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# **A practical solutions framework in the brownfields regeneration process**

**Case study:**  
**Division 77<sup>th</sup> Barracks of Mashhad, Iran**

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# **Part I**

## **Chapter 1 Research background**

## **Introduction**

The land is the arena of all human activities, including the provision of housing, services, and urban facilities. In this regard, brownfields are one of the potential uses used to provide the required spaces at the neighborhood, district, and regional scale, which is often neglected in less developed countries (Liu et al., 2017). In fact, the issue of brownfields is one of the most controversial phenomena that cities face today. In addition to social, economic, and environmental problems, these areas cause a qualitative decline and a threat to urban life and vitality. On the other hand, these areas are also considered opportunities for redevelopment and areas of urban transformation (Sołtysik and Mazur-Belzyt, 2020).

Before delving into this issue, it should be recognized what a brownfield is and how these areas are formed. With the horizontal growth of cities, new infrastructure and bodies are formed in the untouched lands and outer circles of the city (Moore, 2017). While formerly developed lands are often abandoned and unused, do not have the necessary and optimal performance, and are sometimes associated with pollution, In addition to wasting available resources, this causes many environmental, social, economic, and, over time, irreparable losses (Wu et al., 2018). Their redevelopment, in addition to improving the spatial and physical qualities of cities, is a key element in moving towards sustainable communities. Rehabilitation of brownfields and the importance of their redevelopment are due to the fact that the abandonment of these lands will greatly damage the local communities because these lands are highly polluted due to their self-pollution characteristics and environmental damage. They threaten the place. On the other hand, they reduce the value of property located in nearby neighborhoods due to the mentioned threats, control and redevelopment of these lands, reduce pollution, problems, and environmental threats to a great extent, improve social indicators, and it becomes economical (Schilling, 2022).

It can be concluded that the land is the final base and arena of all human activities, and the fair distribution and optimal use of land are considered the primary indicators and tests of the accuracy of the claims of social justice claimants. Today, due to the role of land in providing public welfare and comfort and considering it as a public wealth on the one hand, and also due to the increasing population and its unlimited needs on the other hand, it is necessary to make optimal use of these

limited resources in the public interest. Optimal and sustainable protection should be considered (Strom, 2018).

Reviewing recent studies and practical efforts to use brownfield redevelopment projects reveals that most of these projects are not successful. Studies show that the lack of an integrated approach in the process of redevelopment, defects in the collection of basic information, evaluation, and incorrect inspection of the site are effective components in the failure of Brownfields redevelopment projects (Zhu, 2015).

## **Problem Statement**

Brownfields, which refer to abandoned or underutilized industrial sites, pose significant challenges to urban environments worldwide. These sites suffer from environmental contamination, decaying infrastructure, and neglect, limiting their potential for redevelopment. Despite existing theoretical frameworks and individual case studies, there is a lack of a comprehensive and practical solution framework that can effectively guide the regeneration of brownfields on a larger scale. This absence of a holistic approach hinders global progress in brownfield revitalization efforts.

The Division 77th Barracks in Mashhad, Iran, serves as a specific case study highlighting the need for a tailored solution framework for brownfield regeneration. This site presents unique challenges related to contamination, inadequate infrastructure, and disengaged stakeholders, further complicating the revitalization efforts. The absence of a comprehensive toolkit designed specifically for this context impedes progress and perpetuates the site's underutilization.

The problem at hand is the lack of a unified and practical toolkit that integrates essential elements such as planning, policy, environmental remediation, financing, community engagement, and stakeholder coordination necessary for successful brownfield regeneration. Existing guidelines and methodologies often lack adaptability to diverse brownfield contexts and fail to address the complex challenges faced by decision-makers, urban planners, and stakeholders involved in the revitalization process. As a result, inefficiencies, delays, and suboptimal outcomes arise, hindering the transformation of brownfields into vibrant, sustainable, and inclusive spaces.

To address these challenges and contribute to global brownfield regeneration, there is an urgent need to develop a practical solution framework tailored to the unique complexities of brownfield revitalization. By using the Division 77th Barracks in Mashhad, Iran, as a case study, this research aims to identify and analyze the site-specific challenges and requirements while considering broader implications for brownfield regeneration. The proposed framework will integrate insights from the Division 77th Barracks case study with existing literature, best practices, and case studies from diverse brownfield contexts worldwide. Through extensive stakeholder consultation, data collection, and analysis, this study seeks to develop an integrated toolkit that addresses the distinctive complexities of brownfield revitalization while providing guidance for similar projects globally.

Therefore, the objective of this PhD proposal is to create a comprehensive and practical solution framework for brownfield regeneration processes, with a specific emphasis on the Division 77th Barracks in Mashhad, Iran. The research will analyze the site-specific challenges, identify successful strategies, and incorporate relevant international best practices to develop a toolkit that caters to the unique complexities of brownfield revitalization. By bridging the gap between theory and practice, the framework will provide decision-makers, urban planners, and practitioners with a robust and adaptable resource to guide the regeneration process not only for the Division 77th Barracks but also for brownfields globally. This research aims to promote sustainable urban development, environmental remediation, and improved quality of life for affected communities by addressing the specific challenges faced in brownfield regeneration processes.

## Research Questions

	Questions
1	What is the framework for the applicable solutions already suggested for brownfield redevelopment?
2	What indicators are effectively involved in brownfield redevelopment?
3	Which of the currently available solutions for brownfield redevelopment is applicable to Barracks?

Table 1: Research Questions

## **Research Methodology and Structure**

In fact, this is a research that is conducted with an application of a particular research methodology and can be implemented in a specific structure.

Alternatively, the information desired in a study of this kind is usually obtained by either of the following alternatives.

- Library resources and documents.

Some of the other methods of data collection to be adopted are as follows, considering that the data collection method adopted is one of the most important stages and determining the effectiveness of the received data.

- Actual, current, and recent articles
- Urban development plans
- Domestically and internationally information networks and databases
- Official information of relevant departments and organizations and statistics
- Field observations through interviewing officials, professors

Considering that the data collection method for this study is interview, it utilizes MAXQDA software for a more detailed analysis of qualitative data, which is widely used in environmental and social sciences for statistical analysis.

# **Chapter 2 Theoretical Framework**

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## **Introduction**

The growth of urban physical spaces and the destruction of identity-building spaces have reduced the sense of belonging between citizens and their living environments. Changes in the traditional way of life, the emergence and acceptance of new jobs, and the horizontal expansion of cities have led to spaces that in the past had function and activity becoming abandoned and unused.

The importance of redeveloping these lands lies in the fact that their abandonment has caused great damage to local communities. Through the control and redevelopment of these lands, pollution, problems, and environmental threats will be greatly reduced (De Sousa and Ridsdale, 2021). The term brownfields is used to define spaces that previously had industrial or service use, and as a result of the transition to a new situation, are deprived of manpower and use, and as a ruined space has negative social and environmental effects.

The redevelopment of brownfields will attract and create new jobs in the neighborhood, increase quality and attractiveness, and consequently promote social and economic indicators along with environmental indicators.

The main question is whether these spaces can be used to provide the services needed by underprivileged members of the local community. Is it possible to organize brownfields based on the views of different stakeholders?

Sustainability and sustainable urban development are not limited to the restoration or design of the body but also the effort to produce social spaces, increasing the role-playing functions of the city (De Sousa, 2021).

Action to organize brownfields is important from two perspectives. On the one hand, it is an action in order for citizens to have a healthy life, and on the other hand, changing the use based on the needs of the local community and their participation is a good step to achieve social justice in cities.

Sustainable urban economy, urban solidarity and cohesion, sustainable shelter, sustainable urban ecosystem, and good urban governance are the factors influencing urban sustainability and sustainable urban development (Hammond et al., 2021). It must be acknowledged that sustainable development requires the establishment of social justice in cities. Categories such as eliminating social and economic inequalities, optimal distribution of services and facilities, and paying



attention to the basic needs of citizens increase the importance of the urban management approach to sustainable development. According to the sustainable development approach, neighborhoods are viewed as assets that must meet the current and future needs of their residents. They can be a platform for sustainable development (Ahmad et al., 2018). Redesign of brownfields causes vitality in neighborhoods, mobilization of the local economy, acceleration of development in areas adjacent to target lands, creation and promotion of job opportunities, reduction of environmental risks, increase of safety and health in public spaces, and reduction of social problems and crimes. A very important issue is how to intervene in them. How to deal with any brownfields should be based on their potential to increase the feasibility of the proposed project. In order to achieve this importance, after identifying these lands in urban areas, their type and intervention in this type of land must be determined, which includes destruction, maintenance, preservation of originality, renovations, re-creation, and reorganization.

Low levels of awareness of local policies, property problems, and lack of attention to urban development strategies for these lands are among the many executive problems in the direction of intervention in brownfields.

The physical landscape of semi-active and inactive tissues and lands is based on the perspective of revitalizing urban space. Given that development is a human activity and it makes sense when the center is human, the attention of urban management and planners is towards the pattern of participatory intervention, which is defined in the form of a bottom-up movement. The World Bank and the United Nations have projected that by 2030, over 8% of the world's population will reside in cities. Since there is a growing demand for urban land and land is a finite resource with low output, land values have been rising gradually over the past 40 years in most countries. Also, one of the effects of the rapid development of urbanization in the Third World is the emergence of the phenomenon of urban land scarcity and land struggle, which has been studied in studies related to the Third World.

As a result, it is not surprising that the system of efficient urban land management and planning for it has found an important place among the scientific and practical communities. In this case, the development of applications and their optimal use can help to improve the lives of individuals, and in this regard, municipalities, as the main institution of urban management, can act by attracting foreign

investment. Which can have positive economic, social, and spatial effects for cities. During the 1970s and 1980s, most cities in North America and Europe began to reduce their industrial output. Many industrial products were transferred to countries with cheap labor and easy environmental regulations.

This process led to the emptiness of urban centers, the expansion of suburbanization, and the creation of an idea called the American Dream. This post-industrial age process has caused the problem of urban brownfields not only in the United States but around the world. A similar deindustrialization process is also observed in European urban centers.

As a result, urban brownfields, which have a good opportunity to change land use and development in their service areas due to their location in urban centers, have become a critical stage in the urban planning process among policymakers, developers, and other stakeholders.

Because they have economic growth and many attractions, as an example, Rako, Katney, and Lerner exemplify many active military installations within the city in areas that experience growth of 5 to 10 times the overall growth.

In addition, there are many reasons to justify the reasons for the redevelopment of urban brownfields, among which the following can be mentioned:

- Making more use of existing infrastructures such as communication roads, sewerage networks, water, and electricity lines, etc., and as a result, such infrastructures become more efficient.
- Reconstruction of urban centers.
- Increase human health and reduce environmental threats.
- Development of deprived and abandoned neighborhoods.
- Increase in taxes and economic benefits due to redevelopment.
- Reducing the horizontal development of the city.
- Reduce transportation and consequently reduce energy consumption.
- Expand development to areas adjacent to reconstructed lands.
- Prevention of future pollution.
- Creating new jobs and, finally, improving the urban landscape in the surrounding areas.

## **From industrialization to deindustrialization**

The process by which an agrarian and handicraft economy is replaced by an economy in which production is carried out using machinery is called industrialization. Industrialization brought changes not only in the economic level but also in the social structure, politics, and culture. Almost all classical social theorists considered industrialization a historically disruptive force in British and European society, as well as worldwide, as European countries exported industrial methods (Pula, 2017). Over the past decades, many developing countries have first experienced the process of industrialization, which refers to the transformation from the dominance of the agricultural sector to the industrial sector, and then the process of deindustrialization, which refers to the structural change from the industrial to the service sector (Destek, 2021). Industrialization has long been considered the engine of economic growth. In fact, major structural transformations toward industrialization occurred in the economies of the nations that had tremendous economic growth in the second half of the 20th century.

On the other hand, in the 21st century, due to the phenomenon called “early deindustrialization” that occurred in those countries, latecomers may have difficulty understanding the industrialization required for economic growth (Sato and Kuwamori, 2019). Experiences of industrialization differ considerably in different countries. First, benchmark models of structural change robustly generate hump-shaped patterns for the evolution of the industrial sector. Second, heterogeneous patterns of catch-up in sectoral productivity across countries can generate variation in industrialization experiences similar to those found in the data, including premature deindustrialization. Third, differences in the rate of agricultural productivity growth across economies can account for the majority of the variation in peak industrial employment shares (Huneus and Rogerson, 2020).

Environmental pollution is the biggest problem of industrialization in this modern era (Ullah et al., 2020). Results show that the urbanization process and the progress of the industrial structure are consistent with the goals of energy and carbon intensity (Lin and Zhu, 2017). In the context of political implications, the reindustrialization process of the status quo should be supported by more environmentally friendly technologies, the use of renewable energy in industrial

production should be encouraged, and measures should be taken to ensure the efficient use of energy because the pollution-reducing effect of innovations should be carried out (Erdoğan et al., 2020). The experience of peak carbon emissions in developed economies can be a significant reference for other economies (Dong et al., 2019). In the 1970s, the rich Western economies suffered their first serious economic problems after sustained growth in the post-World War II build-up phase. Moreover, unemployment became a real threat for the first time since the global economic crisis of the late 1920s. The term “deindustrialization” was widely used in England, which suffered from low growth rates and little productivity growth. It was also in use in the United States of America in the early 1980s, when stagflation and a weak industrial base characterized the country's tense economic situation (Klenner and Watanabe, 2009). Deindustrialization refers to the process by which industry plays an increasing role in the economy due to the growth of the service sector or the disappearance of industries from national economies due to foreign competition or downsizing due to volume reduction (Pula, 2017). Therefore, deindustrialization progress is intertwined with increasing unemployment and serious socio-economic problems related to it (Kollmeyer, 2009). Those who initially embraced the idea sought to explain why many factories and plants in North America and Western Europe were closed. Since then, an interdisciplinary field of deindustrialization studies has emerged, expanding its scope beyond factory closings and the number of jobs lost to its broader cultural meaning, memory, and political significance (High, 2020). "Deindustrialization" refers to a structural shift component that is associated with a decline in the country's secondary economy. While economists frequently consider decreases in sectoral output to be equally or even more significant than those in output, sociologists typically define output declines in terms of their relative magnitude. Numerous additional contemporary descriptions exist. An industrialization and deindustrialization model based on the compound annual growth rates (CAGRs) of macroeconomic indicators was created and employed with rigid definitions (Przywara, 2017).

Deindustrialization plays a pivotal role in the resurging apprehension over the social and spatial disparities and political-economic unrest that are discernible in regions commonly referred to as "behind" in the global North following the global financial crisis of 2008. Nevertheless, managing the effects of deindustrialization

has become a worldwide issue that affects the global South. International initiatives to expand and deepen understanding, explanation, and policy formulation for deindustrialization are hampered by the conceptual, theoretical, and geographical fragmentation and compartmentalization of urban and regional studies (Pike, 2022).

Deindustrialization is the term used to describe the long-term drop in the percentage of manufacturing jobs in all industrialized economies. This study makes the case that, in contrast to popular belief, deindustrialization is a positive phenomena that results from industrial dynamism in an advanced economy, and that trade between the North and the South has very little bearing on deindustrialization. The structure of labor market arrangements in advanced economies and the effects of deindustrialization on development expectations are also covered in the article (Rowthorn and Ramaswamy, 1997).

Theoretically, economists disagree about deindustrialization as a phenomenon that threatens the economy. On the one hand, deindustrialization can be a sign that an economy is deeply developed and characterized by high productivity among workers in the production sector (Islami and Hastiadi, 2020). Roderick claims that the deindustrialization process has started earlier than it should for many developing countries, and this rapid transformation is called premature deindustrialization. Therefore, it is also possible that countries that reduce industrialization before reaching the technological maturity level originated by the industry sector will enter the re-industrialization process for their development goals (Rodrik, 2016). On the other hand, other economists argue that deindustrialization may lower one's potential for economic growth, particularly in developing countries. It may slow down the convergence process of their income level with developed countries. The formal manufacturing sector tends to have the most dynamic technology level compared with other sectors, causing it to be a source of unconditional convergence in an economy (Rodrik, 2013).

# **The post-industrial era in developing countries**

## **Post—industrial cities**

Post-industrial cities are cities that have undergone a significant transformation from an industrial economy to a service-based economy. These cities have experienced a decline in traditional manufacturing industries and have shifted to service-based industries such as technology, finance, and healthcare. The shift has resulted in changes to the city's physical, economic, and social landscapes.

One of the most well-known examples of a post-industrial city is Pittsburgh, Pennsylvania. Once known for its steel industry, Pittsburgh has transformed into a hub for education, healthcare, and technology. The development of research universities and tech companies in the city, as well as investments in healthcare and green infrastructure, have all contributed to this transformation (Horne, 2017).

Post-industrial cities face unique challenges as they transition to a service-based economy. One of the primary challenges is the loss of jobs and economic activity associated with traditional manufacturing industries. This loss can result in increased poverty and social inequality, which can further exacerbate economic decline. Additionally, the shift towards a service-based economy can lead to increased income inequality, as jobs in the service sector tend to be higher-paying while jobs in manufacturing tend to be lower-paying (Ehrenhalt, 2012).

To address these challenges, post-industrial cities need to focus on strategies that promote economic diversification and social inclusion. This can include investments in education and workforce development, as well as infrastructure projects that support new industries. Additionally, efforts to promote social equity, such as affordable housing and access to healthcare, can help mitigate the negative effects of economic decline (Florida, 2017).

## **Designing Post—Industrial Sites**

Urbanization and deindustrialization processes have a major impact on how contemporary urban landscapes are shaped (Chrysochoou et al., 2012). The main stages in the historical development of the urban design of the industrial and postindustrial periods—active development of the urban design as an independent type of construction and artistic activity—took place in the industrial period (1900–

2000) under the influence of socio-economic, sociopolitical, historical-cultural, and artistic-aesthetic factors (Mikhailov et al., 2020). It can be hard to figure out how to design restorative and regenerative processes in post-industrial areas because social, ecological, and technical factors all affect people's daily lives (Nogueira and Wallig, 2022).

Post-industrial landscapes are environmentally damaged resources that need to be put back to profitable uses and reintegrated into the surrounding community. They are typically found in prime locations close to city centers or along waterfronts and are supported by the infrastructure that already exists. However, post-industrial redevelopment is challenging due to its complexity, which is expressed in a variety of ways by designers and developers who work on or study these landscapes as well as in the literature. (Loures, 2015).

## **Types of lands (Brownfield, Grayfield, Greenfield)**

### **Gray fields**

Grayfields were built as automobile-related urban fabric from the 1940s onwards and are now highly dysfunctional, as they no longer provide the best housing options but are unable to cope with the traffic demands of the twenty-first-century city. Although they are desperately in need of regeneration, there is no model that can facilitate their transition in a functional and sustainable way (Newton et al., 2020). "Grayfield" is a relatively new term in planning, used here for the description of occupied but economically and technologically obsolete items. However, unlike brownfields, there is usually no need to modify the site. The common characteristics of Grayfield mentioned in many studies are obsolete or economically underutilized buildings, old and damaged architecture, significant grounds, surrounding buildings, lack of reinvestment, need for intervention by public and private institutions, and an uncontaminated environment. Therefore, grayfields are defined as "non-industrially occupied but economically obsolete places with a significant site that need intervention by public or private institutions" (Seo and Lee, 2019). In the United States, this term has historically referred to formerly viable commercial and retail shopping sites (such as regional malls and shopping centers) that have suffered from a lack of reinvestment and have been declassified by larger, better designed ones. These particular grayfield sites are also

referred to as “dead malls” or “ghost boxes” if the anchor or other major tenants have vacated the premises, leaving behind empty shells (Moore, 2013). Grayfields are low-density, undercapitalized, aging suburbs. Small-scale, unplanned grayfield redevelopment that mostly eliminates suburban characteristics while just marginally improving density is made possible by most metropolitan planning concepts. Targets for infill are not being reached as a result. However, there is an alternative that is described as "grayfield precinct regeneration" here: larger-scale integrated redevelopment made possible by the aggregation of land and favorable state and local planning laws (Newton et al., 2020), and to a lesser extent, differences can be made in the area of these lands, as brownfields are generally larger than grayfields (Song et al., 2019).

The term “grayfield” was coined to describe large asphalt parking lots associated with large commercial sites. However, Grayfield is a site that can contain variable features. The Urban Planning Congress states that grayfields include not only abandoned shopping malls and department stores but also airports and areas that were previously occupied by military bases and were underutilized (Seo and Lee, 2019). Some thinkers fill in additional abandoned fields in the development landscape as follows: orange fields (land that contains less efficient functions), gray fields (pedestrian paths, squares, train/road lines, and abandoned parking lots), municipal fields (land managed by central or local authorities), and underground lands (underground spaces such as road tunnels, parking lots, and power stations) (Hadjimichael, 2011). As cities grow farther into rural areas, "grayfields"—construction sites—are produced. These are deserted structures in densely inhabited areas that negatively impact ecosystems and produce undesirable social, economic, and environmental situations.(Newton et al., 2022). So undoubtedly, reducing carbon in the atmosphere is a positive externality of the grayfields redesign as mixed-use, transit-oriented developments (Regnaert, 2019). It should be mentioned that grayfields are places where the land, as opposed to the old buildings, now has the majority of the constructed asset value. The intermediate suburbs are popular because they typically include plenty of neighborhood organizations, local services, and facilities that have been developed over many years. But there isn't enough new housing being built to satisfy the need for varied, well-located 21st-century dwelling, particularly in big, rapidly expanding cities. (Newton et al., 2020). In some urban development projects, residential development in existing urban residential areas, such as existing houses, is



demolished and replaced, and the redevelopment of properties that were previously used for residential purposes is classified as grayfield development to achieve this goal (Gallagher, 2019).

### **Greenfield**

The term urban green field, which is increasingly entering the dictionary of urban planning and management, is a metaphor. It is underdeveloped land around the city used to develop the future of the city. Most urban green lands are used for agriculture, while some have been abandoned naturally (De Sousa, 2021). Green land refers to land that has not been developed before and may be in rural areas or located in an urban area, as well as under agricultural use or urban landscape design. Although the state policy is generally to prevent the development of cities in these lands, in many cases, this type of development cannot be prevented. A green field that was located on the edge of the cities until now has been placed inside the city due to the growth and development of the city and may provide a more economic development opportunity for the cities compared to the abandoned land located in an inappropriate place due to better access to transportation and infrastructure (FCM, 2009). However, many urban strategies are included in the development of green lands within existing local government boundaries as a means of meeting the goals of urban agglomeration. Undeveloped land within existing urban boundaries is a limited resource, meaning that as soon as such green spaces are used, filling existing residential areas or developing gray land would be vital in achieving the goals of urban integration by redeveloping existing urban areas to higher densities (Gallagher, 2019).

### **Brownfields**

Brownfields, with their modern approach and with regard to economic development and the current dynamic increase in the quality of life, are considered an important feature and, at the same time, characteristic of the regional development and spatial arrangement of the environment we live in (Turečková et al., 2021). The emergence of man-made wastelands and abandoned areas is a concern for sustainability. It separates the land from its socially productive function while often having a detrimental effect on natural ecosystems. Land use policy with a sustainable approach seeks to find ways to restore or revive such areas. This is not only related to the post-industrial “brownfields” in urban areas but also

includes many manifestations of dereliction in the countryside (Klusáček et al., 2021). Brownfields are defined as real estate property that is underutilized, neglected, and may also be contaminated. These properties, which can be either land or locations (sites) anywhere in the cadastral region of the cities and municipalities, may be the remnants of industrial, agricultural, military, transport, religious, housing, or other operations (such as public amenities). (Navrátil. et al., 2019), and in many cases there is a strong debate on the issue of brownfields and their related areas (Longo and Campbell, 2017). The development of brownfields is mainly caused by socio-economic factors that are anchored in branch-sector changes in economic activities (Suchacek et al., 2017). However, most brownfields are known for their negative role in current society. The effects of brownfields are particularly characterized by negative impacts that manifest in a wide range of areas related to suburbanization and urban sprawl (Turečková, Varadzin, and Nevima, 2018).

Brownfield redevelopment has gained substantial relevance recently due to its potential to lessen the negative environmental effects of brownfields and promote urban sustainability. (Ahmad et al., 2020). Brownfields are often composed of degraded soils, with the potential availability of pollutants leading to widespread environmental pollution. There are different types of brownfields with multiple problems; while some of them can be easily modified, many others are abandoned and not used for a long time (Ahmad et al., 2018). Generally speaking, brownfields are considered post-industrial sites caused by various human activities located in the downtown area. The scarcity of urban land due to environmental constraints means that environmental policies have become stricter (Filip and Cocean, 2012). After being coined in North America, the word "brownfields" swiftly spread throughout the world, particularly in Europe. There are no particular laws for these sites, though, with the exception of the US. Rules or regulations pertaining to biodiversity, soil contamination, or the environment frequently serve as an indirect foundation for their protection. (Jacek et al., 2022).

## **Identification of brownfields**

With so many social, financial, and environmental advantages for cities, brownfield cleanup has grown in importance throughout the last 40 years as a key component of urban economic rebirth and transition. One of the most important tasks for

brownfield projects is finding urban brownfield areas. Brownfields are commonly located in central cities where basic infrastructure has already been set up (Song et al., 2022). Brownfields are usually linked to underprivileged metropolitan areas that pose a risk to the environment and public health as well as scarce soil and water resources. Urban contaminated land refers to the development, construction, or use of land that results in a certain degree of pollution within a given area. While some urban contaminated land is still in use, brownfields are usually an abandoned part of urban contaminated land (Song et al., 2019). Many underutilized or abandoned places that were previously used for industrial, commercial, or mining uses have been produced; these locations are usually referred to as "brownfield sites," especially in shrinking cities and older industrial zones. (Rall and Haase, 2011). The government's intended land use categories and the findings of the brownfield redevelopment evaluation are determined to be mostly compatible; however, more thorough consideration of social, economic, and ecological concerns is needed. Simultaneously, the government's professional forces must identify and redevelop all of the city's brownfield areas in order to get more accurate and scientific judgments. (Wang et al., 2022).

#### **Definition of Brownfield in the European Union and the United States**

Brownfields can be found to different extents in industrialized countries around the world. However, there is no such thing as a common, official definition of a brownfield, either on the European or American continents (Oliver et al. 2005). Therefore, in view of the diversity of origins and situations, it is worth keeping in mind that the term itself, as well as its resulting definition, has an inherent polysemous nature (Rey and Lufkin 2015). The United States Environmental Protection Agency (EPA), for instance, established its Brownfields Redevelopment Initiative as early as 1993 to encourage and support local governments in their efforts to inventory and assess brownfields (Environmental Protection Agency (EPA) 2006). The formulation of criteria to precisely describe the state of "brownfield" varies among the institutions concerned. As a matter of fact, the study by Oliver et al. identifies as many as 19 different definitions and variations for the term brownfield in Europe alone (Rey et al., 2022).

The term "brownfield" is multisemic and refers to a wide variety of locations. There isn't a formal definition for brownfields in Europe, but there is a growing agreement

that they are urban areas that require remediation. Their placement within urban areas does, in fact, present a strategic opportunity to revitalize and densify the urban fabric at the local level. It is worth pointing out that the origins of the French word for brownfield, *friche*, are to be found in agriculture. Etymologically, the term comes from an evolution of the medieval Dutch word *versch*, which meant “fresh soil” (Dubois et al. 2001). More broadly, it refers to uncultivated agricultural land, disused due to low soil fertility, excess land available, or a transitory fallow situation (Rey et al., 2022). The English word brownfield, which comes from a combination of the adjective “brown” and the noun “field” started being commonly used within urban planning circles in the early nineties to generically qualify abandoned land (Merlin and Choay 2010).

There are differing interpretations and definitions of brownfields, mostly because Americans and Europeans have distinct ideas about what a brownfield is. The US Environmental Protection Agency (USEPA) defines brownfields as real estate where the existence or possible presence of a hazardous material, pollutant, or contaminant may make it difficult to expand, rehabilitate, or reuse the land. (Congress of the United States of America, 2002; US EPA, 2020). Brownfields are described as “sites that have been affected by the former uses of the site and the surrounding land; are derelict or underused; have real or perceived contamination problems; are mainly in developed urban areas; require intervention to bring them back to beneficial use” by the CLARINET (Contaminated Land Rehabilitation Network for Environmental Technologies) project, which is funded by the Environment and Climate Program of the European Commission. (CLARINET Consortium, 2002). Whatever the definition, brownfields are generally associated with old industrial or service-distributed sites. The redevelopment of brownfields has recently received increasing attention in many countries since it is considered a sustainable land use strategy to reuse these spaces to accommodate urban development instead of occupying residual greenfields. The scientific literature in this field is very dense and spread all over the world (Rinaldi, 2020:127). It is estimated that the number of brownfields in the US is between 500,000 and 1,000,000 (Hipel et al., 2010), while the number in Germany is approximately 120,000 (Limasset et al., 2017). The following attributes are common to all of these definitions of brownfields: They are primarily found in fully or partially developed urban areas; (ii) they are derelict or underused; (iii) they have been impacted by

previous uses of the surrounding land or site; (iv) they need intervention to be returned to a beneficial use; and (v) they may have actual or perceived contamination issues. (Zhang et al., 2021).

## **Types and classification of brownfields**

### **Based on the ABC model**

Brownfield projects are divided into different types based on economic benefits. Factors such as reconstruction cost, land, and site price are influential in the classification of these types. Based on this, all types of sites are placed in three categories: A, B, and C.

- Category A: The development projects in this category are carried out with complete reliance on the private sector due to the definite increase in the site value.
- Category B: Investing in these sites is associated with economic risk and requires the cooperation of both the private and public sectors for development.
- Category C: In this category, projects are weak in terms of economic benefits, and the investment in them is based on the public sector.

One of the advantages of this model is that it shows that experts should focus the majority of their efforts on B-type sites to redevelop brownfields. With a small investment, these types of sites can be converted into A-type sites. On the other hand, based on this model, it is clear that the rehabilitation and redevelopment of some sites are very costly and do not have economic benefits. This type of site must change its zone from construction into green and agricultural zones after rehabilitation.

### **Based on economical profit**

Sites that, in the case of regeneration and redevelopment, help to improve the environmental conditions of the city and the network of recreational spaces through the increase of urban open spaces and improve the condition of air, water, and soil but lack financial benefits; sites that, despite the fact that their redevelopment is not financially profitable, help to improve the quality and performance of urban institutions such as schools, parks, etc., increase the vitality and potential of neighborhoods and surrounding lands for investment;

contaminated sites (including large amounts of industrial waste, gasoline, asbestos, lead, etc.) that must be cleaned up before reuse. Although brownfields have great attractions for urban development, private investors have marginalized them, mainly due to their concern about the high cost related to the land contamination originated by dismissed industrial activities, which may lead to reduced profitability (Rinaldi, 2020: 127).

"Derelict or underused sites that have been affected by the former [industrial] uses of the site and surrounding land; may have real or perceived contamination problems; are primarily [found] in developed urban areas; and require intervention to bring them back to beneficial use" is the definition of a brownfield site, according to the European Concerted Action on Brownfields and Economic Regeneration Network (CABERNET). (Oliver et al., 2005). Major economic structural changes such as the end of mass production and its replacement with flexible specialization (Piore and Sabel, 1984), the rapid labor productivity growth in manufacturing due to technological progress (Rowthorn and Ramaswamy, 1997), and the globalization of markets and trade (van Neuss, 2016) have provided, starting from the late 1970s and further by the end of the century, the framework conditions for the rise and diffusion of industrial brownfields in developed urban areas (Modica, 2019). In recent times of economic crisis, noticeable bottom-up, flexible, and low-cost solutions for the cultural re-appropriation of derelict industrial spaces have also emerged under the concept of "temporary reuse" (Oswalt et al., 2013). According to international experience, the cost of a brownfield remediation project is quite high in general (Spiess and De Sousa, 2016), and hence the shortage of funding plays a critical role in the slow progress of brownfield remediation. Furthermore, all of the land and the majority of the initial polluting enterprises are state-owned (Tian, 2015; Zhang et al., 2016).

## **Significance of Brownfields**

Urban renewal is a component of the entire urban development process. With the adjustment of the industrial structure and the decline of industrial zones, a large amount of brownfield has been produced inside cities, exerting an extremely adverse impact on their economy, society, and environment (Zhang et al., 2021). Brownfield regeneration has recently become an important issue at the global level for local and regional development due to its impact on the vitality, livability, and

quality of life in a city, and the terms brownfield vary from one country to another (Abed, 2019). Redeveloping abandoned properties has come to represent green spaces and urban renewal as core principles of urban policy. Furthermore, it seems to be a long-term answer to the issue of how to meet the demand for new development zones without enlarging into undeveloped areas. However, a number of barriers may stand in the way of such projects' successful execution and draw attention to their difficulties, methods of execution, agreements for public-private partnerships, and restrictions regarding civic engagement and spatial integration. (Glumac, B., and Decoville, 2020). Many different countries have implemented a variety of measures, including financial incentives, pertinent legal frameworks, and remediation requirements, to aid in the cleanup and redevelopment of these brownfields. Despite attempts, the process of repurposing brownfields is incredibly slow due to the high technical requirements, diverse and complex conditions, and hefty remediation costs. (Han et al., 2018).

### **Impact of brownfields in inner cities**

The impact of brownfields on inner cities has been well documented in research studies (Kahn & Vaughn, 2000). According to a report by the Environmental Protection Agency (EPA) (2022), there are over 450,000 brownfield sites across the United States, many of which are located in inner cities. The presence of brownfields can lead to environmental injustice, particularly for low-income and minority communities (Center for Disease Control and Prevention, 2022).

Research has also shown that the presence of brownfields can have economic consequences for inner cities, as property values in surrounding neighborhoods may decrease (Kahn & Vaughn, 2000). This can deter businesses and investors from investing in the area, limiting economic development. Additionally, the health risks associated with brownfields can have a significant impact on inner cities, particularly for low-income and minority communities (Center for Disease Control and Prevention, 2022). To address the impact of brownfields on inner cities, the EPA has established the Brownfields Program, which provides funding and technical assistance to communities to assess, clean up, and redevelop brownfield sites (Environmental Protection Agency, 2022). Community-based organizations and advocacy groups have also been working to raise awareness of the impact of brownfields on inner cities and to advocate for policies and initiatives that promote

environmental justice. Overall, the impact of brownfields on inner cities is a significant and ongoing issue that requires a multi-faceted approach to address (Kahn & Vaughn, 2000). By working together, it may be possible to mitigate the impact of brownfields on inner cities and to promote greater economic development, environmental justice, and public health.

## **Negative effects of brownfield**

Brownfield lands refer to previously developed land that may have been contaminated by industrial or commercial activities, making redevelopment challenging. Brownfields can have a range of negative effects on the environment, human health, and the economy.

Environmental effects:

- Contamination of soil, water, and air (Liu et al., 2020).
- Habitat loss and fragmentation (MacDonald et al., 2013).
- Decreased biodiversity (MacDonald et al., 2013).

Human health effects:

- Exposure to toxic chemicals, such as lead, mercury, and benzene, which can lead to serious health problems (Ozkaynak et al., 2013).
- Increased risk of cancer and other diseases (Liu et al., 2020).

Economic effects:

- Reduced property values in the surrounding area (Bartik et al., 2021).
- Increased public health costs (Ozkaynak et al., 2013).
- Decreased tax revenues for local governments (Bartik et al., 2021).

## **Positive effects of brownfield lands**

Brownfield redevelopment can benefit society, the economy, and the environment in a number of ways.

- **Economic Development:** Redeveloping brownfields can boost an area's economy by bringing in new businesses, raising property values, and generating jobs. (U.S. Environmental Protection Agency, 2017).
- **Environmental Benefits:** Reusing brownfield sites can help to preserve green spaces and reduce urban sprawl, which can have environmental benefits



such as reducing air pollution and preserving natural habitats (Hildebrand & Konijnendijk, 2019).

- Community Improvement: Brownfield redevelopment can improve the quality of life for local residents by creating new recreational spaces, increasing access to public transportation, and providing affordable housing options (U.S. Environmental Protection Agency, 2017).
- Public Health: Reusing brownfield sites can help to remediate contaminated soil and water, which can have positive impacts on public health (Hildebrand & Konijnendijk, 2019).

## **Methods of brownfield redevelopment**

Brownfield redevelopment is the use of all potential and actual powers and capacities available at the level of the city, region, or even a neighborhood to reach a sustainable city and all social, physical, political, and economic structures to achieve a qualitative, quantitative, and stable outcome. In this regard, knowing the advantages and obstacles that may exist in the implementation of brownfield redevelopment can be fruitful in introducing the components of this development. In this treatise, the benefits of implementing integrated development plans in the social, economic, physical-spatial, and environmental sectors have been examined (Krupar, 2022).

Regarding the social benefits, it should be said that with a suitable design, mixed-use development can be a new type of development with a mixed residential structure with different income levels because this type of development tries to bridge the gaps between neighborhoods through social justice. Reduced brownfield redevelopment will be successful when it can attract households that have the ability to choose their desired place of residence (Li et al., 2022).

In addition to these, it is possible to improve the urban identity and revive the old texture in the cities, as well as reduce the crime rate, increase the sense of social belonging, improve security and privacy, and create attractive and special areas with different types and lifestyle options, among others. Enumerate the important and noteworthy advantages of the brownfields' redevelopment. Providing the possibility of returning cultural, social, recreational, and entertainment opportunities to the cities, as well as revitalizing the inner and old centers and neighborhoods of the cities, are also among the advantages of this type of

development. This type of development helps to promote the culture of protecting historical monuments in cities to continue their cultural and historical life (Chen et al., 2022).

Also, regarding the economic benefits of brownfield redevelopment, it is a channel for the economic growth of cities and protects the natural resources around the city. The savings resulting from this type of development in the field of energy consumption are very impressive. This development imposes a lower cost on the government than the development of suburbs in green fields because the development of new suburbs requires new facilities such as access roads, water and sewage lines, schools, etc. While brownfield redevelopment can benefit from the existing capacities. From an economic point of view, because the brownfields redevelopment increases the density in the city, it reduces the cost of services for the residents. This type of development helps the economic prosperity of inner-city neighborhoods by creating mixed uses. Reducing transportation costs for residents, reducing the need for a private car, and reducing fuel costs are other economic aspects of this development (Hammond et al., 2021).

Moreover, creating job opportunities, increasing the tax base of the city through creating value in the property or reviving its value, and reducing poverty are other benefits of this type of development (Liang et al., 2022).

The physical-spatial benefits of mixed-use development can include brownfield redevelopment, improvement of historical buildings, protection of symbolic elements, or public squares. Mianafza development provides the possibility of walking in the neighborhoods by replacing empty or abandoned land with dynamic uses where people can access schools, shopping centers, religious places, and parks on foot. Integrated development on a general scale brings harmonious growth to the city body by eliminating the discontinuity between tissues.

Regarding the environmental benefits, according to Felt (2007), brownfield redevelopment plays an essential role in improving the sustainability of urban areas. Brownfields redevelopment with optimal use of empty and unused lands by guiding the pattern of urban growth within the developed levels within the cities reduces the pressure on the development of agricultural lands and open spaces on the outskirts of the cities. Reducing development pressures in green zones and pollution from motor vehicle traffic due to the concentration of development is part of the environmental benefits of brownfield redevelopment (Li et al., 2022).

In conclusion, the most important advantages of the brownfields redevelopment can be expressed from the point of view of Wheeler (2001). Incremental development has many benefits: it can reduce sprawl and protect open spaces, revitalize downtowns and older neighborhoods, create transit-oriented and walkable communities, and improve housing-employment imbalances. reduce infrastructure costs and provide residents with different residential options.

Among the social obstacles of brownfields redevelopment, we can mention the lack of public participation, which is a threat to the success of brownfields redevelopment. The citizens' ignorance of the advantages of this kind of development may be the cause of this. Also, if the residents of the neighborhoods do not have a sense of belonging to their neighborhood and city, they will not participate in its development. Other obstacles in this field are the conflict between the interests of the municipality and the developers, the conflict between the interests of the residents of the neighborhood in the lands designated for brownfield redevelopment, and the lack of motivation of the local government (Hammond et al., 2021).

Accurate recognition of the strengths and weaknesses of the local community and the time-consuming nature of this process due to enabling them to participate in the process of inclusive development is another social challenge of inclusive development. In some cases, as long as the new developments are in contradiction with the existing context of the neighborhood in terms of scale and proportion, these resistances appear. In some neighborhoods, there are concerns about the increase in vehicle traffic and the lack of parking spaces. Concerns about new people coming into the neighborhood due to new developments, fear of a drop in the price of existing properties due to the implementation of new developments, as well as increasing pressure on neighborhood services and facilities, as well as educational spaces, and concerns about the increase in crime and delinquency in neighborhoods can be discussed as social obstacles for inclusive development.

The costs of acquiring and consolidating land for brownfield redevelopment are very high. Also, if the urban infrastructure in the desired area is insufficient or worn out, brownfield redevelopment will face many problems due to the high costs of creating new infrastructure. The high price of Mianafza lands, due to being located within the built-up area of cities, is another economic obstacle. The costlier implementation of brownfield redevelopment projects in the short term compared

to development projects in the suburbs is another economic obstacle that is very important for the private sector.

The physical limitations of the place often limit the possibility of development at intermediate levels. Environmental issues such as vulnerability to earthquakes, floods, wet lands, loose soil, improper drainage, or pollution caused by previous uses are among the major issues that, in addition to the need for investment in order to clean and prepare them, can reduce the amount of buildable land. Some of these lands are in the vicinity of disturbing uses such as car repair shops, busy railway lines, roads, heavy vehicle transportation, and abandoned buildings, which the existence of these conditions causes (Li et al., 2022).

The difficulty of the project will be. Being on steep slopes, having dimensions, sizes, and irregular geometric shapes are also other physical factors that make the development process difficult in the framework of compliance with land use laws or zoning (Schilling, 2022). Some idealistic and strict rules and regulations can also cause difficulties in the brownfields' redevelopment levels, which include:

Improper regulations of zoning, separation, and construction can cause a lack of compatibility and coordination of the prepared plans with the background and characteristics of the existing localities (Hammond et al., 2021).

Regulations and requirements related to the provision of parking spaces for cars, the level of occupation of the building, the amount of setback of the buildings in relation to the street, the amount of landscaping in front of the lot, the amount and width of communication networks, etc.

The limitations considered for building density at some intermediate levels make the feasibility and economic justification of these projects impossible for small plots of brownfield redevelopment.

The rules related to the implementation of some public facilities by mass builders in brownfields redevelopment, such as observing the width of the road network based on detailed plan standards, make the implementation of the project impossible due to the small dimensions of some brownfields' redevelopment. Lack of support for comprehensive plans for brownfield redevelopment and mixed uses.

## **Sustainable Development**

Sustainable development can be defined as follows: “Development that preserves the opportunity to meet the basic needs of their lives for present and future generations and at the same time does not reduce the diversity of nature and preserve the natural functions of ecosystems (Pavolová et al., 2019). There are several connections between the objectives of sustainable urban development and the health and welfare of people. Scholars pinpoint precise measures to enhance well-being via sustainable urban development that encompass all, such as evidence-based policy, integrated planning, and policy implementation monitoring. Additionally, they stress how important it is to advance justice-based planning and efficient governance in order to achieve sustainable, equitable, and healthy urban growth. (Tonne et al., 2021). The past few decades have seen a general increase in human growth that has brought about negative climate change, natural disasters, wars, and political and socioeconomic instability. Through their actions, humans harm the ecosystem and endanger the survival of the planet and future generations. These circumstances signify behavioral shifts intended to reduce pressure and negative environmental effects by managing resources more sensibly and effectively. In the 1970s and particularly in the 1980s of the previous century, the idea of sustainable development took into account practical actions that permit long-term resource utilization without endangering future generations. The notions of development (socio-economic growth within ecological bounds), needs (redistributing resources to ensure everyone has a high standard of living), and future generations (possibility of long-term use of resources to ensure the necessary quality of life for future generations) form the basis of the concept of sustainable development. (Tomislav, 2018). Low levels of trust, in addition to being a severe social problem in itself, also imply a low potential for coherently addressing environmental challenges. There are also increasing financial effects related to the instability of ecological and social systems. Ecological, social, and financial capital are necessary for a sustainable society and for the transition to such a society (Broman and Robèrt, 2017).

It should be kept in mind that many of the unsustainable global activities can be traced back to organizations. However, because organizations are social systems, they cannot be managed for sustainability like ecosystems and natural resources (Etzion, 2018). Adopting a social-ecological systems perspective, many thinkers

around the world are using the emerging concept of leverage points, which is to examine places in complex systems to intervene to bring about change and examine examples of how actions to reconnect people with the environment can help direct society towards sustainability (Ives et al., 2018). The pace of change towards a more sustainable world seems disappointingly slow, and there are urgent calls for increased investments and initiatives from organizations, educational institutions, and governments to implement innovative multidisciplinary approaches to solving current sustainability challenges. (Almeida et al., 2013). Some studies observe that the sustainability discourse has evolved from the relationship between economic and environmental parameters to include social impacts. Normally, the need to analyze similar compounds between all three was given after diagnosis. They concluded that the evolving nature of sustainability requires an adaptive process involving all stakeholders. (Silvestre and Țîrcă, 2019) On the one hand, innovations are essential to implementing sustainability in enterprises, supply chains, institutions, communities, regions, and nations since they are continuously changing the environment and our way of life. In fact, research indicates that innovative strategies should be employed to address sustainability. (Silvestre, 2015).

Economic, social, and environmental sustainability have become increasingly important in urban and territorial development policies in Europe and internationally. The United States and Europe have recently presented green contracts that provide programmatic provisions to achieve territorial sustainability through the redevelopment of brownfields into sustainable industrial sites (Sessa et al., 2022). Over the past 30–40 years, urban change and deindustrialization in advanced economies have created a legacy of vacant and abandoned land that is increasingly seen as a development opportunity rather than a planning problem (Adams et al., 2010). Because brownfield properties are frequently located in core areas and offer advantages for redevelopment, they present excellent opportunities for sustainable urban planning. (Jacek et al., 2022). Brownfield sites are an integral part of the environment, and of course, individual areas whose presence has negative points (Dobrovolskienė et al. 2017).

Sustainable regional development using the implemented system of brownfield sites can be described as a strategic, complex, and synergistic process determining socio-economic, environmental, and institutional aspects of regional development

and drawing a man-made functional model (Razminienė and Tvaronavičienė, 2018). This approach can be achieved by using “sustainability links” as a tool to understand sustainability and the services examined in this regard and to provide a framework for the overall evaluation of brownfield redevelopment work (Bardos et al., 2016). Most developed countries welcome the redevelopment of brownfields and consider it an effective tool of urban policy. While it is just being welcomed due to some challenges. Therefore, it is necessary to identify sustainable solutions that can facilitate the redevelopment of brownfields in developing countries (Ahmad et al., 2021).

### **Infill development**

Urban expansion is a phenomenon that big cities throughout the world are experiencing as a result of the population growth and increased urbanization, and it has numerous negative effects on the environment and the economy. Urban planners are looking for ways to mitigate the negative consequences of urban sprawl on the economy and the environment. Accordingly, infill development is viewed by policymakers and urban planners as a workable remedy for urban sprawl, which boosts density and revitalizes unwanted districts (Chiroma et al., 2017). According to Izvin et al. (2018), some scholars defined infill development as the construction of structures on the sites of existing buildings on land lots large enough to support them. This represents a departure from the general town planning scheme. Cities in Europe are particularly vulnerable to the potential effects of climate change because of their high population density and sophisticated infrastructure (cities' social, economic, and technical weaknesses). Therefore, adaptation strategies that lessen a city's susceptibility to climate threats are especially crucial. However, creating densely populated, compact urban zones is also a typical way to stop urban sprawl. Thus, there appears to be a tension between urban infill expansion and sustainable spatial climate policy (Eichhorn et al., 2021). Infill development is the recycling of vacant and ineffective land within urban areas, which has various infrastructure services such as roads, access, water, and electricity, and is used for the needs of the city (Discussion papers, 2010: 7).

There are three basic strategies that can be used for the development of the city:

- Urban infill strategy as a growth management strategy that can be a substitute for continuous horizontal expansion of cities.

- Urban infill development is an “environmental protection strategy” that can provide opportunities for the development of existing cities without the consumption and destruction of agricultural, arable, and environmentally sensitive lands.
- Urban infill development, or “redevelopment strategy, can be revitalized through the redevelopment of worn-out, withered, and abandoned contexts, barren and brown lands, and inefficient urban areas into urban dynamism and vitality, diversity, and economic and social health (Anderson, 2005:3–4).

The new urbanism advocates preferred architectural and land use patterns as a means of improving quality of life through socioeconomic variety, but many people question these causal claims. Community indicators for social sustainability, such as housing affordability and socioeconomic diversity, are derived from research that evaluate new urbanism as an infill development strategy (Kim and Larsen, 2017). According to the findings, the primary impediments to medium-density infill include poor-quality low-density infill development, which alienates communities and saps developers' motivation to undertake medium-density projects. The research concludes that spatial planners should improve techniques for promoting density benefits and establish minimum residential densities and site sizes for infill construction (Sturiale and Scuderi, 2019).

#### **Smart urban growth**

Smart cities are an international trend of urban policies aiming at improving the quality of life of citizens living in urban areas by leveraging contemporary technology and deploying technologies to address difficulties caused by the big population.(Alderete, 2021). The concept of a smart city seeks to address urbanization issues, especially land use, environmental pollution, energy needs, and transportation congestion. In addition, a smart city requires a diverse set of initiatives to develop better transportation systems and innovative energy-saving policies (Kunzmann, 2021). Smart cities aim to develop innovative tools to improve knowledge, the economy, environmental protection, and technological progress. Over the years, the concept of smart cities has attracted a lot of attention around the world and addresses the challenges facing cities, such as the increase in population, drastic decrease in population, climate change budget, environmental destruction, etc. (Grossi et al., 2020). Therefore, initiatives such as the EU’s smart



cities agenda provide new horizons for innovation (Jiang et al., 2020). Although the term smart city has been recently accepted, there is no comprehensive definition for it. Accordingly, it is said that a city is smart when investment in information and communication technology, social and human capital, sustainable economic growth, and modern transportation is highly supported (Valencia-Arias, 2021). In addition, smart cities show urban problems in supporting the quality of life of citizens, maintaining sustainability, and involving citizens through transparent governance policies (Leon and Rosen, 2020). Also, smart cities heavily use ICT to collect, analyze, and disseminate information to provide facilities and services, increasing operational efficiency that includes better decisions (Verrest and Pfefer, 2011). Accordingly, to protect livable conditions in line with the rapid increase in urban population around the world, extensive knowledge of smart city initiatives is required (Junior et al., 2018).

In addition, based on the necessity of these issues, many cities around the world are looking for smarter methods to manage urban planning (Macke, 2018). However, due to the complexity of developing smart city planning, extracting or providing specialized knowledge by a method that requires providing information related to the smart city as definitive and generalized explicit knowledge is problematic (Lytras and Serban, 2020). Likewise, it takes time for stakeholders, city planners, and developers to search for information on how to successfully adopt smart city initiatives (Li et al., 2020). Hence, stakeholders, decision-makers, and city planners and developers are faced with insufficient information about the dimensions of a smart city needed to achieve sustainable living (Dooley, 2021). A smart city includes comprehensive and integrated aspects of urban life to improve health care, the economy, governance culture, transportation, and green areas (Myeong et al., 2021). The specific features of a smart city include the consolidation and creation of innovation and knowledge (Tcholtchev and Schieferdecker, 2021). Therefore, innovative smart city plans help to increase economic and social competitiveness and the attractiveness of a city that is maintained with its technological infrastructure (McGuirk, 2021). Smart cities require a complex urban environment that includes technology and human behavior systems, the economy, and social and political structures (Grandhi et al., 2021). In particular, a smart city uses technology to optimize effectiveness and the required urban operations,

services, and activities, usually by connecting different components and actors to a perfect intelligent system (Glaeser et al., 2021).

## **Brownfield Regeneration in Europe**

Brownfield regeneration is the process of revitalizing previously developed or contaminated land for new uses. This process has been a key focus in Europe since the late 20th century, when many countries faced significant challenges related to urbanization, industrialization, and environmental degradation.

The history of brownfield regeneration in Europe dates back to the 1970s, when the UK introduced legislation to regulate contaminated land. This was followed by the creation of the UK National Brownfield Strategy in 1998, which aimed to encourage the regeneration of brownfield sites and reduce pressure on greenfield land. Other countries in Europe, such as Germany, the Netherlands, and Belgium, also began to develop policies and strategies for brownfield regeneration during this time (Adriaanse and Teisman, 2000). One important aspect of brownfield regeneration in Europe is the involvement of stakeholders from different sectors and levels of government. This can include local communities, developers, environmental organizations, and government agencies. Effective stakeholder engagement can help to ensure that brownfield regeneration projects are socially and environmentally sustainable, and it can also help to build support and momentum for the project (Healey, 1997). There are various methods and approaches to the redevelopment of brownfields in Europe that aim to promote sustainable land use and maximize the social, economic, and environmental benefits of these sites. One common method is the use of site investigation and remediation to clean up contaminated land for reuse. This can include removing polluted soil or groundwater, installing barriers or containment systems, or employing natural attenuation or bioremediation methods (Kramm and Müller, 2013). In some circumstances, novel remediation technologies, such as phytoremediation or electrokinetic remediation, may be employed (Bardos et al., 2017).

Another important method is the adoption of sustainable land use planning and design principles, which aim to create livable, walkable, and attractive communities on former industrial sites. This can involve the integration of green spaces, green infrastructure, and public amenities into the redevelopment plan, as well as the use

of mixed-use zoning and transit-oriented development (Kramm and Müller, 2013). In addition, community engagement and participation are increasingly recognized as critical factors in the success of brownfield redevelopment projects. This can involve engaging with local stakeholders to identify their needs and priorities, involving them in the planning and design process, and providing opportunities for them to participate in decision-making (Healey, 1997). Finally, financial incentives such as tax credits, grants, or low-interest loans may also be used to encourage brownfield redevelopment and attract private investment (Bardos et al., 2017). Overall, a combination of these methods and approaches is often used to successfully redevelop brownfields in Europe, with a focus on promoting sustainability, community engagement, and economic development.

## **Brownfield Regeneration in the US**

Brownfield regeneration in the United States has a long and complex history, dating back to the 1980s when concerns about environmental contamination on abandoned industrial sites began to emerge.

One of the earliest federal programs aimed at addressing brownfield sites was the Superfund program, established in 1980 to address hazardous waste sites. However, this program focused primarily on remediation rather than redevelopment, and its processes were often slow and costly (Boudreau, 2011).

In the 1990s, several state-level programs were established to promote brownfield redevelopment. These included the New Jersey Brownfield and Contaminated Site Remediation Act of 1998, which established a program to provide grants and loans for cleanup and redevelopment of contaminated sites, and the California Land Reuse and Revitalization Act of 1997, which provided liability relief for developers of contaminated sites (Fennell & Lowry, 2002).

In 2002, the federal government established the Brownfields Tax Incentive Program, which provided tax incentives for developers who cleaned up and redeveloped brownfield sites. This program was expanded in 2018 with the passage of the Tax Cuts and Jobs Act, which made it easier for developers to take advantage of the tax incentives (EPA, 2019).

Today, brownfield regeneration is an important part of many urban revitalization efforts, and numerous federal, state, and local programs exist to support brownfield redevelopment. However, challenges remain, including funding

constraints and the need to address the legacy of environmental contamination on many abandoned industrial sites (Chakrabarti & Halden, 2019).

