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Mapping the Complexity and Future Vision of the Egnatia Corridor

Photo by Héctor González

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Abstract

The Egnatia Corridor has crossed Thessaloniki in northern Greece for over two millennia. The start of the Metro construction on Egnatia in 2006 has led to increased traffic, decreased activity of commercial and historical sites, and a negative image of Egnatia by its citizens. Through analysis of primary and secondary data sources, this study aimed to provide an integrated understanding of current conditions along Egnatia for the Major Development Agency of Thessaloniki to use in future urban development projects. The study captures a future vision of the Corridor from the perspective of multiple stakeholders, a vision that achieves cross-benefits between functionality, economic vitality, historical character, and quality of life for its citizens.

Executive Summary

Introduction

The Egnatia Corridor is the central artery that has crossed the city of Thessaloniki in northern Greece for over two millennia. Egnatia has always been a historic street, carrying different religions and ideologies from Rome to Eastern Europe and the Middle East until the 16th century (The History of the Egnatia Motorway). In 2006, the city began constructing a long-envisioned Metro system under Egnatia Corridor, which holds promise for making Thessaloniki a more sustainable city. Since 2006, the Egnatia Corridor has been negatively impacted by the combined effects of the Metro construction and the economic crisis in Greece. Delays have resulted in longer periods of construction blocking off portions of road and sidewalk, making traversing the area difficult by vehicle and on foot. Due to disruptions, the first phase of the Metro is now projected to be completed in 2022.

In 2018, as part of the 100 Resilient Cities initiative, many stakeholders in the city convened to envision how the existing investment in the Metro could be leveraged to deliver multiple benefits for Egnatia. The stakeholders called attention to the dependencies and interactions between historical and cultural assets, economic revitalization, sustainable transportation, and the quality of public space for citizens. The vision that stakeholders saw for a revitalized Egnatia Corridor requires an approach to urban planning that recognizes the complexity of this urban space. The Major Development Agency of Thessaloniki (MDAT) is interested in using the idea of complexity, a phrase we defined as the interconnected, ever-changing tangible and intangible aspects to a city that define how the citizens and structures within interact. The MDAT is also interested in exploring the notion of urbanity, or the intangible image and identity of Egnatia held by the city's citizens.

The goal of this project was to map the complexity and future vision of the Egnatia Corridor in terms of history, functionality, economy, and urbanity for utilization in future urban development projects. The project specifically focuses on the section of the Egnatia Corridor between Ethnikis Amynis and Plateia Dimokratias.

Overview of Methods

The following data sources were used as indicators of each dimension of complexity. Stakeholders with expertise in culture and tourism, real estate, urban resilience, urban planning, and sustainable urban mobility were interviewed and provided responses regarding all of the dimensions of complexity.

History - We conducted five interviews with experts stakeholders. We then supplemented these responses with existing Geographic Information System (GIS) layers to map the location of historical sites along the street.

Economy - We counted and compared the number of open and vacant commercial spaces between Ethnikis Amynis and Plateia Dimokratias. We also marked locations of construction.

Functionality - We conducted a pedestrian count for six major intersections of Egnatia Corridor, in addition to recording the locations of green spaces, bus stops, and Metro Station locations.

Urbanity - We conducted fifty informal interviews with pedestrians of Thessaloniki to ask about their image of Egnatia, as well as their most favorite, least favorite, and most frequented along the street.

Planned projects and future visions - We conducted five stakeholder interviews with experts to learn of the planned projects around Thessaloniki and how these will affect the Egnatia Corridor.

Findings: Four Dimensions of Complexities of the Egnatia Corridor

Pedestrian activity varies considerably along six major crossings of Egnatia Corridor. Pedestrian traffic differed on the north and south sides of the Egnatia Corridor (Figure ES.4). 56.9% of the total pedestrians measured were travelling on the south side. Plateia Aristotelous and Gounari, the two axes that saw the most pedestrian traffic, had roughly ⅔ of their pedestrian traffic on the south side of Egnatia.

Metro construction continues to have a negative impact on commercial businesses, particularly along the north side of Egnatia. According to observational research, 21% of commercial buildings on the north side of Egnatia were vacant, as of April 2019. Only 11% of commercial buildings were vacant on the south side, corresponding to an overall commercial vacancy rate of roughly 16% along the Corridor. Areas near Metro construction sites, which were concentrated more on the north side of Egnatia, correspond to higher amounts of commercial vacancies (Figure ES.2).

New Metro stations present opportunities to strengthen the historical character, increase economic activity, and positively change the image of the Egnatia Corridor. Roughly 80% of citizens interviewed on the Egnatia Corridor spend most of their time around Plateia Aristotelous or Gounari, places where historical sites such as the Arch of Galerius, Rotunda, and Roman Monumental Fountain are found. The new Metro, Metro stations, and other new projects around the city could encourage citizens and tourists to use the Egnatia Corridor and admire the historic street without the obstruction of construction. Some of the Metro stations will showcase archaeological findings discovered during construction, serving as an "opportunity to promote public transportation in the city and increase tourism on Egnatia" (M. Zourna, personal communication, April 10, 2019). Once the Metro construction is finalized, public spaces, economic development, and sustainable modes of transportation are some of the opportunities that can lead to a new, positive image for the Corridor. The new Metro can be the first step towards that image. Studies have shown the economic potential of the new Metro stations (Roukouni, 2012; Tzouvadakis, 2007). Also, a stakeholder specializing in culture and tourism believes "the Metro will help Egnatia find its greatness again, turning Thessaloniki into another city".

Citizens share a similar, negative image of the Egnatia Corridor. When interviewed, citizens and expert stakeholders associated the Egnatia Corridor with negative connotations such as "crowded" or "traffic", while words with positive connotations such as "convenient" were not frequently mentioned. Additionally, stakeholders stated that they felt unsafe around the Kamara on the Gounari Axis. Citizens also appeared to dislike the area around Plateia Dimokratias, with none of the respondents identifying the area as their favorite location or where they spend the most time.

More people favor areas of the Corridor with large amounts of public and green space. Pedestrian traffic data and citizens responses to informal interviews collaborate to show that more people travel, favor, and spend time in larger public space areas. A prominent example is the most favored area along Egnatia, Plateia Aristotelous, an area with larger pedestrian volumes and more green space. This can be compared to least favored areas west of Aristotelous, where there are no green spaces, little pedestrian traffic, and hardly any accommodating public spaces, as shown in Figure ES.3 and ES.4.

Planned Projects and Future Opportunities for the Egnatia Corridor

Upcoming urban development projects could focus on mobility and sustainable transportation. Many projects in the future relate to mobility, and the Metro, such as the sea port reconstruction, bike lane implementation, and HelExpo revitalization. With the completion of the Metro, new opportunities will arise when the land above the station returns to the city, with the lack of "construction giv[ing] freedom in terms of changing the shape" (G. Dimarelos, personal communication, April 5, 2019). New features on Egnatia, such as two vehicle lanes per direction, a designated bus lane, and biking provisions, can increase the transportation capability of the Egnatia Corridor.

Additionally, plans are already in place towards furthering sustainable transportation efforts around Thessaloniki. With the possibility of more citizens and tourists taking the Metro, a stakeholder specializing in Real Estate is looking forward to seeing Egnatia with less bus stops, reductions in heavy traffic, and noise pollution. Sustainable transportation projects could bolster Egnatia further, encouraging sustainable transportation over private transportation.

