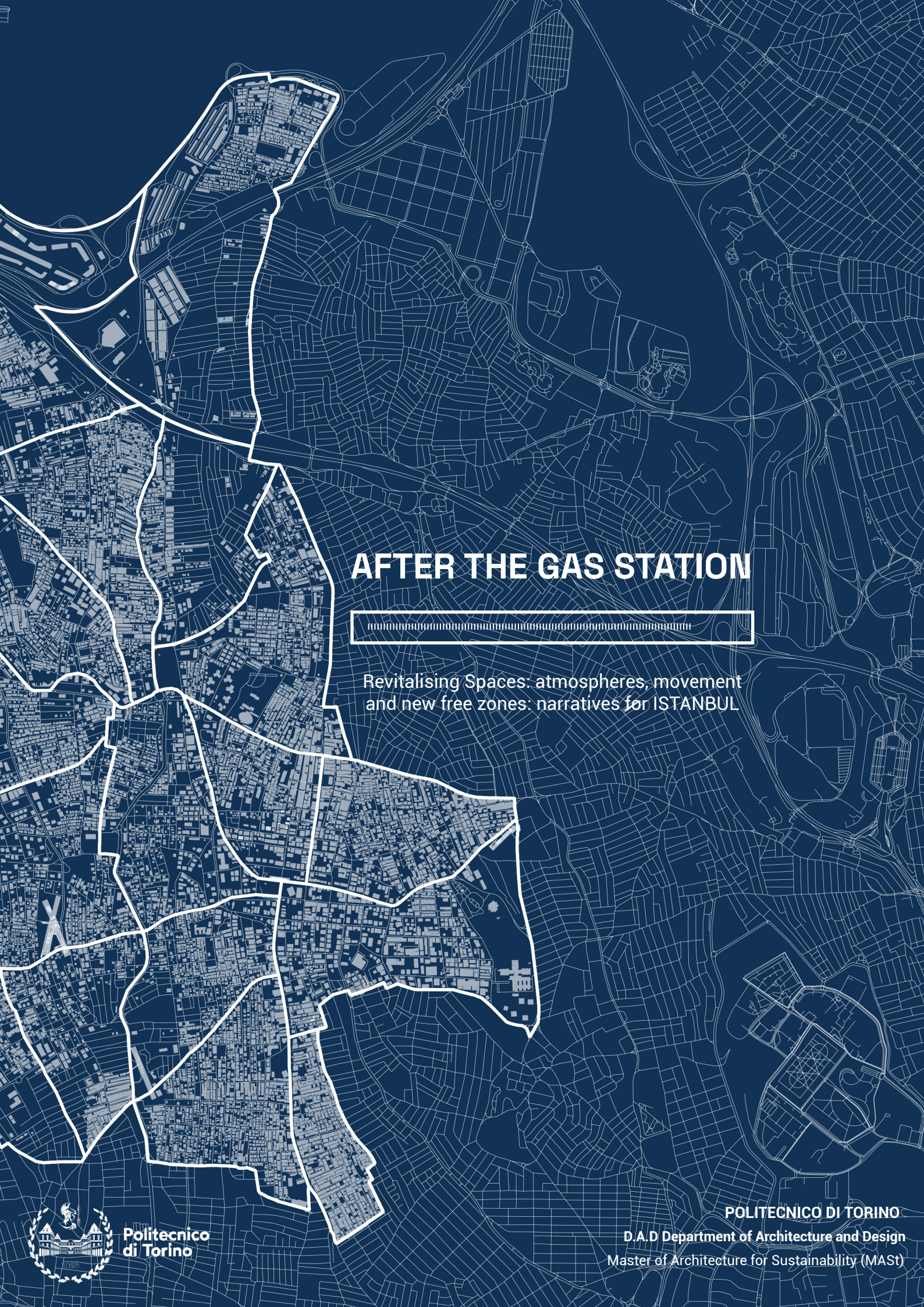

AFTER THE GAS STATION

Revitalising Spaces: atmospheres, movement and new free zones: narratives for ISTANBUL

Politecnico di Torino

POLITECNICO DI TORINO
D.A.D Department of Architecture and Design
Master of Architecture for Sustainability (MASt)

POLITECNICO DI TORINO
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Master's Thesis

Revitalising Spaces: atmospheres, movement and new free zones: narratives for ISTANBUL

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Abstract

This thesis investigates the potential for repurposing gas stations in Istanbul as part of a comprehensive urban regeneration strategy. With the global transition towards sustainable energy sources and the increasing prevalence of electric vehicles, traditional gas stations are becoming obsolete. This research addresses how these spaces can be transformed to mitigate Istanbul's urbanization challenges, including the scarcity of green spaces, air pollution, and urban sprawl.

Through a comprehensive methodology framework, the study assesses the feasibility of converting gas stations into green infrastructure, utilizing principles of acupuncture urban planning. The Bağcılar district is utilized as a pilot case to illustrate the practical application of selected indicators derived from sustainable neighborhood tools.

The thesis critically reviews successful green space strategies from global cities such as New York, London, and Vienna and adapts these strategies to Istanbul's unique context. Key objectives include enhancing urban green spaces, improving social inclusivity, and promoting environmental sustainability. By integrating blue-green infrastructure, the study proposes creating interconnected networks of natural, semi-natural, and cultural areas that enhance ecosystem services.

The research underscores the benefits of urban regeneration in addressing climate change impacts, fostering community engagement, and improving the overall quality of urban life. It advocates for innovative urban planning that prioritizes ecological balance and public health, proposing a visionary framework for transforming Istanbul into a more resilient and sustainable city.

Acknowledgements

(Together)

First and foremost, we owe our deepest gratitude to our supervisors Prof. Arch. Sara Torabi Moghadam and Prof. Arch. Patrizia Lombardi for their guidance throughout the process. This project grew from a variety of sources and intentions; their ability to listen and determine the through line between them made this work possible. Your expertise and patience have been instrumental in the completion of this work.Through this journey we had, special thanks to Politecnico di Torino, department of architecture who gave us an opportunity to grow and success. We spend beloved six yeaar in city of Turin and school of Politecnico di Torino. What a journey! We extend our thanks to my colleagues and friends, for their unwavering support and for always being there to provide advice and motivation. Your camaraderie has made this journey more enjoyable and less daunting.

(Eylül Ayık)

From entering a new country, facing pandamic and now finally receving our master degree, it's feels like a dream. We gave our six beloved years to the city of Turin, and the school of Politecnico the Torino. First i would like to thanks to my family, who gave me this opportunity to study,learn live and grown. Without them i wouldn't be who i am today. Thanks to their continuous support and understanding when undertaking my study, research.

Special gratitude to my brother Necdet Ayık, who is always by my side, keeping up the stress with me, helps me improve myself and grow. Also would like to thanks my dear friend/college Ilgın Biner, for letting me through all the difficulties and reminding me to take breaks and have fun.Finally, biggiest gratitude to my partner Oğuz Kaan Bilgiç,I could not have undertaken this journey without him. Stimulating discussions, the sleepless nights that we were working together for deadlines and of course all the fun. From bachelor to masters, we came a long way. Thank you for the journey, I wouldn't be here if you weren't.

(Oğuz Kaan Bilgiç)

In this long journey, there were ups and downs, but the pursuit of studying and never quiting kept me going. I am grateful to Politecnico di Torino for providing me with the necessary resources and a conducive environment for my research. I am deeply indebted to my thesis partner and friend, Eylul Ayik. Over the past six years, including during the challenging times of the pandemic, we have supported and helped each other through our studies. Her collaboration and encouragement have been invaluable throughout this journey.

Last, I would like to express my profound gratitude to my family. My father, Hakan Bilgic, who believed in me and sent me abroad to pursue my studies, and my mother, Mualla Bilgic, whose unwavering support and encouragement have been my pillars of strength. I am also thankful to my sister, Livza Gokcen Bilgic, and my brother, Fatih Mehmet Bilgic, for their love and encouragement. Their support has been instrumental in helping me achieve my goals. I am proud to represent my country and to contribute to its academic and professional community. "Varlığım Türk varlığına armağan olsun."

Thank you all.

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Chapter 1 :
Introduction

1.1 Problem Statement

In recent years, the global conversation surrounding climate change and the urgent need to transition to cleaner energy sources has gained significant momentum. As governments and industries commit to reducing carbon emissions, the future of gas stations has come under scrutiny. With the rise of electric vehicles (EVs) and the increasing popularity of alternative fuels, it begs the question: what will happen to gas stations after 2035? This topic explores the potential uses for gas stations I and how they could be repurposed in line with the principles of acupuncture urban planning for urban regeneration.

We began to wonder whether there was an exciting opportunity embodied in these parcels. Istanbul is a city that has been grappling with urbanization challenges, such as urban sprawl, lack of green spaces, and increasing air pollution. These problems are primarily caused by the rapid population growth and urbanization that the city has experienced over the years.

The majority of the world's population lives in cities and this rate is increasing. This process, which started with the industrial revolution, caused the proliferation of densely populated built-up areas and the emergence of various urban problems. Epidemics such as typhoid and cholera necessitated the separation of drinking water and wastewater, the establishment of a sewage system and the planning of urban infrastructure.

The Covid-19 epidemic, which started in 2019 and affected the whole world, also deeply affected urban life and emphasized the need to plan cities in the future in a more prepared way and in a way that takes public health into consideration. Likewise, the increase in greenhouse gases in the atmosphere due to the use of fossil fuels has led to the biggest ecological problem of our time, global warming. Making cities resilient against global climate change caused by human activities

is among the main urban planning issues of today. Global climate change causes sudden and extraordinary weather events, floods and floods due to changes in the precipitation regime, drought or heat waves, the formation of heat islands in cities, air pollution and loss of biodiversity. Increasing the resilience of cities against these impacts depends on protecting ecosystems.

The place and importance of natural open and green areas and planned open and green areas, which are considered as a serious indicator of the quality of life in cities, in the urban ecosystem; It is increasing day by day due to increasing population and urban sprawl, global climate change and possible epidemics. Today, the idea of organizing and associating blue-green infrastructure systems at urban, regional and national scales in the world comes to the fore and is accepted. Blue-green infrastructure; It is a sustainable, holistic open and green space system consisting of natural, semi-natural and cultural areas connected to each other by green corridors, protecting ecosystem services and functions. Urban open and green areas planned to create a blue-green infrastructure system provide important contributions in terms of ecological, economic, social, sociocultural, psychological and aesthetic aspects. It plays an important role in creating the quality of urban life with its features that reduce the effects of climate change in the city, ensure the protection of biological diversity and ecological balance, and meet the need for recreation and entertainment by allowing urban residents to connect with nature and socialize together. We need to behave well.

One of the most important ways to achieve this is to protect our green areas, increase the number of active green areas and transform our cities into nature-friendly, environmentally friendly cities. For a sustainable life, giving nature the value it deserves will be much more beneficial to our planet.Green areas are of great importance not only in terms of protecting the environment but also in terms of improving the quality of life of urban residents and creating an environment

where they can breathe and have a pleasant time with their families. In order to achieve our goal of transforming Istanbul into a city where healthy, happy and peaceful people live, it is of great importance that we increase the amount of green space per capita and create systematic and accessible green areas throughout the city.

Conclusion

In conclusion, the transformation of gas stations and urban spaces presents a unique opportunity to address the pressing challenges of urbanization and climate change. As Istanbul grapples with issues such as urban sprawl, air pollution, and the need for more green spaces, repurposing these parcels aligns perfectly with the principles of acupuncture urban planning. By converting former gas stations into blue-green infrastructure, the city can create sustainable, interconnected networks of natural, semi-natural, and cultural areas that enhance ecosystem services and functions.The integration of blue-green infrastructure not only addresses ecological concerns but also significantly improves the quality of urban life. It provides ecological, economic, social, and psychological benefits, from reducing the impacts of climate change to offering recreational spaces for urban residents. This approach fosters a closer connection between people and nature, promoting biodiversity and ecological balance.For Istanbul to become a nature-friendly, environmentally conscious city, it is crucial to protect existing green areas and systematically increase the number of accessible green spaces. This transformation will not only enhance the city's resilience to climate change but also create healthier, happier, and more peaceful living environments for its residents. By prioritizing the development of green infrastructure, Istanbul can lead the way in urban regeneration and sustainability, ensuring a better quality of life for current and future generations.

1.2 Research Objectives

This research aims to study the phenomenon of urban regeneration. It focuses on the Turkey on the city of Istanbul. The research intends to study the process of the regeneration of Istanbul's Gas Stations .In Istanbul, the repurposing of gas stations into public parks or many variable options could help address urbanization challenges such as the lack of green spaces and the need for charging infrastructure. This approach could also be applied to other urban contexts worldwide to create more sustainable and livable environments. It is essential to use scientific data and consider the specific urban context when proposing uses for gas stations to ensure that they contribute positively to the regeneration of the urban environment.

1. Understanding the current situation of the city, exploring potantial design areas to comprehend the connotation of urban regenation suitability

2. Identifying and synthesising decision-making variables for urban regeneration to incorporate local territorial context and assess local conditions.

3. Establishing a decision-making framework for producing suitable urban regeneration modes and strategies by considering both the content and intensity of local context.

4. Reconstructing of existing economic, cultural, social and urban facilities in the area in harmony.

The key question of the thesis is:

How can the reintegrate the gas stations into the city by amplifying city needs?

1.3 Proposed Methodology

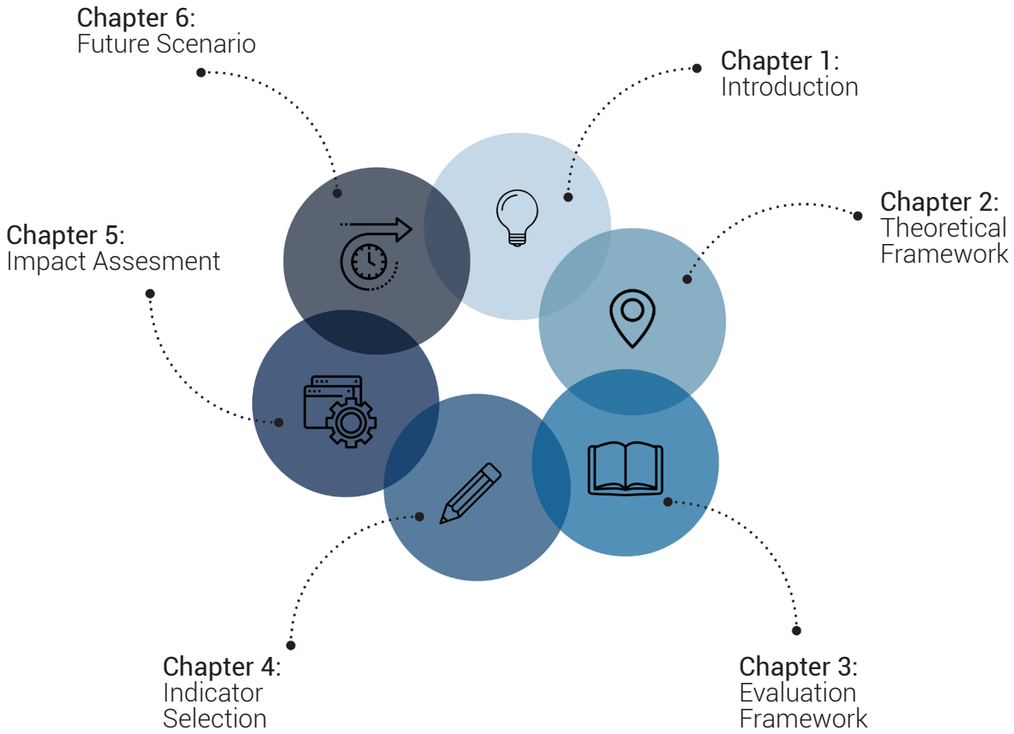
Urban areas worldwide, including Istanbul, face increasing challenges related to environmental sustainability, public health, and community well-being. The rapid urbanization and economic development in Istanbul have led to a proliferation of gas stations, contributing to air pollution, traffic congestion, and the loss of green spaces. This thesis proposes a comprehensive methodology to address these challenges by transforming underutilized gas station sites into green spaces that enhance the urban landscape, improve environmental quality, and promote community resilience.The methodology is structured into three main phases: Indicator Selection, Selecting Province, and Future Scenario Development.

Phase One: Indicator Selection involves a detailed literature review to identify potential indicators relevant to sustainable neighborhood development. Using tools such as the Sustainable Neighbourhood (SN) Tool, key indicators are selected to guide the regeneration process.

Phase Two: Selecting Province focuses on applying and testing the methodology in Bağcılar, Istanbul. This phase includes spatial data collection and analysis of the selected indicators to provide numerical data and concrete results on the level of proximity and sustainability of the urban area.

Phase Three: Future Scenario Development outlines a new master plan for Bağcılar, incorporating the findings from the previous phases. This phase includes impact assessments, SWOT analysis, and the implementation of targeted strategies to enhance green infrastructure and community engagement.

Through collaboration, creativity, and a commitment to sustainability, this methodology offers a holistic framework for reimagining gas station sites as catalysts for positive change in Istanbul's urban environment. The approach seeks to inspire urban regeneration that prioritizes the well-being of people and the planet, ensuring a more livable and resilient future for generations to come.



1.4 Thesis Structure

This study is designed to be read in sequence to gain an understanding of all general concepts before working towards a more detailed description of actions and recommendations. Urban areas worldwide are facing increasing challenges related to environmental sustainability, public health, and community well-being. In Istanbul, the rapid pace of urbanization and economic development has led to the proliferation of gas stations throughout the city, contributing to issues such as air pollution, traffic congestion, and the loss of green spaces. Recognizing the need for innovative solutions to address these challenges, there is a growing interest in repurposing underutilized gas station sites into green areas that enhance the urban landscape, improve environmental quality, and promote community resilience.The thesis's structure is organized in 6 different chapters, divided respectively into 3 thematic sections, wherein each part explains the intents and the objectives of the research work.

Chapter 6: *Future Scenario*

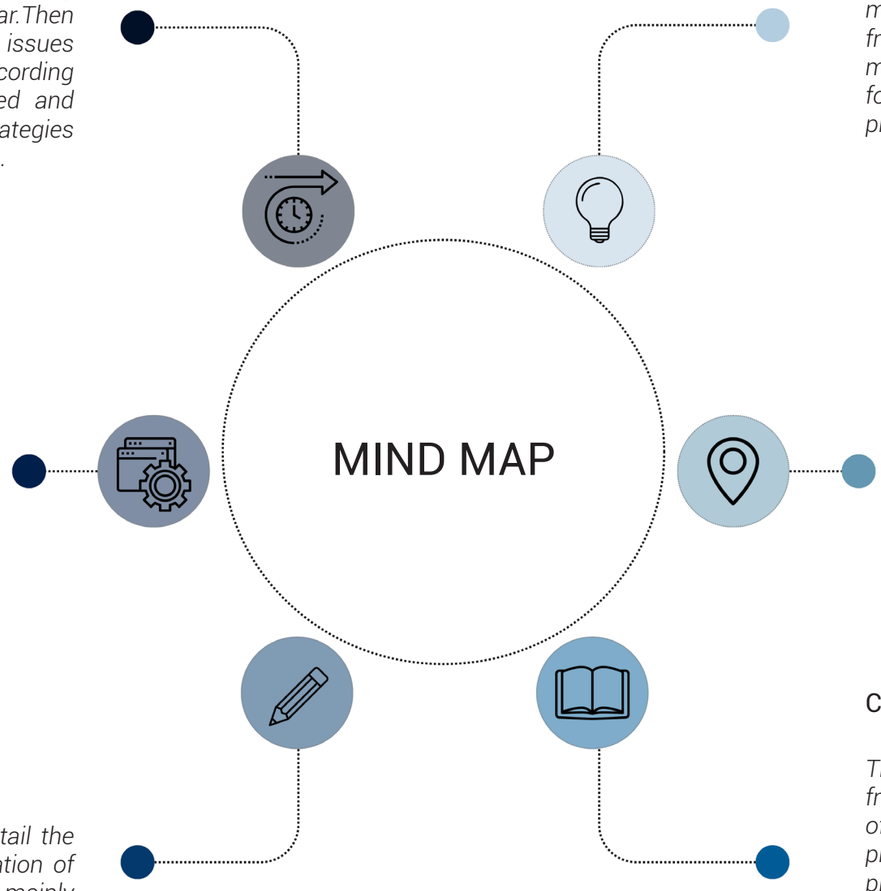
This chapter will briefly summarize what we have been exploring from beginning. Starting with an SWOT analysis of Bağcılar.Then proposing a design proposal by identifying and critizing issues from chapters. Actors and actions will be presented. According to the information, targets/strategies will be developed and implemented on a strategic development plan. Some of strategies will be shown in selected gas stations and neighborhoods.

Chapter 5: *Impact Assesment*

Chapter five will apply the methodology proposed in chapter 3 will be applied and tested here in the Bağcılar neighborhood of the City of Istanbul, chosen as a pilot case. In this chapters main fous is implementation of the indicators which have been selected in chapter 4.Starts with a brief explanation in Bağcılar, introducing land use,mobility and gas station map then focusing on impact assesment of selected indicators and results.

Chapter 4: *Indicator Selection*

This part is the focus of the research work and will detail the logic that has brought about the development and creation of the indicators set proposed in this research. Chapter mainly summarize the therotical framework and evaluation framework in order to helps selection of indicators. But chapter will specificly focus on SN Tool introduction and selected inticators.



Chapter 1: *Introduction*

The introduction presents the statement of the problem and the motivation that led to the need to address the issue to acquire from this event an opportunity to move towards more sustainable management models of cities. This topic explores the potential uses for gas stations and how they could be repurposed in line with the principles of acupuncture urban planning for urban regeneration.

Chapter 2: *Theoretical Framework*

This chapter briefly explores the literature review has the task of highlighting, following a careful reading of the studies previously carried out, some case studies to exploring future developments and strategies.Helps us to understand how to begin the study and selection of indicators territorial framework is one of the most important step.

Chapter 3: *Evaluation Framework*

This chapter shows the evaluation framework, a methodological framework outlines a comprehensive approach to the regeneration of gas stations into green spaces in Istanbul. Drawing upon principles of urban design, landscape architecture, environmental planning, and community engagement, this methodology aims to guide stakeholders through the process of transforming gas station sites into vibrant and sustainable assets for the city. Also explains our main case study Istanbul in a detailed way. Gives us an idea about the residents needs thanks to stakeholders involvement.

Chapter 2 :
Theoretical Framework

2.1 Literature Review

Literature Review: Urban Regeneration and Repurposing of Gas Stations in Istanbul and Beyond

Introduction

Urban regeneration is a critical strategy for revitalizing deteriorated urban areas, addressing economic, social, and environmental challenges. This literature review focuses on the specific context of repurposing gas stations in Istanbul, Turkey, particularly in the district of Bağcılar, and extends the discussion to global practices. Subcategories such as green area availability, social aspects, quality of urban areas, climate change, population density, land use, socioeconomic status, overnumbered gas stations, air quality, public transportation, economic impacts, historical preservation, and community engagement are examined in detail.

Urban Regeneration: Concepts and Practices

Urban regeneration involves comprehensive strategies aimed at rejuvenating urban areas through physical redevelopment, economic revitalization, and social integration (Couch et al., 2011). Effective urban regeneration projects require collaboration between public and private sectors and active community participation to address local needs (Roberts, 2000).

Istanbul's Urban Context and Bağcılar

Istanbul has experienced rapid urbanization and population growth, leading to significant urban challenges (Özdemir, 2012). Historical regeneration efforts have focused on preserving historical sites and improving

infrastructure (Günay, 2016). However, the city's growing population has highlighted the need for more green spaces and recreational areas (Demir & Yılmaz, 2017). The Vision 2050 Strategic Plan outlines a long-term framework for sustainable urban development, emphasizing resilience, inclusivity, and sustainability, including enhancing green spaces and promoting renewable energy (Istanbul Metropolitan Municipality, 2020). In particular, Bağcılar, a densely populated district, has seen a need for improved urban infrastructure and green spaces due to its rapid development (Özdemir, 2012).

Green Area Availability

Green spaces provide essential ecological, social, and health benefits, mitigating urban heat islands, improving air quality, and offering recreational opportunities (Chiesura, 2004). The transformation of obsolete structures such as gas stations into green spaces can significantly enhance urban greenery.

New York City's High Line, a repurposed elevated railway line, exemplifies how urban green spaces can revitalize areas, enhancing urban greenery and recreational facilities (Lindholm, 2013). Similarly, Seoul's Cheonggyecheon Stream Restoration transformed an old highway into a vibrant green corridor, significantly improving urban biodiversity and quality of life (Kim, 2012).

In Istanbul, particularly in Bağcılar, repurposing gas stations into parks can significantly increase urban greenery, addressing the city's deficiency in green spaces (Demir & Yılmaz, 2017). The "Open and Green Space Approaches in Related Plans in Istanbul" report emphasizes the critical need for increasing green spaces in Istanbul's urban fabric, aligning with the city's broader goals of enhancing livability and environmental quality (Istanbul Metropolitan Municipality, 2020).

Geographic Information Systems (GIS) are vital tools for measuring and analyzing green area availability. GIS technology allows for accurate mapping and assessment of green spaces, providing essential data for urban planning and policy-making (Heywood et al., 2011). In Istanbul, and particularly in Bağcılar, GIS can help identify suitable locations for converting gas stations into green spaces and ensure equitable distribution of parks and recreational areas (Istanbul Metropolitan Municipality, 2020).

Many global cities have implemented comprehensive green area strategy plans to enhance urban greenery and sustainability. London's Plan includes extensive strategies for increasing green spaces, enhancing biodiversity, and promoting sustainable urban growth (Greater London Authority, 2021). New York City's OneNYC plan focuses on sustainability and resiliency, with significant efforts to expand and improve green spaces across the city (City of New York, 2015). Vienna's Urban Development Plan (STEP 2025) prioritizes green spaces and sustainable urban development, incorporating measures to protect and expand green areas, integrate green infrastructure, and promote environmental sustainability in urban planning (City of Vienna, 2014).

Social Aspect

Urban regeneration projects must consider social impacts, including community cohesion, social equity, and access to amenities. Effective projects engage local communities in the planning process to ensure

inclusivity and address social disparities (Dempsey et al., 2011).

The transformation of the industrial waterfront into the Guggenheim Museum in Bilbao, Spain, revitalized the city's economy and improved social cohesion (Plaza, 2000). In Melbourne, Australia, urban regeneration focused on enhancing public spaces and community facilities, promoting social interaction and inclusivity (Woodcock et al., 2011).

Repurposing gas stations in Istanbul, especially in Bağcılar, can improve social aspects by creating inclusive public spaces that foster community interaction and provide equal access to amenities (Özdemir, 2012). For example, the proposed Karaköy Gas Station Park aims to convert an old gas station into a public park, enhancing local green space and recreational facilities (Yılmaz, 2020).

In Bağcılar, there is a significant need for social infrastructure improvements. The repurposing of gas stations into community spaces can address the lack of recreational facilities and promote social cohesion in the densely populated district (Özdemir, 2012). Community engagement in the planning and redevelopment process ensures that these spaces meet the needs of local residents and enhance social equity (Dempsey et al., 2011).

Quality of Urban Area

Urban regeneration improves the overall quality of urban areas by upgrading infrastructure, enhancing public spaces, and promoting sustainable development practices (Gehl, 2010). Enhancing urban quality involves creating pedestrian-friendly spaces, improving public transportation, and

developing mixed-use areas (Beatley, 2012).

Copenhagen's focus on pedestrian-friendly spaces and cycling infrastructure has significantly improved urban quality and sustainability (Beatley, 2012). Similarly, Portland, USA, emphasizes mixed-use development and green infrastructure in its urban regeneration projects, enhancing urban livability (Abbott, 2002).

In Istanbul, particularly in Bağcılar, repurposing gas stations can improve the quality of urban areas by transforming underutilized spaces into vibrant community hubs. This approach can enhance the urban environment, provide new amenities, and improve overall livability (Özdemir, 2021). The Vision 2050 Strategic Plan and the Istanbul Bicycle Master Plan both emphasize the importance of enhancing public spaces and developing sustainable transportation infrastructure to improve the quality of urban life (Istanbul Metropolitan Municipality, 2020; 2019).

Climate Change and Sustainability

Urban regeneration can play a crucial role in mitigating climate change impacts by promoting energy efficiency, reducing carbon emissions, and enhancing urban resilience (Bulkeley & Betsill, 2005). Sustainable urban regeneration involves integrating green infrastructure, promoting renewable energy, and enhancing urban biodiversity (Rohracher & Späth, 2014).

Freiburg, Germany, has implemented extensive green building practices and renewable energy projects as part of its urban regeneration efforts, showcasing how cities can integrate sustainability into urban development

(Rohracher & Späth, 2014). Stockholm, Sweden, emphasizes green infrastructure and climate adaptation measures to enhance urban sustainability (Stahre, 2008).

Repurposing gas stations in Istanbul, particularly in Bağcılar, can support sustainability goals by incorporating green infrastructure and renewable energy solutions, such as EV charging stations (Özdemir, 2021). The Taksim Charging Hub project, for instance, aims to transform a disused gas station into an EV charging station, supporting Istanbul's sustainability goals (Özdemir, 2021). The Istanbul Climate Action Plan outlines various strategies to address climate change, emphasizing the importance of urban regeneration in enhancing the city's resilience and sustainability (Istanbul Metropolitan Municipality, 2018).

Population Density and Land Use

Managing population density and optimizing land use are critical components of urban regeneration. Densification strategies can help reduce urban sprawl and promote more efficient use of land (Neuman, 2005). High-density development, mixed-use areas, and effective land use planning can enhance urban sustainability (Yuen, 2009).Singapore's comprehensive land use planning and high-density development have successfully addressed urban growth challenges, showcasing effective management of population density and land use (Yuen, 2009). Vancouver, Canada, focuses on high-density, mixed-use development, improving urban livability and reducing environmental impacts (Grant, 2002).

In Istanbul, particularly in Bağcılar, repurposing gas stations can contribute

to more efficient land use by transforming underutilized spaces into valuable community assets. This approach can support high-density development and provide essential amenities in densely populated areas (Özdemir, 2012). The YAYSIS Istanbul Strategy Report highlights the importance of strategic land use planning in addressing the city's rapid urbanization and promoting sustainable development (YAYSIS, 2020).

Socioeconomic Status

Urban regeneration can address socioeconomic disparities by creating job opportunities, improving housing conditions, and enhancing access to services (Turok, 2005). Effective regeneration projects consider the needs of disadvantaged communities and promote social equity (Brownill, 1990).

The regeneration of the Docklands in London, UK, created new employment opportunities and improved housing, contributing to socioeconomic upliftment (Brownill, 1990). The Favela-Bairro project in Rio de Janeiro, Brazil, aimed at integrating informal settlements into the formal city fabric, improving living conditions and social inclusion (Perlman, 2004).

In Istanbul, particularly in Bağcılar, repurposing gas stations can support socioeconomic development by creating new public spaces, enhancing local amenities, and providing job opportunities in sustainable industries (Yılmaz, 2020). This approach can promote social equity and improve the quality of life for residents (Yılmaz, 2020).

The Istanbul Bicycle Master Plan focuses on developing a comprehensive cycling network throughout Istanbul, promoting cycling as a sustainable

mode of transportation. The plan aims to increase the city's cycling infrastructure, improve safety for cyclists, and integrate cycling with public transportation (Istanbul Metropolitan Municipality, 2019).

Air Quality

Air quality is a significant concern in urban areas, where pollution levels often exceed recommended limits, impacting public health and environmental quality (WHO, 2016). Urban regeneration projects that incorporate green spaces and reduce vehicular traffic can significantly improve air quality.

For instance, the introduction of green spaces has been shown to reduce air pollution by filtering particulate matter and absorbing gaseous pollutants (Nowak et al., 2006). In Seoul, the Cheonggyecheon Stream Restoration project not only improved urban biodiversity but also contributed to better air quality by replacing vehicular traffic with a green corridor (Kim, 2012).

In Istanbul, repurposing gas stations, particularly in Bağcılar, into green spaces can contribute to improved air quality by reducing emissions from idling vehicles and providing natural air filtration through increased vegetation (Demir & Yılmaz, 2017). The Taksim Charging Hub project further supports this goal by promoting the use of electric vehicles, which produce zero emissions (Özdemir, 2021).

Overnumbered Gas Stations

Istanbul, like many major cities, faces the issue of having an excessive number of gas stations, many of which are no longer economically viable or

environmentally sustainable (Ferrell, 2019). The oversupply of gas stations in certain areas contributes to inefficient land use and missed opportunities for urban regeneration (Özdemir, 2012).

Repurposing these overnumbered gas stations can provide a strategic solution to optimize land use and contribute to urban regeneration goals. In Bağcılar, where land is scarce and densely populated, transforming these redundant gas stations into useful public spaces can significantly enhance the urban environment (Yılmaz, 2020).

This approach not only addresses the environmental concerns associated with abandoned or underutilized gas stations but also revitalizes the community by providing new green spaces and social amenities (Ferrell, 2019).

Public Transportation

Effective public transportation systems are vital for sustainable urban regeneration. Enhancing public transit can reduce reliance on private vehicles, decrease traffic congestion, and lower emissions (Pucher & Buehler, 2012).

Curitiba, Brazil, is renowned for its innovative Bus Rapid Transit (BRT) system, which has significantly improved urban mobility and sustainability (Lindau et al., 2010). Similarly, Bogota, Colombia's TransMilenio BRT system has transformed public transportation, reducing traffic congestion and emissions (Rodriguez & Mojica, 2009).

In Istanbul, improving public transportation, particularly in densely populated districts like Bağcılar, can support urban regeneration efforts by enhancing mobility and accessibility. The Istanbul Metropolitan Municipality's plans for expanding the metro and bus networks align with these goals, aiming to provide efficient and sustainable transportation options (Istanbul Metropolitan Municipality, 2020).

Economic Impacts

Urban regeneration can stimulate economic growth by attracting investment, creating jobs, and boosting local economies (Turok, 2005). Successful regeneration projects often lead to increased property values and business opportunities (Smith, 1996).The regeneration of the London Docklands transformed a neglected industrial area into a thriving financial district, significantly boosting the local economy (Brownill, 1990). Similarly, the redevelopment of Melbourne's Southbank area has attracted significant investment and created numerous job opportunities (Woodcock et al., 2011).

In Istanbul, repurposing gas stations into commercial or mixed-use developments can attract investment and create economic opportunities, particularly in areas like Bağcılar. The strategic location of these sites can make them attractive for retail, office, or residential developments, contributing to the local economy (Özdemir, 2012).

Community Engagement

Effective urban regeneration requires active community engagement to ensure that projects meet local needs and gain public support (Dempsey et

al., 2011). Engaging residents in the planning process can lead to more inclusive and sustainable outcomes.

In Portland, USA, community involvement has been a cornerstone of successful urban regeneration projects, fostering local ownership and ensuring that developments reflect community priorities (Abbott, 2002). Similarly, in Freiburg, Germany, public participation in urban planning has contributed to the city's reputation for sustainability and livability (Rohracher & Späth, 2014).

In Istanbul, engaging communities in Bağcılar in the repurposing of gas stations can ensure that these projects address local needs and preferences, fostering social cohesion and community ownership (Özdemir, 2012).

Conclusion

Urban regeneration is a multifaceted process that addresses economic, social, and environmental challenges in urban areas.

Repurposing gas stations in Istanbul, particularly in Bağcılar, offers a promising approach to enhancing green space availability, improving social aspects, elevating the quality of urban areas, supporting sustainability goals, and improving air quality.

By learning from international examples and considering local context, Istanbul can implement successful urban regeneration projects that enhance the city's livability and sustainability. This strategy could serve as a model for other cities worldwide facing similar urbanization challenges.

