig.126)

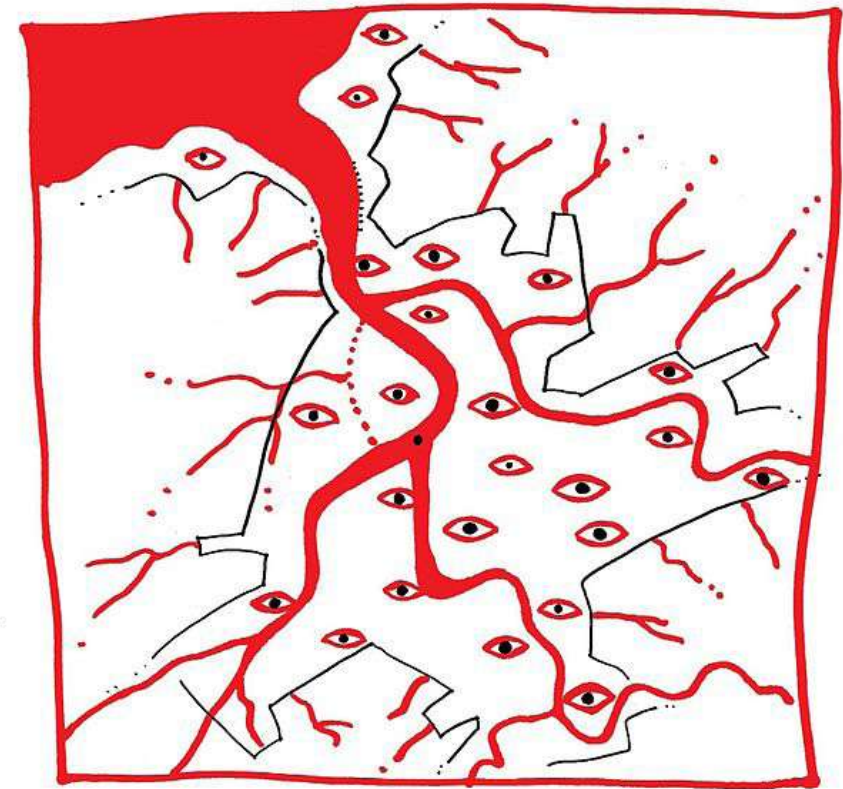


Fig.124: Taipei biophilic acupuncture (Marco Casagrande, 2010)

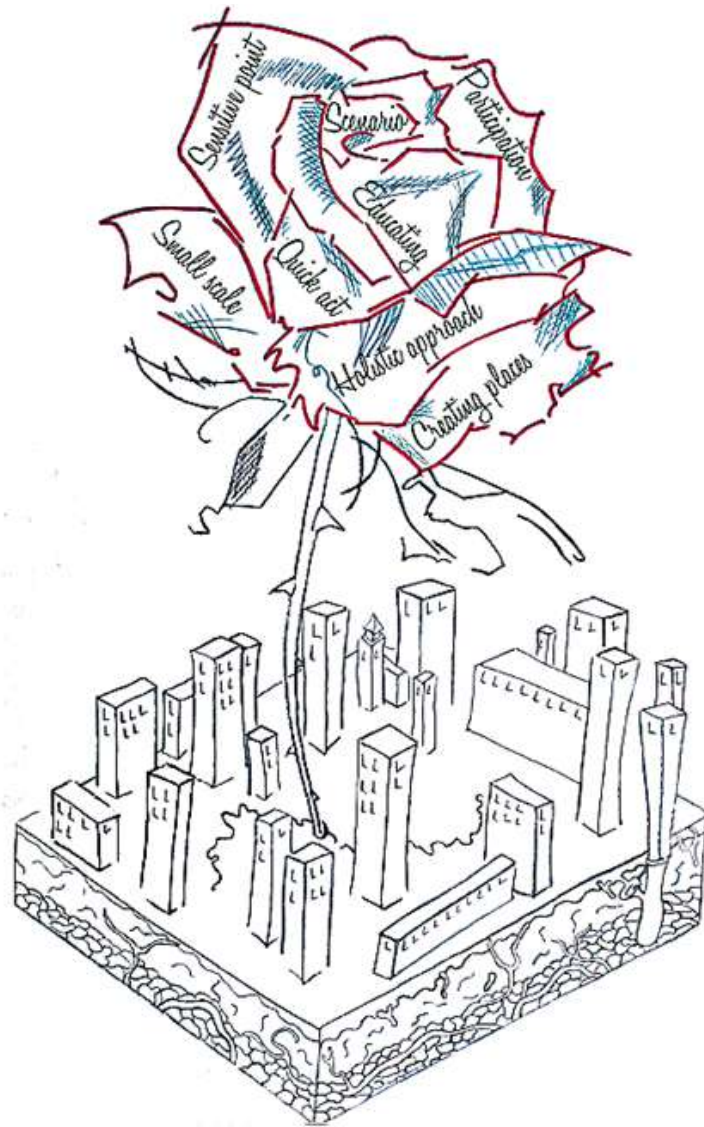


Fig.125: Biophilic urban acupuncture intervention of neighborhood area

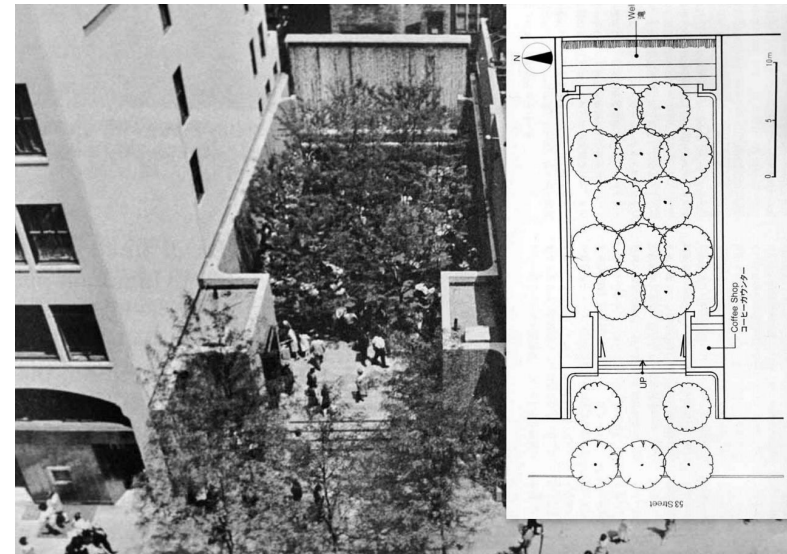


Fig.126: Paley park has refurbished through biophilic urban acupuncture design in New York

5.4 Biophilic Design through Green Infrastructure Planning

Following the 1990s, the Green Infrastructure concept gained attraction in planning theory and practice. While it was a new concept, some scholars believed it was not a new idea, claiming that green infrastructure planning dates back to the 19th century, when green areas were built to provide recreation opportunities for urban populations and resolve public health and urban flood concerns (Benedict & McMahon, 2002); (Mell, 2010). It has been stated that the exemplary designs of Frederick Law Olmsted were central to the creation of the green infrastructure concept (Davies, et al., 2006).

In 19th century, Olmsted's designs were, in a sense, devices to influence human well-being by constructing "natural spaces" with intentions of pacifying residents' urban insecurities. The layering of benefits provided by Olmsted's plan has provided a historical green space matrix to the city of Boston that offers citizens well-being and enabled the city to plan for respecting nature. Fig.127) Others (Amati & Taylor, 2010); (Thomas & Littlewood, 2010) believe that the Green Infrastructure is either related to the existing definition of the green belt (originally found in the UK planning system), or it was first included in the famous 1947 Copenhagen Finger Plan. (Fig.128, Fig.129)



Fig.127: Olmsted's plan has provided a historical green space matrix to the city of Boston, 1894



Fig.128: Copenhagen Finger Plan,1947

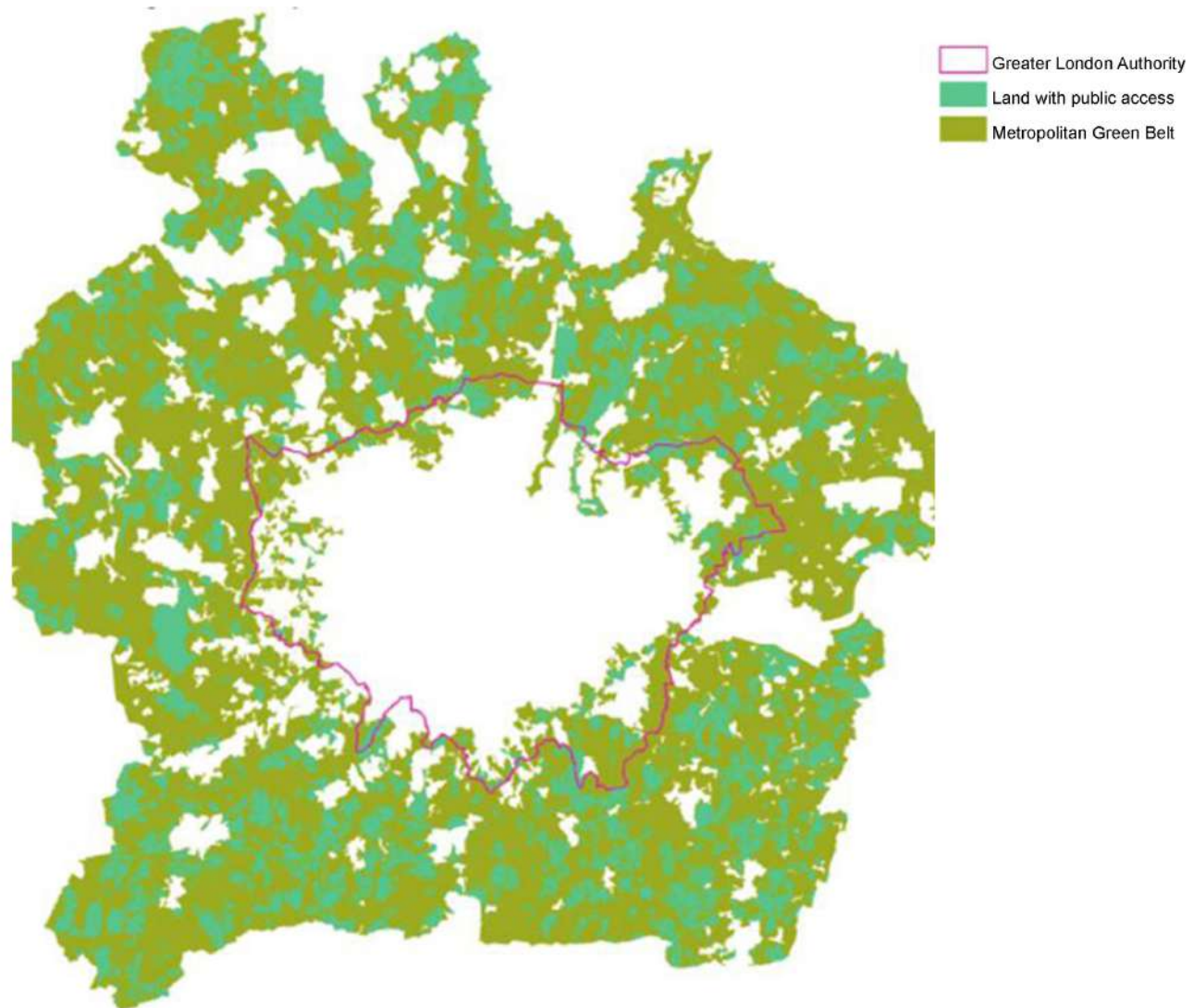


Fig.129: UK planning system,1935

Green Infrastructure thus offers what Davis calls a return to the “Olmstedian values” of innovative and connective planning (Davies, et al., 2006), (Mell, 2010). The idea of linking the ecological capacity and social opportunities of an area is now taken as a great opportunity in urban planning. Regarding the planning scale, green infrastructure can be implemented at various scales. As many researchers claim, it covers urban and local level to the regional level. (City Parks Forum Briefing Papers, 2003); (Benedict & McMahon, 2006); (Mell, 2010); (Lafortezza, et al., 2013); (Lennon, 2014).

Benedict and McMahon define “green infrastructure” as “*an interconnected network of green spaces that conserves natural ecosystem values and functions and provides associated benefits to human populations*” (Benedict & McMahon, 2002). Therefore, green infrastructure plan (GIP) is a plan that aims to identify, evaluate, and develop urban green spaces ((Sandstrom, 2002); (Saglie & Thoren, 2015)). GIP focuses primarily on public spaces, while all types of green spaces should be included in the concept of green infrastructure. GI offers a methodology to connect with the natural environment, while providing relief from the public health burdens often associated with living in cities. (Rice, 2016)(Karhu, 2011)

Most widely interpreted GI is reference to “networks.” This can be seen in policy discussions where reference to GI is made as “ecological networks,” recreation-focused “greenway networks,” ((Little, 1990), (Fabos, 2004)), or some combinations of such (Walmsley, 2006). As

the demand on urban green space rises, following urbanization and densification, this method of mapping and assessment of green spaces will become increasingly important (Nord & Evensen, 2018). On May 2013, the European Commission published a strategy to promote green infrastructure –essential to the functioning of cities and regions– and mainstreamed it in EU policy areas.

Spanish cities, which have historically been dense and compact, have managed to contain growth at a regional level, while conserving and protecting large green areas close to urban places. Barcelona is one of the committed cities to preserving and enhancing the natural heritage present in the city to enable each and every one of citizens to benefit from and enjoy it. The Barcelona Green Infrastructure Plan sets out a long-term action plan aimed at achieving green infrastructure that can offer the following benefits “ *Creating benefits for people, Providing environmental and social services, Creating havens of life within the urban environment, Introducing nature into the city, Connecting and reuniting the city with the territory, Making the city more fertile and resilient to tackle future challenges.*”. (Ajuntament de barcelona, 2020). This plan of Barcelona entirely indicates that how urban planning can support biophilic design through the promotion of “green infrastructure” in the 21st century. (Fig.130)

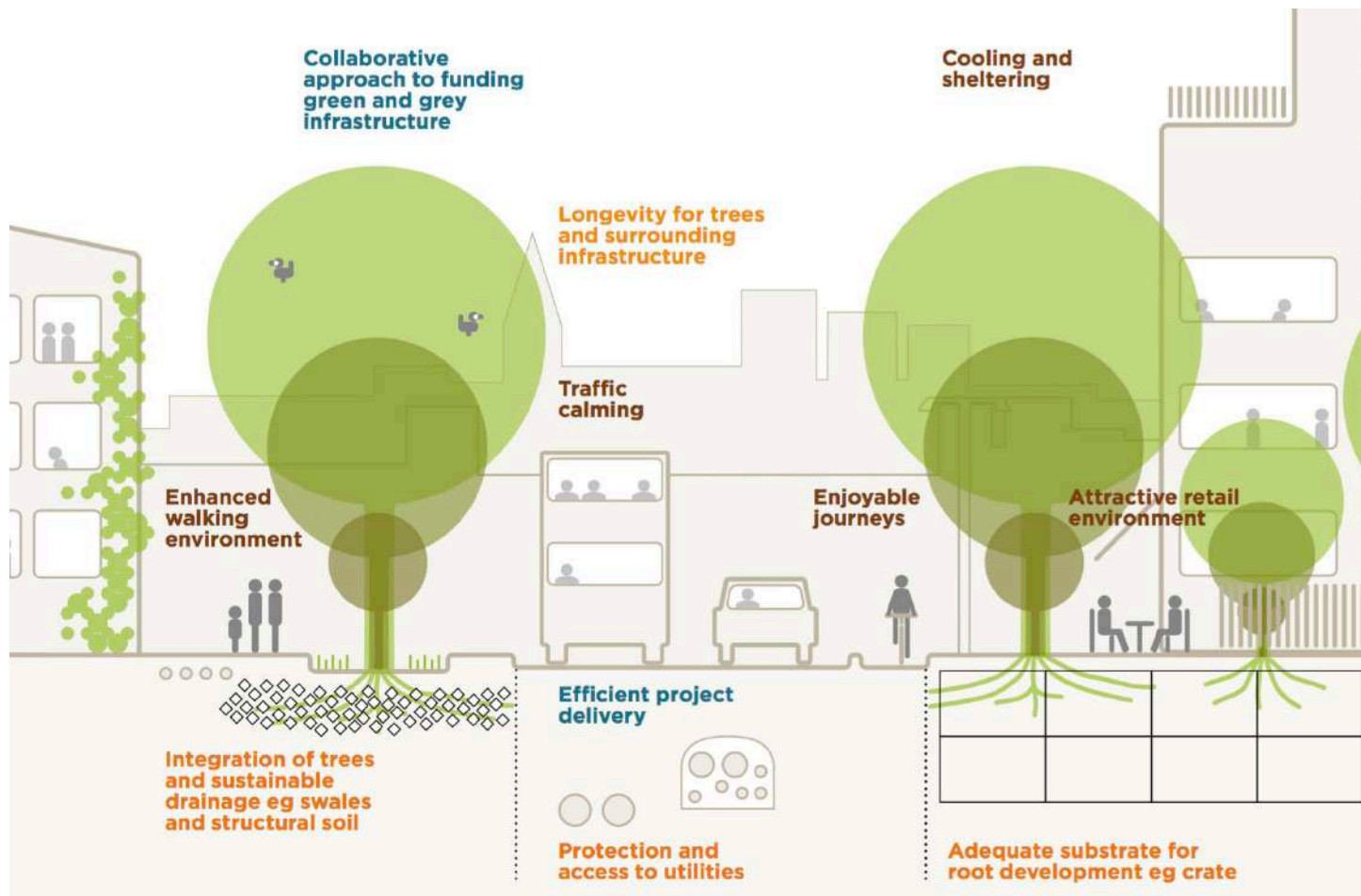


Fig.130: Section for green corridors of GI Planning

5.5 Partial Conclusion

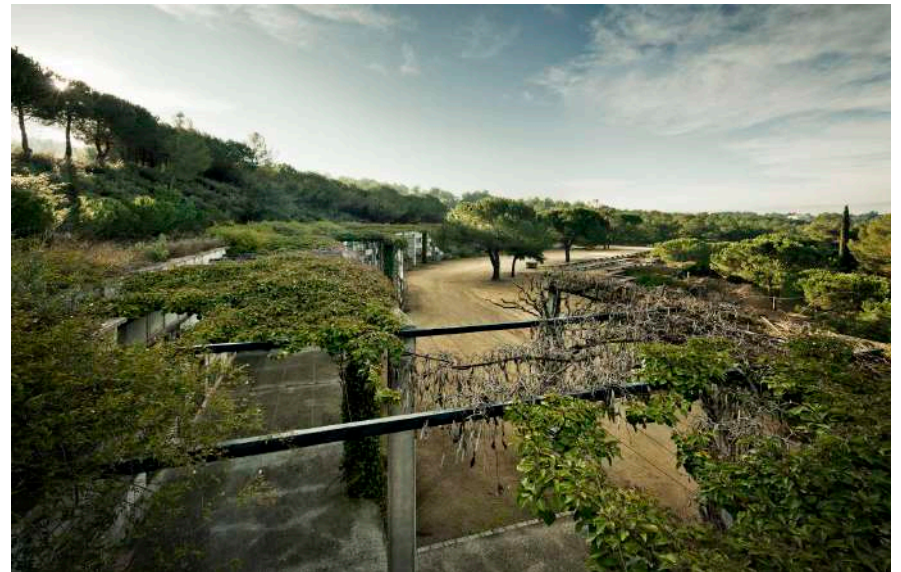
According to this chapter, biophilic design as a sensory design can promote different environmental qualities of urban spaces and areas within different cultures, weathers, managements. But the way that how it could contribute to different scales has been the goal of many theorists and authorities during centuries.

As we mentioned, applying biophilic design to landscape and building architecture is more than just a technical tool. As the theorist states, biophilic design models are flexible and replicable strategies to enhance the user experience, and can be implemented under a range of circumstances. A practical methodology for a more effective interior, building, and landscape architecture can be summarized as follows:

- Presence of water or exposure to the water in vicinity or within buildings (e.g., blue walls, ponds, springs, streams, classic pools, Fountains, or other water features)
- Presence and integration of a wide range of native plants and animals (Biodiversity) (e.g., insects, birds, flowers, trees, grass, Potts, green walls, potted vines, or green roofs)
- Thermal and airflow variability or natural ventilation in buildings (e.g., operable windows, skylights, internal air circulation, mechanical ‘cooling’ systems, or fan-assisted cooling strategies)
- Biomorphic patterns and forms (e.g., gathering spaces, furniture, entrances, graves, facade, or walls)
- Vernacular materials and architecture (e.g., walls, floors, or furniture)
- Natural color and materials (Earthen: plaster, earth, soil - Animal: silk, wool, leather -Natural: mud, clay, wood, thatch, stone - Synthetic: brick, block, concrete, glass, plastic, ceramics - Mineral: marble, sandstone, granite, flagstone, slate)
- Providing views and vistas to nature/natural environment. If direct contact with nature is infeasible, then pictures and images of nature should be provided
- Natural dynamic daylight or warm lighting
- Connection with the natural system (e.g., patina, seasonal vegetation, temporal change within space, seasonal fluctuation in the water table or water movement, using aging or weathering material such as copper, stone, corten steel, or visual visible hydrological cycles such as water sensitive urban design (WSUD)) (Clancy, 2016)
- Complexity and orders
- Mystery
- Refuge

In neighborhood scale, Manuel de Solà-Morales, Jaime Lerner, Casanova & Jesus Hernandez, and Marco Casagrande, share a common line of small-scale urban intervention in vulnerable urban areas to maximize urban setting. Across these ideas, within Marco Casagrande works, we have a better view of how biophilic design could improve neighborhood areas qualities and make them more productive. Therefore, to do so, urbanist can start with searching for sick, ignored and abandoned areas in terms of social, economic, ecological elements and inject the biophilic needles on those points. This intervention can enhance the connection with natural systems, visual connection with the nature, and non-visual connection with nature in neighborhoods.

In region scale we discussed that GIP could offer a biophilic design intervention through urban planning of cities which can improve by its characteristics of the natural environment that finally will promote human health and well-being. We also discussed that GIP network includes all green areas within the urban fabric, all types of green and blue areas (regardless of ownership or origin), and landscaped natural vegetation, while offering ecological, functional, perceptual, social, and economical services. In addition, these services are enhanced further when the connectivity of green infrastructure is achieved.



“The landscape features of the modern park and the modern cemetery are essentially the same, with green grass, flowers, shrubs and trees so arranged as to produce harmonious effect, pleasing to the eye.”

(Weed 1912)

CHAPTER 6

COMPARATIVE CASE STUDIES

Although clear and subject-related theoretical language of biophilic design provides a universal language that can be used as a theoretical tool for discussing, interacting, and understanding the topic, but practical issues are clearly essential for the successful adoption and implementation of biophilic design in urban cemeteries. Accordingly, this chapter demonstrates how biophilic design can be applied to urban cemeteries via providing references from around the world. Those cemeteries are selected within different types, cultures, religions, and climate, and are either designed recently or shaped gradually. These cemeteries have shown successful integration of many principals of biophilic approaches in their urban planning, urban design, building, and landscape architecture.

6.1 Biophilic Design of Scandinavian Urban Cemeteries

6.1.1 GIP Application

Today, in Scandinavia, “green structure” has become an accepted term in the planning process. (Lindholm, 2002). Based on an interpretation from the survey that involved an interpretation of various data sources (e.g., document review of MMPs, GIPs, municipal websites, and a focus group interview), the study shows that cemeteries in Scandinavia are open green spaces that offer qualitative urban design and, which facilitate public life and recreation for the well-being of humans. Moreover they are partly included in the definition of green infrastructure in Scandinavian capitals (Nord & Evensen, 2018). Across Scandinavia, cemeteries have considerably more vegetation compared to cemeteries in the Mediterranean countries. Most Scandinavian cemeteries have lawns and a network of pathways, and the tombstones are arranged in a grid-like pattern.

According to GIP of the Oslo capital, ten significant waterways and a comprehensive network of parks, recreation areas, and green corridors comprise blue and green areas, including recreational islands in Oslo Fjord, parks and cemeteries (which are maintained like parks), sport and recreation areas, and other green spaces regulated for recreational and ecological purposes. (Application Form for the European Green Capital Award, 2019)

Oslo’s guiding principles for urban development shows accessible and high-quality green areas. UOPGS provides vital ecosystem services, including recreational opportunities and wildlife habitats. Oslo databases do not differentiate public and private green areas. Enclosed areas such as cemeteries and green areas governed by the municipality are open to the public, regardless of their ownership. To quote the GIP: *“The cemeteries can be compared to quiet parks, but they have a distinctive role as places for mourning and meditation.... The cemeteries are probably the oldest built green areas, and are linked to our history and tradition.... Primarily, they are places where activities take place with consideration and respect for their surroundings. Secondly, park-like use of the cemeteries, such as taking a walk, sitting on benches, looking at old graves, etc., is an important and desirable use of the cemeteries”.* (Nord & Evensen, 2018)

Blue and green spaces in Oslo

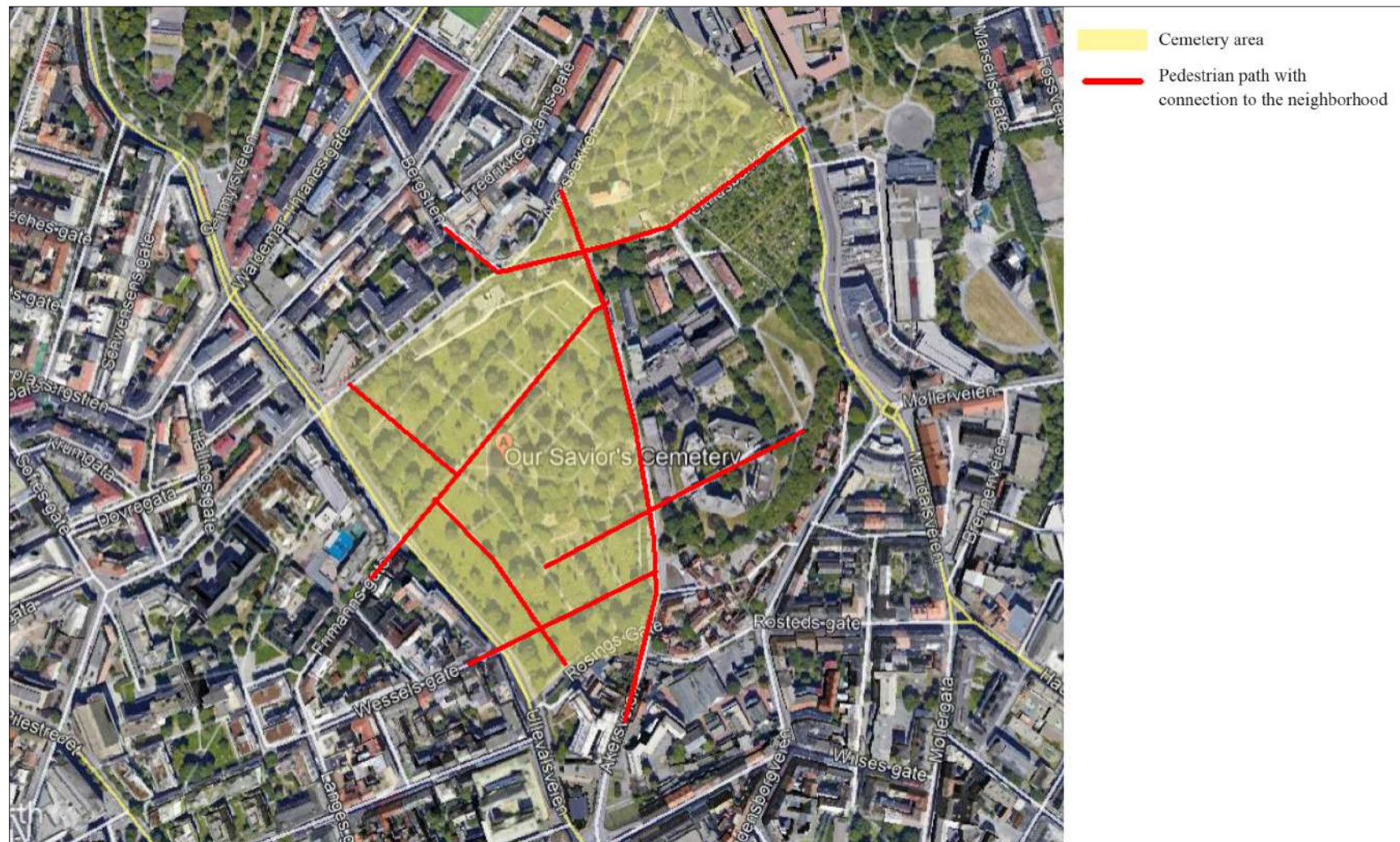


Through this qualitative analysis, it was seen that the urban cemetery, such as Our Savior's Oslo, is viewed as a green open public space that contains the green infrastructure of Oslo. It is the mixture of nature, culture, tradition, and reverence for the deceased and those visiting tombs that made the cemetery distinct from other green spaces in the city by their design. Today, this cemetery is surrounded by a central residential neighborhood. Visitors consider it as “a green lung,” which is a common shortcut for people living in the area to the city center. While it is still in active use as a cemetery, big old trees, paths, and wide-open green areas make the site desirable for a variety of leisure activities that do not conflict with the rules of conduct for such sites (Nord & Evensen, 2018). (Fig.131)



Fig.131: Our Savior's cemetery of Oslo is perceived as an urban open public green space and includes green infrastructure

Connection Paths through the cemetery



6.1.2 Biophilic Landscape and Architecture Design of Skogskyrkogården Cemetery, Enskede, Sweden

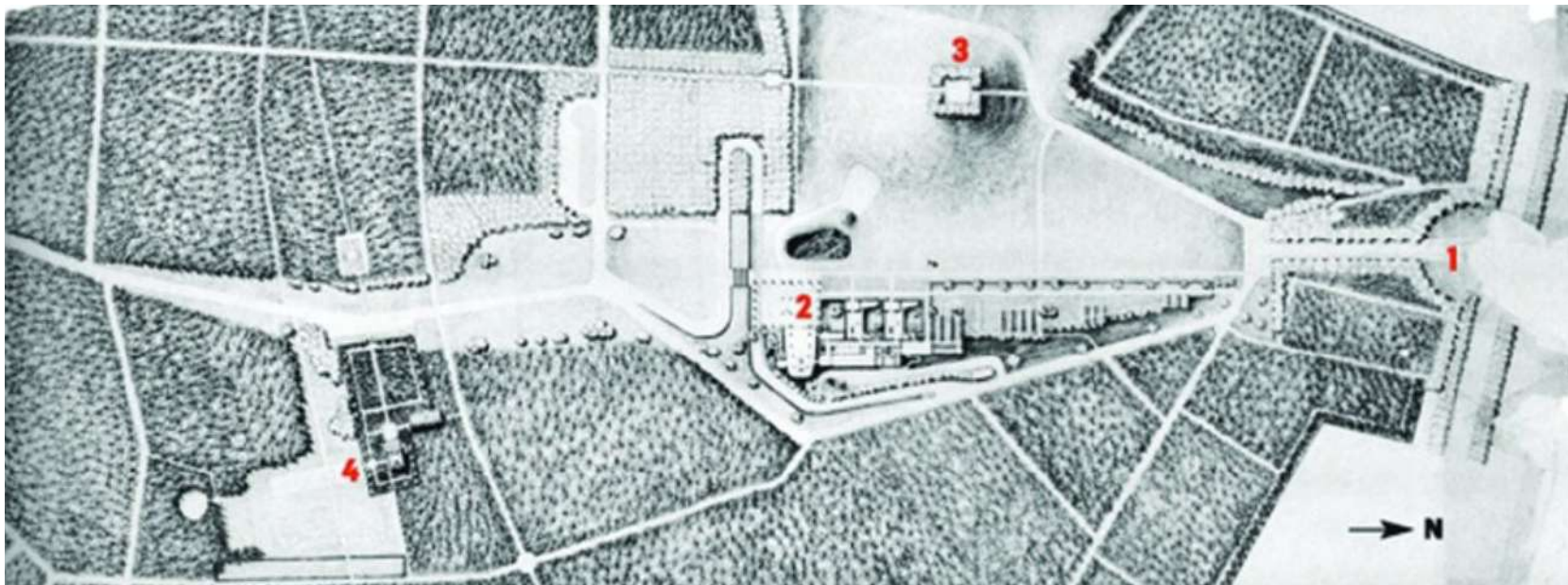
As mentioned earlier, cemeteries in Scandinavia are often well-maintained spaces compared to other green spaces in the cities. Lesser-known or smaller cemeteries in Scandinavia, such as Our Savior's Cemetery in Oslo, have a fairly high number of tourists and have been shown to be used for a variety of daily activities such as dog walking, socializing and cycling (leisure activities). Moreover, some cemeteries are tourist attractions that draw a large number of visitors, such as the World Cultural Heritage site Skogskyrkogården in Stockholm (Sweden), which has about 400,000 visitors annually (Larsson, et al., 2014). (Nord & Evensen, 2018)

Skogskyrkogården was designed by Gunnar Asplund and Sigurd Lewerentz from 1915 to 1940. The challenge in their work was to design an urban public cemetery, secular in nature and decor, while maintaining as many existing natural elements on the site as possible. The unique cemetery was a harmonious mixture of nature, architecture, and artistic decoration. (UNESCO, 1994) It is an outstanding example for the practical feasibility of biophilic design into environmental indicators of urban design in the immediate and place scale. Although biophilic design was officially implemented by Kellert in 1993, this cemetery was designed in an organic and natural way 78 years earlier.

Achieving a tight synthesis between the Scandinavian and Christian traditions, architects worked with natural elements that have symbolic connotations for both: the tree, the water, and the mountain. (Flores, 2005) (Candia, 2015) In a joint collaboration, architects and urban designers created a unity of landscaping and buildings that have become one of the world's leading biophilic urban cemetery.

Today, the function of the cemetery as a park remains in MMP and Stockholm's local park plans. This cemetery is described as "having national cultural heritage values" and possesses all sorts of high-quality indicators of biophilic design.

Skogskyrkogården Site Plan, Asplund, 1940



1. Main entrance 2. Woodland Crematorium and chapels of Faith, Hope and Holy Cross 3. Hill of Remembrance 4. Woodland Chapel

The perceptual permeability of cemetery is created with a 3.6-kilometer short-height vernacular stone walls and the main entrance designed by a spectacular biomorphic semi-circular forecourt. Once passed the entrance, this indicator has enhanced by a straight view between two stone walls and a double avenue of lime trees which the visitors are greeted. (Fig.132)

In one of these walls, a neoclassical porticoes niche (Lewerentz's work from the early 1930s) provides perceptual diversity of place by a small stream of water flow between the rocks. The water moistens the rocks at the bottom of the niche, allowing the growth of small plants in summer and freezing plants in winter which itself indicating the passage of time and the cycle of life in the environment. (Fig.133)

Following the entrance, perceptual permeability of the place has remained with the long natural perspective of Seven Springs walkway (with seven springs spread along the path) while provides a relaxation opportunity in nature and links Elm Hill to the Chapel of the Resurrection continuously. (Fig.134)

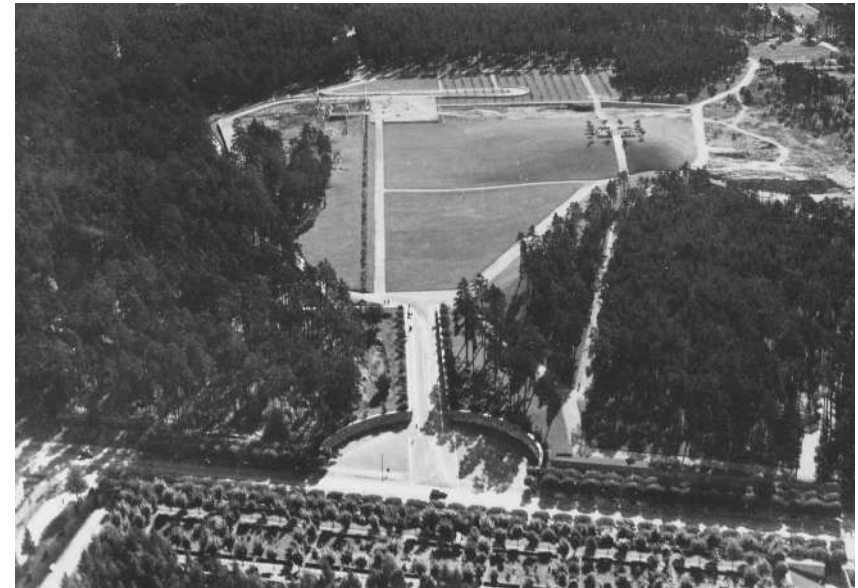


Fig.132: The entrance: biomorphic semi-circular forecourt



Fig.133: Water moistens indicating the passage of time and the cycle of life.