Brownfield regeneration in the US involves various methods that depend on site-specific characteristics, the level of contamination, and the intended reuse.

One common method is excavation and removal of contaminated soil or groundwater, followed by backfilling with clean fill material. This approach is often used for sites with relatively shallow contamination, such as gas stations or dry cleaners (Hansen, 2015).

Another method is in situ remediation, which involves treating the contaminated soil or groundwater in place. This can be accomplished through various techniques such as bioremediation, chemical oxidation, and thermal treatment (USEPA, 2020).

A third approach is capping, which involves placing a barrier over the contaminated soil or groundwater to prevent exposure. This approach is often used for sites with low levels of contamination or where excavation is not feasible, such as landfills or industrial sites (Hansen, 2015).

In addition to these methods, brownfield regeneration often involves community engagement, stakeholder involvement, and public-private partnerships. These partnerships can help leverage funding and resources, promote sustainable redevelopment, and ensure that community needs are addressed (Chakrabarti & Halden, 2019).

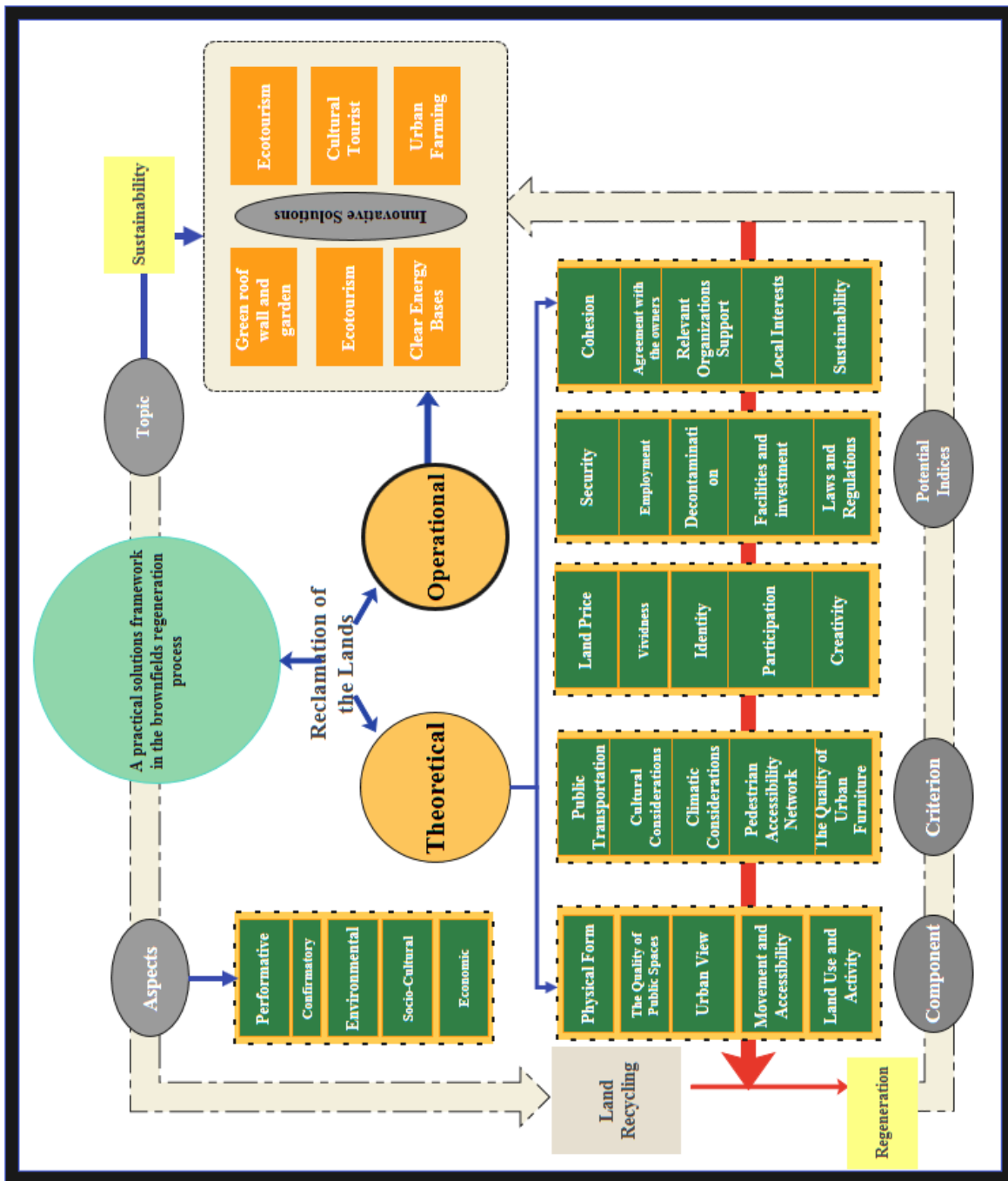


Fig1 : Theoretical Framework

# **Chapter 3 Conceptual framework**

Pag.

## **Contents**

## **Introduction**

This chapter outlines the research methodology employed in this study, encompassing the underlying research philosophy, approaches, data collection methods, and analytical techniques. To this end, first, the methodologies and paradigms of similar studies in the field of brownfield development are reviewed, seeking to use global experience to select appropriate methods for evaluating such projects. Therefore, the research philosophy and approaches were chosen based on the study's primary focus on innovative solutions for brownfield development. Data collection and analysis tools were selected based on the research approaches, analytical methods, and evaluation methods chosen for the study. Finally, the chapter concludes by addressing the research quality control and accuracy requirements, and how they are implemented in the study.

According to what was mentioned above, it could be argued that the literature review of the research questions and keywords discussed in this dissertation highlights several important issues in brownfield redevelopment studies. Accordingly, brownfield development was found to be one of the main challenges brought about by the indiscriminate uncontrolled expansion of cities, all of which have turned into abandoned lands over time. Moreover, brownfields are incompatible with the environment and communities, posing threats to both humans and the environment. Therefore, brownfield sites and their effective redevelopment could be discussed as an increasingly significant concern in the land use field, whose challenges could be reduced by conducting relevant studies and presenting new theoretical and practical solutions.

## **Review of the previous studies' methodology**

A review of the methods used in global brownfield research reveals that the choice of research method depends on the objectives and feasibility of the research and the nature of the topic. Therefore, the possibility of conducting a study can only be determined when its objectives, scope, and topic nature are clearly defined.

Various research methods can be used, based on the nature of the intended study. It should be noted that research methodology refers to a general strategy and

system of philosophical beliefs and assumptions that help address the research questions, paving the way for selecting research methods (Melnikovas, 2018).

Helping define the research scope, the Sanders' research onion model is widely used in field-based studies to organize and develop a research design using step-by-step layers. Therefore, the current study used the model to meet its predefined objectives. The model consists of six stages, starting with the articulation of the main research philosophy, followed by the selection of appropriate approaches, methods, and strategies, and the definition of time horizons, which led the research logic towards designing the methods, techniques, and the main data collection and analysis procedures (Iovino & Tsitsianis, 2020).

It should thus be reiterated that Sanders' research onion model can be used to examine and analyze research methods, as it is an effective model widely used in social sciences (Melnikovas, 2018). Therefore, the model can be used to develop a suitable step-by-step research design for conducting academic studies.

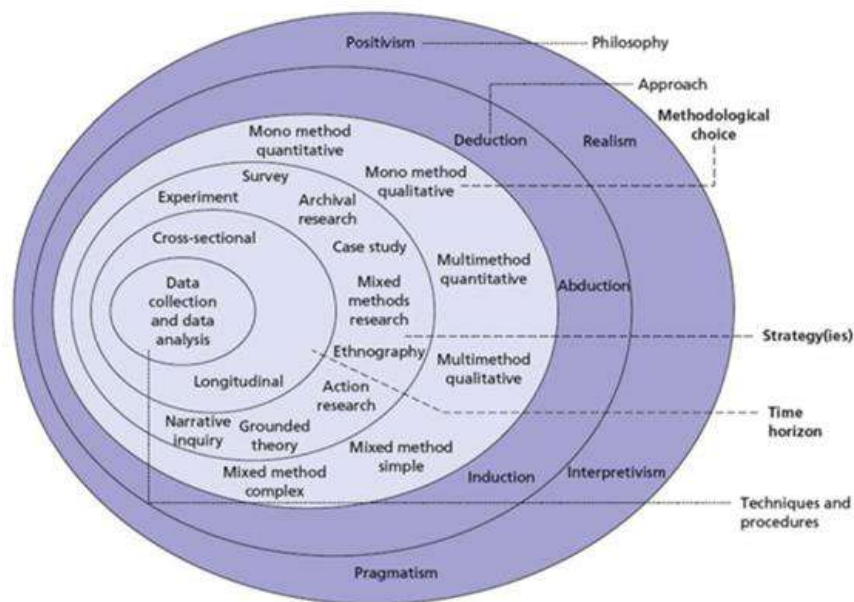


Fig1 : The research onion (Saunders et al., 2012)

The review of the methodology section of the previous studies and the metasynthesis-based studies indicates that the checklist of Critical Appraisal Skills Program (CASP) can be used in a qualitative study, as it makes it possible to



systematically assess the quality of qualitative studies. Being widely used in meta-analyses, the CASP checklist consists of three appraisal sections (Are the results of the study valid? What are the results? Do the results help locally?), which is performed using a three-choice appraisal system (yes, no, cannot say) (Chrastina, 2018). Having performed the checklist, the current study scored each article from one to five using the 50-point CASP method (Ahmadi et al., 2022)<sup>1</sup>. Accordingly, articles with a total score above 21 (Takiyian and Jahanian, 1401) were approved scientifically and qualitatively, and the remainder were removed. After screening the selected list, 29 articles were included in the methodological content analysis process, the list of which is presented in Table 1.

Table 1: Research background methodology

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
1.	Urban brownfield redevelopment and energy transition pathways: A review of planning policies and practices in Freiburg	Mahzouni, A. 2018	To discover a novel aspect of the complicated relationship between energy development and energy transfer by addressing the common eventual interaction between agent and structure	Qualitative	Interview	Coding
2.	The superior effect of nature-based solutions in land management for enhancing	Keesstraet al., 2018	Advanced ecosystem services directly contributes to the achievement of the UN's Sustainable Development Goals	Qualitative	Document Analysis-Library Research	Content Analysis
3.	A negotiation decision model for public-private partnerships in brownfield redevelopment	Glumac & Schaefer 2018	The examination of the methods used in negotiation process of the brownfield redevelopment projects can be improved by offering a proper understanding of the	Mixed	Interview Questionnaire	Thematic Analysis Factor Analysis

1. The scoring was performed as follows: Excellent (40-50), Very Good (31-40), Good (21-30), Moderate (11-20), Poor (0-10).

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
			brownfield characteristics and the interaction between the parties involved			
4.	Amenity proximity analysis for sustainable brownfield redevelopment planning. Landscape and Urban Planning	Beameset al., 2018	A proximity analysis approach based on a geographic information system is specifically developed for this purpose.	Quantitative	Field Surveys Document Analysis- Library Research	Analysis of spatial data
5.	Development of a standard brownfield definition, guidelines, and evaluation index system for brownfield redevelopment in developing countries: The case of Pakistan	Ahmadet al.,2018	The definition of brownfield standard, guidelines, and the index system are developed based on Pakistani context.	Quantitative	Questionnaire Document Analysis- Library Research	Delphi
6.	The transformative power of social innovation in urban planning and local development. Urban Planning	Myseth & Hamdouch, 2019	SI can be used as replacement for economic and technological-based approaches in urban development, such as "Smart Cities," "Creative Cities," etc.	Mixed	Document Analysis- Library Research Questionnaire	Documantar y Analysis Regression Model
7.	Seven lessons for planning nature-based solutions in cities. Environmental Science & Policy	Frantzeskaki 2019	Testing nature-based solutions requires confidence in the local government and the test process itself. Producing common nature-based solutions requires diversity in and learning of social innovations.	Qualitative	Document Analysis- Library Research	Content Analysis
8.	An ICT framework to support nature-based solutions implementations in smart cities ecosystem services. Science of the Total Environment	Spinnaet al., 2019	Developing more comprehensive, resilient, and increasingly sustainable communities through innovative nature-based solutions	Qualitative	Interview Document Analysis- Library Research	SWOT
9.	A methodological approach to evaluating brownfield redevelopment projects	Cappai 2019	Identifying and classifying the elements required for decision-making, including environmental and socio-economic indices	Quantitative	Field Surveys	Analysis of spatial data

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
10	A novel preference elicitation technique based on a graphic model and its application to a brownfield redevelopment conflict in China.	Zhao 2019	The preference data of the DMs involved play a critical role in the identification of the possible results or solutions for the brownfields' problems. Showing how such a participatory evaluation process (mixed methods) can be applied to the redevelopment of a contaminated brownfield site in France	Quantitative	Questionnaire Document Analysis- Library Research	Mean
11	A participatory decision support system for contaminated brownfield redevelopment: a case study from France	Tendero& Plottu2019	Modeling the effect of an increased sea level and the climate change for resilience assessment	Quantitative	Questionnaire Document Analysis- Library Research	Multi- factorial analysis
12	Climate change resilience and sustainability assessment and a coastal brownfield redevelopment	O'Connor et al., 2019	The article requires a systematic analysis of Green Development and Brownfield characteristics that are assessed in terms of sustainable development indices. While examining the experiences which led to the post-industrial formation and redevelopment of brownfield sites in Beijing, the article presents an analysis framework that integrates multi-level evolutionary views	Quantitative	Questionnaire Document Analysis- Library Research	Mean
13	Brownfield development is the new green for sustainable mine-dump redevelopment	Venter, 2020	The hybrid spatialities of post-industrial Beijing: communism, neoliberalism, and brownfield redevelopment	Qualitative	Document Analysis- Library Research	Thematic Analysis
14	Land policy conflict profiles for different densification types: A literature-based approach	Wang et al., 2020	This article develops land policy conflict profiles for different densification based on the related literature.	Qualitative	Interview Document Analysis- Library Research	Content Analysis
15	Are EU policies for brownfield redevelopment sufficient	Puustineet al., 2022	Brwonfeilds are not sufficiently covered by the European Union 's current policies, and the financial	Qualitative	Interview	SWOT
16		Krošelj et al., 2022		Qualitative	Interview	Content Analysis

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
			motivations are difficult to attract and they are distributed among several sources.			
17	Development decision model and sustainable mapping to screen efficiency of brownfield redevelopment based on socioeconomic open data	Chen & Yang, 2022	This study uses a total of open geographical, socio-economic, and environmental-regional data to develop a regional SDG map and show appropriate site for the redevelopment of brownfield. The study also designs an inquiry model for brownfield redevelopment which comprises socio-economic factors.	Quantitative	Field Surveys Document Analysis- Library Research	Analysis of spatial data
18	Research on brownfield redevelopment based on Wuli-Shili-Renli system theory and catastrophe progression method.	Jianet al.,2022	This paper introduces Wuli-Shili-Renli (WSR) system seeking to assess the brownfield redevelopment.	Mixed	Questionnaire Document Analysis- Library Research Interview	Mean Content Analysis
19	Urban forests and green areas as nature-based solutions for brownfield redevelopment: a case study from Brescia Municipal Area.	Masiero et al.,2022	To help fill the knowledge gap in this regard, the article analyzes two NBS-based intervention scenarios.	Mixed	Field Surveys Document Analysis- Library Research Interview	Factor Analysis Spatial data Analysis Content Analysis
20	Redevelopment Initiatives on Brownfield Sites: An Evaluation Model for the Definition of Sustainable Investments	Tajani& Di Liddo2023	The article develops an innovative evaluation model to support the decision-making process of state and private investors, taking into account the current definite needs of and the effective strategies for renovation of brownfield sites.	Quantitative	Questionnaire Document Analysis- Library Research	Factor Analyses
21	Integration of ecosystem services and life cycle assessment allows improved accounting of the sustainability benefits of nature-based solutions for brownfield redevelopment	Alshehri et al.,2023	Integrating ES and LCA to develop a plan for Brownfield redevelopment, offering a framework to support decision-making by proposing a comprehensive environmental analysis	Quantitative	Field Surveys	Analysis of spatial data

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
22	Brownfield redevelopment evaluation based on structure-process-outcome theory and continuous ordered weighted averaging operator-topology method	Jian et al., 2023	of the effects of various scenarios, and proposing a comprehensive approach that encompasses many aspects of environmental sustainability Proposing the structure-process-outcome theory to improve the rationale and scientific power of brownfield redevelopment evaluation process	Quantitative	Field Surveys	Analysis of spatial data
23	Housing accessibility in densifying cities: Entangled housing and land use policy limitations and insights from Oslo	Cavicchia, 2023	Elaborating on the systematic prioritization of environmental sustainability and green growth goals in developing plans for density, and explaining the role which the lack of legal apparatus and economic resources play in supplying moderately-priced houses	Qualitative	Interview	Coding
24	Sustainable brownfield redevelopment and planning: Bibliometric and visual analysis.	Cui & Fang 2023	This study presents a bibliometric analysis of the research works published on brownfield redevelopment since 1990 using the Scopus database	Qualitative	Document Analysis-Library Research	Content Analysis
25	Research on the Spatial Perception of Stakeholders in Brownfield Redevelopment Based on Value Compatibility Analysis	Zheng et al., 2023	Developing an articulation method which suits the general attitude and mindset of the relevant stakeholders to be used in feasibility studies of development planning projects or protecting activities concerning brownfield redevelopment	Qualitative	Interview	Coding

ROW	ENGLISH TITLE	AUTHOR, YEAR	OBJECTIVE	METHOD TYPE	METHODOLOGY	
					COLLECTION TOOL	ANALYSIS METHOD
26	Risk identification and analysis for the green redevelopment of industrial brownfields: a social network analysis	Zhang et al.,2023	Moving beyond the limitations of traditional linear studies, this study elaborates on the internal relationship among the risk factors involved in GRIB projects.	Qualitative	Interview Document Analysis- Library Research	Coding
27	Assessing Community Needs in The Brownfield Site Redevelopment: A Case Study of The Broadway Volvo Site	Bias,2023	The study focuses on those brownfield characteristics related to the correction, classification, legal framework, accessibility to the current data, contamination level, and correction methods	Qualitative	Interview	Content Analysis
28	Conversion of buildings to residential use: England's permitted development laws in comparative perspective	Madeddu & Clifford,2023	The article examines the determining factors involved in housing quality through the conversion process, comparing the deregulation approach followed by the England towards the conversion issue with the approach set in the local planning system of Italy.	Qualitative	Interview	Content Analysis
29	Digital tools for brownfield redevelopment: Stakeholder perspectives and opportunities	Hammond et al.,2023	The study examines the findings achieved by the consultation of the stakeholders with the experts of England's Brownfield sites which was performed with the aim of informing the design of future digital tools and systems and the study of two general issues.	Mixed	Questionnaire Interview Document Analysis- Library Research	Multi- factorial Analysis Coding

The methodology of the aforementioned studies can be examined using Saunders' research onion model. Accordingly, the analysis of the selected articles revealed that none of the authors explicitly addressed the philosophical paradigm. Therefore, this approach has not been directly stated in these studies. However, while none of the researchers directly mentioned their selected approach, a comprehensive analysis of the studies showed that 10 studies (55%) adopted a

positivist paradigm with a hypothesis formulation and inductive approach, 13 studies (15%) initiated their research by posing questions under an interpretive paradigm (which can be said to have followed an inductive approach), five studies (25%) employed a pragmatist paradigm and a comparative inductive approach, and one study (3%) adopted a critical paradigm. Therefore, the coding of the above findings indicated that most of the studies mentioned above were conducted based on the positivist philosophy, comparative approach, and systematic review strategy.

In the research orientation layer, there were 18 instances of applied research, indicating a practical focus on addressing specific real-world issues or problems. On the other hand, there are 11 instances of fundamental research, suggesting that a smaller proportion of studies are dedicated to developing theoretical knowledge or basic principles. Moreover, none of the articles examined in this study was developmental in nature. This distribution highlights the predominant emphasis on practical applications in the body of literature examined in the current study.

As for the time-horizon layer that defines the research timeframe, it was found that 19 studies collected cross-sectional or short-term data at a specific time period, indicating a concentration on investigating the intended phenomena or variables within a limited time frame. On the other hand, ten studies were found have frequently collected their required data over a specific period, suggesting a longitudinal approach that sought to record changes and trends over time.

The research strategy or design determines the general direction for answering research questions. In this regard, the analysis of the strategies followed by the studies examined in this research revealed that eight studies used systematic reviews, five used descriptive-analytical strategies (cross-sectional studies investigating a special phenomenon over a specific time frame), and six adopted a meta-analysis strategy. Accordingly, there were five exploratory studies, three survey studies, and two comparative studies.

On the other hand, the analysis of the coded data indicated that there were 17 case studies among the examined studies, suggesting that a significant portion of the studies concentrated on the exploration and deep analysis of specific cases or

instances, including a detailed examination of individual cases, to obtain a more profound insight or understanding of a phenomenon. Moreover, twelve studies were found to have used the document analysis strategy, investigating the available information resources such as archival materials, official documents, and historical records. Moreover, the studies concentrated on the analysis of the already accessible data to address the research questions and objectives.

The two research strategies mentioned above highlight the diversity and richness of the methodologies found in related literature, indicating the significance of considering and evaluating the methodological differences and implications of various research strategies in the field.

According to what was mentioned above, it can be argued that out of the twenty-nine studies examined in the current research, 14 studies used qualitative methods, ten studies employed quantitative methods, and only five studies applied a mixed method approach.

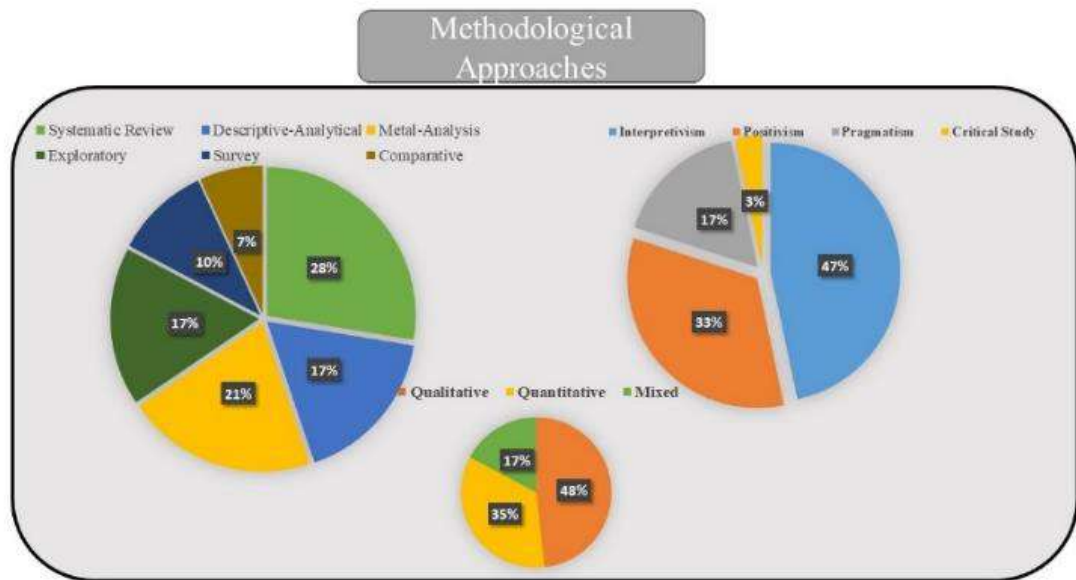


Figure 2: A descriptive chart of the research methodology, nature, and philosophy



Table 2: The Meta-Analysis of the Studies Examined in This Research

Categories	Coding	Code Frequency
Research Philosophy	Interpretivism	13
	Positivism	10
	Pragmatism	5
	Critical Study	1
Research Orientation	Applied	18
	Fundamental	11
Research Strategy	Case Study	17
	Archival Documents	12
Research Nature	Systematic Review	8
	Descriptive - Analytical	5
	Metal-Analysis	6
	Explorative	5
	Survey	3
Methodology	Qualitative	14
	Quantitative	10
	Mixed	5
Approach	Deductive	14
	Inductive	10
	Deductive-Inductive	5

Categories	Coding	Code Frequency
Time Horizons	Cross-Sectional	19
	Longitudinal	10
Data Collection Method	Questionnaire	9
	Interview	14
	Field Survey	6
	Document Analysis - Library Research	19
Qualitative Analysis Method	Coding	5
	Content Analysis	9
	SWOT Analysis	2
	Thematic Analysis	2
	Document Analysis	1
Quantitative Analysis Method	Regression	3
	Delphi	1
	Factor Analysis	3
	Analysis of Spatial Data	6
	Multiple-Factor Analysis	2
	Mean	3
	Coding	5
Qualitative Analysis Software	VOS viewer	3
	VOYAT TOOLS3	2
	MaxQDA	3
Quantitative Analysis Software	Excel	-6
	SPSS	-4
	GIS	7,
	Google Map	2
	Auto CAD	1

Taking the data collection method into consideration, it is evident that archival and library studies are the most widely used methods, with a total of nineteen studies having used these two methods. The finding indicates a reliance on the currently

available information resources and a preference for using archival materials, official documents, or historical records to inform research investigations. Accordingly, fourteen studies used interviews as their main data collection method, suggesting a significant emphasis on collecting structured data through inquiries to address the research objectives of the study and gather insights from participants. Moreover, six studies used field surveys to collect their required data.

As a flexible and powerful approach for examining meanings, themes, and patterns in a database, content analysis is a widely used method in qualitative studies that involves systematic analysis of textual, visual, or audio content. In this regard, the analysis of the articles selected for this study revealed that content analysis was the most frequently used method, applied in nine of the abovementioned articles, followed by open coding, which is a fundamental technique for analyzing qualitative data, allowing researchers to interpret raw qualitative data and identify the basic building blocks of the meanings embedded in them. Moreover, five studies were found to have developed rich sensitive interpretations concerning human experiences and behaviors.

On the other hand, two studies were found to have used the SWOT method as a versatile tool that helps individuals and organizations make informed decisions and develop realistic action plans based on a comprehensive assessment of their internal and external environments. Furthermore, two studies used thematic analysis to identify, analyze, and report identified patterns (themes) embedded in their collected qualitative data. Additionally, one study used document analysis to interpret collected data.

As for the qualitative software used in such investigations, it was found that three studies used VOSviewer and MaxQDA, and two studies used VOYAT TOOLS3. On the other hand, GIS, EXCEL, SPSS, Google Map, Autocad were the main quantitative software used in seven, six, four, two, and one studies, respectively.

Finally, it can be concluded that the philosophical paradigm of a research generally refers to the fundamental beliefs and assumptions that form the researcher's approach to knowledge, reality, and the nature of research, directing the selection of research methods, data collection, analysis tools, and the analysis of findings .

Moreover, using common analytical methods such as content analysis, coding, and thematic analysis, qualitative studies concentrate on rich accounts and the underlying textual data and make a determined attempt to delve into the meanings embedded in research findings.

However, it should be noted that qualitative research is aimed at gaining a deep understanding of human behavior, attitudes, and experiences, seeking to discover and understand the fundamental reasons, motivations, and underlying bases of a phenomenon. Thus, it can be argued that qualitative research is exploratory in nature and seeks to uncover motivations, beliefs, and fundamental attitudes. Therefore, choosing this research method is useful only if a researcher seeks to deeply understand the meanings that individuals attribute to their experiences.

It is worth mentioning that qualitative research employs various data collection methods, including interviews, focus groups, observations, and surveys, which allow researchers to collect rich and deep data that illustrate the complexity of human experiences and perspectives. Accordingly, considering the unknown nature of the intended variables, this study adopted a qualitative approach using structured interviews to collect the required data. It should be noted that the goal of an exploratory design is to discover problems through the collection, analysis, and interpretation of qualitative data.

## **Research Method**

The underlying philosophical worldview of this qualitative thesis elaborates on its methodological position, directing its strategy accordingly. In this regard, it could be argued that this study seeks to provide an understanding and interpretation of humans' meaningful social actions in the world we live in, and thus, it is less technical in nature. In other words, the current study attempts to understand, analyze, and interpret novel solutions for the redevelopment of brownfields by collecting sufficient qualitative evidence from the ongoing social interactions and seemingly stereotypical daily life of citizens, seeking to improve the quality of human life.

To this end, this study selected inductive content analysis as its research method, taking into account the dominance of quantitative studies that have failed to provide a comprehensive picture of the concept and componential elements of brownfield redevelopment. Moreover, few qualitative studies have so far been conducted to explain the psychological nature of relevant novel solutions through the investigation of lived experiences of different countries.

It should be mentioned that content analysis is used for research on specific situations that aim to identify the process of an event and its causes and effects. Moreover, this method is applied in situations where existing theories are insufficient, hypotheses are inadequate, and there is a need for more hypothetical propositions for future studies, or a need for a theory compatible with specific social, economic, and cultural conditions. Therefore, the goal of this fundamental research was to collect information through documentary methods (referring to relevant organizations and agencies for statistics, information, maps, etc.), library methods (for studying theoretical models to determine the criteria for measuring brownfields), and field methods (by observing the current situation of the study area and conducting interviews).

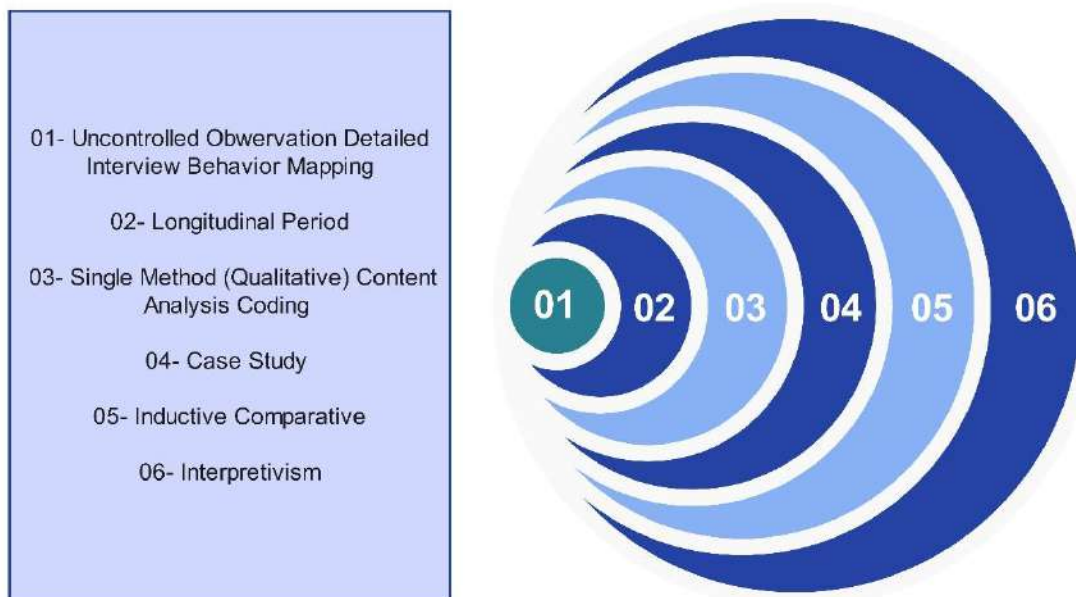


Fig 3: The Research Onion According to the Sander's Model

Content analysis is generally used in cases where the researcher seeks to identify the processes underlying the occurrence of a phenomenon, its causes, and its consequences. Moreover, this method is applied in circumstances where existing theories are insufficient, hypotheses are inadequate, and more hypothetical propositions are required for future studies or when there is a need for a theory that suits specific social, economic, and cultural conditions. Therefore, the current study follows fundamental objectives, trying to fulfil them by collecting the required data through document analysis, referring to the relevant organizations to obtain the necessary statistics, information, maps, etc., conducting library studies to examine theoretical models and determine the criteria for evaluating brownfield sites, performing filed surveys, and conducting interviews.

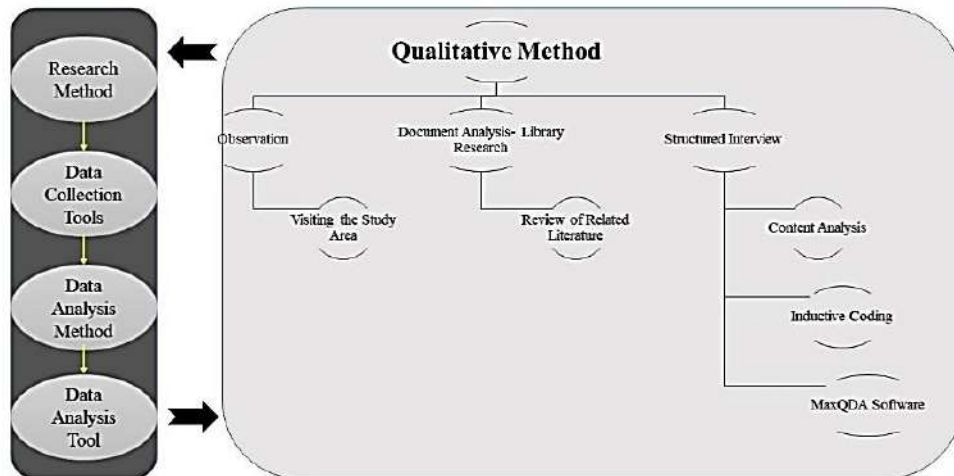


Figure 4: The Process of Conducting the Research

As far as the data collection is concerned, conducting in-depth interviews with key relevant actors and stakeholders engaged in urban planning was the most efficient method used to collect the required data. It should be noted that an in-depth interview is a tool for delving into the thoughts of various actors involved in the projects as the most competent resources in expressing their experiences regarding the projects' processes. On the other hand, in-depth interviews make the interviewees unconsciously offer analyses that reveal many sociological issues and solutions concerning the research topic. In the current thesis, the population of the study comprised all stakeholders involved at different levels of the initial

brainstorming process, planning, policy-making, designing, implementing, and developing brownfields. Therefore, the main groups interviewed in this research were as follows:

- Senior officials and managers of urban projects
- Urban designers and planners
- Urban planning professors

The interviewees were selected using a purposive snowball sampling method according to the common characteristics of those engaged in different stages of policy-making, planning, implementing, and redeveloping brownfields. The sample size was not predetermined at the beginning of the study and was specified based on the theoretical saturation criterion. The interviews were conducted online over a three-month period, from mid-September to late November 2022, with a prior appointment. Moreover, a brief explanation was given to the interviewees regarding the topic of the thesis and its objectives, and they were assured of the confidentiality of their information.

## **Statistical Population**

Geographically, the statistical population of the study comprised of specialized groups. However, as the sample size of the exploratory studies should not necessarily be made of the same number of samples who are selected from the intended population, the participants of the study were selected based on the experts' opinions. Accordingly, in the first stage of data collection, structured interviews were conducted with experts and influential people in urban management. The researcher then performed a comparative and critical analysis of currently available solutions.

Table3 : Description of the Research Components

Research Components	Description of the Components in the Current Study
Paradim	Interpretivism
Approach	Qualitative
Design	Explorative
Data Collection Method	Library Research: Examining books, articles, and relevant documents Qualitative: Direct observation, interview, notetaking
Sampling Method	Systematic
Statistical Population	Relevant experts and professionals
Data Analysis Method	Content Analysis (Inductive coding)

## Sample Size

Considering the topic of the study and the views of relevant experts, some 17 participants were selected to be interviewed. It should be noted that the sample size was finalized when theoretical saturation was achieved.

## Sampling method

Systematic sampling, also known as principled rule-governed sampling, refers to a form of probability sampling method in which samples are selected from a larger population using a fixed periodic interval, starting at a random point. The sampling interval, referred to as the sampling interval, is calculated by dividing the population by the desired sample size. In this extensive application of probability sampling, a sample is created by systematically selecting each member of the group.

## Data collection method

Data collection and review of related literature were carried out through library research using the content analysis method. Accordingly, data regarding foreign experience were gathered through a review of library documents, and information concerning domestic experience was collected via direct observation, field study, and interviews. The environmental components related to the topic of the study were then extracted from the collected data. As for the identification and analysis of brownfields, the current research used field studies to observe and analyze people's behavioral patterns, followed by in-person interviews conducted based on scientific principles (in line with the research objectives) at brownfield sites,

whereby the views of the sites' users were recorded and their behavior was analyzed.

Table 4: Questions and methods used in the research

Questions	Data Collection Method	Research Tool	Data Analysis Technique and Tool	
What is the framework for the applicable solutions already suggested for brownfield redevelopment?	Document Analysis- Library Research- Field Study	Reviewing International Experience	Content Analysis Exploratory Analysis SWOT	Main Question
What indicators are effectively involved in brownfield redevelopment?	Document Analysis- Field Study	Reviewing International Experience Structured Interviews	Content Analysis MAXQDA software	Sub Question1
Which of the currently available solutions for brownfield redevelopment is applicable to Barracks?	Document Analysis- Library Research- Field Study	Reviewing International Experience Field visits of the sites	SWOT	Sub Question2

## Designing Interview Questions

Modifying the conceptual model derived from the related literature, the interviews made in the current study played a crucial role in advancing the research. Accordingly, the research questions to be used in the interviews were continuously designed based on the study process as the study progressed, leading to the development of the study's conceptual model and the design of interview questions. The elaboration of the brownfield redevelopment process (as one of the main components of the model) and developing innovative solutions for such a redevelopment were among the main themes used in designing the research questions.

## Research Interview Protocol

Considering the exploratory nature of the approach adopted in the current study, the interviews enjoyed a simple structure. However, this does not mean that the collected data were incoherent and that it was possible to deviate from the research process, as the researcher had defined a specific scope for the subject under study and interviews at all stages of data collection. Accordingly, after



defining the topic of the study and selecting the research method, the researcher designed a general plan for the interviews. Therefore, at the beginning of this stage, the focus of the study was specified in detail and the relevant words, phrases, concepts, questions, and topics were determined. Finally, the intended themes to be included in the interview were decided, and a draft of the interview guidelines was prepared, according to which the interviews were conducted.

It should be noted that prior to the start of the interviews, the interviewees were informed about the research objectives and reasons why they were selected for the interview, and were given the necessary assurances concerning the confidentiality of the information. Moreover, the researcher conducted interviews according to the prepared guidelines, trying to provide the same conditions for all interviewees. Recording the interviews by a digital recording device, the researcher also wrote down the interpretations she made when the interviews were going on. Finally, after putting down some information such as the title, date, and number of interviews and the name of the interviewee, the recorded interviews were electronically transcribed within the MAXQDA software. It should be noted that the interviews were transcribed word-by-word, and additional explanations are provided in parentheses. Furthermore, when transcribing the interviews, unrelated issues raised by the interviewees were not removed from the final transcripts, and the wordings were kept the same as they were naturally uttered during the course of the interviews.

## **Data Analysis Process**

### **Content Analysis of Documents**

The content analysis performed on the documents regarding the international cases examined in this study sought to apply triangulation, and thus supplement the data obtained from in-depth individual and focus group interviews. Accordingly, the general framework governing the actions and beliefs of urban designers and planners can be discussed in terms of the criteria determined in this study. As an analytical comprehensive strategy that requires a systematic objective examination of the relationship forms within the documented patterns, inductive content analysis was used to investigate the documents collected in this study.

The primary sources used in this study included documents of reports prepared by consultants of brownfield redevelopment projects and documents published by employer and architectural firms. On the other hand, the secondary sources comprised of articles, criticisms, and various reports published over the past years on international cases of brownfield redevelopment in scientific research journals, newspapers, and news websites.

Accordingly, together with the theoretical principles derived from the review of the related literature, the information gained from the initial recognition of the spatial, physical, environmental, and social characteristics of the brownfield sites (as one of the main aspects of the research questions) directed the questions which were designed to be asked in the form of structured interviews. The researcher then visited the study area and investigated the economic dimensions of the site, trends and inclinations in the relevant market, and the patterns of the barrack to be studied compared to similar international cases already examined in other countries using in-person interviews with relevant actors. Simultaneously, with the help of observations and the results obtained by collecting local information from written and unwritten documents and works, important and sensitive points of the case were also investigated.

### **Content Analysis of Structured Interviews**

As a qualitative data analysis technique, inductive coding was used to analyze textual data. Accordingly, the interviews were recorded and transcribed in the MAXQDA software so that qualitative content analysis could be performed. In the next stage, to identify concepts and categories, important sentences were summarized in the form of precise, explicit, and concise propositions, which were then categorized using the coding technique.

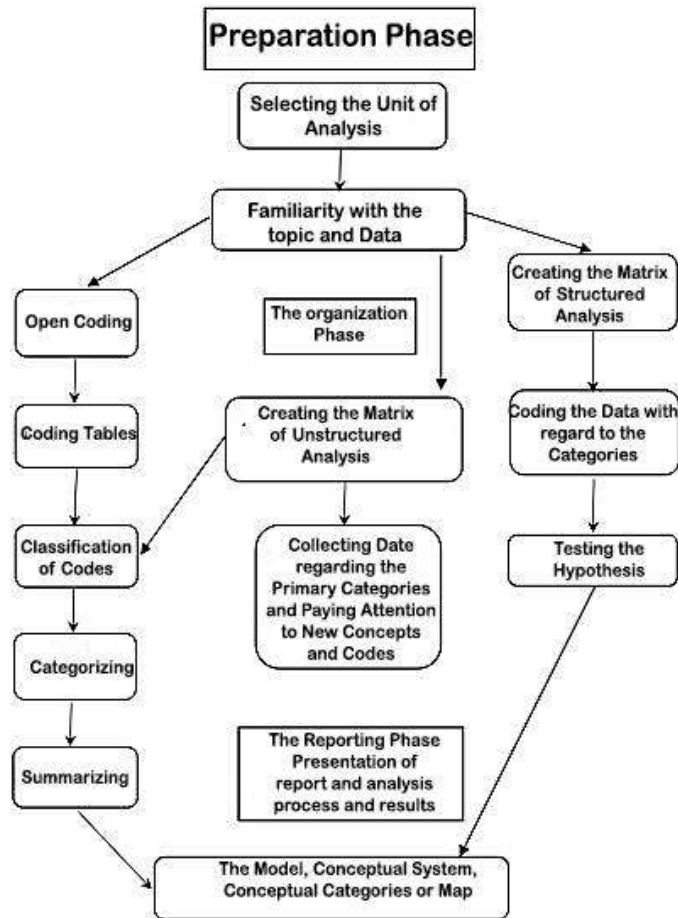


Fig 5: Content Analysis Phases in Two Inductive Paths (Adapted from Elo & Kyngas, 2007: 110)

The analysis-derived concepts and categories are either connected to or derived from the text. Accordingly, the primary and main categories were classified in the form of cluster categories, and ultimately, sub-codes and secondary-level categories were connected to each other via within-case and cross-case analyses. This study used a gradual, cumulative, and stepwise process for collecting and analyzing data, that is, data collection and analysis are intertwined. Therefore, collection is guided and expanded by data analysis, and the analysis phase also proceeds through the process of accumulation, completion, and theoretical saturation of data. Accordingly, the data were initially analyzed step by step for each individual interview.

It should be noted that in qualitative analyses, the required data are collected from various sources, and within-case analyses are performed non-linearly, continuously, and comparatively based on the data obtained in each interview via

different tools. Moreover, in each phase, cross-case analysis was performed simultaneously with data collection and analysis. Finally, the phases are completed by identifying similarities and differences and putting them into deep tests that are carried out through specially designed tools.

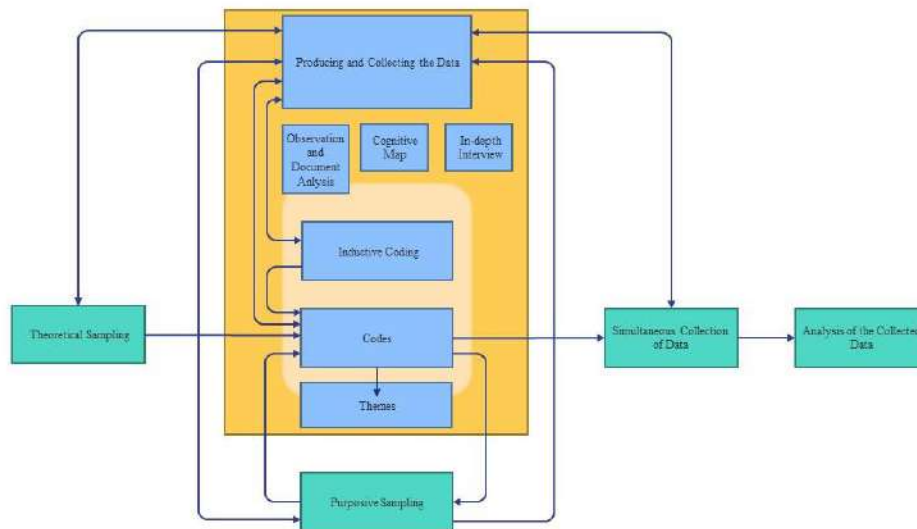


Fig 6: The Phases of Extracting Qualitative Data in the MAXQDA Software

## Conclusion

This chapter outlines the research design of the current study, provides insight into how the study was conducted, and answers the research questions. Considering the research objectives, questions, and conceptual framework, this chapter begins by reviewing the related literature. Then, given the necessity of agreement between the research paradigm and the topic of the thesis under study, the interpretive paradigm was chosen as the primary axis in the framework of research strategy, followed by the introduction of the data collection and analysis methods and tools. Accordingly, a qualitative approach was adopted to answer the research questions. On the other hand, the participants of the study were selected via purposive sampling from among the experts of urbanization and the urban managers.

Furthermore, taking mental maps into consideration, the required data were collected from documents, books, academic articles, theses, etc., using library research and in-depth structured interviews. The linear formative data analysis

process was performed simultaneously with data collection using inductive coding, followed by the application of complementary, convergent, divergent, and meta-inference strategies. It is worth mentioning that the analysis of the literature on brownfield redevelopment from a methodological perspective was a key step in defining the research paradigm and framing the research strategy and method, and designing data collection tools.

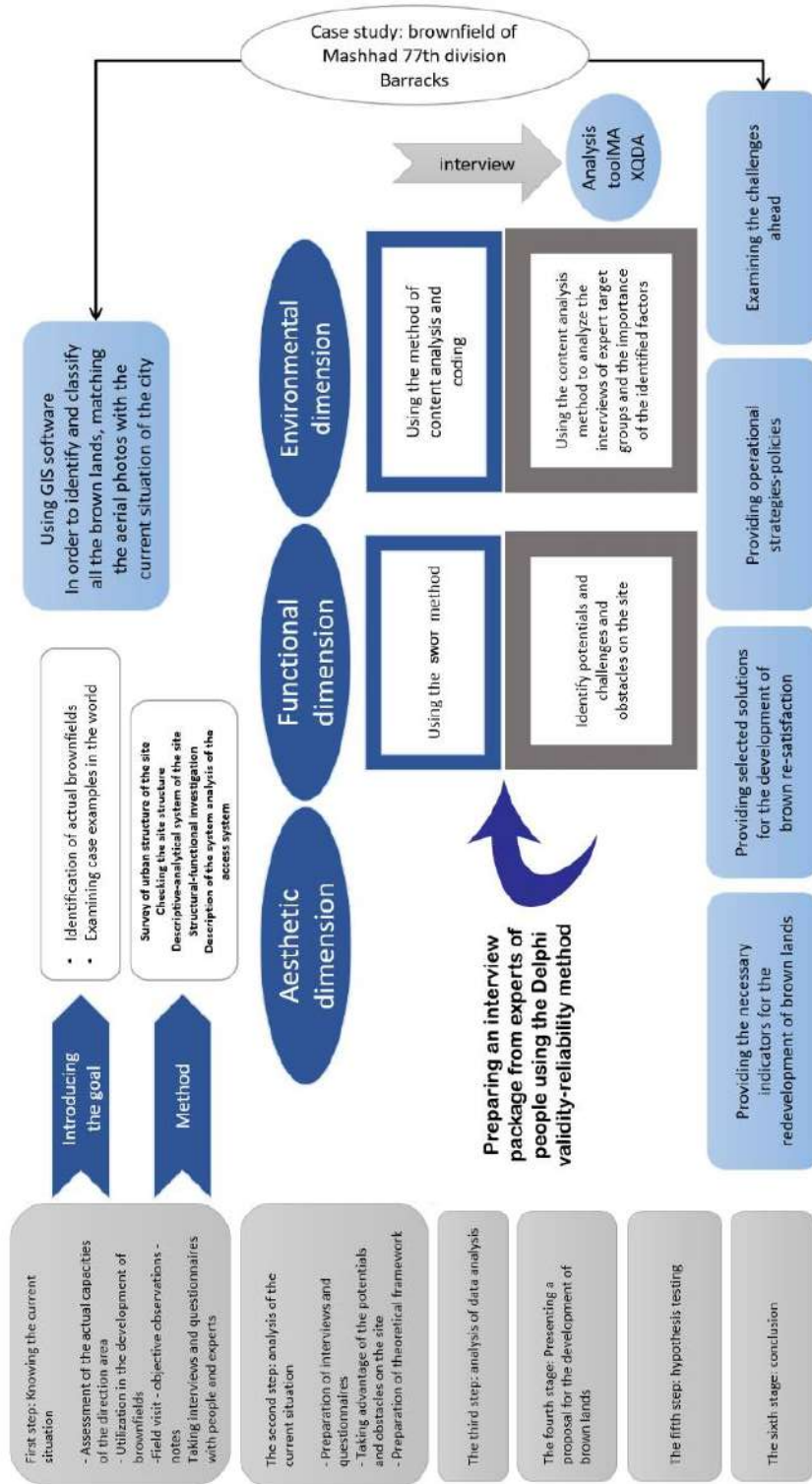


Fig 7: Research methodology process

## **Part II**

### **Chapter 4 Worldwide experiences in urban redevelopment**

## **Introduction**

The land provides the foundation for all human activity, including the supply of houses, services, and urban amenities. Urban planners and managers must make the best use of available land resources. In this regard, barren lands are one of the key potential uses to provide the space needed for public services (green space, parking, libraries, etc.) at the neighborhood, district, and regional scale, which is not addressed to them in less developed countries. However, substantial land areas within cities remain undeveloped for legal, commercial, or environmental reasons, while large-scale, densely populated developments occur in other locations. The Environmental Protection Agency (EPA) defined barren lands in 1994 as abandoned lands without special use or lands used by industrial or commercial facilities that are redeveloped due to natural pollution. And the synthesis they have is complex (Thornton et al., 2007). Urban land reclamation is an idea based on the use of undeveloped land. The existence of undeveloped lands is a suitable tool for their optimal use due to the changes in the social, economic, and physical systems of each region and basically the whole city. These lands provide adequate potential for re-planning in relation to the surrounding areas. These lands can provide an opportunity for neighborhood transformation, and under the best of conditions, these lands create jobs, taxes, and even more development around them (Greenstein et al., 2006). One way to boost the need for more land for development and habitation is through land reclamation. Many coastal nations, including the Netherlands, Britain, Japan, South Korea, and Singapore, have historically rehabilitated and enclosed large areas of the sea to increase the size of their coastal cities, provide land for the development of industries and agriculture along their coasts, and provide storm protection (Wang et al., 2014).

Throughout history, there have been numerous examples of the conversion of unused and dilapidated land and buildings into public urban spaces. This chapter tries to examine some of them in terms of design goals and their design ideas.



# Methodology for Analyzing the Projects

As seen in the graph below, project evaluation is divided into two sections: quantitative and qualitative. The qualitative evaluation includes some information, such as design interventions, function, and location, which were acquired using the comparative table found in the final section of this thesis's practical background chapter. The quantitative evaluation, on the other hand, focused on managerial issues such as information about the owner, stakeholders, money, project viability, maintenance, involvement, and so on. A database warehouse will be utilized to collect all of the information gathered from the case studies.

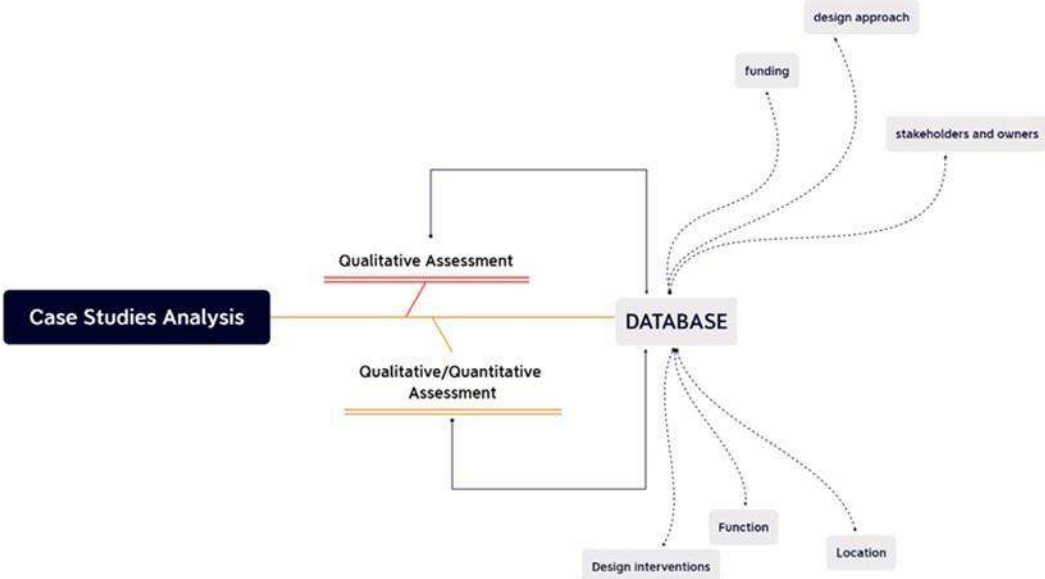


Fig 1:

# United Kingdom

## The King's Cross Development



Fig 2:

King's Cross Development in the United Kingdom is regarded as a major urban regeneration project pointing to a huge area and turning an industrial zone into a vibrant mixed-use neighborhood. Once it was a major industrial and transport hub, and especially a major center of railway activity. But today, it has been remodelled as a flexible urban region that combines business, residential, and recreative areas. Many architectural styles cover hectares of land in the architectural restoration part of the rehabilitation project. Many of these elements in the project are already in effective use and working as the whole project approaches completion.

The sources of funds for the King's Cross Development are broad in scope, from public funding and government investment to contributions from commercial developers and public partnerships. Local government officials, private developers, community leaders, and transportation organizations would be necessary to bring on board to solve the social and economic issues including affordable housing, job creation, and historical preservation. The project has been developed slowly over a few years, reducing the kind of disruptions that other large projects would incur, and the notion is that with careful emphasis on community interaction and feedback tools, citizenship will be stimulated.

The urban redevelopment approach is multifaceted and solutions have been drawn from various fields in the project. Mixed-use zoning is preferred for the encouragement of a mix of residential, business, and cultural activities. Improvements under the guise of improvements to movement and access have included bike infrastructure, pedestrian paths, and public transportation. The key to this kind of project is public spaces with parks, squares and common areas which

people will be able to share. The urban scheme through the creation of a special cityscape, merging modern with historic architectural features is an original project. Green roofs, energy-efficient buildings, and water management are some of the elements for eco-friendly designing considered to represent very high respect for biodiversity and ecological balance.