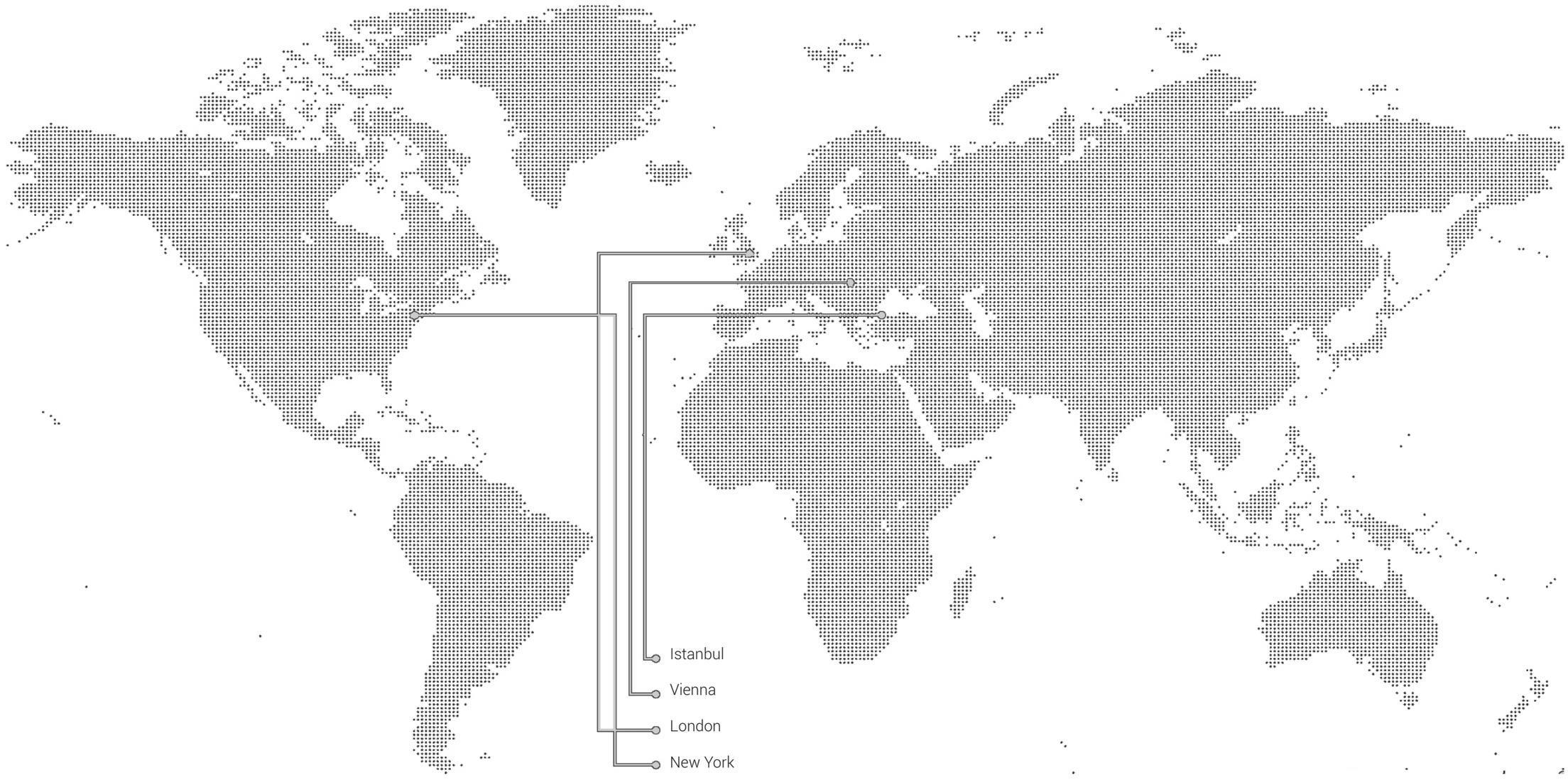


Figure 2-1: Overview Study Cities

2.2 Overview of the Studies

1.New York Green Space Strategy

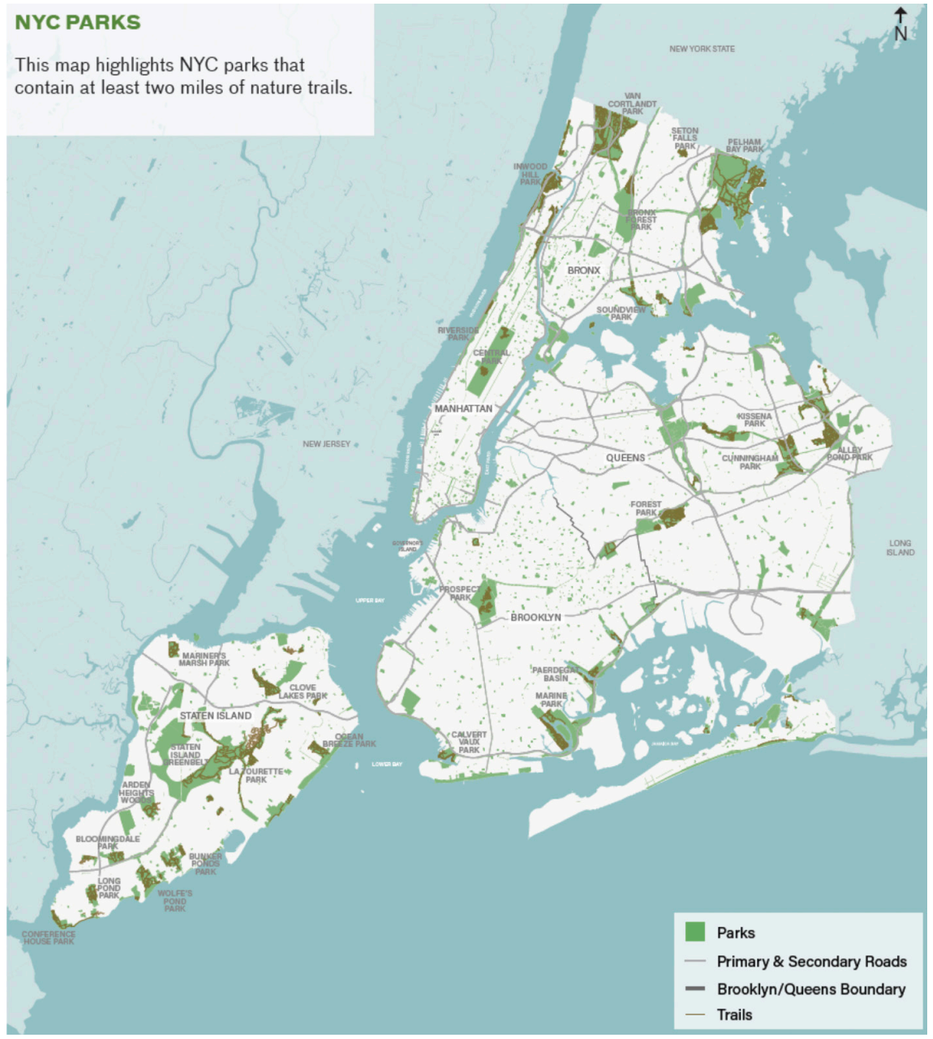


Figure 2-2: NYC Parks

New York is a city in the United States with a surface area of 784 km² and a population of 8.6 million. According to 2019 data, 25% of the city is parkland and 22% of the city area is under tree canopy. The total number of trees in streets, parks, private property gardens and forest areas throughout the city is 7 million (OneNYC 2050, 2019).The plan has been developed since 2007, ensuring that 81.7% of New York residents have access to parks and public areas within a 10 minute walk. They were given access to the area. It is aimed to ensure that 85% of the population has access to these areas by 2030. According to this; OneNYC 2050 plan vision "Building a Strong and Equitable City" Strong and Fair City) (OneNYC 2050, 2019).

The projects targeted to be implemented regarding green areas in the OneNYC2050 plan made in 2019 are as follows:

• Community Parks Initiative (CPI): Developing parks in neighborhoods where the need is greatest.

• OneNYC Plaza Equality Program: Increasing the amount of open space in low- and middle-income neighborhoods with low open space by transforming underused roads, vacant lots, and areas under bridges and highways into pedestrian plazas.

• El-Space Program: 300 miles of elevated train lines and highways located largely in low-income neighborhoods to evaluate the gaps below.

• Improving Recreational Access to Waterfronts: expanding access to safe, improved waterfront public spaces in underserved neighborhoods, exploring opportunities for recreation and passive use.

• Parks Without Borders: Establishing standard park design principles to make parks more inviting, accessible and connected to the surrounding community.

• Green Road Network: Green road network throughout the city.
to develop.

• Regional Parks Initiative (Anchor Parks Initiative): Regional Parks / Anchor Parks are within walking distance of many urban residents.Developing large parks within reach.

Growing Neighborhoods:

Strategy
Ensuring all New Yorkers have access to neighborhood open spaces and cultural resources.
Increasing shared responsibility for community safety and promoting neighborhood policing
Promoting place-based community planning and strategies
Facilitating healthy lifestyles in all neighborhoods
Designing a physical environment that creates the conditions for health and well-being
Achieving carbon neutral and 100% clean electricity
Fighting for climate accountability and justice
Creating economic opportunities for all New Yorkers through climate action

Action
Strengthening open spaces and opportunities for recreation in under-resourced and growing neighborhoods Improving neighborhood access and connectivity to parks and open spaces Supporting arts and culture in all communities Creating and elevating shared spaces to support social cohesion and holistic service delivery
Creating a built environment that encourages physical activity, community building and better mental health
Make proactive improvements in air quality , Improve the quality of waterways protect, restore and preserve the city's natural environment
Providing 100% clean electricity sources
Growing the green economy with well-paying jobs and a skilled workforce.
Creating design solutions for public safety through Neighborhood Activation Involving residents in crime prevention using environmental design Improving neighborhood cleanliness and safety
Creating tools and resources to support place-based planning
Partnering with global cities to support climate accountability and climate justice

2.London Green Space Strategy:

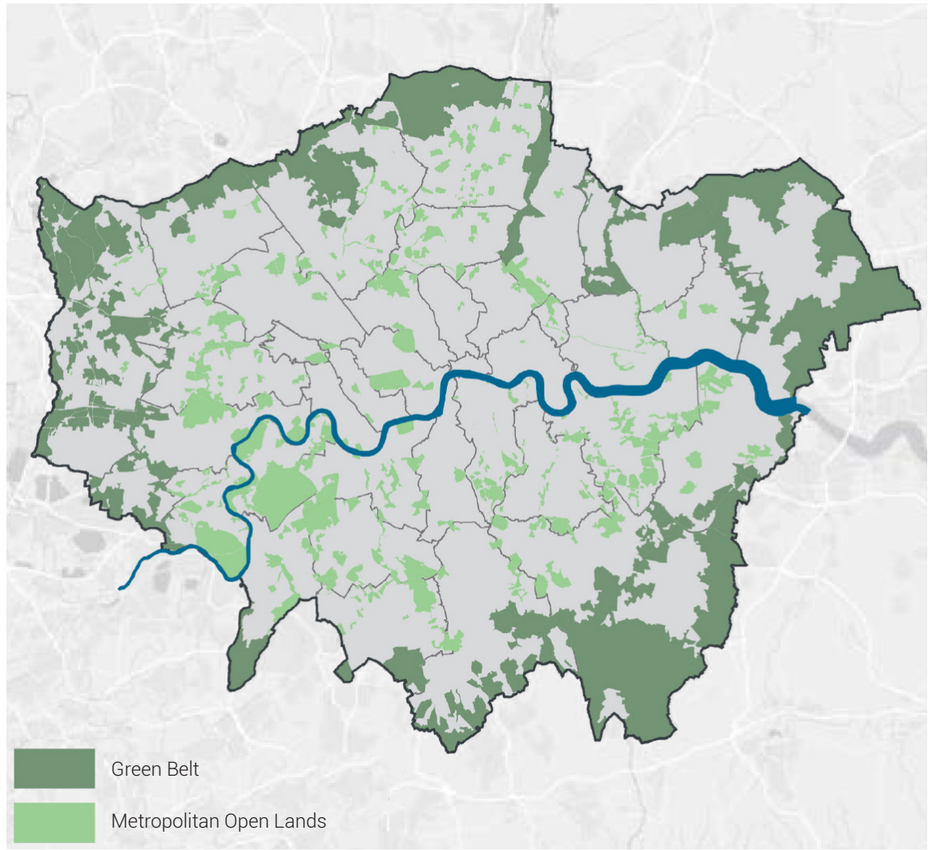


Figure 2-3: London Green Area Map

London is the capital of England, a city with a surface area of 1,572 km² and a population of 8.9 million (2019). In 2021, a London plan was made with the vision of "The London Plan: Planning London's Future-Good Growth" and green areas policies were determined in this plan. Accordingly, the plan; The London Green Area Strategy, part of the broader London Plan and the All London Green Grid (ALGG), aims to create a sustainable and resilient urban environment by integrating green infrastructure across the city. The key components of this strategy include:

Protection and Enhancement of Green Spaces: The strategy emphasizes protecting and enhancing London's existing green and open spaces. It includes parks, gardens, woodlands, rivers, wetlands, and urban greening features such as green roofs and street trees. This integrated network of green infrastructure is designed to provide multiple benefits, including improved air and water quality, climate resilience, and enhanced biodiversity .

Targets and Ambitions: The plan sets ambitious targets for London, such as becoming a zero-carbon city and making more than half of London's area green by 2050. This involves increasing solar energy capacity, reducing food waste by 50% per person by 2030, and enhancing green cover throughout the city.
Integrated Green Infrastructure Approach: Policy G1 of the London Plan outlines an integrated approach to planning, designing, and managing green infrastructure.

Health and Wellbeing: The strategy Promoting mental and physical health and wellbeing. It aims to create spaces that encourage physical activity, reduce the urban heat island effect, and provide areas for relaxation and recreation.

Urban Regeneration and Resilience: By integrating green infrastructure into urban planning, the strategy supports the regeneration of previously developed brownfield sites and enhances the resilience of the city to climate change impacts. It also promotes sustainable urban drainage systems and the conservation of natural habitats (London City Hall).

Overall, the London Green Area Strategy is a comprehensive plan aimed at creating a greener, more sustainable, and resilient city, improving the quality of life for all Londoners, and addressing the challenges posed by climate change and urbanization.

Green Infrastructure and Natural Environment

Strategy	Action
Green Infrastructure	Protecting and enhancing London's open and green space network and green spaces in the built environment
London's Green Belt	Rejection of development proposals that would harm the Green Belt, except in very special cases.
Metropolitan Open Lands	Boroughs work with partners to improve the quality and range of uses. Contribute to the physical fabric of London by being clearly distinguished from residential areas Include outdoor facilities for recreation, sport, arts and culture Features or landscapes of national or metropolitan value (historical, recreational , biodiversity)
Open Spaces	Considering the quality, quantity and accessibility of open space in evaluations. Applications to protect open spaces to meet needs and eliminate deficiencies. Encouraging the creation of new public spaces by ensuring planning of future open space needs. Ensuring that open and green spaces remain accessible to the public.
Urban Greening	Contribute to the greening of London by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainability and drainage into site and building design. Strengthening the Green Belt to provide multi-functional beneficial uses

Biodiversity and Access to Nature	Using up-to-date information on the natural environment and related procedures to identify areas and ecological corridors of importance for nature conservation Identifying areas where access to nature is lacking (areas within walking distance of more than 1 km) and seeking opportunities to address these Protecting priority species and habitats and Biodiversity Promoting opportunities to improve these using Action Plans
Woodland and Forest Areas	Protecting and maintaining urban forests and forest areas and creating forest areas by planting new trees in appropriate places to increase the scope of the forest. Protecting 'senior' trees and old forest areas that are not currently part of a protected area. Identifying tree planting opportunities in strategic locations. Planting additional trees in zoning proposals (especially large-crowned species that provide shade due to their large surface

Social Infrastructure:

Strategy	Action
Games and Entertainment	Safe and stimulating playgrounds suitable for different age groups. Children and young people can move freely
Sports and Recreation	Planning according to need Preserving, encouraging and improving existing networks for walking, cycling and other activities Increasing accessibility Improving multi-purpose use of areas Planning according to conservation principles in case of construction of new recreation facilities

3.Vienna Green Space Strategy

Figure 2-4: Vienna Green Area Map

- Region to be developed in terms of Reactivation
- New Park (2-10 ha)
- Planned open space network partially implemented
- Open area network (Landscape) improvement of the current situation
- Open area network (Urban) improvement of the current situation
- Networking with the environment
- Landscape dominated by forest
- Predominantly agricultural landscape
- Large-scale urban green spaces
- Parks (2-10ha)
- Parks (10-50 ha)
- Clean Air corridors
- Construction Area (2013)
- Forests around Vienna
- Danube water bodies
- Fixed bodies of water
- City Borders
- Surface transportation infrastructure
- Planned surface transportation infrastructure

Vienna, the capital of Austria, is a city with a surface area of 415 km² and a population of 1.8 million (2019). Vienna's urban area totals 42 hectares. 15 hectares (35%) of the urban area consists of residential areas, 19 hectares (46%) of green areas, 2 hectares (5%) of water surfaces, and 6 hectares (14%) of roads and streets. (Brajovic, 2022, p. 2). Vienna Urban Development Plan (Step 2025 Urban Development Plan Vienna); It was developed within the framework of the themes of quality, quantity and adaptation to climate change. With the approach of "Open spaces should be of sufficient quality and quantity, available and usable in every way throughout the city", it is committed to protecting existing natural areas and green corridors, completing the green belt and connecting urban open spaces with natural areas (Step 2025 Urban Development Plan Vienna, 2011).).

Open Spaces Should be Available and Usable in sufficient quality and quantity in every way in the whole city.

Strategy	Action
Protecting Existing Natural Areas and Green Corridors	Creating three new urban-scale recreation areas for Vienna Protected areas approach
Completing the Green Belt	Establishing quality standards to be applied in newly developing areas. Vienna Open Space Network to connect open and green areas Strengthening the Green Belt to provide multi-functional beneficial uses
Connecting Urban Open Spaces with Natural Areas	Local Green Plan – planning tool and barometer for supply efficiency of green spaces Innovative approaches to urban aesthetics Commitment to open and green spaces to citizens Vienna Open Space Network to connect open and green areas Strengthening the Green Belt to provide multi-functional beneficial uses

Chapter 3 :
Evaluation Framework

3.1 Methodology Framework

Urban areas worldwide are facing increasing challenges related to environmental sustainability, public health, and community well-being. In Istanbul, the rapid pace of urbanization and economic development has led to the proliferation of gas stations throughout the city, contributing to issues such as air pollution, traffic congestion, and the loss of green spaces.

Recognizing the need for innovative solutions to address these challenges, there is a growing interest in repurposing underutilized gas station sites into green areas that enhance the urban landscape, improve environmental quality, and promote community resilience.

The proposed methodology outlines a comprehensive approach to the regeneration of gas stations into green spaces in Istanbul.
Drawing upon principles of urban design, landscape architecture, environmental planning, and community engagement, this methodology aims to guide stakeholders through the process of transforming gas station sites into vibrant and sustainable assets for the city.

By integrating green infrastructure elements, promoting social inclusion, and fostering community participation, this approach seeks to create green spaces that not only mitigate the negative impacts of urbanization but also provide benefits to residents and visitors.

This introduction provides an overview of the proposed methodology, which is structured into several key phases. Beginning with preliminary research and stakeholder engagement, the methodology progresses through site analysis, conceptual design development, environmental assessment, regulatory compliance, implementation planning, and monitoring and evaluation.

Each phase is designed to build upon the insights and inputs gathered from stakeholders, leverage the unique characteristics of each gas station site, and achieve the overarching goal of creating sustainable and inclusive green spaces that contribute to the vitality and resilience of Istanbul's urban fabric.Through collaboration, creativity, and a commitment to sustainability, the proposed methodology offers a holistic framework for reimagining gas station sites as catalysts for positive change in Istanbul's built environment.

By harnessing the potential of green infrastructure and community-driven design, this approach seeks to inspire a new vision for urban regeneration that prioritizes the well-being of people and the planet, ensuring a more livable and resilient future for generations to come. Here are some specific points;

Conduct a detailed analysis of selected gas station sites, including site visits, documentation of existing conditions, and assessment of site constraints and opportunities. Inventory existing infrastructure, vegetation, and amenities on each site to inform the design process and identify potential reuse opportunities.

Mainly the research work is structured in three phases:

1. Indicator Selection
2. Selecting Province
3. Future Scenario

This work, has amplifed its objectives, to be as specific as possible starting from the examinating of the city of proximity in a small piece of the city, at the neighborhood scale, with the aim of becoming a adaptable urban regeneration project to be used in gas stations.

First Phase: Indicator Selection

Indicator selection is a critical process. Chapter starts with the conclusion of chapter two: literature review will highlighting the careful reading of studies, overview studies and Istanbul analysis. We analyze them to identifying potential indicators. Lastly we introduce the indicators with the help of SN Tool (Sustainable Neighbourhood Tool).

Second Phase: Selecting Province

This phase concludes chapter two, and first phase. According to our main case study Istanbul which we will explore in chapter three, the methodology will be applied and tested here in the Bağcılar neighborhood of the City of Istanbul, chosen as a pilot case. First spatial data collection, than analyze of the indicators. In general, indicators, and even more so KPIs, should express as precisely as possible to what extent a purpose, objective or standard has been achieved or even exceeded, and this research work intends to use them to provide numerical data and concrete results on the level of proximity of the city under study.

Third Phase: Future Scenario

This chapter will briefly summarize what we have been exploring from beginning. Also it will propose a new master plan for the "Bağcılar". To these means, it is helpful to break the study down into different steps that frame the three Phases of the thesis, in order to understand the research process employed. It will start with conducted analysis of impact assestments and according to the analysis we will summarize the information with SWOT analysis and targets. Finally we will try to implement some strategies to the area.

Overview Methodology

Phase 1: Indicator Selection

Phase 2: Impact Assesment

Phase 3: Future Scenario

METHODS

TOOLS

Background Research

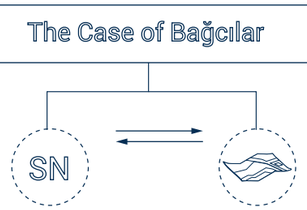
Theoratichal Framework
SN Tool

- *literature review*
  - *Scientific documents analyzed in specific topics*
  - *Related overview studies such as New York, London and Vienna are examinated by strategies.*
- *overview studies*
- *case study Istanbul*
  - *Studying our main case study Istanbul. Mainly its about the consultation of the territorial databases and strategic plans by municipality.*

SN Tool

- *The SN (Selection and Neighborhood) tool is an indicator selection system often used in the context of urban planning and regeneration to help identify the most relevant indicators for monitoring and evaluating projects.*
- *In selecting indicators, several key considerations were prioritized: the relevance of each indicator to the research topic, the local scale of investigation, the presumed availability of data, and the ease of calculating and measuring the indicators.*

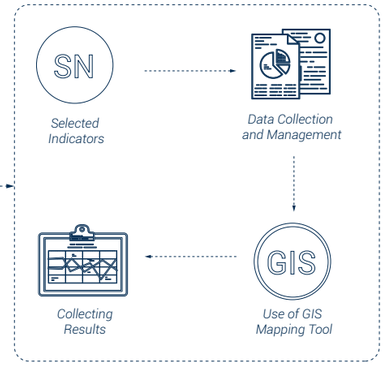
The Case of Bağcılar



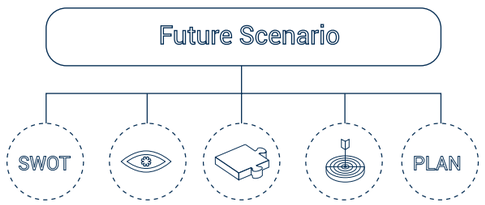
Impact assestment of inditcators from SN Tool
Data collecting and Mapping

- *Literature Review Analysis*
  - *Overview Studies Analysis*
  - *Adapting the inditors which have been selected by SN Tool.*
- *Case Study Analysis*
- *Data Collection and Input*
  Data Management
  Spatial Analysis
  Data Visualization

GIS Mapping Tool



Future Scenario

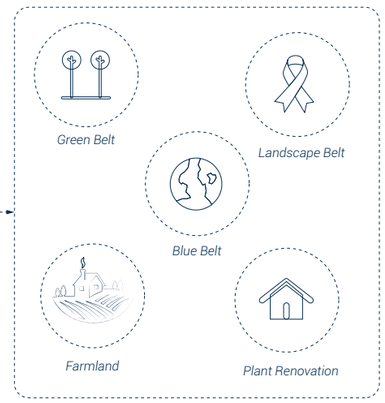


proposing ⇄ *reflecting*

SWOT Analysis
Design Proposal
Actors/Actions
Targets/Strategies
Strategic Master Plan

1. *Identify and evaluate the Strengths, Weaknesses, Opportunities, and Threats.*
2. *Defining concerns, main issues and proposal design options.*
3. *According to the concers and issues, defining the actors and actions.*
4. *Analyzing of the other steps, and trying to propose some strategic applications.*
5. *Implementing the strategic proposal to the addressed gas stations in master plan.*

Strategic Tools



3.2 Case Study: Istanbul

CITY OF ISTANBUL

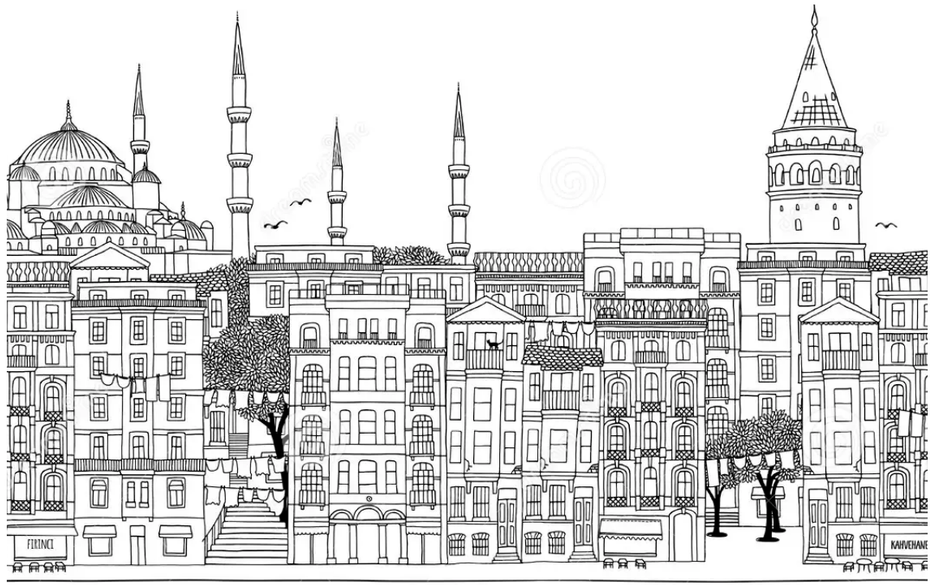
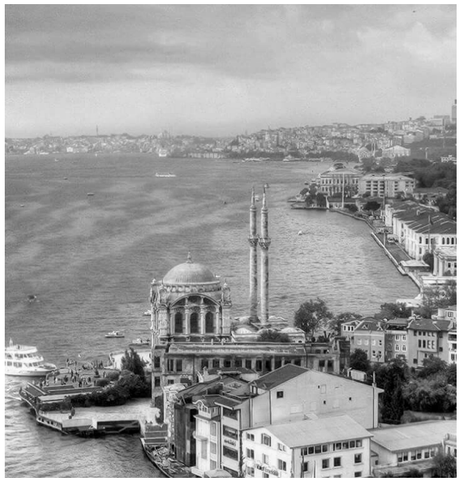


Figure 3-1: Galata Distinct

The previous chapter examined examples from around the world; this chapter will explore Istanbul on a general and neighborhood scale. While doing that, the paper will also introduce the subset of SNTools to make efficient measurements, plans, and strategies to improve Istanbul's sustainability.

The city of Istanbul, 5712 square kilometers, is the largest city in Turkey and one of the largest in Europe. Capital of two empires, is also one of the four cities in the world and certainly the most spectacular, that stands over two continents: Europe and Asia, limited by the Bosphorus Strait, the only maritime route between the Mediterranean Sea and the Black sea, across the Sea of Marmara. This part will benefit from the Municipality of Istanbul's strategic plans and analysis. Regarding plans and analysis, there will be proposals in the next chapter for the one neighborhood with the corresponding plans and needs of the selected sites.


TURYOL



Population:

Istanbul's 2024 population is now estimated at 16,047,350 (Istanbul Population Statistics, 2024). In 1950, the population was significantly smaller, and this growth represents a 1.26% annual change. These population estimates and projections come from the latest revision of the UN World Urbanization Prospects (Istanbul Population Statistics, 2024). These estimates represent the urban agglomeration of Istanbul, which typically includes Istanbul's population in addition to adjacent suburban areas. Istanbul is the largest city in Turkey and the heart of the country. It is also one of the largest agglomerations in Europe and the fifth largest city in the world in terms of population within city limits (Istanbul Population Statistics, 2024). Interestingly, Istanbul is a transcontinental city as it is located on the Bosphorus waterway in northwest Turkey between the Black Sea and the Sea of Marmara. This means the commercial center is in Europe while the rest of the city is in Asia. In 2016, Istanbul had an estimated population of over 14.6 million (Istanbul Population Statistics, 2024). Istanbul has grown very rapidly over the past one hundred years, although it has always had a large population. Istanbul has remained one of the largest cities in the world for most of its long history. Istanbul (then Constantinople) had a population between 400,000 and 500,000 in 500 AD, pushing out Rome as the largest city in the world at the time (Istanbul Population Statistics, 2024).When population data is examined, it is seen that the districts with the highest population on the European side and in the city as a whole are Esenyurt (977,489 people), Küçükçekmece (805,930 people), and Bağcılar (744,371 people) (Istanbul Population Statistics, 2024). On the Anatolian side, Pendik (741,895 people) and Ümraniye (726,758 people) are the districts with the highest population size (Istanbul Population Statistics, 2024). The male population rate in the city is 50.08% and the female population rate is 49.91% (Istanbul Population Statistics, 2024).

Population Density:

Population density significantly impacts urban infrastructure, services, and living conditions. In Istanbul, a city with a historically dense urban core and sprawling outskirts, this indicator helps identify areas where high density may strain resources, prompting a need for smarter growth strategies. Analyzing density enables the identification of neighborhoods that may suffer from overpopulation or, conversely, could benefit from densification to improve efficiency and reduce sprawl. Table 3-1 shows that, Gungoren has the highest population density with 42,875 people per km², followed by Gaziosmanpasa with 40,876, Bahcelievler with 37,023, and Bagcilar with 33,869 (Istanbul Population Density Report, 2024).

District	Area (sq km)	Population 2024	Density (People per sq km)
Güngören	7	300123	42875
Gaziosmanpaşa	12	490512	40876
Kağıthane	12	450123	37510
Bahçelievler	16	592371	37023
Bağcılar	22	719071	32685
Şişli	9	281234	31249
Bayrampaşa	9	274735	30526
Zeytinburnu	10	289746	28975
Esenler	18	520235	28902
Beyoğlu	9	248305	27589
Fatih	16	432164	27010
Kadıköy	21	482714	22987
Esenyurt	43	954579	22197
Küçükçekmece	37	789321	21333
Ataşehir	25	425980	17039
Ümraniye	46	711894	15476
Sultangazi	35	540987	15453
Üsküdar	35	535987	15311
Kartal	32	470215	14694
Avcılar	42	448882	10688
Beşiktaş	18	185063	10281
Maltepe	54	501237	9282
Beylikdüzü	38	352412	9274
Sultanbeyli	36	331589	9211
Bakırköy	29	229239	7905
Sancaktepe	60	436935	7282
Başakşehir	104	469924	4519
Pendik	178	700124	3935
Tuzla	120	273498	2279
Sarıyer	177	345987	1955
Büyükçekmece	139	254103	1828
Çekmeköy	148	264508	1787
Eyüpsultan	229	402287	1756
Adalar	11,1	11242	1013
Beykoz	310	246700	796
Arnavutköy	450	283488	630
Silivri	870	200123	230
Çatalca	1291	73584	57
Şile	785	35412	45

Table 3-1: Istanbul Poplation by Province 2024 (TURKSTAT)

Common problems with these provinces include dense urban fabric, lack of green areas, and poor building quality, leading them into an irreversible socio-economic crisis (Istanbul Population Density Report, 2024). Figure 3-2 shows that, according to the YAYSIS file, these four most dense provinces also correspond with the conservation areas mentioned in the file (YAYSIS Report, 2022).

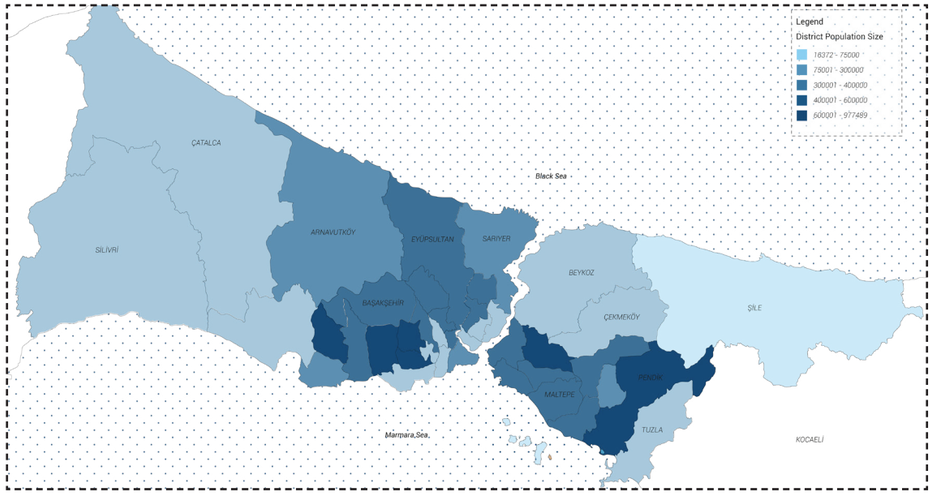


Figure 3-2: Distribution of Istanbul Population by Districts (YAYSIS;2020) (adopted by author)

Socio-Economic Status:

When a ranking is made in terms of socio-economic status, where the highest level is A and the lowest level is D, it was determined that 152 (15.6%) of the neighborhoods were in group A, 788 (81%) were in group B, 29 (3%) were in group C, and 4 (0.4%) were in group D (Istanbul Socio-Economic Status Report, 2024). When socio-economic status groups are examined on a neighborhood basis:

Neighborhoods with Group A status are concentrated in Bakırköy, Beşiktaş,

Beyoğlu, Fatih, Kadıköy, Sarıyer, Şişli, Tuzla, and Üsküdar districts. Neighborhoods with group B status are in all districts of the city. Neighborhoods with group C status are in Beykoz, Çatalca, Silivri, and Şile districts. Neighborhoods with Group D status are located in Bağcılar and Ümraniye districts (Istanbul Socio-Economic Status Report, 2024).

Current Land Use:

Istanbul, with forests in the north, agricultural areas in the west, and residential areas in the south, has an area of 546,242.30 hectares including water surfaces. When the areal distribution of land usage is observed from Figure 3-3, 43.10% consists of forest areas, 27.35% consists of residential areas, 24.27% consists of agricultural areas, 2.57% consists of mining and excavation areas, 2.49% consists of lakes, and 0.21% consists of sandy and rocky areas (Istanbul Land Use Report, 2024).

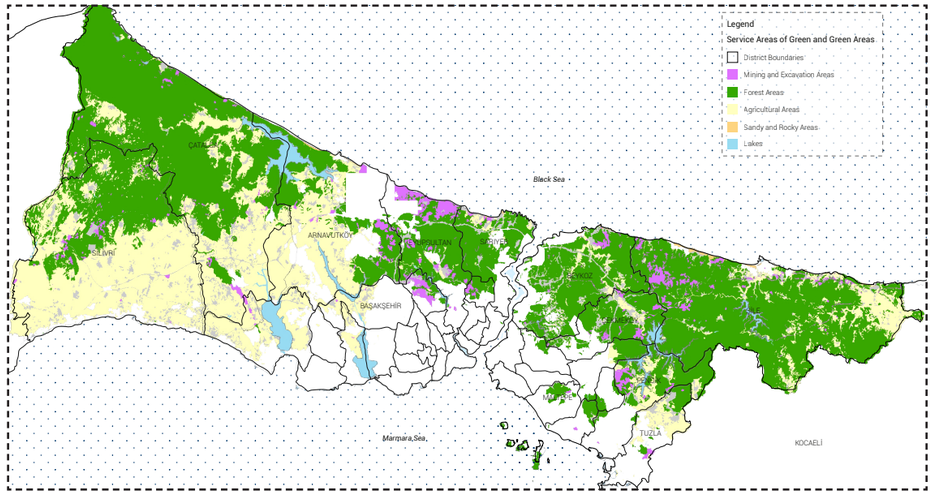


Figure 3-3: Spatial Distribution of Land Use Functions Across Istanbul (YAYSIS;2020) (adopted by author)

It has been determined in Figure 3-4, residential areas in Istanbul have increased by 7.10% over a 13-year period, while forest areas have decreased by 4.03% and agricultural areas by 3.37%. (YAYSIS Report, 2022)

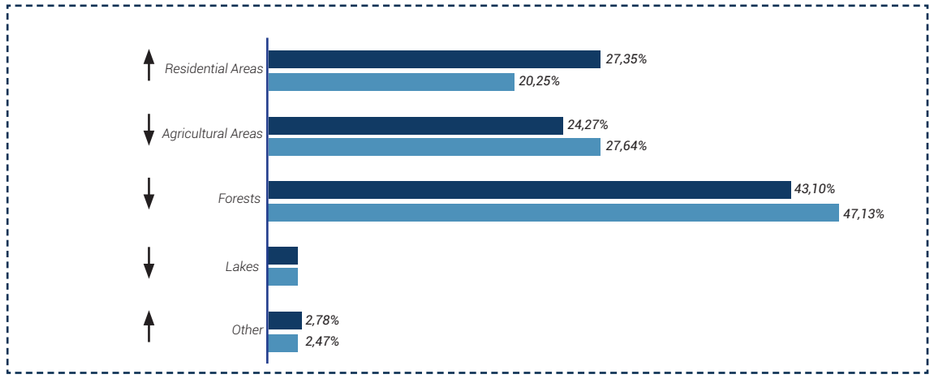


Figure 3-4: Change of Land Use in Istanbul Between 2009 - 2022 (YAYSIS) (adopted by author)

Availability of green urban areas:

Nearest facility analysis, one of the network analysis methods, was used to determine the density of open and green areas. With the analysis, the closest open and green area accessible to the population in Istanbul was determined. Assuming that the population uses the nearest open and green area at the same time, the user density of open and green areas is calculated on the basis of area per person. According to user density analysis, it has been determined that 26% of open and green areas have an area between 1 and 5 m² per person, and 16% have an area between 0.5 and 1 m² (Istanbul Metropolitan Municipality, 2024). Urban open and green areas were evaluated at 3 levels in the open and green areas inventory, which was prepared to cover the urban residential area of Istanbul (YAYSIS Report, 2022). It has been observed in Table 3-2 that the ratio of urban open and green areas to the total area is given according to the classification made. Accordingly, recreational forest areas, which are taken into account in the calculation of the amount of green

space per capita, have a rate of 46.47%, while active green areas have a rate of 19.2%. The rate of parks in the city is 11.58%, the rate of nature parks is 27.60%, and the rate of urban forests is 9.90% (Istanbul Metropolitan Municipality, 2024).

Level 1	Level 2	Ratio (%)	Level 3	Ratio (%)
Urban Open and Green Areas	Urban Public Open Spaces	1,34	Urban Square	0,68
			Pedestrian Zone	0,66
	Active Green Areas	19,20	Childrens Playground	0,25
			Park	11,58
			City Park	5,41
			Grove	1,60
			Fair-Festival Area	0,11
			Botanical Garden	0,26
	Passive Green Areas	26,13	Refugee	11,96
			Slope	1,39
			Woodland	3,52
			Undeveloped Urban Open Space	0,71
			Graveyard	7,88
			Grass-Meadow	0,46
			Urban Farmland	0,21
Social Infrastucture Areas	Sports Grounds	5,12	Open Sports Area	1,62
			Indoor Sports Area	0,25
			Mixed Sports Facility	0,58
			Urban-Regional Sports Area	2,23
			Private Sports Facility	0,44
Natural/Rural Areas	Sandy/Rocky Areas	1,74	Beach Area	0,05
			Rocky Area	1,69
	Recreational Forest Areas	46,47	Urban Forest	9,90
			Nature Park	27,60
			Promenade	8,60
			Arboretum	0,37
	Forest Areas*			
	Agricultural Areas*			

*Forest areas not used for recreational purposes and agricultural areas outside the urban area were not included in the open green areas inventory, but we also analyzed by detail.

Table 3-2: Open and Green Spaces in Istanbul (YAYSIS;2020) (adopted by author)

According to the current neighborhood boundaries, there are 978 neighborhoods within the provincial borders of Istanbul. In 15 neighborhoods, there is no population due to the forest and military areas (Istanbul Metropolitan Municipality, 2024, YAYSIS Report, 2022). According to the sufficiency analysis at the neighborhood level, the number of neighborhoods (with population) without children's playgrounds is 107. It was determined that 79 neighborhoods do not have any active green areas and recreational forest area. When an examination was made according to the standards of Spatial Plans Building Regulation, it was determined that there were only 54 neighborhoods in Istanbul that meet the standards compared to the first admission (only children's playground and parks). According to the second admission, it was seen that the amount of green area per person was below 10.75 m² for 75.4% of the people living in the neighborhoods in Istanbul (Istanbul Metropolitan Municipality, 2024).

Open and Green Area Adequacy According to Neighborhood Population:

The amount of green space per capita in Istanbul is 7.20 square meters by 2022 (YAYSIS Report, 2022). In Table 3-3, the open and green space standards in the Spatial Plans Construction Regulation, the acceptances used within the scope of the qualification, and the amount of green space per person are given at different scales. The 2nd acceptance (active green areas and recreational forest areas) was used to calculate the amount of green space per capita on the basis of district and neighborhood (Istanbul Metropolitan Municipality, 2022).