Experts see the potential for cross-benefits between completion of the Metro, newly uncovered archaeological sites, growth in tourism, and real estate development. Many of the expert stakeholders we conversed with had positive outlooks for the future of Egnatia, stating that "when [the] fences are removed, trees planted, etc. Egnatia will find again its old grandeurs, as it was before". This optimistic view results from the quantity of projects around the Egnatia Corridor to be started and completed soon, including the completion of the Metro in 2022 and commencement of construction on the Holocaust Museum in the Summer of 2019. Many other opportunities exist, such as displaying archaeological findings in Metro stations, new public and green spaces above these Metro stations, and real estate opportunities through the purchase of vacant buildings along the Egnatia Corridor.

The Διοικητήριο (Dioikitirio) Neighborhood above Egnatia has great economic and touristic potential. Investors in the past have purchased less expensive abandoned factories around the Διοικητήριο (Dioikitirio) neighborhood (as shown in Figure ES.5), but are now purchasing more historically and culturally significant buildings, such as the old city hall. Once the Metro construction no longer limits access to the Egnatia Corridor, the northwestern neighborhood can have increased connection to the city. A stakeholder specializing in tourism and culture sees potential for vacant buildings in this area to be transformed into hotels and other housing. Due to the tremendous growth of 2.7 million overnight stays in the past nine years, investment into the less expensive neighborhood in between Plateia Dimokratias and Plateia Aristotelous is appearing to be a promising option for investors.

Public-private partnerships could play an important role in economic development near the new Metro stations. There still exists opportunities for coordination between the private and public sectors before moving forward with new projects. As mentioned previously, the new Metro stations will return to the city once they are completed; therefore planning new features could improve this area and reflect the neighborhood the station is situated in. New features personalize the area around the station, which could lead to a greater sense of social cohesion within the communities. In order for impacts to be predominantly positive, it is important to understand both public and private sector concerns.

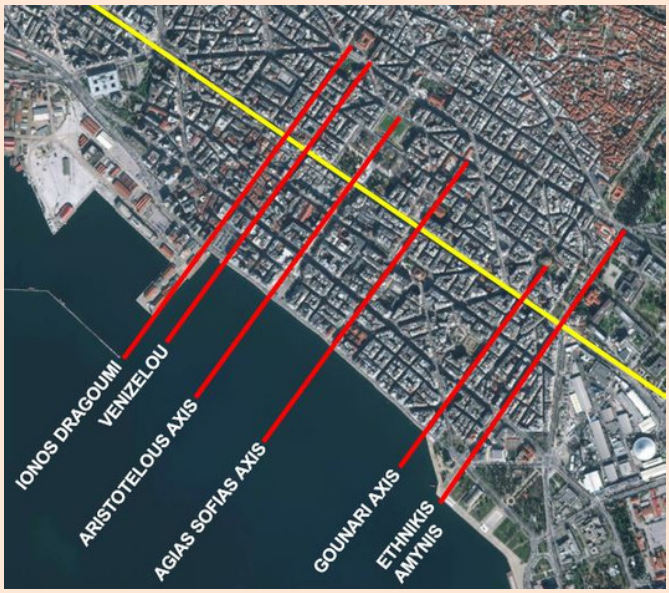

Figure ES.1: Map outlining the area of study between Plateia Dimokratias and Ethnikis Amynis

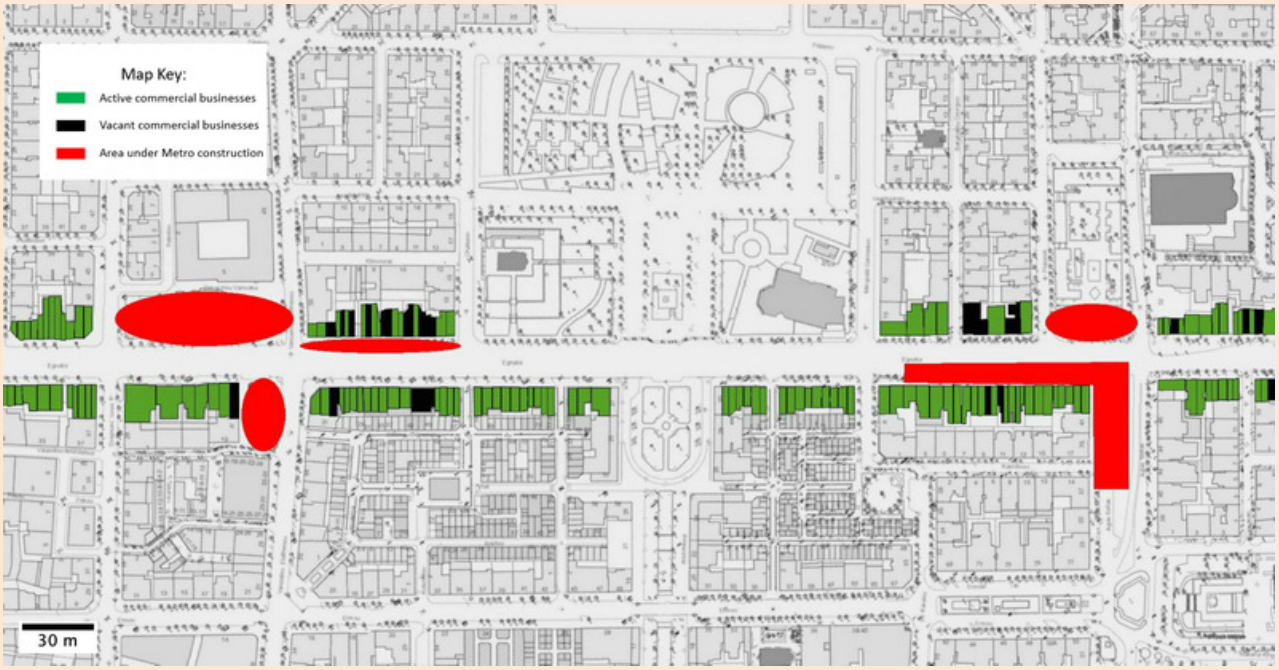

Figure ES.2: Map displaying active and vacant businesses from Ionos Dragoumi to Agias Sofias street. Data was gathered in April 2019.