**The interventions of this project are:**

Project name	Strategy	Interventions
United Kingdom The King's Cross Development	Historical Buildings Adaptive Re-Use	The King's Cross Station, a Grade I listed structure, is a groundbreaking adaptive reuse project in the King's Cross Development. The mixed-use zoning will include residential, commercial, and cultural facilities, creating a vibrant urban environment. The project also encourages comprehensive sustainable transportation, including pedestrian walks, cycle lanes, and public transportation, enhancing mobility and eco-friendliness.
	Smart City Technologies	Smart city technologies allow sharing of real-time data through mobile applications with the support of intelligent infrastructure, benefiting mobility, transportation updates, and improving access to more interactive services. These are some of the factors resulting in techno-savvy urban life to its residents as well as to its visitors.
	Inclusive Public Places	Public spaces are endowed with universal design placing them in a manner that it becomes inclusive. Plazas, parks, and squares are located in strategic places that are easy to access for diverse communities and welcoming to all age groups and abilities. Green Roofs and Sustainable Building Practices
	Green roofs add green spaces	save much energy by a substantial percentage, and reduce the impacts of the urban heat island. Sustainable building practices entail ecological materials and technologies; hence they contribute to the ecological sustainability of the building.
	Creative Storm Water Management	Innovative storm water management, including permeable pavements and water gardens, reduces flooding, recharges groundwater, and minimizes pollution, while fostering biodiversity and ecological resilience in urban ecosystems.
	Art Installations	Sculptures and murals greatly spruce up the public spaces that exist, giving the communities focal points and further promoting their identity and pride.
	Redemption of the buildings will engage the local community	Participatory urban development involves forums, workshops, and feedback channels, empowering local residents to take ownership and collective responsibility, fostering transparent communication between community and developers.

## Europe

### This is not a vacant lot, Zaragoza, Spain

The project is presented in the historic city of Zaragoza, Spain, which has residential buildings combined with street-level commercial spaces. With the increase in the number of young immigrants to this city, a good balance has been established between the old and young population in this city. The concentration of the migrant population has led to an increase in youth and families living in the area, but it has also increased the unemployment rate in the neighborhood. Given this situation, the Zaragoza City Council developed a strategy called "Estonoesunsolar" ("This is not a vacant land"), which was taken over by architect Patrizia di Monte (Casanova & Hernandez, 2015). "Estonoesunsolar" literally means that this is not an empty area, according to which the public open space strategy in the city of Zaragoza was considered. The main goal of this project was to provide public open space by converting the existing vacant land into a temporary living public space (Shirleyana & Sari, 2013). Figure 1 shows a view of the project area of "This is not a vacant lot" throughout Zaragoza and the early pre-reconstruction areas.



Fig 3: An overview of the project at early stage (Casanova & Hernandez, 2015)

The project team started in 2009. In 2010, Patrizia di Monte set up a special office called "This Land is Not Empty," whose primary purpose was to combine an employment plan, providing employment for the long-term unemployed, with a rehabilitation plan to clear many vacant lands in the center of Zaragoza to improve its physical condition. Based on his previous urban studies focusing on vacant land in Zaragoza, Patrizia di Monte, the architect in charge of the technical office "This Land is Not Empty," suggested that the fences and walls that separated the land from public space should be destroyed. In doing so, the vacant plots were

integrated into the city's public space network until they were built (Casanova & Hernandez, 2015). The Technical Office, affiliated with the Zaragoza Vivinda Municipality, combined an employment plan for the unemployed in the area with a plan to clear vacant land, which later became a strategy for public use of the abandoned land. Thus, the walls and fences around many abandoned public and private lands in the dense historic center of Zaragoza collapsed. The grounds were cleared, and many of them were turned into small public squares, children's playgrounds, and community gardens, which were integrated into the city network of urban public spaces.

In 2009, the public could access the vacant lot, which is only open to the street on one side and has walls of nearby buildings on three sides. The space is designed as a theme garden with four areas of shrubs. Aromatic plants, reptiles, and flowers are divided and linked to schools and educational centers to promote educational and recreational activities. There are a number of benches and an informal bicycle parking lot in front of the garden (Casanova & Hernandez, 2015).

The project consisted of three different sections: the Zaragoza government as the initiator, the planning team, and the local community. In practice, local people participated in both the idea and the implementation of the public space tailored to their needs. The success of this project eventually spread throughout the city. There were a number of vacant lots that were successfully turned into children's playgrounds, basketball courts, city gardens, and playgrounds, and they became a lively place that was well used by the community.

The success of this project was mainly due to the good communication and cooperation between the government and society. The direct participation of the community from the beginning of the project, implementation, and operation strengthens the sense of ownership of the temporary public open space created. A sense of ownership and community participation are essential elements for achieving sustainable development (Shirleyana & Sari, 2013). In Figure 2, a view of the completion of the project "This is not a vacant lot" and its use are provided.





Fig4 : An overview of “This is not a vacant lot” (Shirleyana & Sari, 2013).

In this project, 14 vacant plots (12 private vacant plots and 2 public plots) were turned into public spaces in different parts of the city. In addition, 44 vacancies were cleaned and painted to achieve the main goal of the program. This urban renovation covered a total area of 9800 m<sup>2</sup>.

### The interventions of this project are:

Project name	Strategy	Interventions
Europe This is not a vacant lot, Zaragoza, Spain	Public Open Spaces	Redesign Plaza del Sol as a lovely green open space with benches, trees, and paths to enhance the area's beauty while considering the needs of the locals' leisure and play areas.
	Arts Installations	Place sculptures, murals, or interactive art installations as public art installations along "Calle de la Creatividad" to add visual and cultural interest and strengthen the community's distinct identity.
	Mixed-Use Development	Add mixed-use structures to "Avenida de la Convivencia" so that multipurpose structures can be used for business, residential, and recreational activities.
	Outdoor Event Space	Create open areas at "Plaza de la Cultura" for community gatherings, markets, and concerts since they enhance the district's social and cultural vitality.
	Walkability and Bike Ability	In order to provide a comprehensive, linked, safe travel environment, Calle Peatonal's bike lanes, pedestrian-friendly sidewalks, and traffic calming should all be upgraded.
	Adaptive Reuse of Buildings	Calle Historica's current infrastructure is being put to creative, forward-thinking applications, preserving historically significant elements while adapting to changing community demands.
	Smart Technology	The project at Avenida Tecnológica will incorporate smart technologies for sustainability, efficiency, and safety, while also creating affordable housing programs in Barrio Solidario.
Programs and Infrastructures	Zona Educativa offers educational programs and facilities, including community centers with classrooms, libraries, and workshops, which greatly benefit locals in their daily lives.	

- Run on a limited budget
- Some money was spent on the materials used in the interventions
- Idea took for transforming 14 vacant lots in 2009
- Materials: concrete and cleaning 44 vacant lots
- 200,000 euros was used to pay 40 people's salaries and to cover the expenses for the materials used in the interventions in 2009
- The intervention was repeated in 2010
- The Low budget made it difficult to use standard urban furniture elements
- The playground equipment was purchased, the rest of the elements were all built by the working team

**Cost, Financing and Maintenance**

**Stakeholders and owners**

- Subject Plaza of Noite
- Municipality entity Zaragoza

**This is not a vacant lot**  
Zaragoza, Spain

**Measure**

1660 sq. (2009)  
3200 m<sup>2</sup> (2010)

**Citizen Participation**

Participation is organized through a series of meetings between the technical office architect and the main local actors

- Designing each intervention and its subsequent construction all took place within an average period of four weeks per intervention
- 14 interventions were carried out in public spaces in the first year and 5 in the second year
- Applied a long-term strategy that includes the possibility of acquiring a permanent character

**Timing**

- Jobs for people
- Making an employment plan
- Choosing a specific use for the lot based on citizen participation
- The population of elderly people has been compensated by a growing number of young immigrants
- The unemployment rate has risen in neighborhoods

**Social and Economic issues**

Presented with JPHind

Fig 5:

### Temporary interventions in vacant lots, Madrid, Spain

The Spanish economy experienced significant economic growth between 1997 and 2007 due to the "real estate bubble." As a result, the average house price tripled over a ten-year period. This increase also had an impact on Madrid, which is considered to be the nation's capital. As the historic center of Madrid is crowded, the demolition of existing buildings creates interesting urban voids. Depending on their location in a corner piece or between party walls, they are spatially bound by a horizontal floor plate with one, two, or three vertical plates. This strategy activates inactive areas of the city and transforms the abandoned private space into a temporarily programmed active public space. This strategy takes into account changes in the location of active areas over time, depending on the availability of a large number; however, it always ensures a sufficient balance between uses and distances from one intervention to another in order to maintain the intensity of the action (Casanova & Hernandez, 2015). Figure 6 shows a list of candidate locations in Madrid for the proposed project.



Fig 6: The candidate locations of "Temporary interventions in vacant lots" in Madrid (Casanova & Hernandez, 2015).

The project "Temporary interventions in vacant lots" in Madrid, Spain, focuses on the use of vacant or underused land that has not been built or abandoned due to a lack of funding. For this reason, the idea of this project is based on creating spaces to strengthen social interaction through three types of spaces: work, play, and residence. These spaces are in strategic areas while maintaining balance between uses, distances, and major interventions. By changing the scale to the block level,



due to the lack of public space and the large population that currently exists in the area under intervention, it is necessary to free the areas where urban acupuncture can be produced. In these places, play, work, and rest activities are promoted. The "Temporary Vacancies Intervention" project in Madrid, Spain, in turn, has implemented the Plaza del Torico project strategies to draw users to the proposed activities within the block (Cárdenas Sacoto, 2020).

According to this strategy, each empty urban space is associated with the color used to paint the polyurethane foam, which acts as thermal insulation when sprayed on party walls and is based on the vegetation characteristics planted in the ground. This strategy is based on low-cost interventions in terms of implementation and maintenance, because in any case, painting the walls of the party is functionally necessary to protect the spray foam from ultraviolet light. Additionally, encouraging residents to collaborate in creating and managing interventions can reduce costs in some types of interventions (Casanova & Hernandez, 2015). Figure 7 provides an overview of the “temporary interventions in vacant lots” project implementation based on vegetation-based painting of the area.

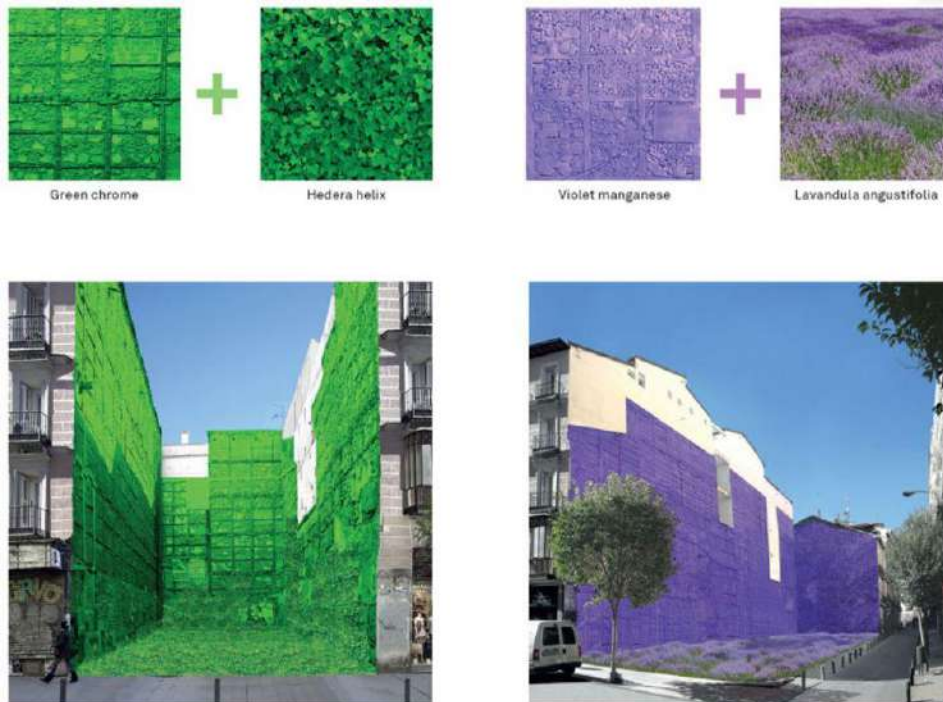
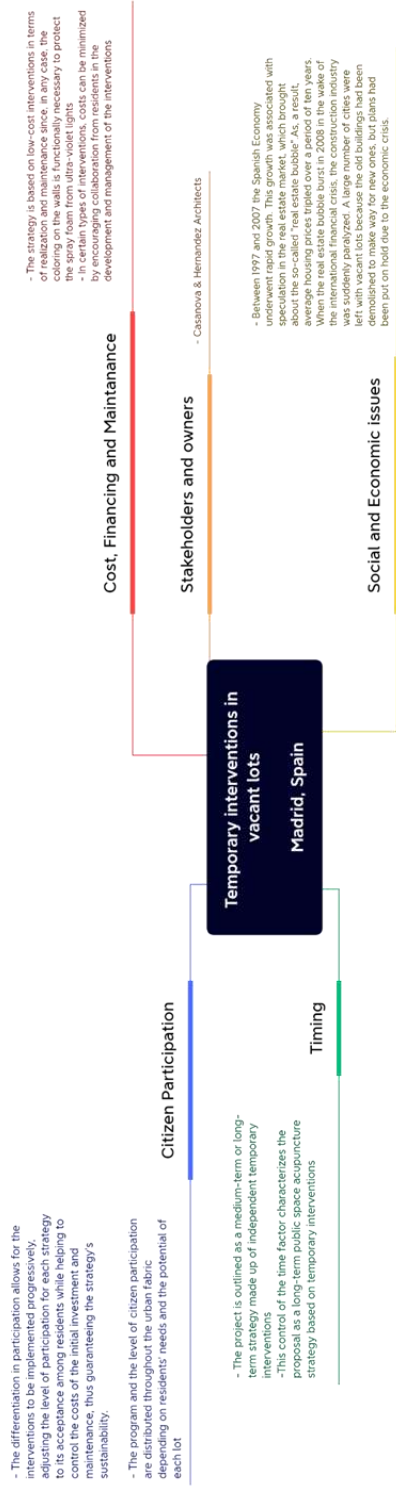


Fig 7: An overview of the “Temporary interventions in vacant lots” project (Casanova & Hernandez, 2015)

## The interventions of this project are:

Project name	Strategy	Interventions
Temporary interventions in vacant lots, Madrid, Spain	Community Gardens	“VerdeVida Plaza” aims to transform empty lots into community gardens, featuring cozy lounging areas, winding walkways, and eye-catching art displays to foster community involvement.
	Pop-up Art Installations	ArtesEfimeras encourages local artists to utilize empty lots as canvas for sculptures, murals, and transient art projects, fostering a dynamic and creative environment.
	Outdoor Performance Spaces	“Escenario Libre” aims to create movable stages for concerts, music festivals, and cultural gatherings, featuring well-planned seating, food vendors, and interactive art pieces to attract visitors and support regional artists.
	Flexible Marketplaces	Create makeshift markets with modular stalls for nearby farmers, craftsmen, and business owners. Because “MercadoMóvil” is flexible, a wide range of merchants are encouraged to participate, boosting the local economy.
	Urban Playgrounds	“JuegoEnLaCiudad” aims to create family-friendly playgrounds featuring movable structures like climbing walls, swings, and creative play components for both kids and adults.
	Fitness Zones	Convert empty lots into outdoor fitness areas with jogging tracks, yoga areas, and exercise equipment. FormaViva encourages inhabitants to lead active, healthy lifestyles and offers a social hub for interaction.
	Temporary Sports Courts	Makeshift fields for sports such as basketball, volleyball, and mini-soccer. Deporte Temporal encourages physical activity, social cohesiveness, and healthy competition.
	Educational Spaces	“SaberAbierto” is partnering with local colleges, universities, and community organizations to establish makeshift learning centers for seminars, talks, and skill-sharing events.



Presented with XMind

Fig 8:

### **I love to play! & Painting initiative, Tirana, Albania**

Edi Rama, a former mayor of Tirana, started it in 2000 after 50 years of communist rule in Albania. He demolished illegal buildings throughout the city center. Also, the neglected communal areas between the communist-built apartment blocks were rebuilt. Existing green areas of squares and parks were rebuilt, and many new ones were created. In parallel with this campaign, he developed a global strategy based on small interventions in the existing urban structure, which is divided into different programs that target specific aspects of public space. Project "I love to play!" It involves the construction of 100 playgrounds that are scattered throughout the city, using blank walls that characterize communist residential blocks as well as small, unused spaces located between them (Casanova & Hernandez, 2015). Figure 8 shows the remnants of communist rule in the city of Tirana.

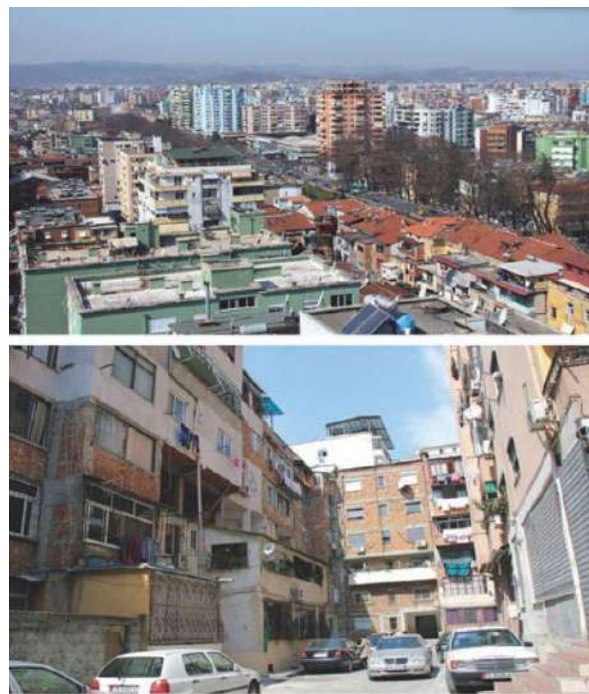


Fig 9: An overview of Tirana in communist rule in Albania (Casanova & Hernandez, 2015)

Figure 9 also shows the candidate locations in Tirana for the construction of playgrounds for children.



Fig 10: The candidate location in "I love to play" project (Casanova & Hernandez, 2015).

I love to play! It is a low-cost strategy that has a great impact on the social life of the neighborhood by using low resources. The meager financial cost of this project was mainly financed by the municipality. Private grants complementing money, materials, and expertise not only helped build the interventions themselves, but also helped create a sense of social significance. Under the project, communist-era residential buildings were transformed into basketball courts or children's playgrounds. In many cases, due to the small and irregular dimensions of the available pieces, the basketball courts were built with only one basket or with unusual ratios (Casanova & Hernandez, 2015). Figure 10, a view of the "I love to play" project.

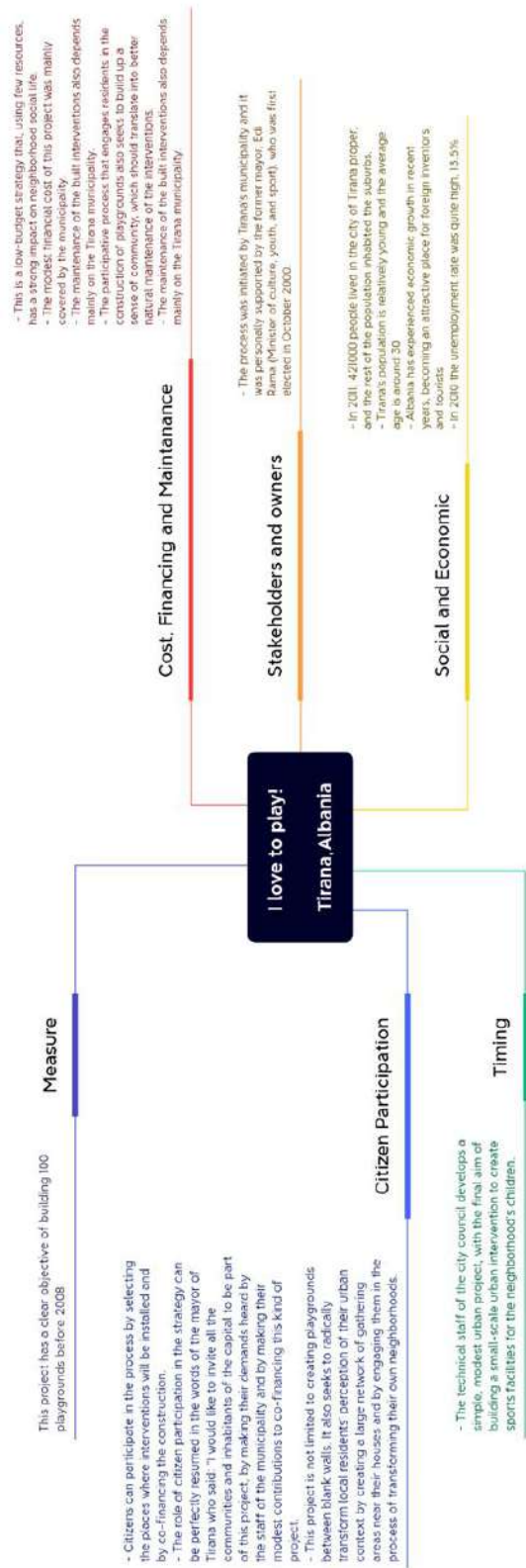


Fig 11: An overview of the "I love to play" project (Casanova & Hernandez, 2015).

**The interventions of this project are:**

Project name	Strategy	Interventions
I love to play! & Painting initiative, Tirana, Albania	Interactive Murals	Develop interactive murals in public spaces, turning them into GraffitiGlee Squares. These spaces will serve as canvases for vibrant, dynamic murals that engage the community, allowing people to actively participate in the artistic transformation.
	Playful Crosswalks	ColorCross Junctions will transform busy intersections into vibrant, colorful spaces, enhancing pedestrian safety and promoting safe city exploration through artistically painted crosswalks.
	Artistic Park Benches	Transform ordinary park benches into artistic installations within Palette Park. Engage local artists to paint unique and colorful designs on benches, turning them into functional art pieces that add vibrancy to public spaces.
	Mural-Wrapped Playgrounds	Envelop playgrounds in the city with imaginative murals, establishing Imagination Play Havens. These vibrant murals will create visually stimulating environments for children, encouraging creativity and playfulness.
	Street Piano Project	"MelodyMingle" Plazas feature painted street pianos in public plazas, allowing local artists to create interactive art installations that encourage music play and community creativity.
	Traffic Signal Art - SignalSplash Street	Create Signal Splash Streets by transforming traffic signals and signal boxes with artistic designs, enhancing the urban landscape's visual appeal and promoting responsible driving.
	Alleyway Murals – KaleidoAlley	Create Kaleido Alleys by transforming neglected alleyways into vibrant murals, inviting local artists to use these spaces as blank canvas, showcasing diverse artistic expressions.
	Community Mosaic Walls – Unity Mosaic Park	'Unity Mosaic' Park plans to create community-driven mosaic walls, promoting unity and diversity through collaborative art projects where residents contribute to beautiful mosaics.





Presented with xMind

Fig 12:

### **Velluters vacant lots, Valencia, Spain**

Velluters is a bustling neighborhood in the center of the historic city of Valencia that was full of businesses and movie theaters until the 1950s. But in the second half of the twentieth century, due to some political and social issues, many buildings in this neighborhood became abandoned or semi-abandoned. As a result, the urban fabric lost its appearance, services in the area declined, and many families moved to new apartments with modern amenities in the suburbs. Since the 1970s, about 57% of the neighborhood's residents have migrated. As a result, the population is aging in this area, and many houses in this area are empty. Because of these factors, Velluters is one of the worst neighborhoods in Valencia compared to the rest of the city. The city has five times more crime and twice the number of vacant houses. According to the results of a survey among residents, there is a lack of facilities, meeting places, playgrounds, and green space in the neighborhood. Problems discovered by residents include prostitution, drugs, insecurity, dirty streets, and the desolate condition of many vacant lots. (*Casanova & Hernandez, 2015*). The areas intended for the implementation of this project are shown in Figure 11.



Fig 11: The Candidate location Velluters project (*Casanova & Hernandez, 2015*).

Therefore, due to the problems in this area, several different local associations, together with Agrupació SOSTRE and Agrupació Arquitectes pel Paisatge, created a platform to promote the reconstruction of the neighborhood and an action plan



for public spaces and vacant lands called "Imagine Velluters" (Casanova & Hernandez, 2015).

The program called for ideas for rebuilding the neighborhood by making temporary interventions on vacant lots. This strategy proposes combining landscape interventions or artistic partnerships with a series of interventions that examine citizen participation as an engine for neighborhood change. Citizens have the opportunity to decide on the use of public space and to participate in participatory strategies with public or even private actors (Casanova & Hernandez, 2015).

Interventions Possible areas for intervention include nearly 30 vacant lots and fencing. In the future, the strategy could expand to six vacant plots currently used for parking purposes and another 30 plots occupied by abandoned buildings that may be demolished. This strategy identifies, reconstructs, and re-evaluates vacant plots in the Velluters neighborhood and activates their functional, social, environmental, and aesthetic potential through different layers of intervention that can be used independently for each plot, depending on their specific location in the neighborhood. Apply their solar orientation and their potential use (Casanova & Hernandez, 2015). Figure 12 shows an example of a reconstruction project in the Velluters neighborhood of Valencia, Spain.

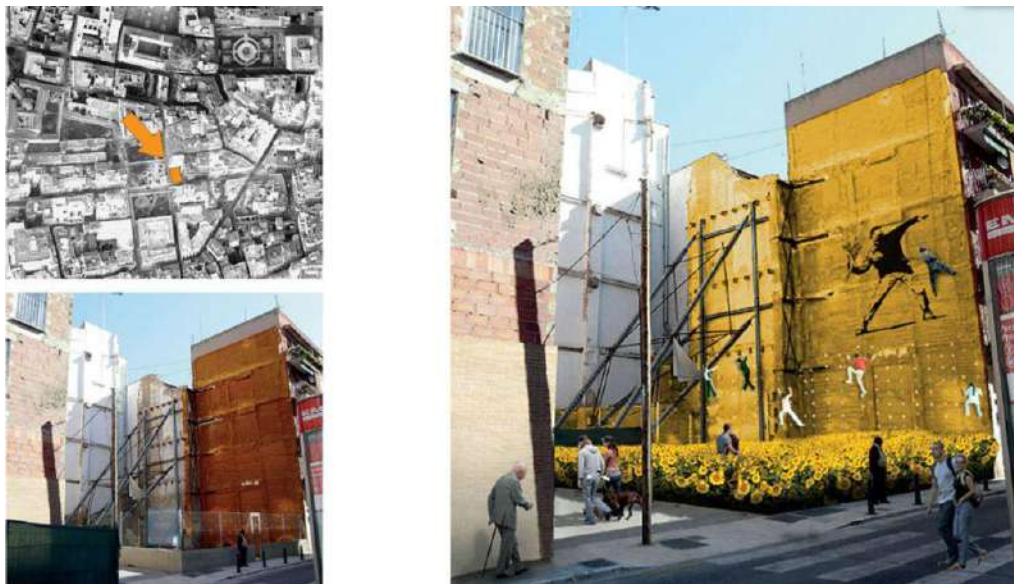


Fig 12: An overview of reconstruction project in the Velluters (Casanova & Hernandez, 2015).

The reconstruction of the Velluters neighborhood includes 30 vacant and fenced areas and 30 abandoned buildings that have been converted into public spaces

based on functional, social, environmental, and aesthetic approaches, given the potential for land and solar orientation. The main goal of this project is to achieve an open and sustainable strategy that can be effective in the short, medium, and long term. In this neighborhood, due to the large number of empty abandoned houses, the crime rate, crime, drugs, prostitution, insecurity, and dirty streets were high, with the participation of 92% of the people, and by designing the area in 3 different levels, reconstruction and the neighborhood and abandoned buildings were renovated. The reconstruction project in the Velluters is a plan to revitalize the historic district of Valencia, Spain, which has suffered from urban decay, social exclusion, and environmental problems. The project aims to improve the living conditions, cultural heritage, and economic opportunities of the residents and visitors of the area.

**The interventions of this project are:**

Project name	Strategy	Interventions
Velluters vacant lots, Valencia, Spain	Community Gardens and Green Spaces	Establish community gardens on vacant lots to promote urban agriculture. Create green spaces with trees, shrubs, and seating areas to enhance the neighborhood's aesthetics.
	Artistic Installations	Transform vacant lots into outdoor art galleries by displaying sculptures, installations, or temporary art exhibitions. Encourage local artists to contribute to the creative atmosphere.
	Pop-up Markets and Events	Utilize vacant lots for pop-up markets, flea markets, or community events. Host cultural festivals, music performances, or food markets to attract residents and visitors.
	Pocket Parks and Playgrounds	Design small pocket parks or playgrounds for children and families to enjoy. Include play equipment, seating, and greenery to create a welcoming recreational space.
	Outdoor Fitness Zones	Set up outdoor fitness equipment in vacant lots to encourage physical activity. Design workout stations that cater to various fitness levels and preferences.
	Community Art Projects	Engage local residents in collaborative art projects, such as mural painting or mosaic installations. Foster a sense of community ownership and pride in the neighborhood's transformation.
	Temporary Performance Spaces	Convert vacant lots into temporary performance spaces for outdoor theater, music concerts, or dance performances. Use the area as a venue for cultural events and performances.
	Educational Gardens or Learning Centers	Establish educational gardens or learning centers focused on sustainability, horticulture, or urban ecology.
	Outdoor Seating and Gathering Areas	Install benches, picnic tables, and other seating options to create inviting gathering spaces. Provide a place for residents to socialize and enjoy the outdoors.
	Rainwater Harvesting and Sustainable Features	Implement sustainable features like rainwater harvesting systems or permeable surfaces to promote eco-friendly practices. Showcase environmentally conscious urban design principles.
	Bike Parks and Cycling Infrastructure	Develop bike parks or cycling infrastructure in vacant lots to promote sustainable transportation. Include bike racks, repair stations, and designated areas for cycling activities.
	Outdoor Art Studios	Provide spaces for outdoor art studios where local artists can work and showcase their creations. Encourage a creative atmosphere and contribute to the artistic identity of the neighborhood.

- The possible areas for intervention encompass nearly 36 fenced-in, empty lots. In the future, the strategy could be extended into six empty lots that are currently used for parking purposes and 30 more lots that are occupied by derelict buildings that may be demolished.

### Measure

- Citizens provided with the opportunity to make decisions about the use of public space and to participate in collaborative strategies together with public or even private actors.
- 38% of residents think that the neighborhood is vibrant and dynamic, although only a third of respondents are regular participants in neighborhood activities.
- 92% of residents said they would be willing to participate in the regeneration of the neighborhood along with the municipal authorities' interest in addressing the neighborhood problems, from together in a strategy that involves interventions in co-production with the municipality or with private actors.
- Citizen participation can work as an important educational tool by integrating the participation of primary and secondary schools in the strategy to awaken young people to a constructive engagement with public space and protection of the environment.
- Each intervention is defined through a citizen participation process, which means that residents of velluters can be involved in the decision-making and in the co-management of some of the proposed interventions.

### Citizen Participation

**Velluters citizens strategy in vacant lots**  
Valencia, Spain

### Cost, Financing and Maintenance

- In some special cases, the decision-making is shared with residents who are allowed near total independence in handling the tasks of management.

### Stakeholders and owners

casanova and hernandez

- Since 1978, more than 24,000 residents have moved away and the neighborhood has lost 57% of its inhabitants. A fact that, combined with a lack of new tenants moving in, has resulted in an aging population.
- One fourth of the neighborhood's residents are over 65 and 36% of the apartments are empty.
- This neighborhood has five times more crime and it has faced empty horros compared with the rest of the city.
- The neighborhood has a high level of social capital in the neighborhood is relatively high.

### Social and Economic Issues

Presented with credit.

### Sandleiten Vienna, Austria

Sandleiten, built in 1928, and Karl-Marx-Hof, built in 1930, were two milestones in the success of the housing policy in Red Vienna. This policy was created in the 1920s in response to the unsanitary and overcrowded living conditions suffered by the poor and working class of Vienna, which became extremely problematic during the period of high inflation and unemployment experienced after World War I. Sandleiten was the largest social housing experiment at the time with 1,587 apartments. After the World War and the increase of immigrants and the creation of the ghetto, as a result of the transformation of the social structure of the area, a sense of social degradation and mistrust was created among the local elderly population and the newly arrived young immigrant families (*Casanova & Hernandez, 2015*).



Fig 28: An overview of Sandleiten project

The Sandleiten project strategy consists of eight interventions located in eight urban squares around which houses are spatially arranged. Collective life is concentrated in these squares, and therefore, acting on them is an attempt to strengthen their identity, their function as an interactive space and as a generator of social life in the neighborhood and each square becomes an open room for citizens that serves as a meeting place (*Casanova & Hernandez, 2015*)

According to this project, a piece of furniture is installed in each of the urban squares, which adds a new program to the public space. Furniture interventions not only change the physical appearance and use of each square, but also the residents' perception of the squares, as they become lively and collaborative places. Also, physical interventions as urban symbols. They operate on a small scale

that defines each square as an open room with a specific use (play, study, meeting) and helps citizens to visually distinguish different areas of the neighborhood. All circular-shaped interventions are designed to respond homogeneously to the different spatial conditions in each square, establishing a strong formal relationship between them and creating a sense of wholeness within a pre-defined strategy (Casanova & Hernandez, 2015)

In some places of this project, standardized public space elements such as basketball court, ping pong table, life-size game board, circular baby swings have been redesigned and become novel design elements to attract citizens (Casanova & Hernandez, 2015)

**The interventions of this project are:**

Project name	Strategy	Interventions
Sandleiten in Vienna, Austria	Social Housing Redevelopment	Sandleiten's social housing complexes, dating back to the early 20th century, are being renovated and modernized to enhance living conditions, energy efficiency, and community-building.
	Mixed-Income Communities	Sandleiten regeneration emphasizes mixed-income communities, promoting social integration and poverty reduction, to create a diverse and cohesive neighborhood.
	Green Spaces and Urban Design	The regeneration project focuses on green spaces and pedestrian-friendly urban design, integrating parks, playgrounds, and green corridors for residents' access to nature, recreational opportunities, and improved air quality.
	Historic Preservation and Cultural Heritage	Historic Preservation and Cultural Heritage: Sandleiten has a rich cultural and architectural heritage, with buildings dating back to the late 19th and early 20th centuries. Regeneration efforts seek to preserve and celebrate this heritage through the adaptive reuse of historic structures and the incorporation of cultural amenities, such as museums, galleries, and cultural centers.
	Community Engagement and Participation	Participatory planning and decision-making involve residents and local stakeholders in regeneration processes, ensuring their needs and preferences are considered in the design and implementation of regeneration projects.
	Sustainability and Energy Efficiency	Sandleiten's regeneration focuses on sustainability and energy efficiency, reducing environmental impact and enhancing climate resilience through retrofitting buildings, promoting renewable energy, and implementing sustainable water management practices.



This project was the largest social housing experiment between 1923 and 1934, with 1587 apartments

- The open rooms strategy proposed for sandeleiten which consists of eight interventions

### Measure

- Promoting citizen participation and tackling cohabitation problems on different levels by creating meeting places where citizens can interact
- Increasing citizen participation by boosting decision-making power to transform and adapt furniture interventions
- Encouraging citizen participation by physical interventions in public space organized by a platform called CULBURE
- Stimulating a feeling of community in the neighborhood and creating the foundation for the second level of participation by some interventions such as inviting residents for collecting recyclable material to build a pavilion together

### Sandleiten

Vienna, Austria

### Stakeholders and owners

General Strategy - CULBURE  
 Furniture interventions: Casanova+Hernandez  
 Interventions: Marcelle Passot, Alexander Felch, Carla Della Belfa, Paul Woodruffe, Walter Klasz

- Aging population with 80% of residents over 70 in 1990
- Rapid increase in the number of immigrants living in Sandleiten that attract by the inexpensive housing
- There are some concerns about the possible ghettoization, especially when comparing the high percentage of immigrants in the area with the figures in other neighborhoods in Vienna
- Contrast among the elderly local population and young immigrants
- Urban life in public space reflects the conflicts arising from the cultural and age differences
- Youth unemployment
- Social isolation
- Insecurity
- Low sense of community

### Social and Economic issues

Presented with X-Mind

### Citizen Participation

## **United States of America**

### **Milwaukee's Menomonee River valley, Michigan, United State**

The Menomonee River Valley Project is a successful effort to revitalize Milwaukee's industrial heart. The project covers an area of more than 1,200 hectares, half a mile from north to south and three miles from east to west, through which the Menomonee River flows. The transformation of the valley from a natural system to an industrial system is a feature that is most evident in Milwaukee's evolution, and unfortunately, the unsustainable model highlights past industrialization efforts. The project, which began in 1869, took a decade to complete. Because large quantities of materials were needed to fill the swamps of the valley, including dredging waste, sand, and municipal and industrial waste, larger industrial complexes, including tanneries, breweries, warehouses, and railroad shops. Dense residential communities spread along the valley bluffs. Industry flourished until the 1920s, and only the Great Depression slowed its growth, which increased rapidly again during World War II.

However, the industrial engine began to decline in the post-war decades. The Menomonee Valley Industrial Center was established in 2006, had ten businesses by 2016, and the last two acres in 2018 to a commercial printing company sold splat and Badger Railing (for development), both of which were completed by spring 2019 (*De Sousa, 2021*).

The Menomonee Valley Social Park section of the store site provides residents with amenities for Valley-based businesses and green space for residents. Reuse of materials was a vital component of this development. The storm water section of the park will provide public infrastructure by transporting, storing, and treating storm water for packages on the industrial site, as well as on Canal Street and other inland roads. Social and new bridges to connect it to neighboring communities. The park is part of the Hank Aaron State Route and provides an outdoor classroom for the Urban Ecology Center, a nonprofit environmental education group, and a supervisor (*De Sousa, 2021*).

Overall, the plan recommended upgrading and revitalizing the valley in order to preserve and strengthen existing industries, attract new industries to the west and

center, promote "compatible" combined development (mainly at the eastern end), and preserve and protect adjacent neighborhoods (*Misky & Nemke, 2010*).



Fig 21: Menomonee Valley Industrial Center and Community Park, Milwaukee, Wisconsin



### Measure

- With a size of more than 1,200 acres, the valley spans over half a mile from north to south and three miles from east to west.

- Respected stakeholders and community representatives should be involved before, during, and after the project.
- encourage and aid in the creation of public-private partnerships that permit the fair participation of all parties
- Making stakeholders more willing to compromise.
- be patient, contribute to the process, and continue to invest in the quality of life of the businesses and residents of the region even after the projects are completed will assist increase buy-in and faith in the process.

### Citizen Participation

- In 1896 the Valley marsh was filled to prepare the site for industry.
- In 2020, Wisconsin's DNR issues a case closure letter confirming the completion of the cleanup of the Menomonee Valley Industrial Center.
- The marsh was filled with dredge spoil, gravel, and municipal and industrial wastes over a decade. By the late 1800s, the Valley had tanneries, breweries, stockyards, and railroad shops.

### Timing

- Sustainability in housing was important to stakeholders
- Seward Street Community Health Center received a \$250,000 EPA grant in 1999. The goal was to recruit high-quality investors and family-supporting businesses to the Valley, restore property value, and re-establish community pride while lowering environmental concerns.
- Sustainable design and landscaping costs continue to be a barrier to incorporating sustainability into the Valley's reconstruction.
- When the sewage treatment plant was moved with the need to clean up brownfields, the process became more challenging.
- Increased tax base, employment, and multiplier and adjacent property value effects have benefited the city.
- Companies appreciate the Valley's various amenities, which make it a fantastic place to work.

### Cost, Financing and Maintenance

### Stakeholders and owners

Casanova and Hernandez

Milwaukee's Menomonee River Valley  
Michigan, United State

- This Valley has always been essential to the city's economic wellbeing.
- The Valley was a great location for industrial activity in the 1900s, due to its proximity to always Lake Michigan, and local river systems.
- The opening of the Milwaukee County Stadium in 1951 and the Valley Park in 1968, the district had the same fate as many rustbelt industrial areas.
- In the 1920s, Valley lost close to 50,000 jobs, 20,000 in the middle of the 1970s, and 7,015 by 1997.
- unemployment, a declining tax base, and pollution were all results of its economic collapse.
- Because several long-established manufacturers continued to operate in the Valley, Milwaukee's City of Milwaukee and other stakeholders agreed that the Valley needed to be regenerated to offer "family-supporting" jobs.
- employment-oriented redevelopment.

### Social and Economic Issues

Presented with Xchined

### **Moran Plant, Burlington, Vermont**

This project was commissioned in 2008 and was designated as a Waterfront Park development that will be connected to pedestrians and other amenities.

By the late 1980s, the landfills along Burlington's waterfront (it was one of the nation's largest lumber ports) were deteriorating, and the remarkable Lake Champlain shoreline was largely inaccessible to the public (Figure 24). The 2.8-acre Moran Mill site, built on land that had previously housed railroad, lumber, and oil businesses, was decommissioned in 1986 and has been inactive except for a small sailing center that is partially used for storage (*US EPA, 2009a*).



Fig 24: The Moran Plant (*De Sousa, 2021*).

The Moran factory building is about seven stories high and has a gross floor area of 44,142 square feet. The structure rests on a solid concrete slab that sits below the lake's surface, allowing water to enter the building for coal-fired boilers and cooling. The generator components make up most of the interior of neglected industrial infrastructure. The main floor has a ceiling height of approximately 20 feet, while the land surrounding the facility is largely undeveloped (*De Sousa, 2021*).

With the voting held in 1986, the factory was removed from the hands of the owners and the idea of creating cultural and public centers such as science and art center, aquarium, entertainment center, baseball stadium, brewery and concert hall was started. The main design idea of this new city is based on creating (1) Green building and extend Waterfront Park); (2) a community and recreation center; (3) a community sailing center; (4) an outdoor concert bandshell; (5) a maritime

museum; (6) a combination of uses with part of the Moran; and (7) a mix of uses in the Moran (*Burlington Community and Economic Development Office, 2008*).

Finally, a preliminary assessment of the building began in 2006, and a corrective action plan for the exterior of the building was soon completed. Internal cleaning and drainage planning started in 2007. The waterfront revitalization project positioned the project as a catalyst for the city's economic growth. Burlington's announced sustainable economic development strategies include financial and technical assistance to small and large businesses and targeted assistance to employers with livable wage jobs and companies that play a central role in downtown vitality. The aim of this project is to create 500 construction workers and 80 permanent jobs (*De Sousa, 2021*).

- The project was delayed due to a thorough financial analysis that the 2009 recession demanded.

- The Moran Blue Ribbon Committee was appointed by the Burlington City Council on April 26, 2010, with the task of reviewing the project's financial structure in terms of how it safeguards taxpayers during a downturn, the financing model used, and the financing plans of the tenants.

- Given that it is a community-based project, the committee concluded that the \$6 million Moran redevelopment would not be viable with traditional financing but would require "non-traditional" vehicles.

- The administration devised a Public Investment Action Plan (PIA) to replace the project by hosting a competition to evaluate Moran Center proposals, with the finalists being put to a public vote.

### Cost, Financing and Maintenance

### Stakeholders and owners

- Freeman French Freeman

- The Waterfront Revitalization Plan boosted the city's economy. Burlington's Sustainable Economic Development Strategies included financial and technical assistance to small and large businesses, livable wage employers, and downtown vitality companies. 500 construction jobs and 80 permanent jobs are planned.

### Social and Economic issues

## Moran Plant Burlington, Vermont

### Measure

- The 2.8-acre Moran Generating Plant site, which had previously housed railroad, lumber, and petroleum businesses, was decommissioned in 1986 and sat idle except for a small sailing center that uses a portion of it for storage.

- The Moran Plant structure is approximately seven stories tall, with a gross floor area of 44,142 square feet.

### Citizen Participation

- Every household in the city received a "Idea Card," and an Idea Review Committee identified over 30 "Idea Categories" to explore. In the fall of 2005, over 140 citizens attended three public forums to discuss Idea Categories. A household survey asked residents to rank redevelopment ideas and factors.

### Timing

- The Burlington's City Council approves advancing phase Ia of the Moran project with a budget of \$6.35 million in 2020.

Presented with ZHund

### Elmhurst Park, New York City

The transformation of Elmhurst Park into a green project was implemented in three phases between 2007 and 2012 to spread the development financing costs over several budget periods. Elmhurst Park is a six-acre community green space located between Grand Avenue and the Long Island Expressway in the borough of Queens. The park replaces an industrial storage facility owned by KeySpan Energy (now part of the US National Grid), which consists of two above-ground gas tanks. The most important challenge of this park was the leakage of caustic gases into the surrounding environment, which caused damage to the public around this park. However, investment in new storage and distribution technologies prompted Keyspan to abandon the Elmhurst gas reservoirs in the 1980s (*Green, 2008*).

In October 2003, the land of this park was finally purchased by the city and the operation of turning it into a green park began. Planning for the new park was completed in 2006 with the participation of local residents. The final project vision for the park includes a playground, recreational trails, public art and landscaping based on the site's pre-industrial terrain (*De Sousa, 2021*).



Fig 25: An overview of Elmhurst Park, New York City (*De Sousa, 2021*).

Design strategies inspired by Olmsted's approach to landscape architecture such as curved paths and differential grading were used to create the impression of a wider green space to park users. Nearly 500 trees were planted on the stripped property to renew ecological functions and create a park-like atmosphere. Landscaping was

limited to native shrubs and plants "resistant to the Asian longhorned beetle." (*De Sousa, 2021*).

The playground is designed in part to promote energy literacy among children through experiential and interpretive features and with reference to the park's industrial heritage. In addition to typical playground equipment, such as swings and slides, children can pedal (one of three stationary bikes) to create a light effect on a nearby pillar" (*Lopes, 2011*). A decorative fountain, benches and lighting were also installed, and an existing building formerly occupied by Key Span was renovated to house the park's maintenance staff. Additional landscaping and 150 more trees completed the second phase of the park's development (*De Sousa, 2021*).

- The park plan was implemented in three phases between 2007 and 2012 to spread the cost of development over several budget cycles. The Mayor's capital budget provided \$20 million.

### Cost, Financing and Maintenance

#### Stakeholders and owners

City's Department of Parks and Recreation

- Elmhurst Park shows how converting brownfields into public assets can promote social sustainability. Community pressure to prioritize neighborhood park space required collaboration between residents, politicians, and private sector stakeholders. Staff and elected officials, including the Mayor, celebrated civic action at the park's opening.

#### Social and Economic issues

- KeySpan generated heat and electricity with natural gas by the 1950s. KeySpan abandoned the Elmhurst Gas Tanks in the 1980s due to new storage and distribution technologies.

- After demolishing the two above-ground storage tanks, KeySpan started the property's remediation in 2001.

- In 2005, KeySpan paid \$1 to transfer ownership of the Elmhurst Gas Tanks property to the city's Department of Parks and Recreation.

#### Timing

**Elmhurst Park**  
New York City

Elmhurst Park is a six-acre community green space in the Queens borough located between Grand Avenue and the Long Island Expressway.

#### Measure

The park takes the place of a two above-ground gas tank industrial storage facility owned by KeySpan Energy Corporation, which is now a division of National Grid USA.

- Residents favored public amenities and services over private ones, but their preferences varied. In a JPCA survey of residents within a quarter mile of the Elmhurst Gas Tanks site, 36.7% wanted a park, 7.9% wanted a residential building, 10% wanted a supermarket, 10% wanted a school, 10% wanted a library, and 9.1% wanted a memorial.

#### Citizen Participation

Presented with XPSfind

### Freshkills Park, New York City

The 2006, 2,200-acre Freshkills Park Project renews and enhances the ecological functions of the area by providing facilities that support a diversity of active and passive recreational opportunities and uses innovative strategies to promote sustainable landscape design (see Figure 26). The project is based on regulations established in four policy areas: landfill, air, water and soil to ensure human health and protect the environment (*De Sousa, 2021*).



Fig 26: An overview of Freshkills Park, New York City (*De Sousa, 2021*).

An area called Freshkills Park on Staten Island's west shore was undeveloped until the mid-20th century, when it became New York City's largest landfill. In 1948, New York City began landfill operations at Freshkills to dispose of municipal solid waste and reclaim land (*Department of Parks and Recreation, n.d.*). As the marshland was not suitable for construction, landfilling was considered a temporary measure to prepare the site for future use. "After three years of landfill, the plan drawn up by New York City Parks Commissioner Robert Moses was to develop a residential community ... and an industrial zone." (*Department of Parks and Recreation, n.d.*). Eventually, a combination of regulatory intervention and public pressure led to the closure of the landfill in 2001. In 2001, an international design competition was launched by the New York City Department of Planning as part of a master planning process for brownfield site reclamation. The goal of the competition was to "generate innovative ideas and designs that meet the needs of the city's communities and respond to the natural and built history of the site" (*Parks and Recreation Department, n.d.*).



The framework set out in the master plan organizes the park into five zones (or five parks in one) – Confluence, North Park, South Park, East Park and West Park. Each park will have its own distinctive character and planning approach developed in response to site opportunities and constraints, public meetings and stakeholder input, agency input, operational and maintenance concerns, and feasibility of implementation.” (*New York, Department of City Planning, 2009*).

The first phase, which began in 2007, established the framework for the physical development of the park. The second phase is proposed to increase the spaces for cultural events and programming as well as to continue the environmental revitalization of the site. The second phase of development was envisioned to attract non-profit and commercial operations such as an “environmental golf course, outdoor amphitheater, marina, cultural and educational center or community hall” and thereby expand programming (*Field Operations, 2006*). The third planned phase of development will augment previous interventions to improve the functionality and features of the park. At this time, complete decomposition and accompanying gas production and settling of buried waste in the landfill were expected. Construction of the park, planned for 2036, was aimed at aligning the natural features of the site into a mature ecosystem (*Field Operations, 2006*).

The concept of Freshkills Park as "a place and a process" is a key component of the project's vision. As a result, life scape presented a design strategy to guide the incremental evolution of Freshkills Park over the next three decades. The development, at 2,200 acres, is "one of the most ambitious public works projects in the city's history."

### Measure

- The participatory planning approach used revealed more than just a preference for recreational amenities or sustainable landscape practices; it also contributed to community consensus and ultimately encouraged support for the reclamation, facilitating project development.

- Public participation was facilitated through meetings, workshops, and charrettes, and a Community Advisory Group was formed to ensure a cross-section of community needs were addressed in the park's development. Proactive public engagement led to a successful planning process, unlike Elmhurst Park.

### Citizen Participation

## Freshkills Park

## New York City

### Cost, Financing and Maintenance

- Given real and perceived land-use concerns about the site's history as a landfill, significant public investment was needed to transform the site and attract future investment. NYC allocated \$100 million for Phase I.
- Freshkills Park's annual operating expenses at build-out are predicted to range between \$15,000 and \$30,000 per acre.

### Stakeholders and owners

landscape architecture firm Field Operations

### Social and Economic issues

- The completed Draft Master Plan, which was submitted to the city in 2006, is an expression of the community's needs and aspirations for reconnecting the area's human and natural systems.

- New York City began landfilling operations at Freshkills in 1948 to dispose of municipal solid waste and reclaim the land.

- Given the project's size and the technical challenges that make its redevelopment challenging, it is divided into three ten-year phases.

- Phase One, which began in 2007 laid the groundwork for the park's physical development.

### Timing

Presented with XPLIND

### **Artspace Commons, Salt Lake City, Utah**

Artspace Commons project is located in the Salt Lake City Grain Depot area, bordered by Temple 600 South, West Temple, and I-15. This area is so named because of the location of the silos along the historic railway corridor. Commercial buildings and low-density warehouses in the area are 50 years old (*Ellin, 2012*). Since the mid-2000s, with the rise of new housing and service-oriented business development, along with a growing new creative culture focused on food, art, and music, the region has undergone significant changes (*Thompson, 2012*).

In response to the opportunity created by this policy framework and identifying the city of Utah as a high priority for remediation, Artspace acquired the site in November 2007 with the intention of renovating and redeveloping it to create affordable housing and workspaces. It is economical for artists, cultural organizations, and nonprofits to revitalize and promote vibrant and safe communities in areas such as the Granary District (*De Sousa, 2021*).

Artspace Utah was founded in 1980 by a group of artists who needed affordable and safe living and working spaces. Artspace is credited with launching a "real estate revolution" with its first project in 1982, which transformed an 80,000-m<sup>2</sup> warehouse into a warehouse for artists, studio spaces, and offices for nonprofits. Following the project's success, the Salt Lake City warehouse area was transformed from a "worn-out, neglected and criminal area" into a hotspot of modern restaurants, hotels, attics, a luxury shopping mall, and a new mall. (*Jones, 2010*).

Artspace Commons has a 102-unit apartment complex with a combination of affordable one-bedroom and two-bedroom units, as well as 50,000 square feet of artist studios and commercial spaces for nonprofits and community groups located on the ground floor (*De Sousa, 2021*).

Two common buildings at 423 West 800 South and 824 South 400 West, approximately two blocks west of Lincoln Highway (I80 / I15), two blocks east of the nearest Trax Light Rail Station (Salt Lake City Transit), and directly on the bike path. South 800 rides provide multidimensional access to the site (*De Sousa, 2021*). Completed in 2010, Artspace Commons leased 99 percent of its homes by 2013 to 12 nonprofit tenants such as TURN Community Services, which provide services to people with disabilities and Bad Dog Arts, a creative arts organization. (*Jensen, 2010; De Sousa, 2021; Skibine, 2012*).



Fig 22: An overview of a building in Artspace Commons project

**Artspace Commons  
Salt Lake City, Utah**

**Measure**

- 3.67-acre
- The green building has 30 affordable residential units and 10,000 square feet of street-level commercial space.

**Timing**

- The project began in the late 1990s. The Salt Lake City Redevelopment Agency (RDA) identified the Grainary District as a high priority for cleanup.
- In 2013, this project will conclude with the completion of the Artspace Solar Gardens.

**Social and Economic issues**

- Artspace Utah was founded in 1980 by artists needing affordable and safe workspaces. Artspace's first project in 1982 converted an 80,000-square-foot warehouse into artist lofts, studio spaces, and non-profit offices.

**Cost, Financing and Maintenance**

- The project will attract creative types. Bringing 12 non-profits, 55 new employees, and 62 new households into the neighborhood is a big step toward turning this brownfield into a model green building project.
- To build its solar panel system, the project was financed with New Markets Tax Credits and received assistance from the Rocky Mountain Power Blue Sky program.
- In terms of green building features, key informants noted a conflict between affordability and environmental sustainability throughout the project.
- Geothermal technology was not used because it was deemed too expensive, and achieving LEED Gold required external funding.
- The Utah Voluntary Cleanup Program and the Federal New Markets Tax Credit program supported the Artspace Commons project. These programs encouraged brownfields redevelopment by reducing contamination risks and providing innovative financing tools.
- The Redevelopment Agency of Salt Lake City awarded Artspace \$450,000 in tax increment reimbursement, which will repay half the project's architectural and engineering design costs.

**Stakeholders and owners**

- Artspace Commons is a highly successful non-profit corporation that seeks to revitalize and promote vibrant neighborhoods by creating affordable housing and workspaces for artists, cultural organizations, and non-profit organizations.

Presented with Xobino

### **Allen—Morrison Pilot, Lynchburg, Virginia**

The Allen-Morrison project, which was built with the name of the same company in its seven hectares of industrial land, was fully operational in 2015. Of course, in 1996, when the said company, which was active in the fields of panel manufacturing, went bankrupt, the idea of turning the large space of this factory into a modern city came to the mind of its owner, Alan Morrison (*Van Ness, 2014*). The city acquired the abandoned Allen Morrison and Thornhill facilities through eminent domain in 2003 with plans to build a park (*Lynchburg Parks & Recreation, 2020*). In 2002, three park concepts were presented in the city's master plan for the Alan Morrison and Schenkel farm estate. Two of the plans included the restoration of some historical structures along with the development of green space, parking, sports fields, community center and other passive and active recreational uses. The site has been managed primarily by the Department of Parks and Recreation since the city took over ownership. Also, in 2003, plans began for a \$6.5 million renovation of Lynchburg City Stadium and its concourse and parking areas.