OPEN AND GREEN STANDARDS IN SPATIAL PLANS BUILDING REGULATION			ACCEPTANCES USED IN CALCULATION OF THE AMOUNT OF GREEN AREAS PER PERSON				AMOUNT OF GREEN AREA (m²)	AMOUNT OF ACTIVE GREEN AREAS PER PERSON (m²/person)
	Open and Green Ares	Standards for Different Population Groups (m²/person)	1.Acceptance	2.Acceptance	Open and Green Ares	TOTAL *All Active Green Areas and Recreational Forest Areas*	*117.075.730,27*	*7,20 m²*
In the Plans Made within District Boundaries	*Childrens Playground* *Park* *Urban Square Neighborhood Sports Area* *Botanical Park* *Promenade* *Recreation*	*10,00*	**Distict and Neighborhood Level**	*City, Distict and Neighborhood Level*	*Childrens Playground* *Park*			
In the Plans Made throughout the City Boundaries	*Zoo* *Urban Forest* *Area to be afforested* *Fair - Festival Area* *Hipodrom*	*5,00*	**City Level**		*City Park* *Grove* *Fair - Festival Area* *Botanical Park* *Urban Forest* *Nature Park* *Promenade* *Arboretum*	**City Scale** *Urban Forest, Nature Park, Arboretum, Grove,City Park, Promenate, Fair Festival Area, Botanical Garden*	*93.526.729,78*	*5,90*
						Neighborhood Scale *Childrens Playground, Park*	*20.549.000,48*	*1,30*

**Istanbul Population: 15.840.900*

Table 3-3: Amount of Green Area per capita (YAYSIS;2020) (adopted by author)

Figure 3-5 shows that districts with the highest green area size per capita are Şile and Beykoz on the Anatolian side. The most obvious reason for this is the fact that the resident population is much less than in other districts and that open and green areas such as recreation areas, nature parks, and city parks are concentrated in these districts. The size of open and green areas per capita in these districts is greater than 100 square meters (Istanbul Metropolitan Municipality, 2022, YAYSIS Report, 2022). After Şile and Beykoz, the other districts with the highest green area size per capita are respectively: Islands, Silivri, Eyüpsultan, Çatalca, Sarıyer, Arnavutköy, and Çekmeköy. The districts with the lowest numbers are respectively: Bağcılar, Güngören, Bahçelievler, Gaziosmanpaşa, Esenyurt, Esenler, and Şişli. These districts, which have less than 1 square meter of open and green area per capita, are generally districts with high building density and population (YAYSIS Report, 2022).According to the current neighborhood boundaries, there are 978 neighborhoods within the provincial borders of Istanbul. In 15 neighborhoods, there is no population due to the forest and military areas (YAYSIS Report, 2022). According to the sufficiency analysis at the neighborhood level, Table 3-4 shows

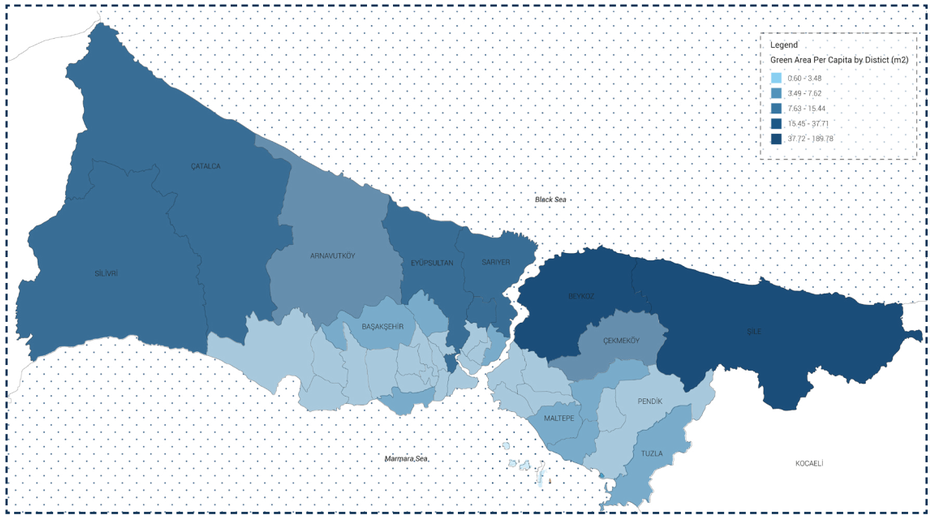


Figure 3-5: Green Area Per Capita by Distinct (YAYSIS;2020) (adopted by author)

that the green area per square kilometer has been calculated. It shows that the lowest green area per square km is in Bayrampaşa with 0.27, Güngören with 0.42, Şişli with 0.63, Esenler with 0.72, Zeytinburnu with 0.8, Beyoğlu with 0.99, and Bağcılar with 1.1 (YAYSIS Report, 2022).

District	Area (sq km)	Green Space Percentage	Green Area (sq km)
Adalar	11,1	25	2,78
Arnavutköy	450	10	45
Ataşehir	25	20	5
Avcılar	42	15	6,3
Bağcılar	22	3	0,62
Bahçelievler	16	6	0,96
Bakırköy	29	12	3,48
Başakşehir	104	18	18,72
Bayrampaşa	9	3	0,27
Beşiktaş	18	22	3,96
Beykoz	310	30	93
Beylikdüzü	38	7	2,66
Beyoğlu	9	11	0,99
Büyükçekmece	139	24	33,36
Çatalca	1291	35	451,85
Çekmeköy	148	19	28,12
Esenler	18	4	0,72
Esenyurt	43	8	3,44
Eyüpsultan	229	14	32,06
Fatih	16	9	1,44
Gaziosmanpaşa	12	13	1,56
Güngören	7	6	0,42
Kadıköy	21	21	4,41
Kağıthane	12	16	1,92
Kartal	32	17	5,44
Küçükçekmece	37	10	3,7
Maltepe	54	15	8,1
Pendik	178	23	40,94
Sancaktepe	60	12	7,2
Sarıyer	177	28	49,56
Silivri	870	40	348
Sultanbeyli	36	9	3,24
Sultangazi	35	5	1,75
Şile	785	50	392,5
Şişli	9	7	0,63
Tuzla	120	18	21,6
Ümraniye	46	11	5,06
Üsküdar	35	15	5,25
Zeytinburnu	10	8	0,8
Total	5503,1	29,75	1637,29

Table 3-4: Green Area by Distinct (YAYSIS;2020) (adopted by author)

Accessibility:

As we mentioned before in urban structure (green areas in relation to the neighborhood population); urban accessibility for individuals with disabilities is an essential component of inclusive urban development. In Istanbul, a city with historical areas that may not always be easily accessible, improving infrastructure to meet accessibility standards is an indicator of social sustainability and equality (Istanbul Metropolitan Municipality, 2023).Within the scope of analysis studies to determine accessibility and impact distances, Figure 3-6 shows that the walking speed for a healthy adult is 6 km/h on a 5% downward slope; for disadvantaged individuals such as physically disabled people, parents with strollers, young children, and the elderly, the average speed is accepted as 3 km/h (Accessibility Study, 2023; YAYSIS Report, 2022).

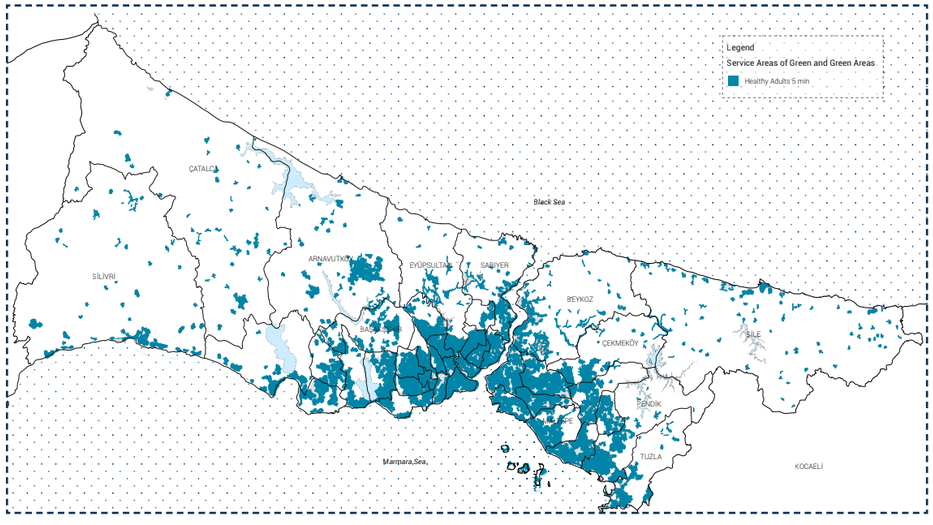


Figure 3-6: Accessibility in Open and Green Spaces (YAYSIS;2020) (adopted by author)

In Figure 3-7, in which the service areas of disadvantaged individuals were examined together with the population, children under the age of 15 and individuals over the age of 65 were taken into account. However, although people with physical

disabilities, parents with strollers, and pregnant women were included in the disadvantaged group, they could not be included in the analysis due to the lack of spatial data. According to population data, there are 4,404,053 people under the age of 15 and over the age of 65 in Istanbul. When the population data and service areas of the groups under the age of 15 and over the age of 65 are analyzed, it has been determined that 40% of this age group cannot receive service from open and green areas (Istanbul Population and Accessibility Report, 2023).

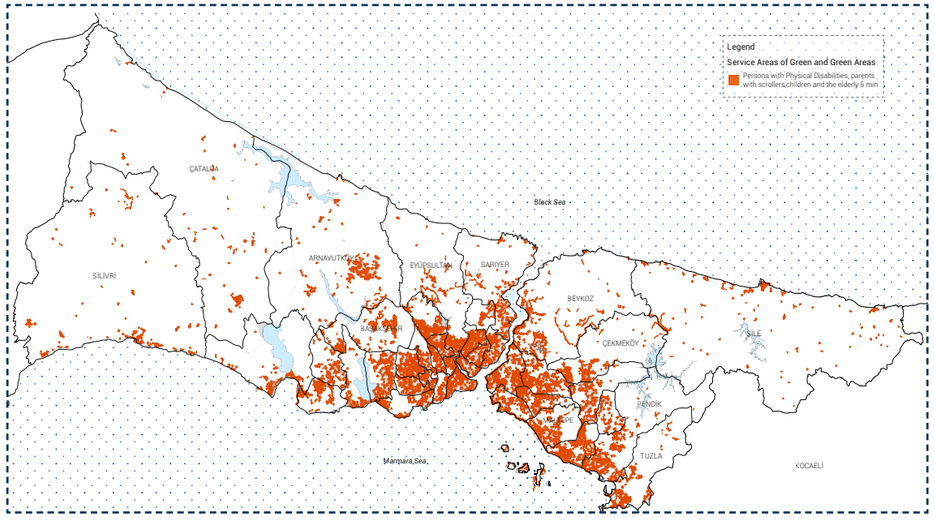


Figure 3-7: Accessibility in Open and Green Spacee (YAYSIS;2020) (adopted by author)

Mobility of Istanbul

Istanbul's transportation network is characterized by its major roadways and comprehensive metro system, which together facilitate the movement of millions of residents and visitors daily. The city's main car roads include the O-1, O-2, and O-3 highways, which form the backbone of Istanbul's road infrastructure. The O-1, also known as the E5, runs parallel to the Bosphorus and connects key districts from the western suburbs to the eastern parts of the city. The O-2, or TEM (Trans-European Motorway), serves as a crucial link for intercity travel and connects

Istanbul to other major cities in Turkey. The O-3, also part of the TEM network, extends towards the northwest, providing access to Europe via the Turkish-Bulgarian border (General Directorate of Highways, 2023; Istanbul Metropolitan Municipality, 2023a).

Complementing the road network, Istanbul's metro system is a vital component of the city's public transportation. Several lines are operational, with the M2 and M5 lines being among the most significant. The M2 line stretches from Hacıosman in the north to Yenikapı in the south, passing through central hubs like Taksim and Şişli, and providing efficient north-south connectivity. The M5 line, Istanbul's first fully automated metro line, connects Üsküdar on the Asian side to Çekmeköy, enhancing east-west mobility across the Bosphorus (Metro Istanbul, 2023).

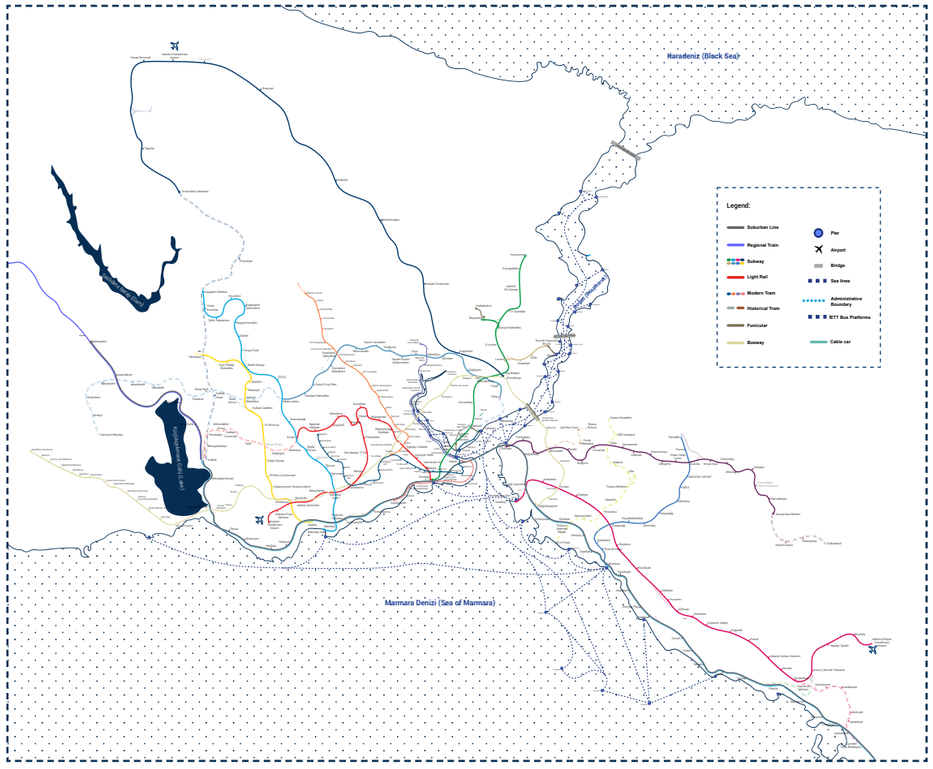


Figure 3-8: Istanbul's Railway Network (2022) (author)

Performance of the Public Transport System

As a city divided by the Bosporus, Istanbul's public transport performance is critical for ensuring cohesive urban mobility. The public transport system plays a crucial role in supporting the economy and providing citizens access to essential services, such as work, health, and education, through healthy and environmentally sustainable options. Effective public transportation reduces reliance on private vehicles, thus decreasing traffic congestion and emissions.

The number of registered motor vehicles in Istanbul published by TurkSTAT in 2020 is around 4.5 million, with 3 million being cars. This increase in vehicles exacerbates traffic congestion, especially during rush hours, resulting in commutes that can take 2-3 hours, significantly affecting the quality of life (TurkSTAT, 2020). According to the 2019 Inrix traffic congestion rankings, Istanbul is ranked as the fourth most congested city in the world – after Bogota (Colombia), Rio de Janeiro (Brazil), and Mexico City (Mexico) – with 153 hours per driver annually lost due to congestion (Inrix, 2019).Getting around Istanbul, especially between its two continents, can be a challenge due to the overwhelming traffic. This situation often pushes people towards public transportation, which can sometimes become overloaded.The lack of car-free zones and bike lanes, coupled with the city's hilly terrain, has hindered residents from cycling as a viable option.

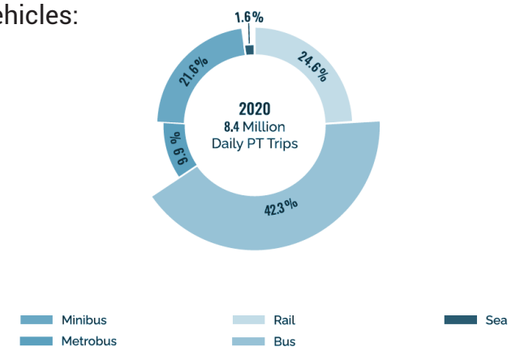
However, Istanbul's 2050 vision holds promise, with plans to construct more cycling and walking paths and expand bike-sharing services, potentially transforming the city's mobility landscape (Istanbul Metropolitan Municipality, 2023a).The daily trips made in Istanbul are over thirty million. The city offers five different transportation options to its residents. The city has been developing its public transportation infrastructure with new subway routes, EV Metrobus, and

special pricing for elders, students, disabled people, and families with newborn children. According to the YAYSIS Report, 89.92% of Istanbul's population can reach all public transportation stops within a 0-5 minute walking distance. Additionally, 99.37% of the population can access public transportation within 15 minutes of walking. These rates and Table 3-5 show that most of the population of Istanbul can easily access public transportation systems in as little as 5 minutes, while almost all can access public transportation systems within an acceptable walking time of 15 minutes. However, the rubber-tyred public transportation system accounts for most of this, with 89.87% of the population reaching a public transportation stop by walking for 0-5 minutes. In contrast, only 3.05% of the population can access rail and maritime transportation stops within a 0-5 minute walking distance.

This situation shows that a tiny proportion of Istanbul's population can benefit from the fast, safe, clean, environmentally friendly rail and maritime transportation systems (YAYSIS Report, 2022).

Istanbuls Public Transportation Vehicles:

1. Metrobus
2. Metro/Tram
3. Water ferries
4. Buses
5. Minibus



The Urban Mobility Readiness Index 2023, made at Berkeley University by Oliver Wyman, ranked 65 cities around the world according to "how prepared they are for mobility's next chapter." The index included recommendations for each city's most critical challenges. The criteria used in the index were social impact, infrastructure, innovation, system efficiency, and market attractiveness.

Electric-Vehicle Infrastructure

The adoption of electric vehicles is a priority in reducing transportation emissions. The presence and expansion of EV infrastructure in Istanbul indicate the city's commitment to reducing its carbon footprint. With the rise of the EV car market globally, Turkey has also started to show an increase. The Turkish EV car brand, TOGG, launched and its market share has increased over the years. According to the Turkish Statistical Institute (TURKSTAT), the registered number of EV cars was 2,797 in 2022. However, a report published on 25 April 2024, indicated that in the first quarter of the year, the number of EV cars reached 99,759, which constitutes 0.6% of the market (TURKSTAT, 2024). The legislation in 2022 increased the tax percentage on EV cars, which prevented the jump in the 2022 statistic from continuing through the years (TURKSTAT, 2024).

Year	Total	(%)	Gasoline	(%)	Diesel	(%)	LPG	(%)	Hybrid [2]	(%)	Electric	(%)	Unknown [3]	(%)
2004	**5 400 440**	**100**	4 062 486	75,2	252 629	4,7	793 081	14,7	-	-	-	-	292 244	5,4
2005	**5 772 745**	**100**	3 883 101	67,3	394 617	6,8	1 259 327	21,8	-	-	-	-	235 700	4,1
2006	**6 140 992**	**100**	3 838 598	62,5	583 794	9,5	1 522 790	24,8	-	-	-	-	195 810	3,2
2007	**6 472 156**	**100**	3 714 973	57,4	763 946	11,8	1 826 126	28,2	-	-	-	-	167 111	2,6
2008	**6 796 624**	**100**	3 531 763	52,0	947 727	13,9	2 214 661	32,6	-	-	-	-	102 473	1,5
2009	**7 093 964**	**100**	3 373 875	47,6	1 111 822	15,7	2 525 449	35,6	-	-	-	-	82 818	1,2
2010	**7 544 862**	**100**	3 191 964	42,3	1 381 631	18,3	2 900 034	38,4	-	-	-	-	71 233	0,9
2011	**8 113 111**	**100**	3 036 129	37,4	1 756 034	21,6	3 259 288	40,2	23	0,0	24	0,0	61 613	0,8
2012	**8 648 875**	**100**	2 929 216	33,9	2 101 206	24,3	3 569 143	41,3	53	0,0	175	0,0	49 082	0,6
2013	**9 283 923**	**100**	2 888 610	31,1	2 497 209	26,9	3 852 336	41,5	83	0,0	353	0,0	45 332	0,5
2014	**9 857 915**	**100**	2 855 078	29,0	2 882 885	29,2	4 076 730	41,4	113	0,0	412	0,0	42 697	0,4
2015	**10 589 337**	**100**	2 927 720	27,6	3 345 951	31,6	4 272 044	40,3	324	0,0	565	0,0	42 733	0,4
2016	**11 317 998**	**100**	3 031 744	26,8	3 803 772	33,6	4 439 631	39,2	517	0,0	643	0,0	41 691	0,4
2017	**12 035 978**	**100**	3 120 407	25,9	4 256 305	35,4	4 616 842	38,4	925	0,0	760	0,0	40 739	0,3
2018	**12 398 190**	**100**	3 089 626	24,9	4 568 665	36,8	4 695 717	37,9	4 415	0,0	952	0,0	38 815	0,3
2019	**12 503 049**	**100**	3 020 017	24,2	4 769 714	38,1	4 661 707	37,3	13 877	0,1	1 176	0,0	36 558	0,3
2020	**13 099 041**	**100**	3 201 894	24,4	5 014 356	38,3	4 810 018	36,7	33 690	0,3	2 797	0,0	36 286	0,3
2021	**13 706 065**	**100**	3 495 172	25,5	5 158 803	37,6	4 923 275	35,9	86 682	0,6	6 267	0,0	35 866	0,3
2022	**14 269 352**	**100**	3 817 104	26,8	5 261 876	36,9	5 005 563	35,1	134 662	0,9	14 552	0,1	35 595	0,2
2023	**15 221 134**	**100**	4 362 975	28,7	5 425 652	35,6	5 094 751	33,5	222 328	1,5	80 043	0,5	35 385	0,2
2024[1]	**15 498 386**	**100**	4 531 009	29,2	5 461 198	35,2	5 113 424	33,0	257 650	1,7	99 759	0,6	35 346	0,2

Table 3-5:Turkish Statistical Institute. "Road Motor Vehicles, January 2024."Turkish Statistical Institute, 2024.

According to the Turkish Electric and Hybrid Vehicles Association (TEHAD), there were 6,500 electric vehicle charging stations in Turkey in 2022. This number reached 12,067 units at the end of December 2023, according to the Energy Market Regulatory Authority (EPDK). Of this number, 8,492 were alternating current (AC) charging stations, while 3,575 were direct current (DC) charging stations. Thus,

according to data at the end of 2023, Turkey's number of electric vehicle charging stations increased by 185% in the last year. With those numbers, Turkey has become the second country in Europe in terms of the total number of electric vehicle charging stations (TEHAD, 2023; EPDK, 2023).

Figure 3-9: Istanbul Charging Stations (2023) (author)

According to EPDK's app and Figure 3-9, the current number of public charging stations in Istanbul is 1,486, which makes it 0.000096 charging stations per inhabitant. EV charging points in Turkey are primarily located in public places like shopping malls, gas stations, parks, and service areas along main roads. However, with the local brand and Tesla's entry into the market, the number of charging points has increased with the demand. Having a charging point has become a marketing tool for the real estate market (EPDK, 2023).

Bicycle Network

A developed bicycle network signals a city's dedication to sustainable and healthy transportation options. For Istanbul, expanding its bicycle infrastructure can enhance urban mobility and reduce traffic congestion. The current bicycle network,

as shown in Figure 3-10, only exists in national parks and coastal parks, indicating that using bicycles as a transportation tool is not safe while traveling between neighborhoods. As mentioned in the transportation performance part, proper bicycle paths would enforce and ease the cross-connection between people and public transportation. The Urban Mobility Readiness Index mentions that the ten cities with the highest percentage of daily trips made via walking are listed below, and Istanbul is second on the list with 49% (Urban Mobility Readiness Index, 2023).

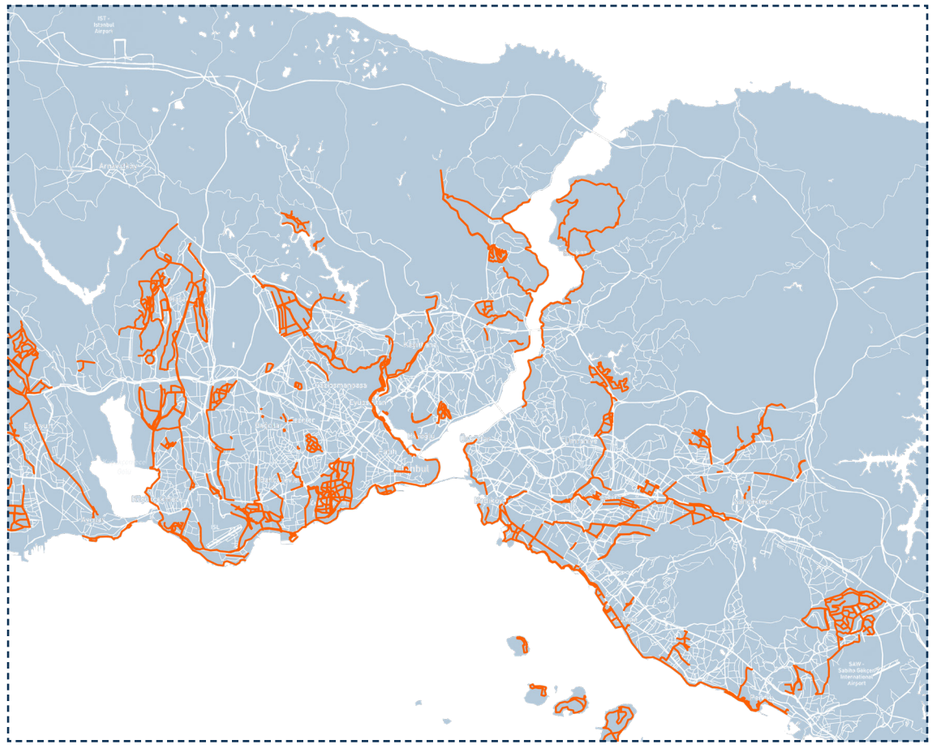


Figure 3-10: Istanbul Bicycle Map (2023) (author)

Air Quality (Particulate Matter - PM10 Concentration)

Air quality, particularly PM10 concentration, is a key health and environmental quality indicator. Istanbul's positioning between two seas and its heavy traffic

contribute to its air pollution challenges. Effective monitoring and reduction of PM10 are crucial for public health, especially in dense urban areas where the concentration is typically higher. According to the European Union (EU), the daily limit of PM10 is 50 µg/m³ (micrograms per cubic meter of air) on average, and this limit should not be exceeded more than 35 times in a calendar year. These limits are determined to protect human health, considering both short-term and long-term exposure to particulate matter (European Environment Agency, 2023). Table 3-6 shows that the city has struggled with poor air quality, previously due to the burning of fossil fuels and biomass in homes and more recently due to a significant increase in traffic. It is estimated that every day there are an additional 700 vehicles on the road. Despite the city being home to three industrial zones, emissions from industrial processes are dwarfed by those from residential homes and private vehicles (Istanbul Metropolitan Municipality, 2023a).

Station	2022	2023	Percentage of Change in pm10
Bağcılar	31,893	38,131	19,56
Başakşehir	35,048	41,869	19,46
Büyükada	15,792	17,782	12,6
Çaltadıkapı	36,922	30,511	-17,36
Esenyurt	51,353	53,463	4,11
Kandilli	29,580	29,127	-1,53
Kartal	47,072	54,095	14,92
Kumköy	20,095	20,865	3,83
Maslak	32,896	29,308	-10,91
Mecidiyeköy	54,089	51,815	-4,2
Sancaktepe	48,160	46,922	-2,57
Sarıyer	24,393	21,837	-10,48
Selimiye	43,147	46,180	7,03
Silivri	31,080	29,665	-4,55
Sultanbeyli	33,819	30,456	-9,94
Sultangazi	49,404	49,240	-0,33
Şile	25,074	20,632	-17,71
Şirinevler	41,126	36,203	-11,97
Tuzla	44,088	47,853	8,54
Ümraniye-1	41,700	42,663	2,31
Ümraniye-2	40,077	35,499	-11,42
Üsküdar-1	27,588	26,235	-4,9
Üsküdar-2	29,199	34,973	19,77
Yenibosna	30,473	51,662	69,54

Table 3-6: Air Quality by Distinct

IMM has been working to monitor air quality more closely and identify solutions to improve existing levels of PM2.5 and PM10. The implementation of curfews in 2020 as a result of the outbreak of COVID-19 saw air pollution levels fall by as much as 45% compared to the same period the previous year (Istanbul Metropolitan Municipality, 2023b).

Greenhouse Gas Emissions

Monitoring greenhouse gas emissions is critical in addressing Istanbul's contribution to climate change. This indicator helps assess the effectiveness of local policies in reducing emissions. Table 3-7 shows the CO2 emissions between 2015, 2030, and 2050. Istanbul's greenhouse gas inventory for 2015, calculated with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), amounts to 47.3 million tCO2e.

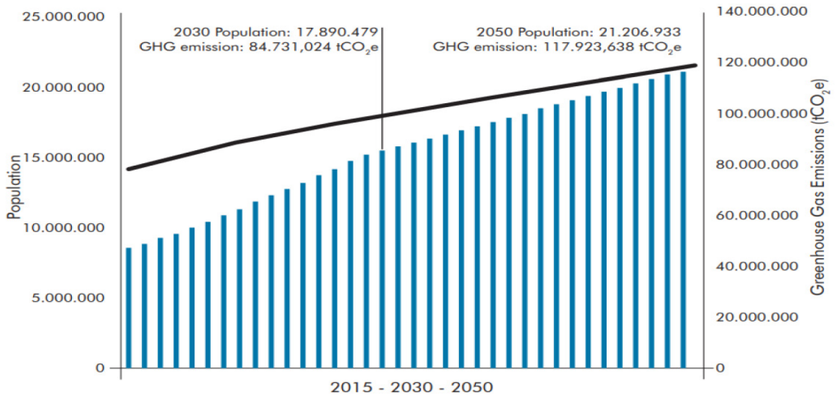


Table 3-7: CO 2 emissions by Population

The calculations suggest that Istanbul's continued growth, especially the number of its inhabitants, does not permit its emissions to reach its peak until 2050. The results indicate that the Business-As-Usual (BAU) scenario emissions of the city will reach 84.7 million tCO2e by 2030 and 117.9 million tCO2e by 2050. The measures proposed in the Istanbul Climate Change Action Plan (ICCAP) will decrease emissions so that 2030 emissions are expected to be 57.1 million tCO2e and 2050 emissions 76.1 million tCO2e, suggesting a reduction of 27.6 million tCO2e (33%) for 2030 compared to the BAU scenario. This "reduction from increase" approach corresponds to Turkey's Intended Nationally Determined Contribution (INDC) of a 21% reduction for 2030 and is an ambitious reduction

target considering Istanbul's rapid economic and population growth expectations. This target will be reached with efforts in energy efficiency in buildings and the industry, renewable energy, waste management, and 1,100 km long metro lines. In addition to IMM, the contribution of local and national actors is vital in attaining these goals (Istanbul Metropolitan Municipality, 2023; Ministry of Environment and Urbanization, 2023).

14.Albedo:

Albedo measures the reflectivity of surfaces and is crucial for managing urban heat. In Istanbul, with its vast expanses of concrete and asphalt, increasing albedo through reflective materials or green roofing can contribute to cooling the urban environment .

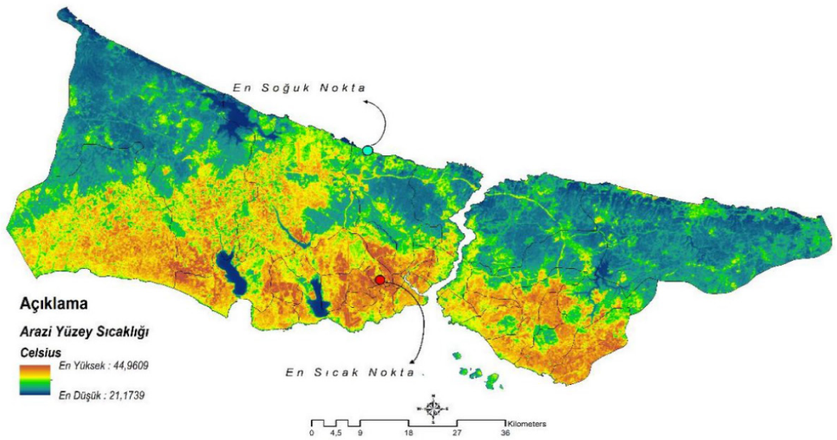


Figure 3-11: Urban Heat Island Effect

The urban heat island effect occurs as a result of high-density construction and loss of green areas. In regions with a high heat island effect, temperature increases are felt more intensely; In hot seasons, the quality of life in open areas is negatively affected and intensive energy use is required for air conditioning.

Permeability of Land

The permeability of land affects water absorption and runoff, with direct implications for flood prevention. Istanbul's topography and waterways make it susceptible to flooding, making this indicator vital for urban resilience planning. Settlements established in stream flood areas throughout Istanbul are expected to be more heavily affected by floods resulting from sudden weather changes. There are approximately 43,000 structures in the stream floodplains, and approximately 290,000 people reside in these structures.

Use of Vegetation to Provide Ambient Outdoor Cooling

Vegetation not only contributes to biodiversity but also to reducing ambient temperature in urban areas. Table 3-8 shows that the percentage of daily trips made via walking could be more comfortable and increased with the correct use of vegetation in ambient cooling, which also helps reduce the urban heat island effect, potentially improving urban health (Istanbul Metropolitan Municipality, 2023b).

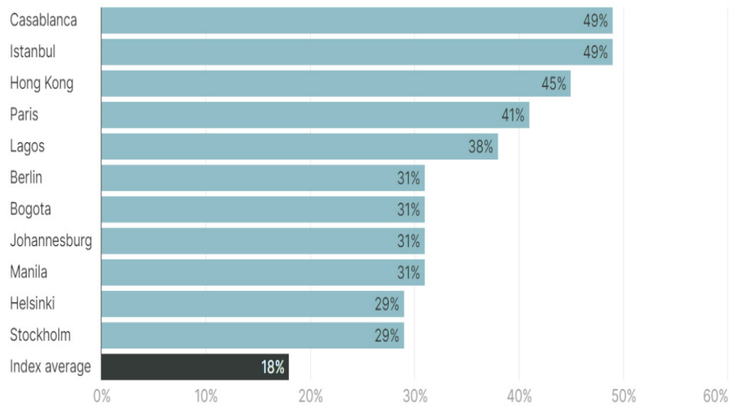


Table 3-8: Percentage of Pedestrian Daily Trips

17.Social Acceptance

Household Survey:

In order to evaluate the demands, expectations and complaints of Istanbulites regarding green areas and to ensure that they have a say in the study, a city-wide household survey is conducted in each district, a visitor survey is conducted in active/recreational green areas such as parks and city parks, and "yaysis.istanbul" is conducted in each district. (YAYSIS,2022)

In the household field study conducted on open and green areas throughout Istanbul, the research population is individuals over the age of 18 residing in households in Istanbul.

The sample in this study; 1120 households representing Istanbul were selected by simple random selection method to cover all districts with a margin of error of ± 2.93 within a 95% confidence interval.

General information about green space use was collected from individuals in the households participating in the study.The household survey conducted in all districts of Istanbul between 21 July 2022 and 3 August 2022 consists of 33 questions, and these questions are;

1. Demographics,
2. Access,
3. Usage method and purpose,
4. Perception and expectation,
5.Satisfaction and Usage Information,

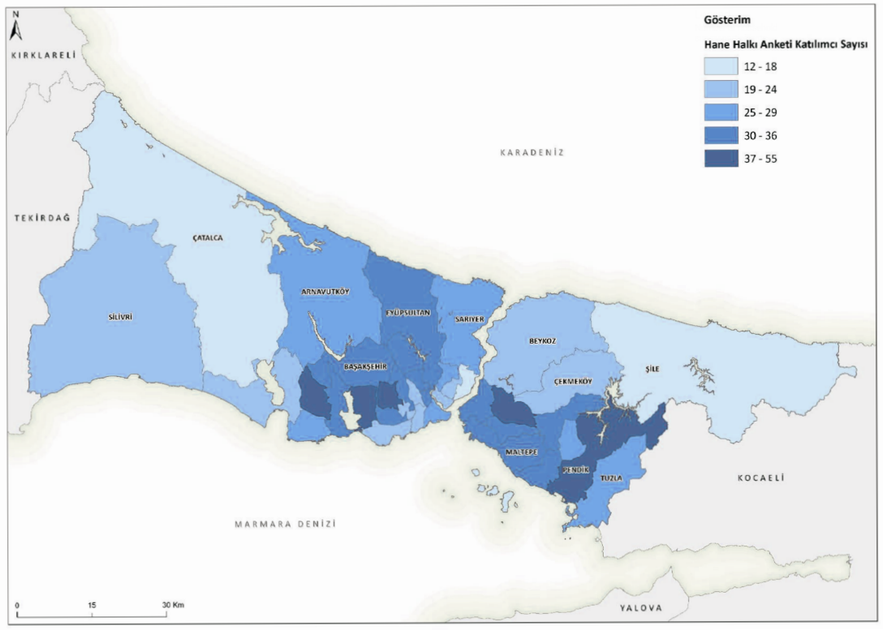


Figure 3-12: Number of Household Survey Participants (YAYSIS)

1.Demographics:

In this section, 4 questions were asked to the participants. Conducted regarding demographic structure

1.1 District distribution of households

1.2. Number of people living in the household

1.3 Gender distribution

1.4 Age distribution

1.1 District distribution of households:

In the Istanbul green areas household survey conducted with 1,120 households;

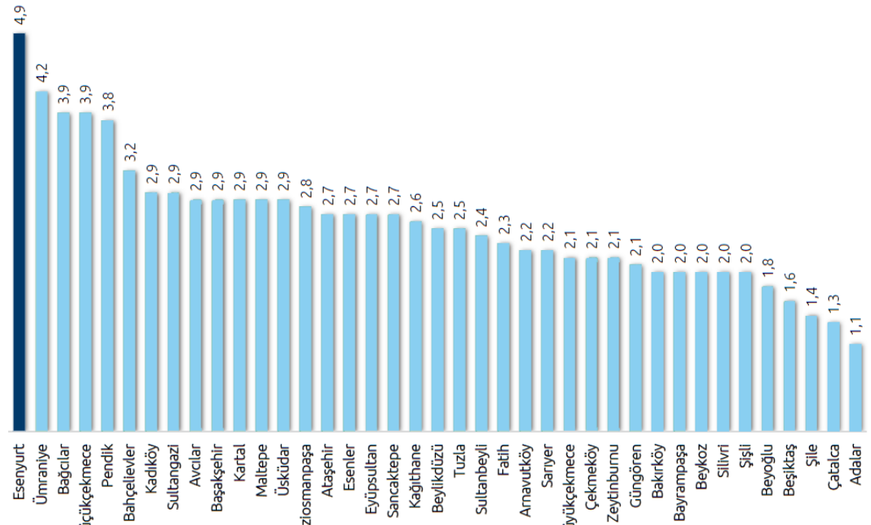


Table 3-9: District distribution of households (YAYSIS,2022)

The highest rate belongs to;

Esenyurt (4.9%) ,Ümraniye (4.2%) **Bağcılar (3,9%)**

In the Table 3-10, the district distribution rates of households are shown in order.

1.2. Number of people living in the household:

According to the average number of people living in households; The districts of Arnavutköy (4.76 people), Bağcılar (4.32 people) and Sultangazi (4.39 people) come to the fore. When evaluated over the sample, it was determined that the average number of people living in the household throughout the province was 3.32. The average number of people living in households by district is given in the Table 3-11.