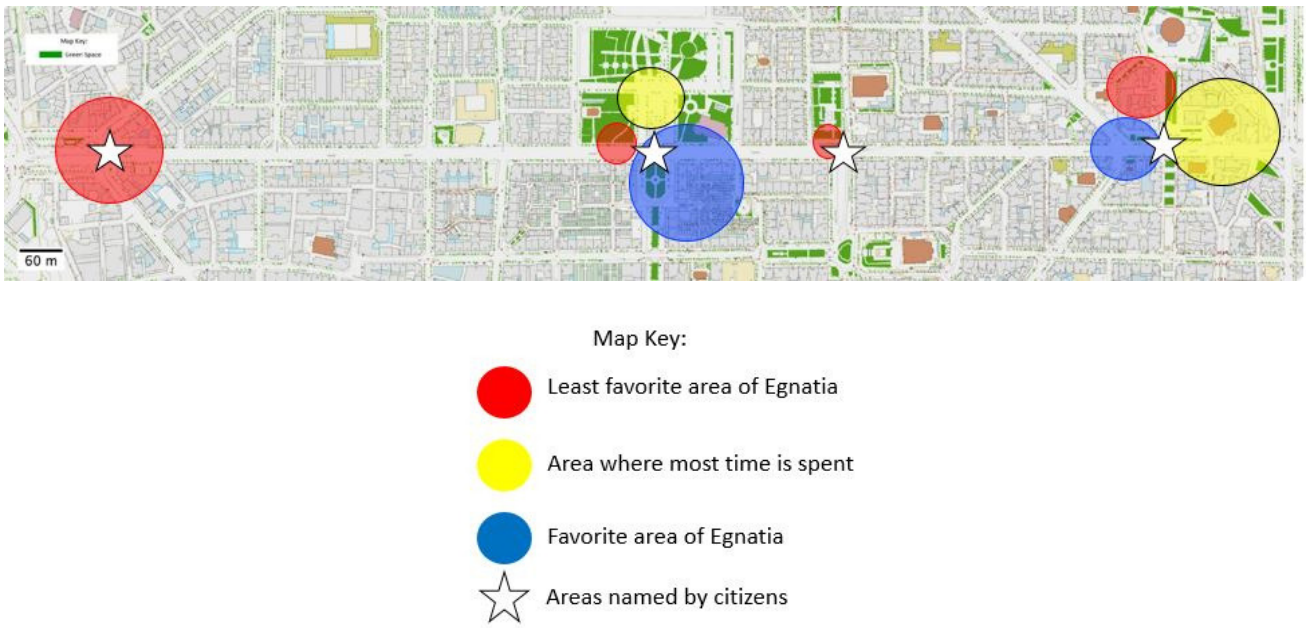

Figure ES.3: Map of study area displaying citizen's image of Egnatia on Plateia Dimokratias, Plateia Aristotelous, Agias Sofias, and Gounari Axis. The larger circles correlate to more responses to a certain question. Data was gathered in April 2019.

Figure ES.4: Map focused on area of study displaying green spaces with pedestrian activity on six major intersections along Egnatia. Data was gathered in April 2019.

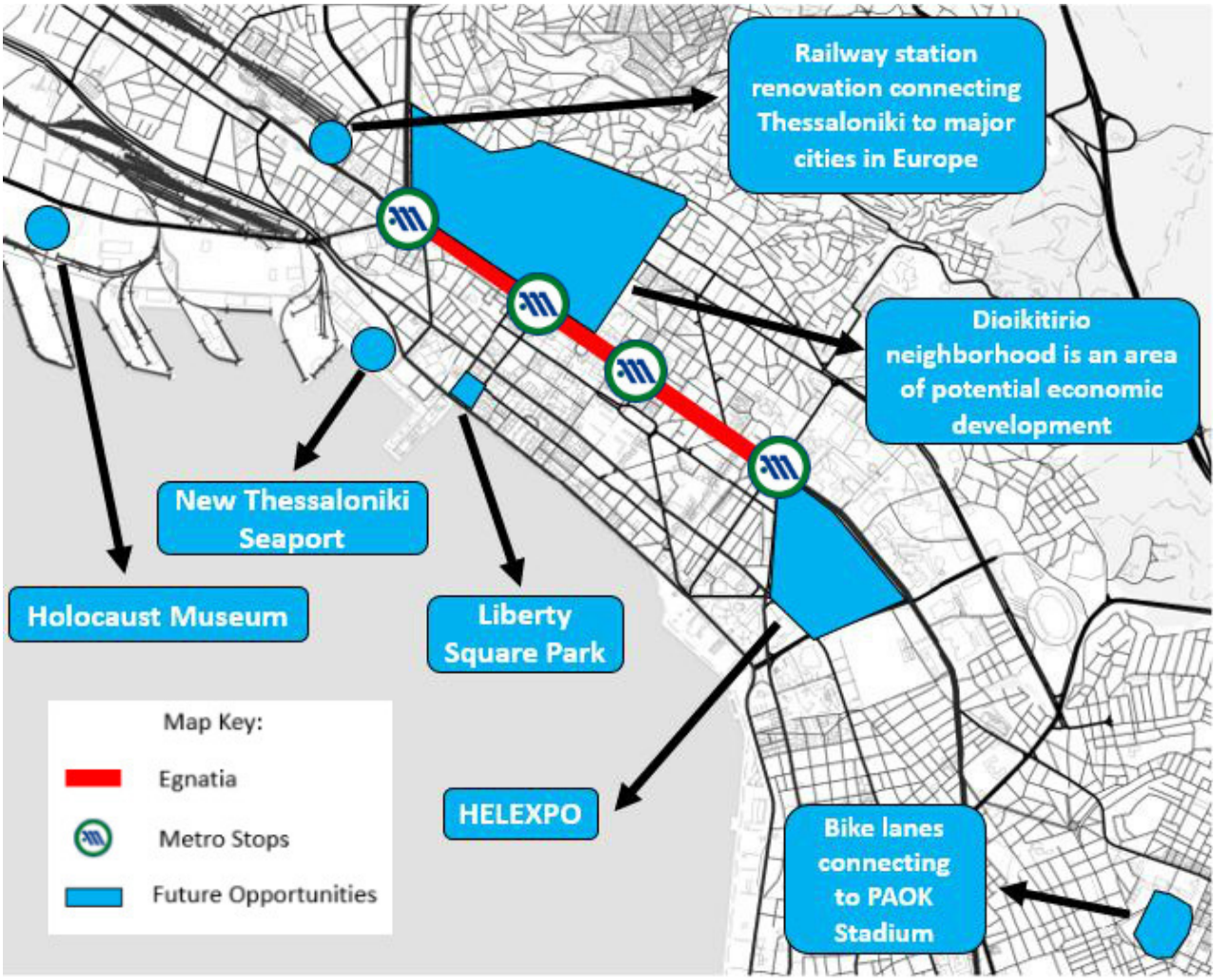

Figure ES.5: Map of Dioikitirio Neighborhood with future opportunities highlighted in Blue. Data was gathered in April 2019.

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1. Introduction

Photo by Alexander Duffield

The Egnatia Corridor is the central artery that has crossed the city of Thessaloniki in northern Greece for over two millennia. The history of the Egnatia Corridor dates back to the second century BC, during the Roman Empire. Egnatia was always a commercial street, even in ancient times, with the street being the "jewelry hub of the city" (G. Mpasmadellis, personal communication, April 5, 2019). Egnatia also carried different religions and ideologies from Rome to Eastern Europe and the Middle East until the 16th century, creating further historical significance (The History of the Egnatia Motorway). By the 1980s, Egnatia Corridor was one of the most commercially fruitful streets in the city. In 2006, the city began constructing the long-envisioned Metro system under the Corridor, which holds promise for making Thessaloniki a more sustainable city.

Since 2006, Egnatia has been negatively impacted by the combined effects of the Metro construction and the economic crisis in Greece. This was in large part due to the archeological findings discovered since construction began in 2006 (G. Mpasmadellis, personal communication, 2019). Excavation has lasted so long that college aged students today do not remember a time before the Metro construction (L. Panagiotidis, personal communication, 2019). Delays have prolonged the Metro's impact on Egnatia, resulting in longer periods of construction blocking off portions of road and sidewalk along the Corridor, making traversing the area difficult by vehicle and on foot. Due to all of these disruptions, the first phase of the Metro is now projected to be completed in 2022.

In 2018, as part of the 100 Resilient Cities initiative, many stakeholders in the city convened to envision how the existing investment in the Metro could be leveraged to deliver multiple benefits for Thessaloniki. From this meeting, the city discovered five common themes, some of which include the importance of enhancing the pedestrian, economic, and historical environment. The workshop also touched on possible ideas for improvements the Corridor could see, such as connecting all the historical and new aspects of Thessaloniki and sustainable transportation. There were no plans on how to implement these new ideas, but rather recommendations on what Thessaloniki should keep in mind while going through the planning process (100 Resilient Cities, 2018). Importantly, the stakeholders called attention to the dependencies and interactions between historical and cultural assets, economic revitalization, sustainable transportation, and the quality of public space for citizens.