In addition to recreational and environmental goals, city leadership is interested in supporting economic development and healthy living by connecting the Alan Morrison project to Lynchburg Grows and the city's stadium (Fraser, 2009). While plans are still being developed, it is hoped to include recreational and sports fields, a skate park, a community center, walking trails and lots of fields. Figure 23 shows a view of this factory during bankruptcy.



Fig 23: A view of the Allen-Morrison industrial plant (*De Sousa, 2021*)

While the park was originally slated to open in 2011, “eco-friendly demolition of the Alan Morrison property only began in 2010. The goal of recycling 75 percent of

all materials was exceeded by another ten percent (*Petska, 2010*). reclaimed wood, brick, and concrete from the building for reuse, and the city also used some of the salvaged materials for local projects (*Petska, 2010*). Thornhill Wagon Co. buildings in the south. project since It has been delayed. According to the latest post on the Lynchburg Parks & Recreation website (2020), once final demolition is complete, and the site will be closed by VDEQ. That happened in 2017, the entire site with lawn and banked land by the city. It will be planted until funds are available for comprehensive planning of a new park (*De Sousa, 2021*)

Currently there is only a site map for the property. Overall, the project, while still a few years away from completion, looks set to provide a valuable and sustainable redevelopment for residents of an area that faces environmental and social inequality challenges. A key feature of sustainability is the goal of reusing and recycling materials from degradation. Brownfield assessment and cleanup will bring previously unusable land back into productive use. The integration of green space and additional facilities seeks to improve the quality of life of the residents of the area and promote active living. The development of a community center also aims to create social capital in the neighborhood (*De Sousa, 2021*).

## Measure

87,800 sq. ft.

- This project allows disabled and disadvantaged people to garden and promotes healthy living. Volunteers helped replant rose bushes, build compost beds, and repair greenhouses after an appeal for help to preserve the site. Participants wanted to clean brownfields and address soil pollution from historic greenhouse activities organically.

- In 2008, the city partnered with Lynchburg Grows to develop a comprehensive master plan with opportunities for remediation by design, shared resources, and neighborhood engagement. Both saw the project as a way to teach citizens about sustainability through design, construction, educational interpretation, and historical preservation.

## Citizen Participation

### Allen-Morrison Pilot Lynchburg, Virginia

## Cost, Financing and Maintenance

- Allen-Morrison deconstruction plan. This included developing a building materials inventory tool, assessing building deconstruction, and identifying building materials that could be sold through reuse and recycling markets or reused onsite in redevelopment.

- The contractor prepared the wood, brick, and concrete remnants from the building for reuse, and some of the salvaged materials were also utilized by the city for regional projects.

## Stakeholders and owners

- Lynchburg Grows

- Building social capital in the community is another goal of the creation of a community center.

- The addition of green space and more amenities aims to improve the quality of life for locals and encourage an active lifestyle.

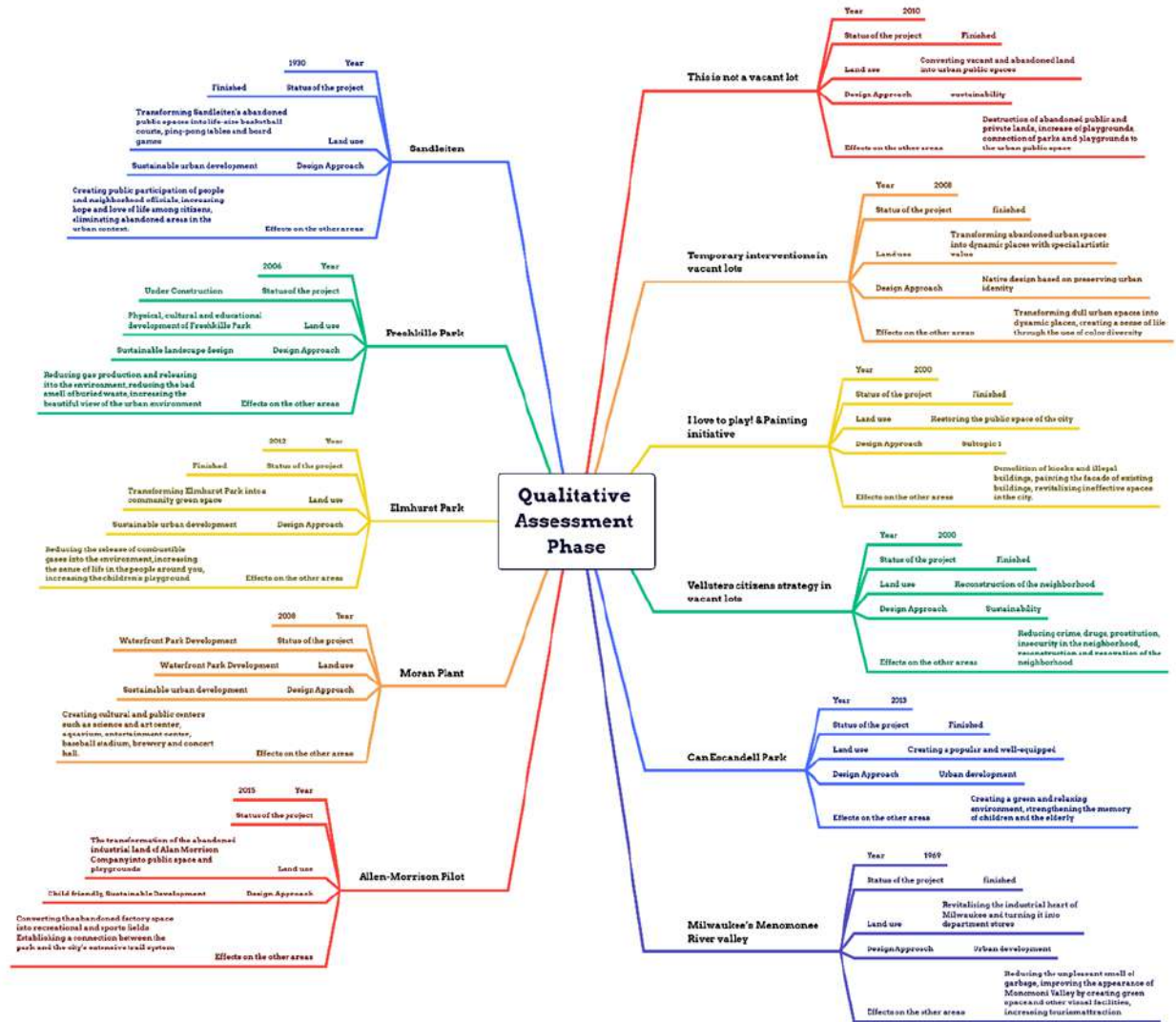
## Social and Economic issues

- The site acquisition by the city of Lynchburg happened in April 2003. Then, in 2015 cleanup alternatives were presented.

## Timing

Presented with X-Mind





Presented with XMind

# Military Sites Redevelopment Projects

## Kapyong Barracks

The Kapyong Barracks, situated between the Tuxedo and River Heights neighborhoods in the southwest of Winnipeg, served as a military base during World War II. It accommodated Lord Strathcona's horses, Princess Patricia's second infantry regiment, and the artillery. The second infantry regiment moved to the Canadian Forces Base Shilo in 2004, and Company Lands Canada bought the barracks' lands in 2007.



The Kapyong Barracks is a landmark initiative that aims to transform the former military site in Winnipeg, Manitoba, into a mixed-use development that reflects the history and culture of the Treaty 1 First Nations (CBC, 2023).



The project is named Naawi-Oodena, which means "Centre of the Heart" in Anishinaabemowin, the language of the Anishinaabe people<sup>3</sup>. The master plan for

the project was unveiled in October 2020, after extensive input from Treaty 1 First Nations members and Winnipeg neighbours. The plan includes residential, commercial, cultural, recreational, and educational facilities, as well as green spaces and active transportation networks (Canada lands company, 2023).

It is expected to generate significant economic and social benefits for the Treaty 1 First Nations and the city of Winnipeg. It is estimated that the project could accommodate between 2,300 to 3,000 homes and between 915,000 and 1.2 million square feet of commercial space, making it the largest multi-use project in modern Winnipeg history and the single largest, strategically located urban Indigenous economic zone in Canada (NAAWI-ODENA MASTER PLAN , 2023),(Canada lands company, 2023).

The Kapyong Barracks also honours the history of the site, which was used as a military base from 1954 to 2004. The plan includes a war museum to commemorate the soldiers who served at the Kapyong Barracks, especially those who fought in the Battle of Kapyong during the Korean War2. The plan also incorporates public art and design elements that reflect cultures and history.

The project is estimated to cost around \$1.2 billion and will take several years to complete. The demolition of the former barracks began in 2018 and is expected to finish in 2021. The construction of the first phase of the development is planned to start in 2022. The master plan for the redevelopment was unveiled in October 2020, after extensive public consultation and input from Treaty 1 First Nations members and Winnipeg neighbours. A three-dimensional model of the project was revealed in October 2021.

**The interventions of this project are:**



- The project is expected to generate significant economic investment and revenue for the Treaty One First Nations economic zone. The TIDC estimates that the project will create over 10,000 jobs and contribute over \$2 billion to the provincial GDP over the next 20 years.
- The project is funded by a combination of sources, including land sales, leases, partnerships, and grants. The TIDC and the CLC have also applied for federal funding through the Investing in Canada Infrastructure Program to support the development of the site.
- The maintenance of the site will be shared by the TIDC and the CLC, depending on their respective areas of responsibility: sewer, garbage collection, and fire protection for the urban reserve, while the CLC will provide similar services to the mixed-use community. The TIDC and the CLC will also collaborate on the maintenance of the common areas, such as the cultural campus, the sports complex, and the active transportation network.

## Cost, Financing and Maintenance

## Interventions

1. creating an urban reserve, also known as a First Nations economic zone
2. building a variety of residential and commercial spaces
3. enhancing the green space and active transportation network on the site
4. honouring the history of the site as a former military base
5. Engaging with the public and stakeholders through surveys, webinars, and information sessions to gather feedback on the master plan
6. Adjusting some housing from medium to low-density to accommodate the preferences of the neighbouring Tuxedo resident.

The site covers 148 acres along Kenaston Boulevard, of which 68 percent will be an urban reserve, also known as a First Nations economic zone. The site will have up to 3,000 new residences and 1.2 million square feet of commercial space, including retail, restaurants, cultural institutions and personal services.

## Measure

- People participated in this project in various ways, such as:
- Taking online surveys to share their opinions and preferences on the initial concept plan.
  - Attending a virtual presentation and in-person information sessions in Winnipeg and First Nation communities.
  - Visiting the project website to view the master plan and other related documents.
  - Following the project updates on social media platforms such as Facebook and Twitter.

## Citizen Participation

# Kapyong Barracks Winnipeg, Canada

## Stakeholders and owners

The project is a joint venture between the Treaty One Development Corporation and the Canada Lands Company, a self-financing Crown corporation.

The project has social and cultural impacts, as it will showcase the diversity and potential of the Treaty First Nations and foster a sense of pride and belonging among their members. The project will also provide a platform for education, awareness, and dialogue between the First Nations and the wider public, and promote social cohesion and reconciliation. The project will honour the history and legacy of the site, which was used as a military base for over 50 years and played a role in the Korean War.

## Social and Economic issues

-The project has been in the works for several years, following a legal dispute over the ownership of the land that was resolved in 2019. The final master plan for the site was released to the public in March 2021, after extensive consultation with the stakeholders and the public. The demolition of the former Kapyong Barracks began in 2018 and finished in fall 2021.

## Timing



## Omega (Warrington)



Fig:

The Omega Regeneration is a large-scale property development in Warrington, Cheshire. The development aims to transform the former Burtonwood Air Force Base into a mixed-use urban area. The project began in 2008 at the former Burtonwood airbase in Warrington, northwest England, with a budget of approximately £1 billion (Dmorgan, 2023).

The site, known as Omega, a 226 ha site straddling the M62 near Warrington, will be a mixed-use development comprising offices, industrial space, leisure facilities and hotel and conference facilities. It is expected to create over 12,000 jobs for the region with the development planned to take place over the next 25 years (Bagaen, 2006). The project site is split into two sections, north and south, by the M62 highway. The northern section and part of the southern section are devoted to industrial activities and specific jobs, forming the largest business village in northwest England. The southern section, adjacent to the existing residential areas, offers a variety of affordable housing options, shopping centers, and leisure facilities. The two sections are linked by green and natural spaces called Greenheart, which feature landscaped areas, parks, forests, and wildlife (sanad).

The Omega masterplan envisages a community of buildings organised around public open spaces and amenities to create a vibrant and active business community. The plan in Figure ... below is composed of discrete development parcels of around 1 million sq ft, each based on a 5 min walking distance. Some of these are likely to be developed in a manner that could appeal to companies such as those in the financial services sector where businesses often prefer to work in a more dense environment whilst others would have campus settings, with low level buildings and more green space, the type of environment that tends to be favoured

by hi-tech companies. The developers have agreed Sustainable Development Principles for Omega. These principles require environmental issues to be addressed in the design, delivery and operation stages of the development. The masterplan espouses urban design values and environmental (including biodiversity) protection and it provides for a range of uses including community facilities and for links with other development areas. A Sustainable Transportation Strategy is being prepared through a Green Travel Plan for the whole site and also a Movement Strategy. The strategy will ensure key improvements to the transport network are phased to each stage of the development. It will promote access to/from the development by a choice of transport modes(Bagaeen,2006).

The reason for choosing the site- Omega can serve as a model for designing the 77th Army barracks in Mashhad, as it is close to the residential area and offers services that align with the general policies of the plan at a large scale.

**The interventions of this project are:**

- creating a net-zero carbon community that will showcase the latest technologies and practices in renewable energy, green transport, circular economy, and biodiversity
- fostering a culture of innovation and entrepreneurship that will attract and support start-ups, SMEs and research institutions in various sectors
- enhancing the social and economic well-being of the residents and workers by providing affordable and accessible housing, education, health and leisure services, as well as opportunities for community engagement and participation
- preserving and enhance the natural environment and the historical heritage of the site

### Interventions

The project is a £1bn, 233-hectare mixed-use development site on part of the former Burtonwood Airbase in Warrington, Cheshire, situated off Junction 8 of the M62.

### Measure

The developers have held several public events to inform the public about the plans and proposals for the Omega site, and to gather feedback and suggestions from the attendees. They also have established regular meetings with representatives from the local community, such as parish councils, residents' associations, businesses, and schools. These groups provide a forum for discussing the progress and impacts of the Omega project, and for raising any issues or concerns that may arise.

### Citizen Participation

## Omega Warrington - England

The Omega project is a £1 billion, 233-hectare mixed-use development site that houses businesses and tenants, such as ASDA, Travis Perkins, Hermes Group, Domino's Pizza, The Hut Group, and Amazon UK, are the occupiers of the Omega site, who have established their operations, distribution, and services in the business park.

### Cost, Financing and Maintenance

It is a joint venture between Omega Warrington Limited, Homes England, and various private developers Omega Warrington Limited is the main developer and landowner of the site. It is a joint venture between Miller Developments and The Royal Bank of Scotland Group. It is responsible for delivering the commercial and residential premises. Homes England is the partner of Omega Warrington Limited in the regeneration project.

### Stakeholders and owners

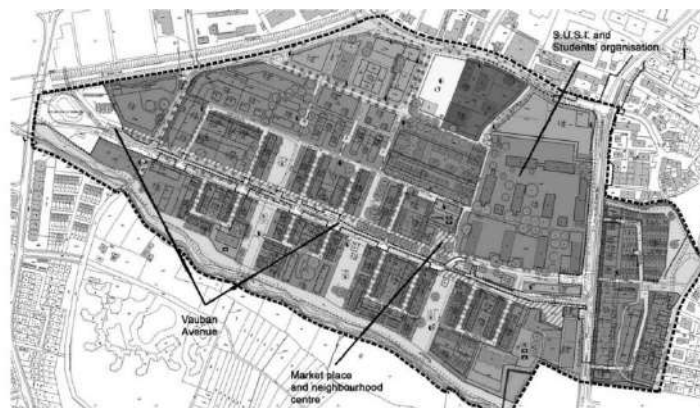
The project is expected to provide significant economic, environmental, and social benefits for the area, such as creating jobs, improving infrastructure, supporting education and training, and enhancing the environment.

### Social and Economic Issues

The project started in 2008, when the demolition of the existing World War II aircraft hangars and runways began. The development of the site was delayed by the Great Recession, but resumed in 2012, when the construction of a warehouse and new roads at Omega North started. The Omega project is expected to be completed by 2028, when the full range of commercial, residential, and community facilities will be delivered.

### Timing

## Vauban (Freiburg)



Quartier Vauban redevelopment plan(Bagaen,2006)

The Vauban regeneration project is a remarkable example of sustainable urban development in Freiburg, Germany. It is a new neighbourhood that was built on the site of a former French army barracks, with the participation of the residents and the city council. Vauban served as a military base from the 1930s until 1990 when the French troops left and campaigners proposed the idea of 'converting barracks into housing' due to a severe lack of homes in the Freiburg region. The citizen's group 'Forum Vauban' (a local NGO) was established in late 1994, and later The Forum became the official representative of the citizens' involvement in 1995. Its main goal was to create a sustainable urban district through a collaborative process that could inspire other projects. The new Vauban residential area was built on the location of an old French military base in Freiburg, a city in south-west Germany. It has been completed in 2006, covering 38 ha and providing homes for 5000 people and 600 jobs. Together with the city authorities and other partners, Forum Vauban developed the project 'Sustainable Model District Vauban' with the aim of establishing a framework to realise, in a participatory and cooperative way, a vision of development for a community that meets ecological, social, economic and cultural needs. This has been the greatest advantage of the project as it engaged the people who were shaping the district. The main motivations for the development of Vauban have been the ideas, the creativity and dedication of the people involved who shared a common vision to create a sustainable and thriving neighbourhood. Vauban has gained national and international acclaim as an outstanding sustainable urban district. This has largely happened as a result of the Forum's work, its projects and efforts in the local community. By dividing the land into small parcels and giving preference to private builders and groups of builders,



a diversity of housing styles was encouraged to create housing of higher density for different social groups where the residents actively took part in the planning process. This participation involved residents' meetings, workshops, a cooperative council, and residents' representatives on the management (Bagaeen, 2006). The regeneration of Vauban Barracks in Germany is an example of how urban development can be done in a way that respects the environment, promotes social justice, and enhances the quality of life of the inhabitants (UCLG, 2023).

The site was chosen because it allows for participatory methods and energy self-reliance policies that facilitate development. This can serve as an appropriate model for the planning and designing of the 77th Army Camp.

### **Intervention:**

- Cooperative Decision-Making:

The district was created through cooperative decision-making, becoming a model of holistic environmental planning and eco-friendly living .

- Green Transportation: The district was planned around green transportation, with a focus on reducing the ecological impact of development through sustainable mobility solutions
- Car-Free Living: Vauban has incorporated "car-free" and "parking-free" living into its landscape, with cars not allowed to park in residential areas, and private cars being parked in a solar car garage located at the periphery of the suburb.

- Hybrid urban form :

The urban form of Vauban is a new kind of hybrid. With block densities that range from 50 to 106 units per acre, Vauban meets the criterion of being urban in density. Yet the urban form is structured to create the experience of an urban park, with green space flowing through the blocks. Clearly this has created an open, flowing green identity and design quality that is valued by the residents. On the other hand, the openness and typical block pattern (i.e., not closed-perimeter blocks) is vexing to urban designers.

- Solar Settlement and Energy: The district features a Solar Settlement, including solar panels and a combined heat and power plant, emphasizing the use of alternative forms of energy .
- Green space :

Vauban is a densely built neighborhood with a lot of green spaces. The public green spaces were designed together with the local residents.

- ✓ The park-boulevard spine has tramway tracks in grass and unfenced right-of-way.
- ✓ The three green spaces crossing the park-boulevard provide linkage and access to the Sankt-Georgen stream.
- ✓ The semipublic space attached to the ground level of the Baugruppen has been used for private gardens and custom-designed bicycle sheds.
- ✓ Many of the Baugruppen employ vertical greening, which provides cooling in the summer and beauty year-round.
- ✓ Over 50% of the buildings have some sort of green roof to provide insulation and rainwater retention or solar collectors for hot water or electric generation

- Community Participation and Social Work:

The project involved participation from the local community, cooperative housing development, and the resolution of conflicts between citizens, providing a stable basis for successful participatory planning

- Passive Houses:

The district includes passive houses that are energy-efficient and cost-effective, with some buildings generating more energy than they consume

- Rainwater Management:

The design of Vauban focuses on rainwater management, incorporating sustainable water practices into the urban landscape

- Affordable Housing:

The co-housing concept resulted in a marked reduction in the individual construction costs, contributing to the development of affordable housing. These innovative ideas and features have made the Vauban Project a model for sustainable urban development, emphasizing environmental sustainability, community participation, and holistic planning.

## Bulimba Barracks, Brisbane, Australia



The Bulimba Barracks regeneration is a large-scale development of a former military site on the Brisbane River in Australia. The site, a former military base, is being repurposed for residential and commercial use, and the redevelopment is aimed at creating a high-quality public realm and village green. The project is also expected to include a mix of housing options, such as houses, townhouses, and unit buildings, up to five storeys high. The redevelopment is being led by the Shayher Group, which has experience in delivering similar mixed-use developments in the region, including the Brisbane Quarter precinct and the former CSIRO site in Indooroopilly. The Department of Defence sold the site to Shayher Group, a private developer, for \$63 million in 2020. The developer plans to create a neighbourhood centre, a community hub, a full-sized AFL field, public parkland and a possible marina on the site and has requested to raise the entire site above the flood level, as the site is located on a flood-prone area. The Greens, a political party, have proposed to buy back the site and turn it into affordable housing, a new public school and green space, as part of their housing strategy. The project's focus on a high-quality public realm, village green, and a mix of housing options reflects a commitment to creating a diverse and sustainable urban environment. Bulimba barrack is still in the planning and approval stage and has generated some controversy and debate among the local community, the council and the political parties over the issues of flood

risk, traffic management, infrastructure provision and public interest (Ray white Bulimba, 2023)

### **Intervention:**

- Sustainable design: Despite the site being vulnerable to floods, the project has used planning measures to create opportunities from the threats.
- Integrating with surrounding area : The project is integrated with the surrounding residential area, with two to three floors developed at the edges of the site and up to five floors in some locations towards the center of the site.
- Affordable Housing: : Referring a combination of different types of housing, including independent and attached units.
- heritage preservation : Preserving the historical parts of the camp and adaptive reuse for a wide range of retail, commercial and ... uses
- creation of a vibrant, integrated community: The plan sets the framework for a new neighborhood which focuses on the riverfront. A landmark within the site is a large historic fabrication workshop, used to construct barges in WWII. The plan retains the workshop within a riverfront retail node. A large public park extends across the entire waterfront providing generous access to the river and a setting for higher density housing to capitalise on this north-facing outlook.
- diversity of dwelling types : A residential interface and a residential core that offers a diversity of dwelling types from terraced houses to low and medium-rise apartment buildings are also part of the master plan.

## **Part III**

### **Chapter 5 Case Study Analysis**

## **First Phase : Case Study**

### **Iran**

#### **Redevelopment laws and policies (Military barracks)**

Changing the use of military barracks to optimize urban functions, improving the quality of the city area and achieving a leading position and role in the economy and urban activities is one of the issues that has been of interest in the world for many years. In fact, barracks and military centers, which were often built on the outskirts of cities in the past, over time and with the development of the city, today are located within the urban textures and sometimes in the city centers and have occupied large areas. Meanwhile, big cities are facing many problems and challenges and are in dire need of suitable land and space for the establishment of various urban facilities. Reviewing global experiences shows that the transfer of barracks provides a good opportunity to improve urban centers, increase per capita and create changes in the development of the city.

In Iran, in recent years, this issue has been taken into consideration, and as a result, many laws, executive and legal measures have been enacted or implemented. Among the most important legal documents related to the subject, the following can be mentioned, the description of each of which is provided below.

- Article 177 of the Law of the Third Plan of Economic, Social and Cultural Development of the Islamic Republic of Iran
- Article 128 of the Law of the Fourth Economic, Social and Cultural Development Program of the Islamic Republic of Iran
- Law of sale and relocation of barracks and other places of the armed forces outside the boundaries of the cities approved in 2008
- Article 202 of the Law of the Fifth Economic, Social and Cultural Development Program of the Islamic Republic of Iran

Article 177 of the Law of the Third Plan of Economic, Social and Cultural Development of the Islamic Republic of Iran, the Ministry of Defense and Support of the Armed Forces of the Islamic Republic of Iran and the armed forces of the country are obliged, after obtaining permission of the supreme commander of the general forces, to sell the barracks and other places of their legal privilege or occupation and within the scope of municipal services (after proof of ownership) and change and separate the use through auction.

The country's Organization for the Registration of Deeds and Property is obliged to issue the ownership document of the lands and receive only 20% of the relevant legal rights and charges. The Commission of Article 5 of the Law on the Establishment of the Supreme Council of Urban Planning and Architecture of Iran approved on March 13, 1973 and its subsequent amendments and the municipalities are obliged to change the use of such lands to suitable uses based on plans development and urban development, and issue construction permits without obtaining the right of change of use. The revenue resulting from the sale of the above lands shall be deposited into the account of the special row provided in the annual budget law and 100% allocated to the relevant organization for the relocation of the above properties and residential units.

Article 128 of the Law of the Fourth Plan of Economic, Social and Cultural Development of the Islamic Republic of Iran, the Ministry of Defense and Support of the Armed Forces, is obliged, based on the opinion of the General Staff of the Armed Forces, to prepare a comprehensive plan for the deployment of the armed forces in the country according to the size and type of threats and environmental conditions in order to comply with the dispersion in the establishment of sensitive and vital facilities and defense industries, and the relocation of barracks and large defense industrial factories from big cities, especially Tehran approved by the General Command of the Armed Forces. The government is obliged to take necessary measures regarding the provision and transfer of credit facilities, banking facilities, land, change in use and creation of privacy for the required facilities.

**Law of sale and relocation of barracks and other places of armed forces outside the boundaries of cities in Iran**

**Article 1**

The Ministry of Defense and Support of the Armed Forces and the Armed Forces of the Islamic Republic of Iran are obliged to sell (through auction or agreement) and relocation barracks and other places under ownership from the boundaries of the cities should be moved outside their boundaries upon the request of the General Staff of the Armed Forces, the government or municipalities through the Ministry of Interior and upon the approval of the General Command with the agreement of the Ministry of Housing and Urban Development or municipalities or other executive organizations. For endowment lands, it will also be done in accordance with the relevant laws.

Note: lands of Basij resistance, Naja, the Ministry of Defense and Support of the Armed Forces and affiliated and subordinate organizations and the Ansar Corps (except for the training barracks, weapons and ammunition production centers and ammunition slums) and scientific, research, medical and welfare centers and residential houses of Armed Forces, General Staff, the headquarters of the General Command of the Revolutionary Guards and the Army, and the headquarters of the forces are excluded from the subject of this article. In the case of disagreement, the opinion of the General Staff of the Armed Forces prevails.

#### Article 2

The Ministry of Defense and Support of the Armed Forces and / or the relevant armed forces for the barracks and other places covered by this law, which had no documents and no objections before the approval of this law, proceed to obtain ownership documents, and in case of issuing ownership documents, act according to this law. Organization for the Registration of Deeds and Property and other related authorities are obliged to take the necessary measure to issue the documents according to the relevant regulations upon the request of the Ministry of Defense and Support of the Armed Forces and / or the Armed Forces.

#### Article 3

The Ministry of Housing and Urban Development, municipalities and other executive organizations are allowed to purchase, with the coordination of the Ministry of Defense and the Armed Forces and the armed forces of the country, the barracks and other places subject to this law at the price of the current expert and / or agree to relocate. The value of the unseparated land will be 35% of the residential use value separated and adjacent to the subject property of the purchase or agreement. The urban development plan of the lands in order to provide at least 40% of the required public urban uses per capita in the region, and the financial sources required for the relocation, in lands less than ten hectares, should be approved by the Commission, Article 5 of the Law on the Establishment of the Supreme Council of Urban Planning and Architecture Iran approved on March 13, 1973 and by the Supreme Council of Urban Planning and Architecture of Iran for lands with an area higher than that.

#### Article 4

The country's Organization for the Registration of Deeds and Property and its subordinate departments are obliged to take measures for the consolidation and



separation of the mentioned lands as well as the issuance of new ownership documents in accordance with the relevant laws and regulations, and the legal fees and charges as the case may be, are collected according to the provisions of the fourth economic, social and cultural development plan of the Islamic Republic of Iran and future plans.

#### Article 5

The Ministry of Agricultural Jihad is obliged to hand over suitable land required for the construction of barracks or alternative places and their privacy in accordance with the standards and regulations of the armed forces in cases of relocation of the subject of this law.

#### Article 6

The sources needed for the purchase of the areas subject to this law are provided every year, based on the proposal of the Ministry of Housing and Urban Development or the relevant executive body, from the credit provided in the annual budget laws and credit and banking facilities and / or the sale of participation papers. Also, the revenue resulting from the sale of the mentioned properties and the exchange, as the case may be, in order to cover all or part of the purchase price, will be deposited into the treasury account and 100% will be allocated to the Ministry of Housing and Urban Development or the executive organization. Banking sources are provided from the source of revenue.

#### Article 7

In cases where the resulting sources are not sufficient for the establishment of barracks and similar facilities on the designated land, the government can predict the remaining required credit with the coordination of the General Staff of the Armed Forces and the Ministry of Defense and Support of the Armed Forces in the annual budgets. In this case, relocation will take place after the construction of the barracks and its facilities (according to the evacuated place).

#### Article 8

The Ministry of Defense and Support of the Armed Forces and the Armed Forces are obliged to deposit the revenue resulting from the enactment of this law into the treasury account, the amount of which is foreseen in the annual budget law, and spend it in order to build alternative places outside the limits and boundaries of the cities. This credit is 100% allocated. The above law, consisting of eight articles and

one note, was approved by the Islamic Council in a public meeting on Sunday, Aug. 23, 2009, and was approved by the Guardian Council on Sep. 2, 2009.

Article 202 of the Law of the Fifth Program of Economic, Social and Cultural Development of the Islamic Republic of Iran, the Ministry of Defense and Support of the Armed Forces, is obliged, based on the opinion of the General Staff of the Armed Forces, to prepare a comprehensive plan for the deployment of the armed forces in the country according to the size and type of threats and environmental conditions in order to comply with the dispersion in the establishment of sensitive and vital facilities and defense industries, and the relocation of barracks and large defense industrial factories from big cities, especially Tehran approved by the General Command of the Armed Forces. The government is obliged to take the necessary measures for the provision and transfer of credit facilities, banking, land, change of use and creation of privacy for the required facilities. Credits received from bank sources will be reimbursed by the sale of the documented lands. In addition to the approved laws, in the national documents and upstream plans, consistent with the internal development and the liberation of the lands of the military areas, the issue of relocating and moving the barracks from the area inside the cities has been raised. Among these plans, we can refer to the national strategic document of sustainable urban regeneration, in which the issue of relocating barracks in order to build and create new life in cities, especially metropolises, has been raised and related policies and functional strategies have been proposed. The establishment of the Civil Engineering and Urban Improvement Company in 1995 by the Ministry of Housing and Urban Development to guide and organize the activities of the government in the field of regeneration, improvement and renovation of old, worn out and inefficient urban structures as well as managing the optimal use of the mentioned facilities for the internal development of cities and the improvement of the urban living environment within the framework of the policies of the Ministry of Housing and Urban Development of the Supreme Council of Urban Planning and Architecture of Iran, was a serious step for promoting the internal development policy in the country, as one of the main policies of this company is to identify problems and determining the lands with inefficient urban uses that do not fit with inner city functions and turn these into desired urban areas and provide the spaces in urban areas through these clearly point to this claim. Among the measures that have been taken and the experiences in this field in the country, we can mention the redevelopment of the G Barracks and Ghala Morghi in Tehran and 06 Barracks in Birjand, Tehran Slaughterhouse, Bahman Hall, Sock Knitting Factory, Haft Chenar Wildlife Museum, Khosravi Leather Factory of Tabriz,

School of Arts, Qasr Prison, and Qasr Museum Garden. The plan to relocate the Mashhad Army 77 barracks outside of this city, since 2008, according to the requirements of the Commander-in-Chief, the Army Commander and the Ground Force Commander was put on the agenda. The necessary measures for this relocation were coordinated by Astan Quds Razavi as the owner and guardian of the protection of the endowment lands, Mashhad Municipality as the urban management and the army as the former operator of these lands with the cooperation of the Governor of Khorasan Razavi and with the change in land use of the area, which were finally approved by the commission of the Supreme Council of Architecture and Urban Planning of Iran on May 9, 2022.

## **Geographical position of Iran**

Iran has been considered with 2 locations by geographers and the United Nations. The geographers' perspective has determined its location in Southwest Asia, which is bordered by Turkmenistan, Azerbaijan, Armenia, Nakhchivan Autonomous Republic and Caspian Sea from the north, by the Oman Sea and the Persian Gulf from the south, by Turkey and Iraq from the west, and Afghanistan and Pakistan from the east. But, Iran's location in South Central Asia is mentioned in publications affiliated with the United Nations. This country is bordered by Armenia, Azerbaijan, and Turkmenistan, all three of the former Soviet republics, and the Caspian Sea from the north, Afghanistan and Pakistan from the east, Turkey and Iraq from the west, and the Persian Gulf and the Oman Sea from the south. Along with China and after Russia, it has the record number of neighbors in the world, with 15 independent countries and 24 states as neighbors (Kirimipour, 2000:23). This country has 7744 km of land and water borders, 2.3 of which approximately are land borders. Its land borders have changed many times during its several thousand-year histories, and its current stability reaches about 50 years.

The current border of Iran is a larger part of the Iranian plateau, which extends from the northwest to the Armenian Plain, from the southeast to the Indus Plain, from the southwest to the Tigris and Euphrates basins, and from the northeast to Transoxiana (<http://forum.persianseven.ir>).



Map 1. Iran's geographic situation

### Geometry

Iran, with an area of more than 1,648,195 km<sup>2</sup>, is the 16<sup>th</sup> country in the world by area (taking into account all land and water areas of 1,873,959 km<sup>2</sup>) and is located in the southwest of the Asian continent and is among the countries of the Middle East. Iran has an important and strategic position. It is very important for the major powers in the world today, and the region between the Persian Gulf in terms of military and geography. The importance of Iran's position in geopolitical theories is mainly due to the fact that this country is connected to the open sea through the Persian Gulf and the Oman Sea and acts as a passage. The connection of the northern borders of Iran to the neighbors and the geographical location of the Persian Gulf have also given this country a special geopolitical value (Hafez Nia et al., 2021). Also, between 25 degrees and 42 degrees, 5 44' east passes through the westernmost point of Iran, and 18 63' east passes through the easternmost point of Iran. Also, 25 3' north passes through the southernmost point of Iran and 39 47' north passes through the northernmost point of the country. In other words, Iran, which is a large part of the Iranian plateau and is located in the southwest of Asia and the southern half of the northern temperate climate, between the latitude 25 to 40 degrees north and the longitude 44 to 64 degrees east (Jedari Aiwazi, 1995: 8) In general, Iran is mountainous and semi-arid, and its average height is more than 1200 m above sea level. More than half of the country's area is mountains and

highlands, a quarter is plains, and less than a quarter is cultivated land. The lowest internal point with a height of 56 m is in Chale Lot, the highest point is Damavand with a height of 5628 m in the middle of the Alborz mountain range, on the southern side of the Caspian Sea, and the height of the land is 28 m below the level of the Azad Sea (<https://kazan.mfa.ir>).

### **Climate**

According to the climate diversity in Iran, three types of climate can be distinguished:

- Desert and semi-desert climate: large parts of the interior and southern coasts have this type of climate. One of the characteristics of this type of climate is the presence of dry and long periods of heat, which sometimes last more than seven months of the year.
- Mountain climate: which is divided into two types of cold mountain climate and moderate mountain climate.

a. The cold mountain climate that occupies about 40,000 km<sup>2</sup> of Iran and the annual rainfall in these areas is more than 500 mm.

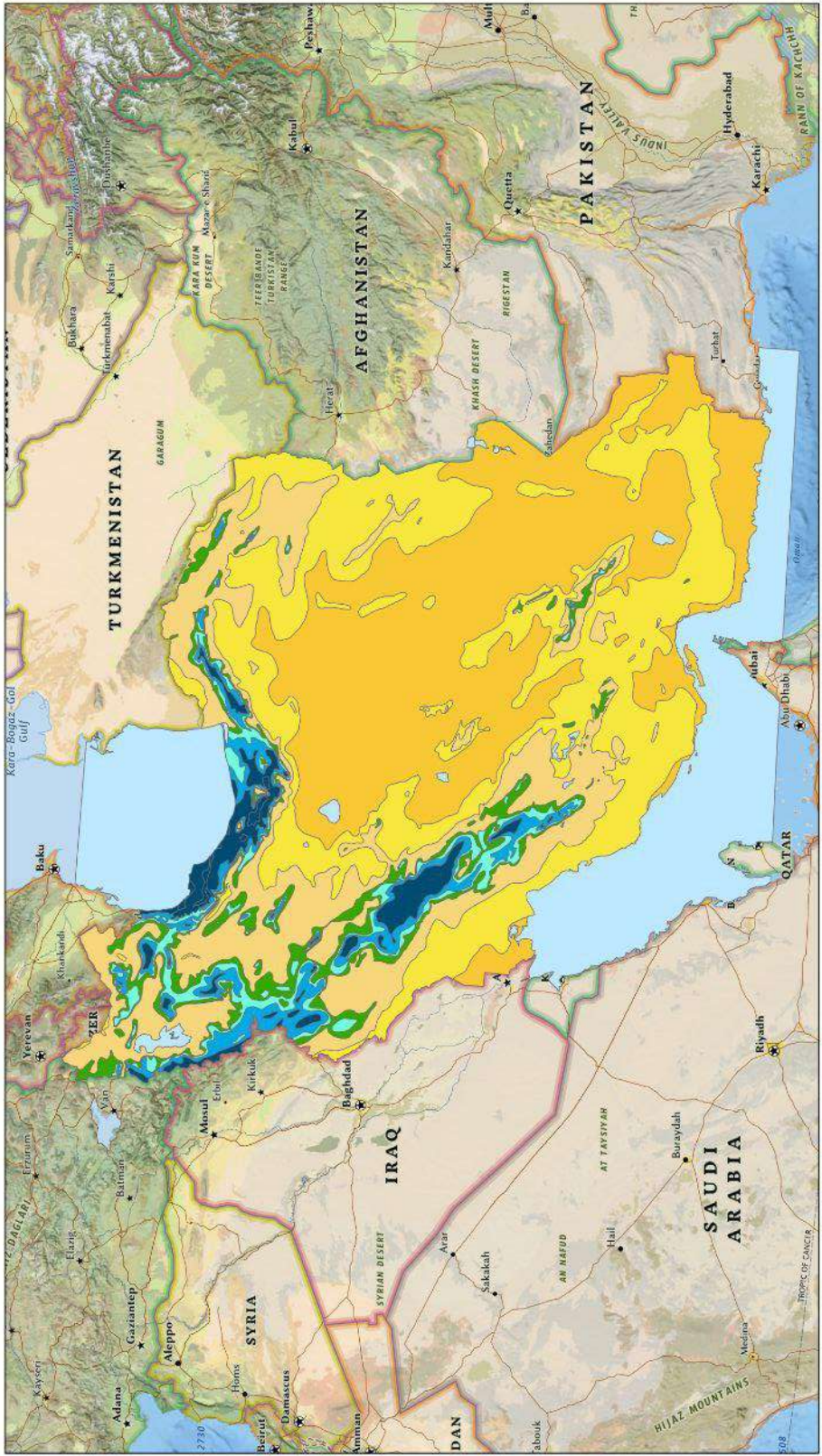
b. Moderate mountain climate: It occupies about 300,000 km<sup>2</sup> of Iran and its annual rainfall varies from 250 mm to 600 mm.

- Caspian climate: which is a narrow and small area between the Caspian Sea and the Alborz mountain range, with an annual rainfall between 600 and 2000 mm (Khodaie et al.: 2017: 77).

Therefore, due to low rainfall, large parts of Iran are in the world's arid climates, from sub-tropical to sub-northern regions. Altitude, latitude, marine influences, seasonal winds and proximity to mountain slopes or deserts play an important role in daily and seasonal temperature fluctuations in the country. For example, the average summer day temperature in Abadan, Khuzestan Province is 43°C and the average winter temperature in Tabriz, East Azarbaijan Province is about freezing so that in the winter of 2020, Sarab, East Azarbaijan Province with a temperature of -30°C was the coldest city in Iran. Rainfall also varies throughout the country; from less than 2 inches in Mirjaveh in the southeast of the country to more than 72 inches in Bandar Anzali on the coast of the Caspian Sea. The average annual rainfall in the country is about 9 inches. The rainiest season in Iran is winter, and more than

half of the annual rainfall occurs in these 3 months. The north of the country causes a big contradiction in the rainfall statistics. Alborz mountains deprive their southern parts from the effect of the Caspian Sea and cause a fertile and forested north for Iran. In the north of Iran, the temperature reaches 38°C, frost is very rare and the humidity may increase to 100%. Except in the north of the country, summer is known as a dry season in Iran. One of the features of Iran's climate is that its different regions can have four separate seasons (Wikipedia, the free encyclopedia).





**Legend**

- sea & lake
- very moist
- moist
- Sub-humid
- Mediterranean
- semi arid
- arid
- ultra arid

### Climatic zoning of Iran

Dottorato di Ricerca in Architettura, Arti e Pianificazione | XXXVI Ciclo  
Curriculum: Pianificazione urbana, territoriale e paesaggistica

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Kilometers

A Practical Solutions Framework  
Of Brownfields Regeneration Process

Division 77th Barracks Of Mashhad, Iran

Tutor: Prof. Daniele Ronisvalle  
Phd Student : Mina Ramezani

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DI ARCHITETTURA  
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Map 2. Climate classification in Iran

# **Khorasan Razavi and Mashhad**

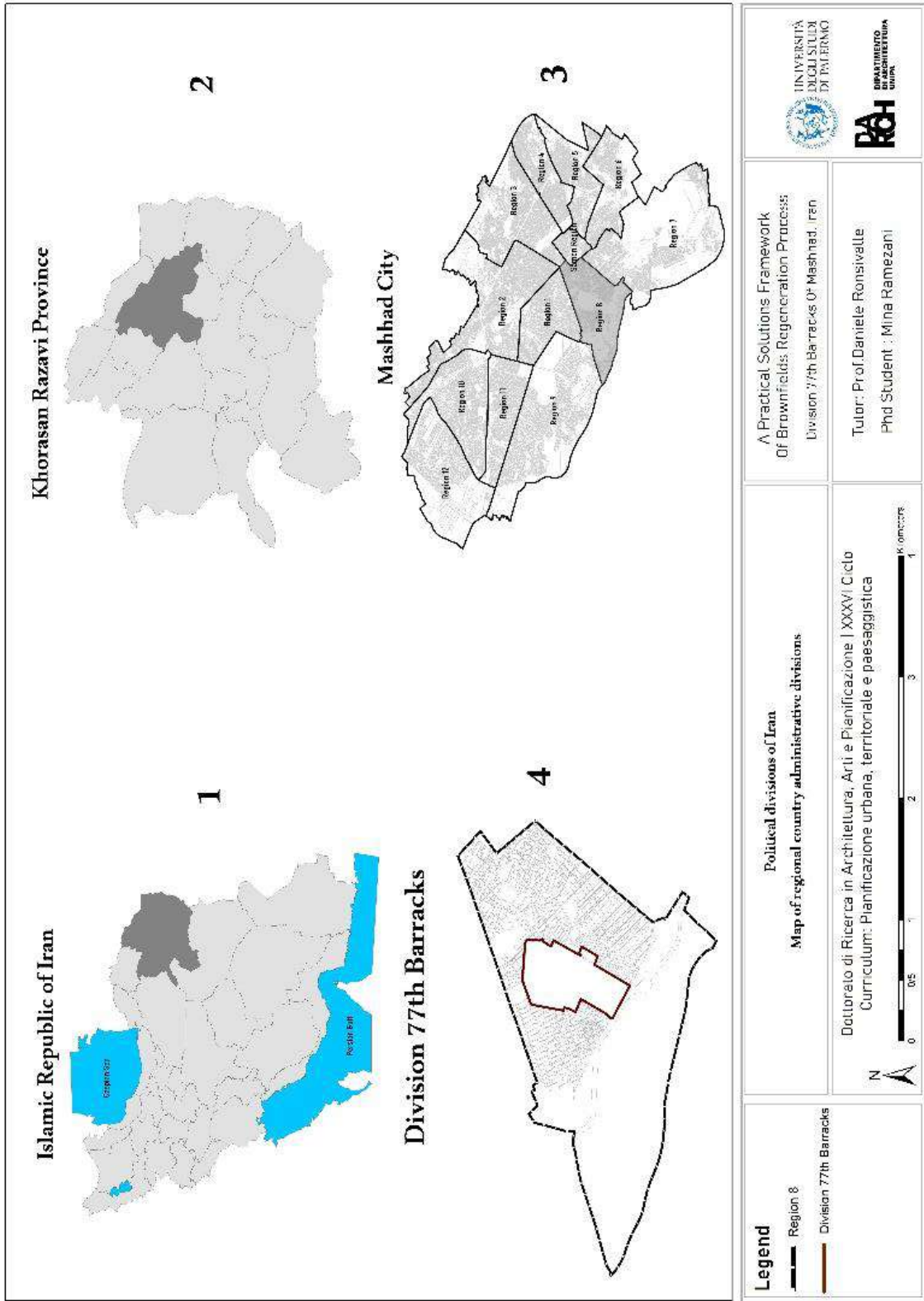
## **Introduction of Razavi Khorasan Province**

### **History and introduction of Mashhad**

Razavi Khorasan Province is one of the parts of Khorasan Provinces in northeastern Iran, with the center Mashhad. This province is located at 33 to 37 degrees north latitude and 61 to 11 degrees east longitude from the Greenwich Meridian (Khorasan Razavi Governorate Management and Planning Deputy, 1955). According to the latest political divisions, Razavi Khorasan Province includes 28 towns, 70 parts, 73 cities and 164 villages. According to the latest census results of 2016, Razavi Khorasan Province has a population of 5,434,501 people and is considered as the second province of the country by population. Mashhad with a population of 278 people and Bajestan with about a population of 8 people per km<sup>2</sup> have the highest and lowest population density in the province (Khorasan Razavi Governorate, 2018). Mashhad was the capital of Iran during the Afsharian era. With an area of 351 km<sup>2</sup>, Mashhad is the second largest city in Iran after Tehran. Mashhad is bounded by Dargaz and Chenaran from the north and north-west, Sarakhs and Kalat from the east, Torbatejam from the southeast, Fariman and Torbet-e-Haidarieh from the south and southwest, and Torghabeh, Shandiz and Neishabur from the west. According to the population and housing census of 2016, this city with a population of 3,001,184 people is the second most populated city in Iran after Tehran. Mashhad is spread in the basin of the Kashfroud river and in the Mashhad plain between the mountains of Hezar Masjid and Binalud (Motahidin 2014: 57-58)

Mashhad has 13 municipal districts and its mayor is elected by the 15-member city council. The economy of Mashhad relies on religious tourism, focusing on Imam Reza shrine. In addition, the presence of large commercial centers and significant medical facilities has led to the growth of recreational tourism and health tourism in this city. More than 93% of the people of Mashhad are Persian speakers. The population density in Mashhad is more than nine thousand tons per km<sup>2</sup> (Master plan of Mashhad, 1999:2).





Map 3. Political divisions of Razavi Khorasan and Mashhad

### Topography of Mashhad

Mashhad consists of two mountainous and plain areas. Mashhad plain is a fertile and relatively watery area, which is part of the Kashf Roud basin. This basin is located in the north of Khorasan Province. From the north, it is limited to the ridge of the Hezar Masjid heights and from the west to the basin of the Atrek River. The total area of the basin is 16,500 km<sup>2</sup>, of which 5,000 km<sup>2</sup> are plains and the rest are highlands. Its highest point is Binalud with a height of 3300 m above sea level and its lowest point is located at the outlet of Khatun bridge basin with a height of 580 m above sea level. For the broad slope of the urban area of Mashhad, about 66% of its area includes areas with a slope of 0-5%, 14% with a slope of 5-10%, which is mainly in the foothills of Binalud in the south of Mashhad, and less than 4% of the area has slopes of more than 30%. Mashhad is connected to the northern slopes of Binalud in the extended southern areas, which have steeper slopes than other areas of the city. For topography, Mashhad has a gentle slope and generally the slope of the city is from north to south, increasing from the south, i.e. Binalud heights, to the north of the city (Armanshahr Consulting Engineers, 2008:18).

### Faults of Mashhad

Geological factors, including epeirogenic and orogenic factors, have played a significant role in the formation of Mashhad Plain. Studies have shown that the Hezar Masjid and Binalud mountain ranges, which are located along the central Alborz mountain range, are affected by alpine movements. The relatively many faults in the north of the Mashhad plain show the land instability. The general direction of the faults is northwest-southeast, which is parallel to the vertical of the Mashhad Plain (Tahiri et al., 2002).

Table 3-1. Types of faults in the area of Mashhad

Fault	Mechanism	Length (km)	Distance from the central point (km)
Kashf Roud (Cheshme Gilas)	inverse	60	42
Binalud	inverse	100	32
Tous (north of Mashhad)	inverse	60	10
South of Chenaran (south of Mashhad)	inverse	100 ≤	5

Shandiz	right handed	85	15
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Hafezi Moghadas et al. (2008: 33)

## Climate

### Precipitation

The heights of the western and southwestern parts of Mashhad have the highest annual rainfall, and the lowest amount of rainfall occurs in the northeastern and southeastern parts. Given to the rainfall in Mashhad, it was found that Mashhad is located in an arid region. Due to the western winds in the middle of the autumn, the rainfall in the autumn is less than in spring.

Binalud heights that stretch along the northwest-southeast plays a significant role in regulating the temperature of this region, and the duration of atmospheric precipitation that continues in the form of snow in these heights until the middle months of the year causes a reduction in temperature even in the hot months of the year. Accordingly, summer months have the highest temperature in the year. The average annual wind speed in Mashhad is 1.1 m/s, the maximum speed is in June (21 m/s) and the minimum wind speed is in December (9 m/s). Given that in urban issues, recognition of disturbing winds is one of the most important variables under study, the most famous local wind of Mashhad is Guchan wind, which blows during the cold season of the year and causes the air to cool down (Khalili et al., 2019: 66).

In Mashhad, the average relative humidity is between 30 and 60%. According to the statistics of the Mashhad Meteorological Station during 1965-1995, the monthly average of evaporation in July and August, which are the hottest months of the year, is the maximum (in July) on average, 11 mm of water has evaporated every day.

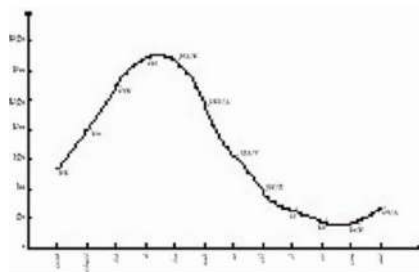


Chart 3-1. Evaporation Curve (Farnahad Consulting Engineers, 2016)

## Social characteristics of Mashhad

### Population

The members of all normal resident households, a resident institution, an institution and a group whose usual residence is in the province at the time of the census, and the members of all non-resident normal households in the province, constitute the population subject to the census in the province. Members of political delegations and foreign embassies in Iran and their family members are not included in the census population. However, Iranians who are members of Iranian political delegations and embassies abroad and their family members are included in the census population.

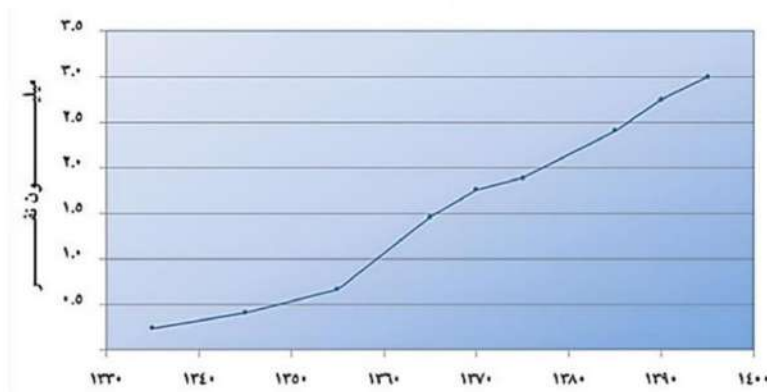
Mashhad as the largest religious city of the country has a history of 1200 years. In the first official census of Iran, which was conducted in 1955, this city was the fourth most populous city in Iran after Tehran, Tabriz and Isfahan, with a population of 2,419,989 people. In the 1955 census, Mashhad was the second most populous city in Iran, after Tehran, and it held the same position until the last census in 2015.

Table 3-2. Population and households of Mashhad by gender during 1955-2015

Year of census	Number of households	population			Gender ratio	Average annual growth rate
		total	men	women		
1955	62,048	241,989	121,471	120,518	101	-
1965	89,047	409,616	211,406	198,210	107	5.4
1975	144,592	667,770	340,644	327,126	104	5
1985	300,317	1,463,508	746,938	716,570	104	8.2
1995	408,299	1,887,414	957,345	930,069	103	2.6
2005	637,424	2,427,316	1,223,840	1,203,476	102	2.5
2010	815,630	2,807,464	1,404,941	1,402,523	100	1.7
2015	930,045	3,057,679	1,532,475	1,525,204	100	1.02

Statistics of Mashhad, 2016

Calculations show that the highest growth rate is 8.14 in the 1965-1985s, and the reasons for which are the increase in natural population growth, the policies of increasing population and urban land at this time, the imposed war that caused many people from the western regions of the country to be sent to Mashhad. and on the other hand, the arrival of Afghan immigrants, the occurrence of natural disasters in Khorasan, and finally, the integration of many surrounding settlements in this city. According to the general population and housing census of 2016, the population of Mashhad is 3,057,679 people. Based on comprehensive studies, its population is predicted to reach 3,371,177 people in 2021 (Mashhad Municipality Statistics and Information Analysis Department, 2016).



Population changes of Mashhad (Statistics of Mashhad, 2016)

As shown in Table 3-7, the growth of the population of Mashhad between the two 2011 and 2016 censuses is 1.72%, which is 0.48% higher than the country and 0.29% higher than the province. Although Mashhad's growth rate has reduced by 0.2% compared to 2011, which is mostly due to the reduction in the size of the household. Among the districts, District 12 is at the top with 11.8% growth, the main reason for which is newness and the increase in constructions and attracting the population of other districts and the addition of Tous to that district. The population density in Mashhad has increased by 1.5% according to the 5-year trend, in other words, from 85.5 people per hectare in 1990 to 87 people per hectare in 2016. However, given the 7% increase in the area of Mashhad, i.e. from 32,823 hectares to 35,147 hectares (Tous and Gerghi), the actual growth rate of population density is more than 1.5%. Given the population growth of Mashhad, and the immigrants, this will be faced with a higher population density in the future.