DISTRICT	AVERAGE NUMBER OF PEOPLE	DISTRICT	AVERAGE NUMBER OF PEOPLE
Adalar	1,67	Gaziosmanpaşa	3,13
Arnavutköy	4,76	Güngören	3,78
Ataşehir	3,73	Kadıköy	2,06
Avcılar	3,00	Kâğıthane	3,31
Bağcılar	4,32	Kartal	3,56
Bahçelievler	3,22	Küçükçekmece	3,95
Bakırköy	2,27	Maltepe	3,06
Başakşehir	4,22	Pendik	2,58
Bayrampaşa	3,05	Sancaktepe	3,00
Beşiktaş	1,89	Sarıyer	3,48
Beykoz	2,23	Silivri	3,82
Beylikdüzü	3,71	Sultanbeyli	2,44
Beyoğlu	4,15	Sultangazi	4,30
Büyükçekmece	2,87	Şile	2,56
Çatalca	3,53	Şişli	2,77
Çekmeköy	3,38	Tuzla	2,96
Esenler	4,10	Ümraniye	3,28
Esenyurt	4,18	Üsküdar	2,94
Eyüpsultan	3,60	Zeytinburnu	3,17
Fatih	2,19	Toplam	3,32

Table 3-10: The average number of people living in households by district (YAYSIS,2020)

1.3 Age distribution:

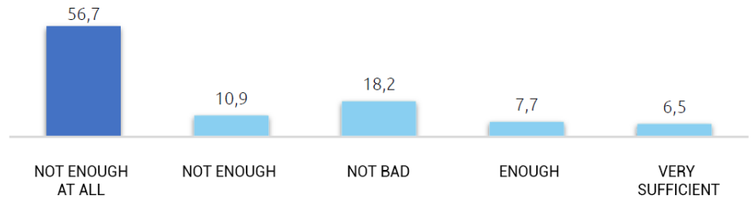
When household age groups are examined; The highest age group is the "25-34 age group" with 17%, while the lowest age group is the "0-5 age group" with 5.4%. The chart below shows the household age distribution. (YAYSIS,2020)

2. Access:

In this section, 3 questions were asked to the participants. The questions asked are as follows:

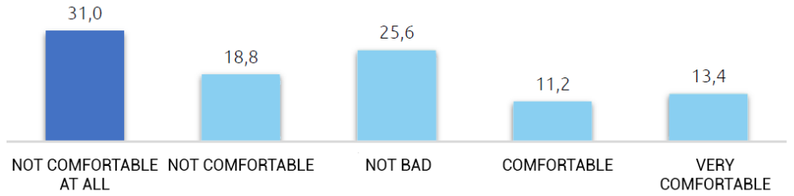
2.1 Do you find the green areas in Istanbul sufficient?

According to the survey; 56.7% of the participants state that they do not find the green areas in Istanbul sufficient at all. The chart below shows the distribution of the answers given. (YAYSIS,2020)



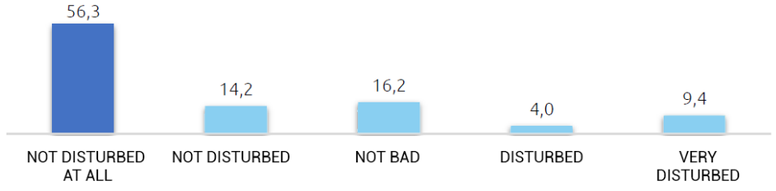
2.2 Do you find pedestrian circulation comfortable in green areas?

According to the survey; 35.5% of the participants reach the nearest green area to their homes by walking in less than 5 minutes. The chart below shows the distribution of the answers given.(YAYSIS,2020)



2.3 Are you uncomfortable using bicycles in green areas?

According to the survey; 56.3% of the participants state that they are not at all bothered by cycling in green areas. The chart below shows the distribution of the answers given.(YAYSIS,2020)

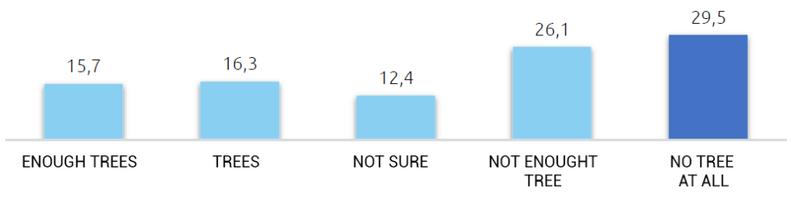


3. Usage method and purpose:

In this section, 3 questions were asked to the participants. The questions asked are as follows:(YAYSIS,2020)

3.1 Do you think that the open and green areas in your immediate surroundings are planted with trees to provide enough shade on the pedestrian paths?

29.5% of the participants think that the open and green areas in their immediate surroundings are not planted with trees to provide shade. The chart below shows the distribution of the answers given.(YAYSIS,2020)

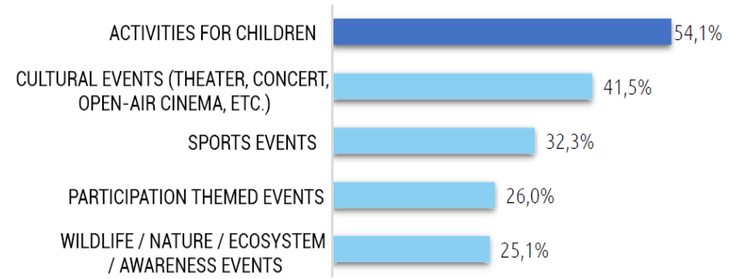


3.2 What do you think is the most important problem in green areas?

48.7% of the participants state that the most important problem in green areas is that the parks are not clean. The chart below shows the distribution of the answers given. (YAYSIS,2020)

3.3 What are the events you would like to be held in open and green areas near you?

54.1% of the participants state that they want activities for children to be organized in open and green areas in their immediate surroundings. The chart below shows the distribution of the answers given. (YAYSIS,2020)

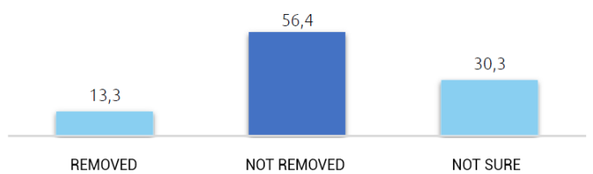


4. Perception and expectation:

In this section, 4 questions were asked to the participants. The questions asked are as follows:

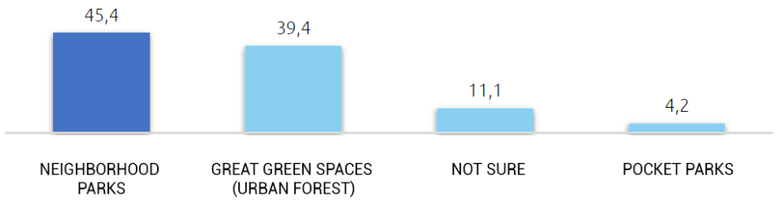
4.1 What Do You Think of Vertical Garden Layout Transformations?

56.4% of the participants think that vertical garden layout transformations should not be removed. The chart below shows the distribution of the answers given.



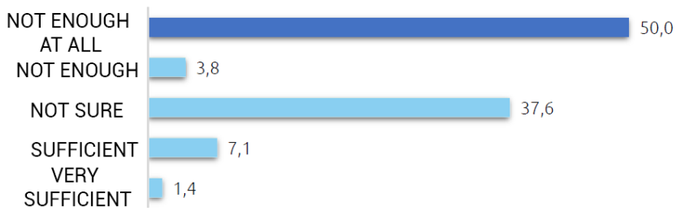
4.2 What Type of Areas Would You Like to See in New Parks to be Created to Increase the Number of Green Areas and Quality of Life?(YAYSIS,2020)

45.4% of the participants state that they would like to see neighborhood parking areas in new parks. The chart below shows the distribution of the answers given.



4.3 Do you think that play facilities are sufficient for disabled children?

50% of the participants think that the play opportunities in the city are not sufficient for disabled children. Participants who think that it is not enough say that "transportation should be made easier" for disabled children and "sufficient space should be opened for disabled children". The chart below shows the distribution of the answers given.(YAYSIS,2020)



4.4 Where are the green areas you know across Istanbul?

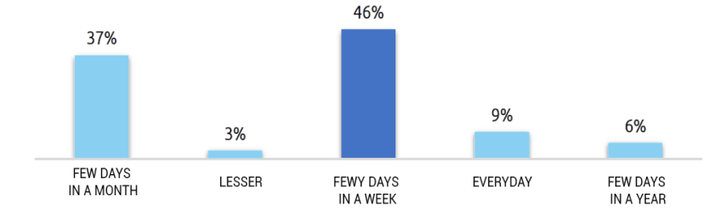
When the green areas that the participants know throughout Istanbul are examined, respectively, "Belgrad Forest", "Maltepe Beach", "National Garden", "Aydos Forest", "Florya Coast Park", "Bakırköy Coast Park", "15 July National Garden", "Taşdelen Recreational Park". Area", "Emirgan Grove", come first.

5.Satisfaction and Usage Information:

In this section, 2 questions were asked to the participants. The questions asked are as follows:(YAYSIS,2020)

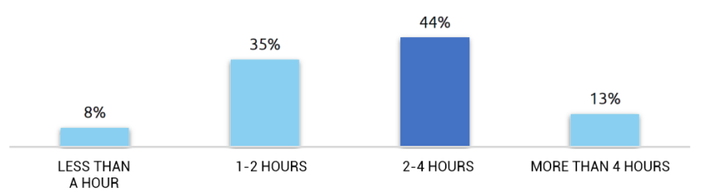
5.1 How often do you use open and green spaces?

In this question, to which 1,145 people participated, 45.76% of the participants ranked first with the answer "a few times a week", while 419 people, 36.59%, ranked second with the answer "1-2 times a month". At the bottom, 32 participants answered "less frequently" with a rate of 2.79%. The chart below shows the distribution of the answers given.(YAYSIS,2020)



5.2 How much time do you spend in open and green areas?

In this question answered by 1,142 participants, 44.05% of the participants stated that they spent "2-4 hours", 35.03% stated that they spent "1-2 hours", while only 7.71% of the participants stated that they spent "less than 1 hour". . The chart below shows the distribution of answers given;(YAYSIS,2020)



Open and Green Space Approaches in Related Plans

Under this heading, in order for the approach developed for Istanbul's open and green areas to be compatible with upper-scale and relevant plans, relevant strategies developed within the scope of the Eleventh Development Plan, Istanbul Environmental Plan, Istanbul Climate Change Action Plan, and Istanbul Vision 2050 Strategic Plan are examined.

Eleventh Development Plan (2019-2023)

The Eleventh Development Plan (2019-2023) was approved at the 105th meeting of the General Assembly of the Turkish Grand National Assembly dated 18.07.2019, in accordance with the law numbered 3067 dated 30.10.1984. According to the plan, the rapidly increasing population, urbanization, economic activities, and diversifying consumption habits increase the pressure on the environment and natural resources.

Environmental problems such as environmental pollution, climate change, desertification, deforestation, biodiversity loss, and drought affect human life and the development process more clearly every day.

In Turkey, emphasis is placed on policies that are people-oriented, respectful of natural life and historical heritage, where basic urban services are provided in a fair and accessible manner, where local services are carried out with the principle of appropriateness, and to create durable settlements with a high quality of life. In this context, priority is given to efforts to prevent environmental pollution, protect and sustainably use biodiversity and natural resources (Eleventh Development Plan, 2019).

Strategies

The main goal is to create cities and settlements that are people-oriented, respectful of natural life and historical heritage, where basic urban services are provided in a fair and accessible manner, with a high quality of life and that produce value.

Areas under disaster danger and risk, as well as plots and lands with risky structures outside these areas, will be transformed in accordance with science and art norms and standards, based on healthy and safe living.

Ensuring the population has access to healthy and safe drinking and utility water and ensuring effective management of wastewater by minimizing its effects on human and environmental health; reducing, recycling, recovering and disposing of waste in order to minimize its effects on human and environmental health and achieve effective management; The main goal is to create accessible, safe, time and cost-effective and sustainable urban transportation systems.

The main aim is to increase social awareness against disasters, to create disaster-resistant and safe settlements, and to minimize the loss of life and property that disasters may cause by carrying out risk reduction studies.

Action

Protection of public spaces in cities, especially open and green spaces; improving access and security; It will be reconstructed within the framework of the human-nature relationship, sensitive to women, children, elderly and disabled people.

Within the scope of the green city vision, National Gardens will be built in our cities and the amount of green areas will be increased in order to increase the quality of life and adapt to climate change.

In order to create healthy living spaces in our cities and to increase urban green space standards and quality of life, National Gardens will be expanded to 81 provinces, and until 2023, National Garden works will be carried out on an area of 81 million m² with the financing of the Ministry of Environment and Urbanization, TOKİ, İLBANK and municipalities.

By prioritizing the risk of buildings in hazardous and risky areas, urban transformation services will be carried out for residences and industrial sites within the city throughout the country, according to the demands and needs from the provinces.

While planning urban transformation practices and new areas to be opened for development throughout Istanbul, disaster and emergency meeting areas will be created by taking into account the population density.

Within the scope of protection, development and sustainable use of water resources, basin-based plans, strategies and action plans will be implemented in an integrated manner.

In order to increase the access and security of public areas, local governments will be supported to carry out needs analysis for vulnerable groups on a neighborhood basis and to increase the quality of services.

In order to effectively use and protect water resources, river basin management plans, sectoral water allocation plans, basin master plans, drought management plans, flood management plans, drinking water basin protection action plans will be completed for 25 basins.

Basin-based planning will be made for the reuse of treated wastewater, especially in agriculture, and the pressure on water resources will be reduced.

Istanbul Climate Change Action Plan (2021)

Within the scope of the Istanbul Climate Change Action Plan created by the Istanbul Metropolitan Municipality, the effects of climate change in the city, heat waves of increasing duration and intensity, drought, and changing precipitation regimes have been considered as priority issues. In the fight against the climate crisis, policy documents have been created to support achieving the vision of "Becoming a Carbon Neutral City by 2050" with effective targets for emission reduction and adaptation strategies (Istanbul Climate Change Action Plan, 2021). These main goals can be summarized as follows:

Goal 1: Become carbon neutral by 2050 and achieve a 52% reduction in emissions by 2030, compared to base year values of 50.9 MtCO2e in 2019.

Goal 2: Increase resilience to the worst impacts of climate change.

Goal 3: Build green and equitable economic development.

The way to achieve these goals is determined by strategies. Some strategies focus on mitigation, some on adaptation, and some on both.

Adaptation strategy:

-Reducing the urban/rural temperature difference, limiting the number of nights experiencing extreme heat, and reducing the effect of increasing urban heat in Istanbul through measures to be taken

-.Increasing water availability in the city to make Istanbul more resilient to drought.

-Reducing flood exposure of coastal and densely urbanized areas due to sea level

rise and/or excessive rainfall through rainwater capture and natural measures.
-Increasing the resilience of Istanbul's food systems and access to high-quality food in a changing climate.

The above adaptation strategies focus on reducing the urban heat island effect, increasing the sustainability of water resources, and preventing floods, taking into account human and natural factors.

Drought: Increasing access to water; increasing urban water storage capacity and preventing loss of function due to leakage.
Extreme Temperature: Reducing the impact of increasing urban heat; planting more trees, cooling systems for critical infrastructure systems, rehabilitation of streams, and green river banks.
Flooding-Sea Level Rise: Reducing flood risk; improving road drainage and keeping the drainage clean.
Food Safety: Increasing resilience in food safety; urban farming in vacant lots and parks, backyard and community gardens, and along roadsides.

Istanbul Vision 2050 Strategy Document

In the Istanbul Vision 2050 Strategy Document developed by Istanbul Metropolitan Municipality, it is aimed for Istanbul to stand out as an innovative, creative, livable, and green city.

-Carrying the traditional values of Istanbul into the future,
-Respecting nature and living in harmony with nature,
-Creating durable urban spaces,
-Supporting circular life and green economy,

-Establishing relationships with the environment within the framework of a productive and holistic conservation approach,
-Being a pioneer in science and technology,
-Providing spatial transformation to accommodate the professions of the future for young people, who are the guarantee of tomorrow with their creativity,
-Aiming to be a world city that offers new work opportunities with a focus on creativity, innovation, and technology.

In the light of all this, the future of Istanbul is shaped by themes of effective and inclusive mobility that protects the environment and is compatible with the changing climate, integrated and smart infrastructure systems, vibrant and sensitive spaces that provide a good life, a transformative and durable economy, accessible and fair urban opportunities for everyone, and an equal and free society.

In this context, Istanbul's vision is defined as "ISTANBUL, a World City Where Life is Alive and Free with All Its Diversity and Where Everyone Lives Well". Among the themes, goals, and objectives related to the defined vision, those related to open and green spaces are listed below (Istanbul Vision 2050 Strategy Document, 2022).

Strategies

Reducing Environmental Pollution and Greenhouse Gas Emissions

Protecting, Improving and Repairing Natural Values

Increasing the City's Adaptation Capacity to Climate Change and Citizens' Participation in the Climate Crisis Fight

Preventing the City from Spreading into Bio-cultural Areas, Creating a Qualified Urban Built Environment

Ensuring Balanced Development of Urban Space to Improve the Quality of Life

Ensuring Green Transformation

Action

Ensuring energy efficiency and reducing consumption, increasing the share of renewable energy in energy production and consumption and using environmentally friendly lighting systems to reduce light pollution

Creation of a buffer zone that keeps the expansion of the built environment under control

Restoring destroyed wetlands such as streams and lakes to the ecosystem.

Protection of coastal and marine ecosystems with an integrated coastal zone management approach

Recognition and protection of all living things that are elements of the ecosystem and part of the urban culture.

Preserving the feeding and resting areas of bird species, especially migratory and visitor species, within the city.

Protection of water basins, surface and underground water resources

Reducing the vulnerability of urban facilities and infrastructure against climate risks and increasing the adaptation capacity (extreme heat waves, urban heat island, floods and floods)

Supporting the production of environmentally friendly products

Development of green and sustainable financing models.

Providing information and support that will facilitate the adaptation of sectors to green transformation

Increasing the quality of urban areas by determining design standards for sustainable construction that takes into account city-specific needs

Ensuring balanced spatial distribution of urban facilities that serve the whole city.

Protection of biocultural areas within built-up urban areas

Re-functioning and bringing unsustainable and idle areas into urban life in a way that will improve urban opportunities and create a vibrant and innovative city.

Creating public spaces that respond to the unique needs of the population living here through participatory processes, in line with the characteristics of different sub-regions. Developing accessible and lively coastal areas within the public open space system.

Chapter 4 :
Indicator Selection

4.1 Indicator Selection

4.1 Indicator Selection

Chapter 4 utilizes literature reviews, case studies, stakeholders, and territorial databases to propose an investigative methodology that can be executed in different contexts.

This section is of the utmost importance as it aims to measure the main urbanization and sustainability problems and the logic for choosing the proper indicators to address Istanbul's common problems. The indicators selected are crucial in guiding future urban planning and sustainability initiatives in Istanbul. In progress toward the global sustainability targets in identifying neighborhoods with various sustainability issues, using one assessment tool and methodologies eliminates the uncertainty and confusion that might be caused by using different tools.

The indicators have to match the city's goals and obstacles in order to make a healthy proposal for the one proposed opportunity to meet success. SNTool offers 134 indicators from 43 categories, with issues under 10. This work intends to choose the most crucial indicators for the case of Istanbul.

SNTools is an assessment system for measuring the sustainability of neighborhoods and urban areas. Its goal is to enhance public administration's capacity to deliver, implement, and monitor sustainability at the neighborhood scale. SNTool MED helps support decision making processes for the development, implementation, and monitoring of urban plans and action plans for more sustainable cities. SNTool can be contextualized and adapted to any Mediterranean region. (SNTool MED;2023)

Indicator Selections Methodologies

This research proposes a clean and basic investigation methodology that can be used in all urban contexts. As previously mentioned, this thesis plans to use urban regeneration strategies over gas stations to solve or ease urbanization challenges. First, we need to choose indicators to make a healthy site selection. In order to select the indicators, we can follow these principles to address the issues that can be improved with the project.

1. Literature Review

- Overview
  Conduct a comprehensive review of existing literature relevant to the thesis topic.

- Indicators and Issues
  Identify and summarize key indicators and issues mentioned in the reference projects.
  Evaluate the relevance and applicability of these indicators to the current thesis.

- Implementation Potential

2. Overview Study Analysis

- Selection of Overview Studies
  Choose case studies that address the issues highlighted in the problem statement.
  Provide a rationale for the selection of these case studies.

- Analysis
  Conduct a detailed analysis of each case study
  Focus on methodologies, outcomes, and lessons learned.

- Comparative Insights
  Compare the findings from different case studies.

3. Case Study Analysis
- Local Needs Assessment
  Assess the specific needs and problems of the city or local area.
  Conduct surveys, interviews, and data analysis to understand local context.

- Benchmarking
  Benchmark the local programs and plans against the findings from the case study analysis.

4. Selection of Indicators

- SN Tool

- Final Selection
  Choose the final set of indicators to be used in the thesis.

Literature Review

Urban regeneration is a complex process aimed at revitalizing urban areas, addressing economic, social, and environmental challenges. This review focuses on repurposing gas stations in Istanbul, particularly in the Bağcılar district, and explores global practices and subcategories such as green area availability, social aspects, quality of urban areas, climate change, population density, land use, socioeconomic status, overnumbered gas stations, and air quality.

Urban Regeneration: Concepts and Practices

Urban regeneration involves strategies for revitalizing urban areas through physical redevelopment, economic revitalization, and social integration (Couch et al., 2011). Istanbul has faced rapid urbanization, necessitating improved green spaces and infrastructure (Özdemir, 2012).

Green Area Availability

Green spaces offer ecological, social, and health benefits, mitigating heat islands, improving air quality, and providing recreation (Chiesura, 2004).

Transforming obsolete gas stations into parks can increase urban greenery, as seen in New York City's High Line and Seoul's Cheonggyecheon Stream Restoration

(Lindholm, 2013; Kim, 2012). In Bağcılar, repurposing gas stations can address the shortage of green spaces (Demir & Yılmaz, 2017).

Social Aspects

Urban regeneration projects must consider social impacts, including community cohesion and social equity (Dempsey et al., 2011).

Repurposing gas stations in Bağcılar can improve social aspects by creating inclusive public spaces, fostering community interaction, and providing equal access to amenities (Özdemir, 2012).

Quality of Urban Areas

Improving urban quality involves upgrading infrastructure and public spaces (Gehl, 2010). In Bağcılar, transforming gas stations can enhance urban quality by creating community hubs and promoting pedestrian-friendly environments (Özdemir, 2021).

Climate Change and Sustainability

Urban regeneration can mitigate climate change by promoting energy efficiency and resilience (Bulkeley & Betsill, 2005).

Repurposing gas stations in Istanbul can support sustainability goals by incorporating green infrastructure and renewable energy solutions (Özdemir, 2021).

Population Density and Land Use

Effective land use and densification strategies can enhance urban sustainability (Neuman, 2005). In Bağcılar, repurposing gas stations can support high-density development and provide essential amenities (Özdemir, 2012).

Socioeconomic Status

Urban regeneration can address socioeconomic disparities by creating job opportunities and improving access to services (Turok, 2005).

In Bağcılar, repurposing gas stations can support socioeconomic development and promote social equity (Yılmaz, 2020).

Air Quality

Improving air quality is crucial in urban areas. Introducing green spaces can filter pollutants and enhance air quality (Nowak et al., 2006). In Istanbul, transforming gas stations into green spaces can significantly improve air quality (Demir & Yılmaz, 2017).

Overnumbered Gas Stations

Istanbul faces an oversupply of gas stations, leading to inefficient land use (Ferrell, 2019). Repurposing these stations in Bağcılar can optimize land use and provide valuable community assets (Yılmaz, 2020).

Urban Planning Approach in Turkey

Turkey's urban planning has shifted towards sustainable development and social inclusion. Istanbul's Vision 2050 Strategic Plan and Climate Action Plan emphasize enhancing green spaces and integrating renewable energy (Istanbul Metropolitan Municipality, 2020; 2018). Repurposing gas stations aligns with these goals, particularly in Bağcılar, by converting underutilized spaces into community assets (Özdemir, 2012).

Conclusion

Urban regeneration through repurposing gas stations in Istanbul, especially in

Bağcılar, offers a promising approach to enhancing green spaces, improving social aspects, elevating urban quality, supporting sustainability, and improving air quality. By learning from global examples and considering local contexts, Istanbul can implement successful urban regeneration projects that enhance livability and sustainability. This strategy can serve as a model for other cities facing similar urbanization challenges.

Document Name	Indicator	Description
Mixed-Use Development	*Land Use Efficiency*	*Measures the effectiveness of land use in combining various functions.*
Mixed-Use Development	*Pedestrian Accessibility*	*Assesses the ease with which pedestrians can navigate and access different facilities.*
Mixed-Use Development	*Public Transportation Availability*	*Evaluates the presence and convenience of public transit options.*
Intermodal Connections	*Connectivity Index*	*Measures the ease of transferring between different models of transportation.*
Intermodal Connections	*Station Accessibility*	*Evaluates how easily people can access transportation hubs.*
Urban Green Spaces	*Park Area per Capita*	*Measures the amount of green space available per resident.*
Urban Green Spaces	*Usage Rates*	*Assesses hoe frequently the green spaces are used by the public.*
Urban Green Spaces	*Environmental Impact*	*Evaluates the benefits of green spaces in terms of air quality and biodiversity.*
Sustainability Measures	*Carbon Footprint*	*Assesses the overall greenhouse gas emissions associated with a developt.*
Alternative Transportation Refuelling	*Station Accessibility*	*Measures how conveniently lovated refueling stations are for users.*
Alternative Transportation Refuelling	*Emission Reduction*	*Assesses the decrease in harmful emissions due to the use of alternative fuels.*
Operational Efficiency	*Performance Metrics*	*Measures the efficiency and reliability of urban services*
Operational Efficiency	*Environmental Impact*	*Evaluates the reduction in environmental harm due to efficient practices.*

Table 4-1: Related Document Analysis

4.1.2 Overview Study Analysis

New York Green Space Strategy

New York City's strategy, as outlined in the OneNYC 2050 plan, focuses on providing equitable access to green spaces. The plan ensures that 81.7% of residents are within a 10-minute walk to a park, aiming for 85% access by 2030. Key projects include the Community Parks Initiative, which develops parks in underserved neighborhoods, and the OneNYC Plaza Equity Program, which transforms underused spaces into pedestrian plazas. The strategy also emphasizes green mobility through the development of bike networks and the improvement of air quality.

London Green Space Strategy

London's strategy, outlined in the 2021 London Plan, aims to use the city's strengths to overcome weaknesses and benefit everyone. The plan's objectives include creating strong and inclusive communities, making best use of land, and delivering the homes Londoners need. Specific policies focus on protecting and enhancing green infrastructure, such as the Green Belt and Metropolitan Open Lands. The strategy also highlights the importance of biodiversity, access to nature, and urban greening. Relevant indicators from this strategy include green urban areas in relation to the neighborhood population, electric vehicle infrastructure, and bicycle network.

Vienna Green Space Strategy

Vienna's strategy, as detailed in the Step 2025 Urban Development Plan, focuses

on protecting existing natural areas, completing the green belt, and connecting urban open spaces with natural areas. The plan includes creating new urban-scale recreation areas and establishing quality standards for green spaces in new developments. It also emphasizes the role of green infrastructure in climate change adaptation. Indicators derived from Vienna's approach include greenhouse gas emissions, permeability of land, and particulate matter concentration.

4.1.3 Case Study: Istanbul

Istanbul's urbanization problem has grown over the years due to political and economic decisions leading to discontinuous urban planning and an overgrowing population, which has accelerated problems for the city and its people.

For the last ten years, the Municipality of Metropol Istanbul has been working on city planning actions with all the departments together to create sustainable, economically affordable, and safe environments for its people.

The Istanbul Metropolitan Municipality, as described in a number of strategy papers (1, 2, 3, 4, 5, 7, 8) with the goal of leading the city's transformation to become a resilient, sustainable, and culturally active metropolis by the middle of the twenty-first century.

City planning, such as the "Istanbul Bicycle Master Plan" (4) and the "Kent Gündemi Sustainable Transportation" (1), implementing sincere planning and action plans to transform the city transportation system's sustainable and improved urban connection.The "Istanbul Sustainable Energy and Climate Action Plan" (7) and the "Istanbul Climate Change Action Plan" (2) describe the plans for becoming carbon-zero and strong resilience against climate change. Which parallels the long-term

planning of the urban environment "Vizyon 2050 Strateji Belgesi" (3). Also, the "YAYSIS Strategy Document" (5) and the "4_SENTESIS_ REPORT" (8) are offering strategies for infrastructure growth and sustainability across many sectors.

As seen in these publications, the Istanbul Metropolitan Municipality has made a concerted effort to incorporate sustainable practices into all facets of urban life. The ultimate goal is to enhance environmental health, cultural diversity, and overall quality of life as Istanbul moves closer to its 2050 strategic vision. The "Vizyon 2050 Strateji" (3) offers a longterm plan for improving the urban and cultural environment for th city

Furthermore, the city's planning agencies have created the "YAYSIS Strategy Document" (5) and the "4_SENTESIS_REPORT" (8), which provide comprehensive strategies for infrastructure growth and sustainability across many sectors. As seen in these publications, the Istanbul Metropolitan Municipality has made a concerted effort to incorporate sustainable practices into all facets of urban life. The ultimate goal is to enhance environmental health, cultural diversity, and overall quality of life as Istanbul moves closer to its 2050 strategic vision. These publications show Istanbul's various strategies for overcoming its urban, environmental, and cultural issues through targeted problem execution and strategic planning.

The main goals are improving environmental sustainability, maintaining strong and inclusive urban infrastructure, and boosting urban mobility. By the middle of the twenty-first century, Istanbul intends to become a dynamic, sustainable, and pleasant global city, and these reports show that goal.This part connects the strategic efforts reported on in different reports, highlighting Istanbul's approach to developing into a more systematic, well planned, and sustainable metropolis.

	Document Name	Publication Date	Content	Responsible Department
1	*Sustainable Transportation*	*November 2023*	*Focuses on sustainable urban mobility strategies in Istanbul.*	*Istanbul Transportation Planning Directorate*
2	*Istanbul Climate Change Action Plan*		*Outlines strategies for achieving a carbon-neutral and climate-resilient Istanbul by 2050.*	*Environmental Protection Directorate of IMM*
3	*Vision 2050 Strategy Document*	*April 2020*	*Strategy document for Istanbuls urban and cultural devolopment up to 2050.*	*Not specified in the extracted content*
4	*Istanbul Bicycle Master Plan*		*Details plans for enhancing bicycle infrastructure and promoting cycling in Istanbul.*	*Istanbul Transportation Planning Directorate*
5	*YAYSIS Strategy Document*		*Document outlines strategic goals for urban sustainability and infrastructure.*	*Istanbul Planning Agency*
6	*Executive Summary*		*Provides an executive summary of a broader report,likely related to urban planning or policy*	
7	*Istanbul Sustainable Energy and Climate Action Plan*		*Discusses comprehensive strategies for sustainable energy and climate actions in Istanbul.*	*Istanbul Metropolitan Municipality Environmental Protection*
8	*4_Sentesis_Report*		*Analyzes various sustainability initiatives*	*Istanbul Sustainability Strategy Department*

Table 4-2: Related Document Analysis

4.1.4 Social Acceptance

1. Access:

A high percentage of the participants stated that green areas were insufficient, pedestrian circulation was not comfortable, they supported the use of bicycles, and a significantly high rate of 64.5% stated that they could reach green areas by walking for more than 5 minutes.

2. Usage and Purpose:

The participants stated that they use green areas a few times a week or once or twice a month, generally between 12.00 and 18.00, on weekends for 1-4 hours and in the summer;They also stated that they mostly go to green areas with their families to spend time or rest/get fresh air, and that they bring ready meals with them when they eat.

3. Perception and Expectation:

Participants stated that they found green areas with little or no trees at a high rate, that the most important problems in green areas were that the parks were not clean, user density and lack of equipment, and that they wanted children's activities to be held in green areas in their immediate surroundings.

4. Awareness and Satisfaction:

A high percentage of participants stated that they did not want vertical gardens to be removed, they wanted new parks to be built as large green areas such as

neighborhood parks or urban forests, they wanted to see sand and wooden materials in children's playgrounds.They stated that game for 5-9 age group opportunities should be more, that game opportunities are not sufficient for disabled children, that a sufficient number of activities have been carried out for the protection and development of wild rocks and that they have participated, but the activities can still be increased.

5.Satisfaction and Usage Information:

Some of the participants are very satisfied with the quality of the parks, some of them are undecided, they find the green areas inadequate, circulation is not comfortable, they generally use them for rest and walking/walking a few days a week, they do not do sports in the parks, and those who do do sports 1-2 hours a day.

They do not follow the social media accounts of IMM Parks, Gardens and Green Areas Department, they do not want to volunteer in activities held in green areas, they can reach the nearest park from their homes on foot in 5 minutes, they generally use green areas for 1-2 hours between 12.00-18.00, they do not go to parks. They stated that they came with their friends, that they also used parks outside the neighborhood where they lived, that they generally came to rest/get fresh air and spend time with family/friends, that the current situation in the parks needed to be improved, that the landscape designs looked nice, but were inadequate in terms of maintenance-repair, disabled people and activities.

General Conclusion:

When the results of are evaluated, it is revealed that the participants can mostly

access green areas in Istanbul in 0-10 minutes, but pedestrian circulation in green areas is not comfortable and the amount of green areas and equipment are inadequate.In addition, it can be said that urban residents prefer to use neighborhood parks and spend time in these areas mostly on weekends at noon and for 1-2 hours to rest/get fresh air or get together with their family/friends.

Participants stated that green areas are not suitable for disabled people, that they are inadequate in terms of security, activities and play opportunities, that these should be improved, and that more afforestation should be in open green areas.

4.2 Final Selection

SN Tool:

The SN (Selection and Neighborhood) tool is an indicator selection system often used in the context of urban planning and regeneration to help identify the most relevant indicators for monitoring and evaluating projects. This tool aids in selecting appropriate indicators from a large set by applying systematic criteria to ensure the chosen indicators align with specific project goals and contexts. SNTool MED. (2023)

SN Tool for Indicator Selection in Urban Regeneration

Overview:

The SN tool helps urban planners and researchers select indicators that are most suitable for assessing the progress and outcomes of urban regeneration projects. This tool is particularly valuable in complex settings where numerous potential indicators could be used, but only a subset will effectively capture the desired information.

In Turkey, and specifically Istanbul, the SN tool can support urban regeneration efforts by selecting indicators that address the unique challenges of rapid urbanization and socio-economic disparities. For example, indicators might include green space per capita, access to public transportation, and local economic development metrics.

Methodological Use:

1.Systematic Criteria Application:

The SN tool applies a set of predefined criteria to evaluate and select indicators. This includes relevance, reliability, feasibility, and sensitivity to changes.

2.Data Envelopment Analysis:

Techniques like data envelopment analysis (DEA) and machine learning algorithms are employed to refine the selection process. These methods help in optimizing the indicator set to ensure comprehensive and efficient monitoring.

3.Participatory Approaches:

Incorporating feedback from stakeholders through participatory approaches ensures the selected indicators meet community needs and project objectives.

Conclusion

The SN tool for indicator selection is a valuable asset in urban regeneration, helping planners and researchers choose the most relevant and effective indicators. Its

methodological rigor and adaptability to different contexts make it an essential component of modern urban planning and regeneration efforts.

This thesis aims to examine the regeneration process of Istanbul's gas stations. In Istanbul, the repurposing of gas stations into public parks or other versatile spaces can address urbanization challenges such as the scarcity of green areas and the need for charging infrastructure. The intention is to create a model that can be applied globally. Therefore, the SNTools have been chosen as the most suitable indicators for this study, as they are designed for Mediterranean cities to develop, implement, and monitor urban and action plans for more sustainable cities.

In selecting indicators, several key considerations were prioritized: the relevance of each indicator to the research topic, the local scale of investigation, the presumed availability of data, and the ease of calculating and measuring the indicators. Following an extensive review of literature, case studies, and local data, the focus was narrowed to five key issues. From an initial pool of 134 potential indicators.

Chapter 4 employs a comprehensive methodology that integrates literature reviews, case studies, stakeholder input, and territorial databases to propose an investigative framework adaptable to various urban contexts. This methodology is critical in measuring the main urbanization and sustainability challenges specific to Istanbul, thereby guiding the selection of appropriate indicators to address these issues.

The process began with a clear definition of the thesis goals and objectives, identifying the core principles and problems to be addressed. An exhaustive literature review followed, synthesizing key insights and identifying essential categories for urban sustainability, such as land use, transportation, social aspects,

climate change mitigation, and environmental quality. These categories are pivotal for cities like Istanbul to develop resilient and inclusive urban planning strategies. Case studies from cities like New York, London, and Vienna provided practical insights into effective urban green space strategies. New York's OneNYC 2050 plan, London's 2021 London Plan, and Vienna's Step 2025 Urban Development Plan highlight the importance of equitable access to green spaces, green mobility, and biodiversity. These case studies informed the selection of relevant indicators, including population density, availability of urban green areas, and public transport system performance.

Local needs assessments and benchmarking against these case studies enabled the contextualization of indicators specific to Istanbul's unique challenges. This process involved surveys, interviews, and data analysis to ensure the selected indicators are both relevant and feasible. The final selection of indicators was based on their relevance to the identified issues, feasibility, measurability, and potential impact.

The 14 selected indicators, including the six KPIs, align with the city's goals and challenges, ensuring that the proposed urban regeneration strategies are effective and sustainable.The next chapter will present these indicators in detail, including their purpose, data sources, assessment methods, and results. SNTool offers 134 criteria from 43 categories, which is under 10 issues with different weights. This work intends to choose the most crucial indicators for the case of Istanbul.

The urban fabric of Istanbul, with its historical legacy and rapid contemporary expansion, presents a compelling case for sustainable neighborhood assessment. This analysis leverages selected indicators from the Sustainable Neighbourhood Tool (SNTool) to gauge the city's diverse urban sustainability.