Fig.134: Natural walkway of Seven Springs leads to the Chapel of the Resurrection.

Elm hill or Almhöjden, the meditation grove accessible through a long flight of steps, provides a mystery for the observer and the path provides more information to the individuals as they travel deeper into the cemetery. Using this pattern also creates a more visually related environment that enhances perceptual compatibility, while reducing stress by inducing shift in focus and enhanced concentration of visitors. (Terrapin Bright Green, 2014) This section also allows visitors, whether in mourning or not, to enter the site without the imminent notice of death. This area possesses a burial-free biomorphic transitional focal point near the entrance to prepare those who enter the cemetery for the burials. Alternatively, functional flexibility of the place has increased by serving as a place of rest and relaxation and meanwhile propose a place for different ceremony and events. Besides, this place offers a place for visitors to lounge in the grass to read or picnic. In the absence of recreation equipment, a variety of additional biomorphic hills can promote functional flexibility of place for children. (Fig.135, Fig.136)



Fig.135: Elm Hill - biomorphic forms to the site and its long flight of steps which provides a mystery section serving as a place of rest and relaxation for visitors



Fig.136: Variety of additional biomorphic hills provides a play area for children

The minimal intervention of footpaths, meandering through the woodland and utilization of high-quality natural flagstones for flooring of site is reflected the functional permeability of place. It provides an appropriate path for daily bikers, joggers, and walkers to enjoy the space during the year. In addition, dynamic daylight and shadows through the woods provide safe alternative paths on the cemetery for pedestrians and cyclists alike. (Fig.137, Fig.138)

During the path within the cemetery, all interior skylines, such as the parking area, are covered by natural elements or regular rows of pruned trees. Moreover, wooden flexible seats, stone benches, and stone steps provides the passive interaction of visitors and functional flexibility in all areas. (Fig.139, Fig.140)



Fig.138: Utilization of high-quality natural flagstones for flooring is reflected in the functional permeability of place



Fig.137: Safe paths on the cemetery for pedestrians and cyclists

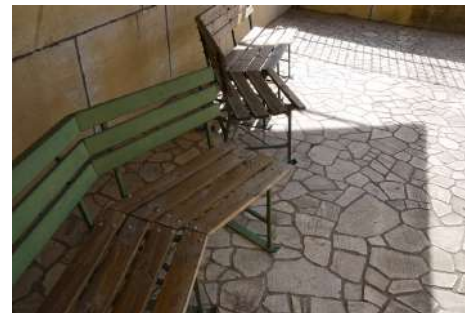


Fig.139: All interior skylines are covered by natural elements - Parking



Fig.140: Variety of benches and seats created using natural material throughout the cemetery

In the cemetery, the appropriateness of the mass and spaces in all areas and low and simple tombstones, as if are emerged from the ground and trees surrounding them, have increased the perceptual permeability of the place. Besides, natural colors and modest forms of graves created perceptual diversity within the woodlands and allow visitors to explore nature and its relaxing atmosphere once again. (Fig.141)

Moreover, according to biophilic principles, water as an ecological diversity indicator could enhance the experience and perceptual experience of the place through seeing, hearing, or touching. (Higgins, 2013) Skogskyrkogården employs water in a variety of ways throughout its site. The cemetery offers an environment that people can see, feel, and touch the water throughout its area. The pool at the crematorium provides a perfect reflection of the sky above. A sequence of seven springs accompanies the visitors across the site, connecting each part of the cemetery with water. (Fig.142)



Fig.141: Low, simple, natural colors and modest forms of graves as if are emerged from the ground and merged with nature



Fig.142: Presence of water in a variety of ways throughout the site - The pool at the crematorium, Remembrance garden, Seven springs in a woodland area

All the buildings (designed by Asplund) are integrated with nature to enhance the perceptual compatibility of the site, including the Woodland Chapel, the Woodland Crematorium (with its three different chapels), and the Tallum Pavilion. The smallest chapel, established in 1918, is visually integrated into its setting and demonstrates a high degree of organic and naturalistic architecture within the cemetery. This small wooden building is a perfect synthesis of Scandinavian hut and Christian temple; a combination of modernity and tradition. The atrium is defined by stylized Tuscan wooden columns that allude to its surrounding trees. The chapel is subordinate to the forest with its triangular roof. While The construction techniques and materials are indigenous and compatible ecologically but the details and resources suggest a deep understanding of modern architectural culture (Rowe, 1978). (Fig.143)



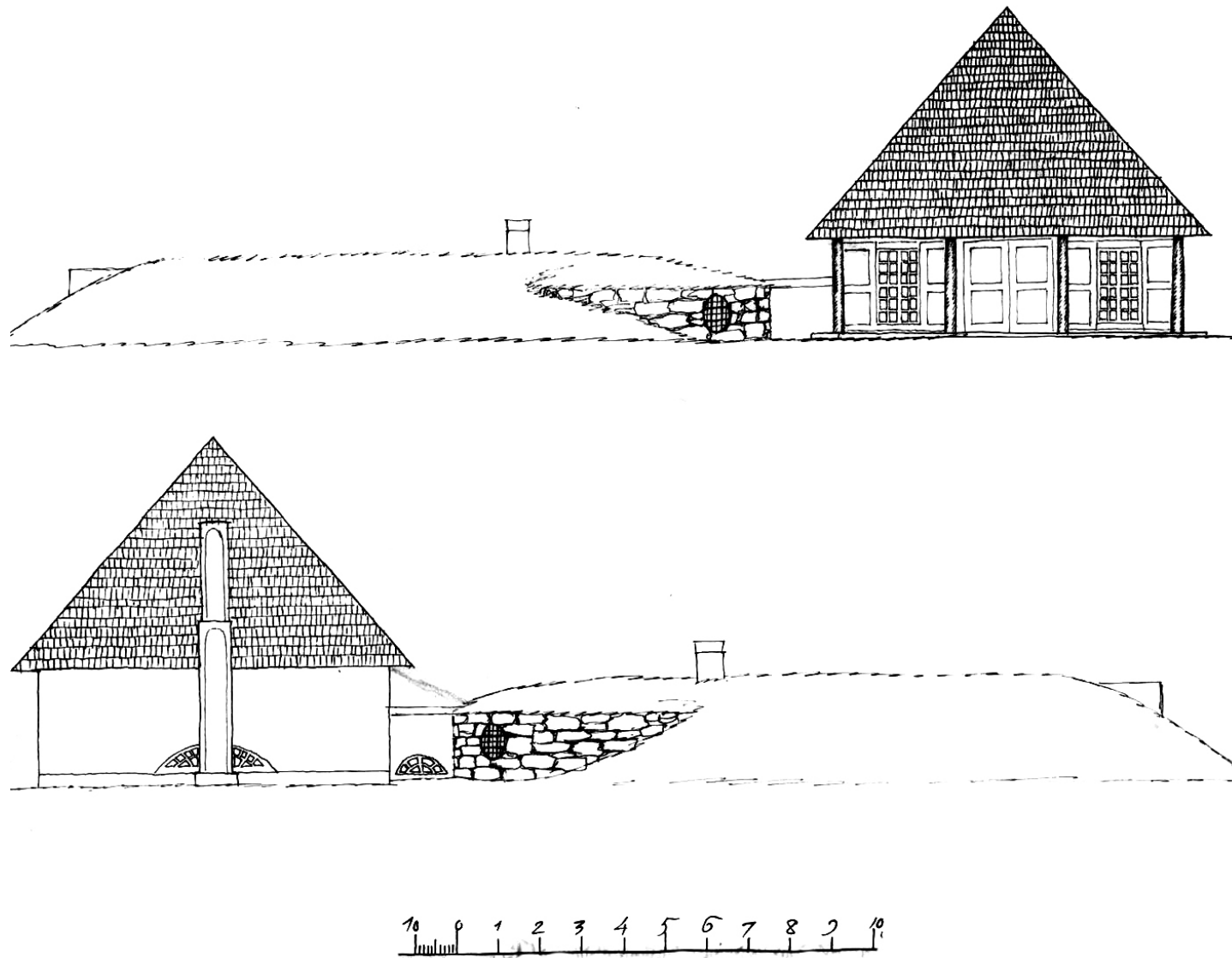


Fig.143: The Woodland Chapel is integrated into its setting -sketch by Erik Gunnar Asplund (1918), © Arkdes Collections.

The chapel of the sacred cross and the crematory complex are built by Asplund in his later years (1935 to 1940). This complex is made up of several subtly-related buildings: two minor chapels, the main chapel, the crematorium, and a large porticoes atrium with a light cover, unified by a stone cladding (Rowe, 1978). (Fig.144) The atrium with its unique skylight (adorned by the “Angel of Death” sculpture by Carl Milles) is a multi-functional space for different ceremonies. Furthermore, while the building provides functional diversity, it also provides a place for withdrawal from environmental conditions and visitors can enjoy varying intensities of light and shadows through the skylight. (Fig.144, Fig.145)



Fig.144: The chapel of the sacred cross and the crematory complex are unified by a stone cladding



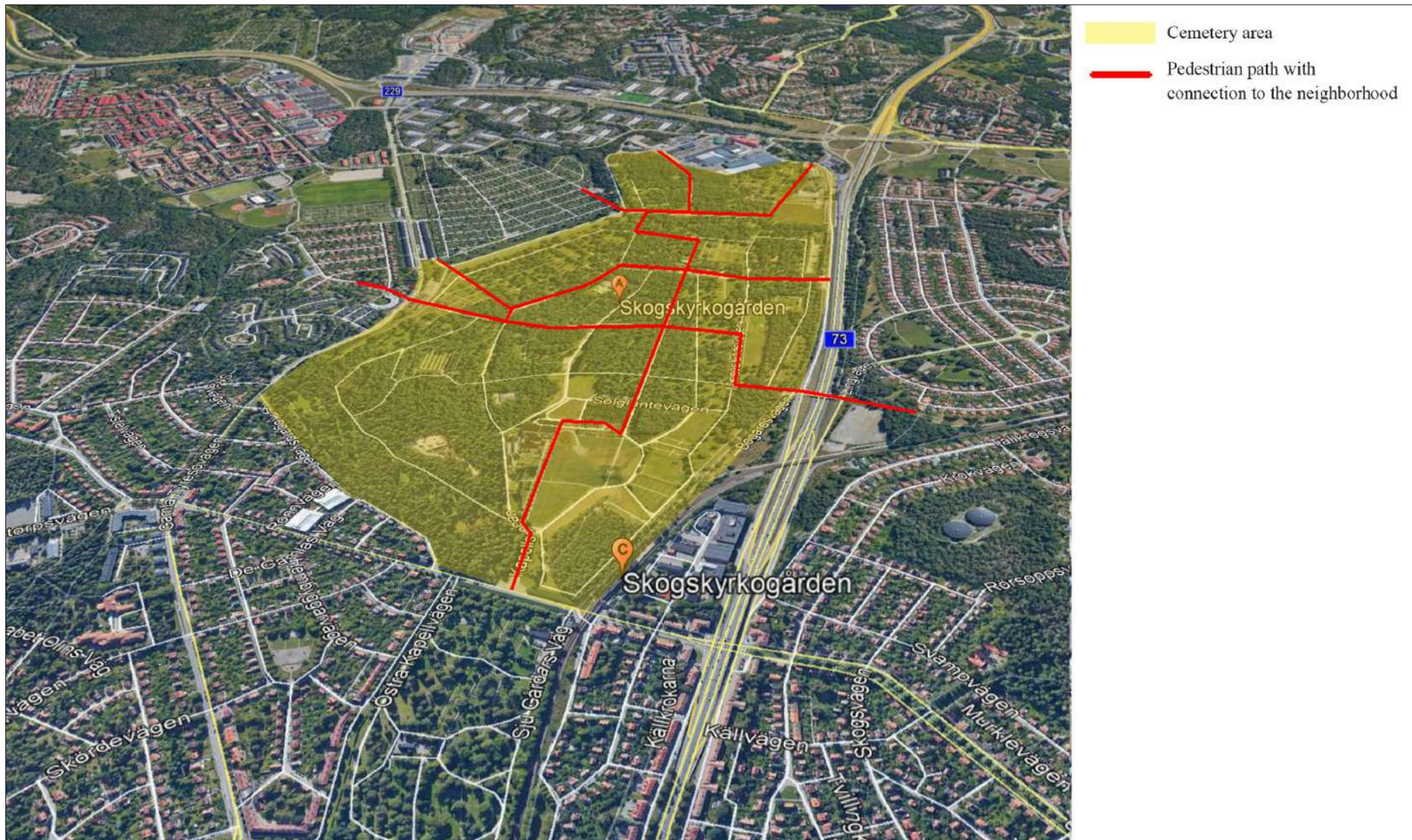
Fig.145: The atrium with The skylight and the natural light within the site is a place for withdrawal from environmental conditions

This heritage of the Skogskyrkogården is preserved under the Historic Environment Act (1988:950). The Burials Act (1990), the Planning and Building Act (1987), and the Environmental Code (1998) also support the preservation of this cemetery. The property is owned and maintained by the Cemeteries Administration of the City of Stockholm, a public body. A formally-constituted steering committee provides a forum for research, consultation, and regulation of property management, although no formal decisions are made by that committee. The Cemeteries Administration possesses a land management program (established in 2005). Skogskyrkogården is an integral member of the Stockholm burial service, and its management and maintenance is financed by burial taxes. The Stockholm City Museum is a significant collaborator in the management and conservation of Skogskyrkogården. It supplies the cemetery with antique experience, visitor center, and guided tours and educating property tourists. Issues to be addressed to preserve the outstanding fundamental value of the property include description and security of the buffer zone, along with the management of the defined environmental and developmental stresses. In particular, projects related to tree regeneration system and other conservation projects, which must be continuously updated in coordination with the management. (UNESCO, 1994)

Today, the Skogskyrkogården cemetery with its biophilic design and functional compatibility (in accordance with its history and appropriate functions of the surrounding area) has become an daily attraction as an urban open public green for the Enskede neighborhood, Stockholm residents, and tourists alike.



Skogskyrkogården cemetery position within the Enskede neighborhood and Connection Paths through the cemetery



6.2 Biophilic Design of Aoyama Urban Cemetery, Minato, Tokyo

Aoyama Cemetery or Aoyama Reien was established in September 1874, and is known as one of Tokyo's oldest public cemeteries. It was Tokyo's first municipal public cemetery, and one of the city's largest and most central cemetery. This cemetery has a total grave area of more than 128,019 square meters, making it the largest cemetery in all of Tokyo's 23 wards. (Aoyama Cemetery, 2020). This cemetery houses the graves of not only Japanese citizens, but also people born with different religious. There are massive monoliths, lanterns, mound-shaped crypts, Shinto and Buddhist architectures such as little torii (gates at shrines), and even Christian crosses in this cemetery. Today, the cemetery is a large, park-like cemetery, located in the chic neighborhood of Aoyama, one of the world's most expensive lands. There are still funerals in the cemetery regularly (Aoyama Cemetery, 2020). Today, the cemetery is not only rich with high biophilic design in place scale (landscapes and architecture dominated by Japanese garden elements and structure), but also in connected with its neighborhood and its region through applying GIP and BAU interventiones. (Fig.146)



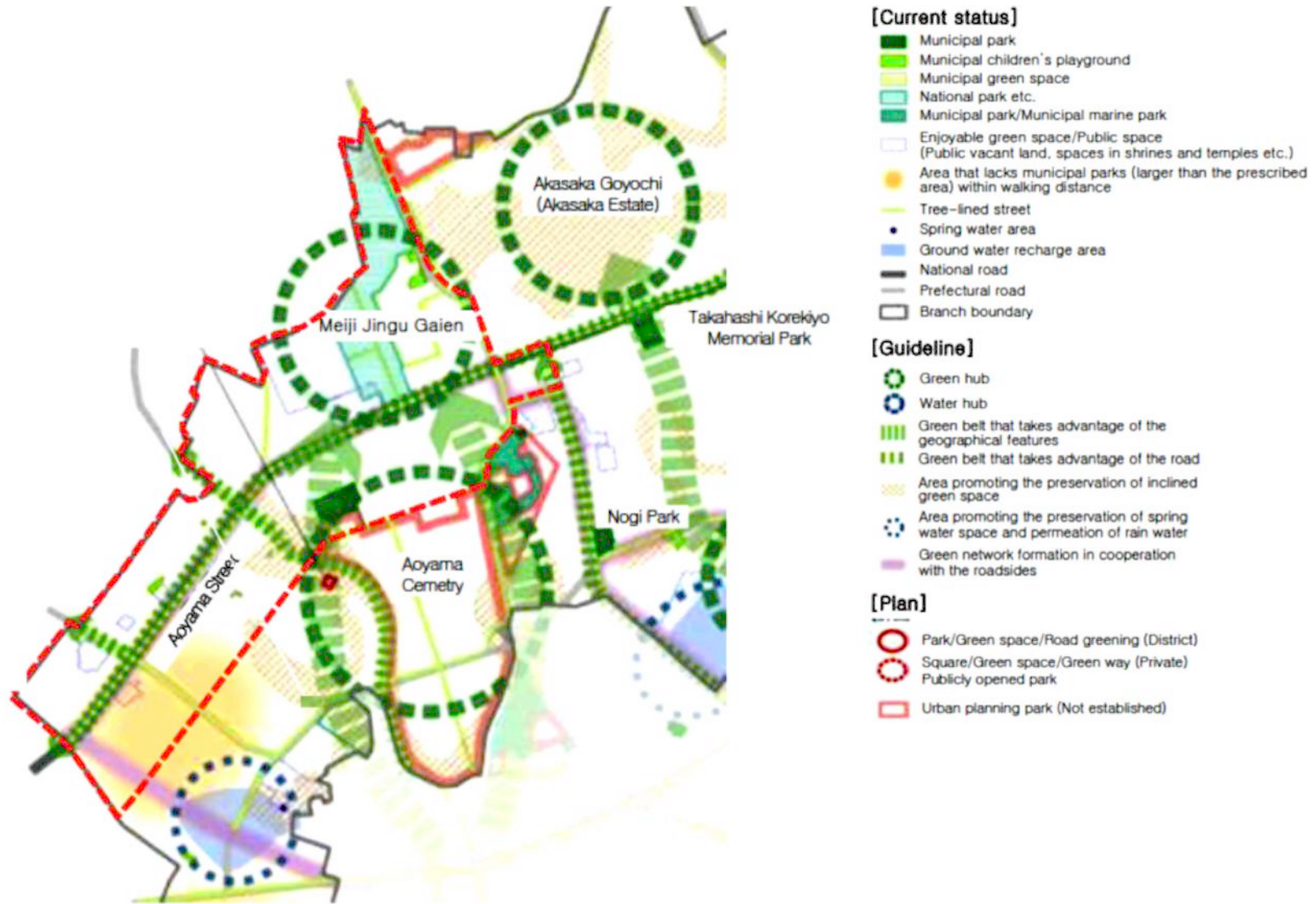
Fig.146: Aoyama Reien, one of the nation's oldest open public green spaces of Minato city and Tokyo natural and cultural heritages

6.2.1 GIP Application and BUA Design of Aoyama Neighborhood

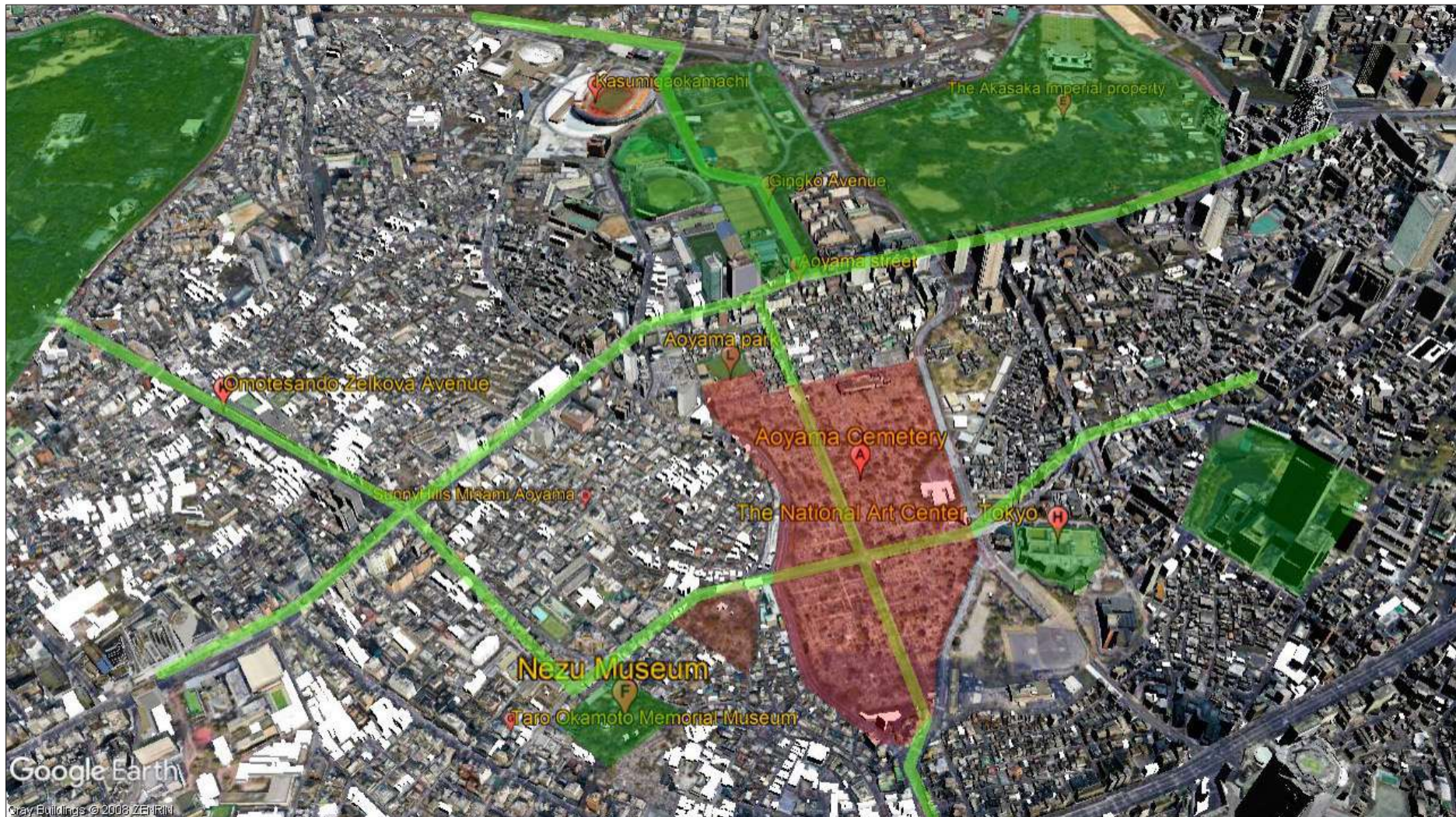
Based on the Aoyama community development guidelines (Minato City, 2015), the cemetery is categorized in green areas and open public spaces in urban planning maps. Since 2007, Tokyo green network is gaining an increased significance, and green network is an accepted term in the planning process similar to Scandinavia. Consequently, the Guideline for Greenery Development in Open Public Spaces has been applied since July 2007 to boost the value of such spaces through efforts that include the creation of greenery networks in open public spaces. Tokyo, and its municipalities, have jointly developed the Comprehensive Policy for Preserving Greenery in May 2010 (The Bureau of Urban Development, 2010), to systematically preserve greenery private land as a part of community development, and connected all green public and private open spaces. Parks and green spaces are urban facilities indispensable for the creation of a comfortable urban environment. They are also important as spaces where citizens can enjoy nature and engage in recreational activities. *“Kankyojiku, or networks of urban spaces lush with greenery, are created through the integration of the greenery of roads, rivers, and parks, with the greenery generated by the development of adjacent communities”* (The Bureau of Urban Development, 2011).

Besides, residential gardens contribute significantly to developing an urban city full of greens. Local cooperation in developing the city’s urban greenery has drawn up greening plans for expansion of residential greenery and award those who have been maintaining that environment. This action encourages citizens to save and develop nature on a neighborhood scale.

Minato city Comprehensive GIP



Green public spaces and green corridors in the neighborhood area of the cemetery



Today, the cemetery is surrounded and connected by different legible functions and nodes such as Jingu Gaien, Palace, Aoyama Park, Hinokicho Park, The National Art Center, and other historical and cultural functions on a neighborhood scale. Three green unique corridors, namely Jingu Gaien Ginkgo Avenue, Aoyama Street, and Omotesando Zelkova Avenue, intensify the perceptual permeability indicator of the neighborhood. These three streets are developed as the main green corridors around the cemetery and they connected the cemetery with its neighborhood area to facilitate pedestrian and bicycles access. Pedestrians and users regardless of their destination or purpose of travel mainly choose to pass through the cemetery and encountered different biophilic experiences. Fig.147)

While the cemetery provides a resting place for the citizens, in addition, BUA interventions have made for buildings, open spaces, corridors, public and private gardens such as Nezu Museum, Sunny Hills Minami Aoyama Store and Aoyama street in this neighborhood. These punctual biophilic interventions in the neighborhood not only enhanced the permeability quality of the neighborhood area but also these spots contribute to the activation of the cemetery and other functions. Fig.148, Fig.149)



Jingu Gaien Ginkgo Avenue



Omotesando Zelkova Avenue



Aoyama street



Jingu Gaien park



Aoyama park



The National Art Center



Jingu Gaien Palace



Hinokicho Park

Cycling network map of the neighborhood, Minato city cycling system, 2013

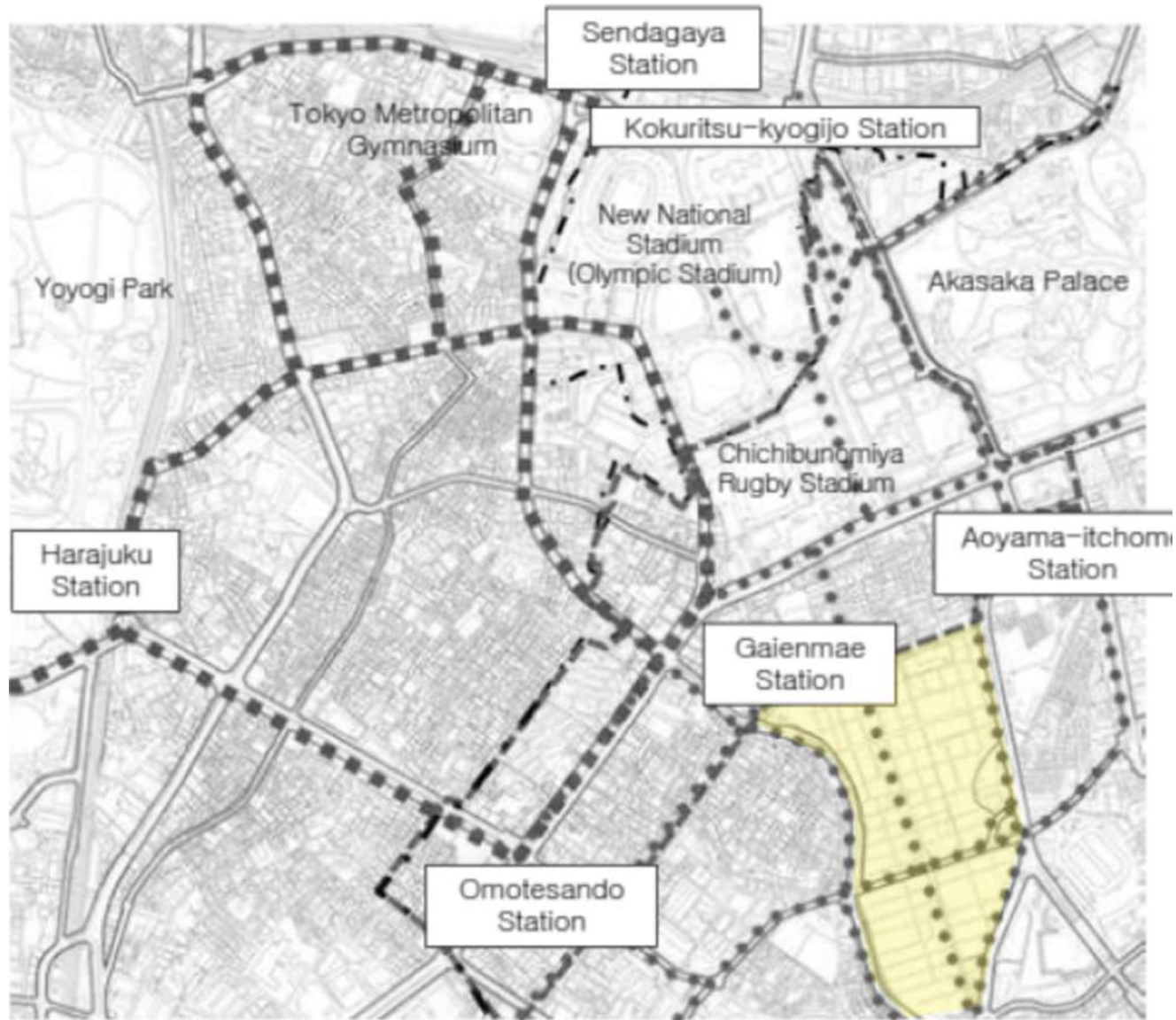




Fig.147: Cycling and pedestrian paths within the cemetery are connected to the Green open public spaces and green corridors in the neighborhood

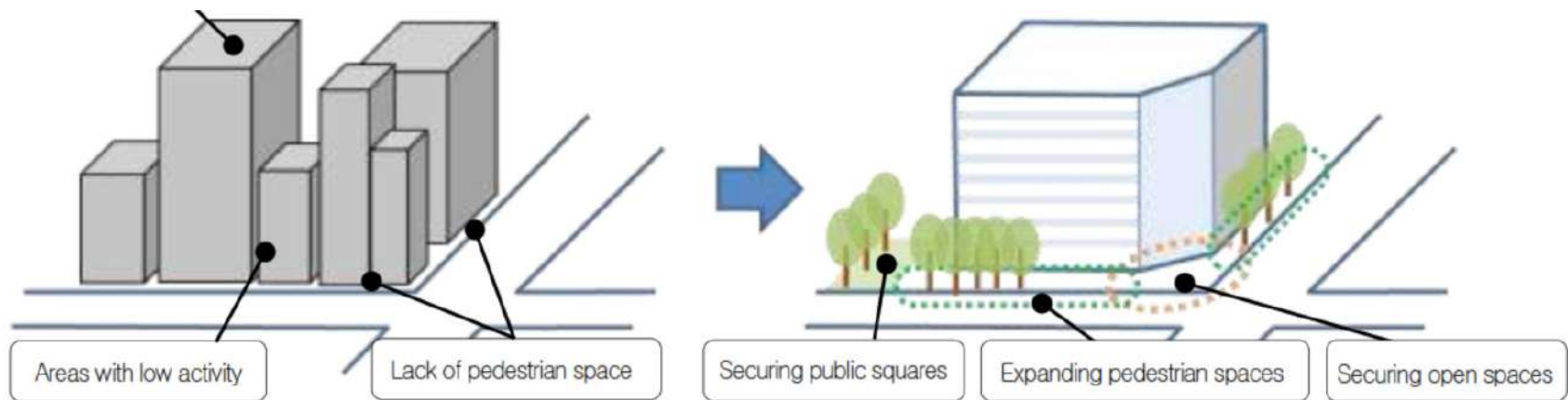


Fig.148: Small BUA interventions in some points of the neighborhood – buildings with green facade, green streets and squares

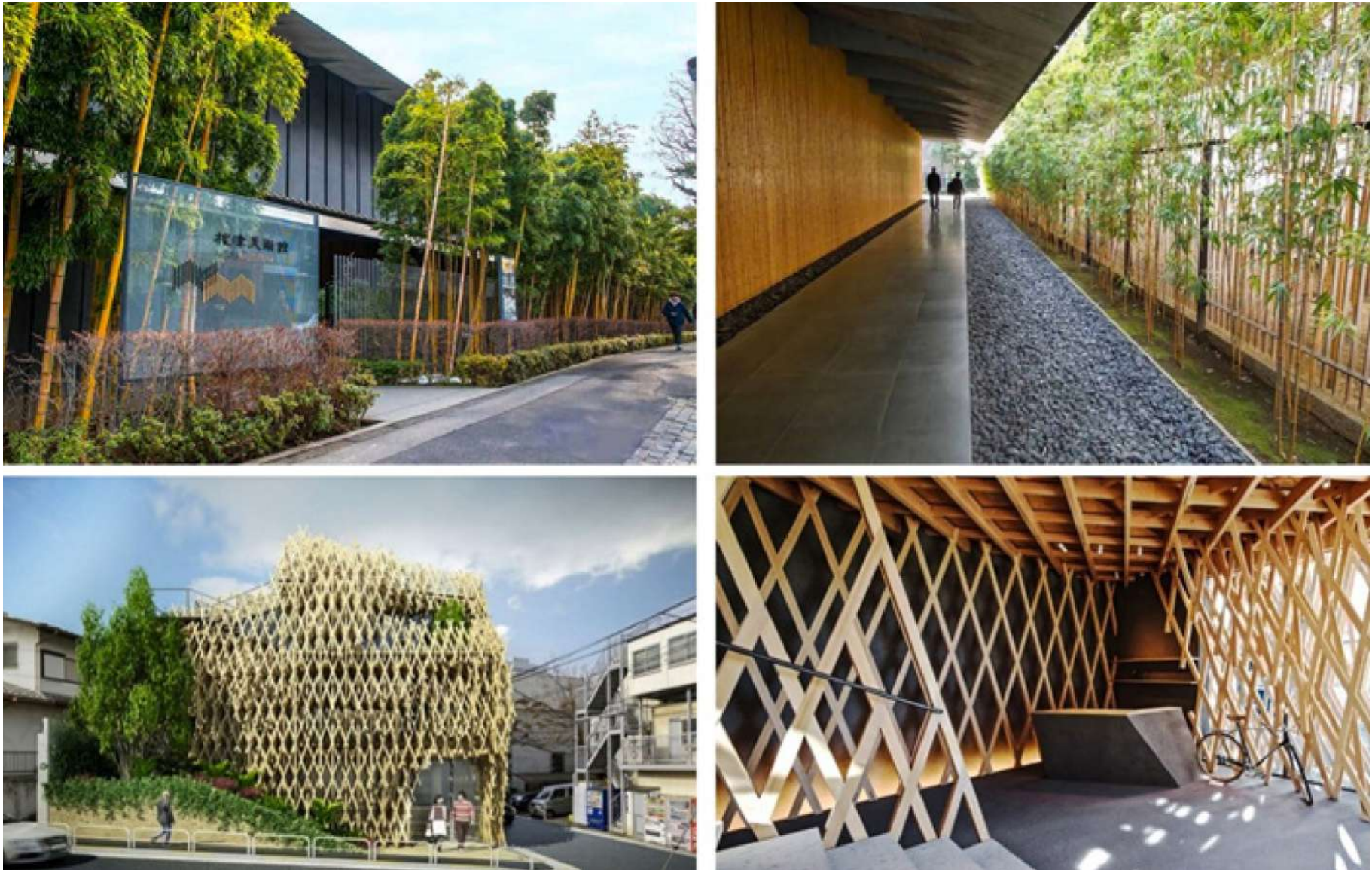


Fig.149: Biophilic design of Nezu Museum, Sunny Hills Minami Aoyama Store in the neighborhood area of the cemetery

6.1.2 Biophilic Landscape and Architecture Design of Aoyama Cemetery

Generally, design of Japanese gardens, temples, and cemeteries are known for their organic and natural design. The visual appropriateness of landscape and architecture of the cemetery are dominated by Japanese garden elements and their historical culture. Most elements, including paths, moss, bamboo fences, and rocks, are more than simple decoration and they indicate the perceptual compatibility of place by carrying a meaning that developed throughout history. The paths and pedestrian accessibility in Japanese cemeteries are made of natural vernacular stones and they have different types and functions. These paths link the graves and buildings to the landscape.