District	Population	Number of households	Area (ha)
Mashhad	3,057,679	930,045	35,147
1	167,013	55,221	1,477
2	513,365	157,592	3,844
3	417,950	125,659	3,307
4	262,184	76,692	1,342
5	175,603	48,593	1,438
6	232,616	67,036	1,869
7	253,236	76,501	742,4
8	92,543	29,989	19,30
9	327,061	103,093	4,473
10	296,823	92,018	2,333
11	200,161	60,609	1,534
12	105,263	32,517	, 5026
Samen	13,861	4,525	356

Table 3-8. Population profile of Mashhad by districts based on 2016 census  
Statistics Management, Mashhad Municipality, 2016

As shown in Table 3-8, the population of District 8, which is investigated in this study, is 92,543 people and its area is 19.30 hectares.

#### **Age and gender ratio**

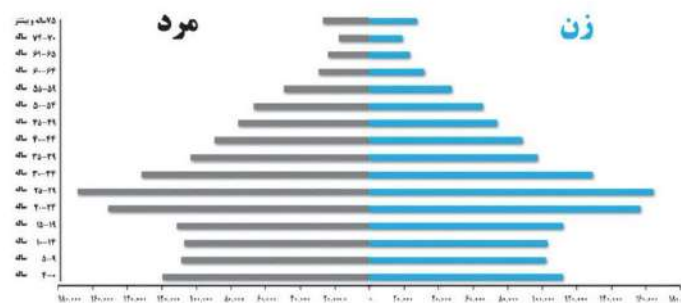
The population growth of Mashhad between 2011 and 2016 censuses is 1.72%, which is 0.48% higher than the whole country and 0.29% higher than the province. Although Mashhad's growth rate has reduced by 0.2% compared to 2011, which is mostly due to the reduction in the size of the household. Among the districts, District 12 is at the top with 11.8% growth, the main reason for which is newness and the increase in constructions and the attraction of the population of other districts and the addition of Tous to that district.

Table 3-9. Population by gender and major age groups, November 2011 (Iran Statistics Center, 2016)

Age group	Total	Men	Women
Below 1 year old (newborn)	47037	24081	22956
1-5 years old (infants)	232015	118557	113458
6-10 years old (babies)	211735	108493	103242
11-14 years old (children)	168834	85227	83607
15-24 years old (youth)	537426	262866	274560
25-67 years old (middle aged)	1428299	715699	712600
65 years old and above (elderly)	140023	68993	71030
unknown	889	212	677
total	2766258	1384128	1382130

Statistics Management, Mashhad Municipality, 2016

Currently, the ratio of men to women in Mashhad is 100.5: 100, i.e., there are 100.5 men for every 100 women. In 2006, Mashhad had a population of 2,424,316 people (1, 223,840 men and 1,203,476 women). Accordingly, the gender ratio was 102 this year. In 2016, Mashhad had a population of 3,057,679 people (1,532,475 men and 1,525,204 women). Accordingly, the gender ratio has been 100 this year. Also, 194,700 people are children under 4 years old, 195,108 people are 5-9 years old, 314,290 people are 20-24 years old, and 38,033 people are 75 years old and above.



Demographic Pyramid of Mashhad in 2011  
(Statistics of Mashhad, 2016)

Given the age pyramid of the population of Mashhad, the dependency ratio of the population less than 15 years and more than 64 years to the independent

population is 43.3, which is 35.9 by the ratio of children under 15 years to the independent population and the dependency ratio of the elderly is 7.5%, indicating the economically inactive population of Mashhad. In addition, given the youth factor of the population, which is obtained from dividing the population less than 15 years old by the total population, the youth factor is 25.01. Therefore, any population whose youth factor is 40% or more is called a population with a young structure. This factor for male and female population in Mashhad is as follows:

- Female youth factor: 24.47
- Male youth factor: 2.56

### **Literacy**

According to the Statistics Center of Iran, all those who can read and write a simple text in Farsi or any other language are considered as literate. In the general population and housing census, concepts have changed to some extent during each statistical period (Iran Statistics Center, 2016).

- Emotional literacy: the ability to establish emotional relationships with family, colleagues, customers, competitors and friends deservedly.
- Communication literacy: the ability to communicate and interact with all members of society, including social etiquette and optimal social relations.
- Financial literacy: the ability to manage income economically, i.e. knowledge of cash flow, investment and cost management.
- Media literacy: knowing which media news is valid and which is invalid; i.e. the ability to recognize the truth of news and other media messages.
- Educational literacy: the ability to raise worthy children
- Computer literacy: the ability to use the seven computer skills or the basic concepts of information and communication technology, computer use, file management, word processing.

Today, in the 21<sup>st</sup> century, being able to read and write, or even having a university degree, does not mean that one is literate. Table 3-10 shows the literacy status in Mashhad.



Table 3-10. Literacy status in Mashhad in 2016

literate			illiterate			Not reported		
total	men	women	total	men	women	total	men	women
2,248,387	1,146,626	1,101,761	205,692	75,547	130,145	18,003	11,757	6,246

Statistics Management, Mashhad Municipality, 2016

Table 3-11. Student population inside and outside the country

Student population	
abroad	Iran
152000	643140

(Statistical Center of Iran, 2016)

Table 3-12. Literate population in Mashhad based on the 2014 census  
Mashhad Municipality

District	Literacy rate (%)	rate of literate non-students with higher education (%)
Mashhad	90.9	17.4
1	95.2	38.3
2	91.2	14.6
3	88.9	6.8
4	87.2	5.9
5	85.3	4.5
6	83.9	4.4
7	90.6	8.7
8	92.3	24.5
9	96.1	33.6
10	95.5	21.5
11	92.6	35.1
12	92.6	17.8
Samen	93.4	10.1

As shown in the above tables, the literacy rate is 92.03% in District 8 of Mashhad.

### Migration

Mashhad, due to the presence of the holy shrine of Razavi and being the capital of the province, with 151,349 immigrants, has the highest number of cities accepting immigrants in Razavi Khorasan Province. The table shows the status of immigrants in Mashhad by districts.

Table 3-13. Immigrants in Mashhad by districts in 2016

District	total
Mashhad	151,349
Samen	1,326

1	2	3	4	5	6
8,205	17,823	17,292	11,833	5,554	11,250
7	8	9	10	11	12
14,607	4,584	22,137	21,151	12,051	3,563

Statistics Management, Mashhad Municipality, 2016

A significant population of Afghan immigrants live in Mashhad. These immigrants mostly immigrated to Iran after the former Soviet invasion of Afghanistan and the emergence of the Taliban and the subsequent attack of the United States and NATO forces. During 1970-1980, a population of nearly 5,000,000 people entered the country as a group and, accordingly, to Khorasan Province and partly to Mashhad. After the US attack on Afghanistan, about one million authorized immigrants and 2,500,000 million unauthorized immigrants entered the country. On the other hand, at the same time as the start of the Iran-Iraq war, another population of Iraqi refugees was also forced to leave Iraq due to the war and unrest, many of whom settled in in Khorasan Razavi Province, especially in Mashhad due to their religious and religious beliefs and social and cultural relations with Iranian citizens and other cities of the province such as Neishabur, and married Iranian women and had families. According to the comprehensive plan for the census and identification of foreign nationals during 1990-2000, a population of around 142,000 Afghans, 13,900 Iraqi people and 100 other nationalities were identified in Razavi Khorasan Province. Currently, according to the available statistics, nearly 60,000 foreign students, 90% of whom are Afghans, are studying in public schools. Also, nearly

2700 foreign students are studying in higher education centers of the province. According to the statistics of the General Directorate of Citizens and Immigrant Affairs of Khorasan Razavi Governorate, 95% of the immigrants of this province live in Mashhad. In recent years, Mashhad has witnessed the migration of Baluch and Kurds (Mehr News Agency, 2013).

Table 3-14. Number of immigrants entered Mashhad during 2006-2016

women	men	total
74515	73864	151349

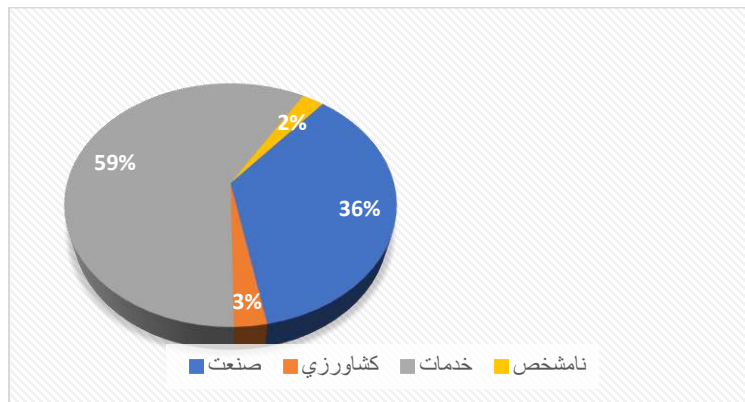
Statistics Management, Mashhad Municipality, 2016

## Economic status of Mashhad

### Activity and employment

The economic dimensions of a city are the employment the free encyclopedia and the active population of that city. The active population in society shows the actual supply of workforce. The employment status in Mashhad is struggling with problems such as the low level of salaries, the limitation of recruitment and the increase in educational coverage, unfortunately causing the unemployment rate to reach 11.4 in 2017.

Distribution rate of employees in Mashhad



According to the 2016 census, 2,337,073 people of the total population of Mashhad were of working age, and 959,777 people were employed.

The structure of employment in different economic sectors of Mashhad during 1965-1995 shows that during the 30-year period, the contribution of agriculture,

industry and mining sectors in the employment structure has gradually reduced and the contribution of the service sector has increased. As a result, in this city, the service sector has always contributed the most in creating job opportunities. Of course, due to the lack of publication of the detailed results of the census of 2011 and 2016, the next developments cannot be followed accurately. Nevertheless, the follow-up of the employment status in the previous censuses has proved this claim and it can be said that in the last few years, this trend has continued in Mashhad. However, conducting field research is necessary in this regard. For this reason, researchers are advised to pay attention to this point in their research.

Table 3-15. Population with work experience of 10 years and above by employment status in Mashhad during 1975-2015

Year	Total population	Population with work experience of 10 years and above		Active population		Employed population		Unemployed population	
		No.	%	No.	%	No.	%	No.	%
1975	667770	467511	70	170166	36.4	161701	95	8465	5
1985	1463508	962988	65.	318406	33	281471	88.4	36935	11.6
1995	1887414	1458971	77.3	477431	32.7	448711	94	28720	6
2005	2427316	2037508	83.94	803063	39.4	744389	92.7	58674	7.3
2010	276258	2319004	73.6	127224	54.8	109087	85.7	18137	14.2
2015	3,057,679	2337073				777959		1559114	10.9

Table 3-16. Population with work experience of 10 years and above by activity status in Mashhad in 2015

Population with work experience of 10 years and above		Population without work experience of 10 years and above		Total population	
women	men	women	men	women	men
111,903	666,056	1172721	1164352	1,525,204	1,532,475

Statistics Management, Mashhad Municipality, 2016

Table 3-17. Employment status and number of employees in Mashhad, 2016

water supply, waste management, sewage and treatment activities	Supply of electricity, gas, steam and air conditioning	agriculture and industry	industrial (construction)	mining	agriculture, forestry and fishing	total
4783	7547	580	147231	2398	16694	729491

Service activities related to providing accommodation and food	Transportation and warehouses	Wholesale, retail, repair of motor vehicles and motorcycles	Construction
18845	75243	136253	105026

education	Administrative and support services	Professional, scientific and technical activities	Real estate	Finance and insurance	Communication and information
51743	9110	14312	7756	14402	9309

Overseas organizations and delegations	Household activities as an employer	Other service activities	art and entertainment	Public administration and defense, compulsory social security	Human health and social worker
69	1474	21786	4421	55414	25035

Administrative and clerical employees	Technicians and assistants	Experts	Legislators, senior officials and managers	total
39217	88750	81040	37201	729128

Workers	Operators, assemblers of machines and devices and vehicle drivers	Craftsmen and employees of related businesses	Skilled agricultural, forestry and fishing workers	Service staff and vendors
110108	89538	175364	15603	125307

According to the general population and housing census in 2016, the unemployment rate in Mashhad was 10.9%, indicating that out of every 100 active people over 10 years, about 11 people are unemployed and Districts 10 and 11 have the highest ratio. On the other hand, the percentage of employees in Mashhad was about 19.7%, which is also the highest in Districts 1, 8, 9, 10, and 11. In general, according to the statistics, it can be concluded that District 8 has relatively better welfare.

Table 3-18. Unemployment rate and employees in the public sector in Mashhad

index	Mashhad	1	2	3	4	5	6
unemployment rate	10.9	11.3	11.1	9.2	9.2	8.4	11.4
	7	8	9	10	11	12	Samen
	9.6	11.4	12.5	12.9	13.5	9.3	11.7
percentage of employees in the public sector	Mashhad	1	2	3	4	5	6
	19.7	24.8	18.7	13.1	11.9	9.2	11.5
	7	8	9	11	11	12	Samen
	18.7	25.9	30.7	26.8	29.9	26.2	12.9

Statistics Management, Mashhad Municipality, 2016

Investigating the structure of employment in different economic sectors of Mashhad during 1975-2015 shows that it has not grown uniformly and during the 45-year period, the contribution of agriculture, industry and mining sectors has gradually reduced and the contribution of services increased. As a result, this city is in the service sector. It has contributed the most in creating job opportunities.

Table 3-19. Employment structure of Mashhad in 2011

sector	employment rate
agriculture	4.25
industry	2.27
service	4.47

Statistics Management, Mashhad Municipality, 2011

## Physical characteristics of Mashhad

The body of a city can be considered as having specific divisions called regions, and these physical regions are also effective on creating a sense of citizenship, recognizing urban boundaries and building urban communities. Hence, the social effects of cities in the body of each city are influential on one side and influenced on the other. Each urban area, as a physical element of the city, is made up of different urban areas, and each area is made up of several urban districts, each district of several neighborhoods, each neighborhood of several alleys, and each alley of several residential units. Table 3-20 shows that the physical divisions of the cities have a specific hierarchy. The fair distribution and allocation of urban resources and services in different areas of the city is according to the needs of the urban community, and of course, the optimal distribution of services is directly related to land use planning. In this table, the largest area is related to agricultural lands and gardens with an area of 47,021 hectares, and the smallest area is related to mines with an area of 576 hectares. The dominant use in Mashhad is residential use.

Table 3-20. Physical characteristics of the city boundary by type of use, 2016

No.	Landuse	area (ha)
1	accommodation-villa	5,393
2	workshop-industrial	6,796
3	residential	3,084
4	mines	576
5	natural zones	18,643
6	agricultural lands and gardens	47,021
7	other	4,688

Statistics Management, Mashhad Municipality, 2015

As shown in Table 3-21, the largest area of use in Mashhad belongs to residential buildings with an area of 77,150,000 and its per capita is 4.22. The highest number of users per capita is related to the religious sector (95), which is certainly due to the fact that Mashhad is a religious city and is also named the spiritual capital of Iran.

# **Design Area studies: Brownfield of the barracks in Mashhad**

## **Historical studies**

### **Evolution during the past periods**

In the present study, based on the subject of the research and the importance of the indirect effect, Mashhad was considered, and then the middle-western area, which is located in the vicinity of the central area of the city and connects this area with new developments on the west side of the city was selected as the comprehensive area. This area had a direct effect on the study area. The location of this area and the presence of administrative, recreational, therapeutic and commercial uses with extra-regional and urban functions caused many trips within Mashhad to take place inside and / or passing this area. The streets bordering the study area selected as the supplementary area of the design area (intervening area) include Imam Khomeini Street, Fayaz Bakhsh Street, Bahar Street, Kohsangi Street and Shahid Kalantari Boulevard.

### **Historical development of Mashhad**

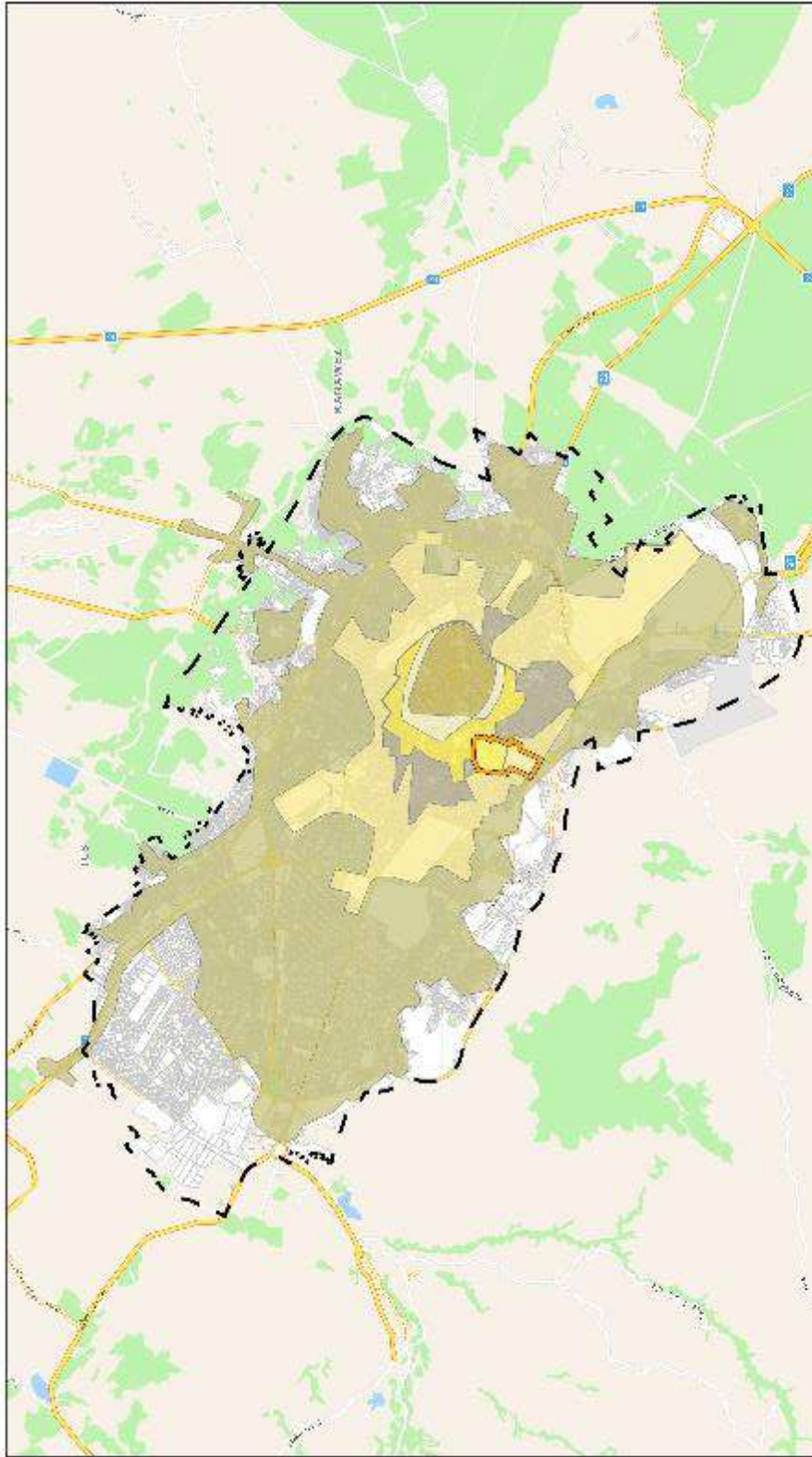
Since 1965, the city has been developed in all parts of the city. In the meantime, another part of Vakil Abad road to Palestine Square has entered the city area and new constructions formed around it. This road is the main axis that later leads the development of the city to the west and creates new residential contexts around it. In addition, since 1965, the development of Mashhad has been determined and guided by the lines of the Development Plan of Mashhad. The main axis of development that was built in this year was the Sento road, which determined the southern and western boundaries of the city until 1975. In addition, Ferdowsi University and Mellat Park on the western border of Sento road were the factors accelerating the development of the city towards the west.



Table 3-21. Area and contribution of each land use in Mashhad 2016

land use	area	Per capita	%
residential	77,150,000	4.22	44.48
commercial	8,522,802	44.2	15.3
educational	7,659,750	19.2	83.2
religious-cultural	330,4593	95	22.1
tourism-hospitality	3,960,000	13.1	46.1
health care	7,141,511	24.2	64.2
sports	5,413,999	55.1	2
green space	42,887,807	2.12	84.15
Administrative police	8,985,826	57.2	32.3
industrial	5,911,600	69.1	18.2
municipal facilities and equipment	4,290,574	23.1	58.11
transportation and warehouse	4,375,725	25.1	62.1
road	64,420,000	41.18	79.23
exhibition	2,000,000	157	74
garden	18,670,000	33.5	89.6
terminal and grocery	61,411,910	75.1	27.2
total	270,835,900	670.8	100

Statistics Management, Mashhad Municipality, 2016



	<p><b>A Practical Solution Framework of Historical Rejuvenation Finance</b> Euisan Tri Permana Mashadi, et al.</p>	<p><b>Historical development of the city of Mashhad</b></p> <p>Doktoranda R. carra in Arsitektur, Arsitektur, Arsitektur, Arsitektur, Arsitektur Cultural and Planning Department, Faculty of Architecture, UPI</p> <p>0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102 108 114 120 meters</p>		
		<p>Author: Prof. Darnelo Ronovalle PhD Student: Mina Ramezan</p>	<p>0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102 108 114 120 meters</p>	

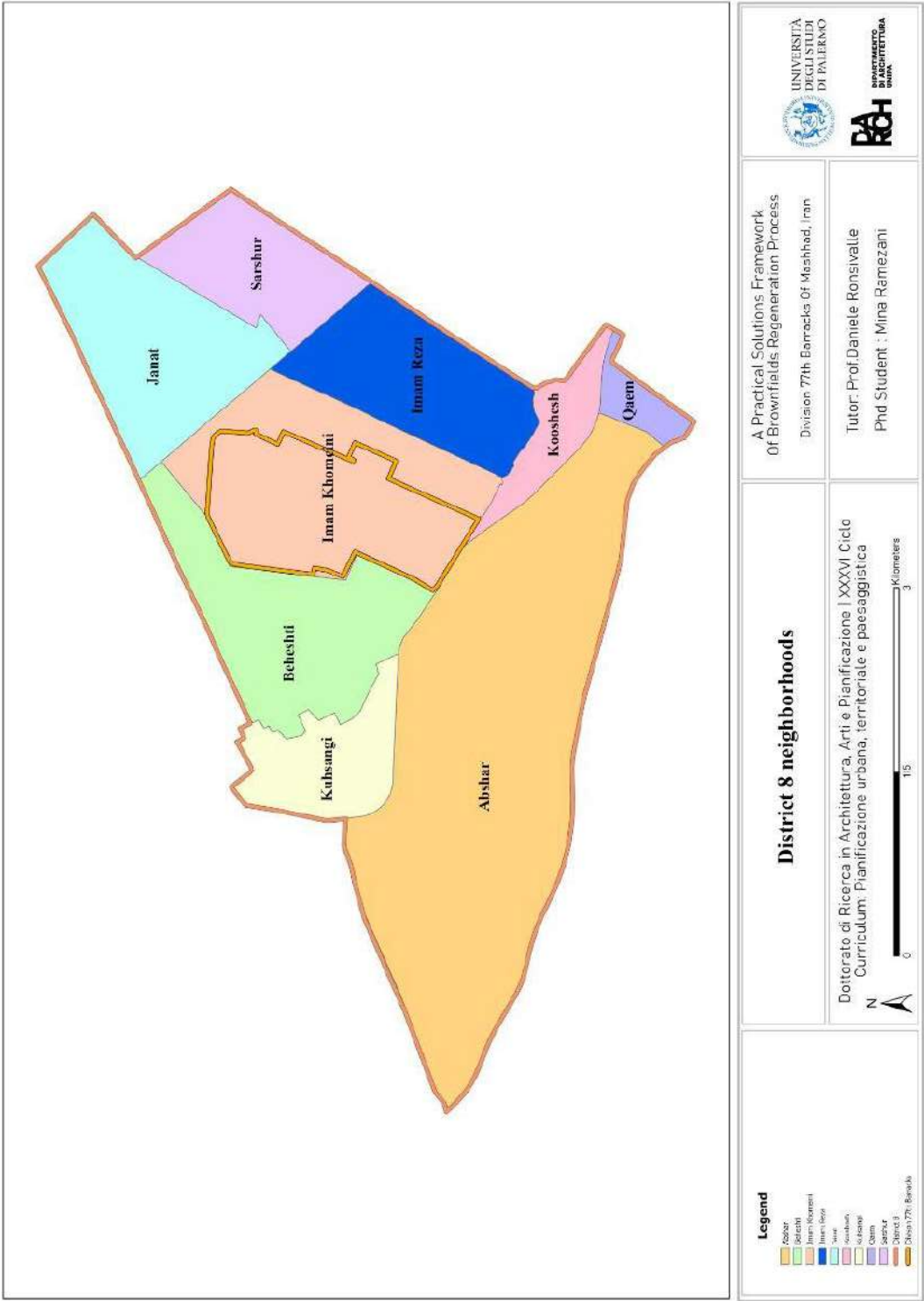
### District 8 of Mashhad

The study area is located in Mashhad and District 8, which has an area of 1961 hectares and a population of 94,227 people. It is divided into 3 areas and 12 neighborhoods based on the national divisions, and the study area is located in area 3 and the Imam Khomeini neighborhood. District 8, includes Shohada Square, Ayatollah Shirazi Street, Azadi Street, Shahid Andarzgo Street, and Bait al-Maqdis Square from the north; Bait al-Maqdis Square, Imam Reza Street, Basij Square, and passenger terminal from the east; Shahid Kalantari Highway, 75-meter south ring road of Mashhad, and Islamic Republic Square from the south; Islamic Republic Square, Dr. Shariati Street, Dr. Shariati Square, University Street and Shohada Square from the west; and Beheshti, Kohsangi, Imam Khomeini (RA), Khorramshahr, Imam Reza (AS), Iman, Sarab, Jannat, 10 Dey, Salam, Ayatollah Khamenei and Danesh neighborhoods.

Table. Information of District 8 of Mashhad Municipality

District 8	Area 1	Imam Khomeini neighborhood
		Janat neighborhood
		Danesh neighborhood
		Salam neighborhood
		Sarab neighborhood
		10 Dey neighborhood
	Area 2	Beheshti neighborhood
		Kohsangi neighborhood
	Area 3	Imam Khomeini neighborhood
		Imam Reza neighborhood
		Iman neighborhood
		Khorramshahr neighborhood

All neighborhoods in this area, especially Imam Khomeini neighborhood, which is discussed in this study, are among the old neighborhoods of Mashhad, and its residents are mostly genuine residents of Mashhad, and there are fewer immigrant parts than in other districts of Mashhad.



Map. Neighborhoods of District 8 of Mashhad Municipality

### **Formation process of the urban texture around the barracks and their usage changes during the periods**

According to the formation periods of Mashhad, the border of the site can be divided into two old and new parts. The northern part of the site, which is located in the north axis of Kalantari, forms the old part of the site, formation of which dates back to 1945-1975, and most of the buildings belong to the first and second Pahlavi period. The southern part of the site, which is made up of barren land and the existing buildings and structures are at a minimal level, is a new area, formation of which dates back to the last two decades.

### **Introduction of barracks lands**

The barracks lands of the 77<sup>th</sup> Saman al-Aema barracks of Mashhad, with an area of 432 hectares, is located in the southern slopes of Mashhad, owned by Astan Quds Razavi. The historical maps of Mashhad show that for the first time barracks lands are seen on the map of Mashhad in 1940. The area map and image of the study area are shown below. The barracks land is located in area 3 and Imam Khomeini neighborhood and is adjacent to Iman, Beheshti, 10 Dey, Imam Reza and Khorramshahr neighborhoods. For the neighborhood identity, Imam Khomeini, Sarab and Kohsangi neighborhoods have a higher identity than other neighborhoods in the local area.

The barracks of the 77<sup>th</sup> barracks of Mashhad has a special position by the accessibility, spatial location, landscape in Mashhad. For the access, this land overlooks the Shahid Kalantari highway of Mashhad. In fact, this highway divides the land of the barracks into two parts and the southern pass of the city, which is under construction, provides proper access to the land from the south. It is also located in the vicinity of the city's passenger terminal and near the city's international airport. For the spatial location, it is also in the vicinity of uses such as Kohsangi Park, passenger terminal and airport. The land of the barracks, especially in the southern part, has a beautiful view of the holy shrine due to its high altitude. On the other hand, it should be noted that the issue of leaving the barracks from the city has been discussed for a long time, and of course, it is the best model and use for the redevelopment of these lands is the subject of many scientific and research studies at the specialized level of urban planning fields. For this reason, selecting this case sample for this study can create a suitable way to create suitable urban spaces at the trans-regional level.

### **Name of the 77<sup>th</sup> Army barracks**

According to the documents, the name of the Khorasan army was clearly mentioned for the first time in the letter of Shah Abbas Safavi. The name of the Khorasan army and its regiments are also evident in many documents left over from the Qajar era, which are kept in the Astan Quds Razavi documents center. The number of regiments has varied during different periods, and offensive or defensive power has been strong and weak. Sometimes, due to the victory of the enemy and the capture of Khorasan, the army of Khorasan disintegrated and after some time was re-formed. This situation happened for the last time at the end of the first Pahlavi period (September 1940), when the Iranian army was disbanded with the invasion of the Soviet Red Army and the occupation of Khorasan, and after six months, it was re-formed with the consent of the allies. With the establishment of the new Iranian army in 1950, the new army of Khorasan was formed based on Article 6 of ... No. 1 with the name and number of the army (Eastern Army 5). This is due to the wide area covered by the army in the east of the country from Estarabad (Gorgan) and Bojnord in the north of Khorasan Province to Dezdab (Zahedan) and the southernmost areas of Sistan. After fourteen years, according to Articles 1 and 2 of ... No. 2120, in Farvardin 1935, based on Army General Order No. 3445, the name and number of the army was changed to "Eastern Army 8". Fourteen years later, on December 19, 1955, the name of the army was changed to "Khorasan Army 12" and the news of it was published in the Khorasan newspaper with the following description: "Change in the number of the Khorasan Army. According to the new organization of the Imperial Army, the number of Khorasan Army 8 was changed to 12 and henceforth Mashhad Army 12". In 1960, the name and number of the army was changed to "Khorasan Army 6" and in 1965 it was changed to "Khorasan Army 77", which has remained until now. In 1980, following the bravery of Khorasan Army 77 in the recapture of Abadan in the Saman al-Aema (AS) operation, the army's ground forces awarded the title of "victory" and thus, the name changed to "victorious Khorasan Army 77". The success in this operation as well as the proximity of the Khorasan Army to the holy shrine of Imam Reza (AS) caused the name of that saint to be like a medal of honor, the army's name, and in this way, the name "Victorious Khorasan Saman al-Aema Army 77" was registered for the army. Second Brigadier Mohammad Kazem Tarokh designed a special arm badge in 2005, which is along with the army emblem, the name of the army and the image of Imam Reza's (AS) court, and on the right arm of the military blouse. Given that

the soldiers did not have houses to live in, they had settled in scattered places in the city, so the order was given to build residential buildings from the side of Bahar St. to the inside of the block, according to their rank, the houses were given, for example, to the generals at the edge of Bahar St., and sergeants up to Eshghi St., Pars St. and Rudaki St.

### **Legal dimension**

Orientation of ongoing projects in Mashhad

Examining the related comprehensive projects of Mashhad can help to provide the appropriate use option for the lands of the military barracks. Hence, the comprehensive plans of Khorasan Razavi Province, Mashhad and the vision of Mashhad in 2025 were reviewed with the focus of the municipality.

### **Khorasan Razavi Province's plan**

Conducting studies on the country's provincial planning is one of the most important issues in order to realize the country's 20-year vision plan by 2025. In of Khorasan Razavi Province's plan, special attention has been paid to the role and position of Mashhad, the results of which based on the description of services on the strategic planning model of strengths, weaknesses, opportunities and threats include the formulation of the vision of Khorasan Razavi Province, a combination of the settlement hierarchy system and the missions of the province in the form of strategies at three trans-regional, regional, area and city levels. Among the strategies of Mashhad consistent with the strategies of Khorasan Razavi Province, the following can be mentioned.

- Relocating industries and disturbing uses (barracks, factories, customs, warehouses, etc.) and turning into public uses needed in Mashhad
- Improving the quality indicators of higher education in Mashhad
- Preventing the unplanned expansion of villages located on the outskirts of Mashhad and organizing the existing marginal areas in order to expand social justice and reduce crimes
- Revival of Mashhad-Toos historical axis in order to strengthen international tourism
- Improving the status of Mashhad in the globalization and urban competition
- Developing social capital and people's participation in activities
- Diversifying the field of transportation and using new plans to control traffic and air pollution

- Delegating the regional and intra-provincial roles of Mashhad to other major cities of the province in order to decentralize Mashhad, reduce the burden of services and activities in order to create intra-regional balance
- Strengthening, deepening and promoting Islamic-Iranian culture and identity in the development process of the city

#### **Mashhad Comprehensive Plan**

In Mashhad Comprehensive Plan, in order to determine the scope of urban management areas and regions as a basis for planning by the Consulting Engineers of Farnahad 2005, the proposal of the city has been presented to the planning and management areas in the form of 7 planning areas, which the consulting engineers are preparing detailed plans for each. Based on this new spatial division, the barracks lands are divided into two parts and their detailed plans are prepared in the form of the detailed plan of the middle-western area by Mehr Azan Consulting Engineers and the detailed plan of the southeast area of Mashhad by Parsumash Consulting Engineers. But the lands of the 77<sup>th</sup> Army barracks in the general model of the development of Mashhad are considered as a function.

No.	plan	Proposed feature or use
1		Establishing military use in the area
2	Mehr Azan	Commercial and residential uses
3	southern Mashhad	Residential use with low density and edge construction of green space
4		Tourism and pilgrim accommodation approach
5	Farnahad	A high-order model
6	southeast area	Natural and recreational tourism on an urban and suburban scale, and diverse accommodation, pilgrimage and residential uses
7	western middle area	Activity mix based on residence



### **Land ownership**

According to the agreements made in the last few years, the contribution of the army and the municipality of the project lands has been determined, which is drawn according to the map. In the meantime, a part of the northern lands of the site has also been designated as conservation military lands. Most of the land area of the municipality contribution is allocated to the use of parks and green spaces, and the rest of the services are only about 10% of the total land area of this entity.

Map. Ownership of lands in the area of barracks



<p><b>Legend</b></p>	<p>Dottorato di Ricerca in Architettura, Arti e Pianificazione   XXXVI Ciclo          Curriculum: Pianificazione urbana, territoriale e paesaggistica</p> <p>N          0 0,5 1          Kilometro</p>	<p>A Practical Solutions Framework          Of Brownfields Regeneration Process</p> <p>Division: 77th Barracks Of Maahhad, Iran</p> <p>Tutor: Prof.Damiele Ronsivalle          Phd Student : Mina Ramezani</p>	<p>UNIVERSITA'          DEGLI STUDI          DI PALERMO</p> <p>RAH          DIPARTIMENTO          DI ARCHITETTURA          URBANA</p>
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The mix of land use owned by the army is more than that of the municipality, and the highest percentage of land use has been allocated to residential use, and the least is related to tourism and recreational use.

Table. Land use proposed by the municipality (except for roads)

Use	Area	Percent of area	Percent of total area
Fire station	3562.94	0.25	0.11
Education	30771.90	2.12	0.93
Park and green space	1297270.05	89.58	39.29
Parking	8520.22	0.59	0.26
Health care	26687.51	1.48	0.81
Culture	65644.02	4.53	1.99
Pilgrimage	1563.96	0.11	0.05
Sports	14120.09	0.98	0.43
Total	1448230.68	100.00	43.87

Table. Land use for the army

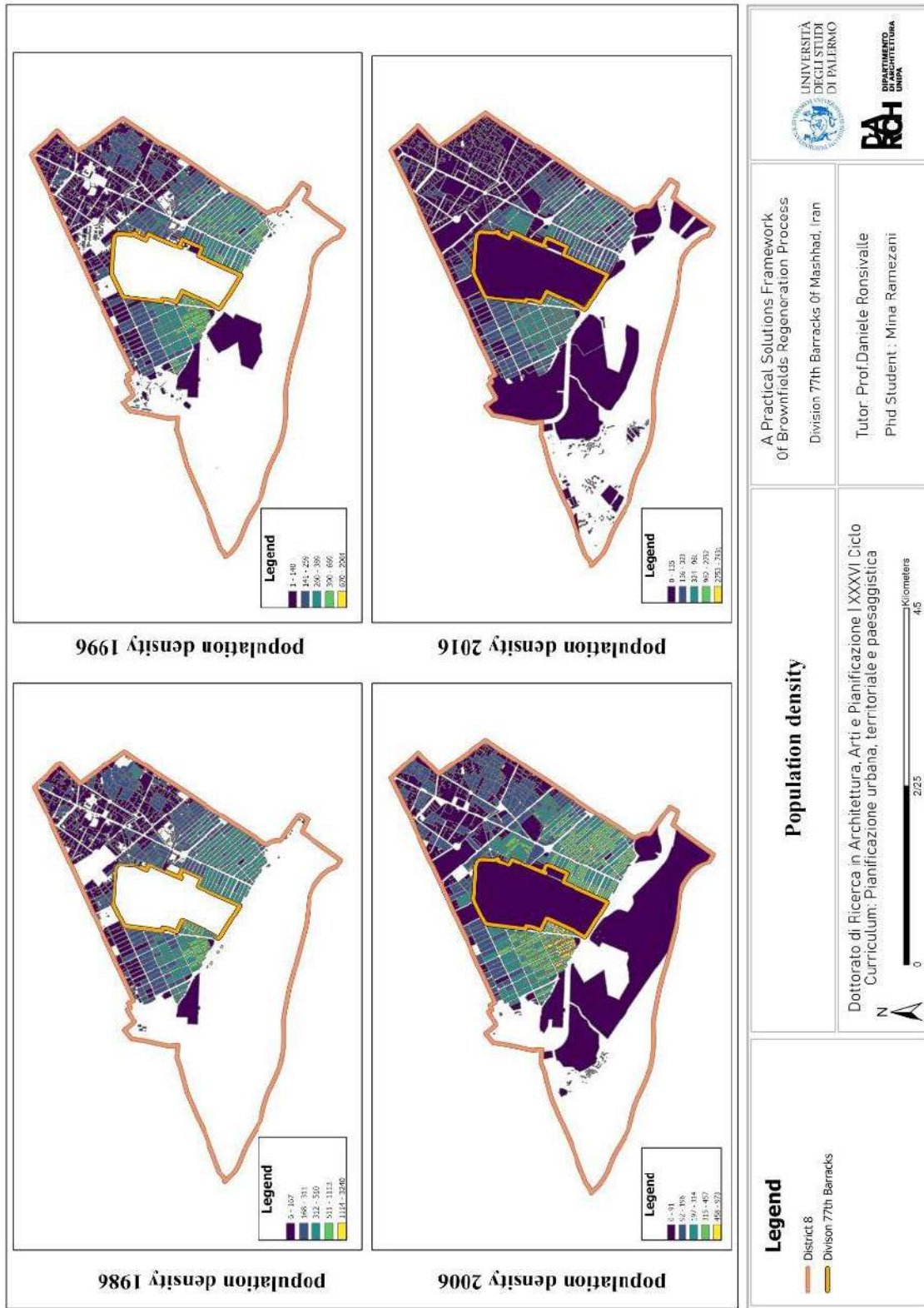
Use	area	Percent of area	Percent of total area
Residential	751681.18	4.56	22.77
Retention	133834.02	7.22	4.05
Accommodation	19034.40	10.27	5.77
Urban facilities	68083.87	3.67	2.06
Commercial	10898.32	5.88	3.30
Recreation	37408.97	2.02	1.13
Mix	432879.97	23.36	13.11
Army m	130033.79	7.02	3.94
Total	1853252.89	100.00	56.13

## Social dimension

### Demographics

Social classification is a system that ranks people according to their desired qualities and places in social classes according to their status. These pleasant qualities are determined by the culture of each society. In fact, social classification is the classification of groups and individuals according to their contribution to socially desired and valuable achievements. According to the studies, most of the residents of this area belong to the middle and relatively low income groups. Also, for the employment rate, they have lower status compared to the average of the city. Based on Mashhad Comprehensive Plan, residential zones in the city are separated into 5 residential areas based on the establishment and accommodation of different income groups. For the classification of subareas of residence (income groups), in addition to all the basic indicators of economic status, three indicators of the residence of these groups, including the size of residential plots, the size of residential units, and the price, are also considered. The population of District 8 of Mashhad were 80,292 and 94,227 people in 2005 and 2015, respectively, and during the last 10 years, its population has increased by 1.17 times. In this way, it

can be seen that despite the positive population growth in the past 10 years, the population base of this region has not been increased much. Meanwhile, area 3 with 46,611 people and area 1 with 12,313 people have the highest and lowest population of this region.



Map. Demographic information of the area



Table. Demographic information of District 8 by gender

2015	total population	men	women
District 8	92227	46609	47618
2005	total population	men	women
District 8	80292	40884	39408

Statistics of 2015



Chart. Demographic information of District 8 by gender

The right side of the chart shows the distribution of the male population in the age groups of 0 to more than 65 years, and the left side shows the distribution of the female population in these age groups. As shown, in the study area, the largest population is in the age group of 25-29 years and 65 years and older, and the lowest population is in the age group of 55-64 and 5-9 years, indicating the relative balance of the elderly and young population of the region.

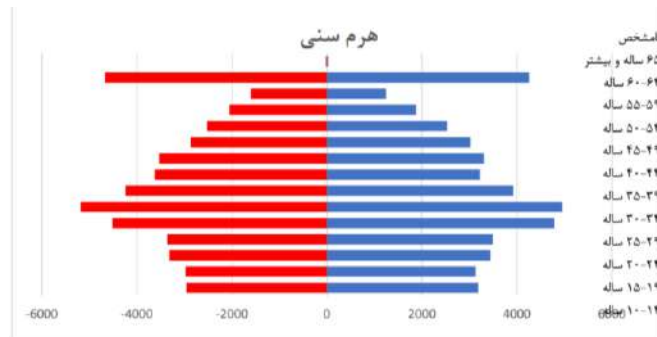


Chart. age-gender pyramid of the area

The population of 94,227 people in District 8 lives in 29,377 households, whose household size is equal to 3.20, and the reduction in household size in the region since 2005 shows that the number of households has grown faster than the population growth.

### Population density

Areas 2 and 3 in District 8 have almost the same gross density and that is because of the population and area that are almost close to each other. The barracks land is located in the area with low density (area 3, Imam Khomeini District, Mashhad).

Table. Gross population density in 2015

area	area (ha)	population	gross population density
1	33239	13313	37
2	5442535	35303	6486
3	75495	46611	6248

The literacy rate in 2015 shows that 79,851 people were literate and 6,279 people were illiterate out of the 6-year population and above in the study area. It should also be noted that District 3 and Imam Khomeini neighborhood have better literacy than other areas and neighborhoods. In fact, the study area has 4 residential sub-areas. The lowest residential sub-area, residential sub-area 4, belongs to the residential zones located on the western side of the barracks lands. In general, as we move from the south to the north side of the area, or in other words, as the distance from the barracks lands increases, the level of the residential sub-areas (income groups) increases. The statistics of their satisfaction with the area has been evaluated to be high in such a way that most of the residents have expressed their negative opinion about the desire to leave the neighborhood, indicating the high sense of belonging to the area. According to the above, as we move away from the barracks to the surrounding area, the sense of belonging reduces. In general, according to the location of the study area in the spatial structure of the city, as well as the establishment of diverse and important activities on urban and even suburban functional scale, such as the important medical centers of the city (Imam Reza, Hefdah Shahrivar, Saman al-Aema, etc.) and recreational and tourism places and various business lines and service and goods exchange, different classes with different needs refer to this area. Accordingly, it can be stated that, with the exception of the treatment centers that have their own specific clients, the others in the area have a desired situation from the social and economic point of view, due to the good quality of the goods and services provided there. In the middle economic groups, they are facing upwards. For the barracks lands, it can be concluded that in this area, about 60-70% of the residents are the owners of the



residential unit, and a small percentage of these houses are occupied by more than one household. They earn between 87 thousand and 150 thousand tomans, which is average in Mashhad. In the area around the barracks, between 40 and 55% of people do not have at least a diploma. And most of the households have vehicles.

## **Economic dimension**

In general, in economic studies, the factors affecting the price of land can be divided into two general categories. The first category are factors that affect all prices and are not specific to a particular group. Inflation with stagnation governing the economic status of a region (which itself is caused by external or internal economic changes), whether or not, has an effect on the price of land, the price of materials and finally the housing. But the second category divided into several groups is one of the factors that have a physical and urban nature, and the effect on each city is different depending on the state of the city. The state of the city's communication network, the location of urban centers (commercial, administrative, industrial, etc.), urban construction regulations and other factors affecting the price of land are among the factors that are different in each city and therefore affect the price. In general, this category of factors is divided into two groups: 1. land use and 2. local quality based on different factors. The effect of the first category of factors on prices is addressed only in the field of economic studies, but the second category of these factors which are included in the territory of the urban economy in two groups, are examined under a general division. District 8 according to the same statistics has a population of 81582 people, of which 26222 people includes the economically active population. Therefore, the activity rate is 49.88%, which according to the same statistics, the employment rate for the area is 31.8%. For the site and its surroundings, District 8 can be divided into three parts: privileged and semi-privileged and prone to privilege. Currently, the price of land and property is high in privileged parts, and the per capita required services are high, and the distribution of services is also appropriate. Also, the condition of the existing buildings is mostly good. The price of land and property in semi-privileged part is at an average level, and services per capita are low and should be strengthened.

### **Prone to privilege area**

The price of land is low and the level of service is very poor, but according to the existing conditions and the definition of the project in the Endogenous Design and Development site, these areas are prone to privilege, which requires planning and prioritizing the implementation of projects to improve the condition of these areas

where the barracks lands are located. In order to improve the economic status of the design site, the implementation of the defined projects according to their uses should be prioritized because the priority and delay of the implementation of the projects has an effect on the investment, facilitating and speeding up other projects. For example, profitable projects cause the creation of other service projects due to the presence of their clients. In order to attract the clients of each of the projects, first, the access to each should be determined in order to justify the investment to attract investors. With the entry of investors, especially in the commercial projects, considering different groups for the target population, the services required for these groups, such as green spaces, parks and amusement parks, parking, small businesses with diverse activities, etc. will be formed in larger projects, and the fields of income generation for the municipality and the investor will be provided. The surrounding area of the barracks is currently a residential texture in which barren lands are very limited for endogenous development. The dominant type of housing in this area is apartment with relatively low density (mainly 2-3 stories). Valuable areas in terms of the price per m<sup>2</sup> of land or property are related to the lands and properties on the side of the main streets that currently have commercial use. In general, studies in the study area that affected the city have shown that despite the high growth rate of land and housing, its changes, like other economic variables, have had fluctuating movements, such that every 3-4 years in relation to the price of urban land and every 4-5 years in the price of residential infrastructure, there is a relative sharp rise in prices. The study results of the land area in the local area (comprehensive) showed that the lowest land price in the area with a meter of around 23-25 million tomans is allocated to the land located on the western side of the barracks, which is increasing by gradually moving towards Kohsangi Park. In general, the textures located around the barracks lands, due to the effect of these lands on the land price, have led to the replacement of the weak social class and high population density, which has also affected the security and identity of the texture. On the other hand, the reluctance of the residents and investors to invest in the area and the economic instability of the area, as well as the low employment rate, especially in the southern parts of the area with low-income groups, have turned these places into low quality textures. It should be noted that the existence of the barracks with high and impenetrable walls in the study area caused the desolation of the space. Of course, although the presence of the guard guaranteed the security of the space, it lacked the necessary identity and public use. Also, the residential texture in the southern edge of the barracks has led to the replacement of the weak social class and high population

density due to its influence on the land price, which has affected the security and identity of the texture. On the other hand, the presence of this plot with its large area in the area has caused the area to have low levels of service uses compared to other parts of the city. The presence of the barracks in the area, along with the above damages and problems, has also brought benefits, the most important of which are the coherence of the local structure, the balanced economic structure of the surrounding lands, etc.

## **Substantive dimension functional component**

### **Land use system and activity**

The city of Mashhad as a strategic area of the project and also as a metropolis has various activities in different scales. Out of the total area of 29236 hectares of the area of Mashhad City, about 45.9% of the land is dedicated to non-residential activities. In fact, from the point of view of the activity structure, the activity conditions of Mashhad is considered a strategic opportunity for the stability and efficiency of the internal development of the metropolis on the one hand and improving its effectiveness and impact in the surrounding urban complex and the network of national and transnational metropolises on the other hand. The main focus of activity has happened around The Holy Shrine and the focus of activity in this area has coincided with the city's demographic and civic areas.

Due to the convenient distance of the 8th zone from the Holy Shrine of Imam Reza (AS) and the presence of very important elements and axes with urban and extra-urban functions in it, such as various medical centers such as Imam Reza (AS) Hospital, Qaem Hospital; shopping centers such as Alton and Zist Khavar; important city parks such as Kuhsangi; main streets such as Imam Khomeini, Kuhsangi, Saadi, etc., the area has received many residents, pilgrims, and tourists throughout the years, meeting their needs in different dimensions. The functional areas of the studied local area are located on the southern side of the city, which in terms of use, include various areas as follows. Most of the cultural centers that provide services at the city level are concentrated in the center and west of the city. The site in question is somehow located in the southwest of the historical core of contemporary Mashhad. The close distance of this complex to the Holy Shrine and to the places such as Kuhsangi Park which is frequently visited by the pilgrims, and the bus terminal, made the zone one of the most potential areas for tourists and pilgrims to visit. The relative centrality of the location of the complex in the city has also provided relatively balanced access to it from all parts of the city. Therefore, in addition to the city and the country, its service level can even be raised at the international level, because the city needs a space that hosts the formation of global interactions and makes the global idea of the city available. The large concentration of medical service centers in District 8 has turned it into an important and main medical zone in the whole city after District 1 of Mashhad. Also, the density of sports centers in the region, in addition to meeting the needs of the residents of the region, has provided services to the residents of other areas of the city. Therefore, considering the wide concentration of the aforementioned service

centers in the region, the studied site with the above diverse uses should be planned so that according to the specific capabilities of the region, a suitable platform is created that, in addition to the realization of some certain ideas and activities, it can respond to the needs and priorities of the region and reduce its shortcomings.



### **Residential areas located around the barracks site**

The residential areas located in the heart of the neighborhoods, which have been densely built based on the increase in population in recent years, are of different building ages. Residential units with a lifespan between 20 and 30 years are mostly located on the east side of the 77th Army Barracks and also in scattered areas in the eastern part of District 3, in the vicinity of Shahid Motahari, Shahid Bakshi, Sahib Al-Zaman, and Sanabad streets. Only in one statistical area, that is, between Imam Khomeini Street and the 77th Army Barracks, the average age of the buildings is more than 30 years.

### **Commercial—service zones located around the barracks site**

It can be said that the area of the barracks is located where it is the main focus of large-scale activities with urban and extra-urban functional levels, and its proximity to the city center and especially the holy shrine of Imam Reza (A.S.) has played a big role in the formation of the land use pattern in this area, so that a significant amount of activities related to pilgrims, such as the bus terminal, parks and urban green spaces, commercial centers, etc., have been established in this area. In addition to creating access between urban elements and components, activity lines have diverse, attractive and permeable activities on the wall levels. In fact, these axes are multi-functional ways in which economic and social activities take place. In addition to facilitating the possibility of movement in the city, these axes have placed elements with urban and extra-urban functions in their surroundings. Some of the main service lines in the area, due to the concentration of a certain type of activity (markets), have turned to activity zones.

The most important of these lines and areas in District 8 are as follows

- Bahar axis: car galleries and exhibitions
- Shahid Chamran axis: medical supplies and goods
- Daneshgah axis: bag and shoe markets
- Saadi axis: audio and video equipment markets
- Namju axis: car repairing garages
- Imam Khomeini and Modarres axes: regional and urban administrative centers
- The line between Bahar Street and Adele Khomeini Street: military and mountaineering clothing markets

Other lines of concentration of certain commercial centers can be seen in some other places on a local and regional scale.

Important activities in the area are caused by factors such as roads, prominent physical elements and special uses. The effective uses located in the area are important in terms of traffic load, population attraction, job creation, etc., the most prominent of which are Imam Reza Hospital, Saman Al-Aemeh Hospital, Public Garden, Kuhsangi Park, Alandasht Garden, Administration Central Post Office, Governor's office, Imam Reza Bus Terminal, and Zist Khavar shopping center.

- Commercial areas located on the side of the main streets including Kuhsangi Street and Daneshgah Street, such as Zist Khavar shopping center, etc.
- Administrative- Military zones including the lands of the army barracks of the 77th division, the central post office, the governorate
- Green areas and gardens including Kuhsangi Park, Alandasht Garden, and Public Garden
- Commercial-residential mixed areas located on the northeast side of the area
- Health Care zones including Imam Reza Hospital, Hefdah-e Shahrivar Hospital, Saman Al-Aima Hospital, Army Hospital, Aria Hospital, Bent Al-Hoda Hospital
- Tourism area including Abadgaran Complex located on the southwest side
- The educational area including the research and training center for agriculture and natural resources
- Storehouse and transportation area including Imam Reza bus terminal

All the mentioned cases are located in this area according to Farda's studies.

#### **Residential, commercial and service areas located in the barracks site**

According to the field observations, there are currently residential, commercial, and service areas on the site, which are as follows:

- Residential areas: These areas, which are built in three patterns of complex, high-rise, and Institutional houses, are scattered in the eastern and western parts of the site.





Figure 3. Residential places located in the study area

- Green areas: These areas are in the form of existing green areas, which occupy the north and east sides of the site. The forest area in the center of the site can be used as places for social interactions, walking and cycling. The green space in the east of this site has also been completed by the district municipality for public use.