The vision that stakeholders saw for a revitalized Egnatia Corridor requires an approach to urban planning that recognizes the complexity of this urban space. The Major Development Agency of Thessaloniki (MDAT) is a group that assists with urban planning and development projects in the city. From their perspective, development projects in the past have usually been planned and implemented in an isolated way without a central goal, but now there is interest in a more integrated approach (P. Tarani, personal communication, March 2019). In particular, the MDAT is interested in using the idea of complexity, a phrase we defined as the interconnected, ever-

changing tangible and intangible aspects to a city that define how the citizens and structures within interact. The MDAT is also interested in exploring the notion of urbanity, or the intangible image and identity of Egnatia held by the city's citizens.

The goal of this project was to map the complexity and future vision of the Egnatia Corridor in terms of history, functionality, economy, and urbanity for utilization in future urban development projects. The project specifically focuses on the section of the Egnatia Corridor between Ethnikis Amynis and Plateia Dimokratias (Figure 3.1). We recorded expert stakeholders' opinions on current conditions and future opportunities along the Egnatia Corridor, while concurrently gaining additional insight into the image of the Corridor through informal interviews with citizens in Thessaloniki. In addition to interviews, a variety of primary and secondary data was utilized to develop comprehensive maps and diagrams.

2. Background

Photo by Christopher René

The city of Thessaloniki has gone through significant events that shaped and defined the problems that affect the city today. This chapter discusses resilience in urban planning and mentions steps the city has already taken towards improving the city's resilience, namely through the 100 Resilient Cities initiative (100RC). We then describe the historical, economic, functionality, and urbanity aspects of the Egnatia Corridor and how they have changed through the years.

2.1 Thessaloniki's Resilience Plan

Through planning for urban resilience, cities can adapt to changes, such as increases in population and changes in technology. The four key attributes of resilient cities are health and well-being, economy and society, infrastructure and environment, and leadership and strategy (Rockefeller Foundation, 2015). The city of Thessaloniki has experienced the effects of an economic crisis over the past decade. With the lack of employment opportunities, the unemployment rate as of 2018 is the highest in the European Union (Eurostat, 2019). Having a plan of resilience involving investing money into infrastructure and transportation not only brings economic growth to the city, but also creates new jobs. Thessaloniki has partnered with 100RC to create a resilience strategy that will serve as a guide for future urban planning projects. In a workshop led by 100RC, in Thessaloniki, stakeholders were able to define some of the key issues affecting Egnatia along with possible design solutions. Some design solutions stakeholders said they wanted implemented were bike shares, digital signs displaying bus times and other important information, and public spaces surrounding historical sites.

Having updated urban transportation infrastructure is important for resilient cities because it is the "backbone to a city's social, economic, and political activity" (100 Resilient Cities, 2018).With the creation of the new Metro system, Thessaloniki is investing in a resilient transportation system, specifically to build and develop the streets above the Metro. The "Masterplan" the city has created for the Corridor has five key elements;

1. Ensuring the street provides a link to sustainable transportation across the city
2. Creating new public spaces
3. Redesigning to fit green spaces and areas that pedestrian and cyclist friendly
4. Linking cultural/historical sites along the Corridor
5. Integrating smart technology to the city's infrastructure (100 Resilient Cities, 2018).

The work of 100 Resilient Cities initiative in Thessaloniki identified the value of interconnections between history and culture, economic activity, transportation, and sustainable infrastructure for the benefit of citizens. We refer to these interacting systems as dimensions of complexity. The rest of this chapter provides an introduction to the historical, economic, and functional values of the Egnatia corridor.

2.2 The Historical Significance of Egnatia Corridor

In this section, we describe the different historical eras that shaped Egnatia to be the commercial and historical center it is today.

2.2.1 Roman, Byzantine, and Ottoman Influences

The history of the Egnatia Corridor dates back to the second century BC, during the Roman Empire. They originally intended the road for military use but it quickly developed into a commercial road, even competing with the traditional sea route from Italy to the North Aegean. The initial road stretched from Rome to its eastern provinces of Illyricum, Macedonia, and Thrace, modern-day Albania, Greece, and North Macedonia (Rowan, 2016). The Via Egnatia was important, connecting Rome with Constantinople, or modern-day Istanbul. During this time the Via Egnatia was a continuum of unpaved roads, until 145 BC when the real construction of the road began under Gnaeus Egnatius, thus the name Via Egnatia (The History of the Egnatia Motorway).

The Via Egnatia was a principal trade route that carried not only various economies but different religions and ideologies from Rome to Eastern Europe and the Middle East until the 16th century (The History of the Egnatia Motorway). In 50 AD, the Apostle Paul traveled from Philippi to Thessaloniki in his second missionary journey using the Via Egnatia. During the crusades, armies of Western Christians traveled on the Via Egnatia to aid Byzantines in taking Jerusalem from the Muslims (Rowan, 2016). The Ottomans also used the Via Egnatia in their conquest of Thessaloniki.

Many Jews who fled Spain during the Inquisition under Queen Isabella also built a large community in Thessaloniki (Lendering, 2014). Thessaloniki is full of rich history, making Egnatia and the city the multicultural hub it is today. When walking along Egnatia you can see Roman structures such as the Rotonda, Byzantine Churches, Mosques, Synagogues, and many Christian Churches. Egnatia allows for citizens and tourists alike to walk through thousands of years of history in one street.

Figure 2.1: Large scope of the Egnatia Corridor highlighted in yellow

2.2.2 Antiparochi in the 20th Century

Moving to the 20th century, The Great Thessaloniki Fire of 1917 damaged many portions of the city. Starting from one house, the fire spread to over “250 acres of building area, 9,500 houses and most of the city's churches, banks, schools, printing presses, hotels and shops” and “left 72,000 people homeless” (Hellenic Macedonia, 2018). The fire destroyed the traditional appearance of the city but paved the way for new ideas, including the Hébrard Plan. Ernest Hébrard was a French architect and urban planner who pioneered a project with a few others that envisioned a new Thessaloniki as a ‘World City’. This involved removing the “Oriental features of Thessaloniki, preserving its Byzantine heritage, and transform(ing) it into a European style city” (Hellenic Macedonia, 2018). The plan led to the development of some recognized architectural buildings, however the antiparochi method of construction characterized the 20th century Egnatia Corridor. Antiparochi favored fast, mass construction of large apartment buildings with little architectural appeal (Co-Hab Athens, 2018). Such buildings still dominate the urban landscape around the Egnatia Corridor.

2.2.3 Egnatia’s Transition from the 20th to 21st Century

Even in 1917, urban planners in Thessaloniki considered implementing a Metro system as a possible urban development project. In preparation for the Metro, tram lines that were operational since the late 1800s were removed in 1957. Planning for the Metro was stagnant until the 1980s, when Egnatia Corridor became one of the most commercially fruitful streets in the city. Due to this prosperity and its promising location, in 1988, planning towards improving the Egnatia

Corridor resumed (100 Resilient Cities, 2018). Eighty-nine years after the initial planning, in 2006, Attiko Metro S.A won a contract to start construction of the Metro system, right under Egnatia Street. The goal of the Metro was to join the center of the city with the eastern part and provide public transportation to all commuters. Unfortunately, due to major archeological findings and monetary constraints, the first phase of the Metro will not be completed until 2022, ten years later than originally anticipated. This phase of the Metro will open with four stations along the downtown sector of the Egnatia Corridor that can be seen in Figure 2.2 as the first four stations on the red line.