Paths mostly increase the perceptual of the place by affecting the experience that visitors are to gain from the landscape. They guide visitors to specific locations with strategic views. Visitors have to walk over a path of stepping stones¹ within space. Stepping stones paths require visitors to make small jumps as they move from one stone to another. Such increased attention ensures that the perceptual experience of the visitor is affected by the environment.

Moreover, the paths close to the main building are formal and straight, and as they move past towards the garden, they become less formal and more natural. (Fig.150)

¹ "Tobi-ishi" is the Japanese term and it is literally translated to "skipping stones" or "flying stones".



Fig.150: Flagstone path, "Flying stones" or "Skipping stones" within the cemetery area

Japanese Zen area within cemetery building designed by natural raked gravel patterns increased the perceptual experience of the place once again. In the early morning or the evening with the sun shines over the garden, the texture of the rocks and gravels becomes prominent and providing a subtle and intriguing biophilic design experience for the cemetery. (Fig.151)

Moss is another biophilic element of Japanese gardens and cemetery and they cover large areas of the stones, trees, and graves. Since they absorb pollutants such as ammonia and nitrates, they increased the ecological compatibility indicator of the cemetery environment. Even though where flowering plants find it difficult to survive, mosses just need nutrient-poor soil to grow well and avoid damage and they could easily survival in those locations (Real Japanese Gardens, 2013). (Fig.152)

Bamboo has been used to enhance the perceptual experience of the location in different ways based on the location and function, frequently. According to the flexible structure of Bamboo, it enables them to be used to separate sceneries and block views. Plus, being erected as walls around some areas, as windbreaks or screens. As low fences, they are commonly employed to separate spots visually, to mark paths, and to lead visitors around the area. In the cemetery, bamboo is employed to indicate paths to avoid visitors from walking over the tombs. (Fig.153)

The cemetery also is covered with seasonal plants, informing visitors of the natural process and temporal changes within the seasons (Tokyo Metropolitan Park Association, 2020). The promenades at the cemetery are lined by numerous cherry trees, displaying magnificent different sceneries throughout the seasons. (Fig.154, Fig.155)



Fig.151: Raked gravel patterns of rock and sand gardens within the cemetery area



Fig.152: Moss plant covers some areas such as the paths within the cemetery



Fig.153: Depending on the situation, natural bamboo design can increase the mystery of the place





Fig.154: Seasonal plants inform visitors of the natural process and temporal changes within the seasons



Camellia



Plum



Azalea



Pansy



Narcissus



Crows



Gardenia



Dandelion white



Fig.155: A variety of seasonal plants are planted in the cemetery

6.3 Biophilic Landscape and Architecture Design of Lakewood Cemetery, Minneapolis, United States

Lakewood Cemetery was established in 1871, and has been carefully planned and developed as a “garden” or “rural” cemetery by long-term management. It is the purest surviving example of such classic cemetery types, occupying more than 250 hectares of rolling landscape next to the historic grand round’s parkway system. It has served as a resting place for Minnesota’s citizens, while being a serene haven in the heart of Minneapolis’s renowned Chain of Lakes and urban parkland for a community gathering place and a chronicle of region’s traditions, cultures, and people. Like other urban cemeteries, today Lakewood Cemetery is surrounded by residential and commercial buildings. (HGA, 2019) (Fig.156, Fig.157)

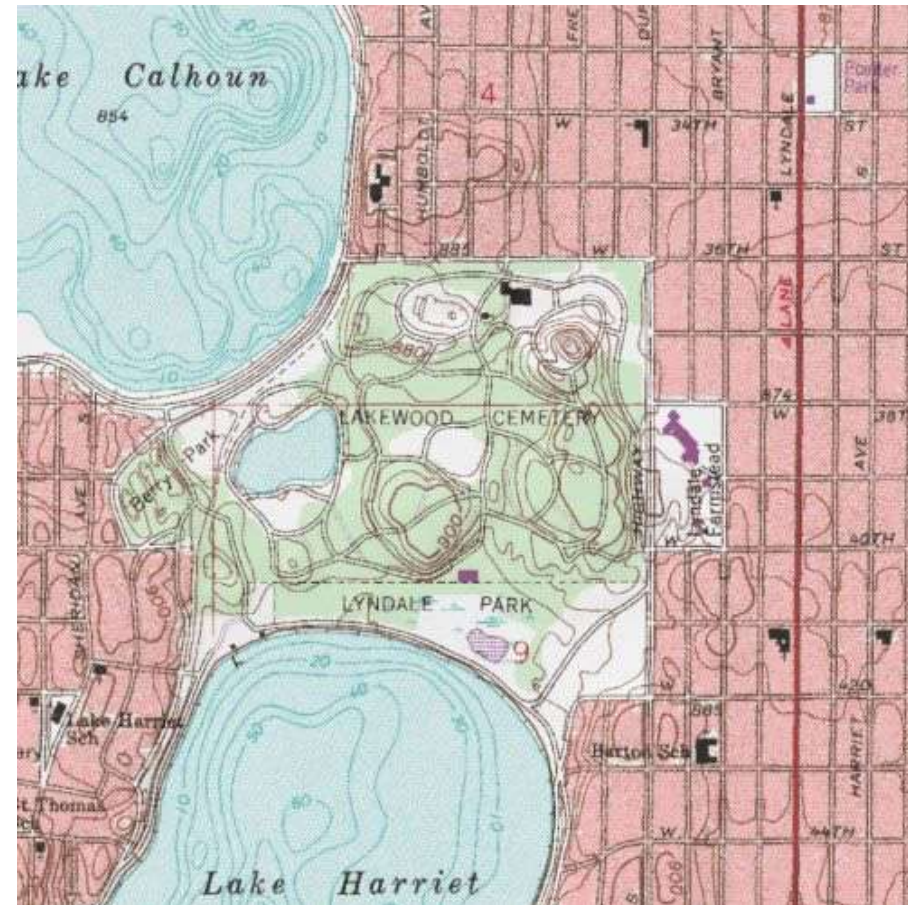


Fig.156: In the vicinity of the city's historic Grand Round's parkway system and surrounded by residential and commercial development projects



Fig.157: Lakewood Cemetery, "garden," and a "rural" cemetery, 1871

In 2003, the proposal called for a new architecture (Mausoleum) to extend the above-ground options for crypt and cremation burials and to accommodate the rituals and traditions of modern memorials.

HGA architects and engineers were assigned with the task of adding a massive structure of 24,500 square feet to the cemetery. They quickly committed to obtaining a plan that would protect and enhance the cemetery's functional, perpetual and ecological compatibility. (Fig.158)

The designers attempted to create a project that accordance with its history and minimizes its impact on the cemetery sense of place. As a result, a significant architecture was emerged and blended with natural themes of cemetery. Furthermore, a diverse range of materials, including granite marble, and architectural details (mosaics, bronze artworks, and stained glass) were selected to create a visual adaptation between the new cemetery and other buildings. (HGA, 2019).

The site for the new Mausoleum was one of the few incongruous lands in the cemetery's landscape. Following a comprehensive analysis of the site in 1910, the new structure was decided to be constructed between the present two-floor Mausoleum on the west and the Byzantine Memorial Chapel on the east. The Project was clustered around a place near the cemetery entrance. (Archdaily, 2020)

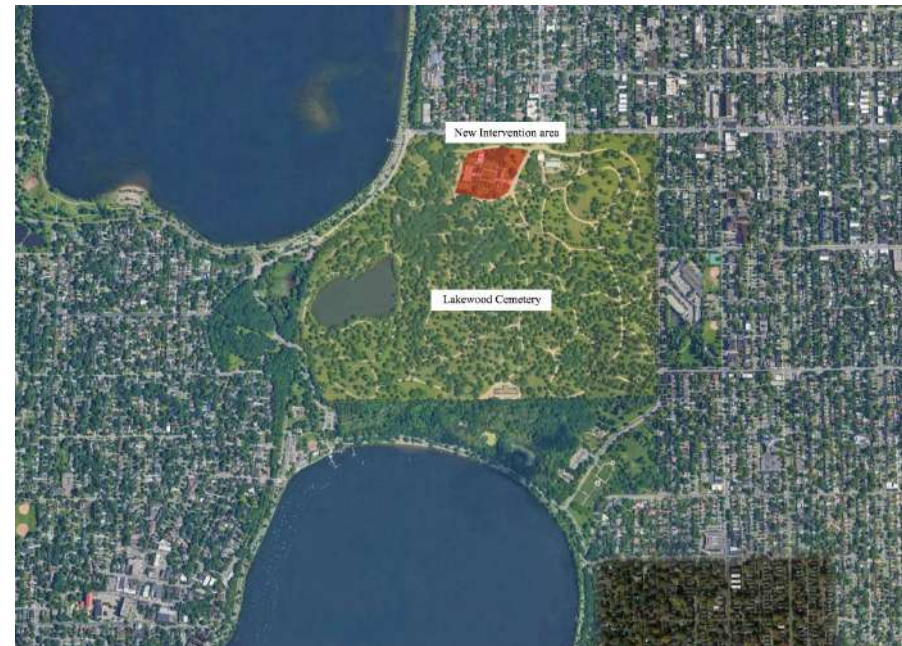
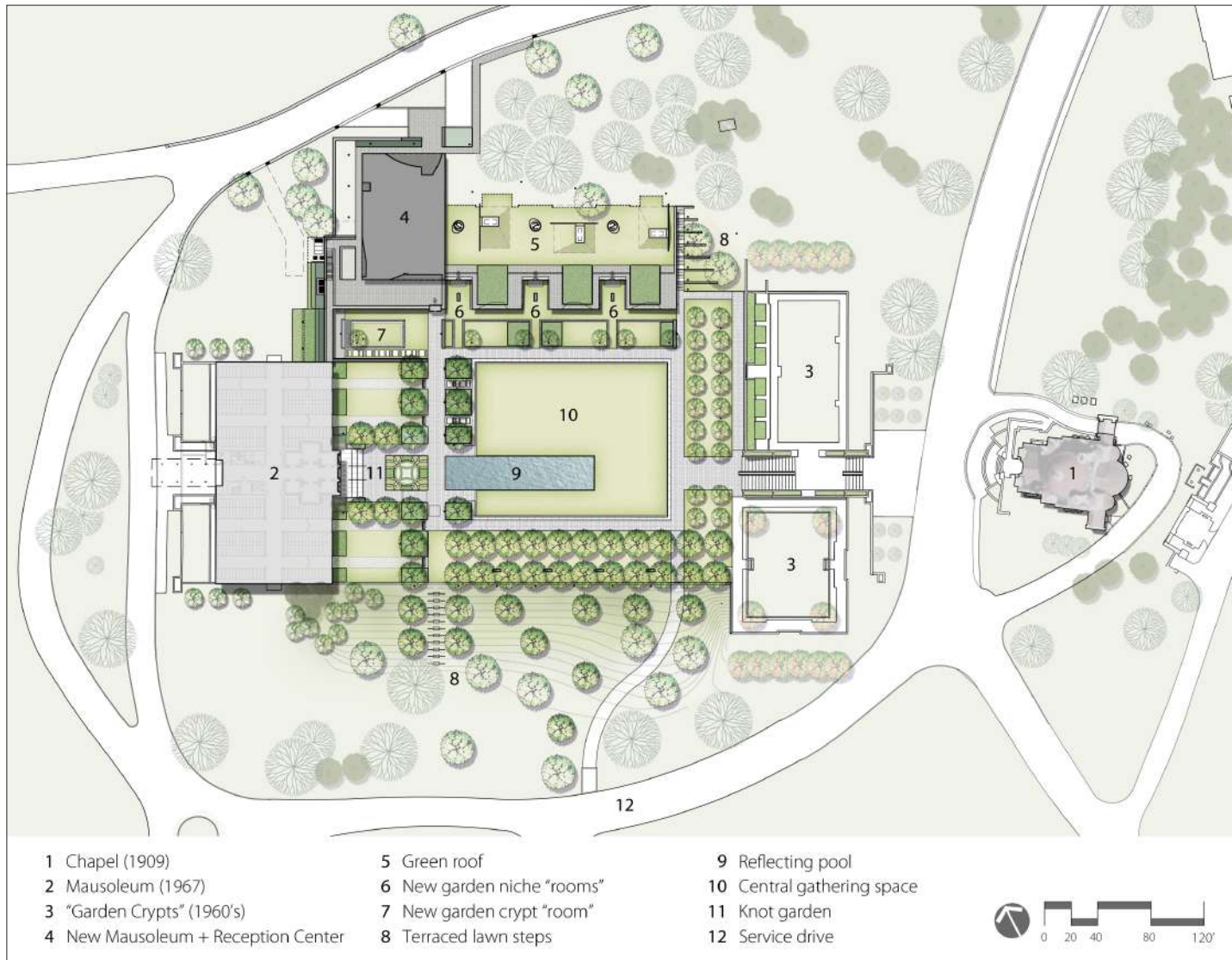


Fig.158: The new intervention area of 24,500 square feet

Diagram plan



Site plan



The Garden Mausoleum entry, on the street level, integrates the landscape and greenery of the area. It represents a small fraction of the overall building mass, including a reception room, a lounge, a small business office, and catering facilities. Two-thirds of the building is engaging in the spatial configuration of the space and lies below, quietly tucked into a south-facing hill and overlooking the lower garden.(ASLA, 2019)

A stone stair faded into the slope draws visitors from the entry to the lower garden level. A green roof, planted above the lower garden level, extends the lawn of the cemetery to a new view in the east of the entrance. (HGA, 2019) (Fig.159)

The slate stone facade in particular, is rich with natural analogues with a graphic painted on its exterior wall. Combining the facade with nature produces symmetries and fractal geometries with a cohesive spatial structure that create a visually nourishing environment. (Terrapin Bright Green, 2014) (Fig.160)



Fig.159: Stone scaled stairs faded into the slope and A green roof planted above the lower garden level



Fig.160: Slate stone facade incorporated with the nature and Providing symmetries and fractal geometries for facade

Inside the Mausoleum, visitors encounter a contemplative space. The interior is designed in a series of spatial experiences. The main entrance is an excellent example of a diverse application of natural material. On one side, the lobby wall is covered in granite stone, and encountered and even touched by passersby. On the other side, the wooden wall is warm in color and provides a sense of serenity for people as they wait for their service. The marble employed for the floor, the wooden furniture, the decorative details like mosaics, bronze artworks, colored glass doors, windows, and the contrast in textures – light and dark, rough and smooth, rustic and refined – call upon both visual and somatosensory senses. Inside the lobby, a simple square opening in the rugged granite wall defines the boundary between the active and public spaces of the Mausoleum and the place for burial, remembrance, and individual reflection. At the east, a single long corridor connects the alternating bays of columbaria (for cremated remains) to the crypt rooms (for caskets). (HGA, 2019) (Fig.161)

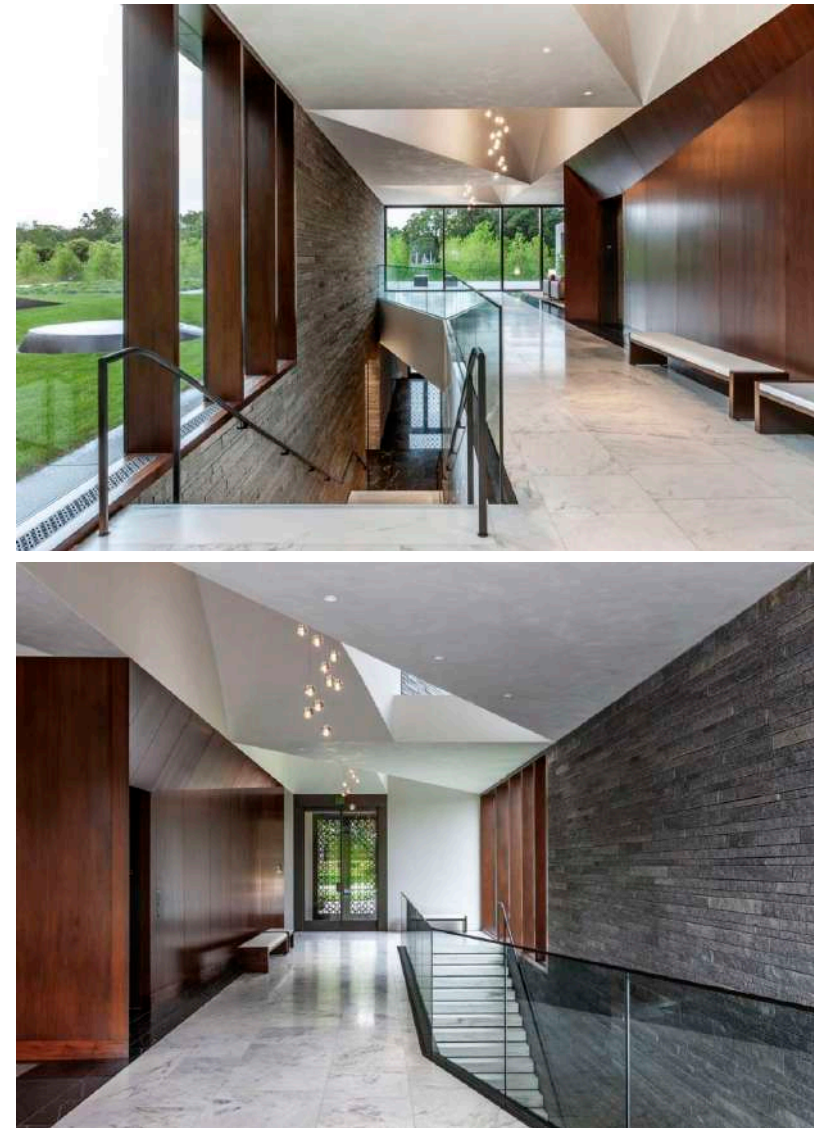
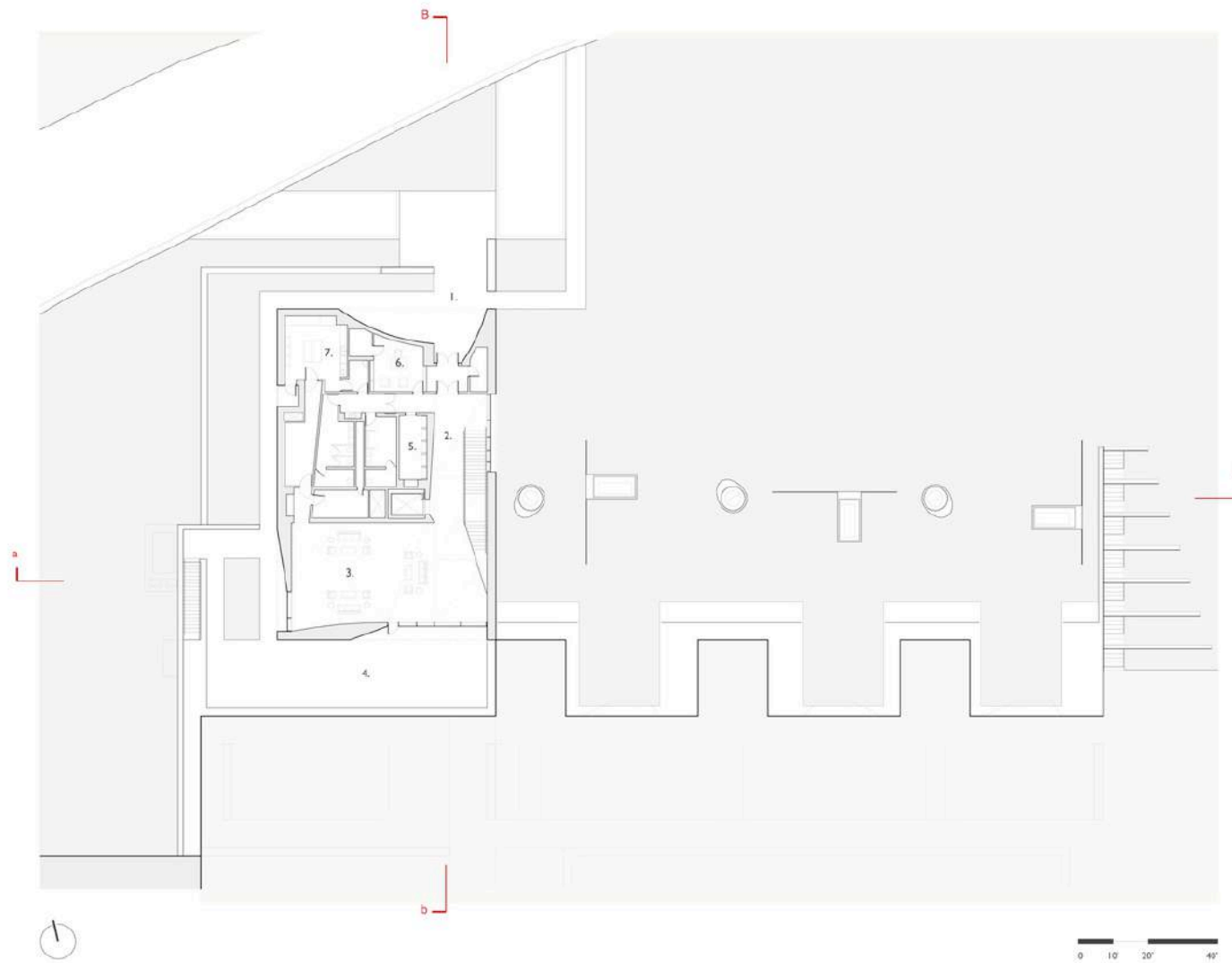


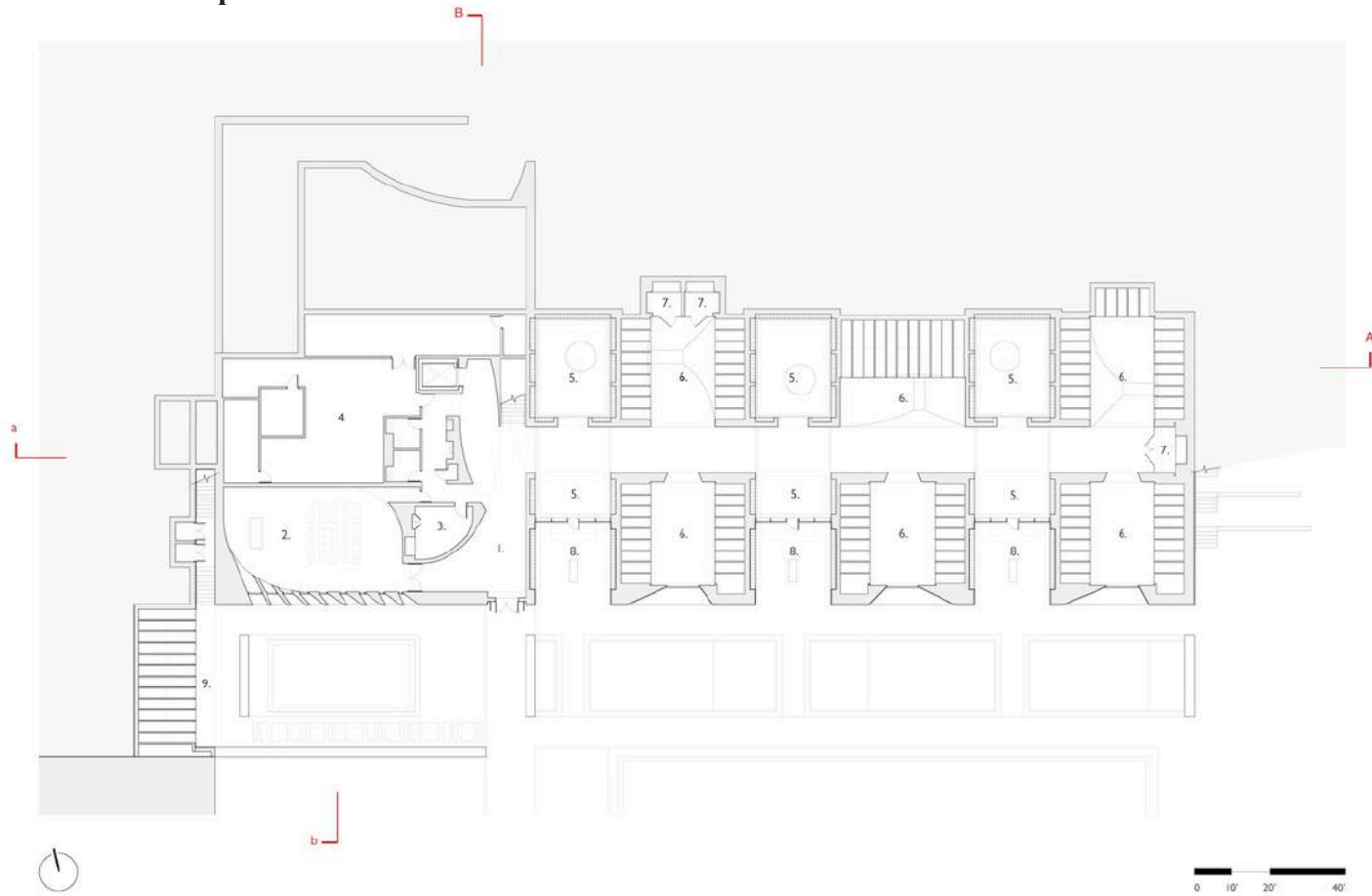
Fig.161: Interior design: diversity of natural material

Street-level plan



1 Entry / Dropoff 2 Foyer 3 Multipurpose / Reception Room 4 Terrace 5 Coat Room 6 Office 7 Catering Kitchen

Garden-level plan



- 1 Lower Foyer 2 Committal Room 3 Grieving Room 4 Mechanical 5 Columbarium Room 6 Crypt Room 7 Family Crypt Room
- 8 Columbarium Garden 9 Garden Crypts

To maximize solar exposure, the building is oriented towards east to west. At the garden level, while some spaces are constructed entirely below the ground, such as a committal room, they are illuminated by natural light through windows or rectangular skylights employed in the crypt rooms, or the circular skylight for columbaria. Windows and skylights change their orientations and move between spaces, to frame a view of close or distant horizons, a canopy of trees, or a clear blue sky. Orientation of windows and skylights allow light to enter at varying levels of illumination to create an enriched experience for the visitors and, while providing natural thermal and airflow within space. They blend with the historic landscape to enhance the bond between the spiritual realm and the earth. Therefore, projections contain skylights for building's hidden spaces and an inception of the fusion between the environment and biophilic design to the minds of the visitors. (LeFevre, 2020) (Fig.163, Fig.162)

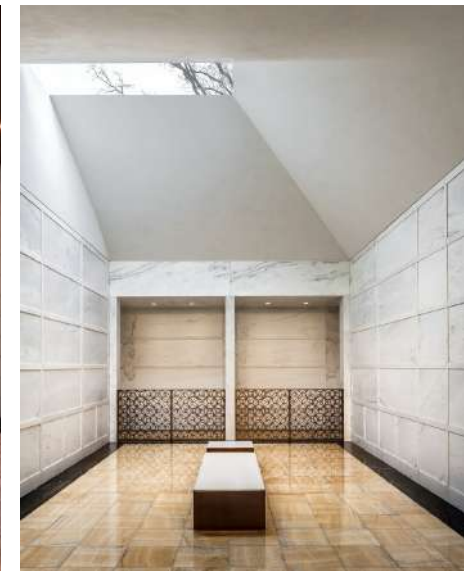
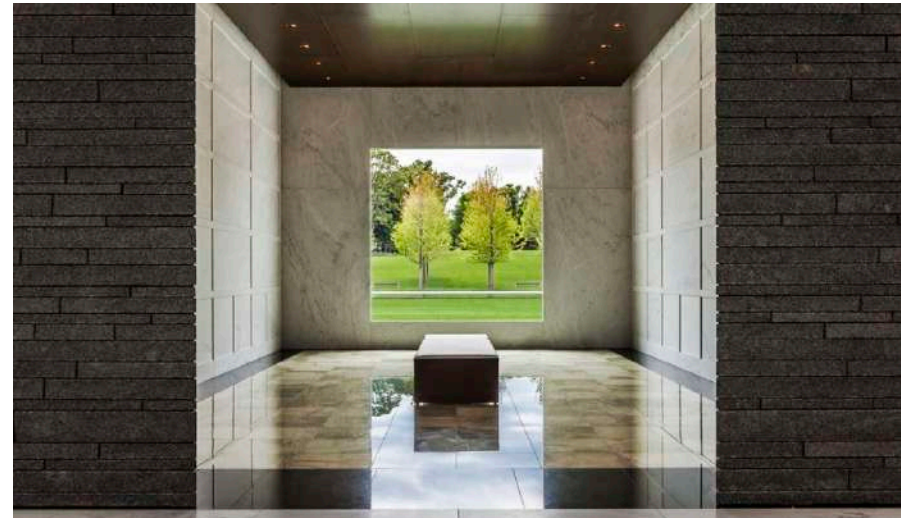
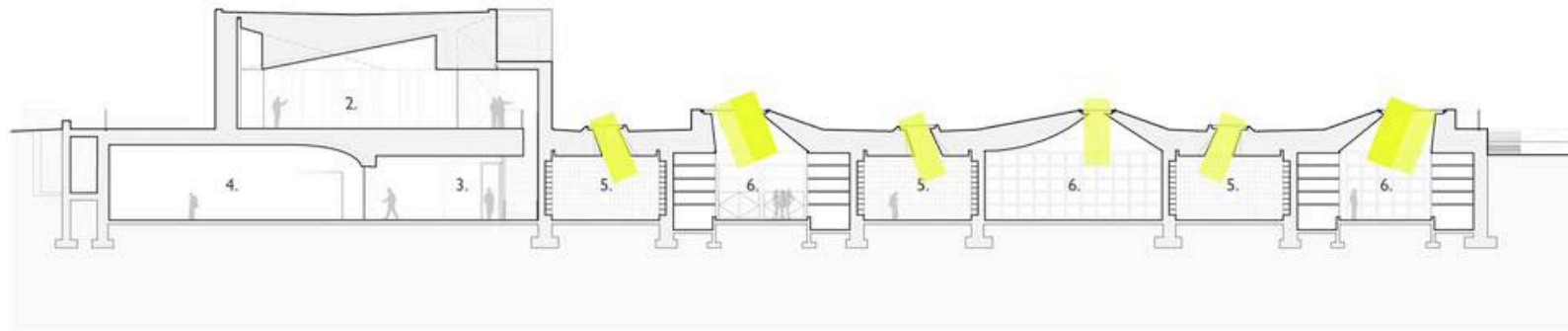


Fig.162: The window and the rectangular skylight for crypt rooms and circular skylight for columbaria

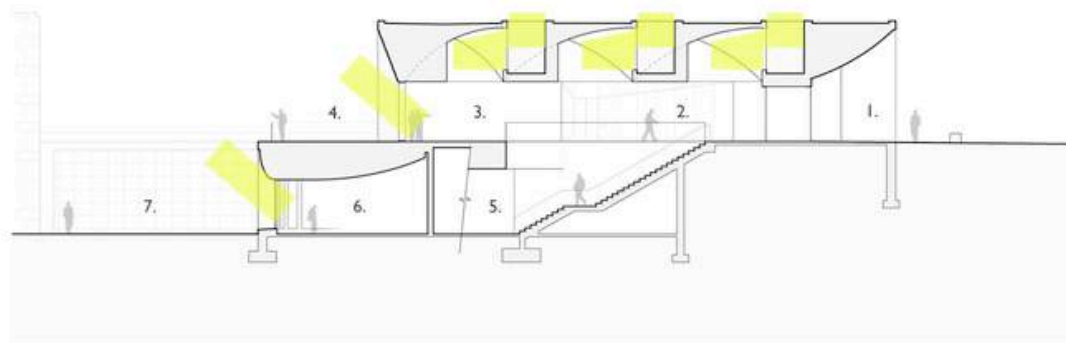
Skylights Position



LONGITUDINAL BUILDING SECTION aA



1 Foyer 2 Multipurpose / Reception Room 3 Lower Foyer 4 Committal Room 5 Columbarium Room 6 Crypt Room



TRANSVERSE BUILDING SECTION bB



1 Street Level Entry 2 Foyer 3 Multipurpose / Reception Room beyond 4 Terrace 5 Lower Foyer 6 Committal Room
7 Garden Crypts beyond

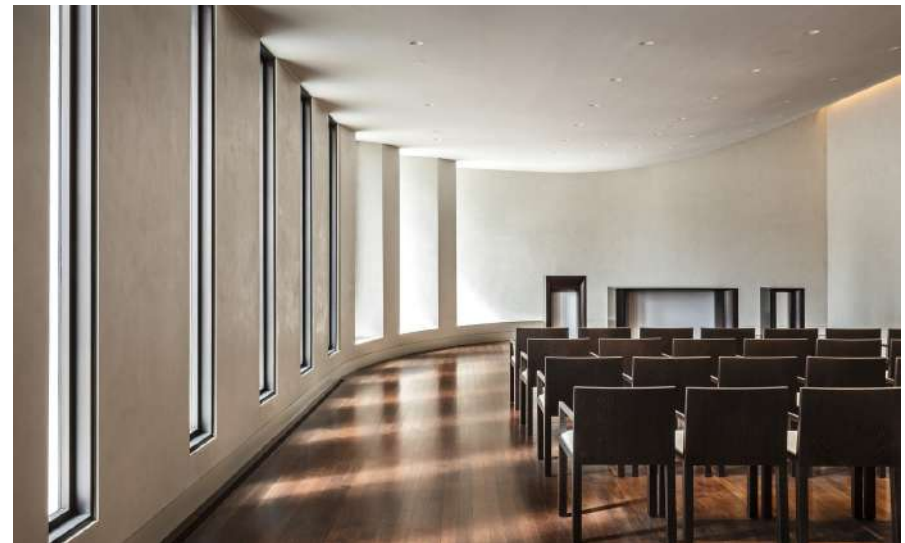


Fig.163: The orientation of windows and skylights allow for light to penetrate the room in various levels

The wide glass doors, sheathed in bronze grids that repeat the looping, and the circular pattern of the mosaic tiles not only offer visitors a distant view of the newly-landscaped lower garden, but also provide rich sensory information that adhere to a spatial hierarchy similar to what is observed in nature. (Fig.164)

Outside the building within landscape, a grove of Hawthorne trees ornate the existing outdoor crypt walls on the east, improving access between the lower garden and the adjoining historic burial plots. (ARCH20, 2019). Additionally, the patina and seasonal changes are reinforced by different types of plants and trees, such as double rows of Autumn Blaze Maple trees that provide change in color and vibrancy from season to season. This system informs the users of the natural processes of the ecosystem. (Fig.165)

A long rectangular pool is located in the middle of an arrangement of walkways through parterres. The pool is an excellent example of what the water demonstrates as a physically expansive substance. The thin sheet of water reflects light, building, and weather conditions from above, and invites passerby to touch. Moreover, it provides a positive restorative response to the human body and relaxation. (Fig.166)