### **Movement and access system**

#### **Network movement and rider access**

Every city includes collections and sub-categories, each of which has sub-territories such as zones, neighborhoods, and residential areas, so the way of distributing goods and transporting passengers in the city should also be planned in the form of these sub-categories and access hierarchies. In order to identify the movement and access system of the area under study and the surrounding area, we will first determine the location of roads and passages in the current situation, and then we will examine the service level of the road network and also the public transportation system. The vital and main arteries of the strategic area are as follows:

- Northern Bypass Freeway - Namaz Highway
- Shahid Baba Nazar Highway
- Shahid Cheragchi Highway
- Imam Ali Highway



- Vakil Abad Boulevard
- Shahid Shushtri Highway
- Shahid Soleimani Highway
- Payambar-e Azam Highway

The city of Mashhad has a special position in terms of access, spatial location, and landscape to visit. In terms of access, this land is overlooking Shahid Kalantari highway of Mashhad city, in fact, this highway has divided the barracks land into two parts, and is also next to the southern passage of the city, which is under construction, to provide proper access to these lands from the south. Also, among the most important entry and exit points of the city, the following can be mentioned

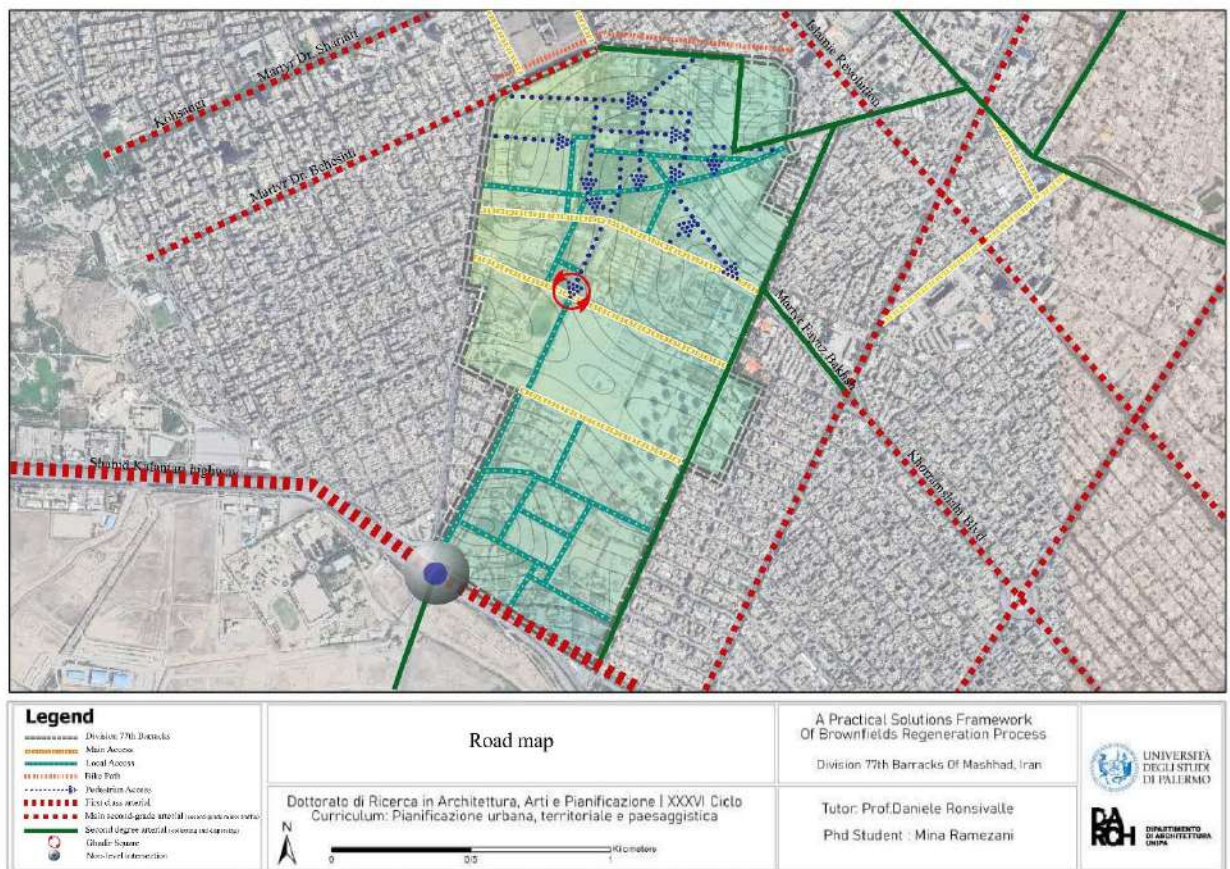
- Payambar-e Azam Axis, the entrance and exit of Mashhad from the northwest side (Qochan, Bojnord, northern cities).
- The axes of Shahid Shoushtari and Shahid Soleimani
- Entrance and exit from the southeast (the cities of Neishabur, Freeman. 77th Army Barracks)

### **The position of texture passages in the existing movement and access system**

Shahid Soleimani Highway located in the south of the area as the main thoroughfare and Imam Reza and Imam Khomeini boulevards as well as Kuhsangi, Daneshgah, Namju, and Bahar streets as secondary (local) axes, play a role in the studied area. For the road access, the axis of Samen Al-aema is also extended on the eastern edge of the barracks lands. In general, in the current situation, the structure of the access network within the site consists of three main axes with an east-west extension and a secondary passage with a north-south extension. The 55-meter axis, which is referred to as the connection between Fayyaz Bakhsh axis and Mulla Sadra axis, is the most important thoroughfare within the site. The entrance and exit of the site are provided through this thoroughfare along with two other thoroughfares, which are stretched parallel to it. On the other hand, the north-south sub-passage that passes through the middle part of the site connects its internal spaces with each other. Ghadir Square, one of the landmarks of the area, is located in the center

of the site, and in terms of access to public vehicles, there are three bus stations and one taxi station inside the site.

In general, due to the establishment of the land of the 77th Army Barracks in the center of the area for a long time, the local area has turned into an impenetrable border and separated from the surrounding roads and textures, so that the network of communication routes around the area has become disjointed. The movement of vehicles in the high-traffic axes of District 8, which is mainly the location of the old residential and service structures of the city, where the existing infrastructure does not have much capacity to respond to the existing traffic volume, results in a lot of noise pollution, which is one of the biggest problems of this part of the region. In the case of Imam Khomeini neighborhood located in District 8 of Mashhad Municipality, the hierarchy of roads is divided into 5 groups, including main road network, secondary (local) road network, access network, pedestrian network and bicycle path network.



### Map of road network in the study area (source: authors)

It should be mentioned that in this site, the local road network is categorized into two types of traffic roads and collector and spreader roads, according to which the north-south roads inside the barracks are of the type of secondary (local) road network. Also, in this plan, the road along the east-west direction and the role of the network of secondary roads is inside the territory of the barracks, which establishes the connection between the axis of Saman Al-Aameh and the axis of Kuhsangi. The level of service is a qualitative measure that describes the practical conditions of traffic and the level of drivers' satisfaction with these conditions. Road users evaluate the quality of the road based on the speed of movement, travel time, freedom of movement, interference with other users, comfort and convenience of the road itself.

Urban areas have high social, economic, cultural and religious interactions, and over time, with the uncontrolled expansion of cities and the increasing use of cars, traffic problems appear in the old areas of cities. Locating each of the components of this system of movement and access should be examined in a systemic mechanism to measure the mutual effects of its components and sub-assemblies in relation to each other and in relation to the whole system. Therefore, by simply changing the location of one of the components, one cannot expect the optimal performance of the city's movement and access system. Compiling a comprehensive plan of the set of sections and sub-sections of the movement and access system and measuring, analyzing and deciding for any change and placement in the form of a general plan and its integrated system will prevent the occurrence of accidents and traffic nodes and promote the speed and quality of transferring passengers, goods, and information in the city and urban areas. Based on the visit to the target site and qualitative evaluation, the studied area is located in a special and strategic location of Mashhad in such a way that it is adjacent to the city center and the concentration of population-attracting uses, and the high volume of travel demand compared to the capacity of the roads have caused the criticality of the service level of the roads located in this area. Most of the axes in the studied area have an unfavorable traffic service level. It should be kept in mind that Shohada Square, which is located in the vicinity of the local area, is the

intersection of six important connecting axes, of which two axes are Imam Khomeini in the studied area. Imam Khomeini axis located on the eastern side of the 8th district, in addition to its heavy traffic load, also bears the traffic flow of Bahar Street, which has caused an increase in the amount of travel demand in this axis. In addition, the branches of Namju Street, which runs along the western side of the barracks have a more unfavorable service level. So it can be concluded that in some important axes of the area, including Kuhsangi and Imam Khomeini, the demand has reached the limit of the road capacity, causing the most unfavorable traffic conditions.

On the other hand, according to the results, residents' access to services in the southern parts of the site, especially its southwestern side, is very weak. This means that most of them have expressed dissatisfaction with the way and extent of access to services, while the access of the northern and eastern parts can be evaluated at the optimal level, due to the existence of the main and important axes.

### **Public transportation system**

The project site is located in the center of some important elements of the city; 3500 meters far from the Holy Shrine as the main goal of pilgrims, 4350 meters from the railway station, 3700 meters from the bus terminal, 7500 meters from the airport 7500 as important elements of urban transportation, and 3400 meters from Kuhsangi Park as one of the major recreational places in the city. Therefore, it can be said that the project site is located in a suitable urban location in terms of the presence of pilgrims and tourists, and this should be taken into account in urban planning and design, and special attention should be paid that this potential (tourist attraction) is used optimally to prevent them from spreading to other areas of the city, as far as is possible. Another factor to be investigated in the movement and access system is the state of public transportation. The existence of a variety of public transportation systems in the studied area will increase the accessibility of different social groups and create favorable conditions for increasing investment in it. According to the information obtained from the upper documents, there are three ways of public transportation in the area: metro, bus, and taxi. The passage of metro lines 1 and 2 along with line 3, which is under construction, through the studied area, as well as various bus lines serving it from all parts of the city, have increased the accessibility of the area.



## Parking lots

The parking space is temporarily located on the west side of the site, and the closest multi-story parking lot to the barracks is the multi-story parking lot on Talash Street, which is about 4.5 km (approximately 15 minutes) away. So it can be concluded that due to the high volume of users of this site, the lack of enough parking is very noticeable.



## Pedestrian and bicycle movement and access network

It should be mentioned that the studied area has a bicycle path north of the site, which is extended along the side of Ershad Al-Reza Street. Also, among the sidewalks provided in this area, we can mention the sidewalks in the northern part of the site and the sidewalks near the center, Ghadir Square.

Again, in this topic, it is important to point out that considering that Imam Khomeini's neighborhood and the barracks site are located in one of the main areas of the 8th district of Mashhad city and it connects several main roads of

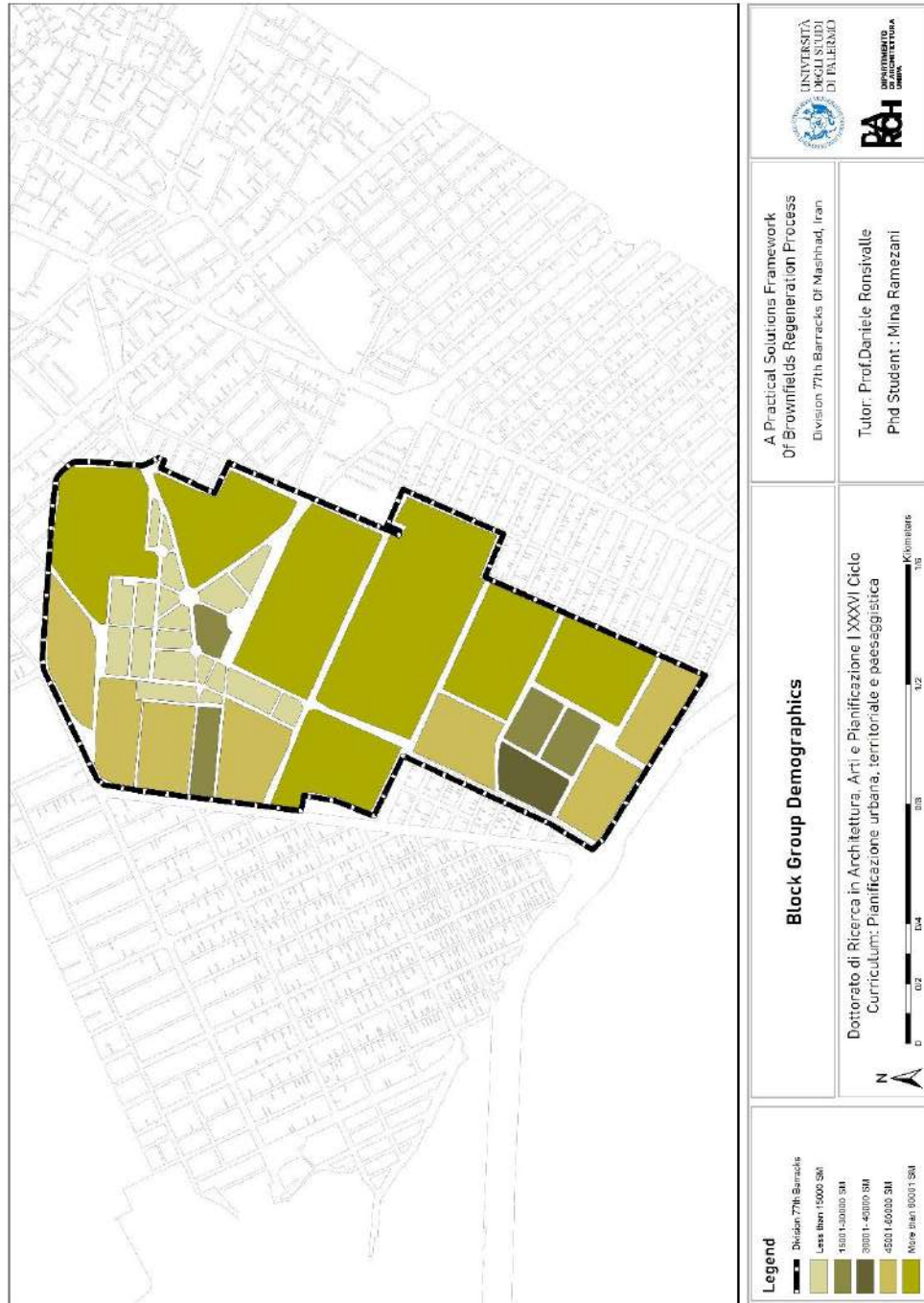
Mashhad city. It is slow and on the other hand, it suffers a lot of traffic and in the current situation, noise and air pollution are very evident, and the network system of pedestrian walkways and accessible paths for cyclists is struggling with a manageable shortage, city managers should Try to promote green transportation in this area.

## **Aesthetic component**

### **Physical system**

#### **Blocking and grading system**

Urban blocks can be defined as the space within the city street pattern that is divided into plots of land for the construction of buildings. This morphological element has been formed according to the current views on urban design and its expectations over the centuries. Blocks may consist of a single building and / or an area with several buildings that vary in size, isolated structures surrounded by nature, or complex nesting. Regardless of the composition, an urban block is the main unit of the urban texture and plays an important role in the mediation of public and private spaces. In the study area, blocking system is traditional. A traditional block is an urban organism that develops gradually over a long period, which is characterized by a large, dense and uniform mass, resulting in a disproportional relationship between the built environment and open spaces. The blocks can be different in terms of shape and size, because they are usually formed based on the space left over from the street pattern. This creates an urban architecture that is limited to the facade.



Map. Blocking system of the study area

On the other hand, grading of the area of Mashhad is coarse and only in the northeastern part of the city is fine-grained. The southern part of the study area located in the southeastern area of the comprehensive plan of Mashhad can be considered as the most coarse-grained lands and urban functions. This area is considered as one of the main gateways of Mashhad and connecting the city with one of the most important suburban axes (Mashhad-Nishabour-Tehran axis). The main and important features of this area are as follows.

- Concentration of the most coarse-grained lands and urban functions
- One of the connections of the city with the southern heights of Mashhad
- Main natural area related to the city
- One of the areas of natural tourism in Mashhad





UNIVERSITÀ DEGLI STUDI DI PALERMO  
 DIPARTIMENTO DI ARCHITETTURA  
**RAH**

A Practical Solutions Framework  
 Of Brownfields Regeneration Process  
 Division: 77th Barracks Of Mashhad, Iran

Tutor: Prof. Daniele Ronsavalle  
 Phd Student: Mina Ramezani

Map. Grading system of the study area

Imam Khomeini neighborhood in District 8 is known with large-scale uses and a residential identity, is mostly known for its proximity to Kohsangi Park, Army 77 barracks, and the passenger terminal in the city and the mid-western area, and has a small share in sports, cultural and religious uses. As a result, it can be said that the main role of this area is residential, recreational, and military. In the study area, in the vicinity of Kohsangi St., up to two blocks deep, the grain size is moderate-coarse, but when we move further south, it become finer, so that in the southwestern of Army 77 barracks, some plots have an area of less than 100 m<sup>2</sup>. In the eastern part of the barracks, the grain size is moderate-fine and most of the plots have an area between 100 and 250 m<sup>2</sup>.

### Height and scale

The lowest height of the city, which is located in the eastern corner, is 920 m high, and the highest point is about 1520 m high, and it is located right on the opposite point in the western corner of the city. The extent of the height classes of Mashhad is shown in the following table:

In District 8, there are two categories of height of 964-1012 and 1012-1059, the majority of which is 964-1012. It can also be said that the highest point in the district is -1012-1059 m and it is located right in the western part of the district, which includes mountainous heights.

Table. Height of Mashhad

Height (m)	Area (ha)
800-1200	52955.3
1200-1600	3493.3

### Mass and space

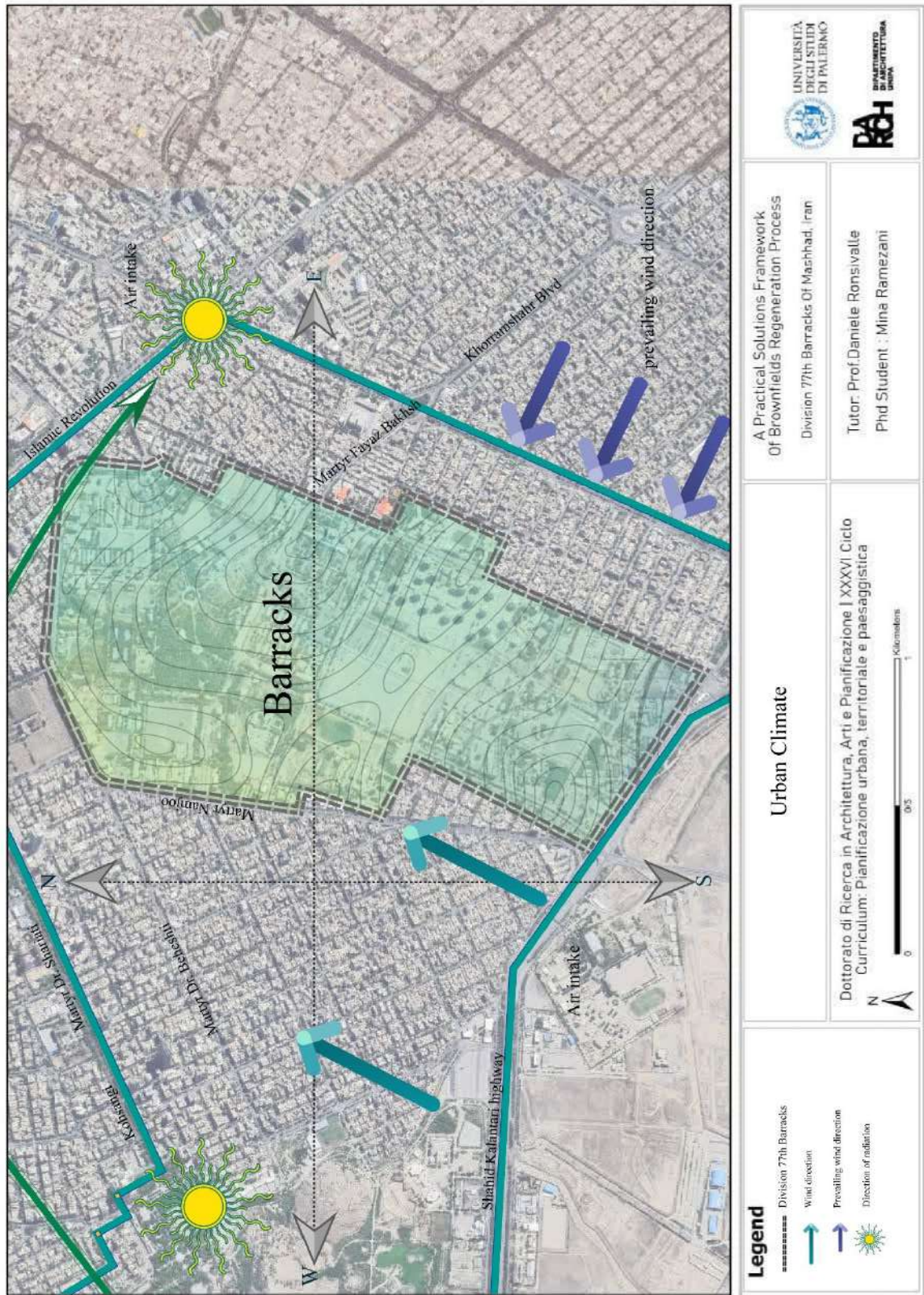
Knowledge of the characteristics of architecture and urban planning depends on the examination of physical components, which is generally called "mass" and the understanding of characteristics is realized with the "lack of mass" which is called space. Architecture is not independent from the existence of mass and space, and different qualities of architectural space are formed from different proportions of mass and space, which is called mass-space system. In fact, the architectural space-mass system creates different quality architectural spaces by creating physical-perceptual and physical-functional structures on the other hand, the three indicators of "enclosure", "movement" and "proportions" resulting from the mass-space system reveal the quality of the architecture and urban planning place.

In the site of Army 77 barracks, the intermediate spaces with the purpose of connecting, communicating and having multiple concepts and meanings have a two-faceted nature, both a process and a product. The effect of the middle space, especially Ghadir Square, on the spatial continuity of urban elements for the construction and spatial organization of service complexes on the site, is the way of connecting the suburban scale with the middle scale of the neighborhood and finally smaller scales.

**Physical form by climatic considerations (sunbathing, sunlight, and energy efficiency)**

Optimum use of light and energy of the sun in Mashhad and the study area for seven months of the year (April, September, October, November, December, January and February) the climate are such that to achieve comfortable conditions in the environment outside the building, it is necessary to take advantage of the radiant energy of the sun. In other months of the year (May, June, July, August and September), the climate of Mashhad is such that people in the shade will feel comfortable in the space. In the shade, it is necessary to create desired conditions in these 5 months.





 UNIVERSITÀ DEGLI STUDI DI PALERMO	A Practical Solutions Framework Of Brownfields Regeneration Process Division 77th Barracks Of Mashhad, Iran	<b>Urban Climate</b> Dottorato di Ricerca in Architettura, Arti e Pianificazione   XXXVI Ciclo Curriculum: Pianificazione urbana, territoriale e paesaggistica	<b>Legend</b> Division 77th Barracks Wind direction Prevailing wind direction Direction of radiation
 DIPARTIMENTO DI ARCHITETTURA	Tutor: Prof. Daniele Ronisvalle Phd Student: Mina Ramezani	0 0.5 1 Kilometers	

Map. Climate of the study area

### Quality of public spaces

The main structure and skeleton of the city is the result of the forms, activities and spaces of the city that have prominent features due to their shape, space or function. In other words, the main structure of the city is the main part of the city where the main functions of the city are located. It defines the city as a whole and its future development direction. The way the spatial structure of the city is formed due to the concentration of economic, political and governmental, cultural, religious and leisure activities and the concentration of social relations strongly affects the distribution mode; of economic firms and guarantees the possibility of their economic survival. District 8 is located in the northern part of the middle-western area of Mashhad Comprehensive Plan, which has a special place in the spatial structure of the city and is the main focus of the activities of the city center as well as activities related to pilgrims. On the one hand, Army 77 barracks is right in the center of the neighborhood. On the other hand, Vakil Abad-Ahmad Abad-Nakhrisi axis, as the most important axis in the spatial structure of the city, also passes through this area. The following are the most important features of this area:

- First reception of urban and suburban level activities and the projection of the central area
- Main focus of urban center activities related to pilgrims
- Spatial interface between the central and western zones
- Connecting area of spatial structure based on different shapes
- Crossing the most important axis in the spatial structure of the city (Vakil Abad, Ahmad Abad, and Nakhrisi).
- Existence of historical neighborhoods
- Endogenous opportunity due to the exit of barracks and Abkoh sugar factory - suitable location in the spatial structure of the city

The elements affecting shaping the spatial organization and structure of Mashhad can be listed as follows:

Landmarks of the city: Astan Quds Razavi Shrine, Ferdowsi University, Malek Abad Garden, Mellat Park, Kohangi, Airport, Railway, Terminal, Khurshid Park, Vakil Abad Park, Chehl Baze Park and activity centers are important in the spatial organization. These centers are formed at the intersections and junctions of roads, shopping centers, stations and changeover points.

Edges: such as natural edges such as rivers or channels, mountains and other natural bodies in Mashhad, including Kal Chehel Bazeh, Khayyam channel, the

heights of the south of the city, highways as traffic edges such as Qaim and Ghadir belts, Kashf Rood, Prison, etc., well-equipped urban axes as centers of activity: university axis, Saadi, Shirazi, Ahmad Abad, Khayyam, Kohsangi, Koshash, Sanabad, Imam Reza, Khosravi, Sajjad, Modares, etc.

Places with collective memory: Razaviholy shrine, Kohsangi, streets leading to Shirazi shrine, Imam Reza shrine, Tabarsi, etc., Park Sq., TV Square, etc.

Main roads: ring road, Imam Ali highway, Vakil Abad, axis of Neishabour road, old Neishabour road, etc., and social and traffic nodes (Park Sq., TV Square, Shahada Square, Ferdowsi Square, Istaqal Square, Exhibition Square, Qaim Intersection, etc.)

#### **Landscaping of public spaces: quality of landscaping, urban furniture and public arts**

One of the main tasks of urban design is the design of public spaces in the form of physical design of public and semi-public spaces in cities. It should be noted that today public arenas are not only a place for people to be present and a place for social interaction of citizens, but also used by tourists as a tourist space. Therefore, with the development of information technology, in addition to raising the awareness of citizens regarding economic development and job creation, the tourism industry, especially urban tourism, has grown greatly over the past decades, and the desire of investors towards urban investment projects has increased. Therefore, in order to provide suitable investment options, it is necessary to study the integrity of public arenas to attract the clients.

#### **The most important open and public spaces in area ۳ of Mashhad**

Another parameter for the identification of public open spaces is their size. According to this parameter, Kohsangi Park is considered as the largest public area in the area. Therefore, Kohsangi Park is one of the most prominent urban green spaces of Mashhad, and new green space of Kohsar, natural areas on the south side of the area, National Garden and al-Nandasht Garden. Also, the axes of Kohsangi, Imam Khomeini, University, Jannett and Bahar are also considered as public spaces, which, due to the variety of commercial-service units on their margins, the formation of diverse barracks around these axes and centers is evident, which is also located in Imam Khomeini neighborhood. On the other hand, if public areas are identified in terms of the traffic, we can point to Kalantari highway, which is located in the southern part of the barracks area. Summarizing the above, it can be pointed out that the study area plays an important role in the spatial structure of the city due to its location in area 3 and District 8. The existence of parks and natural



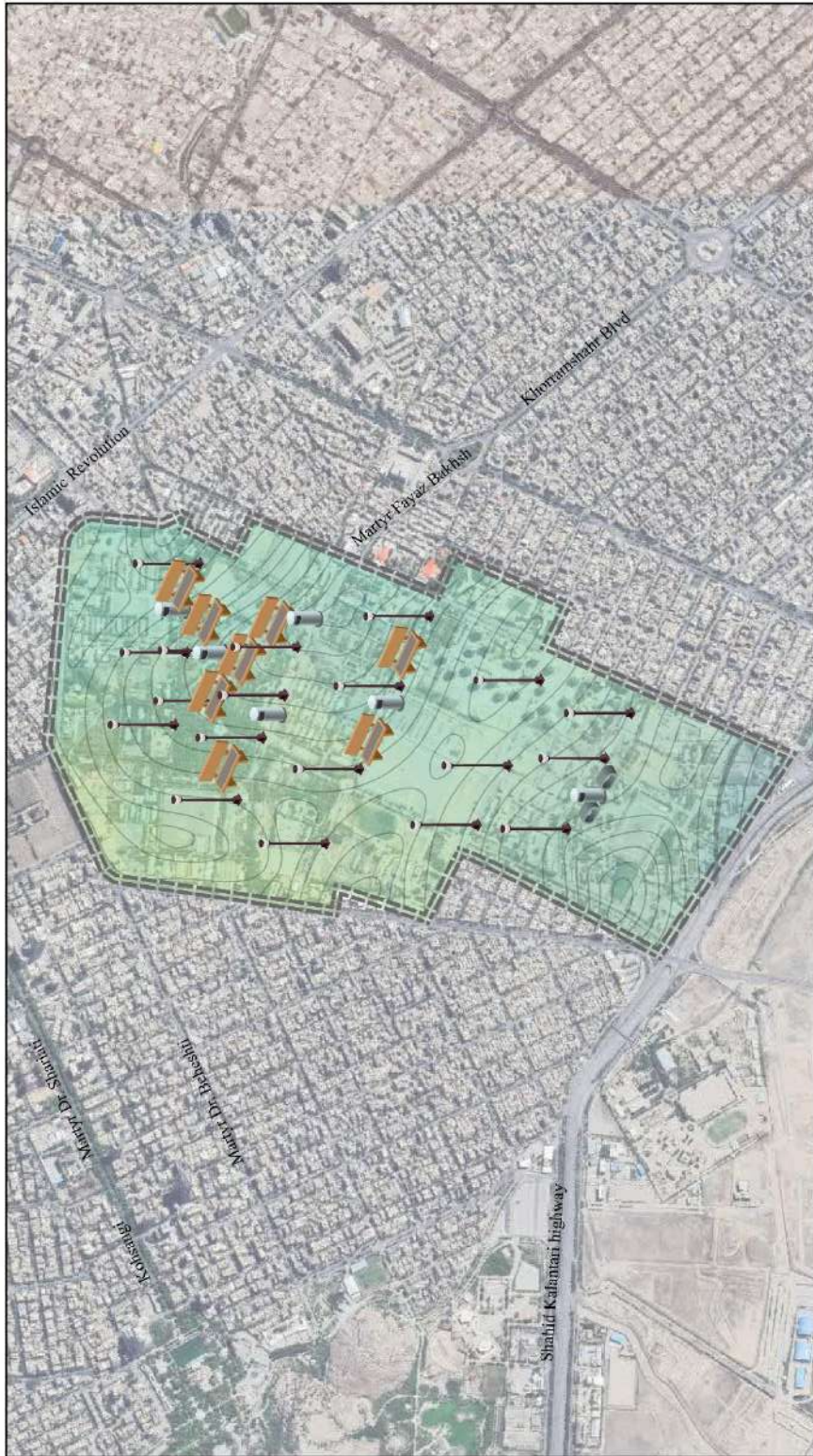
fields as well as playgrounds and lawns located on the southwest side of the area can also be considered as public open spaces in the area.



The design of special elements for the preservation of trees and flooring and lighting from the floor, electric light poles along the streets, as well as benches designed in the area can be considered as public spaces in the area.



Also, the existence of Imam Khomeini's axes are also considered as public spaces, which is evident due to the variety of commercial-service units in their periphery. Urban furniture, as one of the important components of urban design and as an element of the whole city, manifests the urban structure and identity. In fact, urban furniture forms part of the city's appearance, which always makes the urban environment attractive, its beauty, harmony and proportion, as well as the connecting factor between humans and the environment, and provides an attractive environment for residents and tourists. Designing and creating urban furniture is one of the factors that are very important in creating the identity, beauty and readability of the city.



<p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Division 77th Barracks</li> <li>Bench</li> <li>Electric Light Pole</li> <li>Trash Bin</li> <li>Sitting Place</li> </ul>	<p><b>Urban furniture</b></p> <p>Dottorato di Ricerca in Architettura, Arti e Pianificazione   XXXVI Ciclo Curriculum: Pianificazione urbana, territoriale e paesaggistica</p> <p>0 0.5 1 kilometers</p> <p>N</p>	<p>A Practical Solutions Framework Of Brownfields Regeneration Process</p> <p>Division: 77th Barracks Of Mashhad, Iran</p> <p>Tutor: Prof. Daniele Ronsivalle Phd Student: Mina Ramezani</p>	<p>UNIVERSITÀ DEGLI STUDI DI PALERMO</p> <p>RAH DIPARTIMENTO DI ARCHITETTURA URBANA</p>
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Map. Urban furniture of the study area



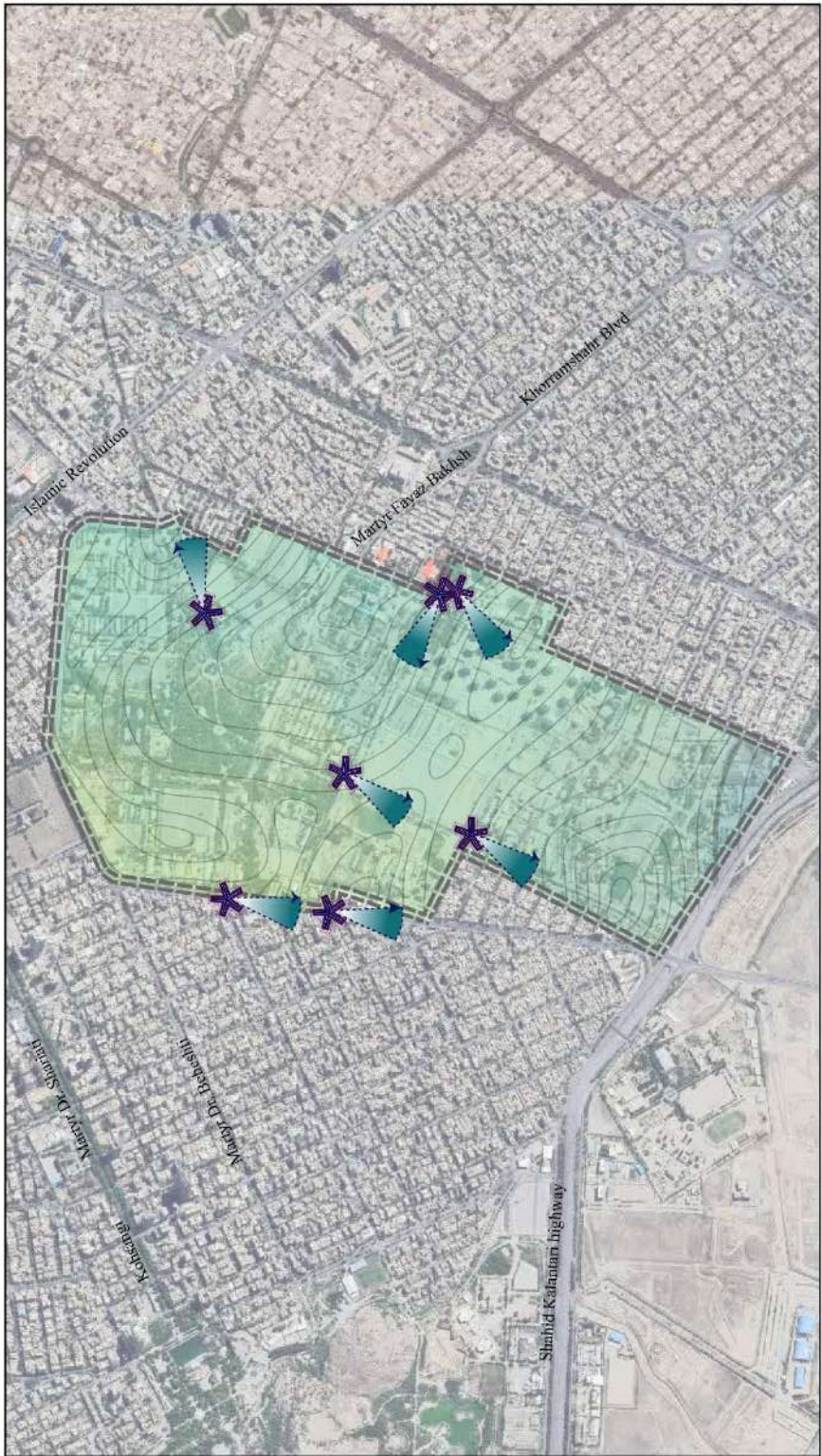
In the eastern area of the site, especially the newly revived public paths of the site, aesthetics, the quality of urban furniture, the sense of place along the footpaths, the effectiveness of nature on the urban space, and the integration of urban furniture are the most important factors for the design of urban furniture in the study area.



## **Urban landscape system**

### **Recognizing local and strategic views (artificial and natural)**

The urban landscape system is the presence of mountains in the background of the barracks as a natural landscape, which draws attention to landmark elements with a large difference in height from the surrounding elements, including Khavar. The relatively high Khavar and Kohsangi have caused direct corridors to these elements from the sub-passages of the area and thus increase the readability. The presence of trees and gardens in some parts of the area has increased the greenness and visual permeability of the area, and as a result, the environmental quality has increased. Based on the skyline of Imam Khomeini St., it can be concluded that the skyline of this area is mostly uniform and often two-line. Accordingly, there is a possibility of increasing the height and changing the skyline in this area. The most important strategic views in the study area are included by the existing broad views. The existing broad views from the northern and southern parts of the area and the southern heights to the area present an image of the general appearance of the texture to the observer. In fact, these types of views to the texture are very valuable and rare in any situation of the study area and need special attention.



Map. Wide visual views in the study area

<p><b>Legend</b></p> <p>Division 77th Barracks</p> <p>Visuals</p> 	<p><b>Visuals</b></p> <p>Dottorato di Ricerca in Architettura, Arti e Pianificazione   XXXVI Ciclo Curriculum: Pianificazione urbana, territoriale e paesaggistica</p> <p>0 0.5 1 Kilometers</p> 	<p>A Practical Solutions Framework Of Brownfields Regeneration Process</p> <p>Division 77th Barracks Of Mashhad, Iran</p> <p>Tutor: Prof. Daniele Ronisvalle Phd Student: Mina Ramezani</p>	 <p>UNIVERSITÀ DEGLI STUDI DI PALERMO</p>  <p>RAH DIPARTIMENTO ARCHITETTURA</p>
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According to the natural features of the land, different points in the project area have different views.

A good and open view of the city

According to the topography and location of the study area, a good view of the city is not found in this area, and generally the surroundings of the site is surrounded by trees, which the following Figs. clearly indicate this point.



#### **Relatively limited view**

Since the study area is enclosed, the public views and landscape sequence outside the area are sectional, and except for a few corridors, an example of which can be seen in the figure below, there is no special urban view and only surrounding buildings of the site are visible.



### **View to the heights**

Due to the topography of the site and the location of the surrounding lands and high-rise constructions, there is no good view of the heights from inside the streets of Saman al-Aimah and Faiyaz Bakhsh.



### **Lynch's five elements within the barracks**

The appearance of the city based on the physical factors of the city include five factors:

Path, edge, node, landmark, and district, and an appropriate combination of which play a very effective role in the readability of the city and the creation of memorable mental images in the minds of the residents and visitors of the city:

#### **Path**

The paths connect the barracks area to Irshad St., Imam Khomeini St. 61 and 63, and Shahid Namjoo St. 2. These paths create the strongest image in the minds of citizens, because these paths play a strong communication role. Irshad and Shahid Namjoo 2 streets also have an important effect on shaping the mental image of citizens due to their strong functional role. The figure below shows the paths surrounding this area.







	<p>A Practical Solutions Framework Of Brownfields Regeneration Process</p> <p>Division: 77th Barracks Of Mashhad, Iran</p>	<p><b>Lynch Elements</b></p> <p>Dottorato di Ricerca in Architettura, Arti e Pianificazione   XXXVI Ciclo Curriculum: Pianificazione urbana, territoriale e paesaggistica</p> <p>0 0.5 1 kilometers</p>	<p><b>Legend</b></p> <p>Division 77th Barracks</p> <p>Edge</p> <p>Landmark</p> <p>Node</p> <p>Main access</p>
	<p>Tutor: Prof. Daniele Ronsivalle Phd Student: Mina Ramezani</p>		

## Edge

The edges that exist in the area are similar in terms of continuity but different physically and visually. The edges in Mashhad are Irshad Street and Shahid Namjoo 2 St., unique in terms of complete continuity with other edges. The continuity is more and more clear than other edges. However, contrary to the usual definition of the edge, it is more influential and this influence is obvious from the point of view of the complete rider, because it is more than an edge, it is known as a path. The barracks plays an important role in the minds of the citizens and due to its influence and the linear park next to it, it plays an important role in the mental image of the citizens.



## Node

According to Lynch; nodes are sensitive points in the city that the observer can enter and the center of hubs that create the origin and destination of his movement and may simply be the intersection of two streets or two roads. Therefore, the nodes can be divided into two categories, 1. traffic nodes and 2. activity nodes. Generally, because they are the gathering place of important urban activities, they play a role as a functional node in the minds of citizens. In this way, we realize that there are no nodes in the city that are places for face-to-face encounters and social



interaction and creating memories. Ghadir Square, located in the center of the barracks area, is considered as the barracks traffic node.



In the study area, the uses such as a mosque, which is a place for gathering and holding prayers and religious activities, and the library in the area of the mosque, as well as ideological and political bases in the study area, where collective activities are held, can be considered as activity and social nodes.



Also, the parks and forest in the area and the designed benches can be considered as collective space and activity nodes in the area of the site.



The morning squares located in the area of the site are considered as social nodes in the area of the barracks.



### Landmark

The entrance to the barracks can remain as a landmark in people's minds. The most important landmark is the front of the mosque, which plays an important role in people's mental image of the city due to its special function and body. Another landmark of the area is the central fountain of the site. The reason for its special function and location near the intersection of main roads plays an important role in the mental image of citizens.



The park on the eastern side of the site, as one of the most important parks in the study area, has a special place in the minds of citizens and is almost affected.

A very old hall located in the northeast of the barracks, which used to be a car repair shop and is currently not open, is also registered in the list of cultural heritage buildings and should not be destroyed in any way, and new uses can be proposed for it in future plans. Also, its location is different from all the uses of the site.



Other landmarks, including its special buildings, electric light poles, site-specific furniture, and elements also play an important role in creating people's mental image of the city due to their special function or body.



## **Environmental component**

### **Natural barracks system: topography, vegetation and water, and earthquake**

The environment and its definitions and the explanation of the environmental components are the factors affecting the continuity of a man-made environment. In this regard, the knowledge and analysis of environmental factors, given its capacity and potential as well as pollution, seems necessary. By analyzing the natural form of the environment and environmental studies, it is possible to direct the planning and location of activities in the project in a direction that will have the least negative or destructive pressure on the environment in the future constructions. In this regard, we examine the following factors:

Topography plays an important role in the formation of the city, its natural environment and ecological structure. In addition, the topography of the city affects the distribution of city uses and its vital infrastructure. In general, the land of Mashhad has emerged in two regions of Kashf Rood Valley and the surrounding heights. The natural factors that operate on the scale of the city and are around the study area include the southern heights of District 8, which are considered as very important natural organs of a city. The study area is part of the raised areas and lands in the south to the middle large valley of Mashhad, and it has mountainous and fertile lands and lacks topographic integrity. Therefore, according to the studies, it can be said that the northern and middle part of the site has a slope of 0-5 % and as we move towards the south of the project site, the slope of the site increases and reaches 10-20%. The direction of the slope of the project site is often towards the east and northeast.

Vegetation, as one of the components of the urban space, plays an important role in energy exchange processes, and in this way, it can affect the microclimate of the environment. Given water shortage and related crises, the extreme heat and the increase in the temperature of the city, as well as the high volume of vehicle traffic in the city in different seasons, due to the movement of the high volume of pilgrims and nearby, plant species suitable for the above cases in the city (green spaces and paths) are cultivated. The geomorphology of Khorasan includes hills and mountainous lands, as well as rivers and valleys and wide valleys that have created plains such as the Mashhad plain, which is the origin of the emergence of two major types of natural vegetation in Mashhad

- Pasture grass cover: which can be seen on the hills and the lands overlooking the valleys. Juniperus, Prunus dulcis and sumac shrubs can also be seen. Among the species of grassy pastures as well as the wooded pastures, Artemisia is the species that is found frequently and has the highest



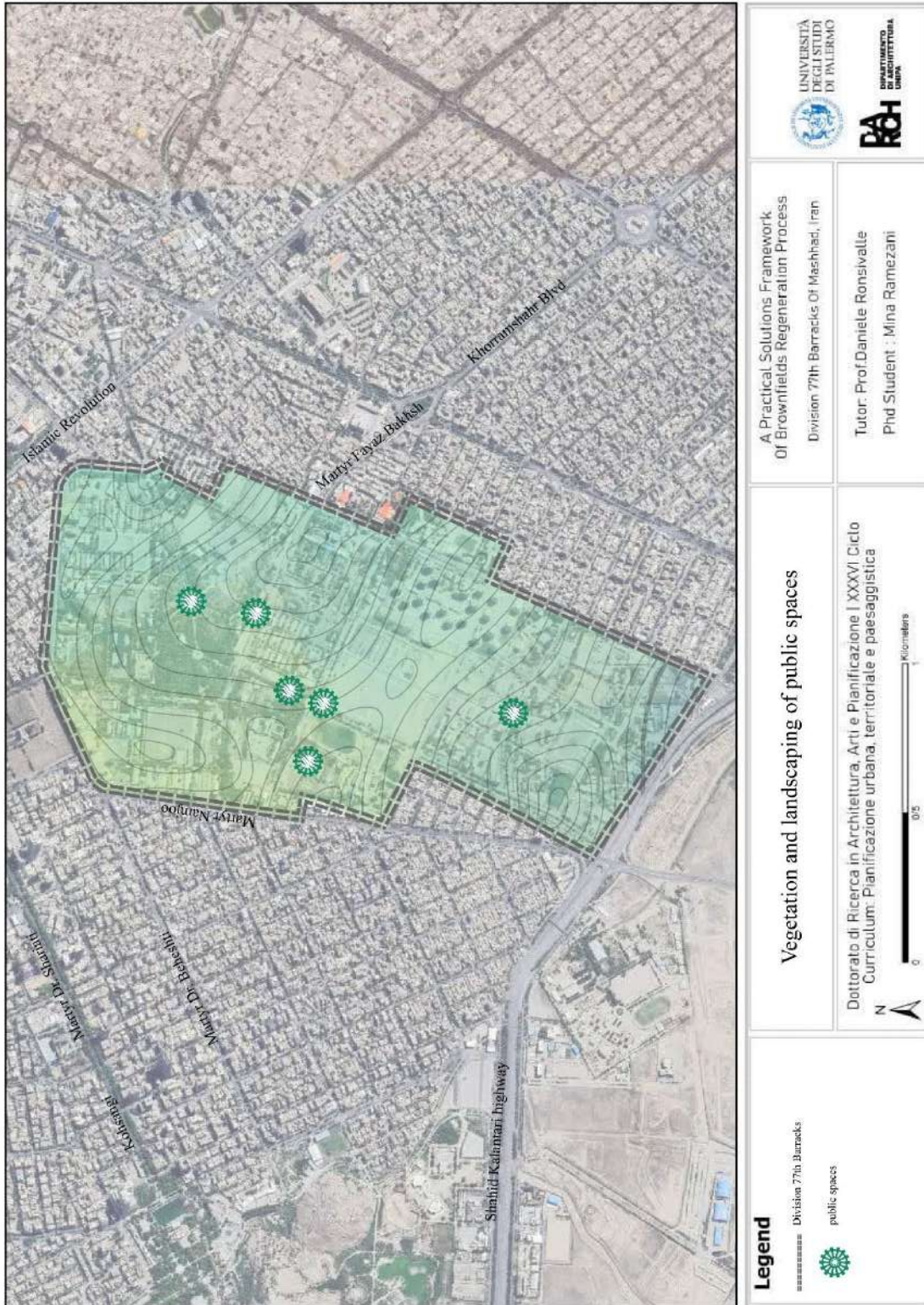
frequency among the plant species that grow naturally in the city. The slopes of the hills in the south of the city and its border are covered by *Artemisia* and *Poa bulbosa*, which seems to be the main type of vegetation in Mashhad and its border. Also, *Artemisia-Astragalus-Poa bulbosa*; *Artemisia-Astragalus-Prunus dulcis* and *Poa bulbosa* are also seen in the southeastern and western parts of the city.

- Riverside tree cover: which is located near rivers and waterways. In addition to the above types, in the less steep areas of the plain due to the proximity to the river and the existence of groundwater sources, irrigated fields, gardens and *Juniperus* bushes have been spread. It should also be noted that the natural vegetation in the urban areas of Mashhad has either completely disappeared or has been replaced by fruitful and non-fruitful hand-planted species in gardens and urban spaces. Almost all the northern edge and the eastern border of the city and its territory are covered by irrigated agricultural lands and gardens, and rainfed fields are scattered in the southeast, south and west of the residential areas.

The vegetation density in the southern and western pastures of Mashhad is low-semi-dense, but a large part of the pastures in this city has a low vegetation density of 5-25% and a limited part has an average density of 26-50%. Also, in District 8 and the study area, due to the existence of Kohnsangi Park and Astan Quds Garden, we see a high density.



Map. Vegetation distribution of the study area



The study area is not separate from Mashhad, and its dominant plant species are the same as in other parts of Mashhad. In the parts of the site that are older, there are old trees, especially Pinus, Platanus, Morus and Robinia are more than 100 years old. A part of the existing vegetation has been placed in the houses of the army, which are currently available to the army employees in the form of villas, and due to the oldness of these houses, the trees are also old there.

Also, part of the design site dedicated to sports fields is planted with grass in some seasons, but due to the high cost of irrigation and maintenance of the grass, it often lacks grass and has alternative vegetation. Regarding the dominant plant species of the area, the following can be mentioned:

Table. Dominant plant species in the study area

description	species
tree	Robinia, Morus, etc.
bush	Yucca, pampas, etc.
hedge	Ligustrum vulgare, Pyracantha, etc.

In the following, it can be concluded that, in general, the concentration of travel attractive uses such as commercial, medical and transportation, plan the urban transportation network, lack of parking, incoherence in pedestrian and bicycle traffic, as well as problems related to the public transportation system had adverse effects on the traffic flow of the study area, which has caused a lot of environmental pollution, including air, noise, and visual pollution. The study area is located in the center of Imam Khomeini neighborhood and leads to Namjoo, Samen al-Aima and Imam Khomeini boulevards. These boulevards are the beginning of the axis of roads that are exposed to traffic pollutants more than other roads in the area. Next, Shahid Beheshti axis is placed in the next rank so that pollution is evaluated as moderate and low. Given that the barracks is in the center of the neighborhood, and inaccessible, and many of its roads have not been reopened to the public, traffic and environmental pollution in the streets leading to this site is estimated to be very high.

On the other hand, in addition to traffic and pollution caused by vehicles, the presence of pollution-producing uses in the area such as transportation terminals, repair shops, medical centers (improper disposal of hospital waste), unauthorized construction, traditional waste collection system, etc. are very effective on intensifying the environmental pollution of the area. The most important role of visual pollution on roads is congestion, crowding, and the feeling of crowding and chaos, which can be seen significantly during the peak hours of traffic in the area. Also, in some parts of the site, inappropriate urban furniture, high density of urban landmarks, and accumulation of construction waste are other visual pollutions in the area. On the other hand, the high per capita green space in urban and suburban functional areas such as Kohsangi Park, National Garden, and al-Nandasht, as well as the density of trees on the edges of the main streets, plays a major role in air conditioning.





## **Integrated analysis using the Swot Plan**

A city is considered as a system of components and relationships in environments with complex characteristics. The necessity of describing, separating, analyzing and combining urban issues is well-known by any urban planning expert, and it has been always attempted to propose modern tools and techniques in order to achieve this. SWOT PLAN has been used in various urban dimensions, including managerial, social, economic, and physical dimensions. In the following, it should be noted that the main objective of SWOT and strategies is the analysis of the barracks site and the change in the existing condition. According to the scope of the study and the analysis of field impressions of this space, it was found that the recognition and prioritization of the following issues in the SWOT table is very important and necessary for the redevelopment of the barracks.

- Existence of abandoned lands and uses suitable for compensating for the lack of neighborhood services and developing tourist-attracting activities in the suburban
- Creation and maintenance of public open spaces and behavioral barracks in the existing abandoned lands and in connection with the pedestrian paths of the site
- Meeting the service needs and deficiencies of the region through releasing and changing the use of lands located within the area of the project
- Site's potential for green transportation in interaction with uses and activity nodes
- Handling and modifying the sewage collection system at the district level
- Paying attention to the physical coherence in the texture in future developments and the existing body in terms of integration in the mental structure of the residents
- Providing appropriate services in order to improve the level of social life
- Using the sense of belonging of the residents, identity and potentials in the neighborhood in order to strengthen the participatory role of people in the construction and improvement of the neighborhood
- Beautifying the street view and night view of the neighborhood
- Using the rules of green infrastructure, improving the quality of the streets of the neighborhood and paying attention to the private landscape of the

streets in order to increase the sense of belonging of the residents and the desire to stay in the neighborhood

- Functions related to social security and social monitoring in the neighborhood
- Paying attention to the entertainment and service of the area and increasing the possibility of social contacts at the neighborhood level
- Developing a comprehensive framework for the protection of the ecological environment and identity
- Increasing the social interactions between the residents by strengthening the behavioral decisions and the trans-regional role of the area in order to increase vitality

According to the above and a field visit to the barrack site, the framework of the SWOT table was prepared in a systematic and integrated manner.

Table 1. Descriptive results of strengths

Strengths (S)		
S1	functional	Access to the main streets of the city such as Shahid Kalantari highway, and Imam Khomeini, Namjo, Fayaz Bakhsh and Kohsangi streets
S2		Existence of bus rapid transit (BRT) and taxis in the three main intersections of the site
S3		Existence of the east-west route to facilitate traffic
S4		Easy access of citizens to medical centers around the site
S5		Possibility of development of the space and service uses of the site for the future of the city
S6		Existence of play equipment for children in the northeast of the site
S7		Existence of two sports uses for citizens in the center of the site
S8	aesthetic	Existence of several historical buildings such as the old mosque in the center of the site, the machine building shed in the east of the site and the administrative buildings of the barracks at the main entrance and the barracks ammunition warehouse in

		the 4 corners of the site dating back more than a hundred years
S9		Provision of a historical and memorable image to the audience at the entrance of the barracks
S10	environmental	Observance of green space per capita in the center of the military barracks site
S11		Existence of a forest park in the northeast of the site

Table 2. Descriptive results of weaknesses

Weaknesses (W)		
W1	functional	Multiplicity of stakeholders in the field of decision-making and economic redevelopment of the study area: <ul style="list-style-type: none"> <li>• Municipality and City Council</li> <li>• Command of the army division barracks</li> <li>• Astan Qods Razavi</li> <li>• Housing and Urban Development Organization</li> <li>• Khorasan Razavi Governorate</li> </ul>
W2		Many urban traffic nodes due to narrow roads in the center of the site
W3		Interference of rider and pedestrian traffic
W4		Existence of traffic in Ghadir Square and the roads leading to it
W5		Noise and environmental pollution due to passing through the dense urban textures
W6		Improper access for disabled and physically disabled people to the main site and three vehicle traffic passages
W7		Lack of access to urban green transportation network around the site
W8		Lack of rest spaces around and in the middle of the site

W9		Inadequate flooring of the barracks, especially in the main access roads
W10		Failure to calm the intersection of pedestrians and cyclists in Ghadir Square and the roads leading to it
W11		Lack of public parking for visitors to the neighborhood
W12		Lack of proper safety for walking spaces in the area and around the site
W13		Relatively high price of land in the main neighborhood of the site (Imam Khomeini)
W14		Unsuitable urban furniture in the center and main square
W15		Lack of adequate number of public toilets
W16	aesthetic	Lack of customization of the night landscape around the site (for night vision)
W17		Lack of coordination of landscaping with neighborhood identity
W18		Non-observance of beautification of the environment and green space
W19	environmental	Non-observance of per capita green space in the streets leading to the barracks

Table 3. Descriptive results of opportunities

Opportunities (O)		
O1	functional	Using unused land to create suitable urban spaces
O2		Basic and appropriate optimization of roads for pedestrians and bike riders
O3		Redevelopment of the barracks site to provide the lack of service uses to meet the needs of the citizens of District 8 and its neighborhoods such as Imam Khomeini neighborhood
O4		Revival of the balance between capacity and demand for essential uses on the site

O5	aesthetic	Creating appropriate advertising spaces for the advancement of public participation
O6		Appropriate landscaping for three old buildings (cultural heritage) in the northeast of the site with emphasis on the identity of the urban area
O7	environmental	Using the land in the center of the site to organize green space and urban agriculture

Table 4. Descriptive results of threats

Threats (T)		
T1	functional	Disregarding the rules, regulations and standards approved in the working group meetings
T2		Not using warning signs for the inner-city military base
T3	aesthetic	Air pollution and urban landscape in the northwest area of the site
T4		Disregarding the night view and the security of the citizens at night
T5		Loss of visual corridors with unauthorized construction, especially in the entrance of the site from Fayaz Bakhsh St.
T6		Existence of destroyed and scattered buildings in the site, which increases the crime rate in District 8, especially in area 3
T7		Digging deep holes for Water and Sewage Co. and lack of fencing for the safety of the residents of Faiyaz Bakhsh and Namjo neighborhoods
T8	environmental	Disregarding harmful environmental effects of the change in use in this area by authorities
T9		Military contamination such as heavy metals, unfilled ammunition pits, etc. in the barracks ammunition storage in the east of the barracks site.
T10		Soil pollution and erosion in excavation of Fayaz Bakhsh and Namjo streets

# **Chapter 6 Solutions of the division 77th barracks of Mashhad, Iran**

## **Introduction**

Brownfield sites, characterized by their previous industrial or commercial use that has left them contaminated or underutilized, present a unique challenge and opportunity for urban development. These neglected spaces hold immense potential for transformation into vibrant, sustainable urban environments. As the world continues to urbanize, it is crucial to explore innovative approaches in urbanism and design to unlock the latent possibilities within brownfield sites. This chapter aims to categorize the diverse solutions implemented in brownfield redevelopment projects worldwide, with a particular focus on new urbanism and design ideas, smart cities approaches, and the integration of cutting-edge technologies.