The indicators chosen align with key aspects of urban sustainability:

- Urban Structure
- Environmental Quality
- Transportation and Mobility
- Social Aspects
- ClimateChange:MitigationandAdaptation

Issues	*Categories*	*Indicator*	*Unit of Measurement*
Use of Land Biodiversity	*Urban Structure*	*Population Density*	*Inhabitant/km2*
		Availability of green urban areas	*%*
	Green Urban Areas	*Green areas in relation to the neighborhood population*	*m2/Inhabitant*
		Green area accessibility	*%*
Transportation And Mobility	*Performance And Mobility Services*	*Performance of the public transportation system*	*%*
	Green Mobility	*Electric vehicle infrastructure(charging stations)*	*N/Inhabitant*
		Bicycle Network	*M/Inhabitant*
		Availability of bicycle parking facilitires	*N/Inhabitant*
Social Aspect	*Availability of Public and Private Facilities and Services*	*Availability and proximity of Key Services*	*%*
	Socio-Economic Status	*Socio Economic Status Index*	*Score*
Environmental Quality	*Air Quality*	*Particulate matter (PM10) concentration*	*Day/Year*

Table 4-3: Selected Indicators

Chapter 5 :

Impact Assesment

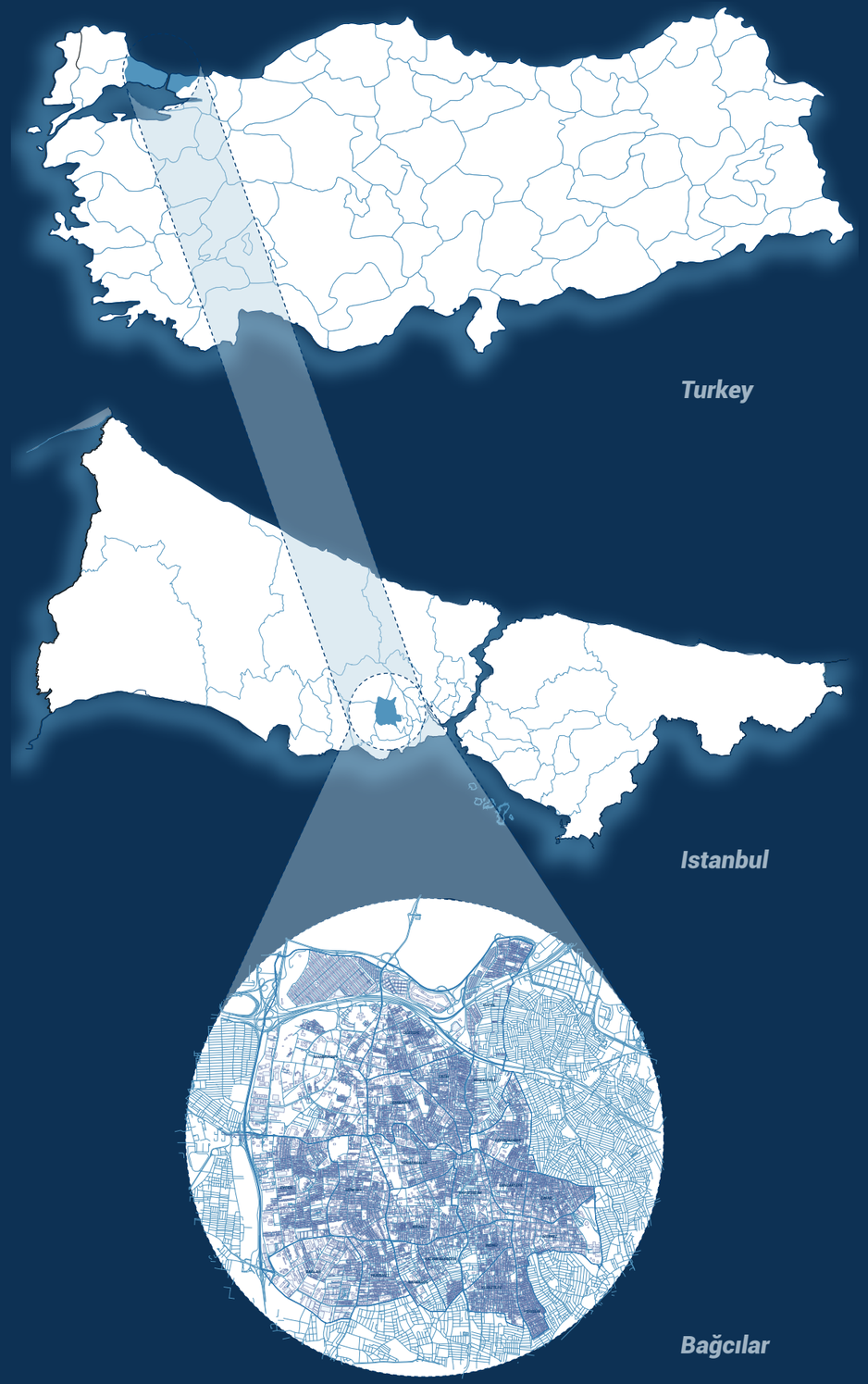


Table 5-1: Location of the Province


BAĞCILAR
YÜKSEKÖĞRETİM
ERKEK ÖĞRENCİ YURDU


Bağcılar Eğitim ve
Araştırma Hastanesi

Bağcılar as a Developing City

Bağcılar, one of the oldest settlements in Istanbul, was initially an area comprising 11 villages, but over time it became a single large village, and the urbanization process accelerated after the establishment of the municipality (Bağcılar District Directorate of National Education, 2019). It is located at the intersection of the D-100 highway and E-5 routes, which are important routes of Istanbul. It also hosts many industrial establishments and business centers.

Bağcılar, which is a small example of Turkey in terms of its demographic structure, is located in a narrow area of twenty-two square kilometers (Bağcılar Municipality, 2020). This location provides excellent connectivity, making Bağcılar an important residential and commercial hub within the Istanbul metropolitan area.Historically, Bağcılar was formed from the combination of the villages Mahmutbey, Bağcılar, and Kirazlı. The name "Bağcılar" reflects its past, as it means "vineyard owners" in Turkish. Over the past few decades, Bağcılar has rapidly urbanized from an agricultural area to a densely populated urban district, driven significantly by migration from Anatolia and Balkan countries.

This demographic shift has contributed to the district's diverse population (Journal of Design for Resilience in Architecture and Planning, 2024).Urban development in Bağcılar focuses on integrating modern infrastructure with sustainable planning practices. The district benefits from advanced rail systems, including metro and tram lines, which are essential for efficient public transportation. These systems are crucial for connecting residents to other parts of Istanbul and facilitating economic activities (Environmental Monitoring and Assessment, 2021).However, the rapid growth of Bağcılar also presents typical challenges of high-density urban areas, such as the need for improved public services and sustainable infrastructure.

Efforts are ongoing to enhance public transportation accessibility, expand green spaces, and develop modern residential and commercial projects to improve the quality of life for its residents (SpringerBriefs in Environment, Security, Development and Peace,2013).

Bağcılar, a district in Istanbul, has undergone significant land use transformation over the past few decades. Originally characterized by agricultural activities, the district has rapidly urbanized since the 1980s, transitioning into a densely populated urban area. This shift in land use has been driven by both internal development and significant migration from other parts of Turkey and neighboring regions.

Urbanization and Residential Development:

The rapid urbanization in Bağcılar has led to extensive residential development. The district's land, which once supported vineyards and other agricultural activities, is now dominated by high-density residential buildings. These residential areas accommodate the district's growing population, which has surged due to migration and natural growth. The shift from rural to urban land use is a common trend in many rapidly developing cities, driven by the need to provide housing and amenities to an increasing population (Environmental Monitoring and Assessment, 2021).

Commercial and Industrial Land Use:

In addition to residential areas, Bağcılar has seen substantial commercial and industrial development. The district's strategic location between major highways has made it an attractive site for businesses and industries. This development includes shopping centers, office buildings, and industrial facilities, contributing to the district's economic growth and providing employment opportunities for residents. The transformation from agricultural land to commercial and industrial use is significant, reflecting the district's integration into Istanbul's broader

economic framework (Journal of Design for Resilience in Architecture and Planning, 2020).

Infrastructure and Public Services:
The urbanization of Bağcılar has also necessitated the development of infrastructure and public services. This includes the construction of roads, public transportation systems like the metro and tram lines, schools, healthcare facilities, and recreational areas. These developments are essential for supporting the district's growing population and improving the quality of life for its residents. Infrastructure development is a critical aspect of land use planning, ensuring that urban areas can sustain their populations and economic activities (SpringerBriefs in Environment, Security, Development and Peace,2013).

Green Spaces and Environmental Considerations:
Despite the extensive urbanization, there is an ongoing effort to incorporate green spaces within Bağcılar. Parks and recreational areas are being developed to provide residents with areas for leisure and to enhance the environmental quality of the district. The integration of green spaces is an important aspect of sustainable urban planning, helping to mitigate the environmental impact of urbanization and improve the overall livability of the area.

Challenges and Future Directions:
The rapid urbanization and change in land use present several challenges, including the need for sustainable development practices to address issues such as overcrowding, traffic congestion, and environmental degradation. Future land use planning in Bağcılar will need to focus on sustainable practices, incorporating green building techniques, efficient public transportation, and the preservation of green spaces. Addressing these challenges is essential for ensuring the long-term sustainability and resilience of the district.

Air Quality in Bağcılar
Bağcılar, a densely populated district in Istanbul, faces significant air quality challenges due to rapid urbanization, high traffic volumes, and industrial activities. These factors contribute to elevated levels of pollutants, which negatively impact the health of the residents.The primary sources of air pollution in Bağcılar include vehicle emissions, industrial activities, and residential heating.

The district's strategic location near major highways like the TEM and E-5 results in heavy traffic, contributing significantly to air pollution. Emissions from vehicles release harmful pollutants such as nitrogen oxides, carbon monoxide, and particulate matter, which deteriorate air quality. (IQAir, 2023; Aerosol and Air Quality Research, 2021).

In conclusion, Bağcılar has transformed from a cluster of small villages into a densely populated urban district within Istanbul, reflecting broader trends of urbanization and migration. The district's strategic location and integration into major transportation routes have facilitated significant residential, commercial, and industrial development. While these changes have spurred economic growth and improved infrastructure, they also present challenges such as overcrowding, traffic congestion, and environmental degradation.

Efforts to enhance public services, expand green spaces, and implement sustainable development practices are crucial for addressing these challenges and ensuring the long-term livability and resilience of Bağcılar. Improving air quality and maintaining environmental standards will be essential for the health and well-being of its residents as the district continues to develop.

Legend:

- Metro/Tram Route
- Bus/Mini Bus Route
- Metro/Tram Stop
- Bus/Mini Bus Stop
- Secondary Roads

Mobility Map of Bağcılar

0 500m 1000 m 1500m 2000 m

Legend:

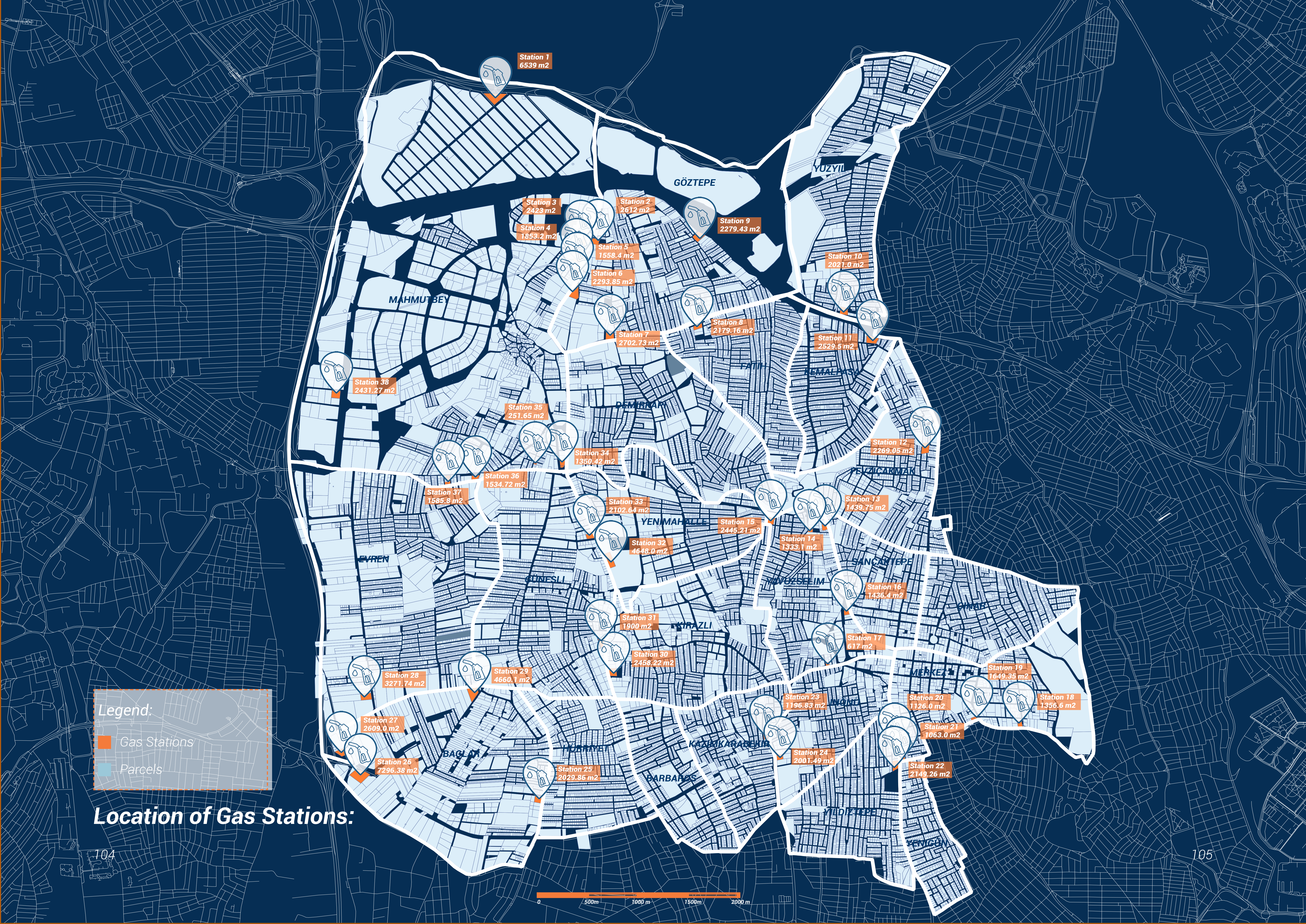
- Soft Cover (Grass)
- Active Green Area
- Passive Green Area
- Residential Area
- Commercial Area
- Brownfield
- Farmland
- Education Area
- Cemetery
- Industrial Area
- Communal Area
- Religious Area
- Residential Community
- Health Facilities
- Educational Buildings
- Sport Facilities
- Police Stations
- Community Buildings
- Super markets

Land-Use Map of Bağcılar

102

103

0 500m 1000m 1500m 2000m



Location of Gas Stations:

Station 1 - Mahmut Bey

Station 34 - Mahmut Bey

Station 7 - Göztepe

STATIONS	NEIGBORHOOD	SQUARE METER (m²)
Station 1	Mahmut Bey	6539 m²
Station 2	Göztepe	2612 m²
Station 3	Mahmut Bey	2423 m²
Station 4	Mahmut Bey	1853.2 m²
Station 5	Mahmut Bey	1558.4 m²
Station 6	Göztepe	2293.85 m²
Station 7	Göztepe	2702.73 m²
Station 8	Fatih	2179.16 m²
Station 9	Göztepe	2279.43 m²
Station 10	Yüzyıl	2021.0 m²
Station 11	Kemal Paşa	2529.5 m²
Station 12	Fevzi Çakmak	2269.05 m²
Station 13	Yavuz Selim	1439.75 m²
Station 14	Yavuz Selim	1333.1 m²
Station 15	Yavuz Selim	2445.21 m²
Station 16	Yavuz Selim	1436.4 m²
Station 17	Yavuz Selim	617.0 m²
Station 18	Merkez	1356.6 m²
Station 19	Merkez	1649.35 m²
Station 20	Yıldıztepe	1126.0 m²
Station 21	Merkez	1063.0 m²
Station 22	Yıldıztepe	2149.26 m²
Station 23	Kazım Karabekir	1196.83 m²
Station 24	İnönü	2001.49 m²
Station 25	Bağlar	2029.86 m²
Station 26	Bağlar	7296.38 m²
Station 27	Bağlar	2609.0 m²
Station 28	Evren	3271.74 m²
Station 29	Bağlar	4660.1 m²
Station 30	Kirazlı	2458.22 m²
Station 31	Güneşli	1900.0 m²
Station 32	Yenimahalle	4648.0 m²
Station 33	Güneşli	2101.64 m²
Station 34	Mahmut Bey	1350.42 m²
Station 35	Mahmut Bey	251.65 m²
Station 36	Mahmut Bey	1534.72 m²
Station 37	Mahmut Bey	1585.8 m²
Station 38	Mahmut Bey	2431.27 m²

Station 14 - Yavuz Selim

Station 19 - Merkez

Station 26 - Bağlar

5.2 Indicator Evaluation Province Level

5.2.1 Use of Land and Biodiversity

1. Urban Structure

1.1 Population Density

Intent
To evaluate the increase of the proximity between residents and local goods and services.

Indicator	Unit of Measure
Population density in built-up areas (neighbourhood area minus green and blue)	Inhabitants / km2

Assesment Methodology

1. Calculate the total neighborhood population.
(A) - numerator

Bagcilar population(2023): **719.071** Inhabitants

2. Calculate the total area of the neighborhood

Bagcilar Area: **22 km2**

3. Calculate the value of the indicator as A/B.
The result shall be expressed as number of persons per square kilometer.

Bagcilar Population Dessity =
32.685 Inhabitants / km2

Like many rapidly urbanized areas, Bagcilar faces challenges such as traffic congestion, high population density, and the need for improved public services. However, its strategic location and ongoing development projects present numerous opportunities for future growth. Bagcilar is the third most crowded district of Istanbul, with a population of 719.071 51% of the population is male, and 41% is female. Bağcılar has a population density of 32.685 inhabitants per square kilometer. This high population density presents unique challenges and opportunities for urban planning and the sustainable use of land.

5.2.1 Use of Land and Biodiversity

2.Green Urban Areas

2.1 Availability of green urban areas

Intent

To improve the permeability of the area and to benefit from the availability of green spaces (capturing pollutants, reducing the H heat island" effect, providing recreational spaces, etc.).

Proportion of all vegetated areas within the neighborhood in relation to the total area.	%

Assessment Methodology

1. Calculate the amount of vegetated areas (in hectares) in the neighborhood. (A) - numerator

2. Calculate the total area of the neighborhood . (B) - denominator

3. Calculate the value of the indicator as: A/B (%)

5.2.1 Use of Land and Biodiversity

2.Green Urban Areas

2.1 Availability of green urban areas

1.Data Source

Content	Format	Data Source
Istanbul Park and Green Area	xlsx	https://data.ibb.gov.tr/en/
Bagcilar 2023 Report	pdf	https://www.bagcilar.bel.tr/

Assessment method

1. Projection of the obtained data in the GIS software.
2. Through the "clip" geoprocessing tool, focus on the selected area.
3. Classification of the urban greenery. in order to analyze
4. Analyze the sq km by urban green area
5. Comparison with the Municipality report in order to verify the numbers
6. Calculation of the proportion of urban green in Bagcilar to the total area of Bagcilar [%]

According to the municipality's 2023 report, there are 176 parks and green spaces totaling 620,590 square meters, which only covers 2.86% of the Bagcilar District. That hints at the low permeability index and high UHI effects on the Bagcilar. When we check the parks on the map, it seems that these green areas lack integrity. They are sprawled around the district, which has increased their accessibility.

5.2.1 Use of Land and Biodiversity

2. Green Urban Areas

2.1 Availability of green urban areas

Province	Neigborhood	QUANTITY	AREA (m²)
Bağcılar	*100. Yıl*	*13*	*46174*
Bağcılar	*Bağlar*	*4*	*15095*
Bağcılar	*Barbaros*	*6*	*12715*
Bağcılar	*Çınar*	*10*	*11371*
Bağcılar	*Demirkapı*	*9*	*26245*
Bağcılar	*15 Temmuz / Evren*	*10*	*35685*
Bağcılar	*Fatih*	*5*	*5469*
Bağcılar	*Fevzi Çakmak*	*11*	*54186*
Bağcılar	*Göztepe*	*9*	*13188*
Bağcılar	*Güneşli*	*11*	*47613*
Bağcılar	*Hürriyet*	*8*	*17849*
Bağcılar	*Inönü*	*6*	*26885*
Bağcılar	*Kazım Karabekir*	*11*	*10408*
Bağcılar	*Kemal Paşa*	*6*	*8759*
Bağcılar	*Kirazlı*	*9*	*19618*
Bağcılar	*Mahmutbey*	*10*	*37048*
Bağcılar	*Merkez*	*10*	*107693*
Bağcılar	*Sancaktepe*	*7*	*11667*
Bağcılar	*Yavuz Selim*	*9*	*31361*
Bağcılar	*Yenigün*	*3*	*3125*
Bağcılar	*Yenimahalle*	*7*	*17510*
Bağcılar	*Yıldıztepe*	*2*	*4320*
Bağcılar	*intersections and medians*	*-*	*57206*
	TOTAL	***176***	***620590***

Bağcılar Green Space Area (2024): 0.620 km²
Bağcılar Area: 22 km²

Availability of Green Urban Areas = (0.620/22) = 3%

5.2.1 Use of Land and Biodiversity

2. Green Urban Areas

2.2 Green areas in relation to the neighborhood population

Intent
To improve the urban environment helping regulate air quality and climate, recharging groundwater supplies and protecting lakes and streams from polluted runoff.

Indicator	Unit of Measure
Total green area in the neighborhood by total population.	m' /inhabitant

Assessment Methodology

1. Calculate the total of green areas in the neighborhood (m2).
(A)- Numerator

2. Calculate the neighborhood's total population.
(B)-Denominator

3. Calculate the value of the indicator as:
A/B (m'/inhabitants)

1.Data Source

Content	Format	Data Source
Istanbul Park and Green Area	xlsx	https://data.ibb.gov.tr/en/

5.2.1 Use of Land and Biodiversity

2. Green Urban Areas

2.2 Green areas in relation to the neighborhood population

For the purpose of this analysis, the green areas are divided into 3 categories;

1. Passive Green Areas
-Forest Cover

2. Soft Green Areas
-Grassland
-Green Along The Road

3. Active Green Areas
-Urban Parks
-Neighborhood Gardens
-Green Play areas

Within the area analysis, these three categories were not all included in the calculation but were displayed and mentioned to understand the green fabric in the area. Soft Green Areas and Active Green Areas are included in the calculation of the availability of green urban areas. However, Passive Green Areas are not included in the calculation because they are not accessible to the public.

The number of inhabitants in the area was referenced from the 2023 municipality report published on the website. (https://www.bagcilar.bel.tr/BBImages/Slider/Image/bb_faaliyetraporu2023.pdf)

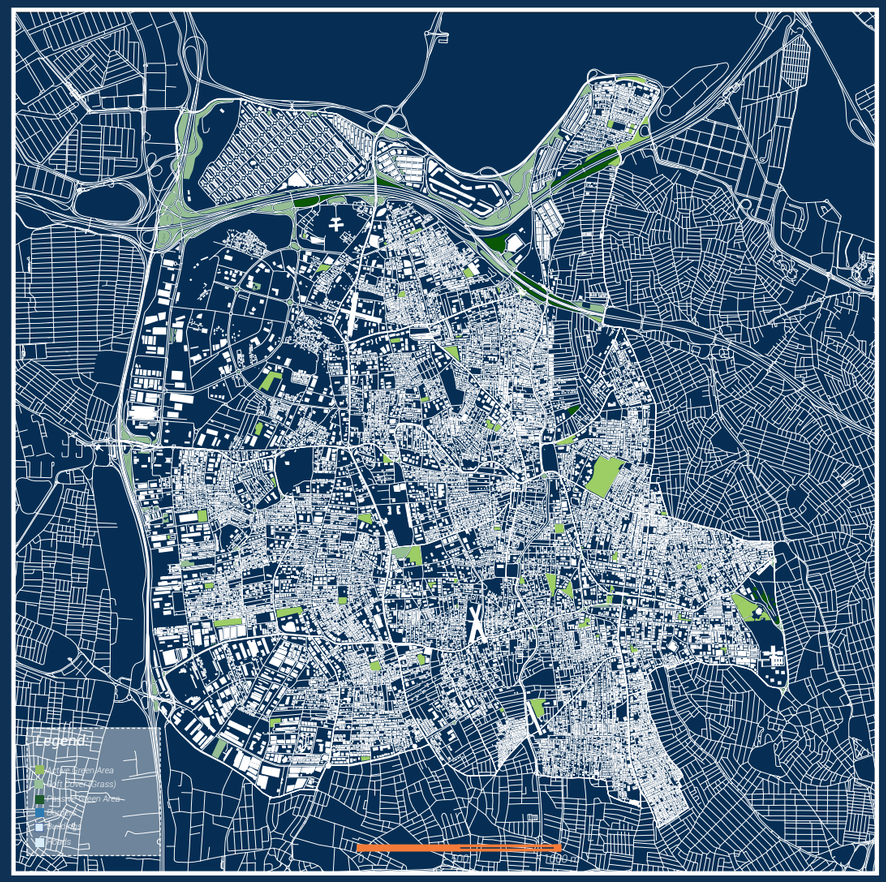
2.Assesment method

1. Projection of the obtained data in the GIS software.
2. Through the "clip" geoprocessing tool, focus on the selected area.
3. Classification of the urban greenery. in order to analyze
4. Analyze the sqm by urban green area
5. Analyse the total number of inhabitants
6. Calculation of the availability of urban green in Bagcilar [mq/inhabitants]

5.2.1 Use of Land and Biodiversity

1. Green Urban Areas

2.2 Green areas in relation to the neighborhood population



Bagcilar Green Space Area:(2024) : **620.590 m2**

Bagcilar Population : **719.071 Inhabitants**

Total green area in the neighborhood by total population.
= (620.590 / 719.071)% = 0.863 m2/Inhabitant

5.2.1 Use of Land and Biodiversity

1. Green Urban Areas

2.3 Green Area Accessibility

Intent

To work towards a higher quality of life for the neighborhood's inhabitants and to reduce the negative effects of the urbanization process.

Indicator	Unit of Measure
Percentage of buildings with accessibility to green areas in 200,400 and 500meter bufferzone.	%

Assesment Methodology

1. Calculate the number of buildings within 200,400 and 500 meter distance of a publicly accessible green space of at least 0.5 ha.
(A) - numerator

2. Calculate the neighborhood's total number of buildings.
(B)- denominator

3. Calculate the value of the indicator as:
A/B (%)

1.Data Source

Content	Format	Data Source
Istanbul Park and Green Area	xlsx	https://data.ibb.gov.tr/en/
OpenSteetMap- Building	GPKG	Qgis- GeoPackage

5.2.1 Use of Land and Biodiversity

1. Green Urban Areas

2.3 Green Area Accessibility

By analyzing the accessibility of green spaces within these concentric zones, rather than using a single buffer, we can gain a layered understanding of how green amenities are distributed in relation to population centers. This approach helps us identify areas of deficiency and assists in the strategic planning of urban green space distribution to improve living conditions in urban areas.

200 meters:

This distance represents a short, easily walkable range, typically used to assess immediate accessibility to small local parks and green areas.

400 meters:

Recognized as a standard measure for a 5-minute walk, 400 meters is used to evaluate access to community-serving green spaces, reflecting daily pedestrian routes.

500 meters:

This distance examines accessibility for those willing to walk slightly longer, useful for understanding the reach of larger parks that attract visitors from surrounding neighborhoods.

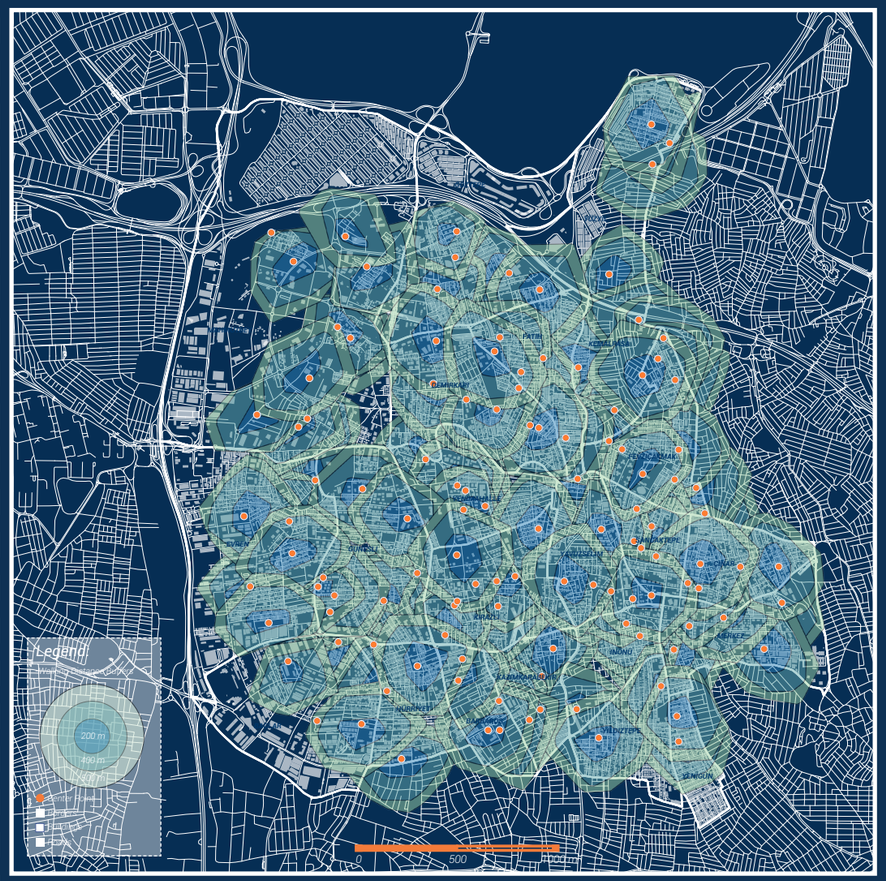
2.Assessment method

1. Projection of the obtained data in the GIS software.
2. Through the “clip” geoprocessing tool, focus on the selected area.
3. Classification of the urban greenery. in order to analyze.
4. Adding road and building data obtained from OpenStreetMap to create buffer zones for walking.
5. By using the ORC tool plugin to create 200m, 400m, and 500m buffer zones.
6. Counting the total number of buildings in the area.
7. Calculation of the buildings that are inside the buffer zones
8. Calculate the proportion of the total buildings to those in the buffer zones[%].

5.2.1 Use of Land and Biodiversity

Green Urban Areas

Green Area Accessibility



A: Number of buildings in the each bufferzone
500 meters =20.430
400 meters =18.970
200 meters=9.500
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**94,6%**
400 meters =**87,8%**
200 meters=**44,0%**

5.2.2 Transportation And Mobility

1. Performance And Mobility Services

1.1 Performance of the public transport system

Intent
To determine the performance of the public transportation system.

Indicator	Unit of Measure
Percentage of buildings that are within 200,400, and 500 meters walking distance of at lesat one public transportation service stop.	%

Assesment Methodology

1. Calculate the number of buildings within 200,400 and 500 meter distance of a accessible public transportation stops. (A) - numerator

2. Calculate the neighborhood's total number of buildings. (B)- denominator

3. Calculate the value of the indicator as: A/B (%)

1.Data Source

Content	Format	Data Source
Public Transport GTFS Data	xlsx	https://data.ibb.gov.tr/

5.2.2 Transportation And Mobility

1. Performance And Mobility Services

1.1 Performance of the public transport system

By analyzing the accessibility of public transportation stops within these concentric zones, rather than using a single buffer, we can gain a layered understanding of how transportation stops distributed in relation to population centers. This approach helps us identify areas of deficiency and assists in the strategic planning of urban green space distribution to improve living conditions in urban areas.

200 meters:
This distance is considered very convenient and represents a minimal walking effort. It is typically used to evaluate access to immediate, nearby transit options, ensuring that stops are within a quick, easy reach for daily commuters.

400 meters:
Often referred to as a standard walking distance in transit planning, 400 meters is approximately a 5-minute walk. This buffer is used to assess a reasonable walking distance for accessing more frequent or major transit services, such as busier bus lines or tram stops.

500 meters:
This extended distance caters to individuals who are comfortable walking a bit further, potentially enhancing access to rapid transit options like metro stations. It is useful for evaluating the catchment area of significant public transport services that serve larger urban areas.

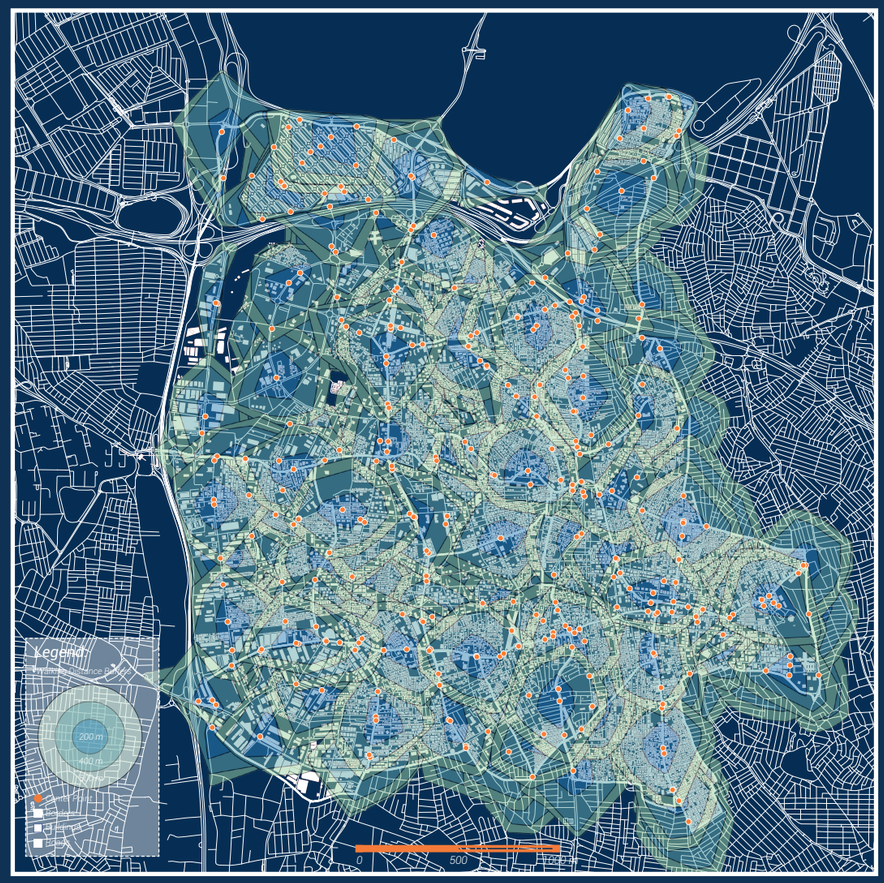
2.Assessment method

1. Locate the public/municipal transport stops with daily total service frequency of at least 20trips, that serve the neighborhood.
2. Through the "clip" geoprocessing tool, focus on the selected area.
3. Classification of the public transportation stops in order to analyze.
4. Adding road and building data obtained from OpenStreetMap to create buffer zones for walking.
5. By using the ORC tool plugin to create 200m, 400m, and 500m buffer zones.
6. Counting the total number of buildings in the area.
7. Calculation of the buildings that are inside the buffer zones
8. Calculate the proportion of the total buildings to those in the buffer zones[%].

5.2.2 Transportation And Mobility

1. Performance And Mobility Services

1.1 Performance of the public transport system



A: Number of buildings in the each bufferzone
500 meters =21.563
400 meters =21.167
200 meters=13.269
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**99,8%**
400 meters =**98%**
200 meters=**61,4%**

5.2.2 Transportation And Mobility

2. Green Mobility

2.1 Bicycle network

Intent

To emphazise the use of bicycles as a method to reduce traffic congestion and pollution.

Indicator	Unit of Measure
Total length of bicycle paths in the neighborhood per inhabitant.	m/inhabitants

Assesment Methodology

1.Calculate the total length of bicycle paths/lanes in the neighborhood.
(A)- Numerator
2. Estimate/calculate the total number of inhabitants in the neighborhood.
(B)-Denominator
3. Calculate the indicator as:
A/B

District Name	Stage Name	Stage Length (km)
Bağcılar	*ISTOÇ Metro Station-Arnavut State Hospital Route*	*0.3 km*
Bağcılar	*Bağcılar District Bahar Street Bicycle Path*	*1.6 km*
Bağcılar	*Bağcılar District Streen Bicycle Path*	*1.7 km*
Bağcılar	*Bağcılar District Tay Ocak Bicycle Path*	*3.0 km*
	Total	6.6 km

1.Data Source

Content	Format	Data Source
ISTANBUL BICYCLE MAP	geojson	https://bisiklet.ibb.istanbul/

5.2.2 Transportation And Mobility

2. Green Mobility

2.1 Bicycle network

(A) Length of bicycle paths/lanes (m) = 6600 meters

(B) Neighborhood's population = 719.071 Inhabitants

Calculate the indicator as:
A/B = 6600/719.071 = 0,0092m/inhabitants

5.2.2 Transportation And Mobility

2. Green Mobility

2.2 Availability of bicycle parking facilities

Intent

To promote cycling as an alternative to vehicle use by providing a safe and efficient mobility network.

Indicator	Unit of Measure
Bicycle parking spaces per inhabitant	N/inhabitants

Assesment Methodology

1. Calculate the number of bicycles parking available in the neighborhood.
(A)- Numerator
2. Calculate the neighborhood's population.
(BJ-Denominator
3. Calculate the indicator as:
A/B

(A) Bicycles parking = 6 spot approximately **100 bike** capacity
(B) Neighborhood's population = **719.071** Inhabitants
A/B = 100/ 719.071 = 0.00014 (insufficient)

Using bicycles is a sustainable and healthy transportation option for developed cities worldwide. As it was mentioned before the existence of, bicycle paths in Istanbul are only present in national parks and coastal parks. The case of the Bagcilar problem is the same as the city. The current bicycle network in Bağcılar is too sparse to calculate meaningful statistics. Such as the bicycle parking stops, as we can see in the figure that, there are only 6 parking spots which is not intersect with the paths.

1.Data Source

Content	Format	Data Source
ISTANBUL BICYCLE MAP	geojson	https://bisiklet.ibb.istanbul/

5.2.2 Transportation And Mobility

2. Green Mobility

2.3 Electric vehicle infrastructure (charging stations)

Intent

To promote the use of electric vehicles

Indicator	Unit of Measure
Electric vehicle's charging stations per inhabitant	N/inhabitants

Assesment Methodology

1. Calculate the number of charging stations for electric vehicles.
(A)- Numerator
2. Calculate the neighborhood's population.
(BJ-Denominator
3. Calculate the indicator as:
A/B

(A) Charging stations = 49 spot approximately **250 car** capacity
(B) Neighborhood's population = 745.125 Inhabitants
A/B = 250/ 719.071 = 0.00035 per inhabitants (insufficient)

In recent years, particularly within the past five years, the sales of electric vehicles (EVs) in Turkey have shown a remarkable upswing, mirroring the global trend. Unfortunally Turkey doesn't have enough charging points against the remarkable use of EV cars.

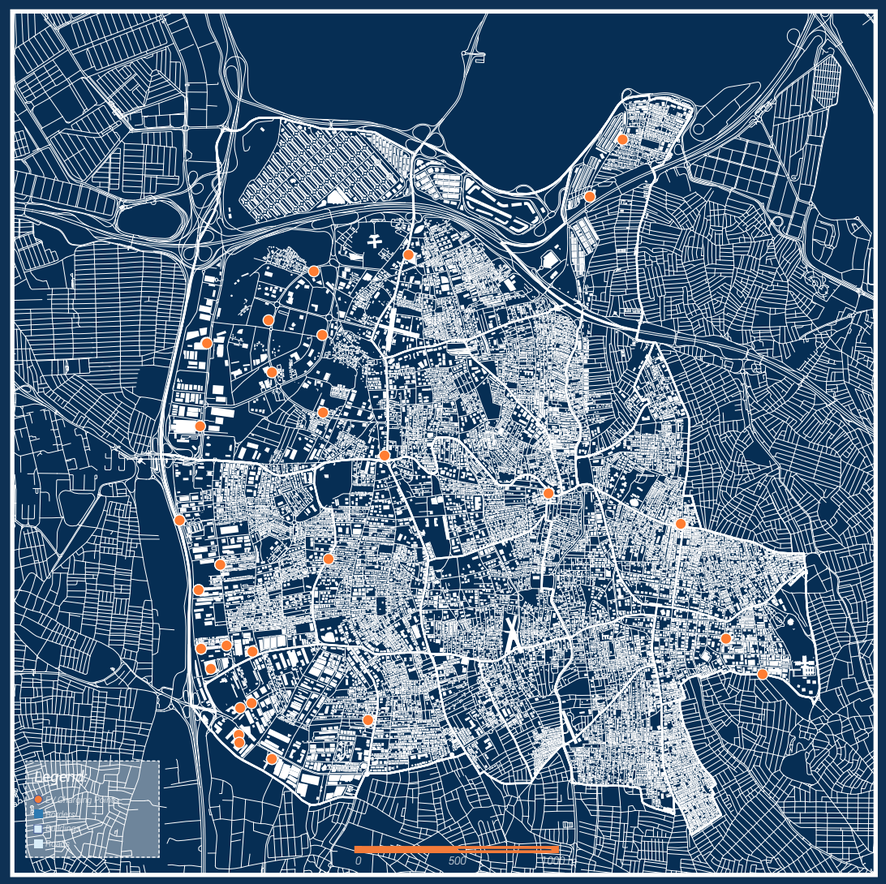
1.Data Source

Content	Format	Data Source
EPDK Charcging Stations List	cvs	https://lisans.epdk.