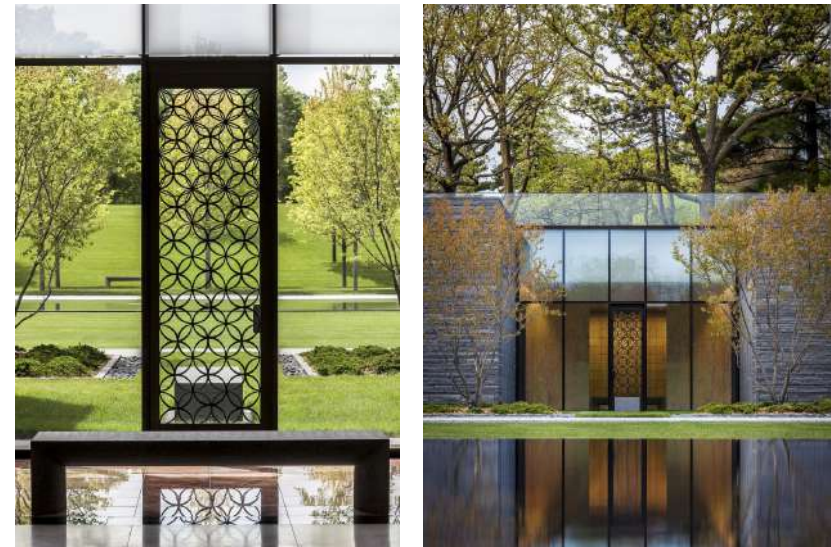


Fig.164: The wide glass doors offer visitors a view of the landscape and provide rich sensory information

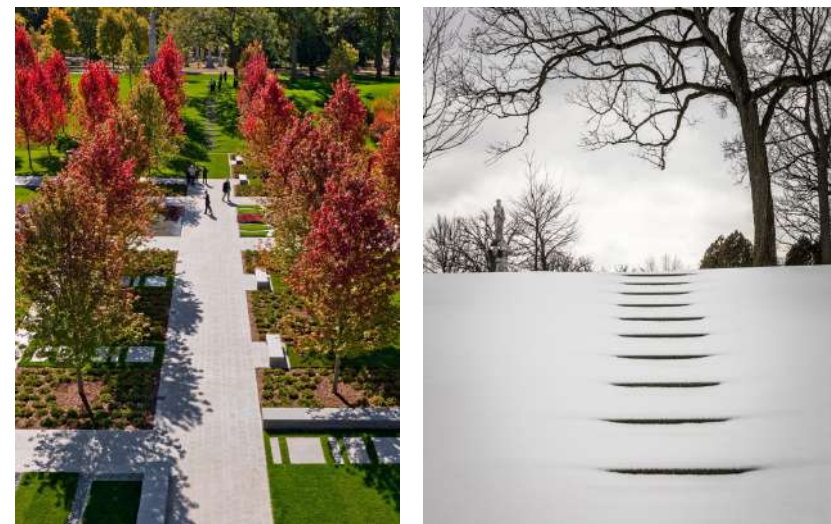


Fig.165: A double rows of Autumn Blaze Maples provide change in color and vibrancy from season to season

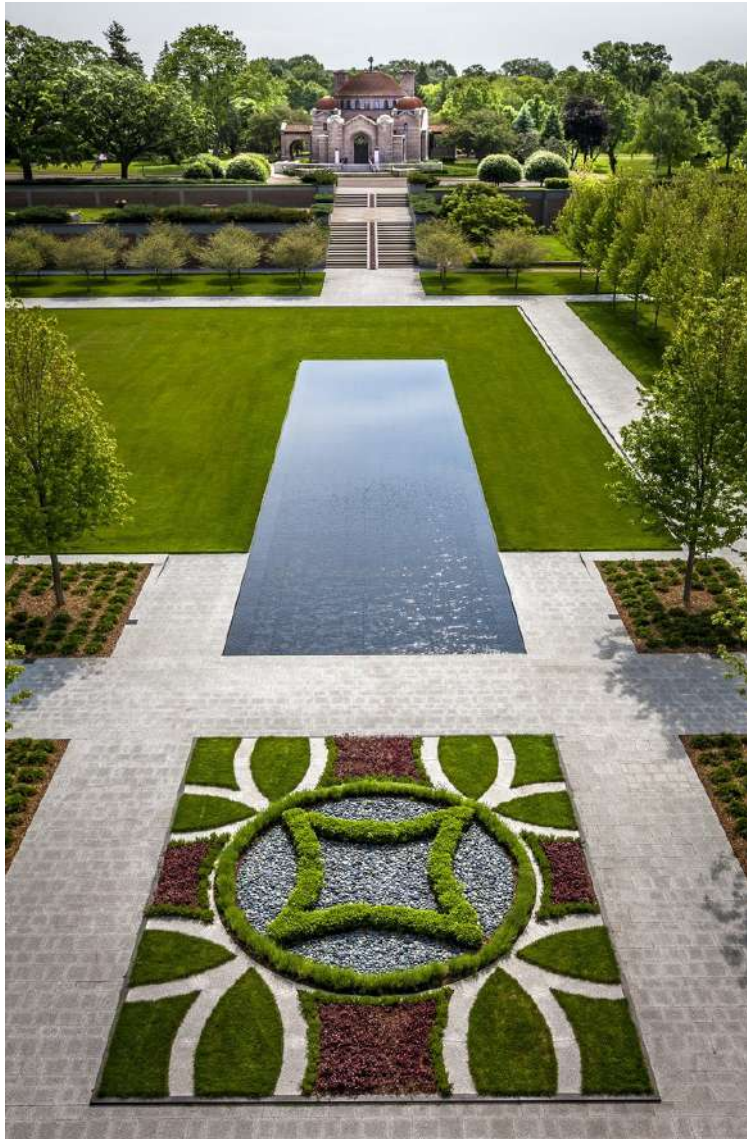


Fig.166: Presence of water - rectangular pool

In general, one of the main greenhouse/cemetery operations in this country is the Lakewood Cemetery. Every season, greenhouse staff cultivate more than 95,000 flowers. Approximately 50 formal flower beds, and 1,500 urns, are planted each spring. Lakewood's commitment to traditions is clearly expressed in the architecture of the formal flower beds. Throughout the years, most beds have had similar flowers. In springs, red tulips are visible at the 36th Street entrance from each side of the front door. In summer, the entrance is decorated by Lakewood cannas. The greenhouse offers fresh floral bouquets, potted plants, Easter lilies, poinsettias, and evergreen wreaths according to the season. (ASLA, 2019) (Fig.167)

As a major feature of the Garden Mausoleum project, the redesigning of the four-acre site enhanced the connections between the spatial and physical of the region and the distinctive historical identity of Lakewood. In addition, this modern biophilic architecture is serving as a multifunctional public space and presenting a high-quality environment for large community events and small family services. Design of the Lakewood Cemetery and creation of perfect integration with nature yielded a valuable UOPGS in the uptown neighborhood of the city. Today, as a nonprofit organization, the generated funds are given to a trust fund to preserve and enhance the natural and architectural treasures of Lakewood. (Lakewood, 2019) (Fig.168)

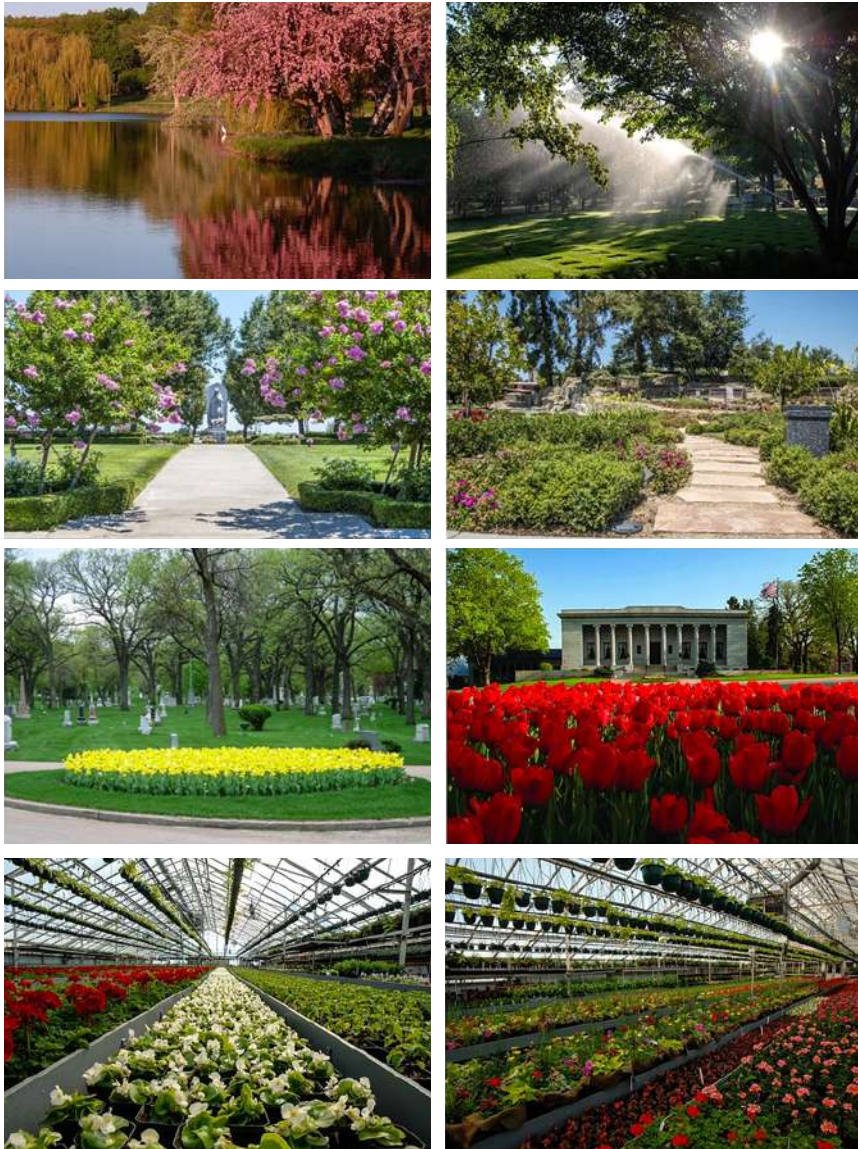


Fig.167: Lakewood cemetery greenhouse offers different types of plants for each season



Fig.168: Design of the Lakewood Cemetery and creation of perfect integration with nature yielded a valuable UOPGS in the uptown neighborhood of the city

6.4 Biophilic design of Landscape and Graves in Roques Blanques Cemetery, Barcelona, Spain

As we described in the previous chapter, biodiversity¹ is one of the main biophilic principles. Since natural habitats are all sensory-rich and transfer information to all human sensory systems, including sight, hearing, touch, taste, and smell, therefore, biodiverse designs of the place could directly promote human-wellbeing by providing perceptual sensations. (Sandstrom, 2008) Therefore, the biophilic urban space can be a biodiverse urban space at its core: a place full of nature, where residents feel, see, and experience rich phenomena of nature such as plants, trees, and animals. Hence, it is suggested that psychological benefits of nature increase with higher levels of biodiversity, not by increasing natural vegetative areas (Dean, et al., 2011)

The Cemetery of Roques Blanques is the first and most significant biophilic cemetery in the Barcelona metropolitan area that has proposed an excellent range of biodiversity in order to increase the ecological and perceptual indicators of the cemetery.

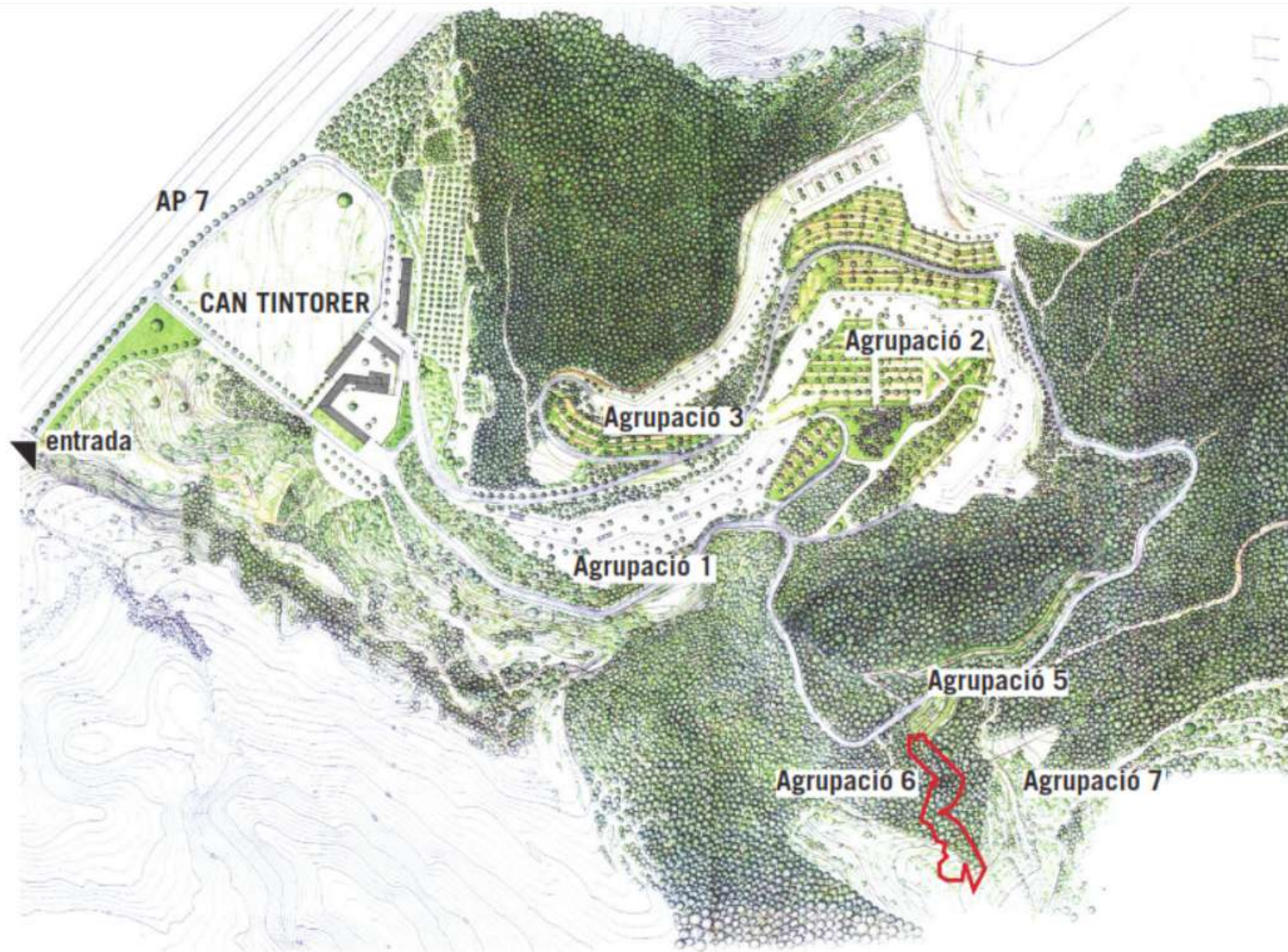
¹ Biodiversity is the living diversity of nature, and an aspect of the environment that many people appreciate. According to Benn (2010), “*Biodiversity is the variety of life on Earth, including all organisms, species, and populations, the genetic variation among these, and their complex assemblages of communities and ecosystems. Its three levels of biodiversity are commonly discussed — genetic, species, and ecosystem diversity.*

1. *Genetic diversity is all the different genes contained in all living species, including individual plants, animals, fungi, and microorganisms.*
2. *Species diversity is all the different species, as well as the differences within and between different species.*
3. *Ecosystem diversity is all the different habitats, biological communities, and ecological processes, as well as variation within individual ecosystems” (Benn, 2010).*

The cemetery is situated in the Serra de Collserola in Barcelona, in the Pico Madrona district, where the mountain has reached the natural route of the Rubí stream. On the one hand, Collserola Mountain provides the typical flora and fauna of the Mediterranean forests. Its flora includes plants such as white pine, oak, and a wide variety of shrubs resistant to hot summers. Among these, squirrels, wild boars, rabbits, fox, weasels, and various species of birds proliferate, making the animal diversity of this area impressively rich. (Barcelona Municipal Institute of Parks and Gardens, 2016) On the other hand, visual connection with natural features of the region and ecological adaption to its context is determined by the layout of the cemetery with a very erratic topography, with slopes between 15% and 30%, and the wooded pine as a main character of the area (Batlle, et al., 2017).

The surface of the Can Tintorer estate is 50 hectares, where the cemetery is located. From this area, approximately 30% has been occupied with different burial spaces such as 6,130 niches, 3,011 tombs, 163 pantheons, some 7,424 ossuaries and cinematic columbarium, 969 Bosc de la Calma, 344 family trees, gardens and Font del Repòs (Cementerio Comarcal Roques Blanques, 2020).

Roques Blanques Cemetery Site plan



The diversity of burial places in this cemetery provides different options for customers according to their religious and cultural beliefs. The different graves and burial spaces of the cemetery with the systematic design of landscape are divided as follows:

Pantheons: Isolated horizontal brown marble stone graves (family-type), surrounded by grass, with 3 section specified for coffins, remains, or ash urns. The plot of land for the graves are 5 by 3 meters, and the concession period is 99 years after the first burial. Fig.169)

Tombs: Granite stone burials (horizontal family-type), surrounded by grass, with 2 departments specified for coffins, remains, or ash urns. The concession period is for 5, 50, or 100 years. (Fig.170)

Columbarium: Horizontal brown marble stone graves surrounded by grass with one section specified for ash urns. The capacity is for 4 urns depending on their size. The concession period is 50 years. Fig.171)

Green niches: Green vertical burial walls with one part specified for coffins. The green gravestones and the concession period can be 10 or 20 years. (Fig.172) (Cementerio Comarcal Roques Blanques, 2020)



Fig.169: Brown marble stone graves (family-type)



Fig.170: Granite stone burials (horizontal family-type)



Fig.171: Columbarium- Horizontal brown marble stone graves



Fig.172: Green vertical burial walls

The two other sections of the cemetery for graves and new tombs were designed by Enric Batlle and Joan Roig in two phases.

Trass Niches: Vertical burial walls with green terrace and one part specified for coffins. The concession period can be 5, 10 or 20 years. (Cementerio Comarcal Roques Blanques, 2020) In this phase, which was planned during 1981-1985, the architects designed niches as retaining walls to allow the creation of terraces. These terraces are divided into groups of two or three, with the appearance of an abandoned garden enclosed in space. The architects established a closed set with pavement and a plantation of trees from the field and garden (palm trees, bananas). The bushes are trimmed according to geometric shapes. A stylized pergola of ivy, jasmine, and wisteria allow the creation of a more intimate nature on the walls. (Batlle, et al., 2017) (Fig.173, Fig.174)

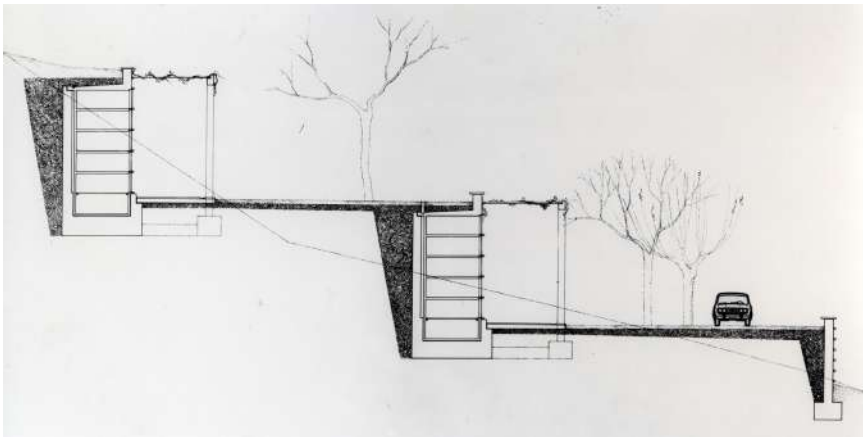


Fig.174: Terrace Section, paths with pavements and a plantation of trees, by Enric Batlle, 1985



Fig.173: Vertical burial walls with green terrace

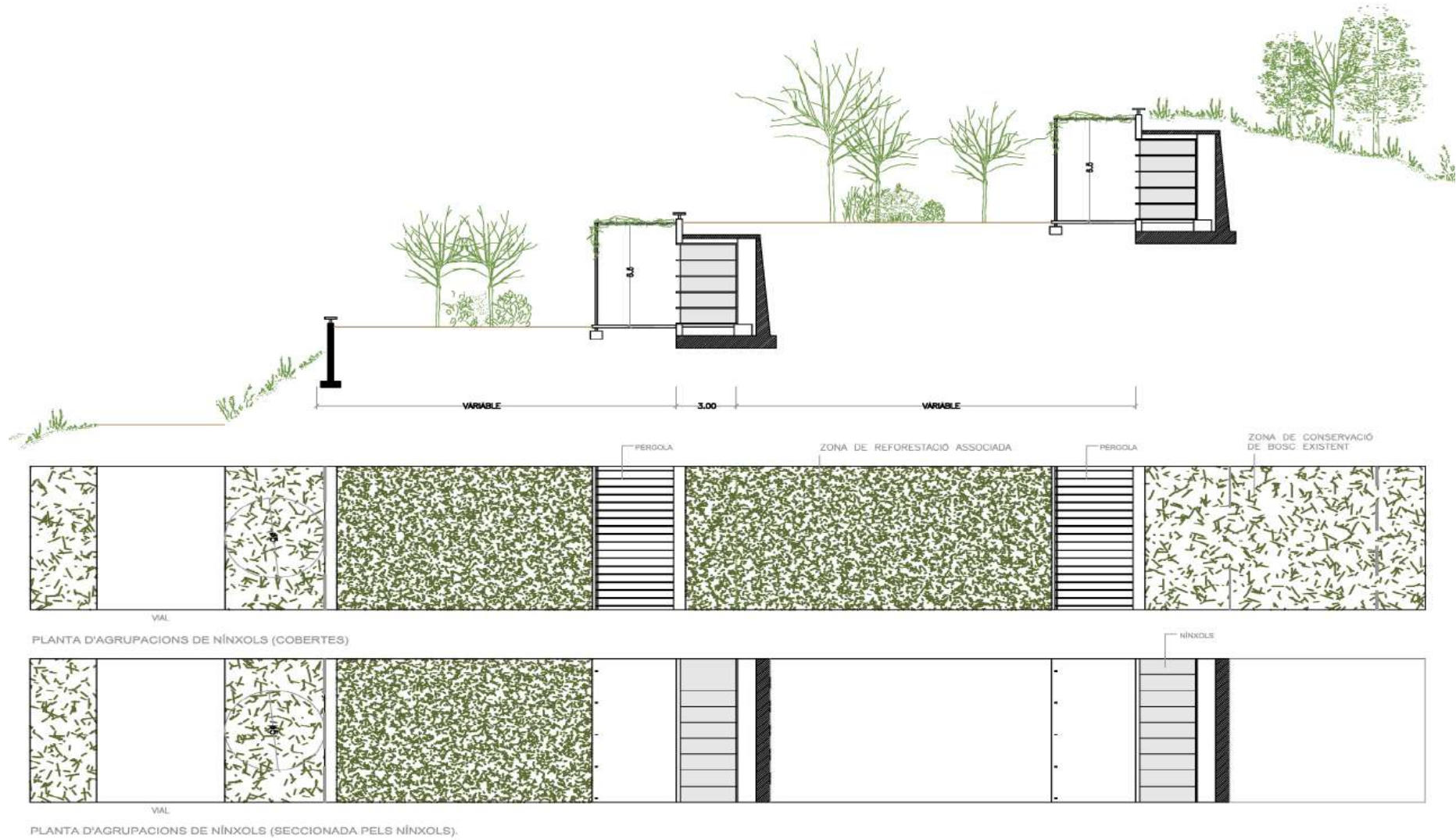


Fig.175: Detail section by Enric Batlle, 1985

Natural burial: This section offers a vanguard design in forms of sepultures and ecological and 100% biodegradable burial paradigms. This phase was established to design a new model for the future of the burials, with a radical change in the manner they are integrated with the landscape. From the destruction of the old mausoleums, or altering the niches significantly through the planting of trees or installation of a columbarium, this project proposes an adequate and optimal solution to current environmental trends. The initial design of Roques Blanques, by Batlle and Roig, is outstanding in terms of designing the ecological compatibility and ecological diversity indicators through biophilic design. The development of the cemetery prepared 1,100 new graves. This intervention respected conservation of the environment in the natural setting of the Collserola Park, as part of the final extension in phase one. (Fig.176)

The wall designed at this stage was a revolutionary system that focused on applying bioengineering to **the landscape and creating the “Path of the forest” and the “Butterfly Garden.”**

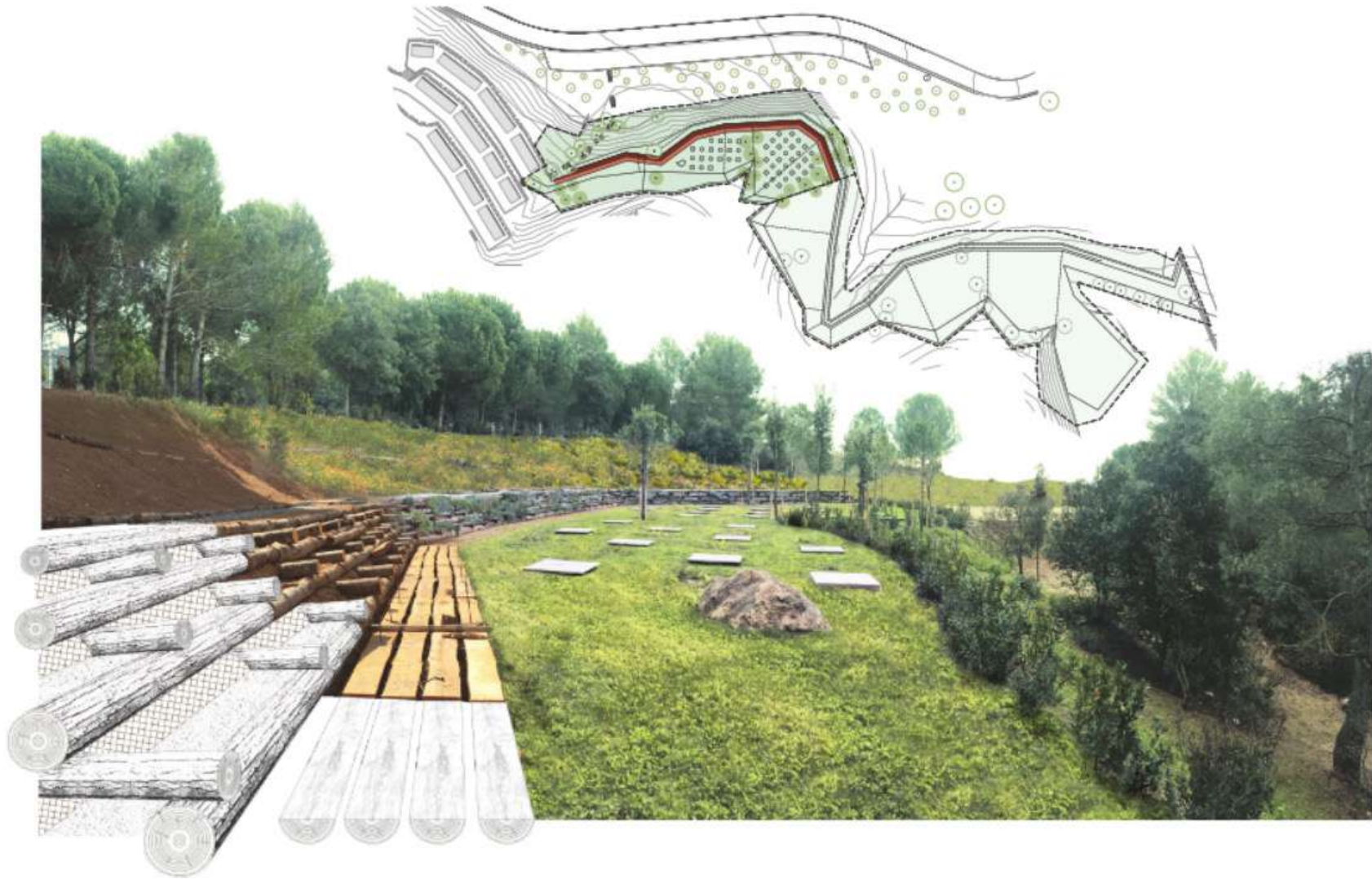
The wall’s construction blends the dead materials and the living materials that are in constant development. In other words, it connects the decay of the dead (trees trunks) with the roots and the development of the living elements (plants with bright chromatic blooms).

The wall consists of a double structure of chestnut tree trunks from the Montseny, fixed with pins. This method improves the control of running water and the quality of the surrounding atmosphere. Designers establish ecological and biodegradable engineering constructions in the form of water dams on the banks of rivers, inspired by the beaver animal that constructs their home from trunks, branches, and terra. (Fig.177) The wall provides shelter and food for the animals on site, such as reptiles and small rodents. Moreover, the organic urns are made of chestnut wood. (Batlle, et al., 2017)(Fig.178)



Fig.176: Space specified for inhuming biodegradable urns next to a native tree of Collserola

Path of the forest Site plan and perspective



The place chosen for the butterfly garden is fortified by a wall to provide protection against the wind that is one of the main enemies of butterflies. This garden is intensely sunny to ensure a generous and sustained flowering. The selected colorful vegetations are vernacular and adopted to the environment. Shrubs and herbaceous plants are selected with bright and contrasting chromatic blooms to promote the presence of butterflies. The plants can attract insects with proper nectar production and chewable leaves for caterpillars (Batlle, et al., 2017). (Fig.179)

The biophilic design, biodiverse design to be precise, of the wall graves increased some ecological and perceptual indicators of the cemetery in place scale. Firstly, the wall is a natural eco- friendly system that creates the large green terrace on the northern slope of the Collserola mountain range.

It is also providing adequate and accessible space for new graves through incorporating with existing vegetation and new local plantations. The wall is constructed quickly by using natural materials from the surrounding environment and to be efficient in material and energy consumption.

Construction with indigenous materials has resulted the cemetery to be a part of the natural biodynamics of the forest where it is located, and recommended a highly distinct sense of place. Secondly, the butterfly garden becomes a biodiversity enhancer that revitalizes the spaces within the Collserola Natural Park and collaborates in increasing the sensitivity of the citizens towards being closer to nature.

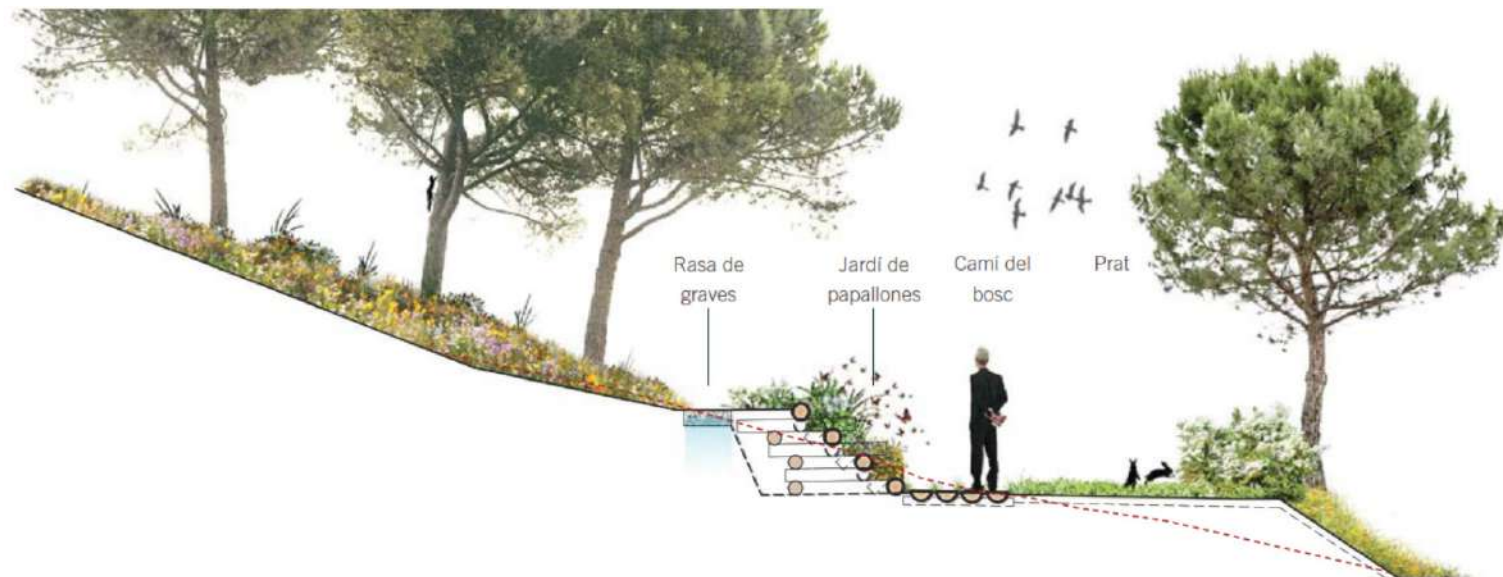


Fig.177: Section of Butterfly wall, 2017

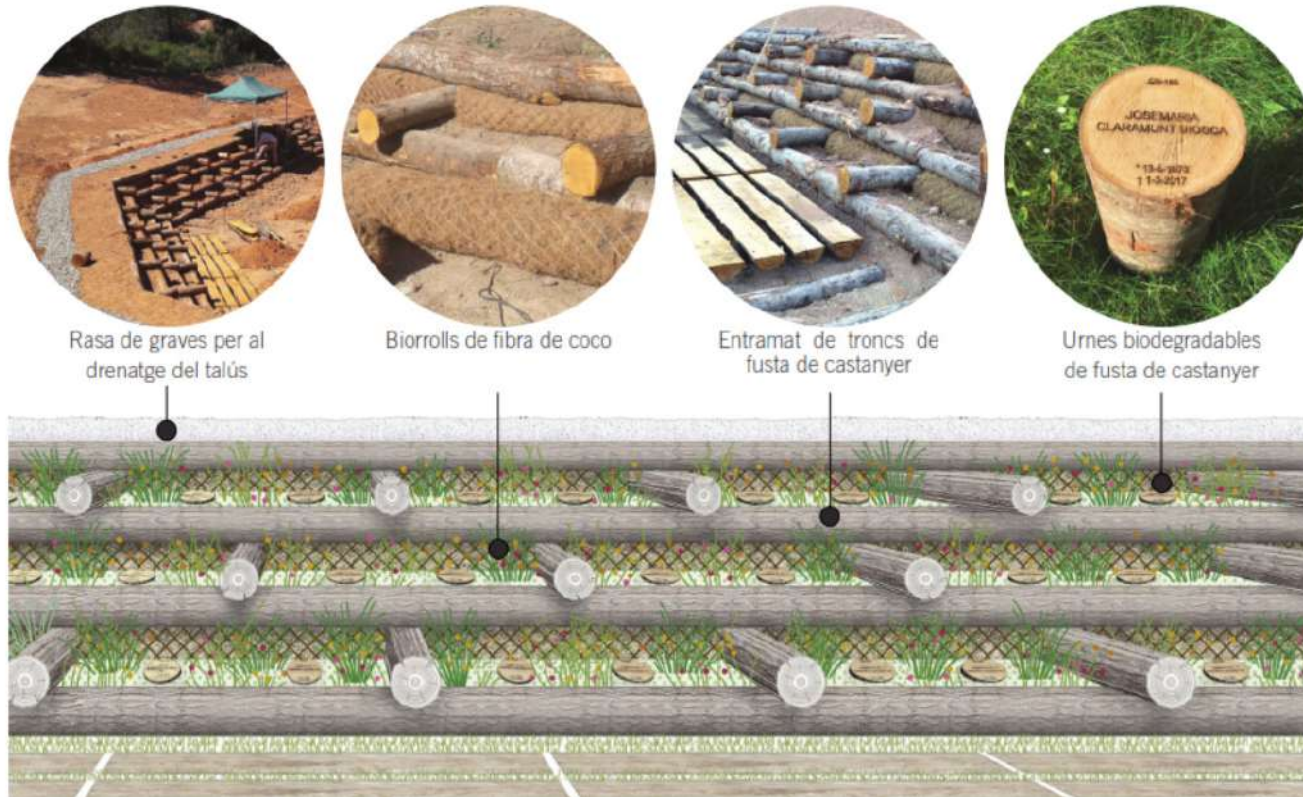


Fig.178: Ecological and biodegradable engineering construction of the wall wall inspired by a beaver animal (nature) indicates the unique biophilic intervention



Fig.179: Butterfly garden is designed with new plantations of native species with different pallet of colors

6.5 Partial conclusion

Providing a degree of biophilic design in urban planning, urban design, and architecture of the aforementioned cases demands new considerations on urban cemetery's design and regeneration. Primarily, GIP application in Scandinavia and Tokyo demonstrated that urban cemeteries are known as natural environments, and often with different vegetation and variety of functions. They have their own objectives in urban planning as a UOPGS and are described according to the definition of green infrastructure in comprehensive plans of the cities. In addition, these cases offer a modern biophilic design and renovation of the cemetery with a significant effect on their neighborhood. In the first point, as Manuel de Solà-Morales confirmed on "Material urbanity," (Solà-Morales, 2008) the ability of urban material to improve social, perceptual, functional, and ecological meanings by applying biophilic design can express all necessities of human well-being, including active engagement, passive engagement, relaxation and comfort. Moreover, BUA in Tokyo urban cemetery neighborhood area illustrates the high effect of the small biophilic intervention on environmental quality indicators of ill and weak spaces on the intermediate scale. Aoyama and Skogskyrkogården cemetery indicate that urban cemeteries in dense areas can be active as a UOPGS to facilitate pedestrian and cyclists' access to the neighborhood by biophilic design. In landscape and architecture all cases show different types and ranges of biophilic intervention that will lead to improvement of the environmental quality's indicators. These biophilic places present a rich built and natural environment that surrounds us with visual delight, sounds, varying temperature,

touching plants, smelling flowers, or sensing the movement of the air. Such sensory experiences often move us both emotionally and intellectually. As visitors move through these cemeteries, deeper meanings of rich sensory such as water, wind, trees, birds, stone, light, and darkness, all promote environmental qualities of the cemetery as a UOPGS.