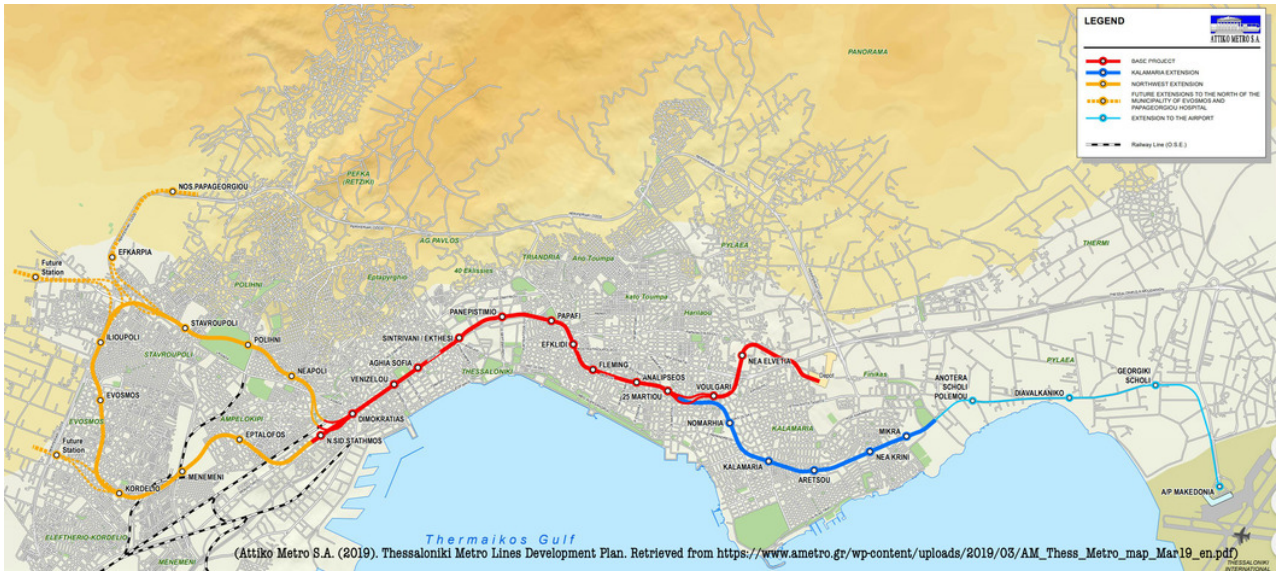

Figure 2.2: Map Outlining Proposed Thessaloniki Metro Lines. Attiko Metro S.A. (2019). Thessaloniki Metro Lines Development Plan. Retrieved from https://www.ametro.gr/wp-content/uploads/2019/03/AM_Thess_Metro_map_Mar19_en.pdf

2.3 Economic Role of the Egnatia Corridor

The Greek economy is still recovering from the 2008 Recession that impacted most of Europe, with the Greek Global Domestic Product (GDP) experiencing a 9% decrease since 2010, as of 2018 (Trading Economics, 2019). Unemployment is one of the most pressing issues facing the Greek people, with around 19% of Greek citizens unemployed as of February 2019, well above the current European Union mean unemployment rate of 6.6%. (Eurostat, 2019). However, the GDP has been forecasted to begin recovering around 2019. Additionally, the GDP from construction and public services has been steadily increasing since 2015. There has been an increase of seven hundred million Euros between 2016 and 2018 for construction and an increase of two billion Euros between 2016 and 2018 for public services (Trading Economics, 2019). Being cognizant of these statistics will allow us to understand which opportunities could be most beneficial for the city. Given the overall optimistic look towards the future, the country may be able to invest in larger-scale projects that will benefit the city for years to come.

2.3.1 Real Estate

According to a Danos International Property Consultants & Valuers Report, between 2016 and 2018, prices for apartments around the city of Thessaloniki decreased around 60% compared to 2007 (Danos, 2017). Greek housing market costs have been steadily increasing since 2018, however, with a 0.8% increase in housing prices being reported between 2017 and 2018 (GTP, 2018). One of the major factors contributing to the stabilization of the real estate market in Thessaloniki is the increase in demand for short-term rentals, such as those available through companies like Airbnb (Eurobank, 2018).

Although this is helping the Greek tourism and economy overall, it is having a negative impact on its residents. In 2017, Thessaloniki experienced a record-breaking demand for apartments on its seafront, due to pressure from short-term tourist rentals (Eurobank, 2018). This created an increase in buyer interest while also causing prices to increase and become unaffordable to residents that intend to invest in the area long-term. Eventually, this could cause tenants to move away from the profitable locations and towards inferior ones (Eurobank, 2018).

2.3.2 Commercial Land Uses

In the commercial sector, the market trended towards lower yields and higher rent prices in 2017 (Danos, 2017). The secondary markets (including Egnatia Corridor) are currently predicted to return a yield between 7.5 and 8%. This yield, compounded by property taxes and uncertainty regarding the tax framework in the short and medium-term, has resulted in the commercial real estate market decreasing considerably. These factors have all culminated in discouraging demand in secondary markets, negatively impacting the businesses in Thessaloniki and the Egnatia Corridor (Bank of Greece, 2016). The outlook for the future is more positive, with the report continuing by saying:

> Once the market returns to stability, tourist property and hotels, leased office spaces and prime office are expected to become the focus of demand for commercial property. At the same time, investor interest in large prime warehouse, which rose in 2014 but lost momentum in 2015, is expected to be renewed (Bank of Greece, 2016).

The completion of the Metro System in 2022 is set to breathe new life into the Egnatia Corridor. Both commercial and residential real estate prices are estimated to increase by 11.3% in an area fifty meters or closer to the stations, which much of the Egnatia Corridor is situated within (Xifilidou, 2012). This is a positive prediction for future opportunities along Egnatia Corridor.

2.3.3 Tourism

Tourism is becoming increasingly important for Greece, with tourism growing to encompass 20.6% of their GDP and around 25% of available occupations (Info, 2019). There has been a 450% increase in overnight stays in Thessaloniki between 2009 and 2018 (G. Mpasmadellis, personal communication, 2019). Revenue attributed to tourism is also increasing. Even though the

amount of people that visited Thessaloniki between 2017 and 2018 decreased by 0.7%, the revenue increased 6.1% (GTP, 2019). The city still comes last in terms of tourism among ten other European cities of similar size, however, namely Birmingham, Cologne, Düsseldorf, Edinburgh, Glasgow, Budapest, Hamburg, Manchester, and Salzburg.

The Officials of Thessaloniki have taken notice of this growing trend, with efforts towards re-introducing themselves to the market of Meetings, Incentives, Conferences, and Exhibitions (MICE) already underway. In May 2018, the Thessaloniki Convention Bureau (TCB) lead Greek journalists on a three-day excursion of the city, with the goal of "demonstrat(ing) the rising popularity for corporate meetings, conferences, and incentive trips" and to show that Thessaloniki was a "destination with all the qualifications to successfully hold corporate meetings, conferences and events." (Krinis, 2018). Spiros Pengas, the Deputy Mayor for Tourism and International Relations in Thessaloniki, summarized the city's goal to be "not just a tourism destination but a tourism investment destination" (Krinis, 2018).