5.2.2 Transportation And Mobility

2. Green Mobility

2.3 Electric vehicle infrastructure (charging stations)



Personal EV car use has rapidly increased over the years. In order to use these EV cars efficiently and increase demand, infrastructure should be well distributed in the city. According to EPDK's app where you can see bunch of brands charging stations current number of public charging statinons in Istanbul are onethousand four hundred and eighty six. For the district of Bagcılar has approximately 0.00035 charging stations per inhabitant total number of 49 stations and 250 spot, indicating a critical need for expanded infrastructure to support the growing number of electric vehicles and promote sustainable transportation.

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Availability of Proximity of key Services

Intent

To determine the accessibility and proximity of key services for local residents (e.g. schools, sport facilities, supermarkets, community buildings, etc.)

Indicator	Unit of Measure
Percentage of inhabitants that are within a 200,400 snf 500 meter of at least 3 key services.	%

Assesment Methodology

1. Identify the location of the key services in the local area.
2. Calculate the percentage of the inhabitants that are within a 200, 400, 500 meters walking-distance from at key services.

Selected key services:
1. Schools
2.Sports Facilities
3.Supermarkets
4.Community Buildings
5.Health Services

1.Data Source

Content	Format	Data Source
OpenStreetMap	geojson	

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Availability of Proximity of key Services

By analyzing the accessibility of key services within these concentric zones, rather than using a single buffer, we can gain a layered understanding of how services are distributed in relation to population centers.

200 meters:
This distance is used to evaluate very close and convenient access, ideal for ensuring that essential services are within a quick and easy walking reach for residents.

400 meters:
Serving as a standard benchmark, a 400-meter buffer is used to assess whether key services are accessible within a typical 5-minute walk, supporting daily needs and activities.

500 meters:
This extended range is considered for evaluating access to services that residents might be willing to travel slightly longer distances to utilize, enhancing service availability across a broader area.

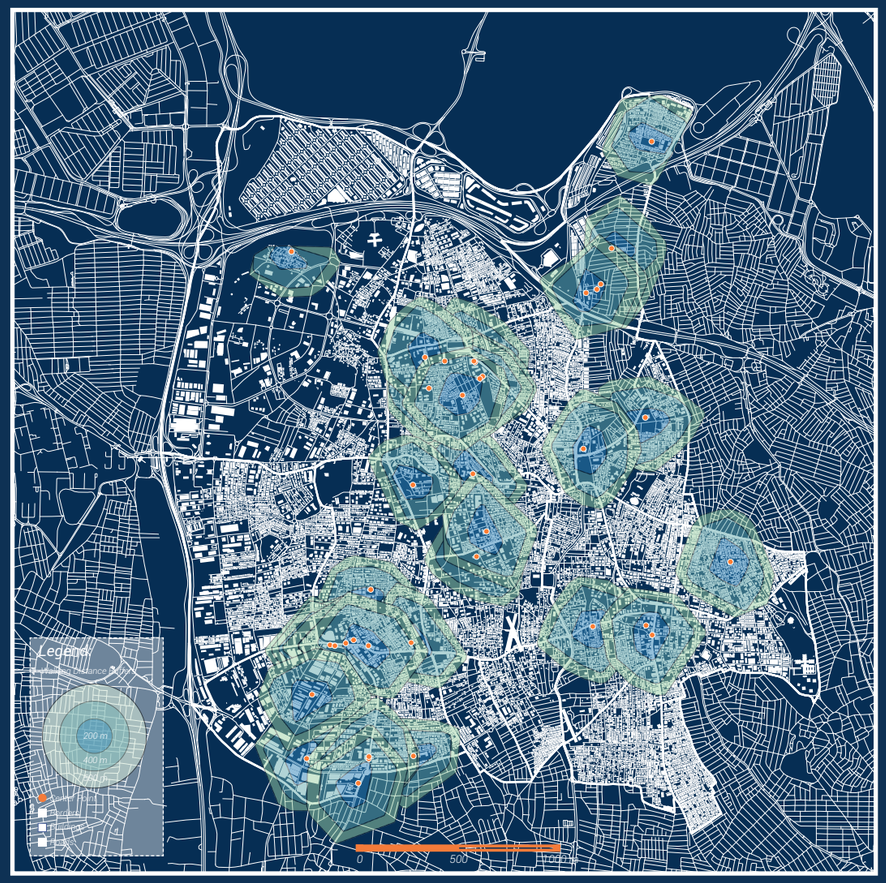
2.Assessment method

1. Locate the service areas with significant daily usage, such as schools, sports facilities, supermarkets, community buildings, and health services that are crucial for the neighborhood.
2. Through the "clip" geoprocessing tool, focus on the selected area containing these services.
3. Classify the service areas in order to analyze their types and functions within the community.
4. Adding road and building data obtained from OpenStreetMap to create buffer zones for walking.
5. By using the ORC tool plugin to create 200m, 400m, and 500m buffer zones.
6. Counting the total number of buildings in the area.
7. Calculation of the buildings that are inside the buffer zones
8. Calculate the proportion of the total buildings to those in the buffer zones[%].

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Education

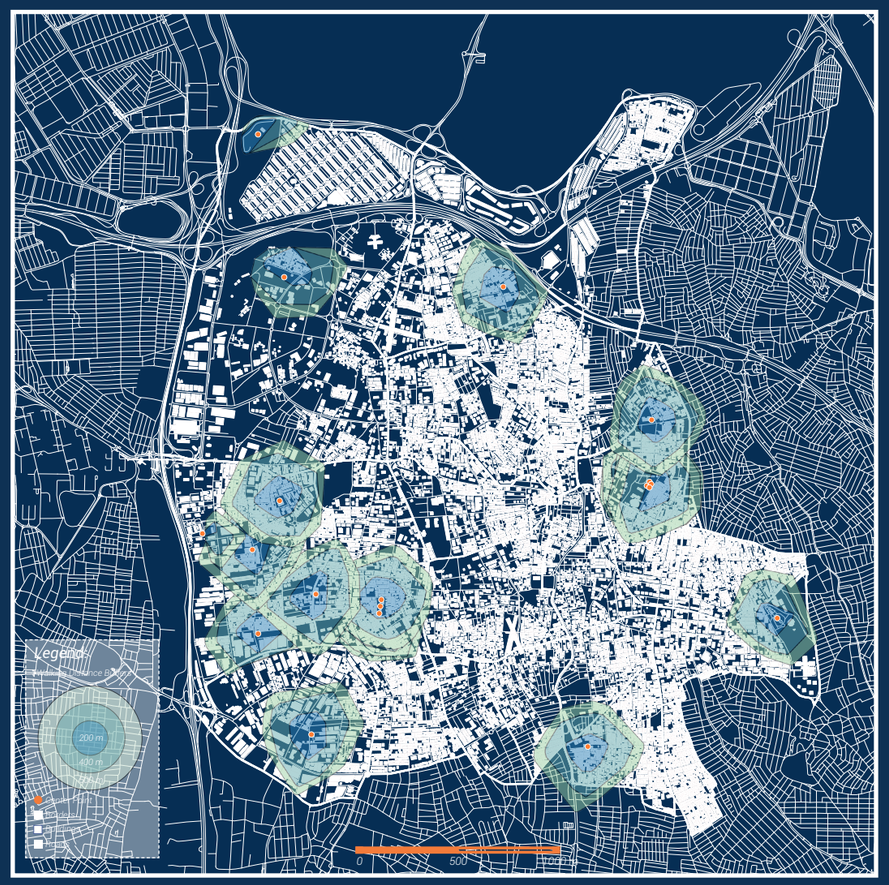


A: Number of buildings in the each bufferzone
500 meters =9.825
400 meters =7.297
200 meters=2.224
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**45.5%**
400 meters =**33.8%**
200 meters=**10.3%**

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Sports Facilities

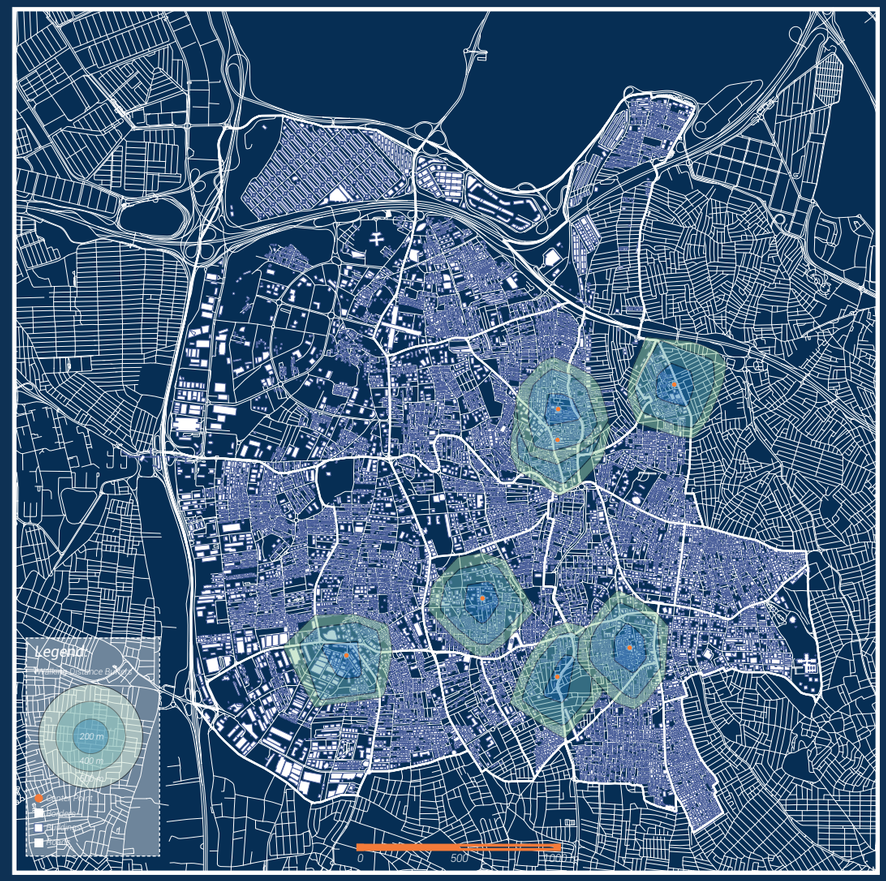


A: Number of buildings in the each bufferzone
500 meters =6.727
400 meters =5.109
200 meters=1.655
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**31.1%**
400 meters =**23.6%**
200 meters=**7.7%**

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Community Buildings

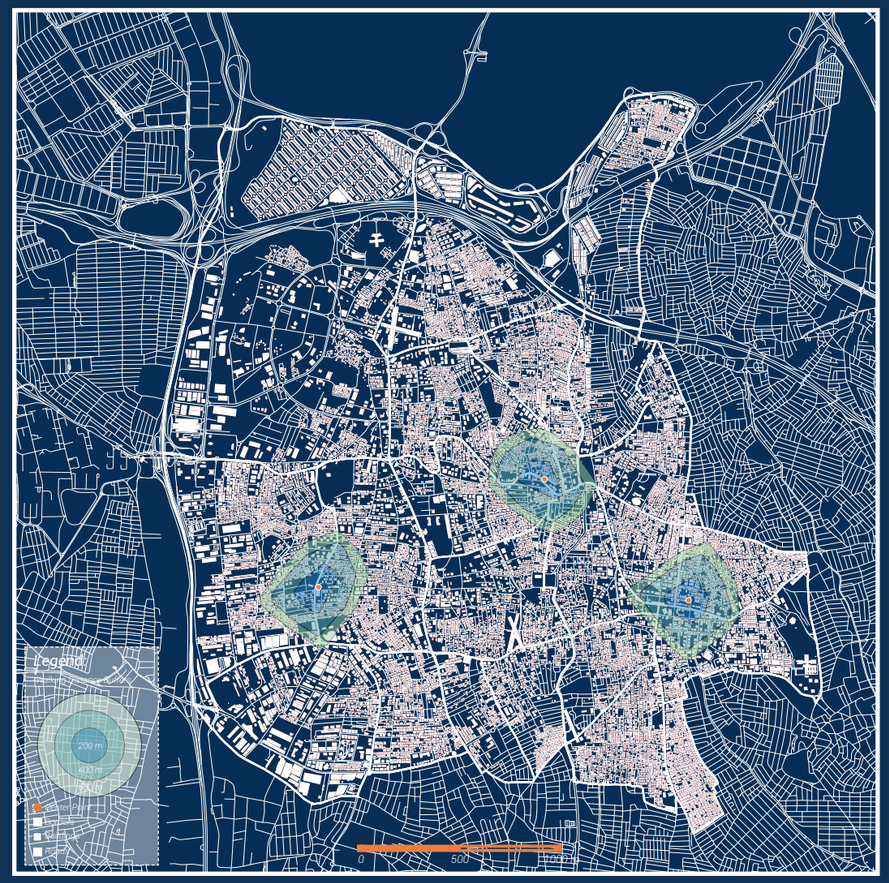


A: Number of buildings in the each bufferzone
500 meters =3.481
400 meters =2.290
200 meters=602
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**16.1%**
400 meters =**10.6%**
200 meters=**2.8%**

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Emergency Police

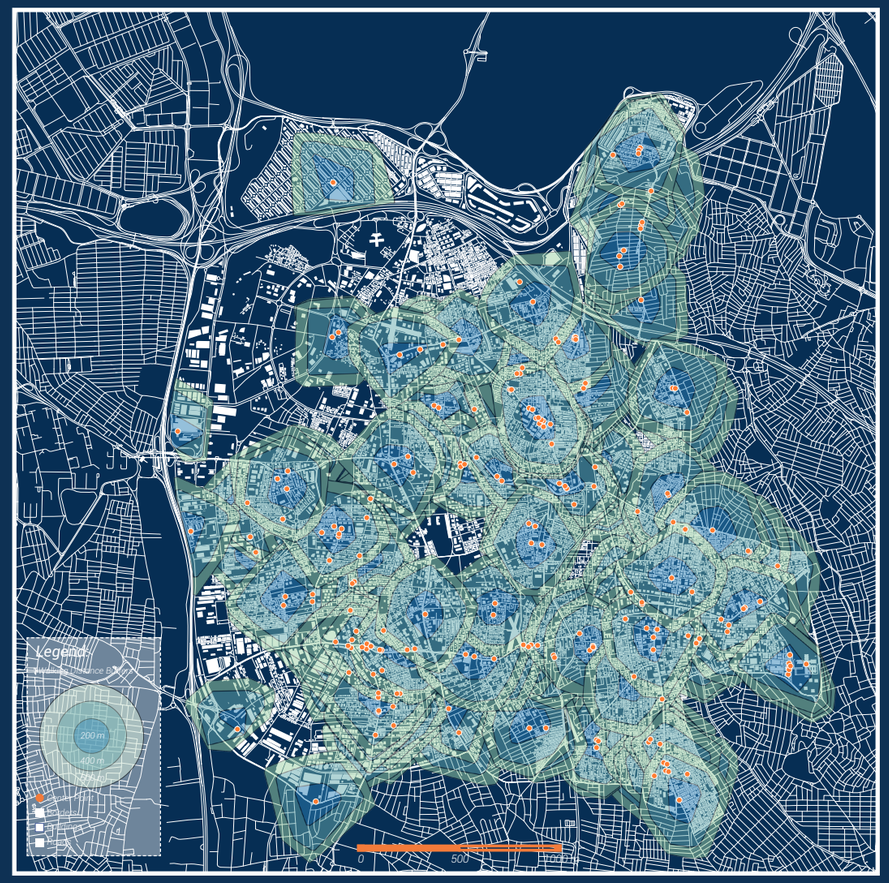


A: Number of buildings in the each bufferzone
500 meters =2.458
400 meters =1.491
200 meters=287
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**11.4%**
400 meters =**6.9%**
200 meters=**1.3%**

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Health Activities

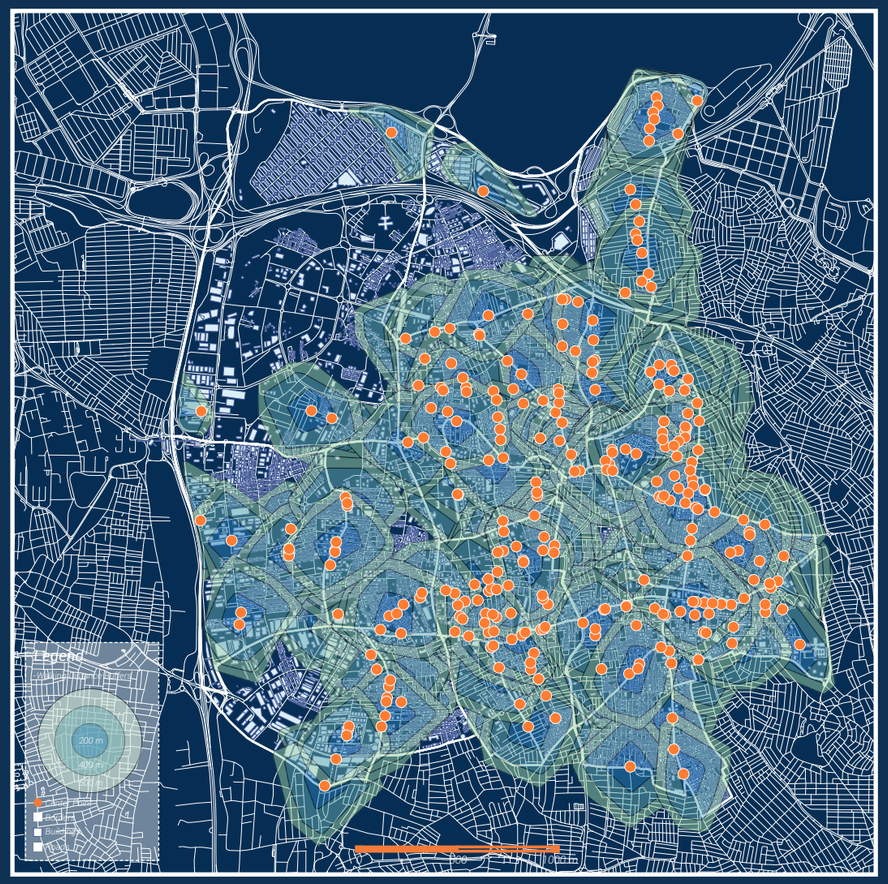


A: Number of buildings in the each bufferzone
500 meters =19.765
400 meters =18.576
200 meters=11.069
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**91.5%**
400 meters =**86%**
200 meters=**51.2%**

5.2.3 Social Aspects

1. Availability of Public and Private Facilities and Services

Supermarkets



A: Number of buildings in the each bufferzone
500 meters =19.765
400 meters =18.122
200 meters=12.141
B: Total Number of buildings in the area = **21.606**
A/B=%
500 meters =**89.9%**
400 meters =**83.9%**
200 meters=**56.2%**

5.2.3 Social Aspects

2. Socio-Economic Status

Socio Economic Index

Intent
The SEI measure is derived from a mix of input variables on topics such as income and poverty,

Indicator	Unit of Measure
Education Variable and Profession Variable	SES Score

Assesment Methodology

SG= E + P
SG: SES Group (includes SES Score)

E: Education Variable
P. Profession Variable

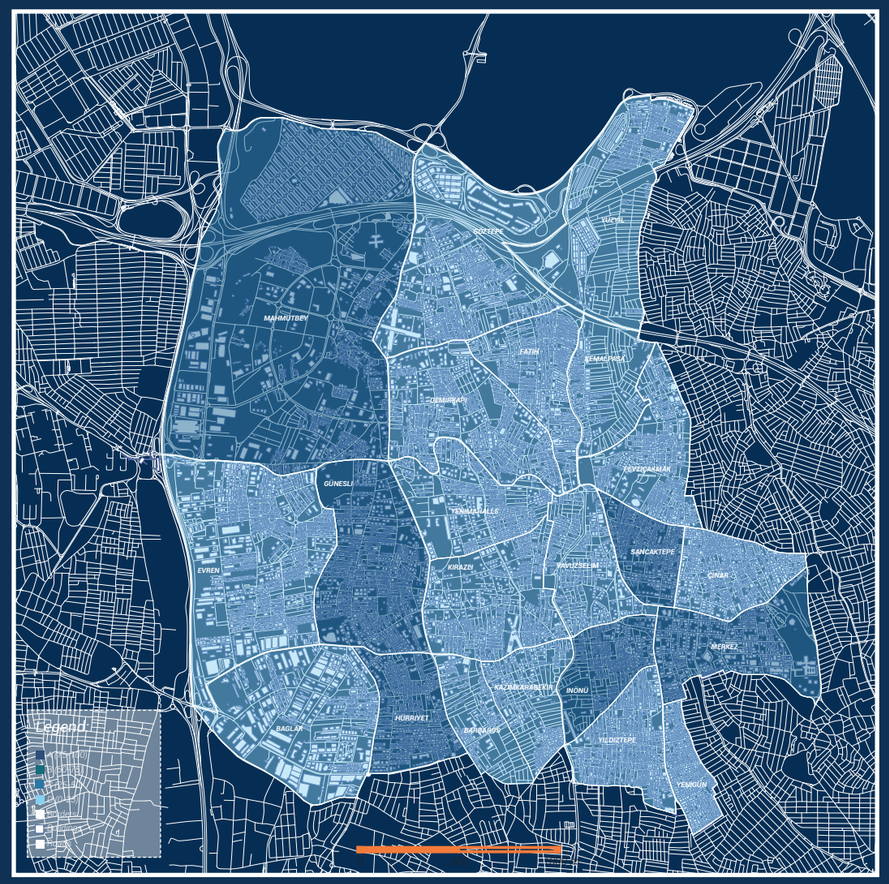
There is a multi-criterion scoring system in the SES index. Using official statistics from various institutions and organizations in the SES index, a SES score was calculated for each neighborhood.

According to this index, two basic criteria were used to understand the socio-economic levels of individuals. These are education level and occupation variables. The Components of the SES Index are formulated as follows (Mahallem İstanbul Projesi, 2016).

5.2.3 Social Aspects

2. Socio-Economic Status

Socio Economic Index



By the SES index, eight groups were identified as A+, A, B+, B, C+, C, D, and E. According to the multi-criteria evaluation (Mahallem İstanbul Project, 2016), the neighborhoods with the highest SES index are at the A+ and A levels, while the neighborhoods with the lowest SES index are at the D and E levels.

5.2.3 Social Aspects

2. Socio-Economic Status

Socio Economic Index

Province	Neigborhood	SES	SES SCORE
Bağcılar	100. Yıl	D	25
Bağcılar	Bağlar	C	37,5
Bağcılar	Barbaros	D	25
Bağcılar	Çınar	D	25
Bağcılar	Demirkapı	D	25
Bağcılar	15 Temmuz / Evren	D	25
Bağcılar	Fatih	D	25
Bağcılar	Fevzi Çakmak	D	25
Bağcılar	Göztepe	D	25
Bağcılar	Güneşli	C	37,5
Bağcılar	Hürriyet	C	37,5
Bağcılar	Inönü	D	25
Bağcılar	Kazım Karabekir	D	25
Bağcılar	Kemal Paşa	D	25
Bağcılar	Kirazlı	D	25
Bağcılar	Mahmutbey	C	37,5
Bağcılar	Merkez	C	37,5
Bağcılar	Sancaktepe	C	37,5
Bağcılar	Yavuz Selim	D	25
Bağcılar	Yenigün	D	25
Bağcılar	Yenimahalle	D	25
Bağcılar	Yıldıztepe	D	25

Household	Per Capita	House Income
3.70	*9,867 turkish lira 280 euro*	*21,597 turkish lira 612 euro*

Environmental Quality

Air Quality

Particulate matter (PM10) concentration

Intent

To assess the long-term ambient air quality with respect to particulates < 10mu (PM10) in the neighborhood.

Indicator	Unit of Measure
Number of days within a year that PM10 concentration exceeds the daily limit.	Days/Year

Assesment Methodology

1.Daily test air samples in accordance with national or regional procedures over a period time of one year.

2. Evaluate the number of days exceeding the daily limits in a year.

64 Days Exeeds the limit

Particulate matter (PM10) concentration: 207 Days/2023 The table indicates days with PM10 levels exceeding the daily 50 µg/m³ limit. According to EU standards, this should happen at most 35 days a year.

In Bağcılar's case, the data shows 57 days classified as 'Poor,' which likely correlates with days where PM10 levels exceeded the EU limit.
While the specific annual average concentration was previously provided, Bagcilar's average 2023 PM10 level is 38,11 µg/m³, which increased by 19,56% compared to the previous year. The current average level is about to pass the EU limit of 40 µg/m³.

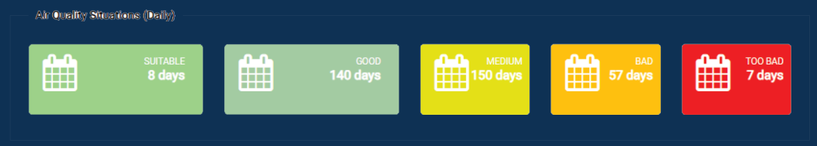
1.Data Source

Content	Format	Data Source
ANNUAL AIR QUALITY CALENDAR	cvs	https://havakalitesi.

Environmental Quality

Air Quality

Particulate matter (PM10) concentration



Daily Air Quality Index According to European Union Standards

Air Quality Index*	PM 10 hourly (µg/m³)	SO 2 hourly (µg/m³)	NO 2 hourly (µg/m³)	O 3 hourly (µg/m³)	CO 8-hour (µg/m³)	PM 2.5 hourly (µg/m³)	
0-25	0-15	0-50	0-50	0-60	0-5,000	0-10	Suitable
25-50	15-30	50-100	50-100	60-120	5,000-7,500	10-20	Good
50-75	30-50	100-350	100-200	120-180	7,500-10,000	20-30	Middle
75-100	50-100	350-500	200-400	180-240	10,000-20,000	30-60	Bad
>100	>100	>500	>400	>240	>20,000	>60	Too bad
-	-	-	-	-	-	-	Invalid

Conclusion:

Bağcılar, as a developing city, faces significant challenges and opportunities due to its rapid urbanization and population growth. The detailed mathematical data from the study highlights the need for comprehensive planning and targeted interventions to address issues related to population density, green spaces, transportation performance, mobility, public services, socio-economic status, and health services. The most important problem of Bağcılar District is the lack of technical and social infrastructure. This situation was due to the rapid growth of the district, intense migration and the fact that the housing need was met by construction activities carried out in violation of the zoning legislation, and the construction of the city was completed without considering its infrastructure. As a result of the regulations that took social problems into consideration and granted amnesty to buildings that violate the zoning legislation, the transformation of legal buildings and their provision of infrastructure has revealed a much more problematic situation.

Green Areas

The uncontrolled construction process in Bağcılar District, marked by a lack of planning, projects, licenses, inspections, and proper settlements, has led to a significant shortage of reinforcement areas. Contrary to what its name might suggest, Bağcılar is extremely deficient in green spaces.The district offers a total of 0.620 square kilometers (620,000 square meters) of green space. Per capita, this translates to only 0.863 square meters of green space which is insufficient to meet the needs of the population and contributes to environmental issues such as the urban heat island effect and poor air quality. Increasing green spaces is essential to improve environmental quality and provide recreational opportunities

for residents.. The district houses a total of 176 parks and green areas, including three special theme parks.In rethinking the development of Bağcılar District, addressing the need for green spaces should be a priority, and it should be done in a systematic and planned manner, much like other essential infrastructure improvements.

Transportation and mobility

Bağcılar District, strategically located between the TEM and E5 main transportation roads, offers convenient access from surrounding areas, even during heavy Istanbul traffic. However, the unplanned development within the district has made transportation in the center highly problematic. The roads within Bağcılar urgently need to be upgraded to meet modern standards.Reorganizing the urban roads in Bağcılar District is crucial for addressing the transportation needs of both residents and those coming from outside the district to access public and private sector services, especially hospitals. The inefficiencies in the district's transportation network directly impact the accessibility and quality of health services, notably at the Bağcılar State Hospital, a large-scale research facility. The congestion caused by this health complex underscores the need for better road infrastructure. Despite these challenges, Bağcılar remains an attractive area due to its proximity to major highways and transportation routes. This accessibility makes it a preferred location for businesses seeking operational convenience. Ensuring that the district's internal transportation network matches the ease of access provided by surrounding roads is essential to maintain its appeal and functionality. According to the mobility map and public transportation performance analysis, Bagcilar performed well. The wide rubber transportation is supported by a rail transportation system that crosses the area from the middle. The buffer performance analysis shows us approximately 99.8% of buildings are within 500

meters of a public transportation stop, 98% are within 400 meters, and 61.4% are within 200 meters. However, the service frequency and efficiency vary, necessitating improvements to ensure reliable and convenient access for all residents. Enhanced public transportation can significantly reduce traffic congestion and improve mobility across the district.

The bike network in the area is notably inadequate, with only 6.6 kilometers of bike paths and just 100 official bike parking spaces. This limited infrastructure makes it challenging for residents who prefer cycling as a mode of transportation. Enhancing the bike network is essential to promote sustainable mobility and provide a viable alternative to car travel, contributing to a healthier and more environmentally friendly community.Although the availability of EV charging stations has increased rapidly in Istanbul, the area still faces significant challenges. With only 250 charging stations, the ratio equates to a mere 0.00035 charging stations per inhabitant. This extremely low coverage makes it difficult for electric vehicle users to find convenient charging options, highlighting the urgent need for expanding the EV charging infrastructure to support the growing number of electric vehicle users and promote sustainable transportation. Expanding sustainable transport options, such as bicycle paths and EV charging infrastructure, is crucial to promoting environmentally friendly mobility solutions and reducing the district's carbon footprint.

Social Aspects

Land use of the map and the service area analysis show us that residential areas form the area widely. General service area performance distribution indicates that Mahmutbey and Goztepe have the lowest service availability in the area.Although accessibility to healthcare facilities within 200, 400, and 500-meter buffers is

generally adequate,. with a coverage rate of 91.5% within a 500-meter buffer zone. This ensures that a vast majority of the population has convenient access to health services, promoting overall well-being and timely medical care.However the increasing population places immense pressure on these services. Expanding healthcare infrastructure and improving service delivery are critical to meeting the growing demand and ensuring residents have access to quality healthcare.

Access to supermarkets is relatively good, with 56.2% of buildings within 200 meters, 83.9% within 400 meters, and 89.9% within 500 meters. This widespread availability ensures that nearly all residents can conveniently access supermarkets, facilitating easy procurement of daily necessities.

Bağcılar has 84 educational institutions, including 3 kindergartens, 55 primary schools, 15 high schools, and 7 vocational high schools. In contrast, in the Bagcilar district, schools cover approximately 50% of the population within a 500-meter buffer zone. While this indicates a moderate level of accessibility, there is significant room for improvement to ensure better educational access for the community.

Access to sports facilities is limited, with 7.7% of buildings within 200 meters, 23.6% within 400 meters, and 31.1% within 500 meters. According to a recent survey, residents have expressed concerns about the lack of sports facilities, which negatively impacts their health and well-being. Addressing this shortfall is crucial for promoting a healthier and more active community.

The performance of community buildings is even more concerning, with only 16.1% of the population having access within a 500-meter buffer zone. This low coverage rate highlights a critical need for improved communal support infrastructure. Enhancing these facilities is essential to meet the area's

socioeconomic needs and foster a stronger sense of community.

Air Quality

In 2023, Bağcılar experienced 57 days classified as 'Poor,' likely due to PM10 levels exceeding the EU limit. The average PM10 level for the year was 38.11 µg/m³, a 19.56% increase from the previous year. This current average is approaching the EU limit of 40 µg/m³, indicating a worsening air quality trend. The main reasons for poor air quality include high traffic emissions, industrial activities, dust from ongoing construction projects, insufficient green spaces, and the use of coal and other solid fuels for heating. Addressing these pollution sources is crucial to improve air quality, protect public health, and enhance the quality of life for residents in Bağcılar.

Socio-Economic Status

Bağcılar's socio-economic index reveals substantial disparities among neighborhoods, primarily due to low educational attainment and limited professional opportunities. Addressing these disparities requires focused efforts to improve education and vocational training, thereby enhancing the socio-economic status of residents. Programs aimed at economic development and poverty alleviation are crucial for promoting social equity and economic stability.

Strategic Recommendations

Urban Planning and Infrastructure Development:Implement comprehensive urban planning strategies to manage population density and ensure adequate infrastructure, including roads, public transportation, and green spaces.

Expansion of Green Spaces: Increase the availability of green urban areas to at least meet the recommended standards of green space per inhabitant. This can be achieved through the development of new parks and the integration of green infrastructure in urban planning.

Enhanced Public Services: Improve the quality and accessibility of education to raise literacy rates and educational attainment. Additionally, enhance the distribution and quality of key public services such as health facilities, sports centers, and community buildings to ensure they are accessible to a larger proportion of the population.

Improved Socio-Economic Development: Implement programs to address socio-economic disparities by improving education and vocational training, promoting economic development, and providing targeted support to low-income neighborhoods.

Sustainable Transportation Initiatives:Develop and promote sustainable transportation options, including expanding the network of bicycle paths and increasing the availability of electric vehicle charging stations.

Environmental Protection Measures: Implement measures to reduce air pollution and improve environmental quality, such as increasing green spaces, regulating industrial emissions, and promoting clean energy solutions.

By addressing these critical areas with targeted strategies, Bağcılar can overcome its current challenges and pave the way for sustainable development, ensuring a higher quality of life for its residents and a more resilient urban environment also of course sustainability.

Chapter 6 :
Future Scenario

6.1 SWOT and TARGET Analysis

Introduction

Urban regeneration is a critical component in the evolution and sustainability of modern cities, especially in rapidly growing districts where development pressures often strain existing infrastructure and social systems. Bağcılar, located on the European side of Istanbul, is a prime example of such a district. Characterized by high population density, diverse demographics, and significant industrial and commercial activity, Bağcılar faces numerous challenges that necessitate a comprehensive and forward-thinking approach to urban planning.

The need for urban regeneration in Bağcılar stems from several key factors. Rapid population growth has resulted in overcrowded living conditions, inadequate public amenities, and increased environmental pollution. The district's advantageous position, providing easy access to major business hubs and transportation networks, also contributes to severe traffic congestion and high levels of industrial emissions. These issues collectively diminish the quality of life for residents, underscoring the urgent need for strategic urban renewal.

This chapter presents a detailed proposal for urban regeneration in Bağcılar, with a focus on the innovative repurposing of existing gas stations. These sites, often underutilized and environmentally problematic, offer unique opportunities for transformation into vibrant green spaces, community centers, and sustainable infrastructure hubs. The proposal aims to tackle the district's pressing needs by enhancing public spaces, improving environmental conditions, and stimulating economic development.

The study is organized around five critical themes: Green Belt, Farmland, Blue Belt, Landscape Belt, and Plant Renovation. Each theme represents a targeted approach

to addressing specific urban challenges, ranging from the creation of green infrastructure and sustainable agriculture to the integration of renewable energy sources and advanced waste management systems. The overarching goal is to develop a cohesive and resilient urban environment that meets current needs while anticipating future demands.

A comprehensive SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis forms the basis of this proposal, offering insights into Bağcılar's current status and identifying key areas for intervention. This analytical framework ensures that the proposed strategies are both effective and contextually appropriate. The SWOT analysis highlights Bağcılar's strategic location and diverse population as significant strengths, while recognizing challenges such as overcrowding, infrastructure deficits, and environmental degradation. Opportunities for urban renewal and green initiatives are contrasted with threats from ongoing population growth and potential environmental risks.The success of this urban regeneration project relies heavily on the involvement of various stakeholders, including local residents, business owners, and public officials. By engaging these groups in the planning and implementation processes, the proposal seeks to foster a sense of ownership and collective responsibility, thereby enhancing social cohesion and community resilience. Active participation from stakeholders ensures that regeneration efforts are reflective of community needs and aspirations, leading to more sustainable and impactful outcomes.The urban regeneration initiative in Bağcılar involves a diverse range of actors and actions aimed at revitalizing the community. Key stakeholders include local residents, families, workers, business persons, and tourists, all of whom engage in various activities such as shopping, dining, commuting, and recreation. The proposal highlights the need for enhanced parks, playgrounds, sports facilities, urban farms, and recreational areas to meet the needs of different groups, including young people, elders, and families.

Purpose of the Research

The primary purpose of this thesis is to develop a comprehensive urban egeneration proposal for the district of Bağcılar, Istanbul, focusing on the innovative repurposing of existing gas stations.

By transforming these underutilized and environmentally problematic sites into vibrant green spaces, community hubs, and sustainable infrastructure, the thesis aims to address multiple socio-economic and environmental challenges faced by the district.

Specific Objectives

Enhance Environmental Sustainability:
-Develop green infrastructure to improve air quality, reduce the urban heat island effect, and promote biodiversity.Integrate renewable energy sources such as solar panels and wind turbines to reduce reliance on fossil fuels.

Improve Quality of Life:
-Create parks, playgrounds, urban farms, and recreational areas to provide residents with accessible and enjoyable public spaces.Address issues of overcrowding, traffic congestion, and inadequate public amenities through strategic urban planning.

Foster Economic Growth:
-Stimulate local economy by creating new commercial opportunities and supporting local businesses.Develop agricultural hubs and urban farms to provide fresh, organic produce and create employment opportunities.

Promote Social Cohesion:

-Engage local residents, families, workers, business persons, and tourists in the planning and implementation process to foster a sense of ownership and community.Develop social programs and recreational facilities tailored to the needs of different demographic groups, including youth and elders.

Address Current and Future Urban Challenges:

-Conduct a comprehensive SWOT analysis to identify Bağcılar's strengths, weaknesses, opportunities, and threats, identifying actors actions and strategies. Ensuring that proposed strategies are contextually relevant and effective.Develop a cohesive master plan that integrates various initiatives into a sustainable and functional urban ecosystem.

Design Proposal Development

Based on the findings from the SWOT analysis, stakeholder engagement, and site analysis, detailed design proposals are developed. These proposals are structured around the five critical themes: Green Belt, Farmland, Blue Belt, Landscape Belt, and Plant Renovation. Each theme includes specific initiatives such as: Green Belt: Creating parks, playgrounds, and urban farms. Farmland: Establishing agricultural hubs and greenhouses. Blue Belt: Developing EV charging stations and bike paths. Landscape Belt: Integrating green corridors and renewable energy installations. Plant Renovation: Upgrading waste management systems and community gardens.