Skogskyrkogården Cemetery, Enskede, Norway, Sweden

GIP:

The cemetery is categorized in green areas and open public spaces urban planning

Vernacular material and architecture:

- Stone wall surrounding the cemetery.
- Small wooden building is a perfect synthesis of Scandinavian hut and Christian temple and is subordinate to the forest
- The construction techniques and materials are indigenous

Natural color and materials:

- All those Buildings on the site incorporate nature and encourage nature to become a popular theme of the site
- Natural colors and modest forms for shaping graves ,tombstones emerge from the ground, surrounded by trees
- Small chapel atrium is defined by stylized Tuscan wooden columns that allude to the trees that surround it
- The buildings of Second chapel are unified by a stone cladding.
- High-quality flagstone for flooring
- Wooden mobile seats ,stone benches and stone steps

Patina of time and changes:

- A small stream of water flow between the rocks at the entrance, growth of small plants in summer and freezing in winter

Biomorphic patterns and forms:

- main entrance has formed by a spectacular biomorphic semi-circular forecourt
- In the absence of play equipment, a variety of additional biomorphic hills that persist in and space

Providing views and vistas to nature -natural environment:

- All interior skylines are constantly covered by natural elements and a regular row of pruned trees in all areas such as the parking area.
- long natural straight perspectives, such as Seven Springs, a walkway with seven springs spread along the path and provide time for the rapture relaxation in nature and linking the Elm Hill to the Chapel of the Resurrection.

Dynamic daylight through space:

- Dynamic daylight and shadows through the woods provide some safe alternative paths on the cemetery both for pedestrians and cyclists
- In the great atrium through skylight, the visitors can leverage varying intensities of light and shadow that changes over time and natural light within building brings a spatial harmony of its surround

Presence of water:

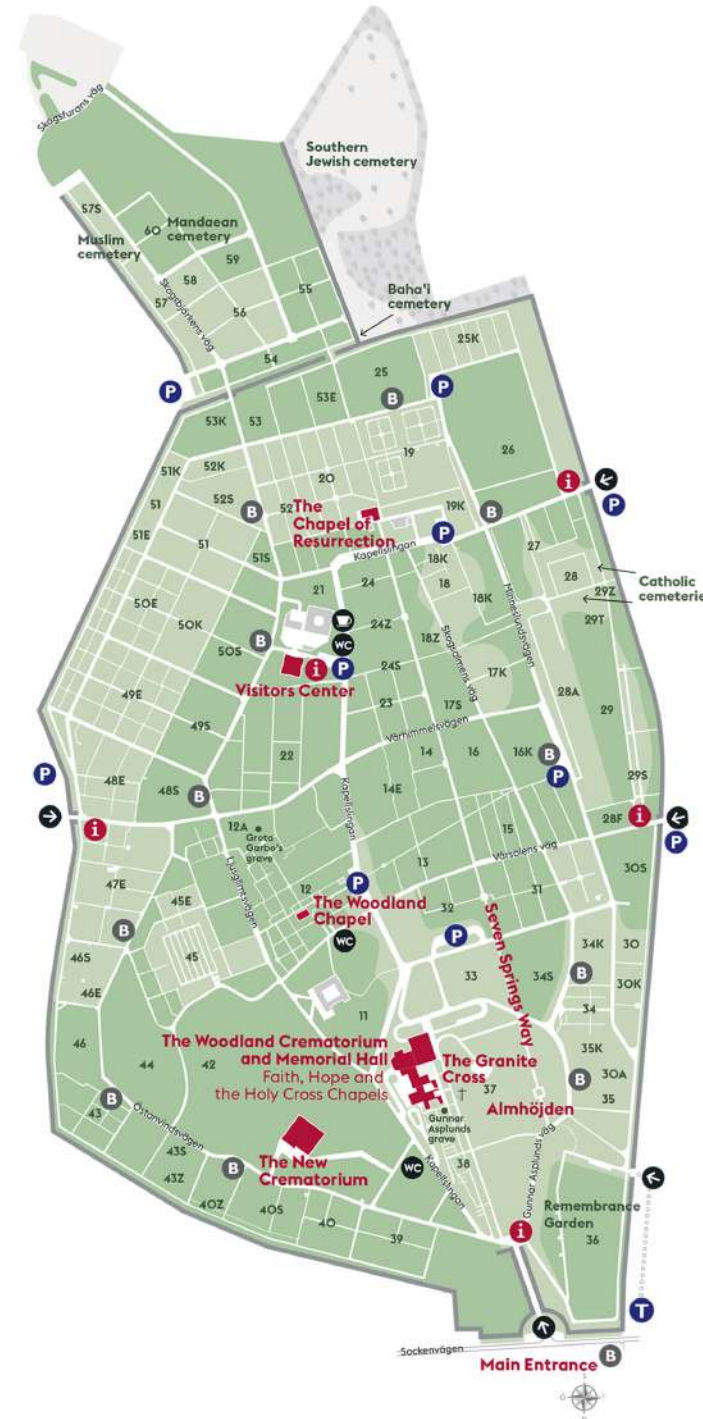
- Falling water at the main entrance
- The pool at the crematorium is the perfect reflection of the sky above.
- A sequence of seven springs also leads visitors across the site, connecting each part of the cemetery with water

Refuge:

- The atrium provides a place for withdrawal from environmental conditions.

Mystery:

- Elm hill or Almhöjden, the meditation grove which is accessible through a long flight of steps provides a mystery section for the observer and the path gives more information to the individuals as much as they travel deeper into the cemetery .



Name	Skogskyrkogården Cemetery
Location	Sweden, Stockholm, Enskededalen
Type	Woodland cemetery
Total area	108.08 Hectare
Built Year	1915-1940
Intervention area	Urban planning and 61000sq
Year of last Intervention	1940
Intervention Type	<ul style="list-style-type: none"> • GIP • Building and landscape architecture
Design Team	Stockholm Municipality and Gunnar Asplund - Sigurd Lewerentz

Aoyama cemetery, Minato, Tokyo, Japan

GIP:

- The cemetery is categorized in green open public areas and connected with other green spaces.

BUA:

- Some punctual biophilic interventions around the cemetery contribute to the activation of the cemetery and other functions.
- The area today is designed to facilitate pedestrian and biking access to all-natural areas

Vernacular material and architecture:

- The landscape and architecture of the cemetery are dominated by Japanese garden elements and the history of culture: as paths, moss, bamboo fences and rocks .

Natural materials :

- Organic and natural design: Stone paths, raked gravel patterns of rock and sand , Moss ,Bamboo fences

Patina of time:

- The cemetery are covered with seasonal plants that aware visitors from natural process and temporal changes within seasons.



Name	Aoyama Cemetery
Location	Japan, Tokyo, Minato
Type	Park cemetery
Total area	26.36 Hectare
Built Year	1874
Intervention area	Urban planning and Urban design intervention for neighborhood
Year of Intervention	2007
Intervention Type	<ul style="list-style-type: none"> • GIP • BUA • Building and landscape architecture
Design Team	Tokyo and Minato Municipality

Lakewood Cemetery, Minneapolis, Chicago, United States

Vernacular material and architecture:

- The rich palette of materials (granite, marble, wood) and architectural features (mosaics, bronze artwork, stained glass) was selected to connect with the cemetery's other buildings.

Thermal and airflow variability or Natural ventilation in buildings:

- The projecting crypt rooms and interstitial columbaria form a series of intimately scaled courtyards, with each space directly tied to the lower garden's landscape through large windows and meanwhile provides natural thermal and airflow variability within the area

Presence of different native plants :

- The greenhouse offers fresh floral bouquets, potted plants, Easter lilies, poinsettias, and evergreen wreaths according to the season.

Natural color and materials :

- The wall of the lobby is covered in granite stone and the wooden wall is warm in color.
- Marble using for the floor, wooden furniture, as well decorative details like mosaics, bronze artwork and colored glass for forming doors, windows, and the contrast of textures – light and dark, rough and smooth, rustic and refined – call upon both visual and tactile human senses.
- Slate stone used for facade.

Complexity and orders:

- The wide glass doors, sheathed in bronze grids that repeat the looping, circular pattern of the mosaic tile, provides rich sensory information that adheres to a spatial hierarchy similar to those encountered in nature.
- The facade, in particular, is rife with natural analogs with a graphic painted on the exterior wall.

Presence of water or Exposure to the water :

- A long rectangular reflecting pool is located in the middle of a simple arrangement of walkways through parterres.

Providing views and vistas to nature :

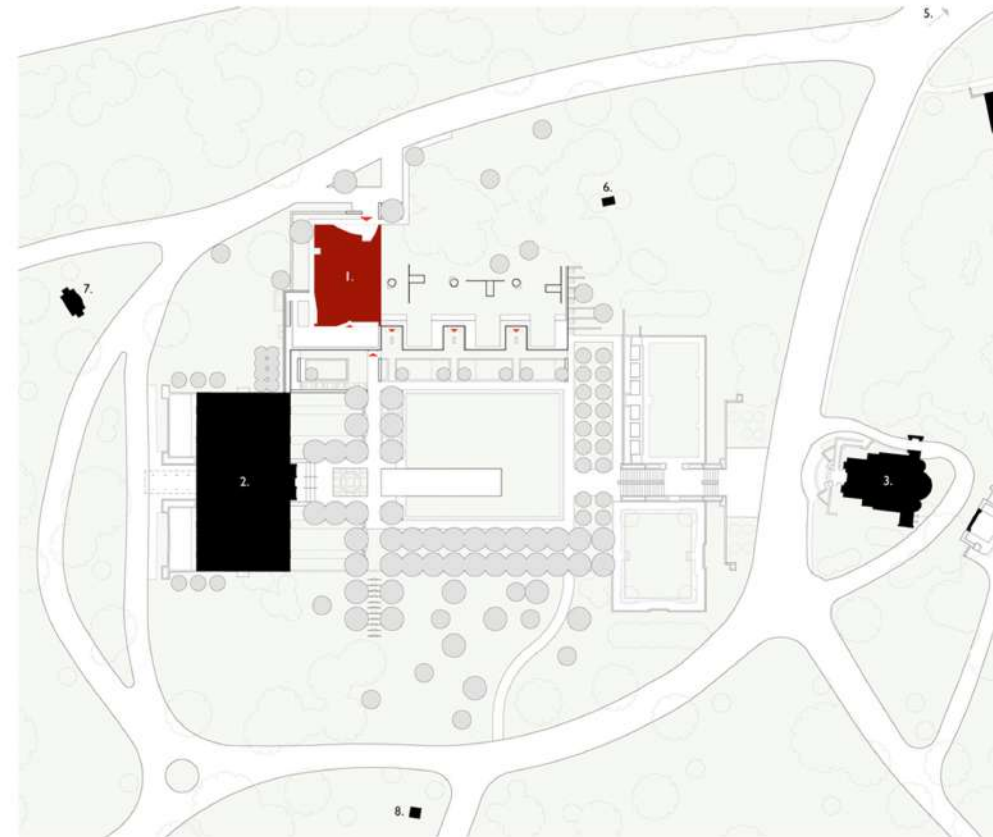
- Facade is incorporating with the nature
- Garden Mausoleum entry on the street level integrates the landscape and greenery of the area.
- A generously stone scaled stair faded into the slope draws visitors from the entry to the lower garden level.
- A green roof, planted above the lower garden level, extends the lawn of the cemetery to a new view.
- Windows and skylight orientations change and move between spaces, variously framing a view of close or distant horizons, a canopy of trees, or a clear blue sky, and a connection to nature through views of a four-acre garden .
- The wide glass doors offer visitors a distant view of the newly landscaped lower garden.

Natural dynamic daylight :

- The differing orientations of windows and skylights allow for light to penetrate at variable levels of diffusion to create an enhanced visitor experience.
- At the garden level, while chambers are constructed entirely below the ground, natural light illuminates each room by a single skylight or rectangular openings for crypt rooms and circular oculi for columbaria.

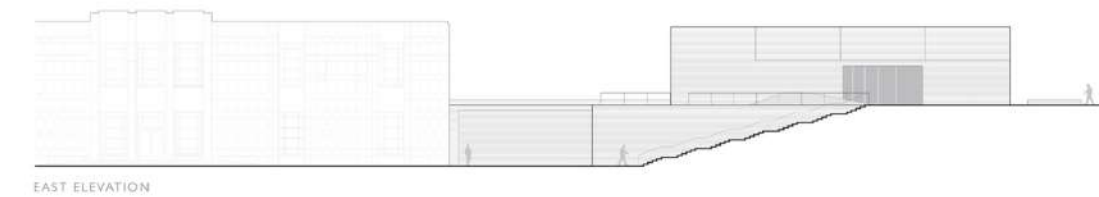
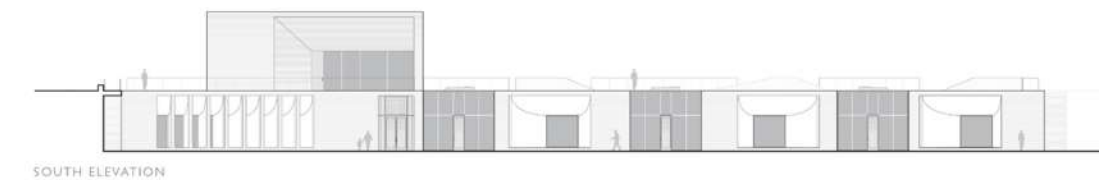
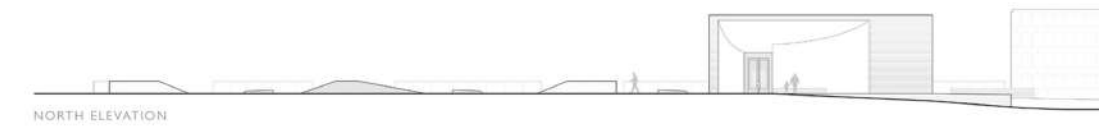
Patina of time ages :

- Seasonal changes are reinforced by different types of place-based plants and trees, such as double rows of Autumn Blaze maple trees that change color and vibrancy from season to season.



SITE PLAN
 1 New Mausoleum 2 Existing Mausoleum 3 Chapel 4 Administration Building 5 Cemetery Entrance
 6 Walker Monument 7 Fridley Monument 8 Pence Monument

0 30' 60' 120'



Name	Lakewood Cemetery
Location	USA, Minnesota, Minneapolis
Type	Rural-Garden cemetery
Total area	101.171 Hectare
Built Year	1871
Intervention area	24.500sq
Year of Intervention	2003
Intervention Type	• Building and landscape architecture
Design Team	HGA architects

Roques Blanques Cemetery, Barcelona, Catalonia, Spain

Vernacular design:

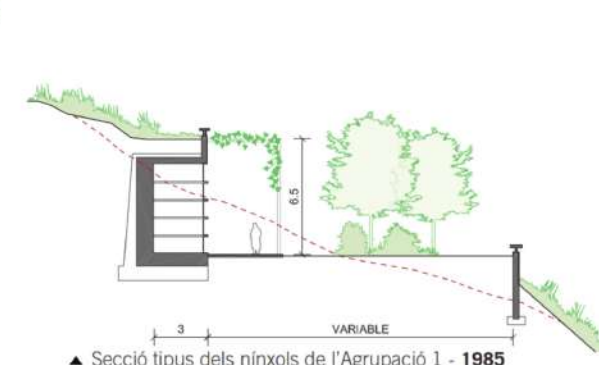
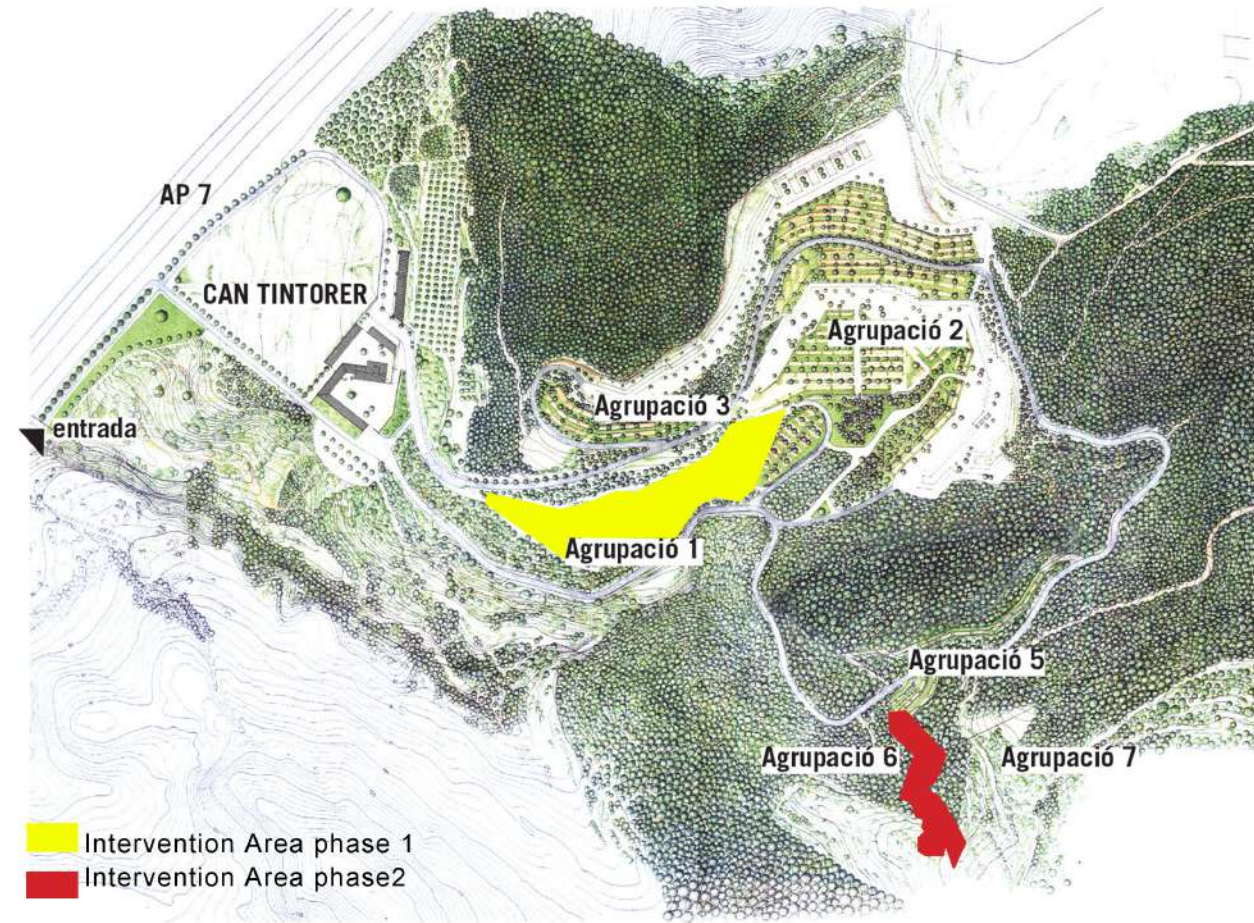
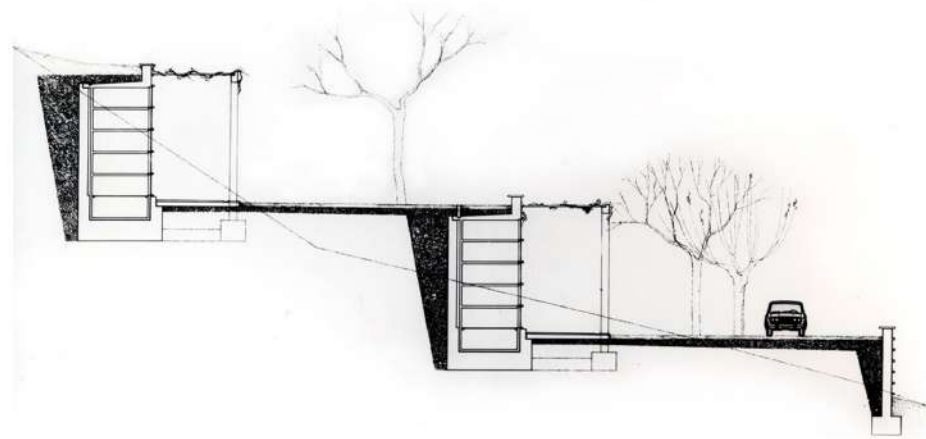
- The urban context of the cemetery, Collserola mountain range, itself provides the typical flora and fauna of the Mediterranean forests. visual connection with the ecological features of the region
- Visual connection with the ecological features of the region was highly determined by the layout of the cemetery with a very erratic topography, with slopes between 15% and 30% and the wooded pine as a main character of the area.
- New intervention based on respect for and conservation of the environment in the natural setting of the Collserola Park .

Natural color and materials:

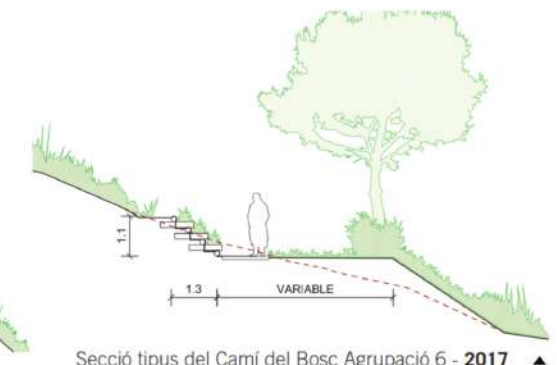
- Brown marble stone graves family-type
- Granite stone burial of horizontal family type, surrounded by grass
- Horizontal brown marble stone grave surrounded by grass
- Green vertical burial wall with green gravestone
- Vertical burial with green terrace
- Natural burial a new form of sepulture, ecological and 100% biodegradable for burial paradigms.

Presence and Integrate of different native plants and animals: (Biodiversity)

- Terraces established a closed set with pavement and a plantation of trees originating from the field, together with more garden trees (palm trees, bananas) and bushes trimmed
- The second wall connects the decay of the dead elements (trunks) with the roots and the development of the living elements (plants with bright chromatic blooms)
- The selected vegetation is native, adapted and has been combined to improve its ornamental characteristics to promote the presence of butterflies.
- The butterfly garden becomes a biodiversity enhancer that revitalizes the spaces for the use of the Collserola Natural Park and collaborates in sensitizing the citizens



▲ Secció tipus dels nínxols de l'Agrupació 1 - 1985



▲ Secció tipus del Camí del Bosc Agrupació 6 - 2017

Name
Roques blanques Cemetery
Location
Spain Barcelona, El Papiol
Type
Park cemetery
Total area
50 Hectare
Built Year
1990
Intervention area
1973sq 560000sq
Year of Intervention
1981-1985 2017
Intervention Type
• landscape architecture
Design Team
Batlleiroig architects

CHAPTER 7

APPLIED STRATEGIES AND GUIDELINES PROPOSAL

This chapter proposes general comprehensive strategies and guidelines for Tehran urban cemetery integration through city and regional urban planning, urban and architectural design implementation for urban cemetery neighbourhood, and urban and architectural design implementation of the immediate area and the cemetery. The rest of the chapter develops an applied proposal for the research case study (Ibn Babawayh Cemetery, Tehran).

7.1 General Strategies and Guidelines for Tehran Metropolitan area

According to the phase one and phase two of research, strategies for Tehran urban cemeteries in general, should provide a foundation for the future urban planning for urban cemeteries as follow:

- * Identifications of urban cemeteries as a UOPGS, rather than a service function, in Tehran urban planning.

- * To set up policies and plan which is obligate the urban design qualities assessment for urban cemeteries in different scales according to the research urban design model of analysis that could recognize the strengths, weaknesses, opportunities, and threats that each urban cemetery is faced with.

- * To establish an implementation green infrastructure planning for Tehran metropolitan area and cemetery regions which would be popular within the society and citizens, and the plan itself must foresee a model of green and blue urban networks in which cemeteries are included in this network

In terms of urban design assessment plan, the plan must define the urban design indicators as guidelines for analysis:

Territorial or regional scale:

- Functional Permeability: Mobility through regional area
- Functional Diversity: Integrated districts
- Compatibility: Spatial and physical adaptability of the region with the historical identity
- Perceptual Permeability: Focal points
- Ecological Compatibility: Natural appropriateness of the environment to the context of region

Intermediate or neighborhood scale:

- Functional Permeability: Mobility, connectivity of the cemetery within the neighborhood, with priority on pedestrian and bicycles and Public transport accessibility
- Functional Diversity: Mixed-use lands for the neighborhood
- Functional Flexibility: Long term management and development of the cemetery in the neighborhood
- Perceptual Permeability: Legible Land marks, nodes, edges, and paths

Immediate and place scale:

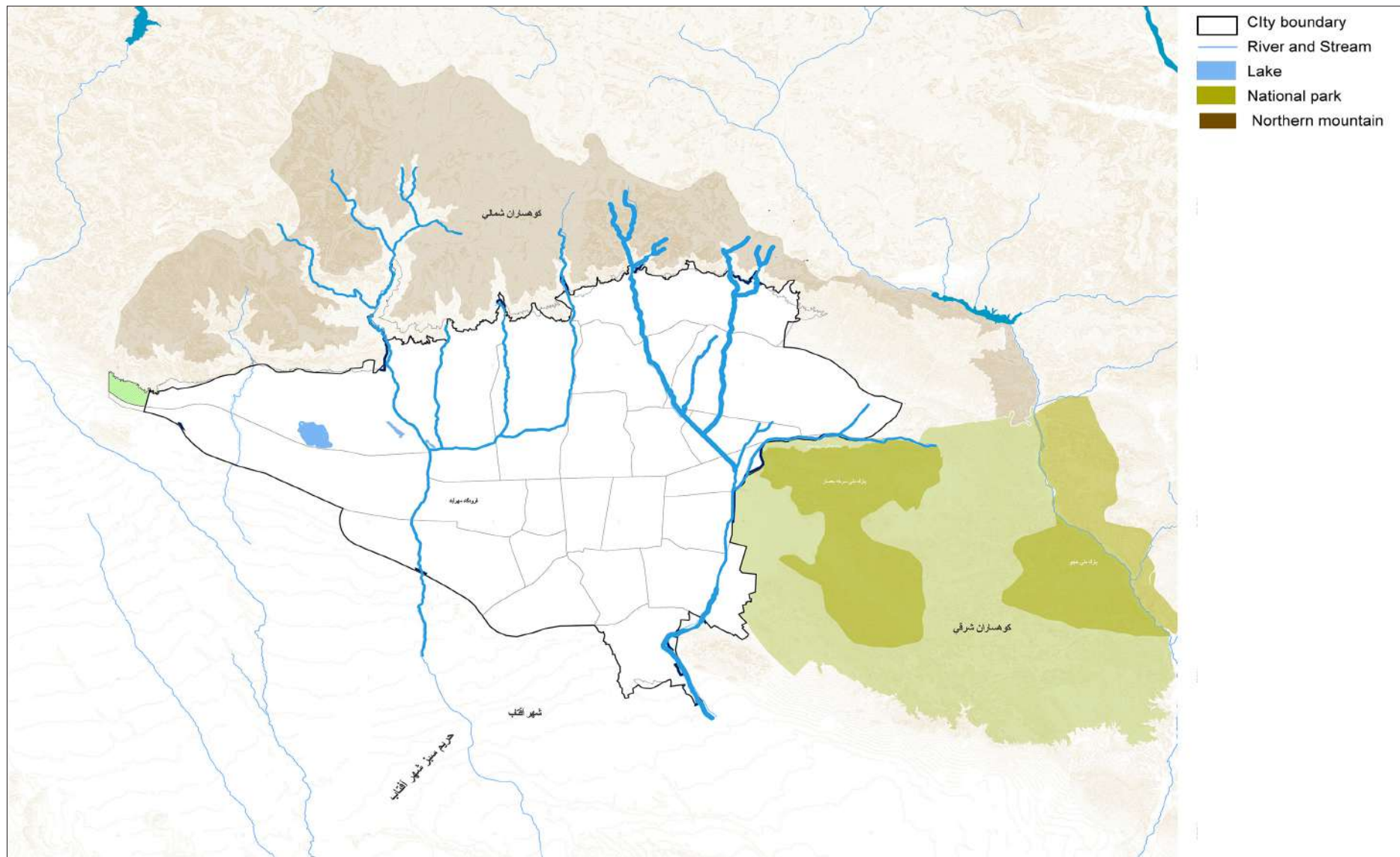
- Functional Compatibility: Cemetery's function in accordance with its history, Appropriate functions of the surrounding land to the context of the cemetery
- Functional Permeability: Accessibility and the quality of the flooring for pedestrian and bicycles
- Functional Diversity: Multi-functionality of public Buildings and urban open public spaces
- Functional Flexibility: Flexible furniture and spaces for different uses and activities
- Perceptual Compatibility: Visual adaptation of the building's in relation to the context of the cemetery (Quality, height and materials)
- Perceptual Permeability: Existence of strategic vistas and views (i.e., landscape and Skyline) inside the cemetery, Clear entrance and unsolid walls and Lighting at night
- Perceptual Diversity: Different colors, sounds and smells
- Ecological Compatibility: Topography and environmental safeties (Eco-friendly)
- Ecological Diversity: Natural elements (Water, plants and animals)

In addition, in line with GIP vision, the Tehran Green infrastructure plan should be organized in a number of guidelines implementation lines to strengthen the value of green and blue infrastructure in city and regions as follow:

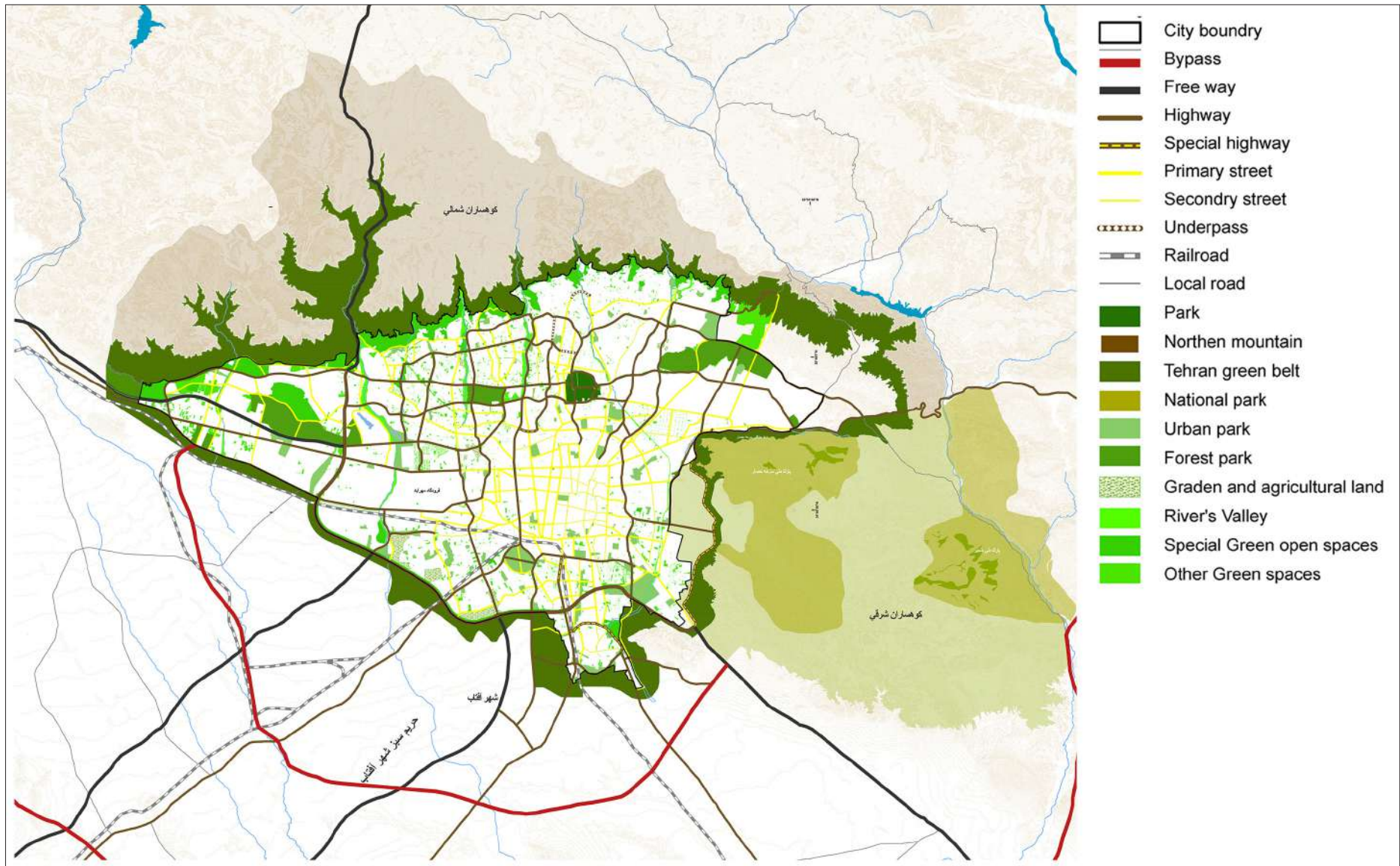
- To prepare and update the map of the blue and green infrastructure
- To monitor the status and development of these natural heritages by implementing a database and a system of indicators on green and blue infrastructures
- To include all types of spaces that make up the city's green and blue network: a range of natural and landscaped, large and small, public and private, simple and complex spaces such as cemeteries, riverbanks, forests, parks, gardens, squares, vegetable gardens, tree-lined streets, street greenery, ponds, roofs, and walls.
- To boost urban cemeteries projects in the city outskirts and metropolitan area for connecting to green infrastructure
- To implement the green and blue corridor network of the regional area of each cemetery according to urban design assessment.