2.4 Functionality

Understanding the current transportation and sustainable infrastructure situation along the Egnatia Corridor allows for urban planners to assess the functionality of the street. Sustainable infrastructure investigates the supporting networks of structures that enable sustainable mobility. Sustainable mobility is the ability for citizens to move around the city using environmentally conscious modes of transportation. Transportation focuses primarily on the different modes citizens use to move around the city, specifically private vehicles, buses, and the Metro. This section identifies how sustainable infrastructure and transportation characterize the overall functionality of the Egnatia Corridor.

2.4.1 Sustainable Infrastructure

Sustainable infrastructure is an important factor of urban planning in order "to meet the infrastructure needs of future generations" (Bryce, 2008). Such infrastructures are designed around sustainable modes of transportation, mainly spotlighting walking and biking, although public transportation routes are often considered as well.

There are currently no accommodating bike lanes on the Egnatia Corridor. Surveys indicated that the inclusion of a separate bike lane or path "can increase a cyclist's perception of safety… [and] cities with higher levels of bicycle infrastructure (lanes and paths) witnessed higher levels of bicycle commuting" (Dill, 2003). Thus, evidence suggests that if a bike lane is implemented in the Egnatia Corridor, citizens and tourists may be more likely to use bikes as a mode of transportation.

The city of Thessaloniki has "identified the desire to improve the …walking environment" (100 Resilient Cities, 2019). A case study investigating the pedestrian Level of Service in Thessaloniki

concluded the following: the walking environment "is characterized by sidewalks with small widths and many obstructions, poor personal security (no lateral separation of pedestrians and vehicles) and many potential conflicts with the vehicles" (Sdoukopoulos, 2014). The poorly accommodating walking environment suggests decreased pedestrian participation and limits walking feasibility.

Green spaces are functional, landscaped public spaces that can break up the cityscape of commercial buildings, provide meeting and recreational spaces for citizens, and additional areas for citizens to walk. The role of green spaces in an urban area is not just attracting and keeping citizens in cities, but to also attract tourists (Madanipour, 1999). Green spaces are also associated with various positive effects, including increasing physiological and psychological health, improving blood pressure and stress levels, and increasing physical activity (Kardan, 2015). Overall, "There are few parks, playgrounds or green public spaces for inclusive, intergenerational, recreational activity" (100 Resilient Cities, 2018) in Thessaloniki. Figure 2.3 and 2.4 highlight the greenspace along the Egnatia Corridor based on Thessaloniki GIS data (City of Thessaloniki, 2019).

Figure 2.3: Green Spaces on Egnatia Corridor (from Plateia Dimokratias to Venizelou street)

Figure 2.4: Green Spaces on Egnatia Corridor (from Platia Aristotelous to Ethnikis Amynis). Data was gathered in April 2019.

2.4.2 Transportation

Egnatia Corridor is one of the main axes of the city and allows traffic to flow from either side of Thessaloniki (Figure 2.1). Thus, the Corridor sees large traffic volumes daily (Egnatia Odos SA, 2012). These large volumes are largely constituted by private vehicles, with 78.26% of people in Thessaloniki making daily trips with their private vehicles (Organization of Urban Transportation of Thessaloniki, 2014).

The bus system is another method of transportation along the Egnatia Corridor, and currently there are "too many bus routes along the Corridor, and they do not integrate with the Metro" (100 Resilient Cities, 2019). Studies have shown that Thessaloniki's overall satisfactory rating for public transportation, as given by the commuters who ride the Thessaloniki Urban Transport Organization (OASTH) buses, was 25%, one of the lowest amongst European cities (Botzoris, Galanis, Profillidis, & Eliou, 2015). According to 2017 data, OASTH buses experience itinerary delays 89% of the time (Perra, Pitsiava-Latinopoulou, & Sdoukopoulos, 2017). The unreliability and dissatisfaction with the bus system may influence the degree to which private vehicles are used.

The Metro system, which is set to be completed by 2022 (Figure 2.5), presents new opportunities for sustainable transportation through Thessaloniki. The line will have 4 stations, providing access to thousands passengers per hour in each direction (Roukouni, 2012). The Metro's transport speed and accessibility may lead to a reduction in private vehicle dependance.

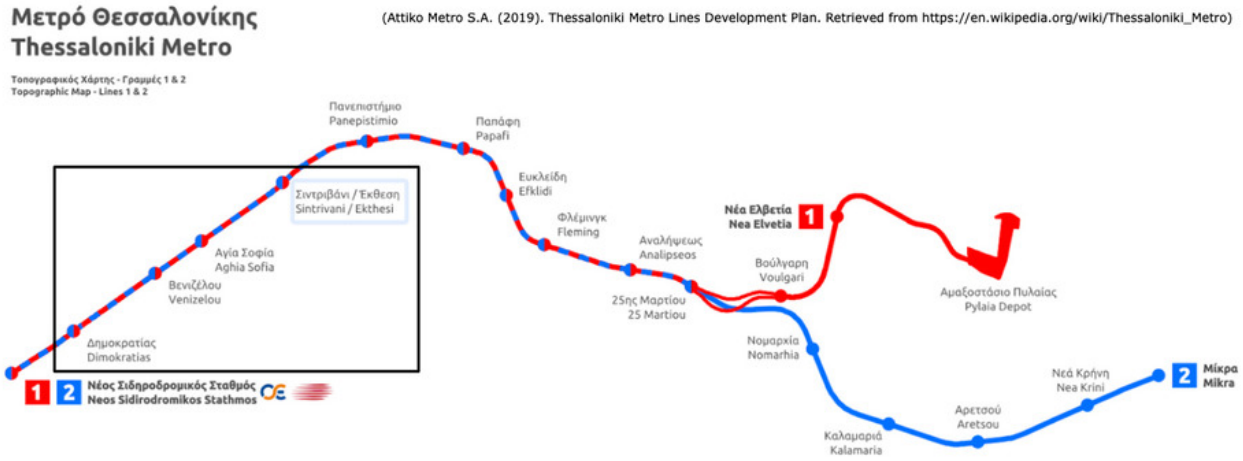

Figure 2.5: Main section (boxed in black) of the Metro that will be completed in 2022. Attiko Metro S.A. (2019). Thessaloniki Metro Lines Development Plan. Retrieved from https://en.wikipedia.org/wiki/Thessaloniki_Metro

2.5 The Image and Identity of Urban Spaces

Urbanity, as defined by our group, is the intangible image and identity of a city held by its citizens. In the book, Image of the City, the American urban planner Kevin Lynch explains how every city has a public image, created by the overlap of many people's images (Lynch, 1959). The image of a city or certain neighborhoods can be influenced by factors such as social divisions and economic opportunities, possibly preventing further development. Each city has unique inhabitants and is shaped over time to have distinguishing features and attractions. The Egnatia Corridor serves as a perfect case study to explore urbanity. It consists of many businesses, historic monuments, and residences which form and create unique areas and neighborhoods along the Corridor.

In every city, neighborhoods are recognized by different elements ranging from bridges to murals to places of interest. Lynch defined these elements as Landmarks, Nodes, Districts, Paths, and Edges. Plateia Aristotelous, as shown in Figure 2.6, is one of the most unique locations in Thessaloniki, possibly categorized by citizens under the elements defined by Lynch. Every city's image is defined by the five elements mentioned previously, serving as a guide to create and design a city (Lynch, 1959). However, the image of a city is not only composed by these five physical elements. The intangible aspect of a city's image is important and cannot be seen just by looking at the built environment. Lynch focused on several questions that led him to determine what parts of a city could be Landmarks, Nodes, Districts, Paths and Edges. Some of these questions were:

1. Which city felt to be a well-oriented one?
2. What were important junctions in the city?
3. What place, or point of interest, is unique or memorable?