### **The division 77th barracks in Mashhad, Iran**

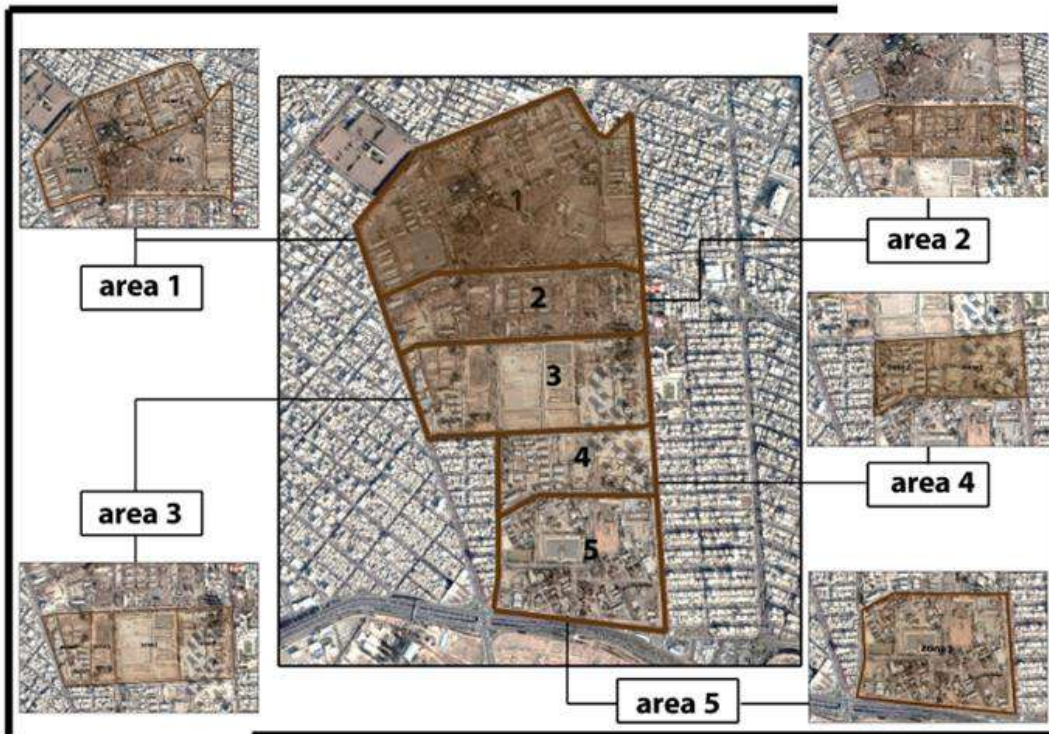
To provide a practical illustration of the concepts discussed in this thesis, this chapter will focus on a case study of the division 77th barracks in Mashhad. The abandoned barracks, a prime example of a brownfield site, poses both environmental and urban planning challenges. By examining this case study, we can explore specific solutions and strategies tailored to the unique context of Iran. Through the lens of new urbanism, smart cities approaches, and the application of cutting-edge technologies, this case study aims to demonstrate the transformative potential of brownfield redevelopment.

By analyzing the barracks redevelopment case study in Iran, this chapter sets the stage for exploring new approaches in urbanism such as smart cities in the context of brownfield redevelopment. Through an in-depth examination of this specific project, we can gain insights into the practical implementation of these solutions and their potential impact on the revitalization of brownfield sites.

This study involved the division of the barrack into five distinct areas, each of which was further subdivided into several zones. Each zone has distinct characteristics. The present study addresses on the revitalization of the barrack through the implementation of solutions derived from other urban redevelopment projects. This chapter provides a description of each region, emphasizing the key features of each. The objective of the description is to determine the identity of the zone, with the aim of selecting effective solutions and fostering a more ideal future.

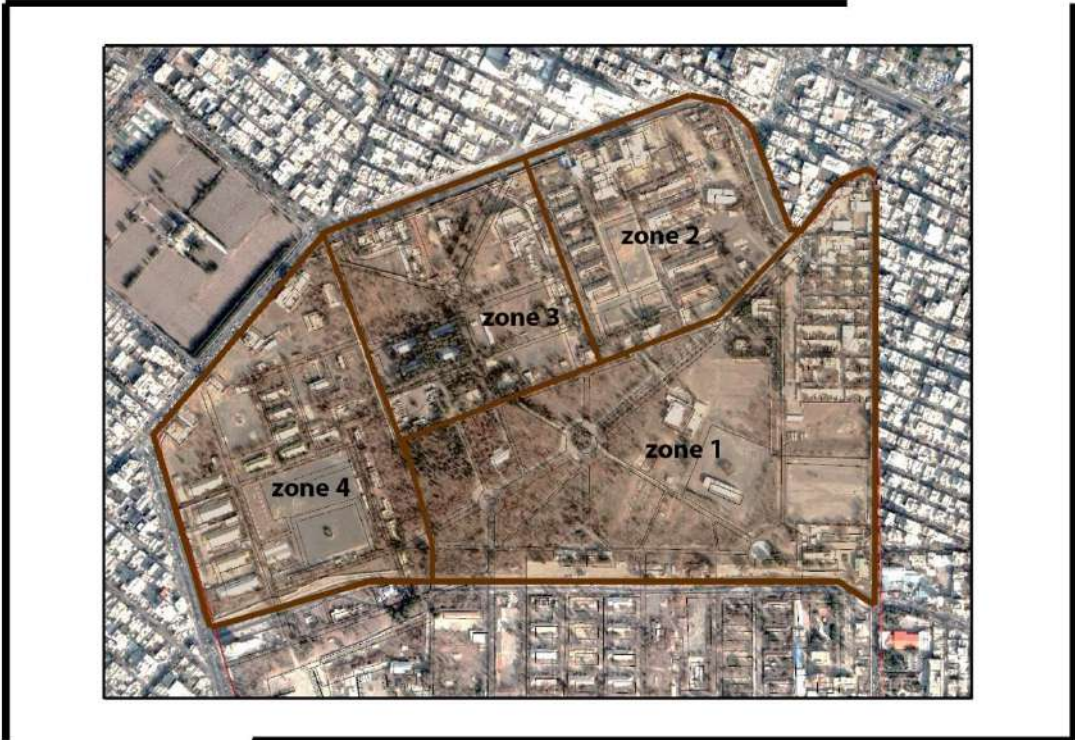


In this section, the barracks site is divided into five zones for ease of recognition:



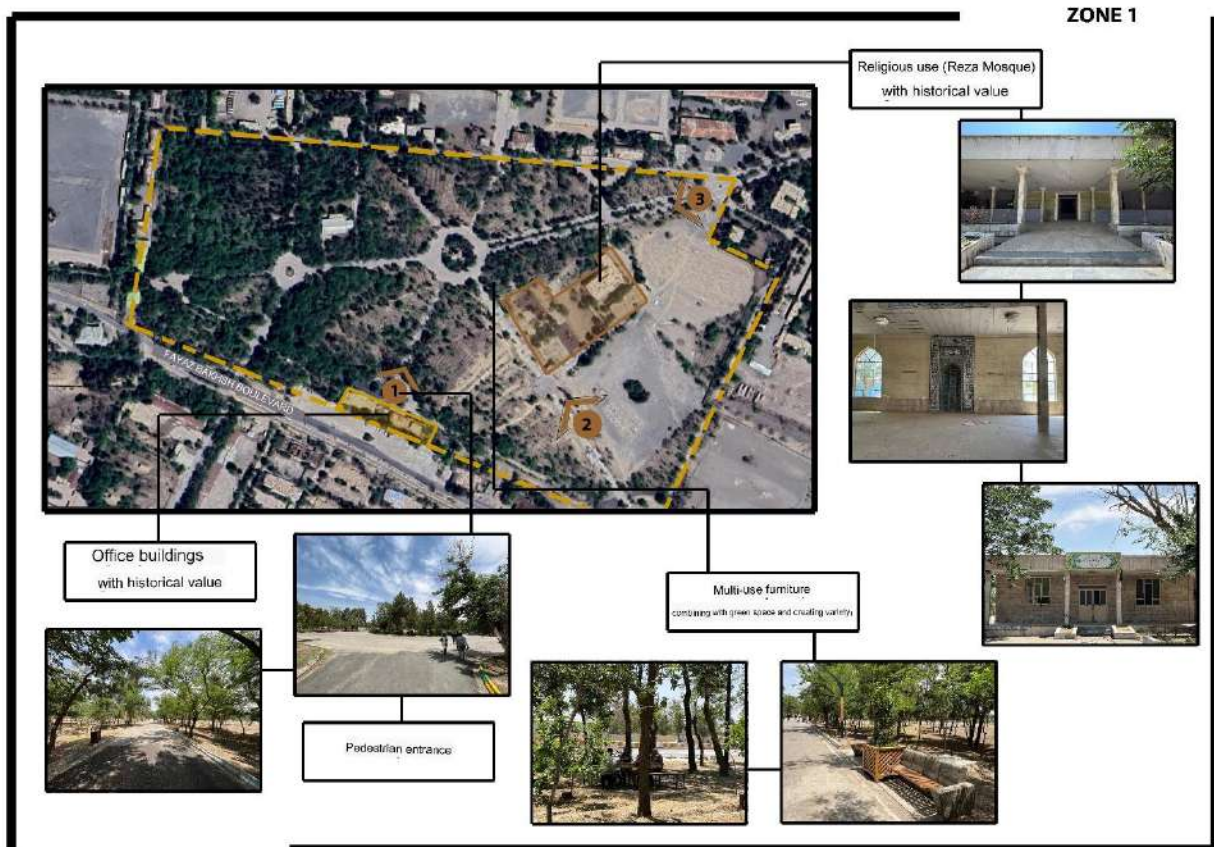


**Area 1 zone 1-4**



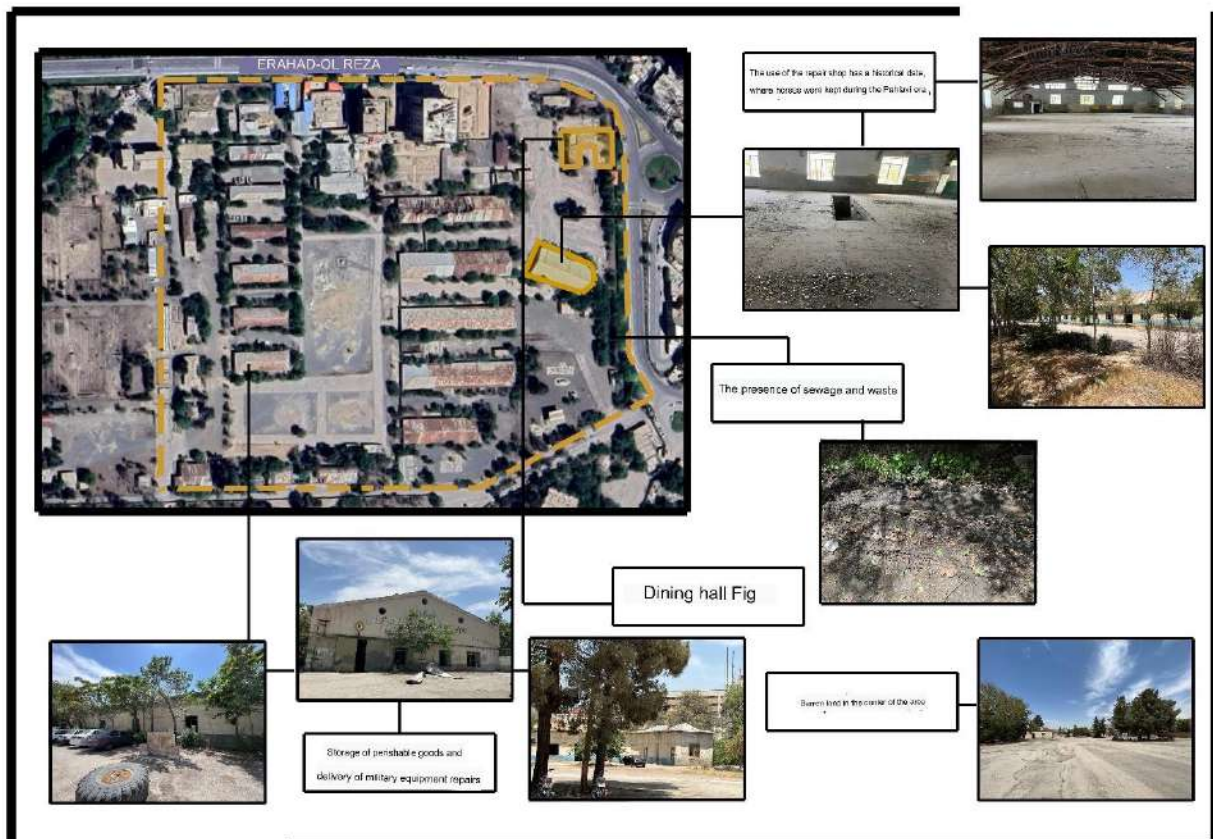
## Area 1 Zone 1

The existence of Reza Mosque and cultural and administrative uses along Fayaz Street, which follow a specific form and architecture, over forty years old, which were formed during the Pahlavi era, and the preservation of this use in this area, easier access to these uses due to the proximity of Fayaz Avenue and the Sabz Pedestrian axis, the presence of different and multi-use furniture along the pedestrian path and green space and their combination with vegetation, as well as the children's play area on the south side of Reza Mosque and It is located near the green sidewalk, the first entrance is located on the south side, and most of the mentioned area is allocated to the green space in map number 1.



## Area 1 zone 2

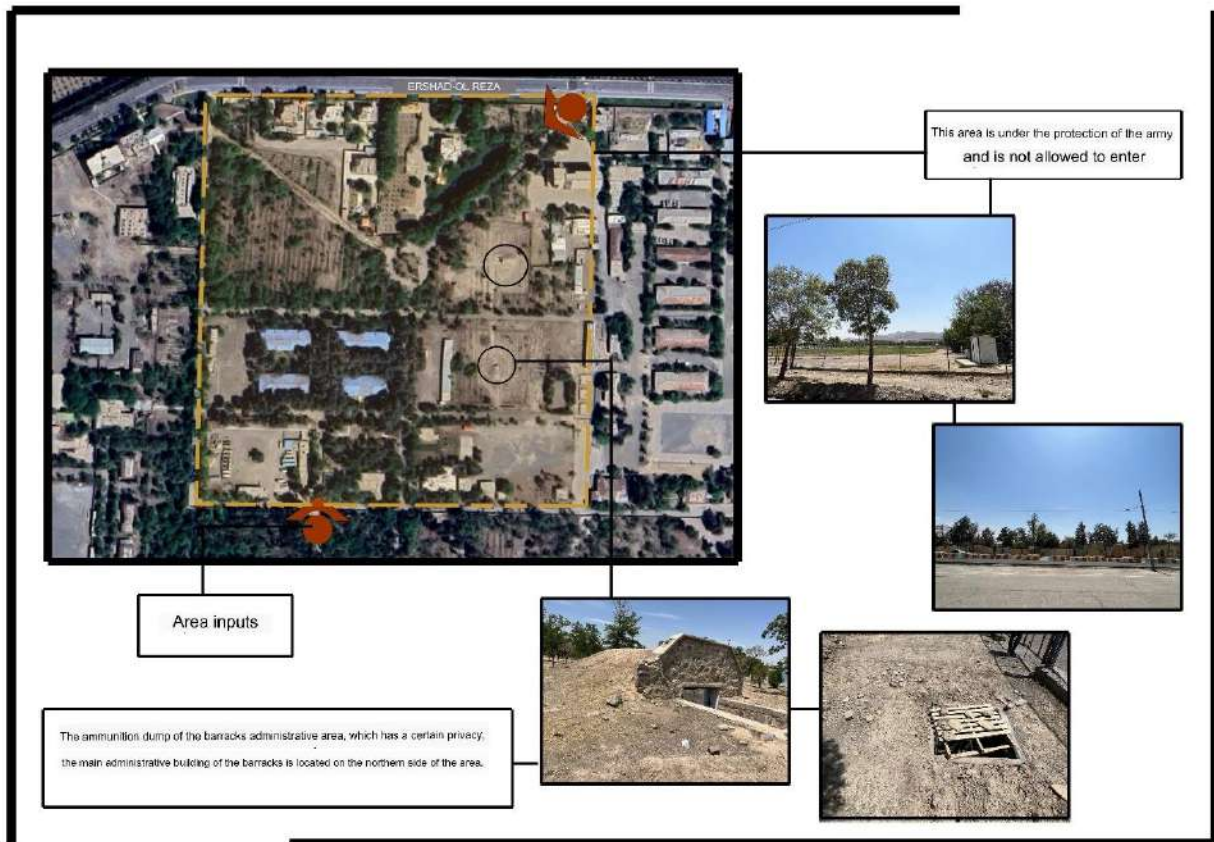
There are commercial and cultural uses on the side of Ershad al-Reza street with the activities of the repair shop and the pilgrimage cultural complex of Al-Ghadir Artesh. There is also a repair shop and a dining hall on the west side, the use of the repair shop is preserved due to its age. The sheds located during the Pahlavi period were the place where the horses were kept, but after the revolution, they changed their use and turned into a repair shop. In the western part of the warehouse plan, before the revolution, it was the place of the Bahrami regiment. Wood, iron, and brick materials have been used in the building of the warehouses, and in the southern part of the plan, administrative buildings have been placed on the side of the road and the detention center on the southern side. The presence of waste and garbage around the eastern sheds of the plan, most of the target area. Assigned to warehouses on map #2.





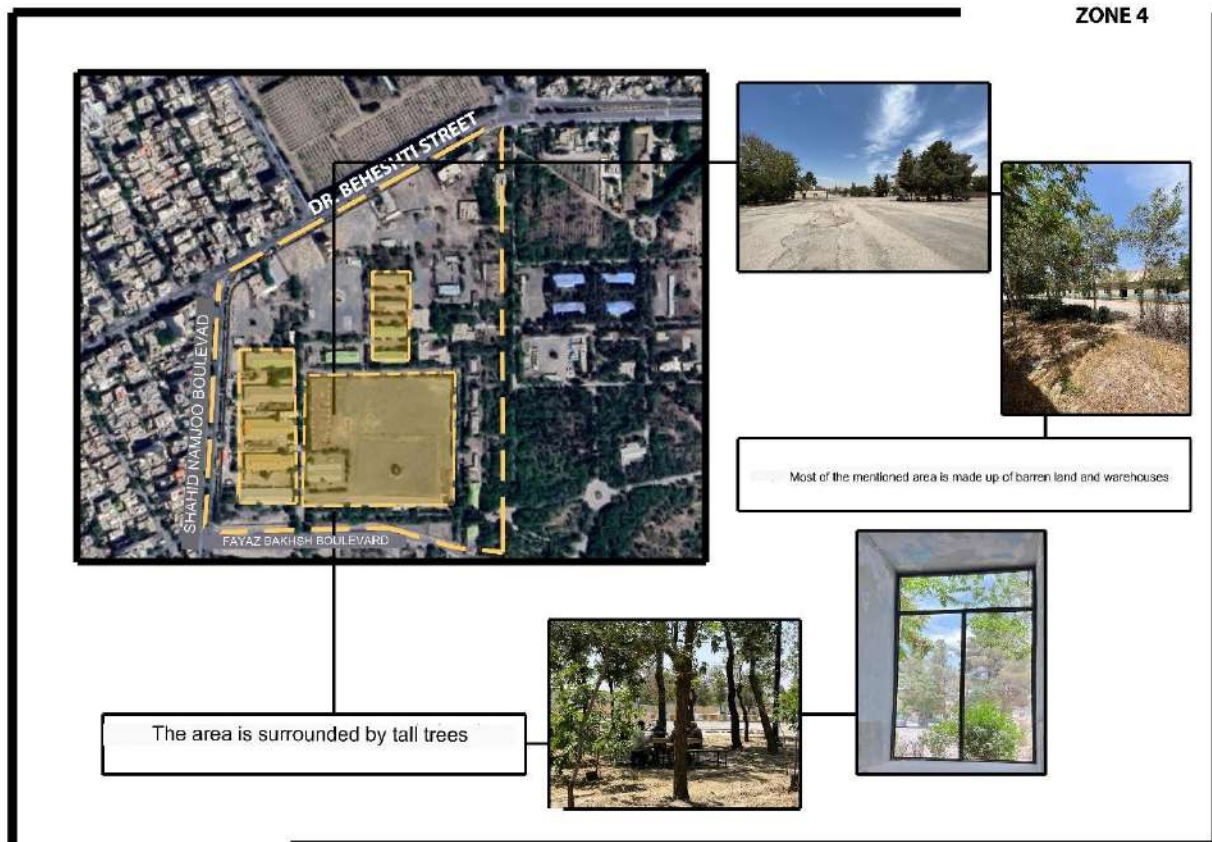
### Area 1 zone 3

In this part, the use of the administrative buildings of the military complex of the barracks is located, and the commercial use with the activities of the dining hall in the northern part, the presence of the barracks ammunition dump in the center and the protection of their privacy due to their explosive radius, as well as the entrances of the military complex in the south and northwest sides. Map number 3 is located

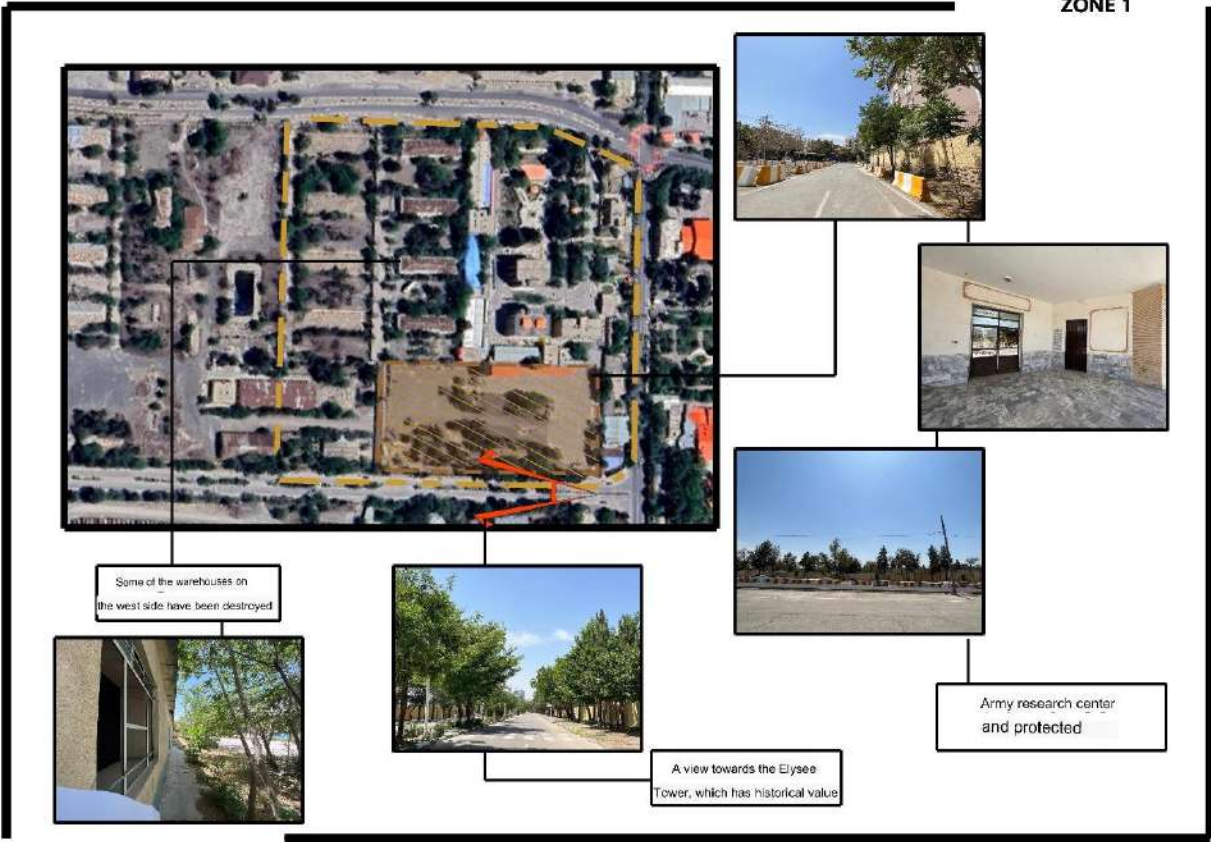


## Area 1 zone 4

The presence of medical use (Saman Al-Aime Medical Complex of Lashgar 77) in the northeast side, as well as the presence of sheds and residential use in this area, most of the space is made up of barren land, and it is the protected area of the army, which is from the east to Namjoo Boulevard, from the north to Beheshti Boulevard is connected in map number 4.

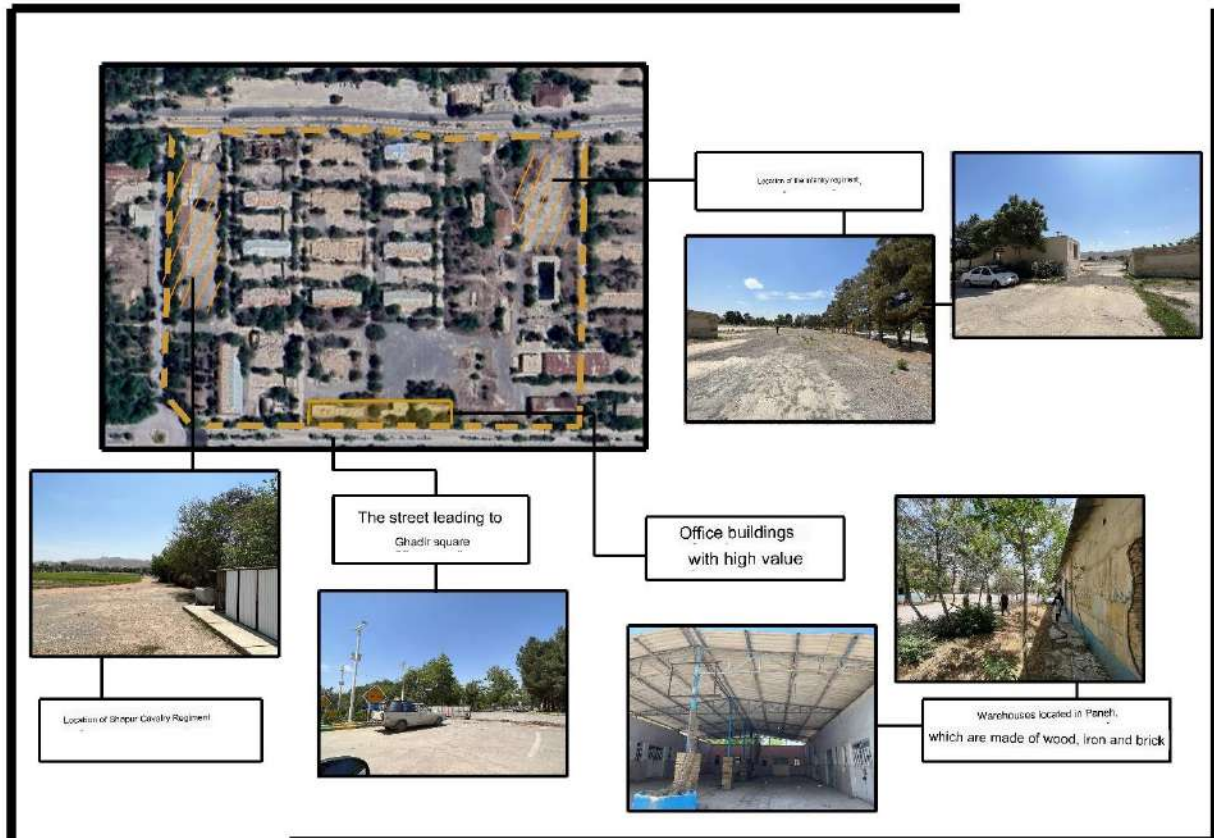


The presence of cultural use in the northern side and its proper access due to its location on the side of the street and the surrounding paths, as well as the presence of the Garrison Research Center on the southern side, and the view of the southern street towards the Elysee Tower can be seen in figure number 5.





The existence of two military regiments, one on the east side and the other on the west side of the area, which is known as the place of the infantry regiment and the place of the Shapur regiment, as well as the valuable building with tile materials on the south side and the side of the street, the central part of the area includes warehouses, which are around them, there are green spaces with tall trees in map number 6.

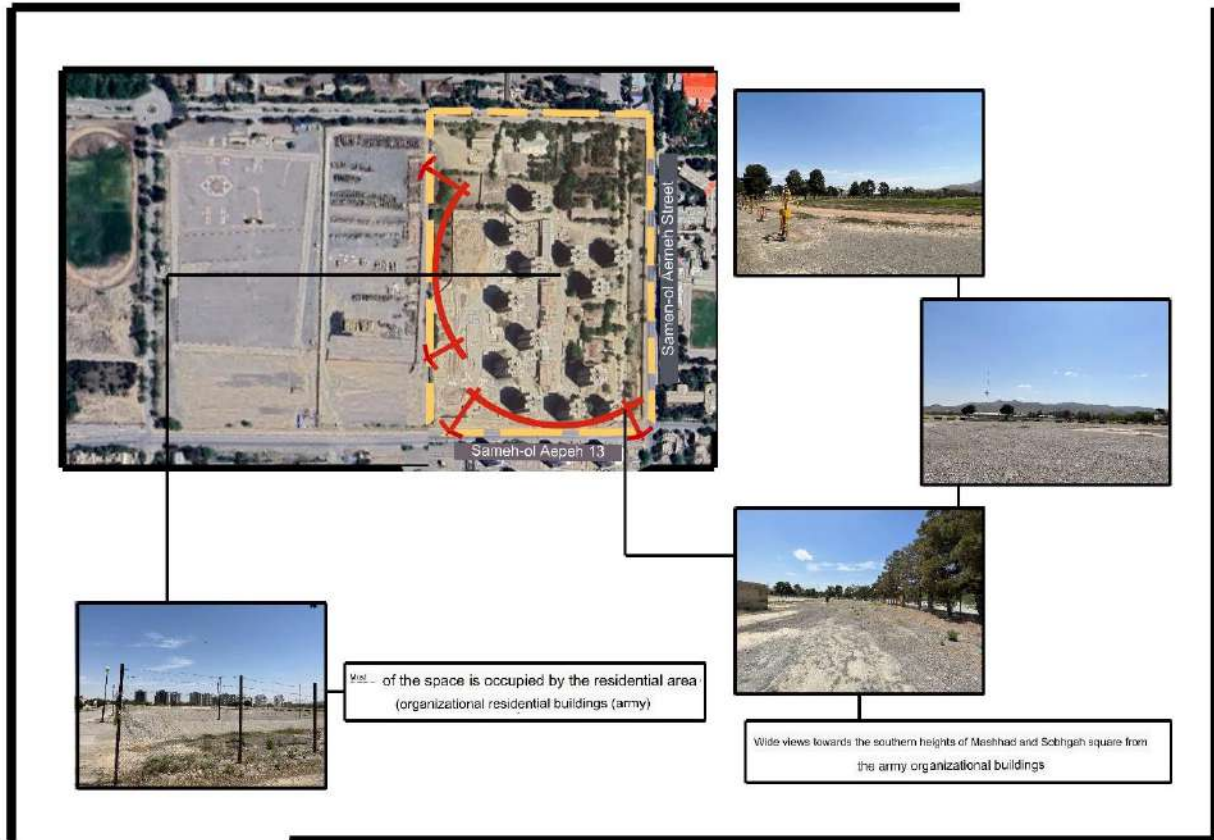


There is a residential use on the side of Namjo Street (Kimiya Hotel and Army Guest Houses) and an office use on the northern side, which has a historical history. All the office uses on the side of Fayaz Boulevard follow a specific form and architecture, the presence of rubble in the eastern part, which has privacy. They are radial because of the explosives, the area in question is mostly empty and green space. Also, the presence of a checkpoint on the eastern street towards Ghadir Square and the presence of 99-year-old trees on the left side of Ghadir Square in Map No. 7

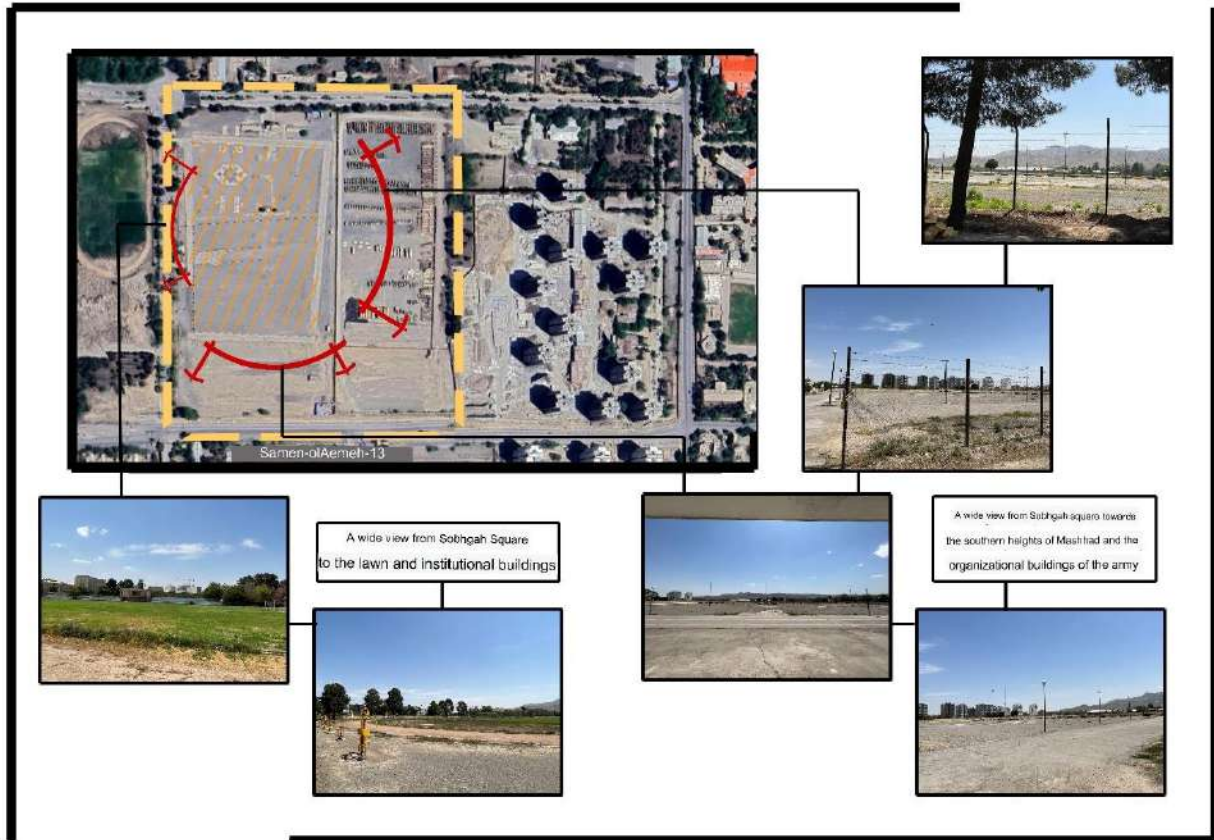




Most of this area is made up of residential uses, there are several sheds in the northern part of the area surrounded by tall trees. The residential towers located in the area are the organizational buildings of the army, which have a view towards the Sobhgah square and the lawn and all the views towards the southern heights of Mashhad city. It is shown in map number 8.



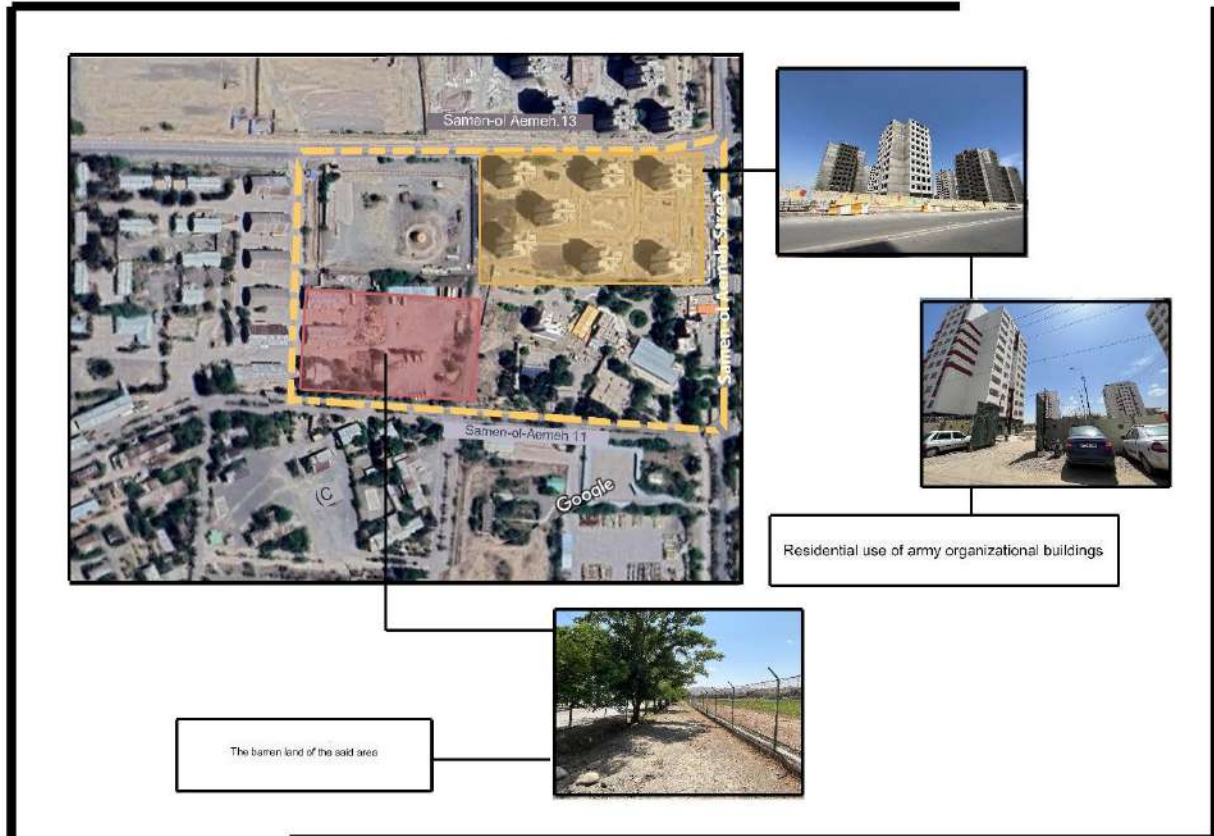
Most of the space in this area is barren land, there is Herat Park on the east side and Sobhgah Square on the west side of this area, and the children's playground in Sobhgah Square, from Sobhgah Square to the lawn and also to the army organizational buildings. It can be seen on the east side and the southern heights of Mashhad, it can be seen in map number 9.



On the west side of the zone, there are residential uses (organizational buildings of the army), cultural (Sarai Sabet research and Farabi girls' school), religious (Koy Yas Mosque) and these uses are supposed to be preserved. It is located on the eastern side of the field of grass, which has a view of the morning square. This area is connected to Namjoo Street from the south and to Namjoo Boulevard from the west. It is shown in map number 10.



In the northern side of the residential area (organizational buildings of the army), cultural (Imam Ali Educational Cultural Complex) and in the southeastern side of the area is Fajr Hall. Half of the area is occupied by barren land, which is currently under construction and is a protected area of the army. This area is connected to Saman Al-Aimeh Street 13 from the north and to Saman Al-Aimeh Boulevard from the east. It is shown in map number 11.





There are warehouses throughout the area, and the sheds in the southern part are formed at a different angle compared to them. Most of the area is occupied by barren land. This area is connected from the west to Namjoo Boulevard, from the north to 13 Saman Al-Aimeh Street in map no. 12 are displayed.

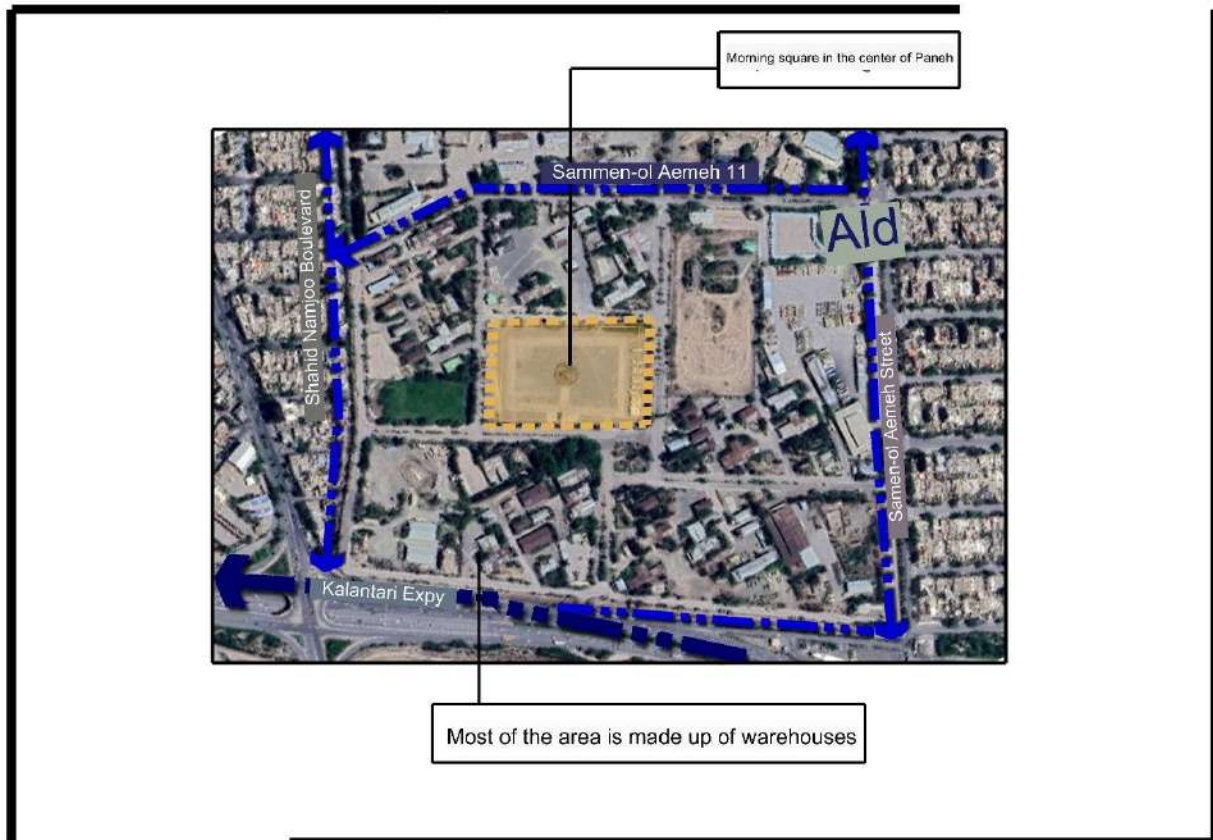


**Area 5**



## Area 5 zone 1

The entire area is made up of sheds and parking lots, and it is classified as vacant land. In the central part of the area, there is Sobhgah square, which overlooks the southern heights of Mashhad city. It connects to Kalantari highway shown in map number 13





# **Chapter 7 Findings : General Framework**

## **Introduction**

Data analysis is a multi-step process in which the data obtained through the use of collection tools in the statistical sample are summarized, coded, and categorized. Finally, the data are processed to provide a basis for various analyses and to establish the relationships between the data in order to test hypotheses. In this process, the data are refined both conceptually and experimentally, and various statistical techniques play a significant role in making inferences and generalizations (Sarmed et al., 2013). Data analysis to check the correctness of the assumptions is of particular importance in any type of research. Nowadays, in most research projects that rely on the information collected from the research subject, data analysis is one of the main and most important parts of the research. Raw data is analyzed using statistical techniques, and after processing, it is provided to users in the form of information. This research deals with developing the framework for solutions in the process of regenerating brownfields. Maxqda software performed the qualitative analysis, and there will be two levels of statistical data tables presented: (a) descriptive and (b) inferential.

## **Research Findings**

Data analysis is a multi-step process in which the data collected through various tools, such as interviews and coding, is categorized and then processed so that various analyses and connections between the data can be made. In this process, data is refined based on concept and experience, and analysis techniques for inference and generalization play an important role. Data analysis is very important and necessary to check the correctness of questions in any type of research, and in today's era, data analysis is considered one of the main parts of research based on the data collected from the research subject. Raw data are analyzed using qualitative techniques and tools, and after processing, they become usable information for researchers, who can use them for discussion and various strategies. To achieve these goals, this chapter uses qualitative methodological approaches, including archival research, fieldwork, and qualitative analysis. Such an interdisciplinary methodology is necessary to understand the complexity and variety of factors and to enable a comprehensive understanding that goes beyond

any simple classification. The qualitative research method and interview tools have been used. Structured interviews were conducted with 17 people from our target community who are expert professors in the fields of architecture and urban planning. Then the output of these interviews was coded and analyzed using MAXQDA software. MAXQDA software is a powerful tool in qualitative data analysis that allows coding, classification, search, and retrieval in the text of the interviews. Using this software, the interviews were recorded, organized, and analyzed to extract patterns and themes in the data. In the following, the findings from the analysis of the interviews are reported in detail.

Variable	Dimension	Component
Approach	Practical solutions	Attention to social cohesion
		Social interactions
		Creating attractive applications
		Assessment of needs and social engagement
		Employing public facilities
		Improving methods for detecting land pollution
		Consideration for the location of property
		Appropriate financial evaluation
		Shift in the viewpoint of government institutions
		Municipal assessment of performance
		Urban development in line with sustainability
	Developing quick-yielding activities	
	Simplify the rules	To Avoid rent-seeking consultants
		Observation of building expenses
		Establishment of development-oriented companies
		Urban management from macro to micro scale
		Paying attention to citizens' vitality in urban planning laws
		Development of brownfields in the direction of urban laws
		Reduce strict regulations
Encourage participation		
Deregulation		
Challenge	Failure to deal with development projects	Maintaining city borders open
		The existence of obstacles due to the scope of the project
		Risk management planning process
		Lack of economic efficiency
		lack of management
		The large scale of these lands
		Inability to provide alternative land
		Legal restrictions
		Conflict of interest
		High regeneration costs
		Agreement with the owners
		Local community resistance
		State ownership of lands

	The reason for the failure of projects	The profitability of economic profitability
		Ignoring the interests of the city
		The need for large investments
		Failure to pay attention to the needs of local communities
		military ownership
		Failure to pay attention to the needs of the city
		Lack of organizational structures
		Land trading
		State ownership of fields and lack of coordination between organizations
		Lack of study background in the field of specialists
		Failure to examine the correlation between the plan and the existing platform
		Lack of sufficient background studies
		Huge expanse of land
		Lack of environmental impact assessment
	Failure to assess social impacts	
	Operational challenges in development	Local communities
		Chemical pollution of soil and water
		Unavailability of scientific data from the site
		Unforeseen expenses
		Professional service fee
		Cost of materials
		Improper development for land use
		The total price of the land
	threats	Lack of a proper land use planning system
		Conflicts concerning land ownership
		Heterogeneous performance
		False inflation
		Inappropriate landscape due to being abandoned
		Lack of proper use of potential capacities
		Commercialization of urban spaces
		Lack of citizen participation
		Social changes in the urban context
		Increase in real estate prices
Reducing the vitality of the environment		
Possible rise in crime		
Poor safety		
Unbalanced urban development		
Inappropriate regeneration		
Environmental pollution		
Abandonment of contaminated land		

Table 1: Separation of keywords (variables, dimensions and components)



After conducting the interviews and collecting the research data, the text of the interviews was entered into the MAXQDA software. As mentioned in the previous articles, this software is a powerful tool in the analysis of qualitative data, which can be used to code, classify, and analyze texts. In this research, the text of the interviews was studied several times, inductive coding was done, and then the extracted concepts and indicators were categorized and analyzed. Obviously, it should be noted that the final indicators were determined using the Delphi method, which followed a review of the relevant literature and the identification of the initial indicators. For this purpose, an interview based on the identified primary indicators was conducted with 17 experts in the field of study. Subsequently, their answers were collected, and the importance of each indicator was determined based on the experts' perspectives. The indicators that at least 70% of the experts recognized as important were selected as the final indicators. With this method, 49 indicators were confirmed as the final ones, which will be used for the next analysis. After three Delphi steps, the desired indicators were summed up in the table below as keywords (variables, dimensions, and components).

### **Descriptive statistics of experts**

Before addressing the findings of the research, it is necessary to provide descriptive statistics related to the demographic characteristics of the interviewees. Therefore, based on the interviews conducted and the findings drawn in Tables 1–4 and the related diagrams, it should be kept in mind that, due to the complexity of the subject and the specialization of its studies, all the interviewees have PhD degrees.

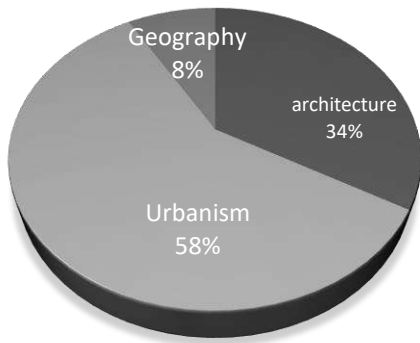
Table 2: Descriptive statistics of experts participating in the interview

Variable	Type	Abundance	Frequency
Scale	international	0	0
	National	1	3/8
	regional	7	3/58
	local	4	3/33
Field of study	architecture	4	3/33
	Urbanism	7	3/58
	Geography	1	3/8
degree of education	PHD	12	0/100
history	Between 10and 15years	2	7/41
	Between 5and 10 years	7	7/41
	Less than 10years	3	7/16
Job	University professor	4	3/33
	expert	1	3/8
	Consultant	4	3/33
	Design and Implementation	2	7/16
	manager	1	3/8

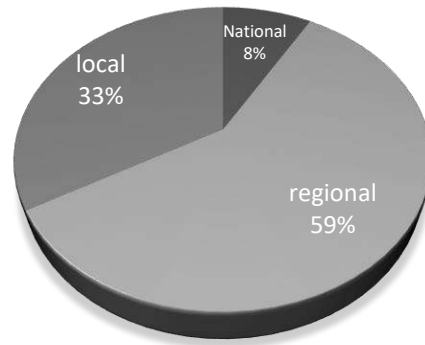
On the other hand, the most frequent field of study is urban planning (58%), followed by architecture (34%), and finally geography (8%). In terms of occupation, the highest statistics (33%) are assigned to university professors and consultants in this field. and after that, design and implementation are 17%, and expert and executive directors are also 8%. The most work experience of these people is between 5 and 5 years, with a number of 58%, and the most work scale in this field is related to regional affairs, with a percentage of 59.

According to the descriptive statistics of the experts participating in the Delphi test, many graphs have been drawn below:

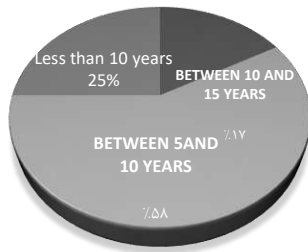




Descriptive statistics chart by field of study



Descriptive statistics chart according to work scale



Descriptive statistics chart by history



Descriptive statistics chart by education

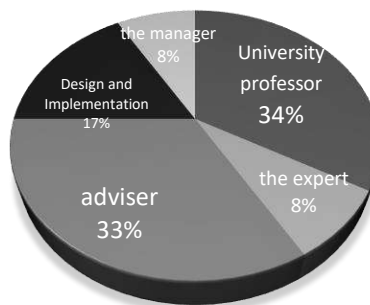


Chart of descriptive statistics by occupation

Figure2 :Descriptive statistics charts of the interview

The validity and reliability of the parts taken from interviews using the Delphi technique are also shown.

### Descriptive Statistics

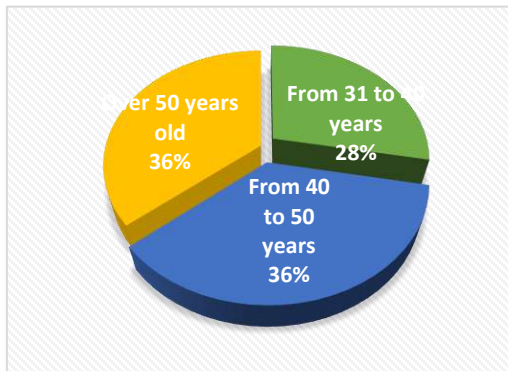
The descriptive statistics show that 8% of the people surveyed agreed that the information was correct. Of these, 7 people are between 31 and 40 years old, 9

people are between 41 and 50 years old, and 9 people are over 50 years old. In terms of education, 11 people have a master's degree, and 14 people have a PhD.

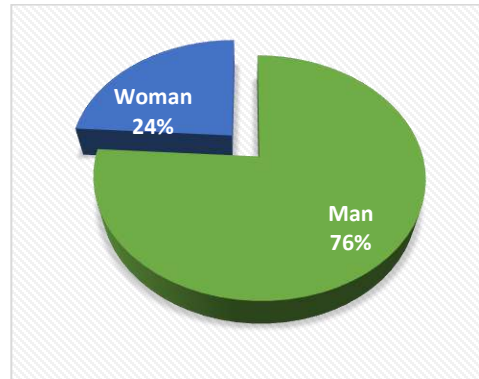
Characteristic	Issue	Abundance	frequency
characteristic	Man	19	0/76
	Woman	6	0/24
Age	From 31 to 40 years	7	0/28
	From 40 to 50 years	9	0/36
	Over 50 years old	9	0/36
education	Masters	11	0/44
	P.H.D	14	0/56

**Table3:** frequency and percentage of characteristics of experts

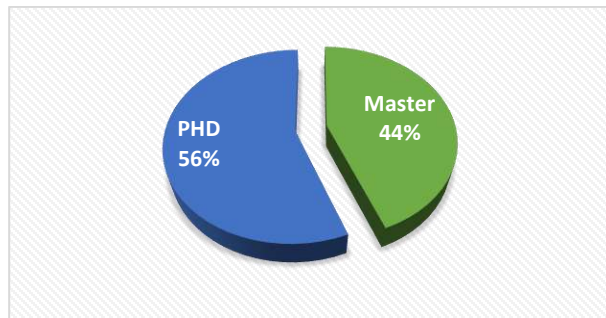
According to the descriptive statistics of the experts participating in the Delphi test, many graphs have been drawn below:



Frequency percentage by age



Frequency percentage by gender



Frequency percentage based on education

**Figure3 :** Descriptive statistics charts of the expert

## **First stage Delphi method**

Validity means to what extent the method or tool used can correctly measure the characteristic; In other words, the validity concept answers the question of how well the measurement tool measures the characteristic. Therefore, when it is said that the data collection tool must be valid, it means that whether you prepare a questionnaire, whether you want to conduct an interview, or whether you conduct your evaluation by face-to-face observation, what is being measured must be related to the goal you have set; otherwise, In this case, the final result will not have a special value. There are several ways to determine the validity of a measuring instrument.