Understanding the unique characteristics of each neighborhood within Bağcılar is crucial for tailoring the strategies effectively. Individual analyses are conducted for

selected neighborhoods, presenting specific strategic theme suggestions for each. This approach ensures that the interventions are not only strategic but also highly relevant to the local context, fostering a sense of community ownership and participation.The master plan integrates all these components into a cohesive framework, outlining the proposed interventions for each gas station and the rationale behind strategy selection. It emphasizes the large-scale relationships between stations and the connections established through green and blue corridors. This comprehensive approach ensures that the stations operate as part of a cohesive network, enhancing the overall functionality and sustainability of the urban landscape.

The envisioned future scenario for Bağcılar involves creating central public spaces like People Square and implementing a structured design process that identifies main issues, addresses community concerns, and considers various interventional factors. This comprehensive approach aims to directly and indirectly improve the urban environment through well-planned architectural and urban design interventions.By repurposing gas stations and implementing targeted strategies, the proposal seeks to create a more sustainable, vibrant, and livable Bağcılar. The project emphasizes the importance of community engagement, environmental stewardship, and innovative solutions in urban regeneration. This strategic approach not only addresses the district's current challenges but also sets a precedent for other urban areas facing similar issues.By leveraging innovative design, strategic planning, and active community involvement, this urban regeneration proposal aspires to transform Bağcılar into a model of sustainable urban development. The project envisions a future where Bağcılar is characterized by its livable spaces, environmental sustainability, and vibrant community life, serving as an inspiring example for other cities embarking on similar journeys of urban renewal.

SWOT ANALYSIS

1.Strategic Location:
-Geographical Advantage: Situated on the European side of Istanbul, Bağcılar's location provides easy access to key business districts, airports (Istanbul Airport and Sabiha Gökçen Airport), and the city center.
-Transport Connectivity: Major highways (TEM and E5) and metro lines (M1B and M3) connect Bağcılar to other parts of Istanbul, facilitating movement for residents and businesses. The proximity to these transport arteries supports logistical operations for industries.

2.Diverse Population
-Cultural Diversity: Bağcılar hosts a blend of ethnic groups, including Turkish nationals, Kurds, and migrants from various regions. This diversity enriches the cultural landscape and promotes a dynamic social environment.
-Workforce Diversity: The diverse demographic provides a wide range of skills and talents, beneficial for businesses seeking various competencies.

3.Strong Industrial and Commercial Base:
-Industrial Zones: Areas like the Bağcılar Industrial Zone house numerous manufacturing and commercial enterprises, driving economic activity. Industries include textiles, automotive parts, electronics, and food processing.
-Commercial Centers: Shopping malls like Güneşli Park and 212 Istanbul Power Outlet serve as commercial hubs, attracting consumers from within and outside the district.

4.Public Infrastructure:
-Transport Infrastructure: The extensive public transport network, including buses and trams, reduces reliance on private vehicles and connects residents to key areas of Istanbul.
-Educational Facilities: With numerous schools and vocational training centers, Bağcılar supports educational needs and workforce development.

5.Educational Institutions:
-Primary and Secondary Schools: The district is home to a variety of public and private schools, ensuring access to basic education.
-Vocational Training: Facilities offering vocational training equip residents with practical skills, enhancing employability and supporting local industries.

1.Overcrowding and Housing Issues:
-Population Density: High population density results in overcrowded housing conditions, particularly in older neighborhoods where buildings are not designed to accommodate the current population levels.
-Housing Quality: Many residential areas feature outdated housing stock with inadequate amenities, leading to poor living conditions.

2.Traffic Congestion:
-High Vehicle Volume: The sheer number of vehicles, coupled with narrow streets and insufficient road capacity, causes severe traffic congestion, especially during peak hours.
-Insufficient Road Infrastructure:Existing road networks are not equipped to handle the current traffic volume, leading to frequent jams and delays.

3.Economic Disparities:
-Income Inequality: Significant economic disparities exist, with affluent areas contrasting sharply with poorer neighborhoods. This disparity is evident in access to resources and quality of life.
-Access to Resources: Unequal distribution of resources like quality education, healthcare, and recreational facilities exacerbates social inequalities.

4.Environmental Challenges:
-Air Pollution: Industrial activities and heavy traffic contribute to high levels of air pollution, posing health risks to residents.
-Noise Pollution: Noise from traffic and industrial operations disrupts daily life and can cause health issues.
-Waste Management: Inadequate waste management systems lead to littering and environmental pollution, affecting the urban environment.

5.Lack of Green Area/Service Area:
-The neighborhood lacks sufficient parks and green areas, limiting opportunities for outdoor activities.
-The neighborhood lacks sufficient servies areas such as supermarkets, health facilities, sports areas, communuty buildings and schools.

6.Insufficient Facilities:
-There are not enough bicycle lanes or electric car charging stations.

S W T O

1.Continued Population Growth
-Strain on Infrastructure: Unchecked population growth could further strain infrastructure, housing, and public services, leading to deteriorating living conditions.
-Urban Sprawl: Risk of uncontrolled urban sprawl can result in loss of green spaces and increased environmental degradation.

2.Economic Volatility
-Economic Downturns: Economic downturns or shifts in the industrial base could impact employment and local economic stability, particularly if there is over-reliance on specific sectors.
-Dependence on Specific Industries: Over-reliance on certain industries makes the local economy vulnerable.

3.Environmental Risks
-Natural Disasters: Vulnerability to natural disasters, such as earthquakes and floods, poses significant risks to infrastructure and public safety.
-Climate Change: Long-term impacts of climate change, including rising temperatures and extreme weather events, could exacerbate existing environmental challenges.

4.Social Tensions
-Economic Disparities: Persistent economic disparities and lack of social mobility could lead to social tensions and conflicts.
-Cultural Differences: If not managed effectively, cultural differences could lead to social fragmentation and unrest.

5.Regulatory and Policy Changes
-Unfavorable Policies: Changes in government policies or regulations could impact development projects, economic activities, and investment climate.

1.Urban Renewal and Development
-Redevelopment Projects: Initiatives to redevelop old and underdeveloped areas can improve housing quality and urban infrastructure. Projects can include modern residential complexes, commercial spaces, and public amenities.
-Smart City Initiatives: Implementing smart city technologies (e.g., smart grids, IoT) can enhance urban management, improve service delivery, and promote sustainability.

2.Economic Diversification
-New Industries: Attracting new industries, particularly in technology, green energy, and services, can diversify the local economy and create high-quality jobs.
-Innovation Hubs: Developing technology and innovation hubs can attract startups and research institutions, fostering economic growth and technological advancement.

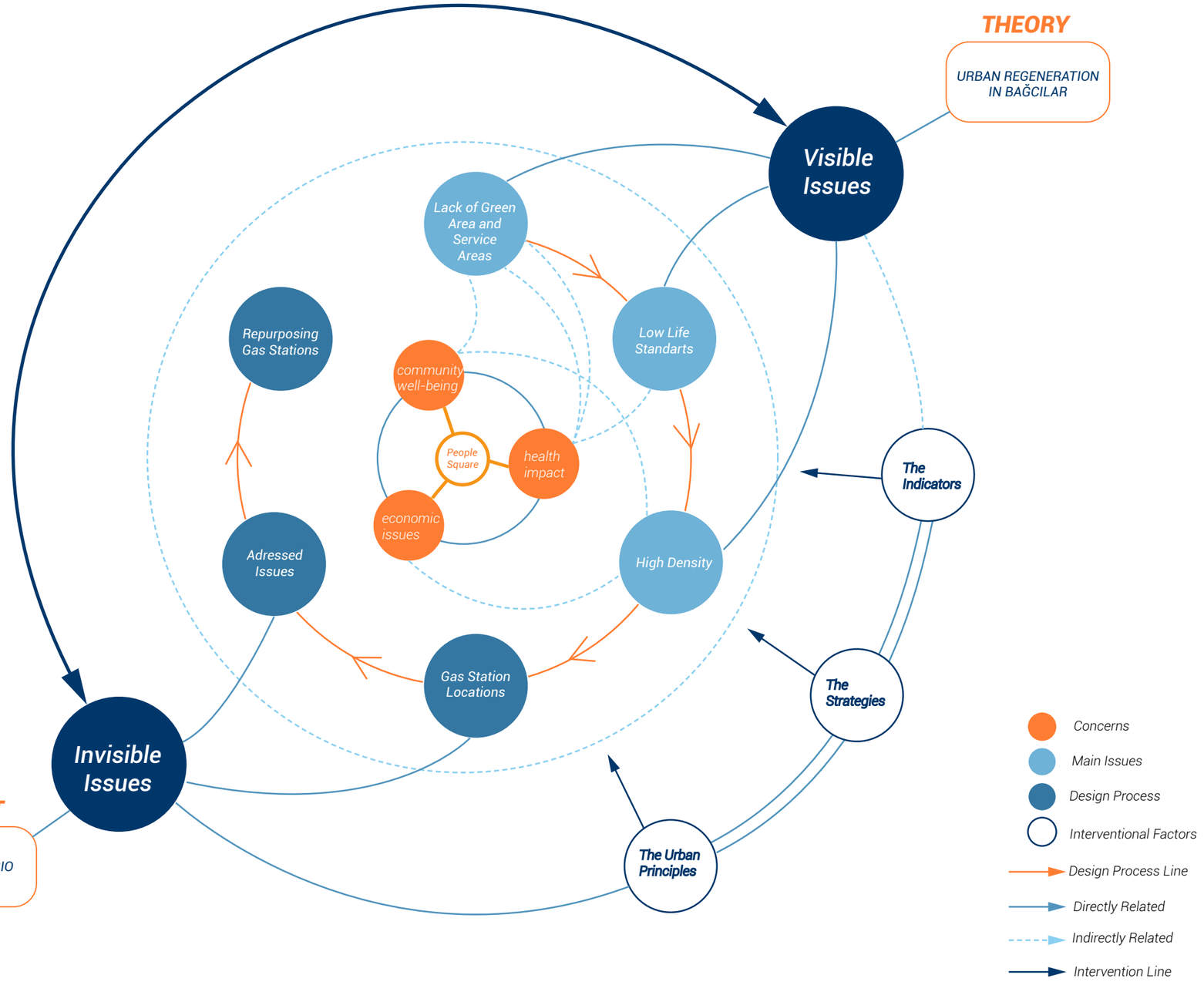
3.Public-Private Partnerships
-Infrastructure Investment: Collaborations between government and private sector can drive investments in critical infrastructure, such as transport, utilities, and public facilities.
-Affordable Housing: Partnerships to develop affordable housing projects can address overcrowding and improve living standards for lower-income residents.

4.Green Initiatives
-Sustainable Development:Implementing projects to create green spaces, urban parks, and promote environmental sustainability can enhance urban living and reduce pollution.
-Renewable Energy: Encouraging the use of renewable energy sources (e.g., solar, wind) and energy-efficient practices can reduce the district's carbon footprint.

5.Social Programs
-Community Engagement: Developing programs that promote social integration and community engagement can foster social cohesion and reduce economic disparities.

DESIGN PROPOSAL

The proposal for urban regeneration in Bağcılar aims to address several critical issues to enhance the area's livability. The primary visible problems include a lack of green and service areas, low living standards, high population density, and an overabundance of gas stations. To tackle these, the proposal suggests repurposing the numerous gas stations to create more green spaces and reduce density, thereby better serving the community. Additionally, the plan focuses on improving health outcomes, enhancing overall well-being, and addressing economic challenges. It also considers less obvious issues by understanding the broader urban context. The envisioned future scenario involves creating central public spaces like People Square and implementing a structured design process that identifies main issues, addresses community concerns, and considers various interventional factors. This comprehensive approach aims to directly and indirectly improve the urban environment through well-planned architectural and urban design interventions.



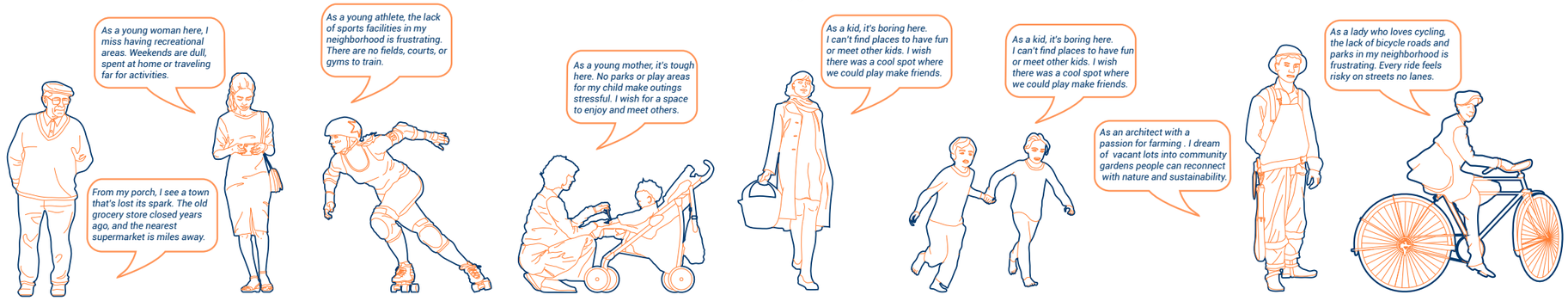
ACTORS/ACTIONS

Activities: Shopping · Dining Out · Gathering · Commuting · Business Trip · Family Activities · Walking · Children Care · Exercise · Matchmaking · Visiting · Working

Actors: Ladies · Young People · Gentlemen · Student · Workers · Business Person · Residents · Family · Elders · Teenager · Mother and children · Visitor · Workers · Governer · Local Statts

Population Group: Local Residents · Commuter · Local Families · Tourist · Workers

Areas: Service Needs · Activity Space · Recreational Areas · Parks/Playgrounds/Sports · Urban Farms/Warehouses · Bazaars/Concert Area · EV Charging/Bicycle



Strategy: Plant Renovation · Green Belt · Farmland · Blue Belt · Landscape Belt

TARGETS/STRATEGIES

Vision :

Vision is to maximize living condition for residents in Bağcılar. For this reasons potantial strategic applications for gas station sites. Five different strategic application is introduced in this part.

Targets:

1.Maximize Strategic Location Benefits:
Increase connectivity and access to other parts of Istanbul by expanding transportation networks.

2.Leverage Diverse Population:
Foster a culture of inclusivity and innovation by utilizing the diverse skills and talents of the population.

3.Improve Public Infrastructure:
Ensure all areas of Bağcılar have access to reliable public services.-Action: Invest in upgrading utilities, transport networks, and public spaces.

4.Enhance Educational Institutions:
Raise the quality of education and increase access to advanced educational opportunities.

5.Combat Environmental Challenges:
Reduce air and noise pollution levels

6.Expand Green Initiatives:
Increase green space per capita by 50%.

7.Enhance Social Programs:
Increase participation in community programs.

8.Address Social Tensions:
Reduce incidents of social conflict and increase community cohesion.

9.Mitigate Environmental Risks:
Increase resilience to natural disasters and climate change impacts.

10.Expand Industrial and Commercial Base:
Attract new businesses and industries to further strengthen the economy.

	Green Belt	Farmland	Blue Belt	Landscape Belt	Plant Renovation
Categories	Community Open Spaces -Landscapes for recreation, social life and small-scale food cultivation	Working+Productive Landscapes -Landscapes which generates new knowledge grow energy and food.	Blue Infrastructure -Working+Productive infrastructure	Traditional Landscapes+ Productive Landscapes -Temporary landscapes that clean soil and enable new forms of social life and creative displays	Creative Needy Transformation -Flexivle structural transformation provides various space and functions
Strategies	accessible various social spaces creating multi functinal social spaces creating new bicycle lanes for areas small kiosks for public spaces	to make production in agricultural-based industries. supporting living diversity production of rich agricultural lands improving waste disposal facilities and biogass.	considering about nature and global warming. using renewable energy sources to generate energy. by establishing renewable energy sources. trying to creatre a conscious society	creating an area for urban farming. a space where they can organize events. local bazaar which also contributues economy. new social areas especially for remediation fields.	creating new employment areas with local sectors. community courses for residents. creating new service areas for residents. new social areas for residents.
Elements	run/walk cycle, food kiosks, playgrounds, recreation centers, bicycle road, bicycle parks, rest area, open air spor facilities	Warehouse, Wind turbines, Urban Farms, fruit trees, solar farm, garbage disposal	bicycle road, wind turbines, trees, bicycle parks, solar panels, EV charging stations	Concert Hall, Urban Forest, Bazaar, Remediation fields	Hospitals, Supermarket, Cafe Restaurant, Schools, Cinema Theather

MAHMUTBEY-1

Location

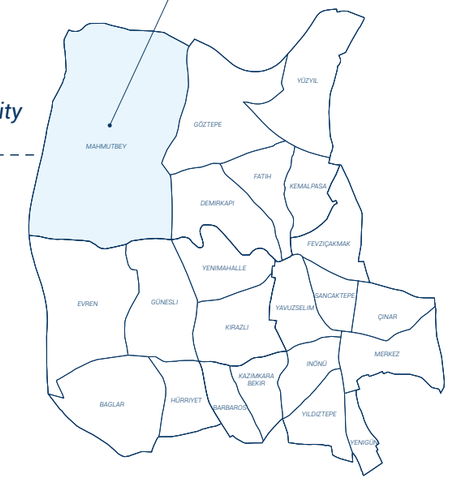
Istanbul,Turkey

Project Framework

Local Opportunity

Gas Stations

Mahmutbey



Working Method

Designing with Clearances

- **Urban (XL) Scale**
  Detailed analysis of Istanbul
- **Neigborhood (L) Scale**
  Detailed analysis of Bağcılar
- **Local (S) Scale**
  Proposed master plan of Mahmutbey

Distinct Issues

Population: *26.700*
Density: *5,434.40*

C. Buildings	Police Station	Parks	Sports
Amount:0 *Percentage: %0*	*Amount:0* *Percentage: %0*	*37.048 sqm* *Percentage: %6*	*Amount:2* *Percentage: %11*

Schools	Stops	Supermarkets	Health
Amount:1 *Percentage: %3*	*Amount:51* *Percentage: %16*	*Amount:4* *Percentage: %1*	*Amount:6* *Percentage: %3*

S W T O

Transportation Availability: *Excellent connectivity with metro lines, bus routes, and proximity to major highways.*
Economic Activity: *Presence of industrial and commercial zones supports local employment.*
Permeability: *Good road network facilitating easy movement.*

Limited Green Areas: *Insufficient parks and recreational spaces.*
High Population Density: *Overcrowding leading to pressure on infrastructure and services.*
Traffic Congestion: *Frequent traffic jams, especially during peak hours.*
Lack of Service Areas:
Lack of supermarkets, schools, ev car station.

Overdevelopment: *Unregulated construction leading to infrastructure strain.*
Environmental Degradation: *Increased pollution from industrial activity.*
Infrastructure Strain: *Rapid growth outpacing infrastructure development.*
Economic Downturns: *Impacting local employment and investment.*

Urban Regeneration: *Transforming underutilized areas into green spaces.*
Green Infrastructure: *Implementing green roofs and vertical gardens.*
Enhanced Bicycle Infrastructure: *Developing dedicated bike lanes.*
Expansion of Greean/Service Areas: *Increasing service areas and parks.*

Possible Solutions

Urban Regeneration

Green Belt

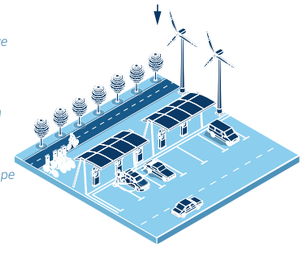
Community Open Spaces
-Landscapes for recreation, social life and small-scale food cultivation

Playgrounds
Schools
Community Parks
Sports Fields
Recreation Centers
Greenbelt
Cycle Route
Local Food Kiosks

Blue Belt

Blue Infrastructure
-Working+Productive infrastructure

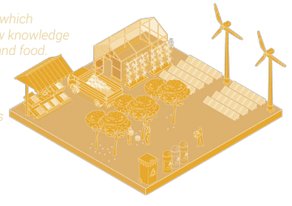
EV Charging Station
Cycle Route
Parkway
Pond
Productive Landscape



Farmland

Working+Productive Landscapes
-Landscapes which generates new knowledge grow energy and food

Urban Farms
Solar Panels
Wind Turbines
Fruit Trees
Warehouses



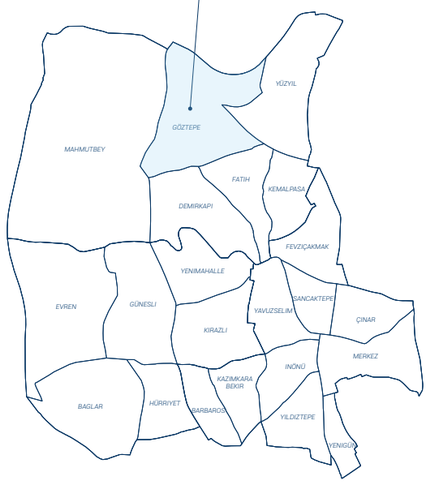
GÖZTEPE-1

Location
Istanbul,Turkey

Project Framework

Local Opportunity
Gas Stations

Göztepe



Working Method
Designing with Clearances

- *Urban (XL) Scale*
  Detailed analysis of Istanbul
- *Neigborhood (L) Scale*
  Detailed analysis of Bağcılar
- *Local (S) Scale*
  Proposed master plan of Göztepe

Distinct Issues

Population: *42,351*
Density: *21,175.50*

C. Buildings	Police Station	Parks	Sports
Amount:0	*Amount:0*	*13.188 sqm*	*Amount:1*
Percentage: %0	*Percentage: %0*	*Percentage: %2*	*Percentage: %5*

Schools	Stops	Supermarkets	Health
Amount:1	*Amount:14*	*Amount:2*	*Amount:2*
Percentage: %3	*Percentage: %4*	*Percentage: %1*	*Percentage: %1*

Transportation Availability:
Connectivity the area is well-connected through major roads and public transportation, including metro and bus services, facilitating easy movement within Istanbul.
Economic Activity: *Active commercial sector supporting the local economy.*

Limited Green Spaces: *Göztepe has a scarcity of parks and green areas, which limits recreational opportunities and impacts environmental quality.*
High population density: *leads to overcrowding, putting pressure on infrastructure and public services, and contributing to traffic congestion.*
Environmental Concerns:*The area faces issues related to air and noise pollution .*
Lack of Service Areas:
Lack of supermarkets, schools, ev car station.

S W T O

Overdevelopment: *Unregulated construction leading to infrastructure strain.*
Environmental Degradation: *Increased pollution from industrial activity.*
Infrastructure Strain: *Rapid growth outpacing infrastructure development.*
Economic Downturns: *Impacting local employment and investment.*

Public Transport: *Expanding public transport options.*
Green Space Development: *There is potential to transform underutilized areas into green spaces, improving environmental quality and providing more recreational facilities.*
Infrastructure Development: *Increasing the number of bicycle lanes and electric car charging stations can promote environmentally friendly transportation methods.*

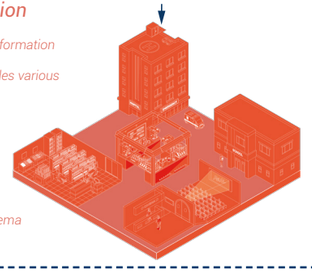
Possible Solutions
Urban Regeneration

Green Belt
Community Open Spaces
-Landscapes for recreation, social life and small-scale food cultivation

Playgrounds
Schools
Community Parks
Sports Fields
Recreation Centers
Greenbelt
Cycle Route
Local Food Kiosks

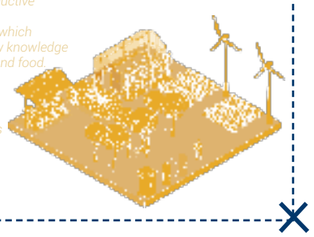
Plant Renovation
Creative Needy Transformation
-Flexivle structural transformation provides various space and functions

Supermarkets
Schools
Health Services
Museum/Gallery
Workshop
Social Spaces
Restaurant/Cafe/Cinema
Offices



Farmland
Working+Productive Landscapes
-Landscapes which generates new knowledge grow energy and food

Urban Farms
Solar Panels
Wind Turbines
Fruit Trees
Warehouses



BAĞLAR-1

Location

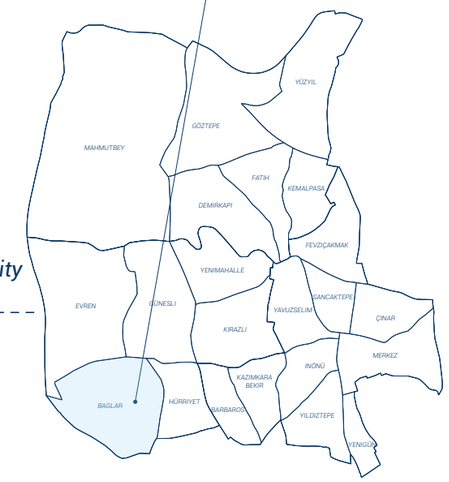
Istanbul,Turkey

Project Framework

Local Opportunity

Gas Stations

Bağlar



Distinct Issues

Population: 17.607
Density: 1,238.1

C. Buildings	Police Station	Parks	Sports
Amount:1 Percentage: %14	Amount:0 Percentage: %0	15.095 sqm Percentage: %2	Amount:1 Percentage: %5

Schools	Stops	Supermarkets	Health
Amount:7 Percentage: %19	Amount:14 Percentage: %4	Amount:10 Percentage: %4	Amount:9 Percentage: %5

Service Areas: *Bağlar is well-served with healthcare facilities and schools, ensuring residents have access to essential services.*
Transportation Availability: *Bağlar is well-connected by major roads and public transportation, including metro and bus services, which facilitate easy commuting within Istanbul.*
Community Infrastructure: *The area includes, community centers, and recreational amenities, contributing to a vibrant community life.*

Limited Green Spaces: *The neighborhood lacks sufficient parks and green areas, limiting opportunities for outdoor activities.*
High Population Density: *pressure on infrastructure and public services, and contributes to traffic congestion.*
Environmental Concerns: *Bağlar faces significant air and noise pollution issues due to dense urban development and heavy traffic.*
Insufficient Facilities: *There are not enough bicycle lanes or electric car charging stations.*

S W T O

Population Growth: *Continued population growth and urbanization may outpace infrastructure development, leading to degraded public services and living conditions.*
Industrial Activity: *Ongoing industrial activity and high traffic volumes, without proper environmental management, can lead to worsening pollution and negatively impact residents' health and well-being.*

Green Space Development: *There is potential to convert underutilized or vacant areas into green spaces, which would improve environmental quality and provide more recreational opportunities.*
Transportation Improvements: *Expanding and improving public transport services can help alleviate traffic congestion and enhance connectivity.*
Infrastructure Development: *Increasing the number of bicycle lanes and electric car charging stations*

Working Method

Designing with Clearances

- **Urban (XL) Scale** — Detailed analysis of Istanbul
- **Neigborhood (L) Scale** — Detailed analysis of Bağcılar
- **Local (S) Scale** — Proposed master plan of Bağlar

Possible Solutions

Urban Regeneration

Green Belt

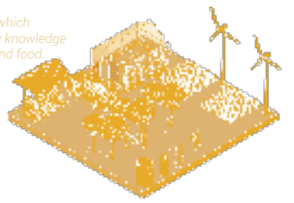
Community Open Spaces
-Landscapes for recreation, social life and small-scale food cultivation

Playgrounds
Schools
Community Parks
Sports Fields
Recreation Centers
Greenbelt
Cycle Route
Local Food Kiosks

Farmland

Working+Productive Landscapes
-Landscapes which generates new knowledge grow energy and food

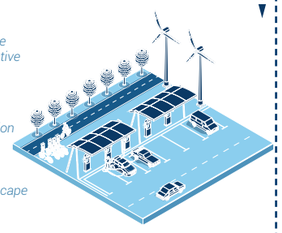
Urban Farms
Solar Panels
Wind Turbines
Fruit Trees
Warehouses



Blue Belt

Blue Infrastructure
-Working+Productive infrastructure

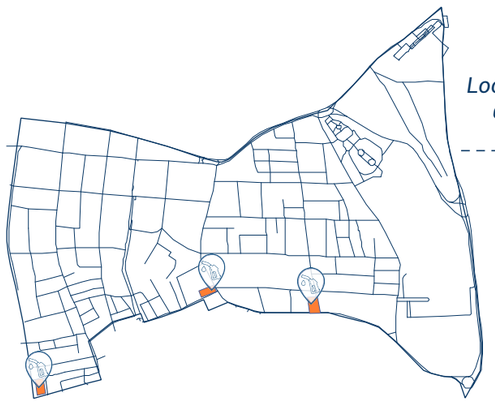
EV Charging Station
Cycle Route
Parkway
Pond
Productive Landscape



MERKEZ-1

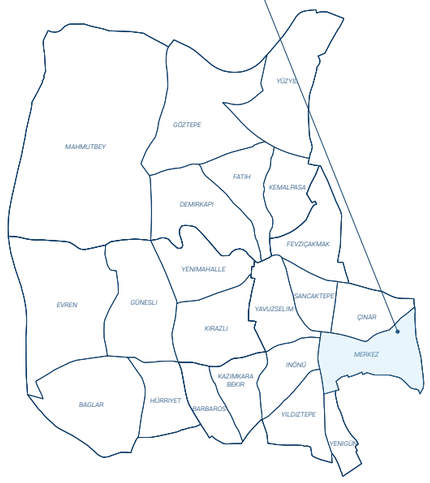
Location
Istanbul,Turkey

Project Framework



Local Opportunity
Gas Stations

Merkez



Distinct Issues

Population: 27.844
Density: 32,742

C. Buildings	Police Station	Parks	Sports
Amount:0 Percentage: %0	Amount:0 Percentage: %0	107.693 sqm Percentage: %17	Amount:1 Percentage: %5

Schools	Stops	Supermarkets	Health
Amount:0 Percentage: %0	Amount:24 Percentage: %8	Amount:22 Percentage: %8	Amount:14 Percentage: %7

Connectivity: *Proximity to major roads, metro lines, and bus routes ensures high connectivity and ease of transportation.*
Healthcare: *Well-served by a network of healthcare facilities.*
Commercial Facilities: *Presence of numerous supermarkets, shops, and markets offering a variety of goods and services.*

Overcrowding: *High population density results in overcrowding, putting pressure on infrastructure and public services, and contributing to traffic congestion.*
Pollution: *The area faces significant air and noise pollution due to dense urban development and heavy traffic.*
Insufficient Facilities: *There are not enough bicycle lanes or electric car charging stations.*

S W T O

Population Growth: *Continued population growth and urbanization may outpace infrastructure development, leading to degraded public services and living conditions.*
Industrial Activity: *Ongoing industrial activity and high traffic volumes, without proper environmental management, can lead to worsening pollution and negatively impact residents' health and well-being.*

Infrastructure Development: *Increasing the number of bicycle lanes and electric car charging stations can promote the use of environmentally friendly transportation.*
Social Initiatives: *Implementing community-driven projects and events can foster social cohesion and strengthen the sense of community.*

Working Method
Designing with Clearances

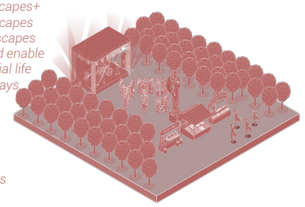
- **Urban (XL) Scale**
  Detailed analysis of Istanbul
- **Neigborhood (L) Scale**
  Detailed analysis of Bağcılar
- **Local (S) Scale**
  Proposed master plan of Merkez

Possible Solutions
Urban Regeneration

Landscape Belt

Traditional Landscapes+ Productive Landscapes -Temporary landscapes that clean soil and enable new forms of social life and creative displays

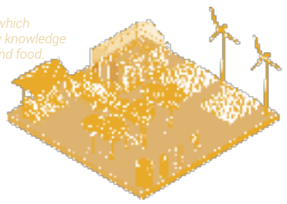
Art-scapes
Urban Meadows
Plaza
Event Lanscape
Remediation fields
Bazaars



Farmland

Working+Productive Landscapes -Landscapes which generates new knowledge grow energy and food

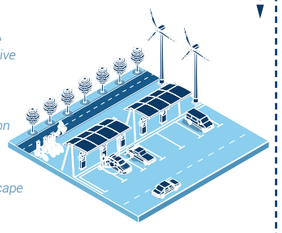
Urban Farms
Solar Panels
Wind Turbines
Fruit Trees
Warehouses



Blue Belt

Blue Infrastructure -Working+Productive infrastructure

EV Charging Station
Cycle Route
Parkway
Pond
Productive Landscape



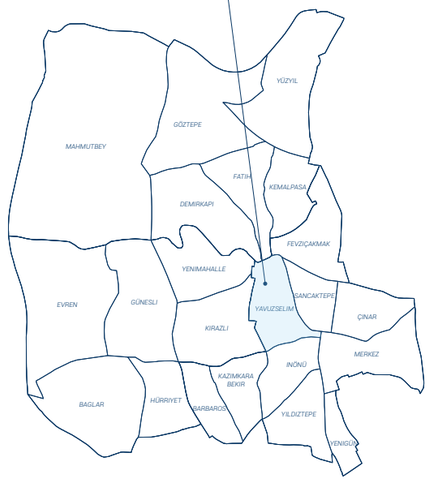
YAVUZ SELİM-1

Location
Istanbul,Turkey

Project Framework

Local Opportunity
Gas Stations

Yavuz Selim



Distinct Issues

Population: 28.160
Density: 43,990

C. Buildings	Police Station	Parks	Sports
Amount:0 Percentage: %0	Amount:0 Percentage: %0	31.361 sqm Percentage: %5	Amount:0 Percentage: %0

Schools	Stops	Supermarkets	Health
Amount:0 Percentage: %0	Amount:14 Percentage: %4	Amount:3 Percentage: %1	Amount:5 Percentage: %3

Transportation Availability: Connectivity the area is well-connected through major roads and public transportation, including metro and bus services, facilitating easy movement within Istanbul.
Economic Activity: Active commercial sector supporting the local economy.

Limited Green Spaces: The neighborhood lacks adequate parks and green areas, limiting outdoor recreational opportunities and impacting the environmental quality.
Overcrowding: High population density results in overcrowding, putting pressure on infrastructure and public services, and contributing to traffic congestion.
Pollution: The area faces significant air and noise pollution due to dense urban development and heavy traffic.

S W T O

Unchecked Growth: Excessive or unregulated development can exacerbate existing issues such as traffic congestion, pollution, and strain on public services.
Impact on Local Economy: Economic downturns could negatively affect local businesses and employment, reducing economic stability.
Industrial Activity: Ongoing industrial activity and high traffic volumes, without proper environmental management, can lead to worsening pollution and negatively impact residents' health and well-being.

Green Space Development: Potential to transform underutilized or vacant areas into green spaces, improving environmental quality and providing more recreational facilities.
Transportation Improvements: Expanding and improving public transport services can help alleviate traffic congestion and enhance connectivity.
Social Initiatives: Implementing community-driven projects and events can foster social cohesion and strengthen the sense of community.

Possible Solutions

Urban Regeneration

Working Method
Designing with Clearances

- **Urban (XL) Scale** — Detailed analysis of Istanbul
- **Neigborhood (L) Scale** — Detailed analysis of Bağcılar
- **Local (S) Scale** — Proposed master plan of Yavuz Selim

Green Belt

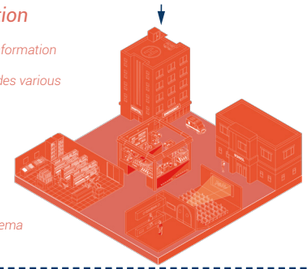
Community Open Spaces
-Landscapes for recreation, social life and small-scale food cultivation

Playgrounds
Schools
Community Parks
Sports Fields
Recreation Centers
Greenbelt
Cycle Route
Local Food Kiosks

Plant Renovation

Creative Needy Transformation
-Flexivle structural transformation provides various space and functions

Supermarkets
Schools
Health Services
Museum/Gallery
Workshop
Social Spaces
Restaurant/Cafe/Cinema
Offices



Farmland

Working+Productive Landscapes
-Landscapes which generates new knowledge grow energy and food

Urban Farms
Solar Panels
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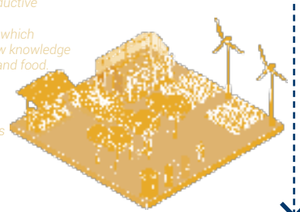
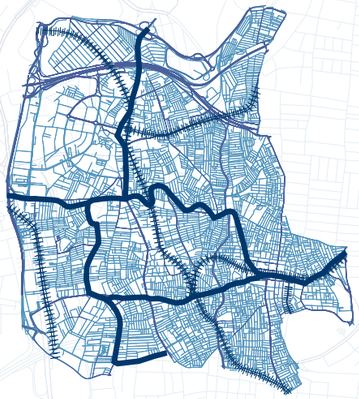


Strategic Development Plan:

The Strategic Development Plan for the urban regeneration of Bağcılar outlines a comprehensive approach to transforming the district into a more sustainable, vibrant, and livable community. This plan integrates various themes and initiatives to address the district's socio-economic and environmental challenges. This map highlightes the potantial use strategies for gas stations in selected neighborhoods.

Green Corridor Introduction

The Green Corridor initiative focuses on creating a continuous network of green spaces throughout Bağcılar to enhance environmental sustainability and residents' quality of life.



Blue Corridor Introduction

The Blue Corridor initiative aims to create a sustainable and eco-friendly urban environment in Bağcılar by integrating renewable energy and green transportation solutions.

1 — Since it between connection roads, we prefered this area to be Blue Belt.

2 — Since its located close to industrial area, it can be a place to grow.

3 — Since it located in the end of green corridor, area needs a station.

4 — Since the area really close located gas stations, we tried to create green corridor with area needs.

5 — Since the area really close located gas stations, we tried to create green corridor with area needs.

6 — Since the area really close located gas stations, we tried to create green corridor with area needs.

7 — Since the area suffers from the need of sevice areas, this location can be design for the needs.

8 — Since area sited with boundaries, we designed the space as connective element for both parts.

9 — Station located as an edge point for green corridor and bicycle path.

10 — Station located as an edge point for green corridor and bicycle path.

11 — Since the area lack of recreational spaces, we can use the area agricultural creative use.

12 — Since it between connection roads, we prefered this area to be Blue Belt.

13 — Implementing community-driven projects and events can foster social cohesion and strengthen the sense of community.

14 — Since it between connection roads, we prefered this area to be Blue Belt.

15 — Bağlar faces significant air and noise pollution this area designed for ecogolocial needs to solve it.

16 — There are not enough bicycle lanes or electric car charging stations..

17 — Since the are suffers from pollution this place can help as disposal.

18 — Since the are suffers from pollution this place can help as disposal.

19 — Implementing community-driven projects and events can foster social cohesion and strengthen the sense of community.

20 — Since the area suffers from the need of sevice areas, this location can be design for the needs.

21 — Improving environmental quality and providing more recreational facilities.

22 — The neighborhood lacks adequate parks and green areas

23 — Since the are suffers from pollution this place can help as disposal.