Urban planners in Thessaloniki do not have much information about how the historical sites, commercial activity, transportation systems, and public spaces interact to affect citizens' image of the Egnatia Corridor.

Figure 2.6: Plateia Aristotelous along Egnatia.

3. Methodology

Photo by Marilyn Galdámez

The goal of this project was to map the complexity and future opportunities of the Egnatia Corridor in terms of history, functionality, economy, and urbanity to benefit future urban planning projects. This chapter outlines the methods we used to achieve this goal All stakeholder questions can be seen in Appendix A and all protocols can be seen Appendix B.

3.1 Characterize the Complexity of Egnatia Corridor

The Egnatia Corridor is one of the main axes of Thessaloniki, containing many complex layers. The Urban Planner of the MDAT, Paraskevi Tarani, defined the four dimensions of complexity of the Egnatia Corridor to be history, functionality, economy, and urbanity (P. Tarani, Personal Interview, March 13, 2019). We investigated the portion of the Egnatia Corridor between Aristotle University and Plateia Dimokratias (Democracy Square) as shown in Figure 3.1.

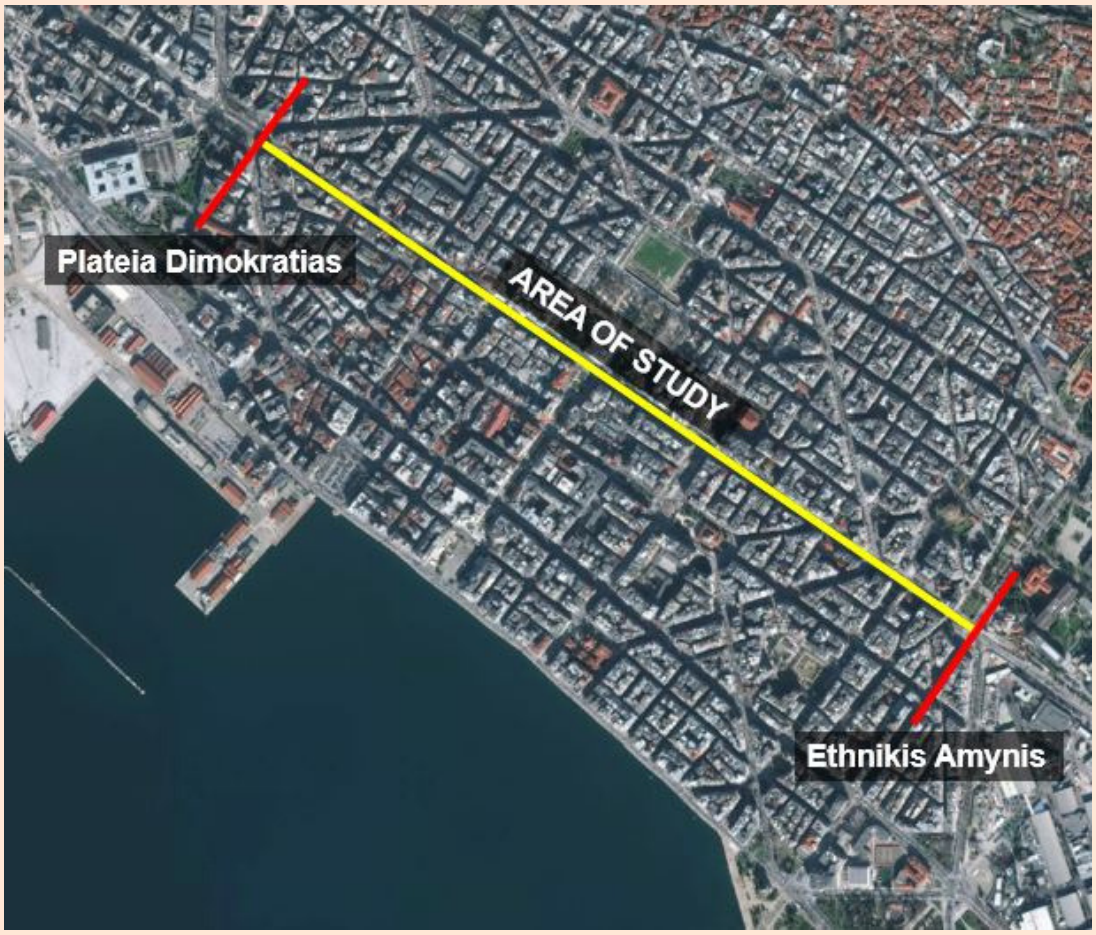

Figure 3.1: Area of Study Between Plateia Dimokratias and Ethnikis Amynis Street

We characterized this central portion based on the four dimensions of complexity. We chose indicators for each dimension:

- History: Location of Historical Landmarks
- Economy: Percentage of Vacant Commercial Buildings
- Functionality: Transportation Infrastructure, Green Space, and Pedestrian Traffic
- Urbanity: Citizens' Image of Egnatia

The following sections describe the data gathering methods for these indicators and how the data was analyzed to map the current conditions in an integrative way.

3.1.1 Engage Expert Stakeholders

To characterize the current conditions of the Egnatia Corridor, we gathered input from stakeholders by conducting expert formal interviews. The following five experts were interviewed:

- Katerina Danadiadou, Head of the Department of Urban Planning
- Giorgos Dimarelos, Deputy Mayor of Urban Resilience
- Konstantinos Haitoudis, Association of Real Estate Owners
- Giorgos Mpasmadellis, Department of Culture and Tourism
- Maria Zourna, Head of the Department of Sustainable Urban Mobility

We interviewed expert stakeholders by asking questions related to each dimension of complexity. This interview was lead by one facilitator, who primarily asked the questions, while the other team members recorded the stakeholder's responses. This allowed every topic mentioned by the stakeholder to be recorded, as well as open the door for additional questions if any of the four members noticed the stakeholder seemed interested in taking the interview in another direction.

3.1.2 Identify Historical Assets

In order to characterize the historical assets of Egnatia, we began by using the Thessaloniki Monuments' Map and GIS layer to identify historical sites and landmarks. We also used the expert interviews, previously described, to gain more in-depth information about the historical character of the street that would otherwise not be apparent from maps. We asked them about the many historical assets along Egnatia and whether they were being used for their intended purpose. One of the five people we interviewed had the expertise to provide insights about the historical assets, although all of the experts provided some insight into the dimension of history.

3.1.3 Understand Economic Conditions.

To have a visual representation of the economic dimension of complexity, we used the percent of vacant commercial buildings as an indicator. To get this information, we conducted a three-hour-long observation beginning at 10:00 on March 28, 2019, when most storefronts were already open for the day. Using GIS maps available through Thessaloniki's public domain, we could see the individual buildings along Egnatia. We began in the southeast end of the Street at Ethnikis Amynis Street and concluded in the northwest end at Plateia Dimokratias. For each of the buildings, we noted the number of businesses spaces in a single building in a single building and marked the active commercial spaces with a "✓" and the vacant commercial spaces with an "X".

Although this method was effective and efficient in allowing us to get the data we needed, there were a few constraints and limitations. Specifically, it was difficult at times to identify if a commercial space was vacant or simply closed for the day. We addressed this by defining indicators that determine an inactive business such as boarded-up windows, little to no merchandise, large amounts of vandalism, and accumulation of trash.