According to the master plan of Tehran metropolitan area, our research proposes Tehran's network of urban green and blue corridors which should connect the green spaces within the city to the main surrounding natural areas, such as Tochal mountain in the north, seven river valleys within the metropolitan area, national parks and forests in the east and agricultural lands in the south. Urban cemeteries should be employed as one of the series of green elements to join detached green spaces in the city.

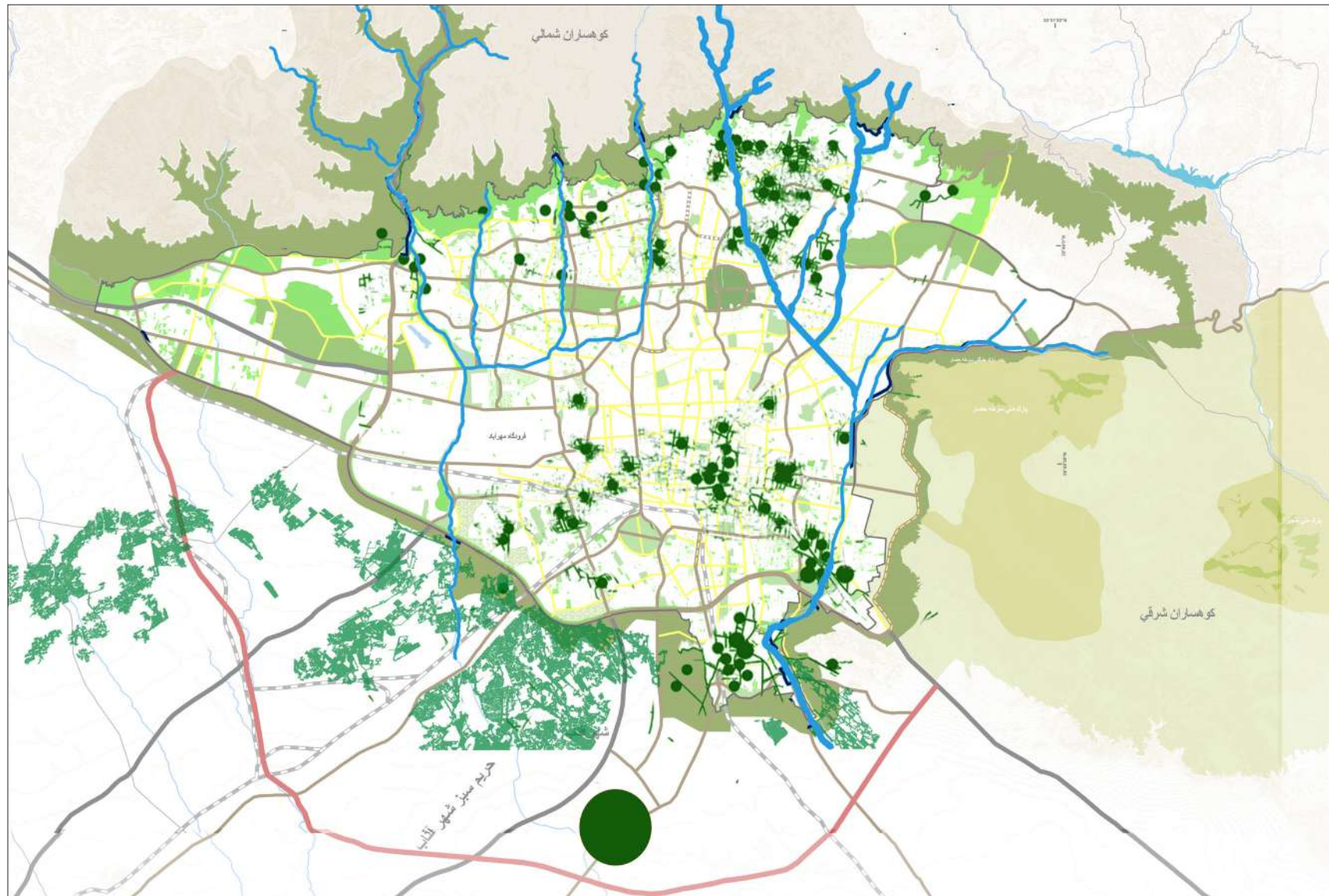
Blue sources of the Tehran metropolitan area



Green sources of the Tehran metropolitan area



Proposal for GIP of Tehran includes Cemeteries, Green and Blue areas and corridors



Tehran's regions



In terms of neighborhood scale and BUA method of intervention, following strategy and key guidelines should be carried out for cemetery's neighborhood in Tehran metropolitan areas ¹:

- * Urban planners and designers should define a comprehensive GI plan for each cemetery neighborhood area according to the opportunities of urban design assessment

- To create green, blue and social spaces in temporarily unused, ill and weak plots.

- To organize a network for existing public green spaces, local natural reserves, cultural spaces and heritages.

- To establish a green and blue pedestrian and cycling connection between existing areas and the new UOPGS.

¹ In this approach, early consultation with local and regional communities of Tehran on the longer-term needs of these lands should set the groundwork for an easier and more successful development outcome. (Bennett & Davies, 2015)

Regard to immediate and place scale, the primary function of the cemetery is to provide burial space and meanwhile, it must fulfil multiple purposes, and be appreciated by citizens with its high environmental qualities. We argued that it will be possible to renovate and activate urban cemeteries by increasing the quality of its urban design indicators with biophilic design that stimulate a sense of a biophilic environment in their interior design, building, and landscape architecture by the following strategies:

- * To create a space with good biomorphic forms, and interesting, comfortable, possibly captivating, contemplative or even absorptive patterns
- * To define space with a good connection to natural systems
- * To extend the persistence of water
- * To set up natural ventilation inside buildings and landscapes
- * To design with vernacular materials and architectures
- * To use natural colors and materials
- * To provide natural views and vistas within space
- * To create natural dynamic daylight or warm lighting within spaces
- * To define shelters
- * To implement biodiversity-friendly programs

Our study illustrates different potentials and values of Tehran's urban cemeteries that can contribute to biodiversity conservation in urban areas and support specific ecosystem services. Therefore, applying and considering biodiversity is one of the key challenges in cemeteries integration in Tehran, on the place scale. This strategy aims to improve a sense of well-being and contribute to urban ecological components of the cemetery. Biodiversity plans should act as a strategic tool that sets out challenges, goals, and commitments of the local government when it comes to preserving biological diversity (Ajuntament de Barcelona, 2020). This strategy should be developed on the basis of the following key guidelines:

- To develop biodiversity preservation protocols for the cemetery
- To diversify tree and animal species
- To adapt vegetation to Tehran environmental conditions

For making a biodiverse environment, one should take advantage of different types of vernacular plants in Tehran with different types to illustrate passing of time, changing of the seasons, and chromaticity in all cemeteries. In the following, the research proposes different vernacular plants according to climate, air pollution, water salinity, and lack of water in the Tehran metropolitan area.

Tree species suitable for Tehran city with lack of water



Betula verrucosa



Eleagnus angustifolia



Platanus acerifolia



Salix alba



Quercus rubra



Creeper plants

Tree species for warm and dry climate of Tehran



Rosemary



Acalypha Marginata



Coreopsis tinctoria and Rudbeckia hirta



Lamb's ears



Achillea



Cortaderia selloana

Tree species for water salinity of Tehran



Robinia pseudoacacia



Cupressus sempervirens



Fraxinus excelsior



Pinus longifolia



Ligustrum vulgare

Tree species for Tehran air pollution



Ailanthus altissima



Celtis australis



Albizia julibrissin (Persian silk tree)



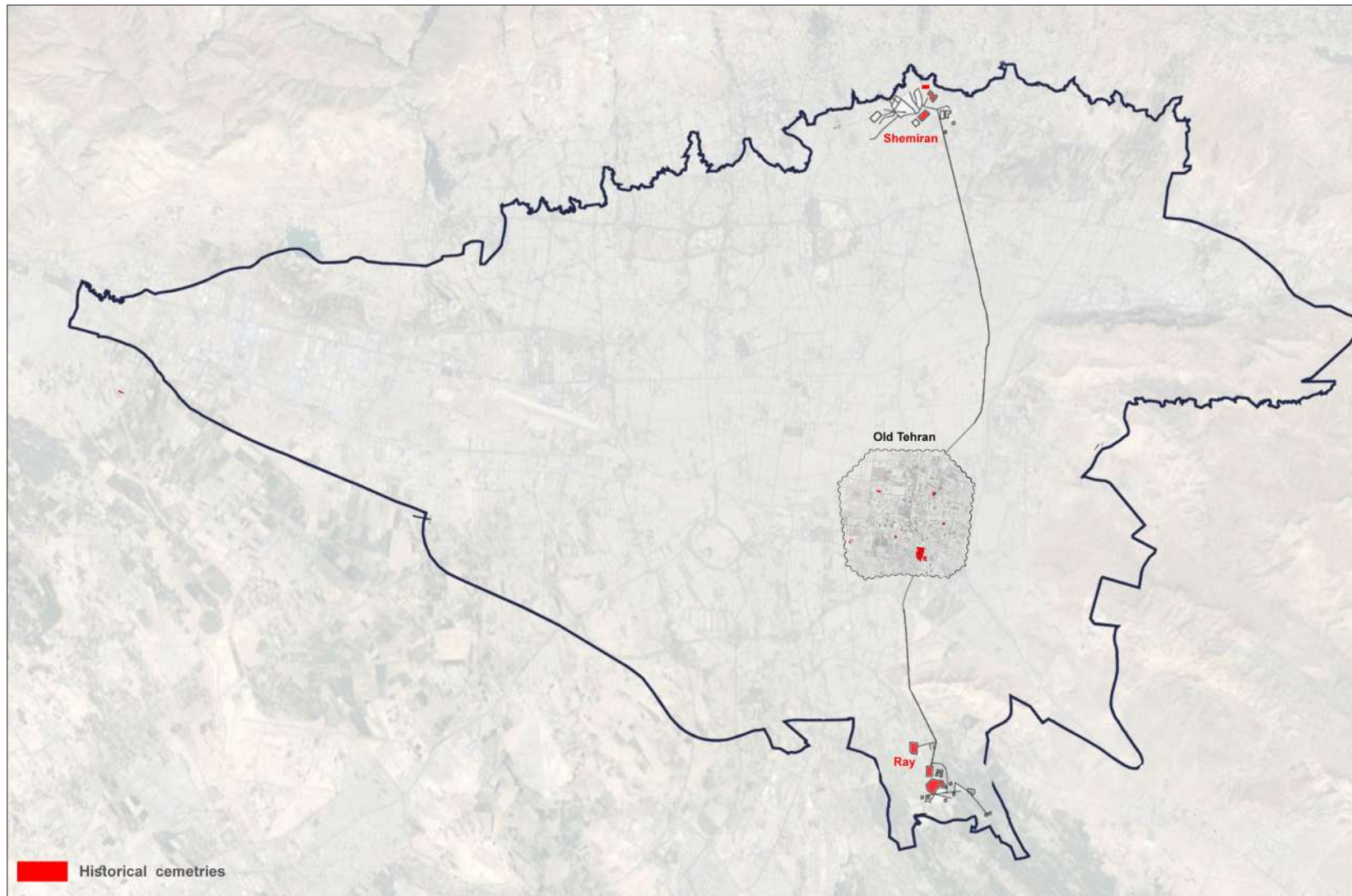
Morus alba

7.2 Application Guidelines for Case Study (Ibn Babawayh Cemetery)

7.2.1 Regional Scal

We discussed in the previous section, it is fundamental to establish an urban region for cemeteries where nature and built environments are integrated. The urban design assessment of the case study showed that the district 20 (Shahr-e Rey) includes most open areas and historical center of Tehran and it is located at the end of Darband-Rey corridor (one of the most important corridors of Tehran Spatial Organization). Therefore the green infrastructure of Rey should deliver and enhance multiple functions and services, while combining UOPGS and creating and restoring connections with the natural area.

Darband-Rey corridor as an important corridor in Tehran Spatial Organization



To obtain systematic GIP in the area of our case study, the research presented a graphical schemes of Rey's Green areas to illustrate how urban cemeteries and green networks can join the implementation of the Rey Green Infrastructure Plan. The aim here is to transform the region into a network that connects existing green spaces with one another and with the surrounding natural areas. Hence, GIP of Rey should: (Fig.180)

- Deliver and enhance multiple functions and services by generating urban centers
- Establish green continuity and combine green and gray infrastructure
- Establish green and blue networks to be interconnected with the entire area

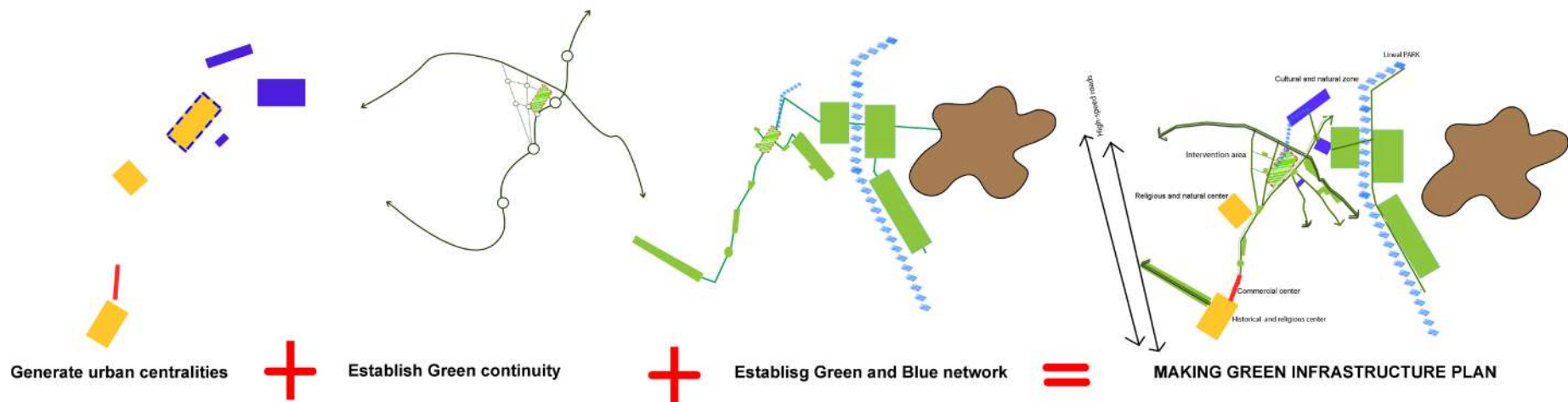


Fig.180: Diagram scheme: GIP for Rey region, by author

Therefore, the main structure of the region, based on opportunities derived from research urban design assessment, includes: Significant urban open public centers such as: Abdol Azim shrine complex, Abdolah shrine/cemetery, old Bazar and caravanserai, Tughrul Tower, Rashkan Castle and Hill, Cheshmeh Ali and Tabrak Castle and the wall of Old Rey, Bibi Shahrbanu mausoleum, and Naghareh Khaneh Tower. (Fig.181, Fig.182, Fig.183)

- Fadaiyan-e Islam and Ibn Babawayh streets in the north-south directions, and Rey Ring Road in the east-west direction as main connectors of urban open public spaces
- Four intersections, including Shahr-e-Rey, Safaiyeh, Vramin and Ibn Babawayh Square as the main social and functional points of the Ibn Babawayh corridor in the north and south
- Natural elements such as Bibi Shahrbanu mountain range and the Sorkkeh Hesar river in the east.

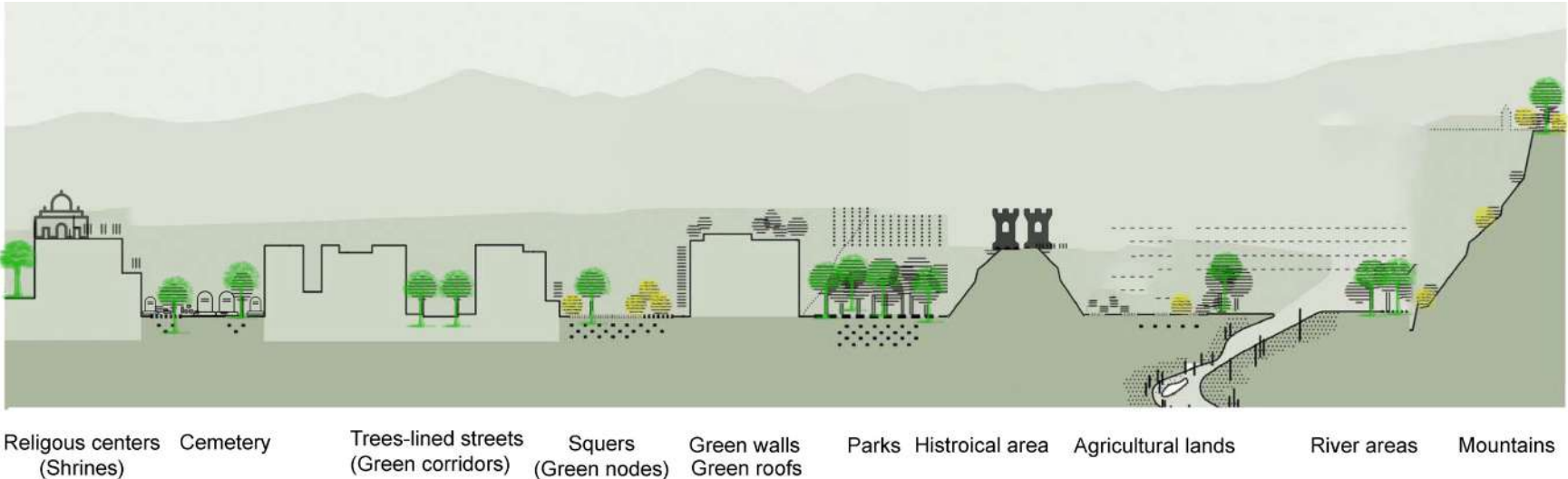


Fig.181: The proposed scheme for Rey (inspired by Barcelona GIP), by author

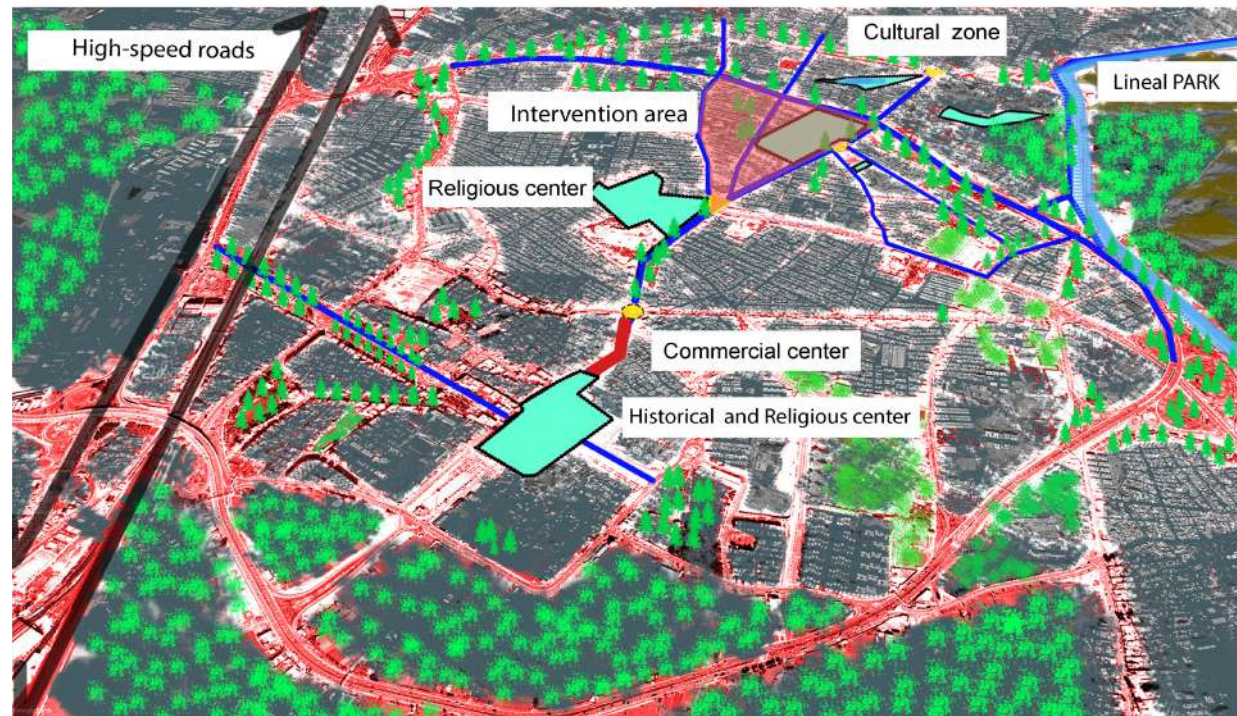
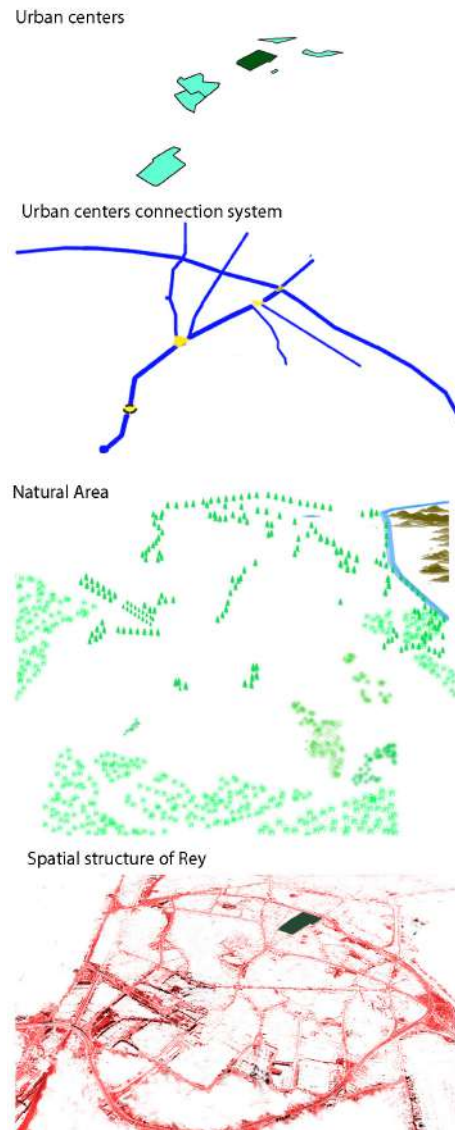


Fig.182: Axonometric scheme of Rey GIP, by author

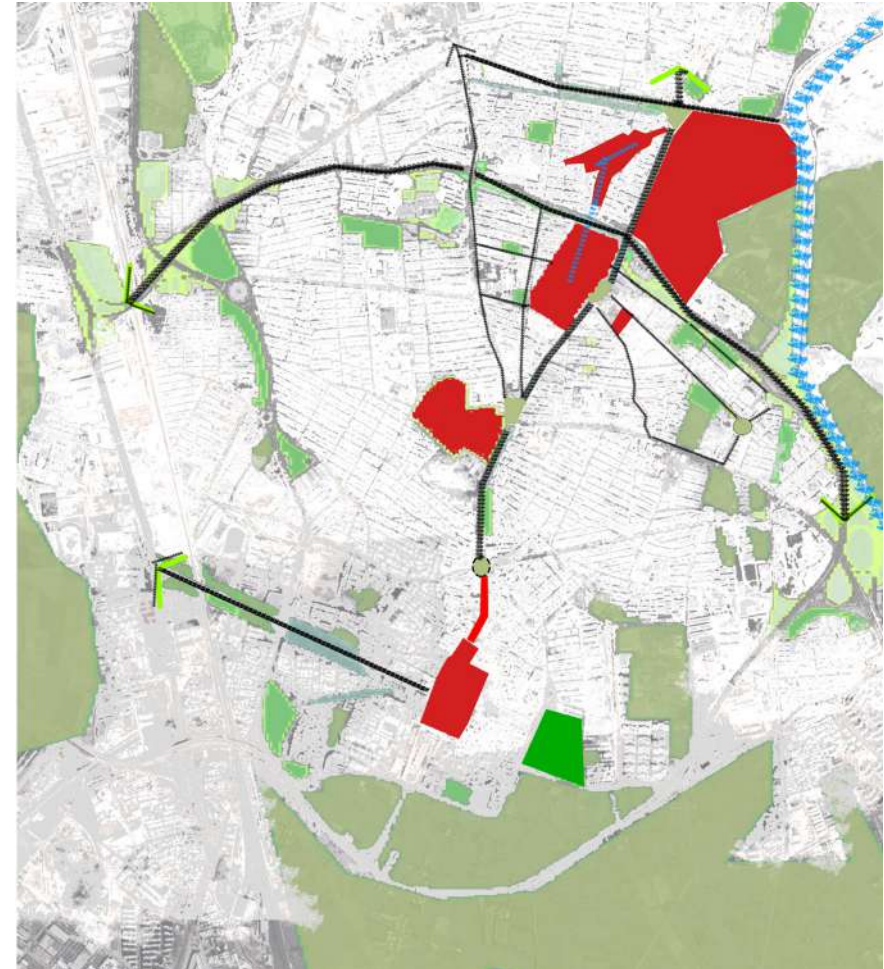
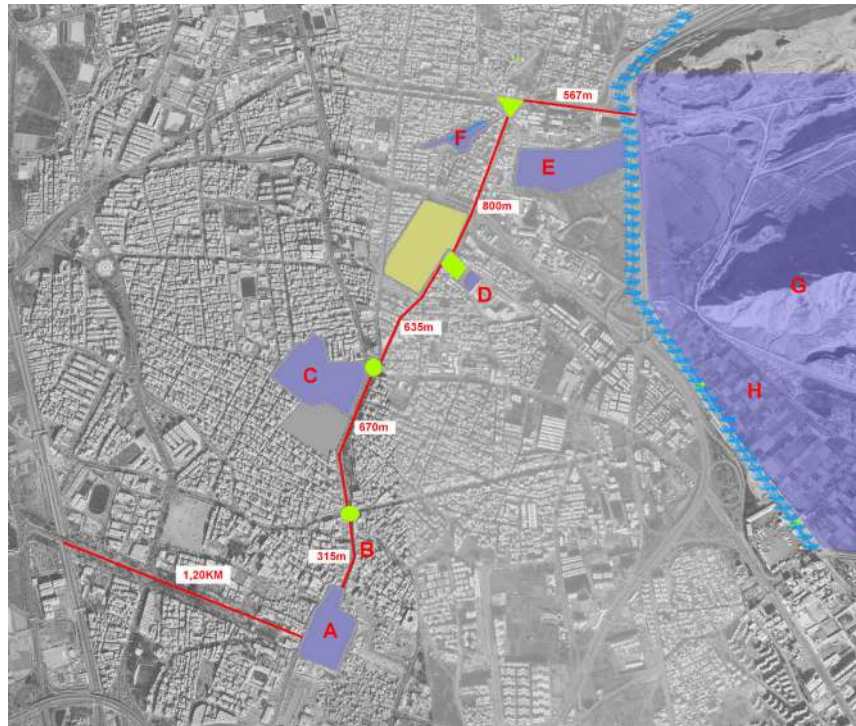


Fig.183: Site plan schme of Rey GIP, by author

7.2.2 Neighborhood scale:

The urban design assessment of case study neighborhood, indicated that this neighborhood is a compact area with high population density and few natural areas. Except for a few green open areas, there is a very small presence of flora, fauna, and water in this neighborhood. In addition, the land use map analysis of Rey showed that the area includes several ill, weak, and unused plots. Consequently, the neighborhood has the potential to improve its quality through the research method of biophilic urban acupuncture in line with the opportunities derived from urban design assessment. Fig.184). Therefore, the following actions should be carried out for the neighborhood of case study cemetery:

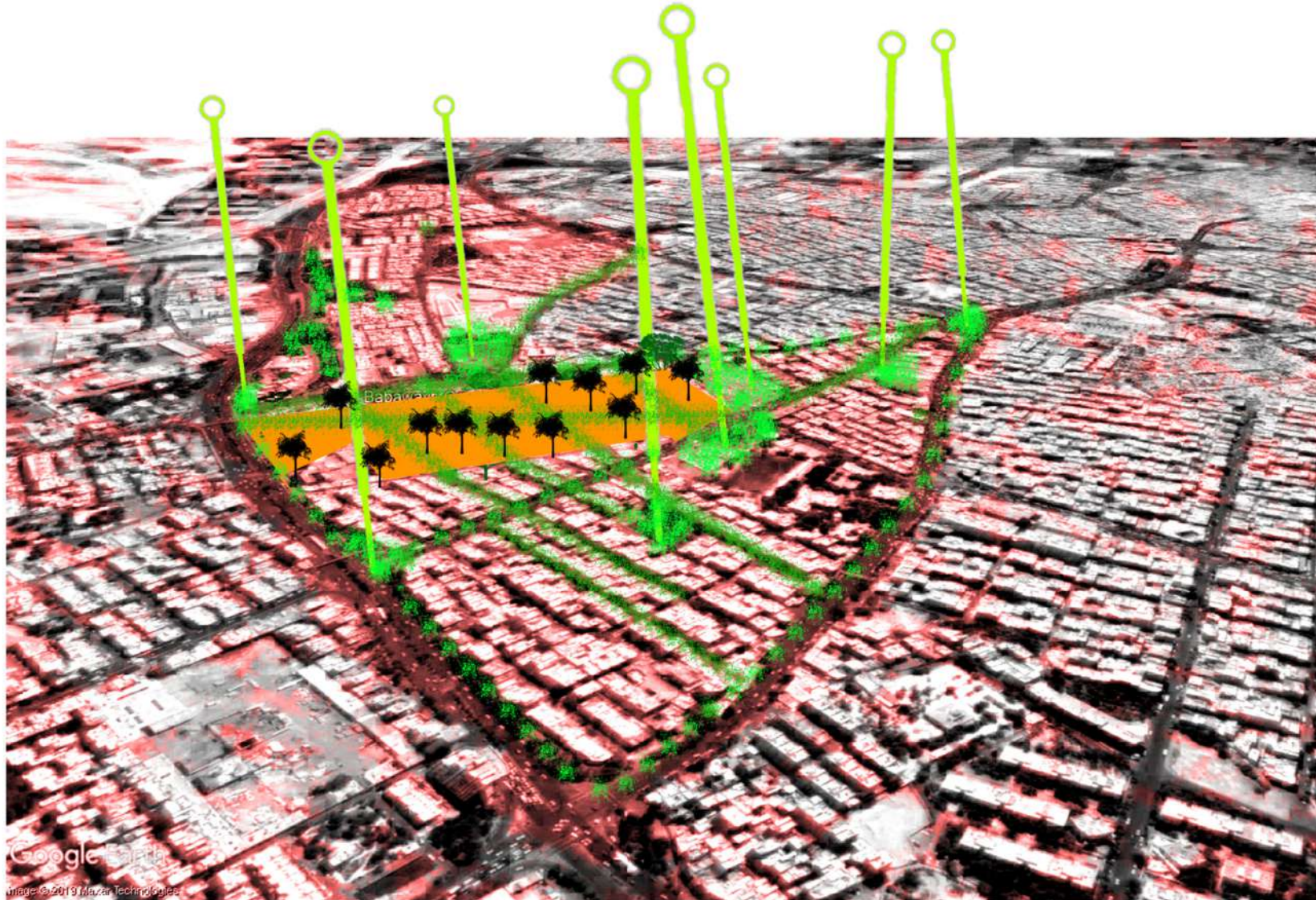


Fig.184: Proposed biophilic urban acupuncture implementation in the cemetery neighborhood, by author

- Set the intensity for the green sociable nodes and increase biomass in the intersection areas (Fig.185)





Fig.185: The intersection and nodes in neighborhood area which have potential to be green sociable nodes

- Create new green spaces in the weak and ill shaped areas and establish a green functional grid (Fig.186)



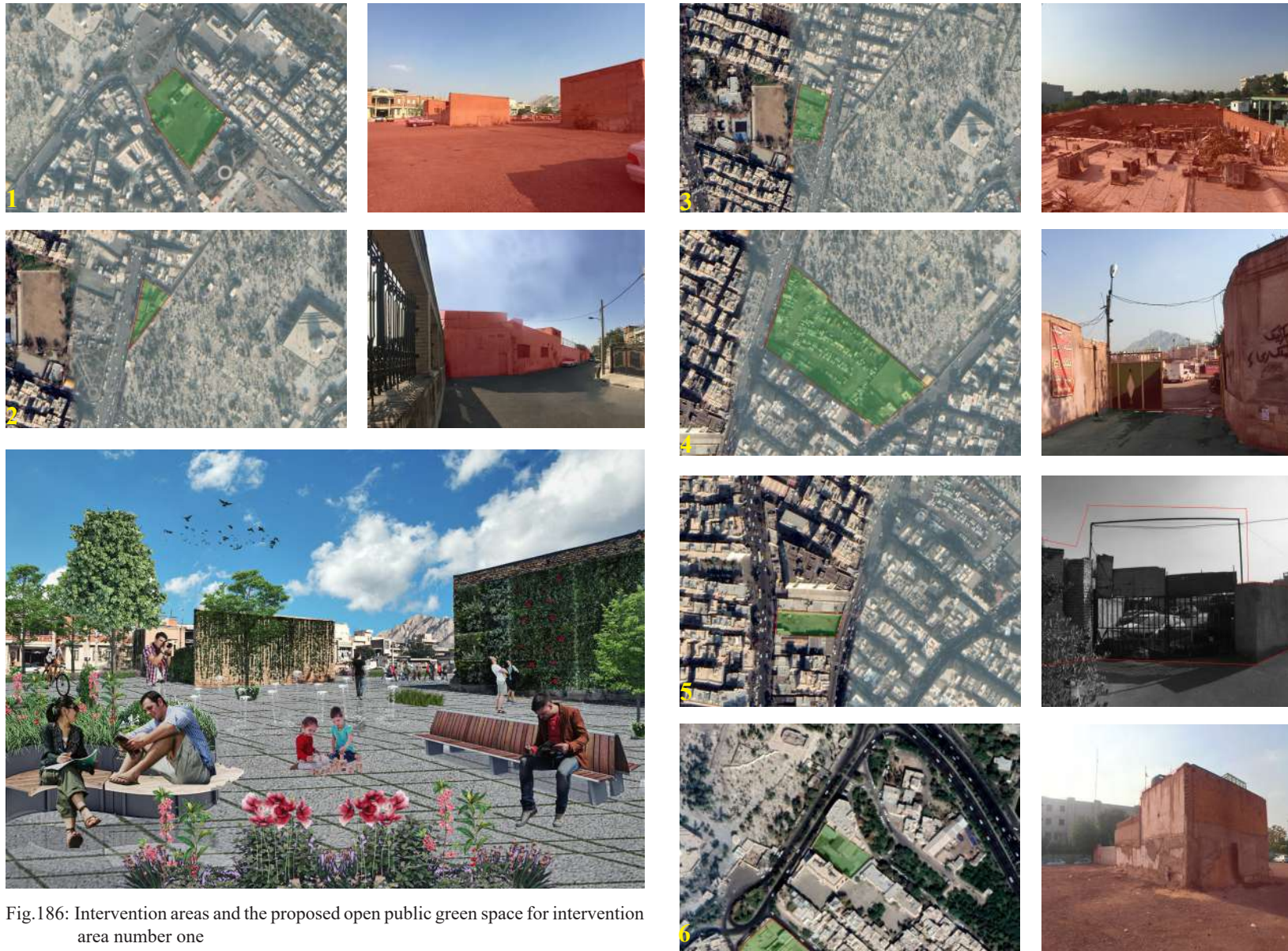


Fig.186: Intervention areas and the proposed open public green space for intervention area number one

- Generate and implement green accessible networks (include Corridors) to provide cycling and pedestrian continuity in the neighborhood