The validity of the item structure of an instrument can be determined based on factor analysis. Factor analysis is done in two general ways, which include exploratory and confirmatory factor analysis. Exploratory factor analysis can be implemented in most of the available statistical software, including SPSS, but confirmatory factor analysis cannot be done with SPSS, and other software must be used for its implementation. Confirmatory factor analysis is used when the instrument or questionnaire used has adequate construct validity and is used to confirm previous work. Therefore, it is not possible to extract new factors in this type of factor analysis. Also, in confirmatory factor analysis, one describes or explains experimental data by having a model. This model is based on a set of pre-existing data, and it is mostly used in confirmatory studies. In this research, the validity of the research tool (a researcher-made interview) was measured and evaluated in the form of content validity. Content validity refers to the extent to which the sample of questions used in a test is representative of the entire community of possible questions that can be prepared from the content or topic in question. The better the test is in this respect, the more valid it is. Therefore, if the researcher wants to make a valid questionnaire for his subject, his questionnaire should include a correct and accurate sample of the relevant subject matter. Meanwhile, this questionnaire should not measure anything outside the content and goals of the subject. According to the above explanations, in order to make a valid questionnaire, we should try to make the questions of the questionnaire a perfect example of the objectives and content of the subject.

### How to measure CVR:

The validity rate of the content is calculated using the following relationship:

$$CVR = \frac{n_E - \frac{N}{2}}{\frac{N}{2}}$$

where  $n_E$  is the number of experts who have recognized the question as absolutely necessary, and  $N$  is the total number of experts who have commented on the necessity of the question. Therefore, the CVR index is a direct linear transformation of experts who consider the question essential. As you can see, the above value can be between a negative one and a positive one. After calculating the CVR index for a question, based on its value, we make a decision about the question in the following order:

1. If the value of CVR is negative, the necessity of the question is rejected, and the question should be removed from the questionnaire.
2. If the value of CVR is zero or more, we compare the corresponding value with the values in the table below, which is known as the Lavshe table. If the value of CVR is greater than the corresponding value from the table, the question is considered necessary and remains in the questionnaire.

Note: The table shows different values based on the fact that the questionnaire was distributed to several experts in order to evaluate the questions. In this research, due to the fact that the number of experts is 25, it is compared with the number of 0.37 according to Lavshe's table 3-4-3. Calculation of content validity index (CVI):

The content validity index is calculated using the following relationship:

$$CVI = \frac{n_r + n_t}{N}$$

We add the number of specialists who have chosen options 3 and 4, put it in the form, and divide it by the total number of specialists. If the CVI value is above 79%, the validity of the question is confirmed, but if, for example, the CVI value related to the transparency of the question is lower than 79%, that question should be revised and asked in another form that has more transparency. The results related to the evaluation of questions designed by experts are described in Tables NO.

Dimensions	Number of questions	Cronbach's alpha	Content validity ratio	content validity index
Practical solutions	6	749/0	844/0	914/0
Simplify the rules	1	725/0	769/0	919/0
Failure to deal with development projects	1	728/0	794/0	978/0
The reason for the failure of projects	2	712/0	799/0	926/0
Operational challenges in development	2	718/0	784/0	914/0
The most important threat	2	721/0	815/0	897/0

Table4: content validity of Delphi codes of the third stage based on the criteria

According to the table of Cronbach's alpha, the ratio of content validity to content reliability index is more than 0.7, which indicates the validity and reliability of the interview questions.

### **Second stage Delphi:**

method In the next stage of the Delphi project, the proposed components of developing a framework of innovative solutions in the process of brownfield regeneration were provided to the group of experts to give their opinion on the importance of the presence of the mentioned items to the researcher. The members of the expert group were asked to present their agreement and disagreement with these issues raised in the research model. In the following, those dimensions that had a positive score higher than 0.7 remained in the study and were entered into the study for the second stage of Delphi.

**Table5:** The level of experts' agreement with each of the items

Dimensions	Component	agree on		Against	
		Abundance	Frequency	Abundance	Frequency
Practical solutions	Attention to social cohesion	19	76/0	6	0/24
	Social interactions	25	100/0	0	0
	Creating attractive	25	100/0	0	0
	Need assessment and social	18	72/0	7	28/0
	Use of government facilities	24	96/0	1	4/0
	Improving methods for detecting land pollution	12	48/0	13	52/0
	Paying attention to the location of the land	25	100/0	0	0
	Correct financial assessment	19	76/0	6	24/0
	Change in the way	22	88/0	3	12/0
	Municipal evaluation is	19	76/0	6	24/0
	Urban development in line with sustainability	14	56/0	11	44/0
	Create quick-yield activities.	13	52/0	12	48/0
Simplify the rules	Stay away from rental	25	100/0	0	0
	Attention to engineering	25	100/0	0	0
	The formation of developer	22	88/0	3	12/0
	Macro-to-micro urban	25	100/0	0	0
	Attention to the spirit of life	16	64/0	9	36/0
	Development of brown	25	100/0	0	0
	Reduce strict regulations.	22	88/0	3	12/0
	Encourage participation	22	88/0	3	12/0
	Deregulation	15	60/0	10	40/0
Failure to deal with development projects	Not closing city borders	13	52/0	12	48/0
	The existence of obstacles	25	100/0	0	0
	Risk management planning	25	100/0	0	0
	Lack of economic efficiency	25	100/0	0	0
	Weaknesses in management	19	76/0	6	24/0
	The large scale of these	19	76/0	6	24/0
	Inability to provide	19	76/0	6	24/0
	Legal restrictions	19	76/0	6	24/0
	Conflict of interest	22	88/0	3	12/0
	High cost of regeneration	25	100/0	0	0
	Agreement with the owners	25	100/0	0	0
	Local community resistance	25	100/0	0	0
	State ownership of lands	25	100/0	0	0

The reason for the failure of projects	The profitability of economic profitability	22	88/0	3	12/0
	Ignoring the interests of the	20	80/0	5	20/0
	The need for large	25	100/0	0	0
	Failure to pay attention to	25	100/0	0	0
	Mainly, military ownership	25	100/0	0	0
	Failure to pay attention to	10	40/0	15	60/0
	Lack of organizational	25	100/0	0	0
	Land trading	25	100/0	0	0
	State ownership of fields	25	100/0	0	0
	Lack of study background	19	76/0	6	24/0
	Failure to examine the	19	76/0	6	0/24
	Lack of sufficient	25	100/0	0	0
	The large area of these	25	100/0	0	0
	Lack of environmental	19	76/0	6	0/24
	Failure to assess social	24	96/0	1	4/0
Operational challenges in development	Local communities	16	64/0	9	36/0
	Chemical pollution of soil	25	100/0	0	0
	Unavailability of scientific	19	76/0	6	24/0
	Unforeseen expenses	22	88/0	3	12/0
	Professional service fee	19	76/0	6	24/0
	Cost of materials and	19	76/0	6	24/0
	Improper development for	13	52/0	12	48/0
	land price	25	100/0	0	0
Lack of a land use planning	25	100/0	0	0	
The most important threat	Cultural issues	22	88/0	3	12/0
	Heterogeneous	25	100/0	0	0
	False inflation	19	76/0	6	24/0
	Inappropriate view due to	25	100/0	0	0
	Failure to properly use	22	88/0	3	12/0
	Conflict over land ownership	22	88/0	3	12/0
	Commercialization of urban	19	76/0	6	24/0
	Non-participation in	25	100/0	0	0
	Social changes in the urban	19	76/0	6	24/0
	Increase in real estate prices	25	100/0	0	0
	Reducing the vitality of the	25	100/0	0	0
	A breeding ground for crime	19	76/0	6	24/0
	unsafety	19	76/0	6	24/0
	Unbalanced urban	19	76/0	6	24/0
	Inappropriate regeneration	19	76/0	6	24/0
Environmental pollution	22	88/0	3	12/0	
Abandonment of	25	100/0	0	0	



**The third stage of Delphi :**

In the last stage of the study, the items were extracted from the review of related texts. After the important dimensions required for the design of the model were determined from the point of view of the experts, the number of 7 components was removed, and the rest of them were placed in the second stage of the Delphi design with slight changes in the order, which examined the dimensions. The proposed components for each of the research variables should be discussed, and according to the opinions and views of the responding experts, the required dimensions should be proposed and explained. The results of these answers are shown in the table. Three components were removed, and the remaining components were confirmed and entered the third stage of Delphi.

Dimensions	Components	I agree	I agree	medium	I disagree	I strongly	Average	standard deviation	Result
Practical solutions	Attention to social cohesion	10	4	3	6	2	3/56	0/71	accept
	Social interactions	11	5	5	2	2	3/84	0/92	accept
	Creating attractive applications	14	3	4	2	2	4/0	0/88	accept
	Need assessment and social participation.	7	5	6	4	3	3/36	0/82	accept
	Use of government facilities	15	2	4	2	2	4/04	1/04	accept
	Paying attention to the location of the land	11	6	2	3	3	3/76	0/96	accept
	Correct financial assessment	13	3	1	3	5	3/64	0/71	accept
	Change in the way government institutions look	10	5	3	2	5	3/52	0/82	accept
	Municipal evaluation is higher than that of other bodies.	13	6	2	2	2	4/04	0/75	accept
	Creation of quick-yield activities	11	6	1	2	5	3/64	0/99	accept
Simplify the rules	Stay away from rental consultants.	11	7	4	1	2	3/96	0/92	accept
	Attention to engineering costs	9	8	2	2	4	3/64	0/98	accept
	The formation of developer companies	11	8	3	2	1	4/04	1/08	accept

Dimensions	Components	I agree	I agree	medium	I disagree	I strongly	Average	standard deviation	Result
	Macro-to-micro urban management	10	6	7	0	2	3/88	0/91	accept
	Development of brown lands in the direction of urban laws	12	7	3	0	3	4/0	0/96	accept
	Reduce strict regulations.	13	4	7	1	0	4/16	0/87	accept
	Encourage participation	15	4	4	1	1	4/24	0/82	accept
Failure to deal with development projects	The existence of obstacles due to the scope of the project	15	2	4	3	1	4/08	0/99	accept
	Risk management planning process	12	8	3	1	1	4/16	0/71	accept
	Lack of economic efficiency	10	8	4	2	1	3/96	0/92	accept
	Weaknesses in management	13	8	2	2	0	4/28	0/88	accept
	The large scale of these lands	1	5	2	6	11	2/16	0/82	rejection
	Inability to provide alternative land	12	6	1	5	1	3/92	1/04	accept
	Legal restrictions	10	7	3	4	1	3/84	0/96	accept
	Conflict of interest	11	7	1	4	2	3/84	0/71	accept
	High cost of regeneration	13	6	2	2	2	4/04	0/82	accept
	Agreement with the owners	12	7	0	5	1	3/96	0/75	accept

Dimensions	Components	I agree	I agree	medium	I disagree	I strongly	Average	standard deviation	Result
	Local community resistance	13	5	0	4	3	3/84	0/99	accept
	State ownership of lands	15	5	1	2	1	4/12	0/92	accept
The reason for the failure of projects	The profitability of economic profitability	10	8	2	1	2	3/68	0/98	accept
	Ignoring the interests of the city	12	7	0	5	1	3/96	1/08	accept
	The need for large investments	14	5	1	3	2	4/04	0/91	accept
	Failure to pay attention to the needs of local communities	13	8	1	3	0	4/24	0/96	accept
	Mainly, military ownership	13	6	4	2	0	4/2	0/87	accept
	Lack of organizational structures	11	8	2	3	1	4/0	0/82	accept
	Land trading	12	6	5	1	1	4/08	0/99	accept
	State ownership of fields and lack of coordination between organizations	14	5	4	1	1	4/2	0/99	accept
	Lack of study background	15	5	3	1	1	4/28	0/92	accept

Dimensions	Components	I agree	I agree	medium	I disagree	I strongly	Average	standard deviation	Result
	Failure to examine the relationship between the plan and the existing platform	11	6	5	1	2	3/92	0/98	accept
	Lack of sufficient background studies	1	5	4	1	14	4/2	1/08	rejection
	The large area of these lands	10	8	5	1	1	4/0	1/08	accept
	Lack of environmental impact assessment	15	2	2	4	2	3/96	0/91	accept
	Failure to assess social impacts	13	5	3	2	2	4/0	0/96	accept
Operational challenges in development	Chemical pollution of soil and water	10	4	3	6	2	3/56	0/87	accept
	Unavailability of scientific data from the site	11	5	5	2	2	3/84	0/82	accept
	Unforeseen expenses	14	3	4	2	2	4/0	0/99	accept
	Professional service fee	7	5	6	4	3	3/36	0/71	accept
	Cost of materials and materials	15	2	4	2	2	4/04	0/92	accept
	Improper development for end use	11	6	2	3	3	3/76	0/88	accept
	land price	13	3	1	3	5	3/64	0/82	accept
	Lack of a land use planning system	10	5	3	2	5	3/52	1/04	accept
	Cultural issues	13	6	2	2	2	4/04	0/96	accept

Dimensions	Components	I agree	I agree	medium	I disagree	I strongly	Average	standard deviation	Result
The most important threat	Inappropriate view due to being abandoned	2	6	1	2	14	3/64	0/71	rejection
	Failure to properly use potential capacities	11	7	4	1	2	3/96	0/82	accept
	Conflict over land ownership	9	8	2	2	4	3/64	0/75	accept
	Commercialization of urban spaces	11	8	3	2	1	4/04	0/99	accept
	Non-participation in citizenship	10	6	7	0	2	3/88	1/08	accept
	Social changes in the urban context	12	7	3	0	3	4/0	0/91	accept
	Increase in real estate prices	13	4	7	1	0	4/16	0/96	accept
	Reducing the vitality of the environment	15	4	4	1	1	4/24	0/87	accept
	A breeding ground for crime	15	2	4	3	1	4/08	0/82	accept
	unsafety	12	8	3	1	1	4/16	0/99	accept
	Unbalanced urban development	10	8	4	2	1	3/96	0/71	accept
	Inappropriate regeneration	13	8	2	2	0	4/28	0/92	accept
	Environmental pollution	11	5	2	6	1	3/76	0/88	accept
Abandonment of contaminated land	12	6	1	5	1	3/92	0/82	accept	

**Table6:** The percentage of relative frequency of experts' views in the third stage

## **Research findings**

Based on the systems in the table of research findings and the items and their defined sub-factors, questions were asked, and then the results of the interview and the analysis of their answers were discussed.

According to the topic of the research, for the classification of the components and indicators obtained from the interview and their analysis, the stable location model of Dr. Golkar has been used. It is the builder of the quality of urban design, which consists of the combination of four environmental aspects, including imagination, activities, body, and ecosystem, and three experimental-aesthetic, functional, and environmental components. In this research, all three components are investigated in the field of brown fields.

- According to table number 7, the respondents believe that the environmental factor in the development of brown lands is effective in reducing the destruction of natural resources because the development of brown lands mostly changes the use of agricultural lands that were previously used and are now being used.
- According to the table, the respondents believe that the functional factor in the regeneration of brown lands in the city is also very important and necessary because efforts are being made to increase the equitable distribution of welfare services and access to infrastructure.
- According to the table, the respondents believe that the environmental and aesthetic factors are effective in reducing environmental pollution and creating ecological health and landscape beauty with regard to the transformation of these lands into recreational centers, green spaces, and multi-functional spaces.



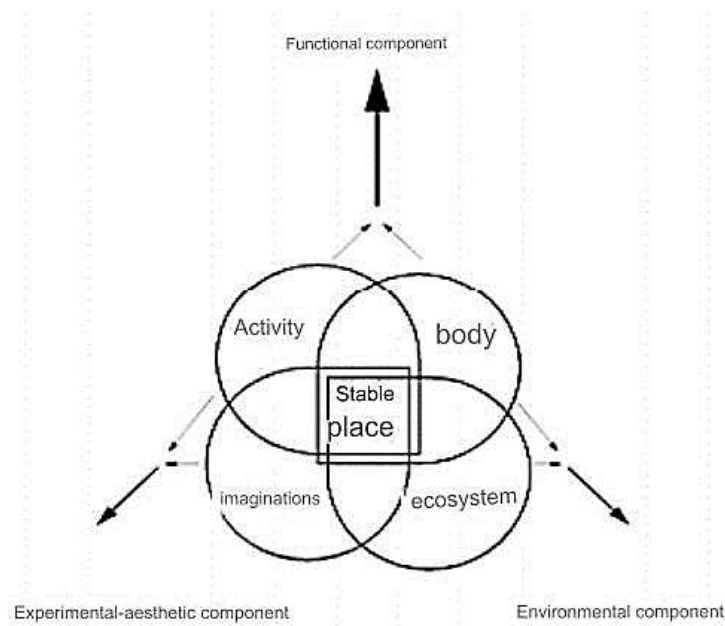


Figure 4: Golkar's stable location model (source: Golkar, 2019, 33)

## Analysis of research findings

Urban growth and development are unavoidable processes that are always changing and evolving. One of the most important concerns in this development is determining the appropriate directions and the way of physical expansion of the city to meet current needs and forecast future needs. In addition to urban planning policies, economic, social, and environmental issues affect many urban areas. In this regard, due to the limited land available for the development of cities as well as the problems resulting from the uncontrolled and scattered growth of cities, sustainable development is considered an appropriate approach. Attention has been given to the approach that causes the least damage to the environment and provides a healthy city for life. One of the approaches proposed for the sustainable development of cities is paying attention to brownfields. In this approach, the emphasis is on the reuse of urban lands that are deteriorating due to pollution and lack of use. Abandoning these fields causes many environmental, social, economic, and functional problems and, over time, irreparable losses in the cities. If the regeneration of brown fields, in addition to improving the spatial and physical qualities of cities, is a key element in Moving towards sustainable communities is considered. The regeneration of brownfields brings vitality to neighborhoods and neighboring units, the mobility of

the local economy, the acceleration of development in the areas adjacent to these lands, the creation and development of job opportunities, the reduction of environmental risks, the increase of safety and health in public spaces, and the reduction of problems and crimes. becomes social, a very important issue regarding the regeneration of these lands is how to intervene in them. How to deal with each Brownfield should be based on its potential to increase the feasibility of the plan presented for it. In order to achieve this goal, after identifying these lands in urban areas, the type of Brownfield and intervention in these types of lands should be determined. In the next level, the way of public and private sector participation in regeneration is of considerable sensitivity. Land use planning is an important concern in urban development to meet needs, solve the challenge of land shortages, and determine the physical expansion of the city. Urban regeneration by reviving brown fields, which are abandoned and unused due to their functionality, leads to optimal utilization of inner city lands, reducing pollution, and improving the socio-economic space of the city.

Table No.: Strengths, weaknesses, opportunities, and threats of brownfield regeneration

<b>SWOT table of revision on the regeneration of brown fields</b>	
<b>Strengths</b>	<ul style="list-style-type: none"> <li>• Renovation, rehabilitation, and development of land</li> <li>• Urban revitalization and prosperity</li> <li>• Reducing the time and cost of inner-city trips</li> <li>• Intertextual development and filling empty and abandoned spaces</li> <li>• Helping to improve the urban landscape and skyline</li> <li>• Fixing the existing discontinuities and dispersions</li> <li>• Removing pollution / Existing environmental problems</li> <li>• Ecological health</li> <li>• Above ground economic value</li> <li>• Existence of urban infrastructure and public services</li> <li>• Protection of historical and valuable buildings through minor physical changes</li> <li>• Existence of wide areas for development in the city center</li> </ul>
<b>Weaknesses</b>	<ul style="list-style-type: none"> <li>• Existence of environmental pollution</li> <li>• existence of uses incompatible with the surrounding environment</li> <li>• existence of abandoned, old, demolished, and unused buildings in the area of land</li> <li>• high cost of preparation and reconstruction</li> <li>• high cost of land acquisition</li> <li>• existence of parts with irregular geometric shapes and/or the irregularity of different masses in relatively wide areas of these lands</li> <li>• wear and tear of the infrastructure of the area</li> </ul>

<b>SWOT table of revision on the regeneration of brown fields</b>	
	<ul style="list-style-type: none"> <li>• the low level of social security in these areas</li> <li>• the lack of services needed by the residents in significant parts of these areas due to the relatively large areas of land.</li> </ul>
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Providing models that are appropriate to the environment and surrounding contexts</li> <li>• eliminating unsafe areas due to previous use</li> <li>• economic prosperity of urban neighborhoods by creating different uses, including the increase of new residential units and the expansion of industry and commercial and public open spaces</li> <li>• increasing employment, income and taxes</li> <li>• preventing Horizontal expansion of cities</li> <li>• support of government bodies, institutions and organizations and environmentalists</li> <li>• reduction of development pressure on green sites</li> <li>• protection of underground water sources</li> <li>• removal of negative labels around these sites</li> <li>• attraction of domestic and foreign investors</li> <li>• possibility of development at national and international levels International</li> <li>• possibility of using index elements and different elements to identify the boundaries of these lands</li> </ul>
<b>Threats</b>	<ul style="list-style-type: none"> <li>• Lack of government funds</li> <li>• exceeding the cost of reconstruction from the current value of the property</li> <li>• not erasing the labels and notoriety of the area due to the creation of unsafe areas and as a result destructive social and economic effects on the surrounding areas</li> <li>• non-cooperation of relevant bodies and organizations</li> <li>• lack of people's attitude to plan and reduce their participation in the process of development</li> <li>• emigration of the residents of the area from around the site and the abandonment of the area and the progress and continuation of insecurity in the environment</li> <li>• the presence of disturbing uses around the site such as car repair shops, the existence of railway lines or urban facilities</li> </ul>

**Answers to research questions**

In this part of this chapter, which consists of testing questions and conclusions, it is necessary to examine and test the research questions based on the research questions and with the help of various qualitative methods, and analyze the research questions with the help of structural qualitative analysis. and presented solutions and conclusions to you.

**First question: What is the framework of applicable solutions for the regeneration of brown fields?**

As it was mentioned in the previous chapters, brownfields are among the useful and potential lands within the limits of the cities, and paying attention to them and planning for their development can have long-term and wide dimensions. be fruitful and profitable. In addition, the regeneration of these lands can solve many problems, including the challenges caused by the horizontal expansion of cities. In this regard, the above research has taken a step towards defining the model and strategies for the regeneration of these lands and their design in cities with the aim of creating practical, habitable, and safe environments for people to use. In this regard, by studying the world's successful executive experiences and with the help of the research background, applicable and practical points were analyzed and extracted on a case-by-case basis, and finally, after evaluation, they were presented in the form of tables with various titles, such as design strategies. With the help of these strategies, in future research, it is possible to achieve the exact patterns and criteria for designing and changing the use of these lands.



The above strategies are divided into the categories of decontamination, climate and natural environment, political and government planning, urban body, and energy, and each of them is carefully evaluated in smaller categories according to the needs in order to develop a strategic model as best as possible. have taken. It is hoped that through these strategies, a small step can be taken towards the development and improvement of society.

<b>Goals and strategies</b>		<b>Classification of approaches</b>
Soil testing, investigation, and detection of its polluting and toxic factors in order to remove and clean the Eliminating the factors that disturb comfort and visual beauty Transferring unhealthy and irrelevant uses to an area outside the city Organizing streams, springs, and natural factors on the site and taking advantage of them Evaluation of existing buildings on the site to plan and carry out the necessary measures, including demolition, reconstruction, etc.		Decontamination
Using the sun's energy by installing photovoltaic panels on the roofs of houses and public places in areas with good sunlight. They are available year-round. Collection, treatment, and management of rainwater and its use in irrigation Using the maximum potential of receiving natural light by turning the buildings towards the light Paying attention to the manner of establishing tall buildings in such a way that the shadow caused by them covers public and important places, especially in the cold seasons. Do not cover, and you can also use the shadow created in hot seasons to design collective spaces. Creating shade in hot weather through landscape design and planting trees, or designing many gazebos and canopies Increasing the use of natural elements in alleys and public spaces and creating	Maximum exploitation of the conditions The climate of the site and the use of the potential its	climate and Environment normal
Respecting nature and the habitats of living beings and preserving and revitalizing them Use of local and ecological materials Using biogas produced by the sewage system for domestic use	Management of natural resources and their correct use	
Incentive policies to use public transportation Helping residents generate income by purchasing excess electricity produced by units that have photovoltaic panels on the roofs of their houses.		Political and government planning

Goals and strategies	Classification of approaches	
<p>Planning support policies, concessions, low-interest and long-term facilities, and exemption from municipal taxes for citizens who have participated in the project implementation process.</p> <p>Assigning the management and maintenance of semi-private and semi-public areas to residents to encourage more participation and create a sense of responsibility in them</p> <p>Considering the neighborhood crisis management headquarters to deal with the affairs of the residents in the event of natural disasters and accidents and create critical conditions.</p> <p>Compilation of rules and regulations for the creation of green spaces calculated according to the human scale within the site</p>		
<p>Creating a wide and accessible transportation network</p> <p>Compliance with the hierarchy of access and the correct definition of main, local, and secondary streets and arteries...</p> <p>Create a defined entrance for residents and be addressable through visual cues.</p> <p>Creating the possibility of vehicle access to the vicinity of the residential unit</p> <p>Separating the privacy of pedestrians and riders</p> <p>Considering a separate section for pedestrian and bicycle crossings</p> <p>Creating openings in areas where the concentration of unwanted activity is likely</p>	<p>Transportation and access</p>	
<p>Creating and using elements of signs, boards, and statues to improve the level of culture and awareness of people</p> <p>Creating a completely clear and specific mental image to create a unique identity or to emphasize identity elements and symbols</p> <p>The past in the neighborhood</p> <p>The visual and functional continuity of elements and details in the environment , such as architectural forms, pavements, materials, colors, signs , and urban furniture</p> <p>Not using too many and redundant details</p> <p>Modifying the dimensions, sizes, and scales of existing city streets and landscapes if possible</p> <p>Using the elements of signs in order to identify the direction and position of people in the neighborhood</p> <p>Using unique bodies and forms at key points to enable positioning</p> <p>Equipping some public and gathering spaces in the neighborhood to hold special ceremonies</p> <p>Using distinctions and physical differences in order to recognize different parts from each other</p> <p>Appropriate lighting and furniture</p>	<p>Signs, elements and visual effects</p>	<p>uban physical</p>



<b>Goals and strategies</b>		<b>Classification of approaches</b>
Removing hidden corners, low light and low traffic		
<p>Both currency and prioritizing masses and spaces in the neighborhood</p> <p>Development and change of mass and space in the neighborhood according to the needs of the day</p> <p>Avoiding misplaced openings and widths that are inconsistent with graining</p> <p>Designing empty seeds and converting them to the needs of the neighborhood</p> <p>Appropriate placement of seeds according to the context of urban space and surrounding areas</p>	Mass and space	
<p>Creating a connection between the users in the neighborhood with each other</p> <p>Designing the center of the neighborhood and creating a suitable skeleton with high resolution</p> <p>Attention to the establishment of all the required public services in the place by creating one or more neighborhood centers</p> <p>Creating different uses to increase social interactions and their interaction with each other in order to create balance and avoid monotony</p> <p>Deployment of applications with performance and activity until late at night in order to improve the level of security of the environment,</p> <p>Allocation of spaces for cultural, religious, social, wildlife activities, etc., to improve people's awareness and culture, generate income</p> <p>and creating a habitat for living organisms</p> <p>Revival of buildings that are worth maintaining. (historically, culturally, religiously, etc.)</p> <p>Designing spaces for the use of children, the elderly, the disabled, and the physically challenged</p> <p>Preventing the creation of regional and extra-regional uses within the region</p> <p>Preventing the creation of a commercial exchange of a specific type of use in the neighborhood due to the destruction of locality</p> <p>Avoid monopolizing spaces outside of privacy</p>	Applications	
Paying attention to the plan base for the design of buildings in terms of density and height	Density form and height	

Goals and strategies		Classification of approaches
Creating open spaces and reducing the height of buildings in main nodes Preventing overcrowding in different sectors and controlling population density Observance of perceptible rhythm and hierarchy in height and volumes Suitability of the form and area of different uses with its type		
Improving and improving the quality of canals and infrastructures for directing water and designing channels and streams for the proper disposal of surface water (design indoor) Displacement of existing power transmission lines in parts of the site that lead to visual disturbance and distortion of the skyline has been	Urban infrastructure	
Insulation of walls and doors and use of double or triple windows to prevent energy wastage of the The use of materials with colors suitable for the type of climate (absorbing or repelling heat) Using a green roof or wall to prevent energy consumption by stabilizing the temperature inside the building Preventing the creation of wind channels by establishing high buildings and avoiding creating stagnant spaces The use of building openings in directions that match the climatic characteristics (use of radiation and blinds)		Energy

Table No.: Brownfields design strategies

**Second question: What indicators are effective in the regeneration of brown fields?**

Brownfield regeneration projects play a very important role in meeting the needs of urban land to provide urban services, increase environmental quality, and promote the sustainable development of urban and economic society. Gaining a deep understanding of the expectations of different stakeholders forms the foundation for the sustainable development of brownfields. According to this topic, in this research, the structures of power and interest of the beneficiary groups, including beneficiary groups (citizens), decision-makers and urban decision-makers (municipality, detailed plan consultant, city council), local institutions (neighborhood elders, neighborhood service offices), military and market organs, and unions, and existing conflicts in these structures are examined and analyzed.

Figure 5: Proposed model of investigated indicators

## **Stakeholder analysis**

In the social dimension, all these stakeholders hope to strengthen their participation in the regeneration of brown fields, but the existence of value, economic and procedural conflicts of participation, social stability, and the achievement of the goals of the regeneration of brownfields have faced problems. What has been done on the surface and in the interviews and also shown in the study sample is that there are conflicts between the interests of the government and the citizens, but what has been analyzed in the hidden layer of the power-benefit structure shows that the main elements of the power-benefit structure The beneficiaries of the regeneration of the brownfields of the cities can be considered the big land owners, municipalities, and the central government, because these beneficiaries have a key role in acquiring resources, exercising power, and maximizing exploitation.

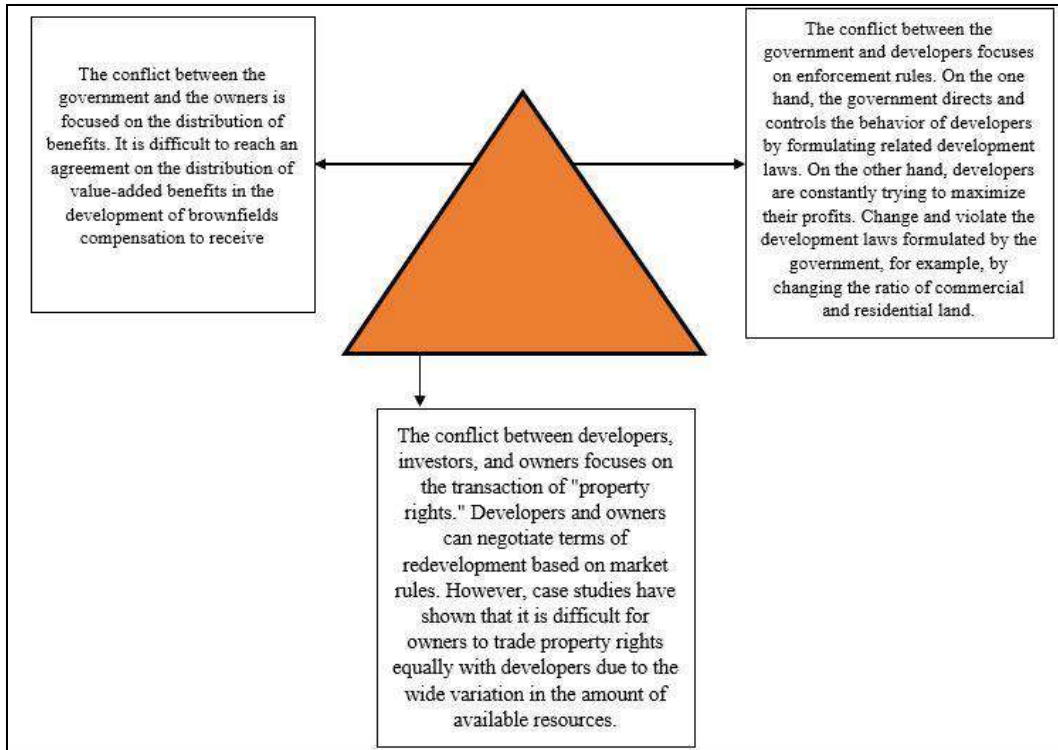


Figure 6: Stakeholders in Brownfields Development Projects

**Third question: Which of the existing solutions for the regeneration of brownfields in the 77th Division Barracks is applicable?**

According to the case sample chapter of this research and the presentation of the SWOT table regarding the evaluation of the garrison site, this question can be analyzed in a completely specialized way. It should be kept in mind that there are many large-scale brownfields in the religious metropolis of Mashhad. Due to the lack of compatibility with the environment and the society around them and environmental damage, they threaten the health of local communities to a great extent, on the other hand, they lower the value of properties located in their nearby neighborhoods due to the aforementioned threats; the results of the research indicate that that according to the indices of land price, access to facilities and services, the number of land users in the unused lands of the study area and similar areas should be placed at the top of the priorities of decision-makers and urban decision-makers; Therefore, the institutions and organizations involved in the sustainable planning of brownfields can take a positive step towards advancing

the goals by focusing and emphasizing on these factors and provide the basis for the use of all groups and different social and economic strata of the city. Based on the analysis, intractable challenges will occur if the current trends are not paid attention to. The center of Razi's problems is the barracks in Mazak city of Mashhad. In this important problem is institutional management (inefficiency of regulations and documents, environmental, socio-economic, and physical, spatial, Hoyda). To get to the best possible situation in all areas and key factors, changes in socio-economic and physical space based on the coefficients of the key factors studied can make a big difference in making things better in the study area. This is why, in The present research can be considered as practical suggestions for the planning studies of the brownfields of the 77th Lashkar Barracks in Mashhad and other similar lands, as follows:

- Suggestions in the direction of economic-social development are based on improving the quality of life of users, strengthening diversity and coordination in urban uses and activities, empowering users by strengthening investment in education and culture, and creating spaces for improving social interactions.
- Suggestions for the sustainable development of infrastructure and environmental potentials: the improvement of vegetation and greenery, the protection of the quality and quantity of water resources, the improvement of the state of the public transportation network, the improvement of cleanliness, and the reduction of environmental pollution;
- Suggestions to strengthen tourism and spatial justice include improving the hierarchical service delivery system, developing tourism services, and strengthening the visual and physical permeability of the area by using private sector investment.

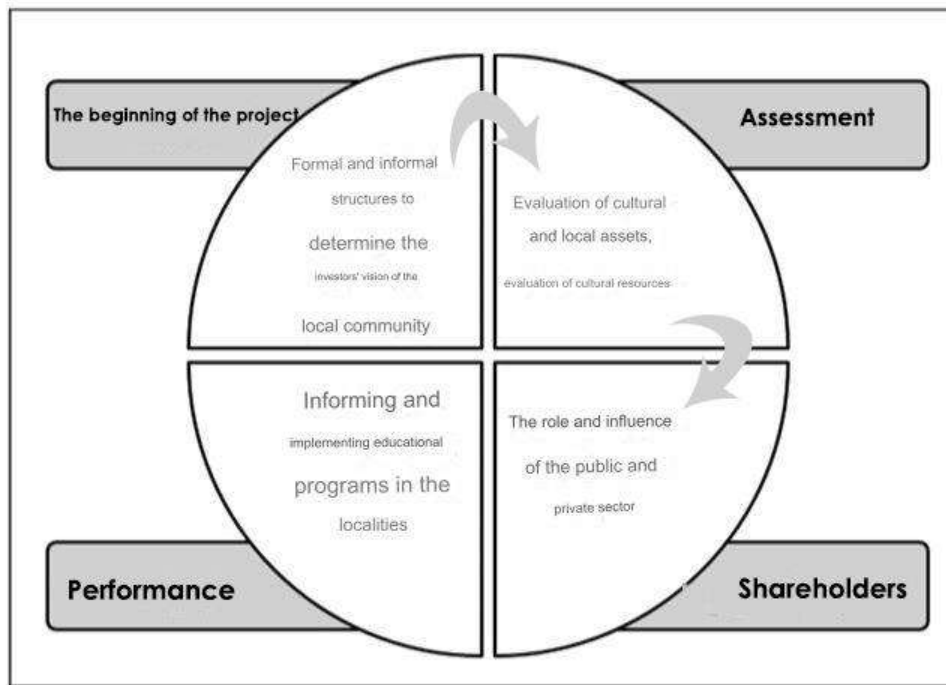


Figure 7: Proposed model of brownfields development process in Mashhad city

### **Suitable uses for replacement in the context of the Division 77th Barracks of Mashhad, Iran**

One of the main goals of this research is the use of suitable uses for replacement in the urban fabric of the barracks. According to the comprehensive and detailed plans in Mashhad city, land use refers to the functional dimension of land for human purposes or various economic and social activities. According to the opinions of the beneficiaries and the presence of the site in question, the main priorities of the beneficiaries are the cultural uses and green spaces, and then the uses related to tourism and recreation are very popular among the citizens and officials.

### **Conclusion**

It should be kept in mind that studies in the field of theory and global experiences have been investigated in this research, and global solutions for the development of brownfields have been reviewed, in addition to the implementation of

operational plans on selected brownfields and It has been identified, and of course it must be based on detailed and planned operational plans by taking advantage of the prioritization of favorable areas for the development of the tourism industry. Also, in order to achieve this development of the tourism industry, attention should be paid to the infrastructure and the improvement and renovation of brownfields such as buildings. Abandoned and dilapidated in different neighborhoods of the city, it was noted that they should be designed based on the standards of urban design in the regeneration of brownfields. In this regard, several items, including operational plans, rules and regulations of urban development, executive mechanisms, and conditions for the realization of aging, are presented. has been Investigating and evaluating the place of brownfields in endogenous development with an emphasis on the development of the tourism industry based on the regeneration of factories, zoos, and abandoned businesses and identifying the capabilities of coarse-grained barren lands for the development of the tourism industry. The regeneration of brownfields has three directions. because it causes the negative effects of polluted soil and water due to the existence of these land plants, which are due to the accumulation of garbage and construction debris, the accumulation of addicted and petrified people, and the ugliness of the environment of each neighborhood, which significantly reduces human health and the ecological system. The regeneration of these brownfields prevents the use of agricultural and rural lands. Also, these lands bring economic, social, and environmental growth to the city and its citizens and are considered an important element for sustainable development. With the development of these lands in terms of health, social, economic, and environmental benefits, they are considered urban opportunity points for cities to develop the tourism industry. It is worth mentioning that we know that there are different neighborhoods in the city; some of them are old, some of them are due to the passage of time and the lack of care by the owners, the high value of land and property, the location of industries and factories, and the dumping of garbage and construction debris in wastelands. Abandoned and ruined buildings and commercial uses related to polluted industries have been created. They have been turned into brown fields. In the same direction, these brownfields cause a decrease in the quality of life in different urban areas, a decrease in security and crime, a decrease in health, and a low economy in these

urban areas. In the following, it can be stated that, according to the title of the subject, the feasibility of the place of brownfields in endogenous development with an emphasis on the development of the tourism industry. The type of intervention in abandoned and dilapidated residential buildings is divided into several categories, which include: complete destruction; removal; relocating and moving to another place; repair; improvement-renovation and reconstruction.

Table No: Practical solutions for brownfields regeneration

Healthy life	Capacity	Biodiversity		Wastage	Climate changes	Items presented in the program
Using architects and urban designers to create multi-purpose places for more communication		Building new habitats around buildings		Efficient construction and design according to weather conditions		Design and planning
Creating environmental monitoring equipment		Increase communication		Use of contaminated and useless land		
Health and safety		Site access standards Language services signs		Management of natural resources in their proper use (water energy, materials, waste management, control of water , and soil pollution)		
Use of healthy building materials in order to create safety and health on the site		Use of local materials	Minimizing the amount of waste and promotion Use of secondary materials	Using materials with the lowest amount of carbon		Materials
Active travel planning Less use of vehicles		Shipping available Creating many services				Transportation



## **Appendix**

### **Interview Questions**

**Dear participant**

**This questionnaire on "Practical solutions in brownfields regeneration process".**

**Thanks for your time and consideration.**

Your participation in this questionnaire and interview will take important step towards progressing this research.

Required information for participants:

**Research title:**

**A framework of practical solutions in brownfields regeneration process**

(Case study: Lands of Mashhad 77 Lashkar Garrison)

Researchers: Daniele Ronsivalle (supervisor), Mina Ramezani (student)

Mina.Ramezani@unipa.it : student email

Telegram and WhatsApp contact number:3453324959

**What should I do when participating in this research?**

The form that is shared with you in this section is related to conducting a virtual questionnaire that includes multiple choice and descriptive questions.

Many thanks for reading this information and participating in this research.

Please write your name and email address (optional).



**1. What scale of projects do you usually work on?** International  National  Regional  local  Other: \_\_\_\_\_

**2. What is your highest level of education?** PHD  master  Bachelor  Other: \_\_\_\_\_

**3. How many years of professional experience do you have in the field of urban planning?**

More than 15 years  Between 10 and 15 years   
Between 5 and 10 years  Less than 5 years

**4. What do you do in the field of urban planning?**

University professor  the expert   
Consultant  Design and Implementation   
the manager   
other: \_\_\_\_\_

**5. Is housing the priority for brownfield redevelopment (instead of commercial use or green space, etc.) Please write your reason?**

I quite agree	<input type="checkbox"/>	I agree	<input type="checkbox"/>
I agree to some extent.	<input type="checkbox"/>	I don't agree and disagree	<input type="checkbox"/>
Almost disagree	<input type="checkbox"/>	disagree	<input type="checkbox"/>
I completely disagree	<input type="checkbox"/>		
Other: _____			

**6- In your opinion, what is the best alternative solution for brownfields other than housing? Why?**

Please answer this question descriptively

**7- Does the correction of pollution and geoengineering costs have the greatest effect on the economic sustainability of brownfield redevelopment projects?**

I quite agree	<input type="checkbox"/>	I agree	<input type="checkbox"/>
I agree to some extent.	<input type="checkbox"/>	I don't agree and disagree	<input type="checkbox"/>
Almost disagree	<input type="checkbox"/>	disagree	<input type="checkbox"/>
I completely disagree	<input type="checkbox"/>		
Other:_____			

**8-During the development of brownfields, is it necessary to understand the problems in the ground conditions?**

I quite agree	<input type="checkbox"/>	I agree	<input type="checkbox"/>
I agree to some extent.	<input type="checkbox"/>	I don't agree and disagree	<input type="checkbox"/>
Almost disagree	<input type="checkbox"/>	disagree	<input type="checkbox"/>
I completely disagree	<input type="checkbox"/>		
Other:_____			

**9-What do you think are the most important practical challenges in brownfield redevelopment? Why?**

*The second question of the virtual interview section..*

Land use planning system	<input type="checkbox"/>	land price	<input type="checkbox"/>
Improper development for final use	<input type="checkbox"/>	Cost of materials	<input type="checkbox"/>
Professional service fee	<input type="checkbox"/>	Unforeseen expenses	<input type="checkbox"/>
Geography and infrastructure (e.g. road links, being close to recycling center etc.)	<input type="checkbox"/>		
Unavailability of scientific data from the site	<input type="checkbox"/>	Environmental restrictions	<input type="checkbox"/>
The presence of dangerous materials such as asbestos, chemical pollution, etc	<input type="checkbox"/>		
Lack of awareness of the redevelopment process	<input type="checkbox"/>		
Local communities	<input type="checkbox"/>		

**10-In your opinion, what is the most important threat of brownfields for cities and citizens? Why?**

Please answer this question descriptively

**11-In your opinion, what is the most important reason for not doing research on the development of brownfields?**

**12-In your opinion, what is the most important reason for the failure of brown land development studies?**

Please answer this question descriptively

**13-To what extent are relevant organizations willing to the use/testing of solutions for the rehabilitation of brownfields?**

Examples:

- solar farms, wind turbines, and geothermal plants
- Vertical farming, rooftop gardens, green roofs, rain gardens, and bioswales, community gardens
- Sustainable housing, eco-friendly housing, co-housing
- Pop-up architecture, Temporary installations, Public art installations
- Co-working spaces, Creative workspaces
- Eco-Tourism

Please answer this question descriptively

**14-In your opinion, what is the best solution to facilitate the redevelopment of brownfields and why?**

Please answer this question descriptively

**15-Do you agree with the development of existing brownfields in the city where you live to create multipurpose uses? What ideas do you suggest?**

Please answer this question descriptively

**16-In your opinion, to what extent can the amount of social participation and presence of people be increased with the development of brownfields?**

Please answer this question descriptively

**17-To what extent do you think expanding brownfields areas can contribute to creating social and urban fabric cohesion in different areas and regions?**

Please answer this question descriptively

**18-To what extent will the development of new urban spaces in the regeneration of brownfields affect the economic growth ?**

Please answer this question descriptively.

### **Abstract of Articles**

## **Meta—analysis of Articles' Research Methods in the Field of Brownfield Redevelopment**

Mina Ramezani, Daniele Ronsivalle

It will be submitted in March 2024

In many developed countries, brownfield redevelopment is seen as a useful urban policy tool. While this method may present challenges at first, finding sustainable solutions to promote the redevelopment of brownfields in developing countries is also considered very important and necessary. The purpose of this research is to study the literature and backgrounds related to the areas of redevelopment of brown lands and to identify the research methods and analysis tools of these studies, and based on the purpose of the research, 22 articles were selected. Then,

in order to analyze the content of the articles, the method of content analysis and open coding was used, and to analyze the findings of the research, MAXQDA software was used. Based on the subject classification of the research, the mentioned studies can be divided into four groups; Rehabilitation and redevelopment of brown land, climate and ecosystem pollution, environmental sustainability and technology. The most frequent category is related to the revival and development of brown lands, which can be concluded that the redevelopment of brown lands is one of the important concerns and challenges facing designers and urban planners, which requires extensive and specialized studies to solve it. Of course, it should be kept in mind that the research method of the reviewed studies and the research achievements of recent years in the world are qualitative, followed by mixed methods, but the studies with quantitative and experimental research methods are very little welcomed by the authors.

key words: Meta-study, Environmental sustainability, Brownfields

## **Critical Challenges of brownfield Redeployment in Developing Countries: A Case Study of Iran**

Mina Ramezani, Daniele Ronsivalle

It will be submitted in April 2024

In this century, with emphasis on concepts such as sustainable urban development, brownfields as areas with special opportunities for regional revitalization and redevelopment have attracted the attention of urban design and planning experts. In addition, in the last decade, the policy of redevelopment of these lands has been proposed as one of the important solutions to control the scattered growth of cities. Based on this, identifying the opportunities, limitations and challenges of the redevelopment of brownfield sites is one of the most necessary steps as well as important considerations regarding the effectiveness and success of the redevelopment process. Before developing any plans, it is essential to concentrate

on comprehending the opportunities and limitations in brownfield redevelopment projects as this creates the basis for an informative approach that can maximize the chances of accomplishing targeted redevelopment goals. A thorough investigation of the current conditions and complex issues commonly associated with brownfield sites is necessary to devise feasible solutions and mitigate potential risks. Due to the importance of the issue, the problems of brownfield redevelopment are recognized with the aim of optimizing the use of urban land and reducing pollution and improving the socio-economic environment. These fundamental objectives are the focus of this article. This article's descriptive-analytical research methodology includes document studies to investigate the theoretical foundations, definitions, and characteristics of brownfields, as well as the necessity, benefits, and challenges of utilizing these lands after the study. Finally, the necessary redevelopment actions are analyzed and summarized from social, economic, environmental, and other perspectives.

Key words: sustainable development, brownfields, redevelopment, Iran

## **Sustainability and Redevelopment of Brownfields: A Systematic Review 2018–2024**

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The majority of developed nations view brownfield redevelopment as an effective urban policy tool, and the sustainable development of a region attained through the use of brownfield sites can be described as a strategic, complex, and synergistic action. which incorporates a variety of social, economic, environmental, and institutional factors in influencing the regional development landscape while creating a man-made operational framework. Therefore, the purpose of this research is to identify and study the literature and background of the redevelopment of brownfields with the approach of promoting sustainability, and based on the purpose of the research, 20 articles were selected. Data were

collected from articles published between 2018 and 2023 in the fields of architecture, urban planning, and environmental studies obtained from the Google Scholar database, and qualitative components were extracted based on the purpose and classification of the reviewed articles. Then, in order to analyze the content of the articles, the method of content analysis and selective coding was used, and Max QDA software was used to analyze the research findings. Based on the subject classification of the research, the mentioned studies can be divided into five groups; Environmental sustainability, reconstruction and redevelopment of brownfields, sustainability assessment frameworks, real estate development and sustainable urban reconstruction and new technologies in the redevelopment of brownfields with a sustainable approach. The majority of this category relates to the rehabilitation and development of brownfields, indicating that the rehabilitation and redevelopment of brownfield sites appears to be an important focal point and a significant challenge for designers and urban planners, as well as the need for further research. and has extensive research and specialized exams.

Key words: sustainability, brownfields, systematic review

### **Comparative study of alternative strategies of brownfields in Europe and Iran**

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In the last few decades, due to the increase in the population in the whole world, migration from villages to cities and as a result, the growth of widespread marginalization and the cities have witnessed the confrontation with wide-ranging problems, including the loss of land and the natural environment around the city, urban poverty, lack of Cultural identity, the decline of citizenship ethics, and at the macro level, the costs imposed for the development of urban infrastructure. Furthermore, as urban areas have grown and expanded horizontally, barren lands, including facilities such as barracks, factories, slaughterhouses, and prisons that were traditionally located on the outskirts of cities due to their nature and function,

have gradually been incorporated into the central and even inner parts of cities and residential neighborhoods.

This caused the cities to face problems as well. For example, due to the type of land use, these lands caused insecurity or environmental pollution in the surrounding residential areas and threatened the health of local communities, or in other cases, due to the increase in the economic value of the land in that area, its existence The specific type of use had no economic justification. Due to the existence of the aforementioned threats, these lands in some circumstances decreased the value of the nearby buildings. We can note the imposition of high expenses for the establishment of fundamental urban infrastructure and its development on a big scale as some of the other effects that followed the horizontal expansion of the cities and as a result the extensive marginalization of the cities. Therefore, the purpose of this article is to compare the alternative strategies of brownfields in Europe and Iran, so that the best alternative methods can be found and compared. This article is an applied research that, due to the nature of the subject, used the qualitative method of content analysis and the software capabilities of Max QDA and Excel in data analysis, and the required data were obtained through the investigation of alternative strategies of brownfields in European cities and Iran.

Keywords: comparative study, urban planning, brownfields

## **Analysis of Iran's Brownfields Redevelopment Laws**

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Confrontation of brownfields with the fabric of the city and especially residential areas, in the wake of urban development, is a serious threat and at the same time, a vital opportunity for the decline or improvement of living qualities such as vitality, dynamism, legibility, identity and environmental security. Despite the efforts made in recent years, in the world as well as in Iran, in order to revive and redevelop these lands, the formulation of codified principles and considerations in order to provide a codified process for their redevelopment has still been neglected. In addition to having countless wasted potentials, these lands can also have many



environmental pollutions. The study of a few specific laws relating to these lands and their security in front of the environment Surrounding these lands is thought to be inevitable and very important. Although it is new for Iran to pay attention to these lands, the laws of principles and detailed strategies for their use have not yet been presented by the relevant bodies. Because security in any society causes growth and excellence, and its absence will prevent people from continuing their activities in that society and will lead to irreparable social damage. The approach of the research is qualitative and the methodology at the theoretical level is meta-composite so that the principles and considerations are first extracted and compiled from the literature and then at the experimental level and based on the case study method, in connection with real examples. In this way, the principles of "understanding the importance and narration of urban planning considerations", "determining the causes of site abandonment", "pollution control", "compatibility of secondary use according to site conditions and surrounding context", "flexibility for reuse", " Preservation, display and use of valuable and valuable elements", "preservation and improvement of the quality of visual vision" and "observance of environmental laws" specific considerations of each of these cases have been evaluated.

Keywords: urban laws, urban planning, urban design, brownfields

### **Brownfield Research : A Comprehensive Review of Library—Based Data Collection and Descriptive Analysis**

Mina Ramezani

In press, Infolio 42 Journal

Brownfields, often neglected in less developed countries, can provide redevelopment opportunities and urban transformation. These areas have high economic and social potential and can be recycled to reduce environmental pollution and save resources. The article examines library-based data collection and descriptive analysis within brownfield research, finding that abandoned lands can be used to revitalize urban zones and improve urban spaces. Although this research originates from the Western world, it is more linked to research data from the Eastern world, especially Iran.

Keywords: Land use, Brownfield, less developed countries, Eastern world

### **A Novel Approach to Composing the Research Bibliography Chapter in a PhD Thesis, Using “Brownfield” Keyword as an Example**

Mina Ramezani

In press, Infolio 42 Journal

An effective method for performing a literature review for a research project is to create a "literature map." It can be a helpful tool for efficiently evaluating and understanding the work of other researchers, academics, and practitioners. When conducting a literature search for a research project, one useful technique is to create a "literature map." To effectively identify, assess, and comprehend the work of other researchers, academics, and practitioners in the same research field, a literature map can be a useful tool. An essential aspect of any literature study is drawing a diagram showing the relationships between various ideas, arguments, and concepts. It's also cited as an effective method for bringing one's internalized insight into the open. A literature map can be defined as a "graphical plan" of the topic that is being studied. This article examines a study that the author herself conducted on “Brownfield” keyword, explains how to write the bibliography section using Vosviewer and Histcite, and compares the comprehensive findings.

Keywords: Research bibliography, bibliometric relations, Histcite, VOS viewer, brownfield

### **The strategy of Temporary use in brownfields redevelopment process**

Mina Ramezani

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Brownfields, or abandoned or underutilized industrial sites, are a major environmental and economic challenge in many cities worldwide. The redevelopment of these sites has the potential to revitalize urban areas. This study provides an analysis of the brownfield situation in Gdansk, a city located in northern Poland, and explores the potential for brownfield redevelopment in the city, including the proposal for temporary use of brownfield sites as a strategy to support redevelopment efforts. The study is based on a review of the existing literature, original data collection and analysis, and case studies of selected

brownfields in Gdansk. The findings indicate that the brownfield situation in the case studies of this research is complex and there are significant opportunities for brownfield redevelopment in Gdansk. The study has significant implications for policymakers, practitioners, and researchers interested in promoting sustainable urban development through brownfield redevelopment, especially through the application of temporary use as a catalyst for redevelopment efforts.

**Keywords:** Brownfields Redevelopment, Temporary use of Brownfields, Reuse Brownfields, Gdansk

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