MAHMUTBEY

GOZTEPE

YAVUZSELIM

MERKEZ

BAGLAR

0 500m 1000 m 1500m 2000 m

Strategies

- creating new employment areas with local sectors.
- community courses for residents.
- creating new service areas for residents.
- new social areas for residents.
- accessible various social spaces
- creating multi functinal social spaces
- creating new bicycle lanes for areas
- small kiosks for public spaces
- to make production in agricultural based industries.
- supporting living diversity
- production of rich agricultural lands
- improving waste disposal facilities and biogass.
- considering about nature and global warming.
- using renewable energy, EV car charging
- by establishing renewable energy sources.
- trying to creatre a conscious society
- creating an area for urban farming
- a space where they can organize events.
- local bazaar which also contributues economy.
- new social areas especially for remediation fields.
- stations turned into "blue belt"
- stations turned into "green belt"
- stations turned into "farmland"
- stations turned into "landscape belt"
- stations turned into "plant renovation"
- stations that we dont interfere

MAHMUTBEY BAĞCILAR :
GREEN BELT

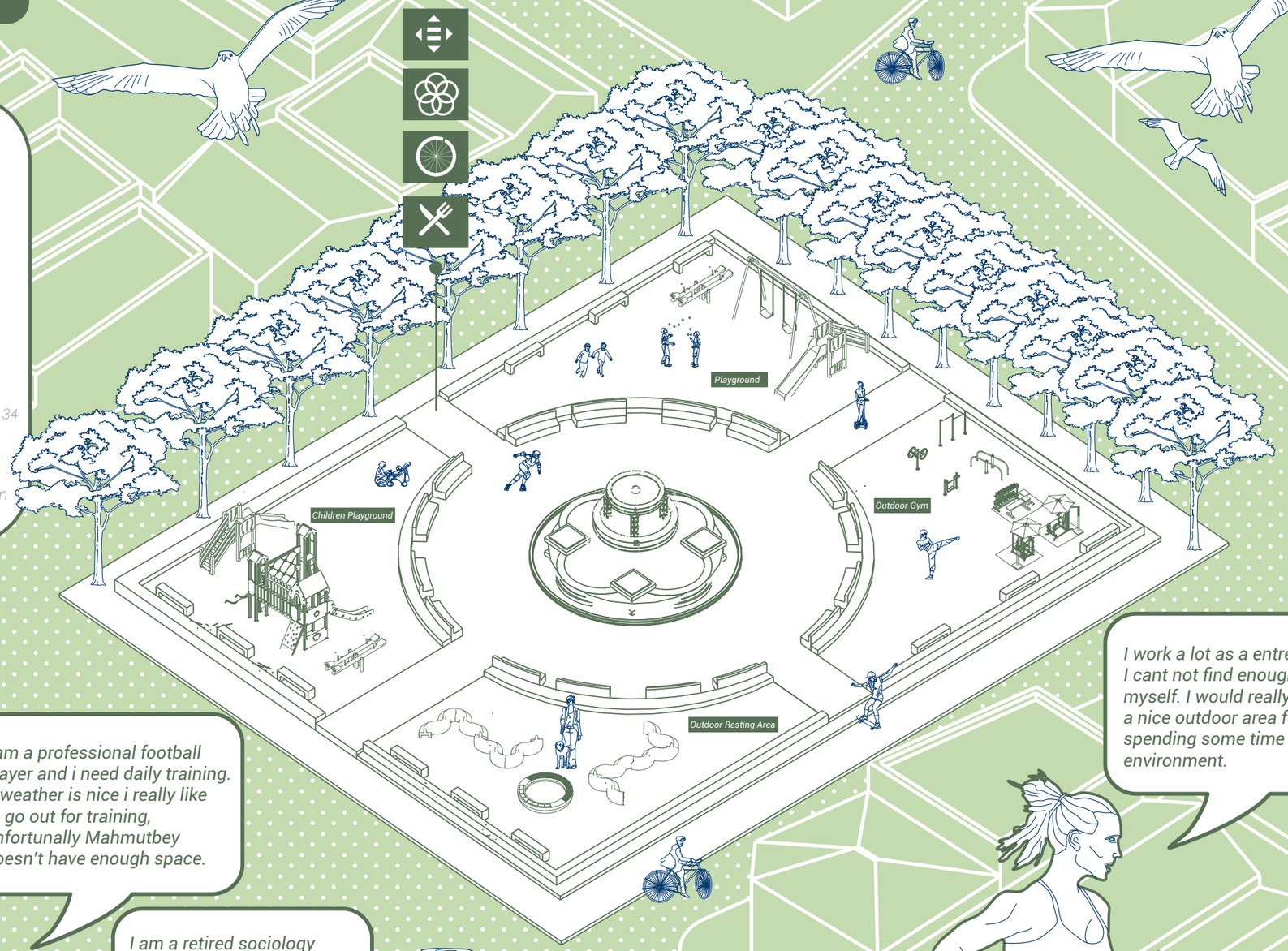
Re-considering

station 34

Station located as an edge point for green corridor and bicycle path. Considering is a quite big area, station designed according to needs.

Re-purposing

- *accessible various social spaces*
- *creating multi functinal social spaces*
- *creating new bicycle lanes for areas*
- *small kiosks for public spaces*



I am a professional football player and i need daily training. If weather is nice i really like to go out for training, unfortunally Mahmutbey doesn't have enough space.

I am a retired sociology professor, i still really enjoy reading new typologies of sociology. I would really like if i can read some of them outdoors.

I work a lot as a entrepreneur. I cant not find enough time for myself. I would really enjoy a nice outdoor area for running spending some time in nice environment.

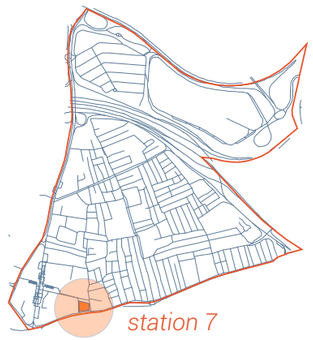
I have three kids and one of them is still very small. I want to take my kids to the park, while i take care of the little one, my other kids can play and enjoy the area.

To Build New Future

Station 34

GÖZTEPE BAĞCILAR : PLANT RENOVATION

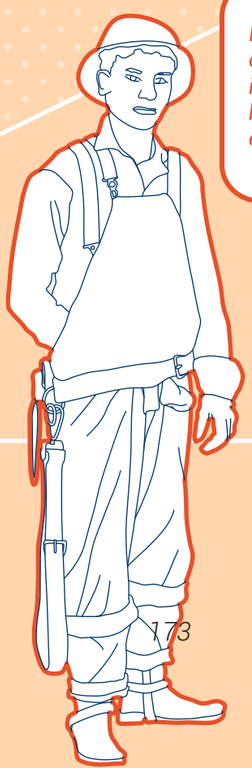
Re-considering



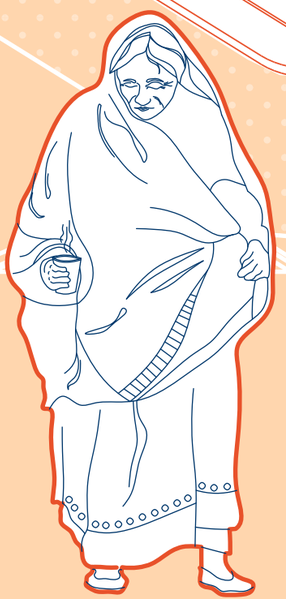
Since the area suffers from the need of sevice areas, this location can be design for the needs.

Re-purposing

- creating new employment areas with local sectors.
- community courses for residents.
- creating new service areas for residents.
- new social areas for residents.



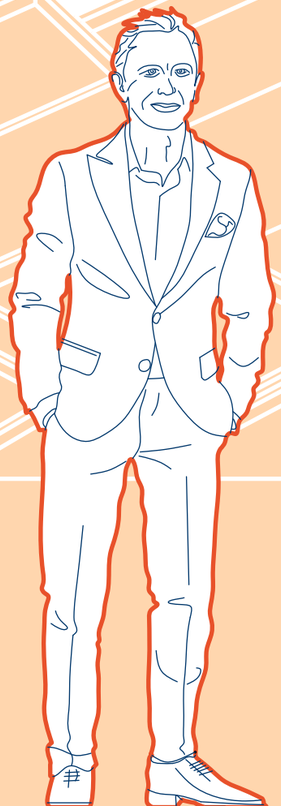
Im a gardener, i have a lot of fresh vegetables that i can sell in my neighborhood but unfortunally we dont have enough local/supermarkets.



My kids are working, i spend most of my time alone. I wish i had some community courses close to me that i can socialize and learn. Maybe neeting?

To Build New Future

Station 7



I own a construction company in Istanbul. I started a new construction in Göztepe but there is not enough restaurants or cafes where i can meet my business

Me and my family love spend time around our neighborhood but we dont have enough opportunities to enjoy and spend quality time in Göztepe, Bağcılar.

BAĞLAR BAĞCILAR : BLUE BELT

Re-considering

station 26

Bağlar suffers from lack of bicycle road and charging stations. Also well connected with main roads.

Re-purposing

considering about nature and global warming.

using renewable energy, EV car charging

by establishing renewable energy sources.

trying to creatre a conscious society

Wind Turbines

Parking

Bicycle Parks

Supermarket

Charging Station

Car Wash

Bike Path

" Hello i want the buy the house in Bağlar/Bağcılar, just wanna make sure that its has a EV Car charging station thank you."

Dad what does EV means? Dont we have a normal car?

I love using bicycle and it would really help if we has bicycle road in Bağlar!

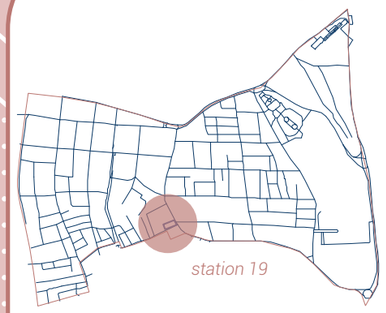
Just some taking notes about Blue belt functions, what will serve to our community.

To Build New Future

Station 26

MERKEZ BAĞCILAR :
LANDSCAPE BELT

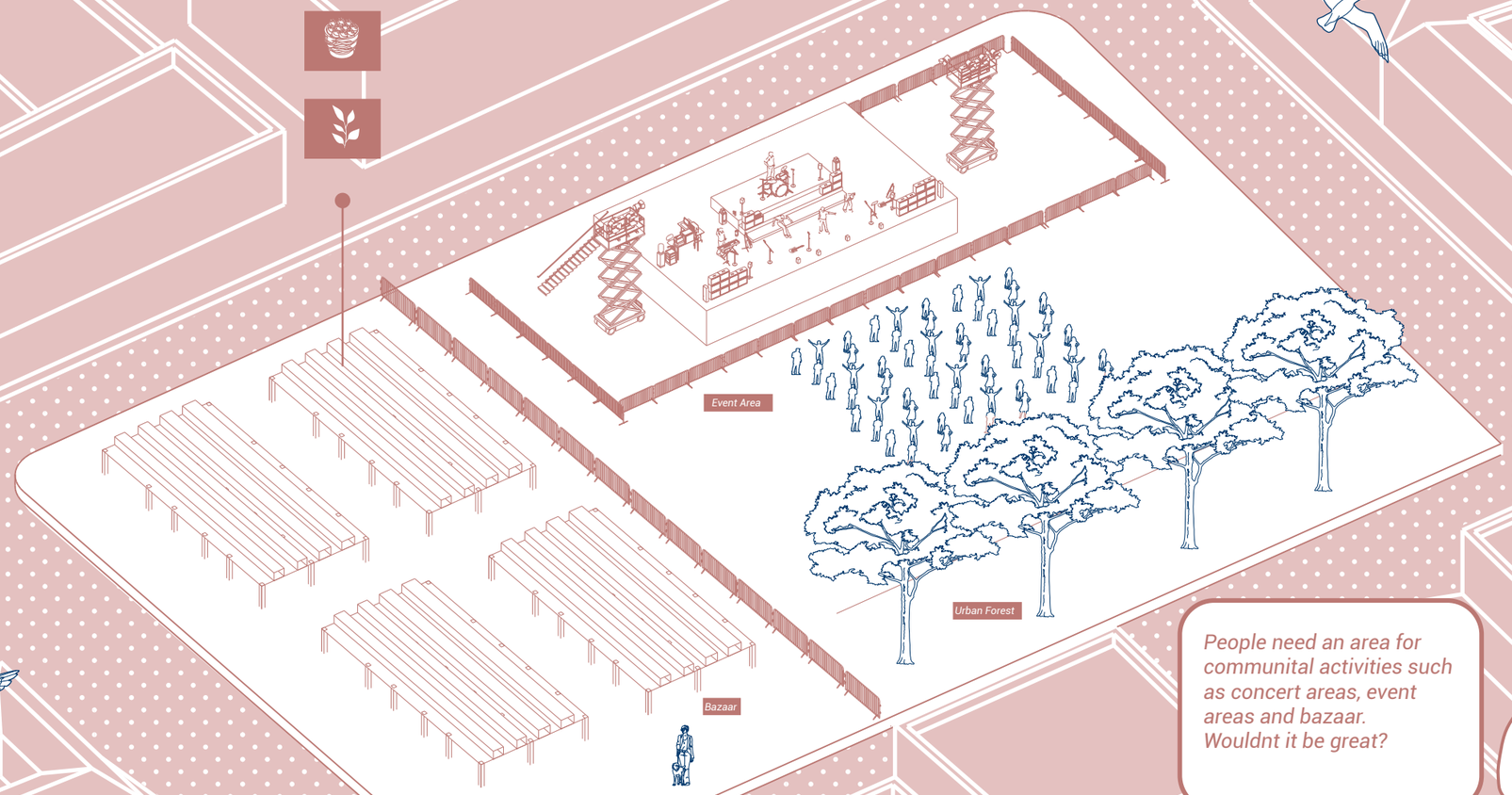
Re-considering



Since Merkez area is the central of Bağcılar, we preffered this area for is node for attraction.

Re-purposing

- *creating an area for urban farming.*
- *a space where they can organize events.*
- *local bazaar which also contributues economy.*
- *new social areas especially for remediation fields.*



I am a ballerina and i love doing yoga for streching, i would appreciate a space inside forest for remediation fields.

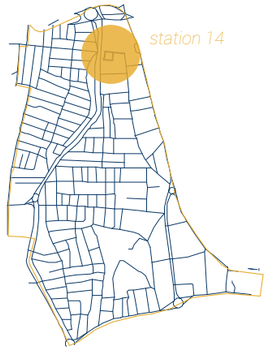
People need an area for communital activities such as concert areas, event areas and bazaar. Wouldnt it be great?

Ohh!! Can I also play?

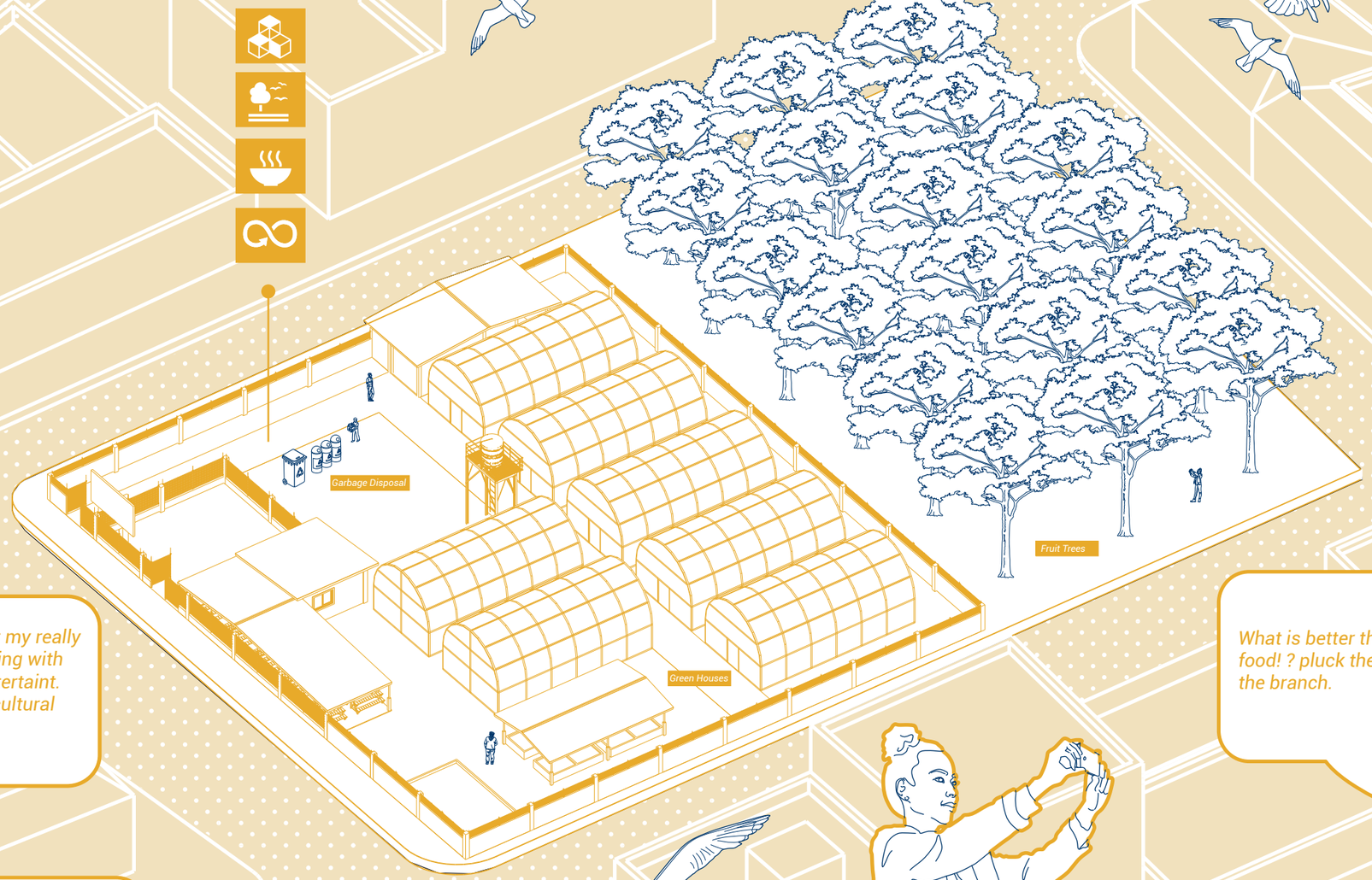
To Build
New Future
Station 19

YAVUZ SELİM BAĞCILAR : FARMLAND

Re-considering



Since the are suffers from pollution agricultural lands help to reduce, also it can create social space.



Re-purposing

- *to make production in agricultural-based industries.*
- *supporting living diversity*
- *production of rich agricultural lands*
- *improving waste disposal facilities and biogass.*

I am an architect but my really passion is soil, working with soil. It makes me entertaint. Can we make a agricultural land ?

I hate seeing garbage bag outsite, hate the smell and view. Can we find a sustainable solution for garbage disposal?

To Build New Future
Station 14

Fruit Tree gardens should help the living features, we can create them a space to live. Can i take photographs?

What is better than organic food! ? pluck the fruit from the branch.

Conclusion

The urban regeneration proposal for Bağcılar represents a transformative vision designed to address the district's complex challenges through a strategic and holistic approach.

By repurposing existing gas stations and implementing a series of comprehensive initiatives, the proposal aims to create a more sustainable, vibrant, and livable community. This conclusion synthesizes the critical elements of the project, underscoring its potential impact and the guiding principles behind its development.

SWOT Analysis and Strategic Framework

A thorough SWOT analysis laid the foundation for the regeneration strategy by identifying Bağcılar's strengths, weaknesses, opportunities, and threats. This analytical framework provided insights into the district's current conditions and external factors influencing the project. Key strengths included Bağcılar's strategic location, diverse population, robust industrial and commercial base, and extensive public infrastructure. However, the district also faced significant weaknesses, such as overcrowding, traffic congestion, economic disparities, and environmental challenges.

Opportunities were identified in urban renewal, economic diversification, public-private partnerships, and green initiatives, while threats included continued population growth, economic volatility, environmental risks, social tensions, and regulatory changes. This comprehensive analysis informed the development of targeted strategies across five main themes: Green Belt, Farmland, Blue Belt, Landscape Belt, and Plant Renovation.

Actors and Actions

The urban regeneration initiative in Bağcılar involves a diverse range of actors and actions aimed at revitalizing the community. Key stakeholders include local residents, families, workers, business persons, and tourists, all of whom engage in various activities such as shopping, dining, commuting, and recreation.

The proposal highlights the need for enhanced parks, playgrounds, sports facilities, urban farms, and recreational areas to meet the needs of different groups, including young people, elders, and families.

Local Residents:

Residents are central to the regeneration efforts, with the project aiming to improve their quality of life through better housing, green spaces, and public facilities. The involvement of residents in planning and implementation fosters a sense of community ownership and engagement.

Families:

Families benefit from the creation of parks, playgrounds, and recreational areas. These spaces provide safe and enjoyable environments for children and encourage family activities and social interaction.

Workers and Business Persons:

The proposal addresses the needs of workers and business persons by improving transportation infrastructure, creating more commercial opportunities, and

enhancing the overall economic environment. Initiatives like urban farms and renewable energy projects provide new employment opportunities and support local businesses.

Tourists:

Enhancing Bağcılar's attractiveness through improved public spaces, cultural venues, and recreational facilities aims to draw more visitors. This influx can boost the local economy and create a vibrant, dynamic atmosphere.
Youth and Elders:

The project includes specific provisions for young people and elders, such as sports facilities, community centers, and social programs. These initiatives aim to foster social cohesion, support active lifestyles, and provide opportunities for education and engagement.

Neighborhood Scale Considerations and Master Plan

Understanding the unique characteristics of each neighborhood within Bağcılar was crucial for tailoring the strategies effectively. Individual analyses were conducted for selected neighborhoods, presenting specific strategic theme suggestions for each. This approach ensured that the interventions were not only strategic but also highly relevant to the local context, fostering a sense of community ownership and participation.

The master plan integrates all these components into a cohesive framework, outlining the proposed interventions for each gas station and the rationale behind strategy selection. It emphasizes the large-scale relationships between stations

and the connections established through green and blue corridors. This comprehensive approach ensures that the stations operate as part of a cohesive network, enhancing the overall functionality and sustainability of the urban landscape.

Detailed Design Proposals

Green Belt:

The Green Belt initiative focuses on integrating green infrastructure to promote environmental well-being and enhance the quality of life for residents. The proposal includes the development of parks, playgrounds, urban farms, and recreational areas. By creating extensive green spaces and utilizing renewable energy sources, the project aims to reduce the urban heat island effect, improve air quality, and provide habitats for wildlife.

Farmland:

The Farmland proposal seeks to transform urban spaces into productive agricultural areas, fostering a sustainable future. This includes converting gas stations into hubs for agricultural industries, creating fruit tree gardens, greenhouses, and improving waste disposal facilities with biogas production. These initiatives aim to support local biodiversity, provide organic food, and create social spaces that enhance community well-being.

Blue Belt:

The Blue Belt initiative focuses on repurposing urban spaces to integrate eco-

friendly transportation and renewable energy solutions. Key features include establishing electric vehicle (EV) charging stations, car washes, bike paths, wind turbines, and parking areas.

The proposal addresses the lack of bicycle infrastructure and promotes the use of renewable energy sources, fostering a more sustainable and connected urban environment.

Landscape Belt:

The Landscape Belt aims to create a continuous green corridor, enhancing urban sustainability and environmental health. This project involves developing extensive green areas, incorporating renewable energy sources like solar panels and wind turbines, and providing accessible recreational areas, walking and biking paths, and social spaces.

By integrating residential, commercial, and recreational zones, the Landscape Belt creates a cohesive and livable urban ecosystem.

Plant Renovation:

The Plant Renovation initiative focuses on modernizing and improving plant facilities to support sustainable urban development. Key aspects include upgrading waste disposal systems, incorporating biogas production, and creating community gardens and urban farms.

These efforts aim to reduce the environmental impact of urban areas while providing residents with access to green spaces and fresh produce.

Future Vision and Impact

The envisioned future scenario for Bağcılar involves creating central public spaces like People Square and implementing a structured design process that identifies main issues, addresses community concerns, and considers various interventional factors. This comprehensive approach aims to directly and indirectly improve the urban environment through well-planned architectural and urban design interventions.

By repurposing gas stations and implementing targeted strategies, the proposal seeks to create a more sustainable, vibrant, and livable Bağcılar. The project emphasizes the importance of community engagement, environmental stewardship, and innovative solutions in urban regeneration. This strategic approach not only addresses the district's current challenges but also sets a precedent for other urban areas facing similar issues.

Conclusion

In conclusion, the urban regeneration proposal for Bağcılar is a visionary plan that combines innovative design, strategic planning, and community engagement to transform the district into a more sustainable and vibrant urban environment.

By addressing both visible and invisible community issues, the project aims to enhance the quality of life for all residents and ensure the long-term sustainability and vitality of Bağcılar. This comprehensive approach to urban regeneration serves as a model for other cities, demonstrating the potential of innovative and community-driven solutions in creating livable and sustainable urban areas.

Chapter 7 :
Conclusion

Conclusion

This thesis has meticulously investigated the potential for repurposing gas stations in Istanbul as part of an innovative urban regeneration strategy. The global transition towards sustainable energy sources and the rise of electric vehicles have rendered traditional gas stations increasingly obsolete. This research highlights how these spaces can be transformed to address Istanbul's urban challenges, including the scarcity of green spaces, air pollution, and urban sprawl. This thesis investigates the strategic repurposing of gas stations in Istanbul, with a particular focus on the Bağcılar district, as a paradigm for urban regeneration. The primary objective is to transform these underutilized spaces into vibrant green areas, addressing critical urban challenges such as environmental sustainability, public health, and community well-being.Through a comprehensive methodology integrating urban design, landscapearchitecture, environmental planning, and community engagement, the study presents a robust framework for reimagining these urban spaces.

Effective urban regeneration projects necessitate active community participationand collaboration between public private sectors. Engaging local communitiesin the planning process ensures inclusivity addresses social disparities,fostering social cohesion and providing equitable access to amenities. Community involvement is crucial for the success of these projects, as it ensuresthat the developed spaces meet the needs and preferences of the local population.

Addressing Urban Challenges

Istanbul, a rapidly growing metropolis, faces several pressing issues due to its rapid population growth and urbanization:

Scarcity of Green Spaces:

The city lacks sufficient green areas, impacting ecological balance and residents' quality of life. The limited availability of green spaces restricts recreational activities and contributes to the urban heat island effect. The analysis revealed a significant deficit in per capita green space, which is critical for enhancing the livability and ecological balance of urban areas (referenced in literature review).

Air Pollution:

High levels of vehicular emissions contribute to poor air quality, posing significant health risks. Air pollution from traffic is a major concern, exacerbating respiratory conditions and reducing overall public health. Strategies to mitigate air pollution, such as increasing green cover, are essential to improve air quality and public health outcomes (referenced in Chapter 3).

Urban Sprawl:

Uncontrolled expansion has led to inefficient land use and increased pressure on infrastructure. Urban sprawl results in longer commutes, higher energy consumption, and the loss of valuable agricultural and natural lands. Addressing urban sprawl requires strategic urban planning and the development of compact, green urban areas (referenced in Chapter 3).

Transformative Potential of Repurposing Gas Stations

The repurposing of gas stations presents a unique opportunity to address these urban challenges comprehensively. By converting these underutilized spaces into green infrastructure, Istanbul can enhance its urban environment in several significant ways:

Ecological Enhancement:

Transforming gas stations into green spaces can significantly improve urban biodiversity, create interconnected natural networks, and mitigate the urban heat island effect. These green spaces will serve as ecological corridors, supporting urban wildlife and improving overall environmental health. The introduction of native plant species can enhance local biodiversity and contribute to ecosystem stability (referenced in Chapter 3).

Social Benefits:

Repurposed gas stations can become community hubs, offering recreational spaces, promoting social interaction, and improving public health. These areas will provide residents with accessible places for physical activity, relaxation, and community events, fostering social cohesion and a sense of belonging. The availability of green spaces can also reduce stress and improve mental health, providing a respite from the urban environment (referenced in Chapter 3).

Environmental Impact:

The integration of blue-green infrastructure can improve air quality, reduce greenhouse gas emissions, and enhance the city's resilience to climate change impacts. Green spaces act as natural air filters, absorbing pollutants and offering cleaner air for urban residents. The addition of green roofs, rain gardens, and permeable surfaces can enhance stormwater management and reduce flooding risks (referenced in Chapter 3).

Methodological Insights

The research employed a structured methodological framework, focusing on the Bağcılar district as a pilot case study to illustrate applications. This involved:

Indicator Selection:

Key indicators were identified through a comprehensive literature review and the Sustainable Neighborhood (SN) Tool,including green space availability, air quality, social inclusivity, and urban connectivity. These indicators provided basis evaluating the potential of repurposing gas stations (referenced in Chapter 1).

Spatial Data Collection and Analysis:

Detailed spatial data were collected to assess current conditions and potential transformation sites in Bağcılar. This analysis provided the foundation for evaluating the feasibility of converting gas stations into green spaces. GIS tools were used to map existing green spaces, identify gaps, and propose new green corridors (referenced in Chapter 1).

Future Scenario Development:

A new master plan for Bağcılar was developed, incorporating findings from the indicator evaluation and impact assessments. This phase included a SWOT analysis, target setting, and strategic interventions to enhance green infrastructure and community engagement. The master plan proposed specific design solutions, such as creating pocket parks, linear parks along transportation corridors, and multi-functional green spaces (referenced in Chapter 1).

Case Study: Bağcılar District

Bağcılar, one of Istanbul's most densely populated districts, exemplifies the urban challenges faced by the city. The district suffers from limited green spaces, high

levels of air pollution, and significant urban sprawl. This research focused on Bağcılar to illustrate the practical application of transforming gas stations into green infrastructure:

Green Space Availability:
Bağcılar has a notable deficiency in green spaces. Currently, the per capita green space in Bağcılar is significantly lower than the recommended standards. Repurposing gas stations in the district can increase the availability of green areas, providing much-needed recreational spaces for residents. The creation of green spaces can enhance the visual appeal of the district and provide a sense of place for residents (referenced in Chapter 4).

Air Quality Improvement:
The district experiences high vehicular emissions, which contribute to poor air quality. Transforming gas stations into green spaces can help improve air quality by introducing more vegetation, which acts as natural air filters. Tree planting initiatives can further enhance air quality by sequestering carbon dioxide and releasing oxygen. Additionally, these green spaces can serve as buffers against traffic noise, contributing to a quieter urban environment (referenced in Chapter 4).

Community Engagement:
The transformation process in Bağcılar involved engaging with local communities to ensure that the repurposed spaces meet their needs and preferences. This fosters a sense of ownership and social cohesion among residents. Public participation workshops and surveys were conducted to gather input and ensure the inclusivity of the design process. Community gardens and spaces for local markets were included to enhance community interaction and economic activity (referenced in Chapter 4).

Implemented Indicators

The research meticulously implemented several key indicators to guide the transformation process:

Green Space Availability:

The study aimed to increase the amount of green space per capita in Bağcılar. Detailed spatial analysis identified areas lacking green spaces and proposed new parks and green corridors to enhance connectivity. The goal was to ensure that every resident has access to a green space within a short walking distance, promoting physical activity and well-being. The proposed green spaces include a mix of small pocket parks, larger neighborhood parks, and linear parks along major roads and waterways (referenced in Chapter 4)

Air Quality:

Air quality indicators focused on reducing particulate matter (PM10 and PM2.5) and nitrogen dioxide (NO2) levels. The introduction of vegetation, including trees and shrubs, was strategically planned to act as natural air filters. The study also proposed the installation of green walls and green roofs on existing structures to further improve air quality. Monitoring stations were suggested to track improvements in air quality over time (referenced in indicator Chapter 4).

Social Inclusivity:

Social indicators emphasized the creation of inclusive and accessible green spaces. The design process involved extensive community engagement to

understand the needs and preferences of different demographic groups, including children, elderly, and people with disabilities. Features such as playgrounds, seating areas, and accessible pathways were incorporated to ensure that green spaces are welcoming to all. Inclusive design principles were applied to ensure that green spaces are safe, accessible, and user-friendly for everyone (referenced in Chapter 4).

Urban Connectivity:

Connectivity indicators aimed to integrate green spaces into the broader urban fabric. The study proposed the development of green corridors along major transportation routes, linking existing parks and creating a network of green spaces. This approach enhances mobility and provides safe and pleasant routes for pedestrians and cyclists. The green corridors were designed to connect key destinations such as schools, markets, and transit hubs, facilitating easier access and promoting non-motorized transport (referenced in Chapter 4).

Learning from Global Examples

The study reviewed successful green space strategies from cities like New York, London, and Vienna, adapting these strategies to Istanbul's unique context.

New York's Green Belt:
This repurposed elevated railway line has revitalized urban areas, increasing green space providing recreational facilities. The High Line serves model for how linear parks can be integrated into dense urban environments. The principles of adaptive reuse and urban greening were applied to the context of Bağcılar, proposing similar linear parks along disused infrastructure (referenced in Chapter 2).

London's Green Infrastructure Initiatives:
London's extensive green infrastructure plans focus on integrating green spaces into urban areas, enhancing biodiversity, and promoting sustainable urban growth. London's approach emphasizes the importance of green infrastructure in urban resilience and climate adaptation. The strategies of creating multifunctional green spaces and incorporating biodiversity into urban design were adapted for Bağcılar (referenced in Chapter 2).

Vienna's Strategic
Urban Development Plans: Vienna's plans emphasize protecting natural areas and green corridors, completing the green belt, and connecting urban open spaces with natural areas. Vienna's comprehensive urban planning framework highlights the importance of connectivity and accessibility in green space planning. The concept of green belts and the integration of green spaces into the urban fabric were key inspirations for the Bağcılar plan (referenced in Chapter 2).

Practical Applications and Implications

The transformation of gas stations into green infrastructure aligns with Istanbul's broader goals of enhancing livability and sustainability. This approach addresses multiple urban challenges simultaneously:

Environmental Sustainability:
Prioritizing green infrastructure will reduce Istanbul's carbon footprint, enhance urban biodiversity, and improve air quality, contributing to the city's overall sustainability and resilience to climate change. The implementation of green infrastructure can also mitigate urban heat islands, reducing energy consumption for cooling. The newly created green spaces will serve as carbon sinks, absorbing

CO_2 and helping to combat climate change (referenced in Chapter 2).

Social Inclusivity:

Developing accessible green spaces will promote social equity, providing all residents with opportunities for recreation and social interaction. This can improve public health outcomes and foster a more inclusive urban environment. Inclusive design principles ensure that green spaces are accessible to people of all ages and abilities. Community events and activities in these spaces can strengthen social bonds and enhance community resilience (referenced in Chapter 3).

Economic Revitalization:

Green infrastructure development will attract investments, create jobs in sustainable industries, and increase property values. This economic uplift can benefit local communities and contribute to Istanbul's broader economic growth. The presence of green spaces can enhance property values and attract businesses, contributing to local economic development. Additionally, the creation of green spaces can boost local tourism and recreational activities, generating additional revenue for the district (referenced in Chapter 3).

Vision for the Future

Repurposing gas stations in Istanbul presents a visionary framework for urban regeneration. By transforming underutilized spaces into vibrant green infrastructure, Istanbul can lead the way in urban sustainability and resilience. This approach advocates for innovative urban planning that balances ecological sustainability with public health and social inclusivity.

Impacts on Bağcılar

The impact of this transformation in Bağcılar can serve as a model for other districts in Istanbul and similar urban contexts globally. Bağcılar's conversion of gas stations into green spaces can significantly improve the district's livability by:

Enhancing Green Coverage:

Increasing the per capita green space, providing residents with more opportunities for outdoor activities, and creating a healthier living environment. The creation of green spaces can also contribute to the aesthetic enhancement of the district, making it a more attractive place to live and work (referenced in Chapter 6).

Reducing Pollution:

Plants and trees in these green spaces will help filter pollutants, improving air quality and reducing health risks associated with pollution. The introduction of green infrastructure can also contribute to the reduction of noise pollution. The combined effect of improved air quality and reduced noise levels can enhance overall public health and well-being (referenced in Chapter 6).

Fostering Community:

Green spaces can act as communal areas where residents can gather, interact, and build stronger community ties, enhancing social cohesion. Community gardens and urban farms can provide opportunities for local food production and community engagement. These spaces can also host cultural and social events, fostering a sense of community and belonging residents (referenced in Chapter 6).

Long-term Sustainability

Community Involvement:

Engaging local residents in the planning and upkeep of these green spaces ensures that they are utilized effectively and appreciated by the community. Volunteer programs and community stewardship initiatives can foster a sense of ownership and responsibility. Regular community feedback sessions can help identify areas for improvement and ensure that the spaces remain relevant and useful (referenced in Chapter 6).

Policy Support:

Strong support from local and city-wide policies will be essential in maintaining and expanding green infrastructure initiatives. Policy frameworks should incorporate green infrastructure planning into zoning regulations and development codes. Incentives for developers to include green spaces in their projects can also promote widespread adoption of green infrastructure principles (referenced in Chapter 6).

Adaptive Management:

Monitoring and adapting strategies based on feedback and changing environmental conditions will help sustain the benefits of these green spaces. Regular assessments and updates to management practices can ensure the long-term success of green infrastructure projects. The use of technology, such as remote sensing and environmental sensors, can aid in the monitoring and management of these spaces (referenced in Chapter 6).

Conclusion

Transforming these spaces into community hubs addresses social inequities by providing recreational facilities, fostering community interaction, and promoting social cohesion. This contributes to a better quality of life for residents, particularly in densely populated areas like Bağcılar.

Urban regeneration projects can create status of local communities. The development of green infrastructure and public
amenities supports economic revitalization and social inclusion. Enhancing green spaces and reducing air pollution have significant health benefits. Improved air quality and access to recreational areas contribute to better physical and mental health for urban residents.

Urban regeneration projects must consider social impacts, including community cohesion, social equity, and access to amenities. Repurposing gas stations in Istanbul can improve social aspects by creating inclusive public spaces that foster community interaction and provide equal access to amenities. This approach addresses the lack of recreational facilities in Bağcılar, promoting social cohesion in the densely populated district.

Managing population density and optimizing land use are critical components of urban regeneration. High-density development, mixed-use areas, and effective land use planning can enhance urban sustainability.

In Bağcılar, repurposing gas stations can contribute to more efficient land use, providing essential amenities in densely populated areas.Urban regeneration can address socioeconomic disparities by creating job opportunities, improving

housing conditions, and enhancing access to services.Repurposing gas stations in Bağcılar can support socioeconomic development by creating new public spaces, enhancing local amenities, and providing job opportunities in sustainable industries.The strategies and methodologies proposed in this thesis can serve as a model for other cities facing similar urbanization challenges.

By prioritizing the development of green infrastructure, cities can enhance livability and sustainability, employment opportunities in sustainable industries, improving the socioeconomic ensuring a better quality of life for current and future generations. The comprehensive approach to urban regeneration presented in this study provides a replicable framework that can be adapted to different urban contexts globally.

In conclusion, the repurposing of gas stations in Istanbul, particularly in Bağcılar, represents a strategic approach to urban regeneration. By transforming these underutilized spaces into green areas, the city can address critical urban challenges such as environmental sustainability, public health, and community resilience.

The comprehensive methodology and carefully selected indicators provide a solid framework for planning and implementing these transformations, drawing on successful international examples and local context.

This strategy not only enhances the urban environment but also serves as a replicable model for other cities, showcasing the potential of urban regeneration to create healthier, more sustainable, and vibrant urban communities. The future scenarios outlined in this thesis offer a vision of an inclusive, resilient, and sustainable urban future, setting a benchmark for innovative urban regeneration practices worldwide.

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