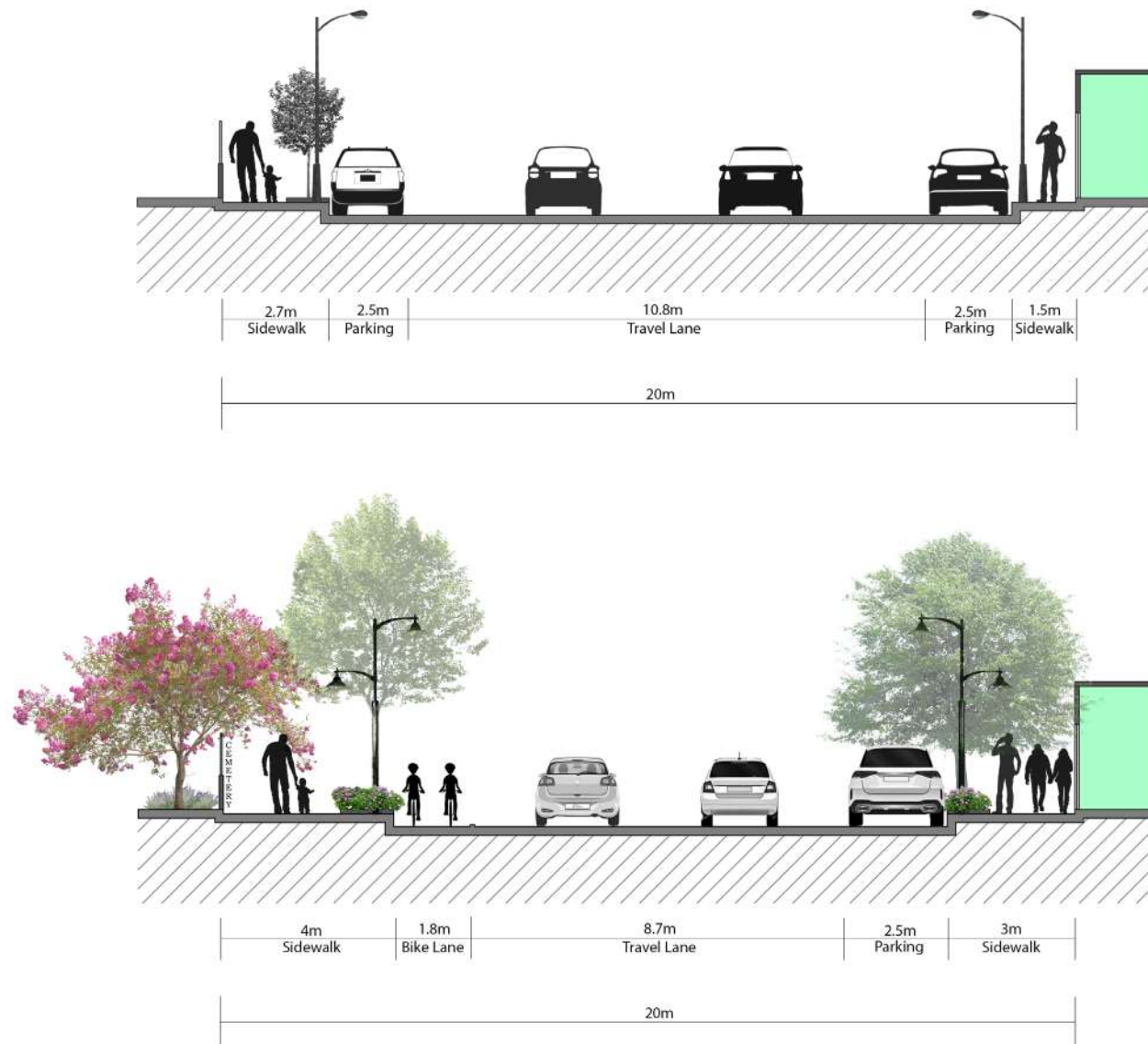


Fig.187: Proposed design for Ibn Babawayh street –Southern part

7.2.3 Immediate and Place scale

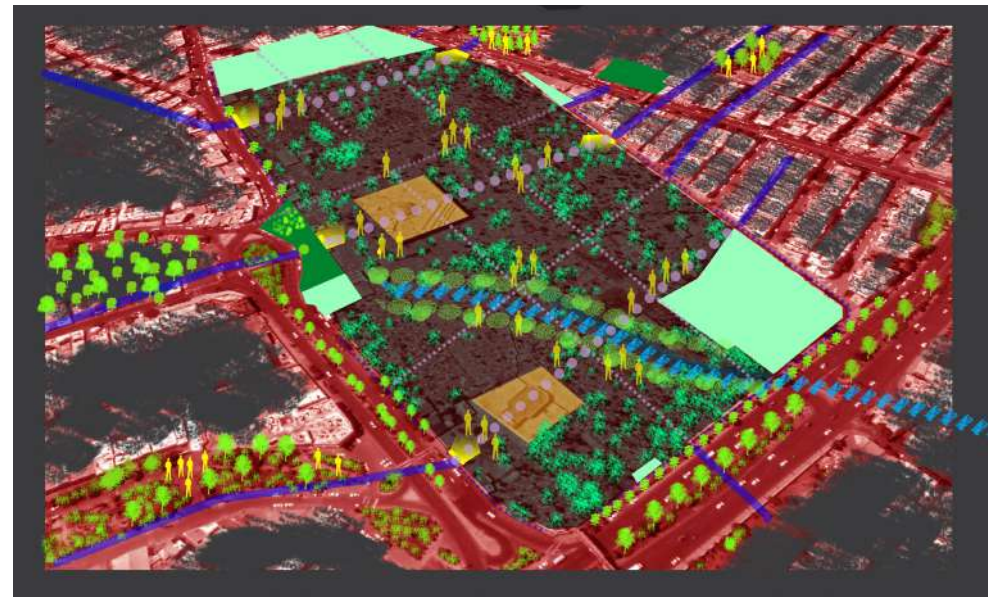
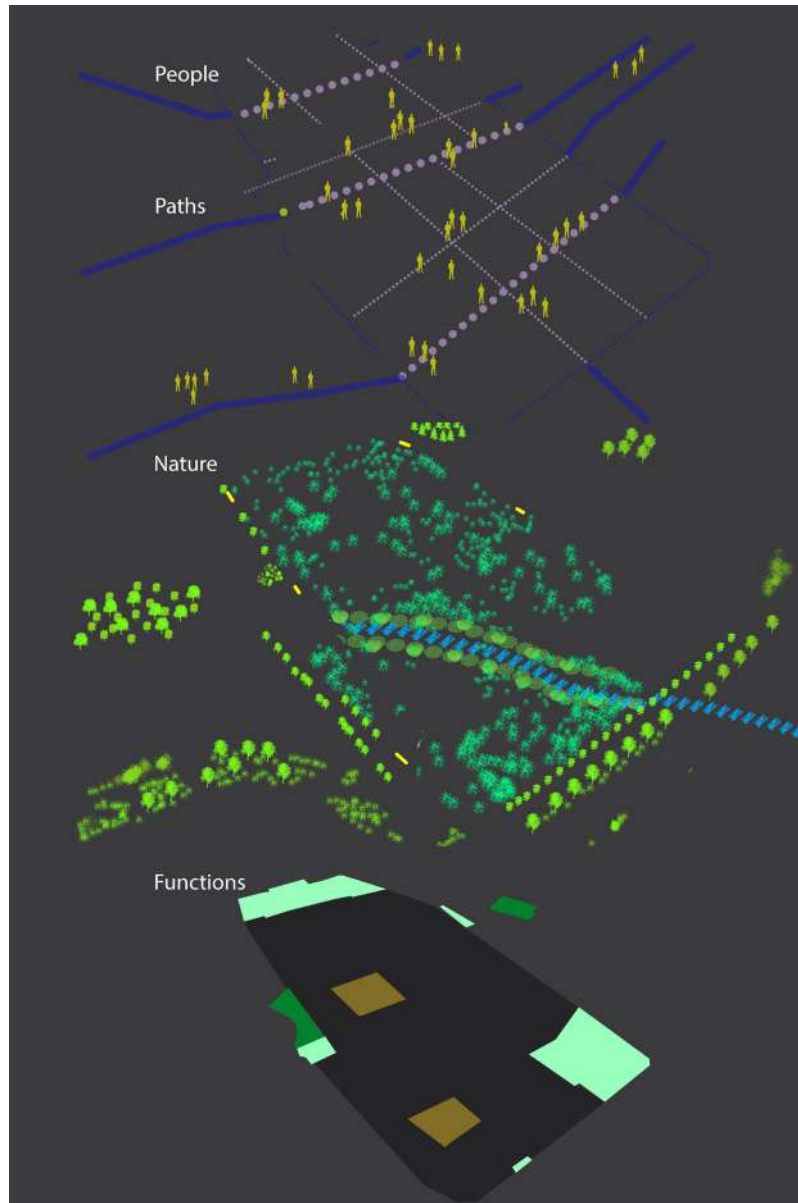
According to the research findings, urban cemeteries as UGGS should be a place to merge nature and people, and as a multifunctional UGGS be integrated into its immediate area. In specific, since Iranian gardens have long been unique for their vernacular architecture and landscape design, design of the urban cemeteries should be designed and renovate due to them. (Fig.188, Fig.189) Therefore the research proposes, urban landscape and architecture design actions as following which should be applied to the case study in line with opportunities derived from assessment and biophilic design intervention principals:



Fig.188: Fin garden, Kashan, Iran



Fig.189: Shahzadeh Mahan Graden, Kerman, Iran



- Set up the green pedestrian and cycling movement through the cemetery



- Restore the historical water channel inside cemetery and establish more waterways and ponds (Fig.190)





Fig.190: Proposed section design for waterway renovation inside the cemetery, by author

- Set up walls, entrances, and floors with different natural and vernacular materials, plants, and colors related to the context



- Establish collective green transversal spaces in front of entrances (Fig.191)



Fig.191: Proposed design for the open area in front of the cemetery as a collective space, by author

- Provide natural dynamic and diffusing day lighting for the buildings and night lighting for burial areas and landscape



- Define a simple green grid for the tombs



- Enhance biodiversity of the place by different intensity animals and vegetations quantities according to mosaic of habitat pattern². (Batlle, 2011) (Fig.192)

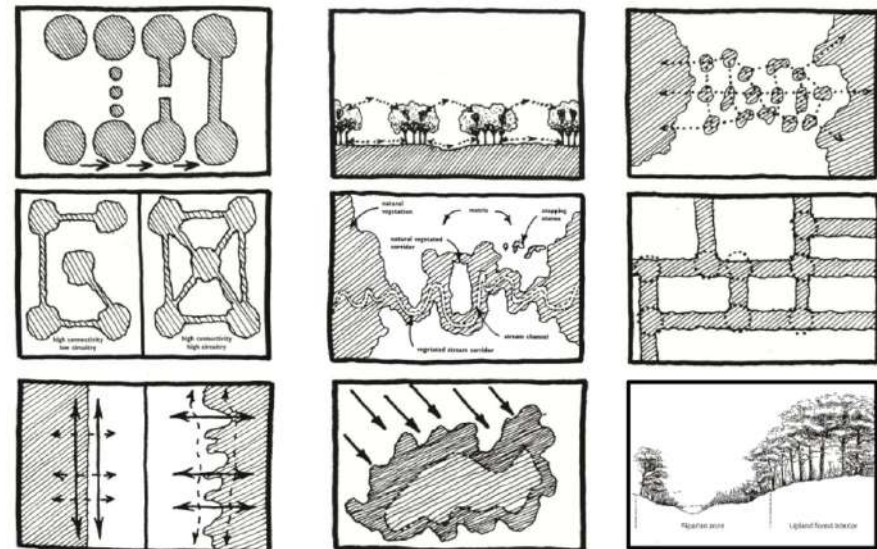


Fig.192: Richard Forman mosaic pattern diagram, 1996

² An area or site comprised of multiple habitat types. Supplement. A habitat mosaic can be formed through an ecological disturbance, such as fire. A habitat mosaic is ecologically important in creating or maintaining biodiversity. Forman describes mosaic patterns in landscapes and regions according to the patch- corridor-matrix model. Both nature and humans create spatial patterns according to the model. For example, forested patches and corridors produce spatial heterogeneity in an agricultural matrix.(Batlle, 2011)

- Design biomorphic flexible furniture and ceremony area



CHAPTER 8

DISCUSSION AND CONCLUSION

This study was an attempt to investigate the urban cemetery integration process and develop a deeper insight and better understanding of biophilic and acupuncture design approaches in urban cemeteries as UOPGS for human well-being in Iran, Tehran metropolitan area. The major findings of the chapters have been discussed in details at the end of the chapters. However, this chapter intends to emphasize the important parts of these results and to integrate them into a coherent conclusion for the research. This includes an examination of the research question and hypothesis; but more importantly, it attempts to organize the theoretical principles which contribute to the relevant areas of urban knowledge. The chapter is, therefore, divided into three sections. The first section gives a brief overview of the research question and hypothesis. Section two reviews the main themes of research, the findings and results areas of urban design assessments and justification of the intervention method of the study (biophilic and acupuncture approaches). It develops a framework for the dissemination and utilisation of the research findings for policy and practice. This will be achieved in five major discussions.

8.1 Review of the Research Question and Addressing Hypothesis

The thesis initiated the discussion with an introduction to the inherent concept of the cemetery and its evolution in the world. Hence the research explained that the population, religion, culture, history, access, economy, and ecological factors in cities are among the key variables of the cemetery's creation and their evolution overtimes in cities.

The research was followed by a review of the burial history and cemeteries before and after Islam in Iran. We found during the pre-Islamic period in Iran, cemeteries were spaces and places integrated with nature and cities. Following the arrival of Islam in Iran and according to Islamic beliefs early cemeteries were formed next to Imamzadeh (Shrines) and other sacred spaces in cities. We argued that these spaces have played an important role in the structure of Iranian cities and have been considered as the main religious, social and cultural spaces of Iranian cities.

The research discussed that with the growth in population and the removal of these urban spaces from cities, the urban environmental indicators in these places have been lost. As a consequence, the lack of connection to community, society, and cities contributes to a sense of fear among citizens. It was also discussed that this conflict has intensified with cities development and leads to a confrontation of these spaces with territorial, intermediate, and immediate areas.

In order to resolve this problem in the capital of Iran, the thesis scrutinized the history of this transformation during the modernization era in the Tehran metropolitan area in chapter one.

The combination of the general problem of the research with the actual examples of urban cemeteries transformation in Tehran metropolitan area led to the introduction of one essential question that How can be the urban cemetery reintegration process (as an open public green space) so as to promote human physical, mental and social well-being? During the study, we encountered some sub-questions in order to answer the main question, such as:

- What is urban open public green space?
- What is the human-well-being requirements and needs within urban cemeteries as a UOPGS?
- Which kind of urban open public green spaces, cemeteries could be in order to be respond human needs?
- How the environmental qualities of the built environment such as cemeteries have an effect on human well-being?
- What are the urban cemeteries (UOPGS) environmental components?
- What are indicators of a high-quality urban cemetery (UOPGS)?

In the first phase, an extensive literature review was conducted to construct an urban design assessment framework of research according to answer sub-questions and determine key aims:

- Interpreting and introducing UOPGS definitions
- Studying and clarifying the major necessities of human well-being in urban spaces
- Specifying the main components of urban cemeteries
- Identifying the environmental qualities indicators of urban cemeteries that advantageous in increasing well-being
- Assessing the outcomes and impacts of indicators (Case study of Tehran)

In order to respond to the main question, the research raised up with hypothesis that applying Biophilic design and biophilic urban acupuncture to the design of cemeteries, their surrounding areas, and the urban planning of their regions can improve the environment and the quality of life in the city and promote human physical, mental and social well-being

In the second phase regarding the hypothesis of the research, the study literature review concentrated on the aim of applications approaches:

- Explaining the principles of biophilic design and urban acupuncture to enhance the environmental indicators qualities of the built environment (place, neighbourhood, region and city)
- Evaluating the biophilic design and acupuncture impacts in urban planning, urban design, landscape and architecture through international cases.

8.2 Key Findings, Results and Main themes of the research

The main question and hypothesis impregnated the thesis with major themes upon which the main body of the thesis was based: urban design assessment, biophilic and BUA application methods for intervention. This section gives a general description of the main findings based on the main themes of the research as follow (Fig.193):

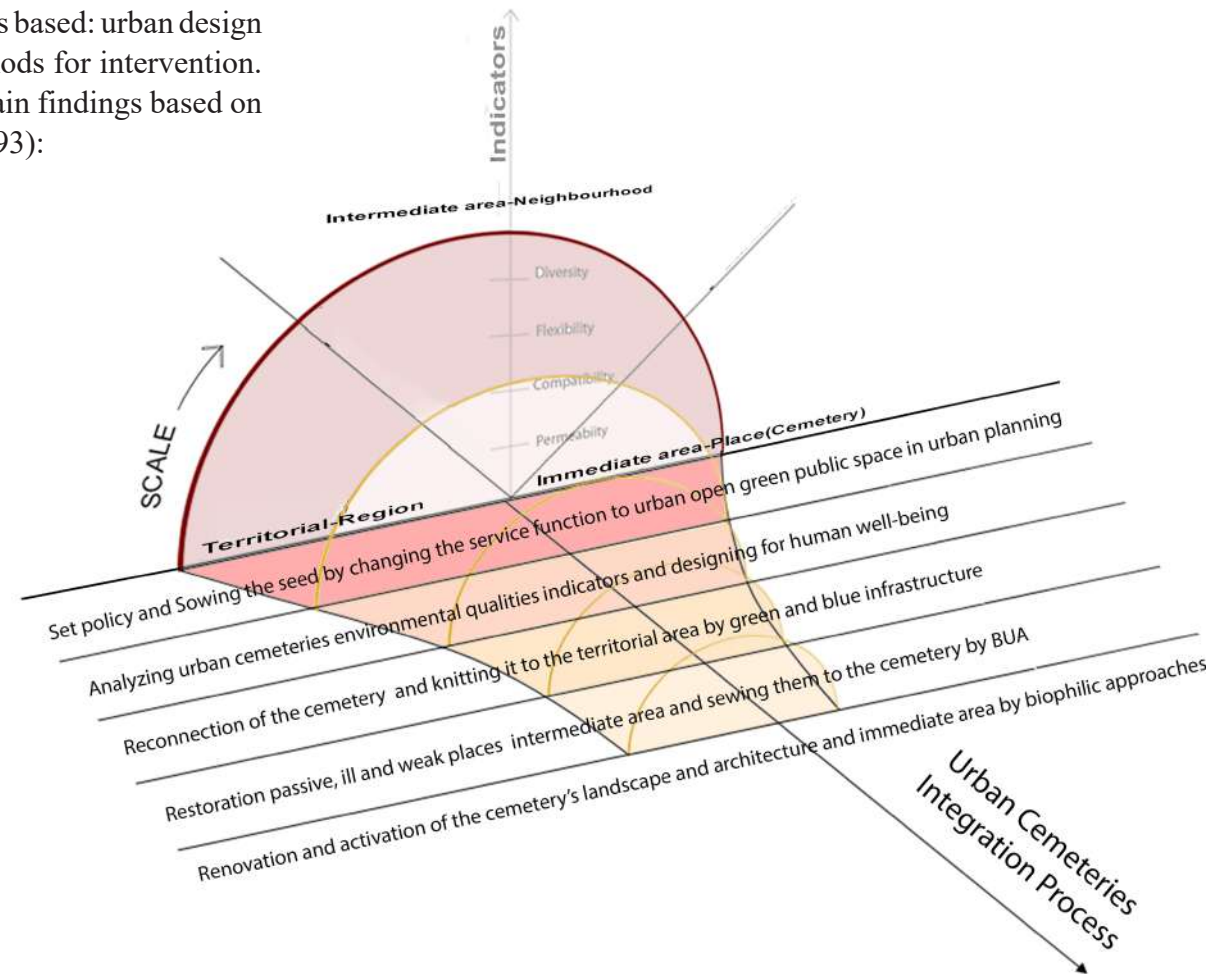


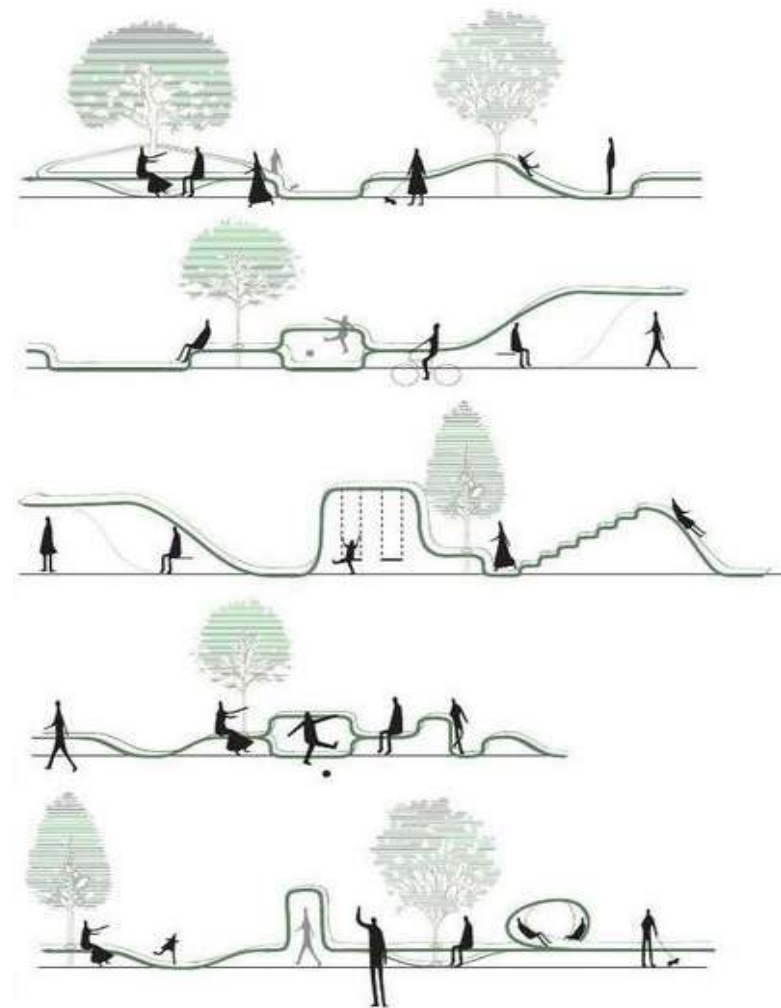
Fig.193: Urban cemetery biophilic integration process diagram, by author

8.2.1 From Service Function to Urban Open Public Green Space

One of the main themes that came through was the neglect in urban policies for urban cemetery function in Iranian cities. The results of literature reviews of UOPGS revealed that the urban cemetery function and land use in urban planning has been directly involved in this process. The finding of this study shows the main concepts and features of urban, open, public, and green spaces within cities.

It also indicates that the concept of UOPGS together is relating to the spatial structure, amenity, ecological and social aspects of spaces regardless of their private or public ownerships.

Therefore, despite the current function of cemeteries as a service in most urban planning of cities, significantly we discussed that urban cemeteries should be identified as urban open public green spaces. Urban planners should treat with urban cemeteries as like as other public spaces within cities. Urban cemeteries should contain characteristics and indicators of UOPGS and be integrated with other open public green spaces in urban areas. These spaces must provide opportunities as UOPGS to respond to human well-being in urban areas, especially where there exists a severe lack of suitable public green spaces.



8.2.2 Analyzing Urban cemetery's Urban design Environmental qualities indicators and Designing for Human well-being

The second theme of research focuses on human well-being needs in UOPGS according to behavioral science and address the ways that have been utilized. The results of this investigation showed that how people look at a space today and communicate with it, mostly depends on their understanding of space to see that whether space meets their needs or not and the memory they will have from the environment in general. Thus, the thesis found that improving the environmental qualities and urban function of cemetery would lead to a shift in modern humans' attitude to life, death, and understanding of cemetery's environment, and the way cemeteries are dealt with in modern times. Since the research found that many urban policymakers have been constantly investigating the connection between human needs within the urban design, urban planning, and architecture for many years. Investigation of all urban theories and ideas indicates that designing the urban cemeteries environment should consider social, mental, and physical factors of human well-being and meet user's needs. Therefore, in terms of urban design the study proposed a model of human well-being requirements in urban cemetery. Accordingly, this study has presented four principles of relaxation and comfort, passive engagement, active engagement, the sensory experiment of human beings in urban cemetery environment which would lead to mental, social, and physical well-being.

Our study followed a greater approach employed by the urban design theories to improve the quality of UOPGS, in terms of human well-being requirements. The result showed that human needs can

be addressed by modifying qualitative urban design components and indicators. To this aim, according to the different urban design theories and researches, this study proposed a coherent urban design model to recognize urban cemeteries components and assess their environmental qualities. The research finds that functional, perceptual, and ecological factors are identified as the main urban design components of the urban cemetery. Therefore, we argued that understanding urban design indicators related to these components in territorial, intermediate, immediate and place of urban cemeteries will lead us recognize all strengths, weaknesses, opportunities, and threats which urban cemeteries are faced with and designing a successful UOPGS based on human needs and well-being. Fig.194)

Regarding the results of this part, the outcomes and impacts of environmental quality components and indicators were evaluated in the case study for a cemetery in Tehran. The examined case study indicates that how this model provides a standard basis for analysis cemeteries within the urban areas in the Tehran metropolitan area. As this case study confirms urban design assessment is the second step towards the cemetery's integration process as a UOPGS.

Accordingly, the study proposed that all opportunities of urban design analysis open to the urban cemeteries could be taken into account for the new intervention of biophilic and BUA for urban cemeteries.

Principles high-quality urban cemetery

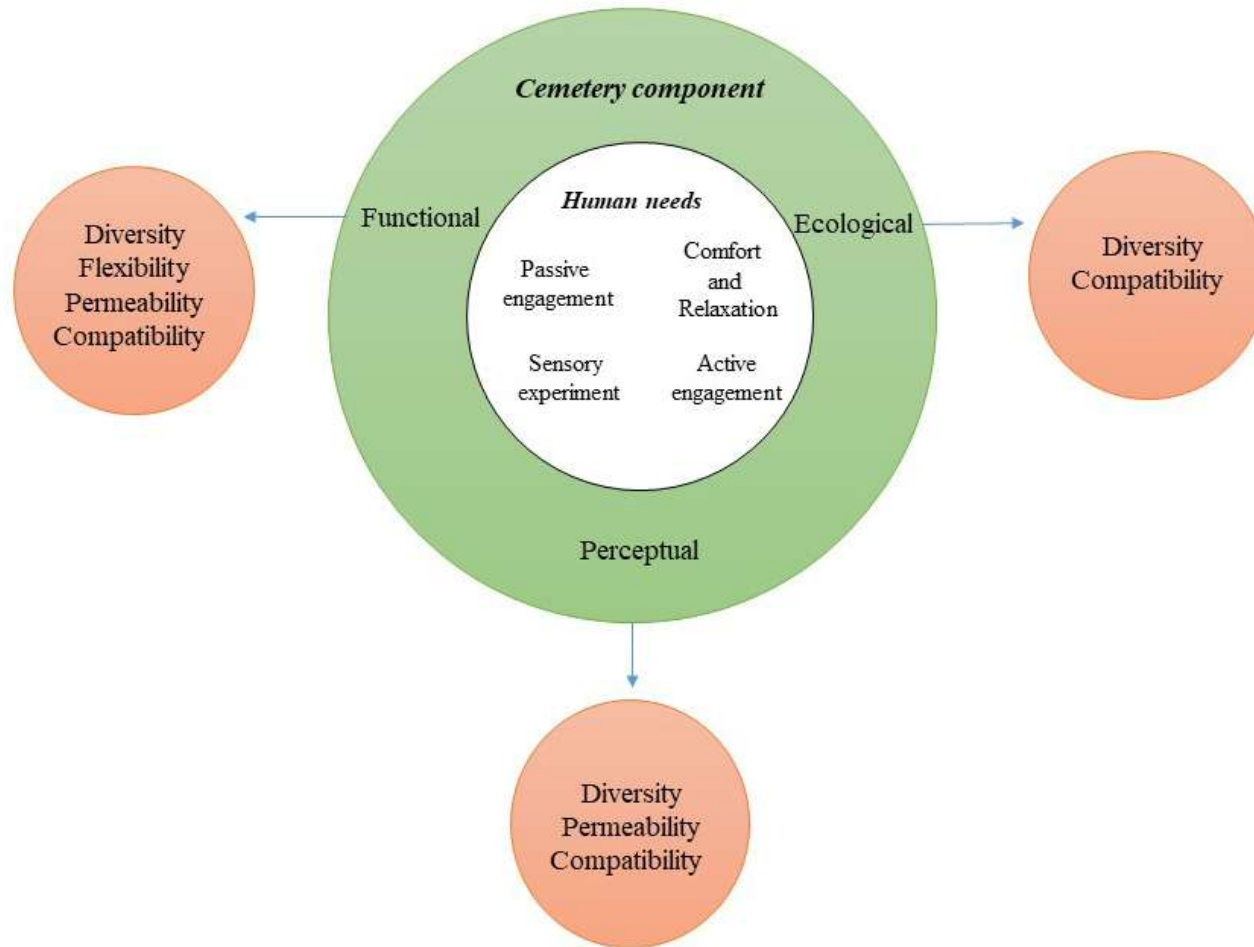


Fig.194: Indicators and components of qualitative urban design for urban cemetery according to the human well-being and needs, by author

8.2.3 Reconnecting urban cemetery and knitting to the territorial areas and cities by blue and green infrastructure

One of the initial theoretical conjectures of the hypothesis was the relationship between human well-being and nature or in general biophilic design. As the hypothesis of research assumed and through the second vast literature review of biophilic and urban acupuncture design, we concluded that biophilic design as a multisensory design could enhance the quality of urban design environmental indicators. It can also be used in various scales of the interior, building, landscape architecture, urban design and planning for cities as an intervention and applied approach to integrating urban cemeteries.

As the empirical investigation of international case studies revealed how high-quality indicators of the urban cemetery could be applied by biophilic and urban acupuncture methods. This provided a basis for the emergence of a new series of human well-being and people's attitudes within urban cemeteries and represent a different approach to the urban cemeteries' environment.

In order to identify the above-mentioned results, we discussed about biophilic and acupuncture within the architectural, landscape, urban design, and planning scales. Through territorial and regional theories and studies we found out that GIP is the application methods of Biophilic intervention in the city and regional planning. Fig.195)

Also, by studying international cases, including Scandinavia (Oslo) and Japan (Tokyo), we found out that GIP could be applied by connecting green spaces, public spaces, and blue areas such as parks,

cemeteries, waterways, green corridors, etc., in regional and urban planning. This method not only leads to cemeteries integration with other spaces but also, they can be used for ecological purposes and ultimately for human well-being. GIP would be an effective practical method for the regional and urban integration of cemeteries while considering and taking advantage of the opportunities identified from urban design evaluation. To do so, the findings of this study showed that the GI creation of comprehensive and master plans should be prioritized by planners and policymakers. City developers need to take into account that, cemeteries should contribute to green and blue networks, corridors and nodes (urban parks, cultural trails, greenways, and rivers) to enhance environmental qualities in urban regions. The strategic and planning of GIP in cities also will encourage cooperation among all citizens to respond to their identified needs.

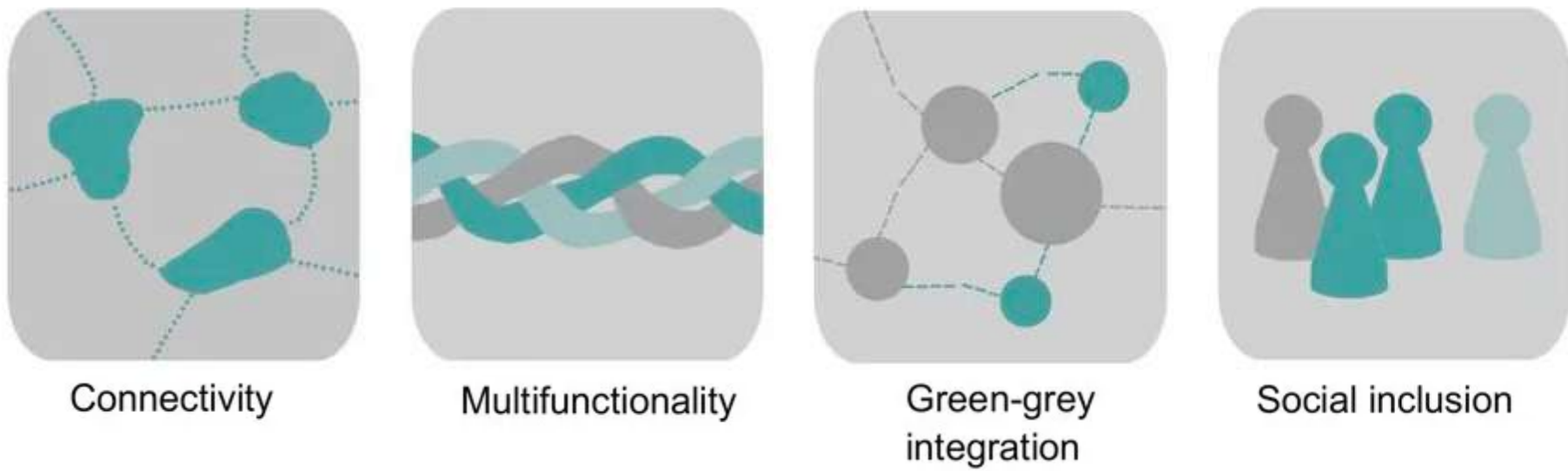


Fig.195: Four key principles of Urban Green Infrastructure Planning

8.2.4 Restoring passive, ill and weak places of intermediate area and sewing them to the cemetery (BUA)

The research indicates that the character of the neighborhood is expressed in all UOGPS (including urban cemeteries). In the cemetery neighborhood, all those abandoned, destroyed, and sick urban spaces have detrimental effects on other functions as well. In addition, the urban design assessment of the research showed that neighborhoods must be designed with the priority of pedestrians and easy access to facilities for resident's well-being.

According to the urban acupuncture studies of research, we find that there is no need for large-scale destruction and interventions for the regeneration cemetery's urban neighborhood (Fig.196). The research results show that implementing BUA to the cemetery's neighborhoods could create a high-quality urban environment around cemeteries that satisfies all aspects of human well-being. Studying of Tokyo, the international case study, indicates clearly how the BUA intervention in the Aoyama neighborhood has led to the enhancement of urban design indicators and the connection between the cemetery and neighborhood which itself led to the usage of cemetery by pedestrians and cyclists.

Therefore, this study demonstrated that by taking advantageous of urban design assessment, biophilic urban acupuncture intervention for ill, passive, and weak places along with the biophilic design principals would contribute to the cemetery's neighborhood restoration.



Fig.196: Biophilic urban acupuncture intervention method for restoring neighbourhood areas

8.2.5 Renovating and activating the cemetery landscape and architecture by biophilic principals

WHO (2016): *“In being recreational spaces, cemeteries can contribute to public well-being and health similar to several green spaces.”*

According to this study, we showed that cemeteries generally contain both natural elements, natural environment, (e.g., trees and wildlife), and architectural, cultural, and historical elements, built- environment, (e.g., gravestones, buildings, and sculptures). We argued also that cemetery place, at its core, needs to be a sanctuary with the power of healing, restorative and offers proper grieving opportunity for people. In addition to this innate functionality, we discussed that it must also offer an active and lively spaces, in line with responding to human well-being in cities.

This study demonstrated that the biophilic method could lead to the renovation and activation of the urban cemetery's place and space. In regard to this, biophilic principles of landscape design and architecture were presented as a framework that includes: Presence of water or exposure to the water in the vicinity or within cemetery's buildings and landscape, Thermal and airflow variability or natural ventilation in spaces, Biomorphic patterns and forms, Biodiversity, Vernacular materials and architecture, Natural color and materials, Providing views and vistas to nature/natural environment, Natural dynamic daylight or warm lighting, Connection with the natural system, Complexity and orders, Mystery and Refuge.

Although we discussed that these principals must be applied in different cases according to the culture, climate, management, and opportunities ahead in the urban cemetery. Indeed, In the analysis of international cases, the research concludes that the way of implementing landscape and architectural interventions in each cemetery is different depending on the opportunities ahead, however in terms of theory, all followed the fundamental principles of biophilic-design. Besides, we argued that biophilic interventions are flexible on the scales of landscape and architecture and repeatable in some cases.

Therefore, landscape and architectural designers must renovate and activate urban cemeteries according to the opportunities derived from the urban design assessment and based on the biophilic principles. Beyond the results, the research also emphasized that the preservation and renovation of urban cemeteries are possible through proper management or establishment of non-profit organizations or corporations for each cemetery in neighborhood scale. Therefore, the designing and multifunctionality of modern and new cemeteries must change with the development of their surrounding through long term management.

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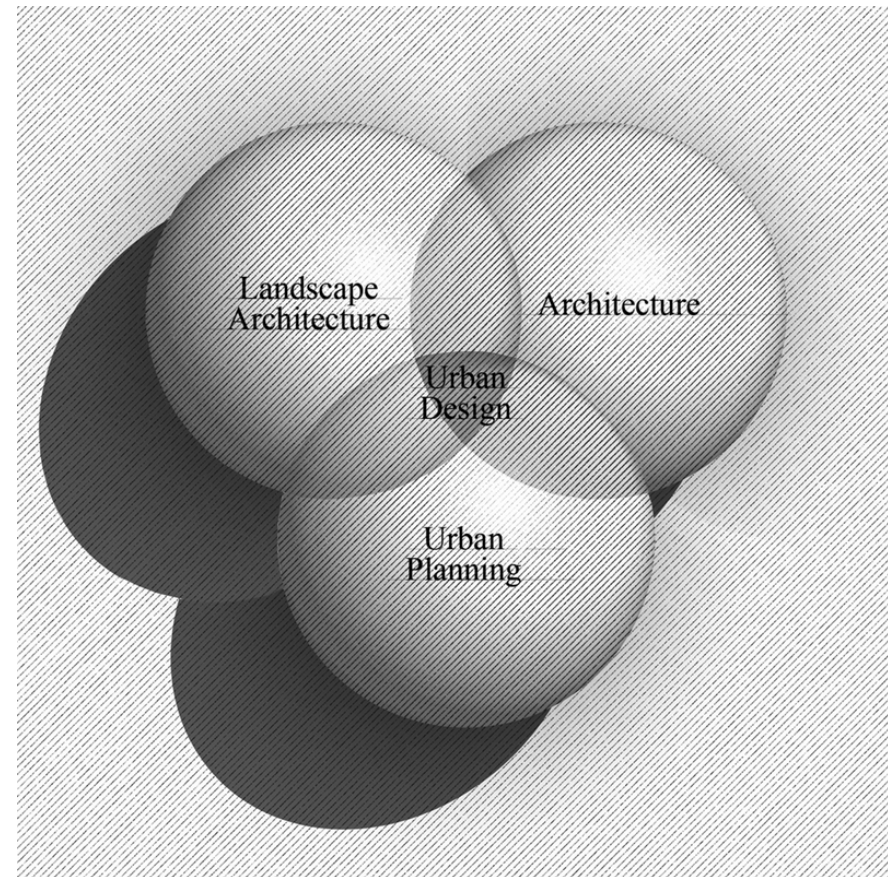
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Terminology

1. MMP: Municipal Master Plan
2. GIP: Green Infrastructure Planning
3. BUA: Biophilic Urban Acupuncture
4. WSUD: Water-Sensitive Urban Design
5. Graveyards: The term graveyard is often used interchangeably with "cemetery.". However, a graveyard primarily refers to a burial ground within a churchyard. During Middle Ages, burial began to take place in "Graveyards," which were predominantly plots of land surrounding churches. By the late 18th and 19th centuries, graveyards were replaced by cemeteries
6. A natural cemetery, eco-cemetery, green cemetery, or conservation cemetery: is a new type of cemetery. It is defined as an area set aside for natural burials (with or without coffins). (GBC, 2010) It provides the opportunity for minimal environmental impact through the contribution of the graves themselves to the environment. Coffins can be made from alternative materials such as wicker and biodegradable materials, while trees and other fauna are being used in place of headstones. Both practices provide sustainable alternatives to traditional burial practices. Natural burials have been attracting people for reasons outside of environmental and sustainability factors as well. Many scientists have argued that natural burials would be a highly efficient use of land if they are designed specifically to save endangered habitats. Natural burial became popularized in the United Kingdom in the early 1990s by Ken West, a professional cremator operator for the city of Carlisle. It was in response to the U.K's call for changes in government that were aligned with the United Nations' Environmental Program Local Agenda 21. Besides, there are multiple green burial sites in the United States. Green burials are currently developing in Canada (Victoria, BC, and Cobourg, Ontario), as well as in Australia and Ireland. (Ecosystems, and species, (Holden & McDonald-Madden, 2018))
7. Shrine in Islam: Imamzadeh in Persian: امامزاده): refers to an immediate descendant of a Shi'i Imam in the Persian language. Imamzadeh literary means "offspring," or the descendants of Imams, who are directly related to Muhammad. There are many other different ways of spelling this term in English. These Cemeteries within shrines are used as centers of Shi'i devotion and pilgrimage.
8. Burial ground: "*They usually has tended to be arbitrary: it may refer to all types of burial space, including cemeteries and churchyards; or it may refer more specifically to smaller and more informal sites.*" (Rugg,2000)

9. Landscape Design: Landscape has six main compositional elements: landform, vertical structure, horizontal structure, vegetation, water, and climate. Landscape design is the art of arranging these elements (Gardenvisit, 2020)

10. Urban design: It involves the arrangement and design of buildings, public spaces, transport systems, services, and amenities. Urban design is the process of giving form, shape, and character to a group of buildings, neighborhoods, and the city. It is a framework that orders the elements into a network of streets, squares, and blocks. Urban design blends architecture, landscape architecture, and city planning to make urban areas functional and attractive. Urban design is about making connections between people and places, movement and urban form, and nature and the built fabric. Urban design draws together the many strands of place-making, environmental stewardship, social equity, and economic viability to create places with distinct beauty and identity. (Urban design, 2020)



Appendix

I. Typology of Cemeteries in Iran

Burial places are chosen either by the deceased person (prior to their death) or their relatives. This choice is dependent on a number of physical and non-physical factors. This variety of opinions among different ethnicity, nationality, city, and village, presents different types of cemeteries. It should be noted that some characteristics, such as ethnicity and religion, limits the options for the right place for burials. Consequently, the typology of cemeteries in Tehran is as follows:

- Astudan (Dakhma - Tower of silence)
Dakhma belonged to the followers of the Zoroastrian religion and can be considered as the oldest known cemetery in Rey.
- Churches
Old Armenians buried their dead in the yards of Churches, which were considered among the holiest places. The oldest Armenian cemeteries have been transformed, but there still exist some remaining. Some examples of cemeteries around Churches in this area include St. George (Shahpur Ave. 1833-1905 AD) and Tadaus Barto Timous – Bartolimevos (Tehran Grand Bazaar 1842-1854 AD).
Over time, only a few tombstones are left through gradual changes. These tombs often belong to historic figures, priests, saints,

and other prominent people. Chapels, or small churches, were constructed in almost all Armenian neighborhoods of Tehran for long, to construct cemeteries. In these chapels, funeral ceremonies (requiescat) were held, and they are still occasionally being held in functioning cemeteries. In most churches in Tehran, at least one grave exists, which usually belongs to a holy priesthood who served in the church for many years.

- Holy Shrines
A number of holy shrines from the early years of the Islamic period are among the oldest cemeteries left. Devotees of Imams, their offspring, and their descendants have historically been buried in the vicinity of Imams and mausoleums. Depending on the architecture of the Imamzadeh and according to their social level, the deceased were buried in different places, including the arena, courtyard, porch, or basement, which were eventually formed into cemeteries. Until recently, burial ceremonies was performed in cemeteries near the holy shrines. In comparison with formal burial facilities, many cemeteries were formed in the vicinity of Imamzadeh shrines. These cemeteries were generally formed due to the shrine's breadth, urban location, the dedication of the people towards that Imam or his ancestors, and the magnificence and resplendence of the Imamzadeh.

- Tombs of Academic, Religious, and Political Celebrities

Some famous cemeteries in Tehran have gradually formed after scientific, religious, and political celebrities (often religious scholars) were buried in gardens or mortmain land. Ibn-Babawayh Cemetery (burial place of Sheikh Saduq, the Shiite scholar of the fourth century AH) and Zahir-al-Dowleh Cemetery (burial place of Mirza Alikhan Zahir-al-Dowleh, son in law to Nasser-al-Din Shah and constitutionalist and Sufi man) are among these cemeteries. In the development of these cemeteries, even though the dedication to the buried person was the main reason for the creation of the cemetery, their social status and local position increased its prosperity and development over time.

- Familial Sepulchers

Familial tombstones are mostly common in the northern part of Tehran. The owners of these gardens and estates were mostly from the distinguished individuals of the late Qajar period and dedicated part of their property to bury their deceased. As a result, small cemeteries were formed in the name of that family. Of these small family cemeteries, one can refer to the family of Hedayat in Darroush neighborhood, the mausoleum of the Mostofi al-Mamalek dynasty in Vanak County, and the maseloum of the Salur family in the current place of Shahid Beheshti University. Occasionally, cemeteries for local residents gradually emerged in the vicinity of the family sanctuaries. Deh-e-Vanak Cemetery has a similar background.

- Individual Tombs

The number of individual tombs for prominent researchers and collectors in Tehran may be beyond imagination. Many of such deceased were buried in gardens and private properties adjacent to libraries, mosques, schools, and universities. This symbolic behavior was prevalent in Tehran and other cities (like the Tomb of late Dr. Hesabi in his hometown of Tafresh, which still exists) until the early Pahlavi era, and endowed publicity to a place which was the private property of the deceased and his family.

These individual tombs have rarely been called cemeteries. Throughout history, most of the scientific and literary celebrities have been buried in these tombs.

- Local Cemeteries

There are rarely cemeteries in the urban fabric dedicated to martyrs and deceased of historical events or natural disasters. Among well-known cemeteries of this kind in Tehran, the grave of Malik Al-Motekallemin and Mirza Jahangir Khan Sooresrafil (late Qajar constitutionalists) can be named, who were assassinated in the garden of Shah, and are buried outside of this place. At present, there is evidence of their graves near Makhsoos Street, past the Qazvin Street. Other examples include the burial site of Mirza Reza Kermani, who was executed outside the Naseri enclosure.

- Arid Lands

In the past, the most common way of locating burials was to choose a “vacant and sandy land” around the city and construct a gate and fence around it. The same procedure is still being inevitably used. The old cemeteries of Hassan Abad Square (Old Cemetery in Qajar era), adjacent to the Sare-Qabr-Agha, was considered as an outlying enclosure before the expansion of Tehran towards the second fence. This expansion placed the cemetery inside the “Arazi-e-Vazir” (lands of the minister), near the second graveyard, by the customs gate. Gradually, many other cemeteries were replaced by peripheral structures. Shortly after, their nature was changed, while they are all considered among these types of cemeteries. Few of these cemeteries have long been outdoor promenades, due to their local location and suitable urban space. Hassan Abad or the Old Cemetery has previously had such a reputation.

The oldest cemetery of the city



Zoroastrian religion- Astudan or Tower of silence



Saint Thaddeus Church Cemetery



Islamic Republic of Iran era



Qajar era



1849-1856

Pre-Islamic era

1842-1854

Islamic era

1553-1848

Zeid shrine -Holy Shrines



Qajar era

Shrine of Syed Nasiruddin - Holy Shrines



Second Pahlavi era

Emamzadeh Yahya Shrine- Holy Shrines



Second Pahlavi era

Seyed Esmail shrine-Holy Shrines



Qajar era

Seyed Vali shrine- Holy Shrines



Islamic Republic of Iran era



Islamic Republic of Iran era



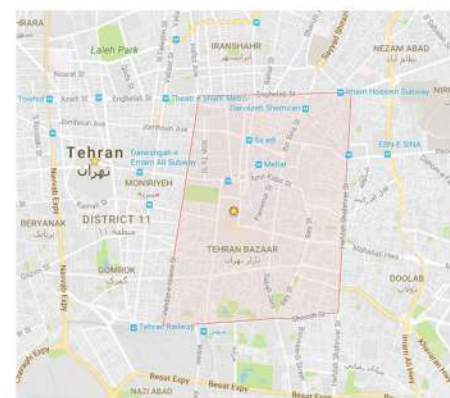
Islamic Republic of Iran era



Islamic Republic of Iran era



Islamic Republic of Iran era



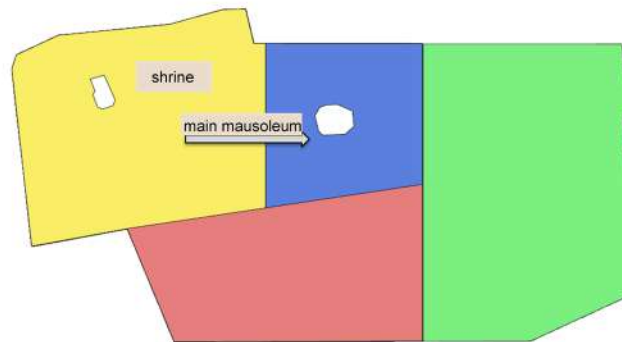
Located in 12 district of Tehran



Qabr aqa (Old cemetery)



Islamic Republic of Iran era



First core

Second core

Third core

Forth core

1890-until the present

1833-1905

1857-1925

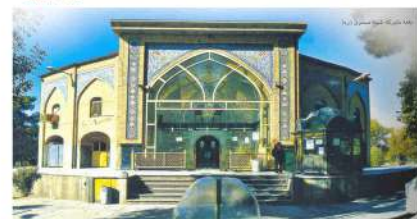
Holy Georg Church Cemetery



Ibn Babawayh Cemetery



Qajar era



Pahlavi era



MEHR



MEHR

Islamic Republic of Iran era



Takhti's Tomb

Islamic Republic of Iran



Abdullah shrine
Holy Shrines

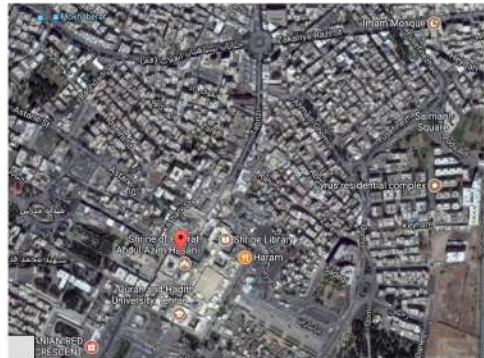
1890-until the present

Islamic Republic of Iran



Zoroastrian Cemetery
Arid land

Shah-Abdol-Azim shrine
Holy Shrines



Islamic Republic of Iran



Qajar era



Zahir-od-dowleh cemetery
Tombs of academic, religious, and political celebrities
1927

Old Mesgar Abad Cemetery
Today Khavaran Cultural center
and Fadalian Islam Park - Arid land
1937-1969



First Pahlavi era
Khavaran cultural center replaced Mesgar Abad cemetery-1993 -till now
Republic Islamic of Iran era

1937-until the present

Jew cemetery- Arid land



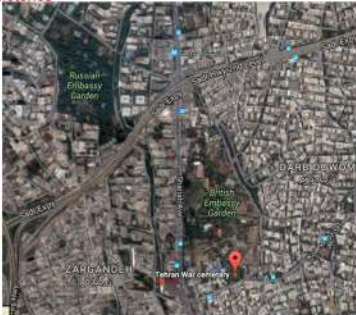
Catholic Armenian Cemetery - Arid land
(Doulab cemetery-Polish cemetery-Armenian cemetery)



1937-until the present

1979-until the present

England embassy-Tehran War cemetery
Local cemeteries



Yaftebad martyrs Cemetery-Local cemeteries



II. Conservation Policies and Practices for Urban Cemeteries in Tehran's New Comprehensive Plan

There exist various cemeteries in most cities of Iran with different management styles, which complicates the monitoring process. At the moment, cemeteries are managed in three ways: 1) some are managed by the endowment directorate, 2) in large cities, cemeteries function under the supervision of municipal agencies, and 3) in smaller cities and districts, cemeteries are under the direct supervision of municipalities. One complication in the cemetery management in cities is unauthorized burials in local and abandoned cemeteries in the residential fabric. Thus, the major problem in this management system is the presence of such abandoned urban cemeteries and the acquisition of their lands.

Tehran municipality, according to the provisions of the clause 13 of article 55 of the municipality's law, is mandated to perform the following proceedings to organize the cemeteries of Tehran province and preserve the historical and cultural identity of cemeteries:

The usage of cemeteries should be considered in accordance with the strategic principles in the Comprehensive Plan of Tehran. Burials should be carried out by the municipality (Behesht Zahra Organization), with regards to the environmental, social, and cultural factors of the cemetery, and in accordance with the general conditions. In another part of this article, it is stressed that any action regarding the cultural, religious, servicing, and tourism applications of the cemetery, is subject to the agreement between Tehran's municipality and Mortmain and Endowments Department, and should be coordinated according to the comprehensive and detailed plans. In the case of undocumented cemeteries, the Tehran municipality is responsible for the final verdict.

Moreover, cooperation and partnership in preserving historical spaces and places in abandoned and active cemeteries of Tehran, along with the installation of memorial monuments to introduce the outstanding cultural, social, and religious celebrities buried in the cemeteries should be performed in accordance with Cultural Heritage, Handicrafts and Tourism Organization of Iran and other related organizations. According to this plan, the Municipality of Tehran is obligated to provide a report of its studies regarding the general situation of the abandoned and active cemeteries in the territory of Tehran to the city council, at most one year after the announcement of this resolution.

Therefore, all cultural and environmental conditions must be respected in all cemeteries. In case of the existence of any environmental problems, burials should be forbidden. Moreover, in case of burial prohibitions due to non-compliance of environmental conditions, Tehran Municipality is obligated to compensate for any possible delayed charges to the citizens.

Resuscitation of old and scattered cemeteries around the city, due to the increase in urban lands and population, is one of the problems that has gained much attention in the past decades.

Generally, cemeteries and historic graveyards provided service to users regardless of their valuable potential. Nowadays, with the awareness and coordination between the respective bodies (mainly the municipality and cultural heritage organization), the need for more attention in designing of cemeteries and refurbishment of historical cemeteries is much more evident. (Omrani, 2013, translated from Persian)

The review of the published proposals reflect the impressive attention of the Tehran comprehensive Plan towards the following two main issues:

- Development and organization of the designing of cemeteries in Tehran
- Restoration and organization of local cemeteries
- The most significant proposed standards of Tehran's comprehensive plan for cemeteries include:
 - Preservation of the historical, cultural, and contemporary monuments of Tehran. In specific, protection of all registered buildings and all buildings that will be registered in the future, and observance of any mandatory privacy of the registered complexes. Any interference in the field of these complexes and buildings is prohibited.
 - Protection of all elements and components of the natural, historical, and cultural heritage of Tehran, including ancient sites, urban fabrics, historical complexes and cemeteries, natural-historic corridors, old gardens, Qanats, and fountains.
 - Identified historical sites are mandated to be made available for excavation and conservation.
 - Any construction in the vicinity or proximity of registered buildings is strictly authorized with the permission and observance of the rules and regulations of the Cultural Heritage, Handcraft, and Tourism Organization. (Omrani, 2013, translated from Persian)

Terms and Conditions for Burial of the Decedents:

Article 21- Burial of the decedents in places other than official cemeteries is forbidden.

Article 22- The dimensions of the grave should be at least 2 meters by 80 centimeters. The width and length of the graves should be less than these scales for children, according to their age.

Article 23- Each grave should have a 30 centimeters distance from its neighboring graves.

Article 24- Each decedent requires a separate grave, and burial of two or more decedents in one grave is forbidden.

Article 25- The cemetery should satisfy the following conditions:

- A. It should be surrounded by walls or iron fence, and have streets, trees and flowers in accordance with the municipality approved maps.
- B. The construction of private graves in the cemetery should be in accordance with the maps approved by the Department of Health. (Omrani, 2013, translated from Persian)

Location, Position and Area of new Cemeteries:

Article 1- The distance between the cemetery and the city services should be between 10 to 13 kilometers.

Remark: For villages, the cemeteries should be placed outside the village, with a distance of at least 1000 meters.

Article 9- The area of the cemetery should be determined by considering a 2-square meter area for each dead body, and taking into account that the cemetery should suffice for the burial of the dead for at least 30 years.

Remark 1: The area necessary for construction of spaces and infrastructures, including the streets, landscaping, green spaces, office buildings, mortuary, tombstone workshops, and parking should be added to the total area.

Remark 2: The number of dead bodies should be calculated according to the population growth rate provided using statistical methods.

Article 10- The cemetery should have maps approved by the municipality in urban areas, and by the county, in the villages.

Article 11- The cemetery should be enclosed (it is better to be enclosed by walls, as long as possible).

Article 12- The cemetery should have streets, landscapes, green spaces, trees, and flowers.

Article 13- The cemetery should have appropriate mortuary, refrigerating room, a room for saying prayers, and W.C.

Article 15- It is recommended for the cemetery to have a separate system for the water supply of the green spaces. (Omrani, 2013, translated from Persian)

III. Different historical public spaces in Rey city

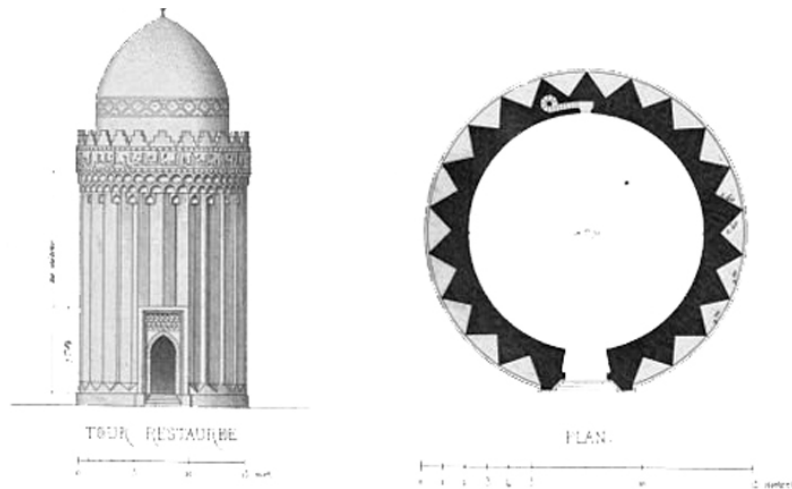
1. Abdol Azim Shrine Complex: Shah Abdol Azim was a fifth-generation descendant of Hasan (the son of Imam Ali in Shia Islam). After Shah Abdol Azim was dead in the 9th century AH, his body was entombed here. Adjacent to the shrine and within the complex, there exists the mausoleum of Imamzadeh Tahir (son of the fourth Shia Imam Sajjad) and Imamzadeh Hamzeh (brother of the eighth Imām - Imām Reza). The overall construction consists of a portal with a lofty Iwan decorated with mirrors, several courtyards, a golden cupola, two tile minarets, a portico, a sepulcher, and a mosque. The Toti garden is a cemetery on the western side of Shah Abdol Azim shrine. This cemetery has access to the shrine from one side and the Bazar of Rey from the other side. Many celebrities are buried in this cemetery.



2. Old Bazar and Caravanserai: According to (Falamaki, 2018), the functioning of economic, social, religious, and cultural centers within a Bazar was a phenomenon common to Iranian cities. The administrative affairs of the city were conducted in specific spaces provided in the Bazar. The Bazar was the heart of traditional Iranian cities and served as their major thoroughfare. They functioned as fully integrated bodies by containing the major public buildings and were centers for commerce and social, cultural, religious, and political activities. Rey Bazar is located north of Shah-Abdol-Azim's shrine and is comprised of two sections, with a crossroad at their intersection. It has long been a center for the sale of spices, traditional herbs, and commercial goods imported by traders via the Silk Road. The bazaar is constructed from plaster, brick, raw mud brick, and mud. It dates back to the Safavid era and is approximately 500 years old. It starts from the Twin Caravanserai and ends at the bathhouse of Hazrati Mall. The initial Bazar was developed during Agha Mohammad Khan's monarchy. Now, it contains approximately 100 chambers. It is evident that the large city of Rey had other Bazars whose names have not mentioned. The Bazars of Rey were located in front of the gates of the city. Moreover, Caravanserai was one of the ancient residential and commercial complexes used as a lodging space by traders in Iranian cities. In Rey, they were located on the Abdul Azim shrine street, close to the Bazar. They comprise four verandas and are surrounded by stones, which used to serve as a market place where goods and commercial products were presented by traders.



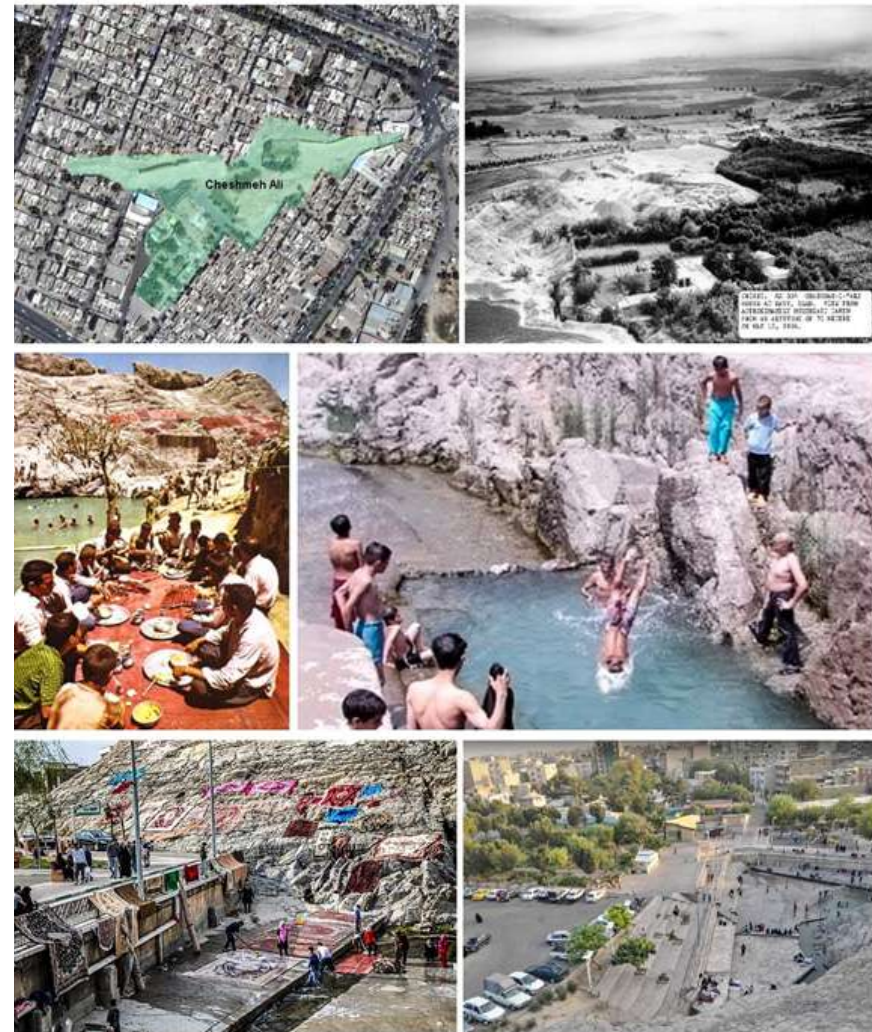
3. Tughrul Tower: It was constructed during the Seljuq dynasty in 1140 AD, by order of Tughrul Beg. It is close to Cheshmeh Ali and is located by the Ibn Babawayh cemetery. It is a remaining from the Islamic age in Rey, and a multi-sided building surrounded by houses and gardens of the modern Rey. The tower is 20 meters high. The exterior is divided into 24 sections, which symbolizes the constellation and the 24-hour length of time, while manifesting beauty and durability. Its architectural shape represents the era it was built. Moreover, it is said that this building is the tomb of Tughrul I, the founder of the Seljuq Empire.



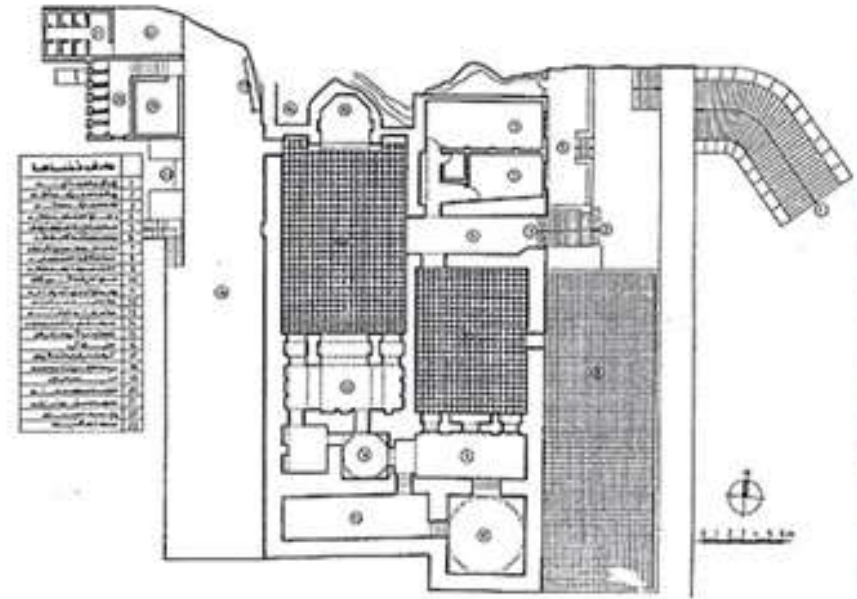
4. Rashkan Castle and Hill: Although this site is on the list of National Heritage of Iran, as the center of the Buyid governance, some indications of Sassanid and Islamic eras have been discovered in its architectures as well. A fortress near the Seljuq citadel was used as the center of the Buyid governance. Unfortunately, two-thirds of the citadel has been demolished following the construction of the cement factory and the unit seven of Tehran cement factory. Instead of the Stony Mount, now a huge hole is visible. Rashkan Castle was constructed at the side of a mountain range and was stretched in parallel with Bibi Shahrbanu Mountain. However, the cement machinery excavated the materials from the Stony Mount. What is remaining now is the fortress beside the citadel. Today, the Rashkan fortress maintains some of its constructions, dating back to the 1st millennium BC, historical millennium, and early Islamic era. A set of steps lead to the top of the hill, which was historically used as a watchtower. By order of Fath Ali Shah Qajar, a slide was erected on the Rashkan hill as a recreation tool for the monarchic family.



5. Cheshmeh Ali, Tabrak Castle, and Old Rey's Wall: From 1933 to 1936, Cheshmeh Ali hill was excavated by archaeologists from the Boston Fine Arts Museum and the University Museum at the University of Pennsylvania. This excavation was led by Erich Schmidt and resulted in the discovery of 7,000-year-old artifacts. Due to its beautiful attractions, Rey was used as a recreation center during the Qajar dynasty. Cheshmeh Ali area (ancient Iranians called it "Surena" because it was near to the Anahita temple) is a natural urban fabric. Its ramparts were approximately 5 meters in the past. Today the spring has become a recreational place, including parks and green spaces, and it is adjacent to some ancient buildings. The old wall of Rey is constructed above the spring. Before 1319 AH (1940 AD), when the first swimming pool was inaugurated in Tehran, people used Cheshmeh Ali as a swimming pool. Moreover, in the Chalcolithic era, it was used as a burial place. (Matney, 1995) The most important activities in the Old Rey during the Islamic era are a set of adobes and stone walls used as the rampart and citadel of the city during the Abbasid era. Inside the Tabrak Castle, there is a building built high up in a mountain called Tabrak. The castle was one of the greatest constructions in Rey, which slowly became ruined after the sixth century AH.



6. Bibi Shahrbanu mausoleum: There is also a shrine to commemorate Princess Shahrbanu, eldest daughter of the last ruler of the Sassanid Empire. The nearby mountain is also named after her. The site is connected to the mountain from the north. In the past, only a stone and gypsum wall fortified this mausoleum from the east and west. An entrance was constructed in the middle of the western side, which was later blocked. Now, only a small part of the stone view above the entrance can be seen from outside the site. To the south, there is a historical building, which dates back to Rey's prosperity era. The most important building in the area is located in the southeastern corner. What is remaining from this building is just its old stone dome. When we look at Bibi Shahrbanu mausoleum from the outside, in addition to this stone dome and Kashani (the tile works) from the Qajar era over the shrine, another old stone dome attracts our attention. Bibi Shahrbanu Shrine is in the middle of the building and is connected to a narrow and long room preserved carefully. Over the shrine, a dome dating back to the early Qajar era is seen. The room in the west of the shrine is the mosque, while lighting provided by the ceiling. The old building of Bibi Sharbanu mausoleum includes a large yard and four rooms in the south. The room in the southeast, its adjacent room, and the present shrine, each had a dedicated entrance to the yard. Today, a part of the yard is used as the portico for women.



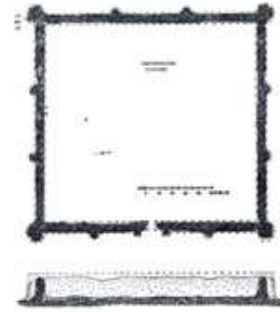
7. Naghareh Khaneh Tower: Anyanaj Tower, an octagonal tower known as Naghareh Khaneh, stands on the slopes of Tabrak Mountain. A cellar is linked to the tower through a vestibule from underneath erected outside. The tower, which is constructed on the ruined site of early Zoroastrian tower of silence, and built by stone and plaster and decorated by brickwork and zigzag vaults, dates back to the Saljuk era.



8. Zubaida Bibi Mausoleum: It is a mausoleum located on a north part of Rey, west of Ibn Babawayh cemetery. The mausoleum dates back to the fifth century AH, but new buildings are constructed recently.



9. Gabri Wall: It is located southeast of Rey. The castle was constructed during the Sassanid era and dates back to 1700 years ago. It covers an area of approximately 3000 square meters. Due to erosion, its tower and walls are destroyed. What is remaining is merely some high and long walls made of adobe and stone. Prior to the Islamic Revolution, the castle was used as a gunpowder factory. After the death of its owner, it was allocated to the shrine of Hazrat Abdol Azim. Nevertheless, since its internal space is not significant, its walls are high, and it is located on a hill, it is now used as a storehouse.



10. Harun Prison: The historical building of Harun Prison is 12 kilometers away from Tehran-Khorasan Road, by the Mesgarabad mountainside. It contains a cuboid-shaped building. The prison is made of irregular dark stones and gypsum mortar and has brick vaults with a height of nine meters. The interior and exterior of the building are connected by a hole in the wall on the southern side. It has two floors, each with four planes. It is said that this unusual building dates back to the Buyid era in the fourth century AH.



Let's not stand in dread of death.

Death is not the end of a pigeon.

Death is not the inversion of a cricket.

Death flows in the minds of acacias.

Death dwells in the Pleasant Climate of Mind.

Death speaks of dawn in the Nature of Village Night.

Death goes into the mouth with a bunch of grapes.

Death sings in the larynx of the robbin.

Death is responsible for the beauty of butterfly's wings.

"Sohrab Sepehri"

تترسیم از مرگ.

مرگ پایان کبوتر نیست.

مرگ وارانه‌ی یک زنجره نیست.

مرگ در ذهن افاقی جاریست.

مرگ در آب و هوای خوش اندیشه نشیمن دارد.

مرگ در ذات شب دهکده از صبح سخن میگوید.

مرگ باخوشه‌ی انگور می‌آید به دهان.

مرگ در جگره سرخ - گلو میخواند.

مرگ مسؤل قشکی پرشاگرد است.

"سهراب سپهری"

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