3.1.4 Characterize Multiple Aspects of Functionality.

The functionality dimension of complexity was understood through the elements of pedestrian traffic, green space land use, bus stops, and Metro station locations. We conducted a pedestrian count along six major intersections of the Egnatia Corridor, in addition to recording locations of green spaces and public transportation stops. The pedestrian count revealed information relating to how citizens within Thessaloniki move with reference to Egnatia, while the other elements were researched as supplementary material to further connect different dimensions of complexity.

Our group utilized existing Thessaloniki Geographic Information System (GIS) layers to display the bus stops on geographical maps. We also created and overlaid Metro station stops and green spaces using available government information. The combined layers completes our sustainable infrastructure map.

There are six major streets that intersect with the Egnatia Corridor (Figure 3.2) and lead directly to the coast. We counted pedestrians at each of the six major intersections for two hours during weekdays in March and April, 2019. Counts were conducted during the hours of 14:00-15:00 and 17:00-18:00 based on advice provided by the MDAT. In most cases, there were two observers per intersection, one on the north side of the Egnatia Corridor and one on the south side. Each observer counted pedestrians moving both northbound and southbound along the axes. The template shown in Appendix E was followed, with pedestrians noted with tally marks. A representative map of pedestrian traffic on the north and south sides of Egnatia for each axis was developed (Figure 4.1). The map displays the highest hour of traffic counted for each of the axes.

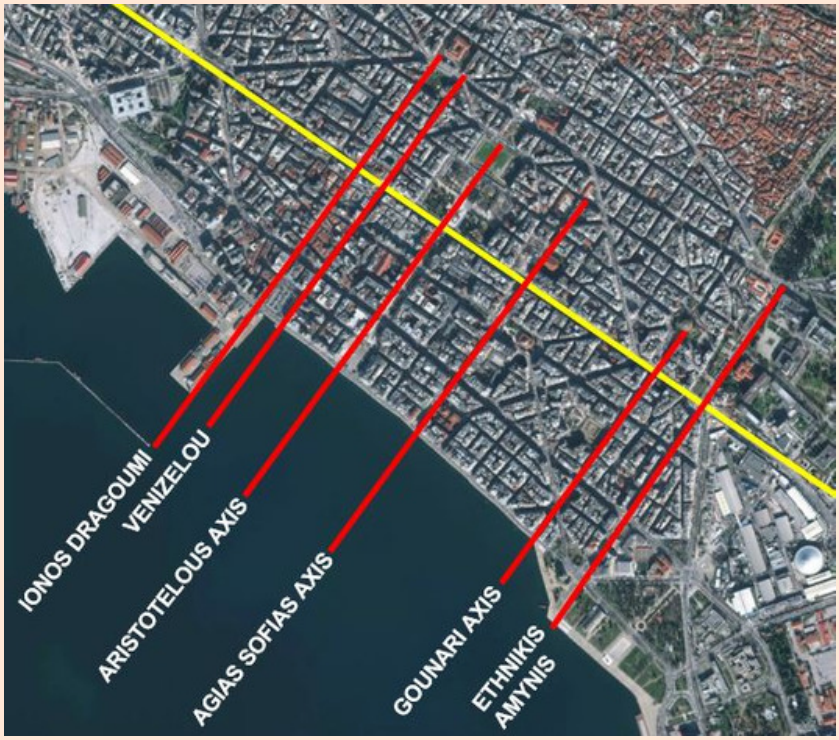

Figure 3.1: Area of Study Between Plateia Dimokratias and Ethnikis Amynis Street

The data collected provides a snapshot of pedestrian activity, therefore there were limitations. Some limiting variables that could affect the validity of data collected could include weather, special events (holidays), and counting errors. Also, most of the counts were conducted on different days of the week.

3.1.5 Explore Peoples' Images of Egnatia.

We also investigated the urbanity, or image of the city, through the eyes of citizens in order to understand the current conditions of urbanity and areas for improvement. We interviewed local citizens on the Egnatia Corridor and asked them four questions related to the image of Egnatia, shown below:

1. What is the first thing that comes into mind when you think of Egnatia?
2. What is your favorite part of Egnatia in terms of aesthetics (looks)?
3. What is your least favorite part of Egnatia in terms of aesthetics (looks)?
4. Where on Egnatia do you like to spend the most time?

In order to interview more stakeholders, we broke up into pairs, with each pair comprised of someone who conducted the interviews while the other made note of the citizen's responses. Interviews were conducted in our area of study and along the six major intersections with Egnatia, as shown in Figure 3.2. We discovered that older citizens often did not speak English or did not want to be interviewed, leading us to focus more on a younger demographic. We collected citizens' input by having them mark their responses with stickers on a map of Egnatia. The stickers were color coded in order to help us identify which response belonged to which question. By the end of our data collection process, we interviewed approximately fifty citizens.

There are several other limitations of this data collection method. Many of the fifty respondents were Greek citizens between eighteen and thirty years old, since younger people were more likely to speak with us and understand English. The language barrier, in addition to the age bias in our sample, could influence the sample as younger people could have different views of Egnatia than older generations. Due to the small number of interviews, this data cannot be considered representative of all citizens.

3.1.6 Analyze and Map Complexity.

Geographical maps supplemented by a word map were produced to visually represent the information obtained from the previous objectives. Specifically, we produced geographical maps of pedestrian traffic levels, commercial vacancies, historical landmarks, green spaces, public spaces, and informal stakeholders favorite, least favorite, and most frequented areas along the Egnatia Corridor. To portray the image of Egnatia as told to us during our informal interviews with citizens, we created a word map that displayed the most frequent words used to describe Egnatia.

We then examined the spatial data in an integrative way to answer the following types of questions:

- How much does the historical assets, economic condition, functionality, and image vary along the Corridor?
- To what extent can interrelationships be seen between historical assets, economic activity, functionality, and peoples' images of the corridor?

After drawing some conclusions to these questions, we created additional maps to illustrate multiple dimensions of complexity and the relationships between them.

3.2 Characterize Future Opportunities and Visions for the Egnatia Corridor

The responses that we received were used in tandem with the data gained in Objective 3.1 to better identify areas of opportunity for all four dimensions of complexity along the Egnatia Corridor.

During the interviews described previously, we asked the stakeholders about planned projects and future opportunities as well. This information was used to create a map of projects in or soon-to-be in development, as well as record new ideas on urban projects to implement through Thessaloniki in the future.

4. Findings: Four Dimensions of Complexity of the Egnatia Corridor

Photo by Alexander Duffield

In this chapter we use the four dimensions of complexity to characterize different segments of the Egnatia Corridor, emphasizing how the dimensions are interconnected. We present the current conditions of the Corridor in relation to those four dimensions of complexity. Conclusions made in this chapter are based on an analysis of GIS data along with qualitative and quantitative information gathered during our own fieldwork.

This section first presents pedestrian foot traffic data and how pedestrian activity is connected with commercial businesses. Next, the impact of the Metro construction on commercial businesses on Egnatia Corridor is discussed, as well as the Metro's promise for economic activity. We then talk about the historical dimension, mainly regarding how construction and historical infrastures interact in the eyes of pedestrians. Finally, we present the image of the city through the eyes of its citizens, show how pedestrian activity relates to public and green spaces, and highlight the connections between how citizens view Egnatia and the different dimensions of complexity.

4.1 Pedestrian Traffic

In this section we discuss the six major axes that cross Egnatia Corridor and how pedestrian flow differs between them.

Pedestrian activity varies considerably along six major crossings of Egnatia Corridor. A map displaying the highest volume of pedestrian travel counted for each axis over one hour (peak hour), on both north and south sides of the Egnatia Corridor, can be seen in Figure 4.1. See Appendix E for more detailed information for each of the axes.

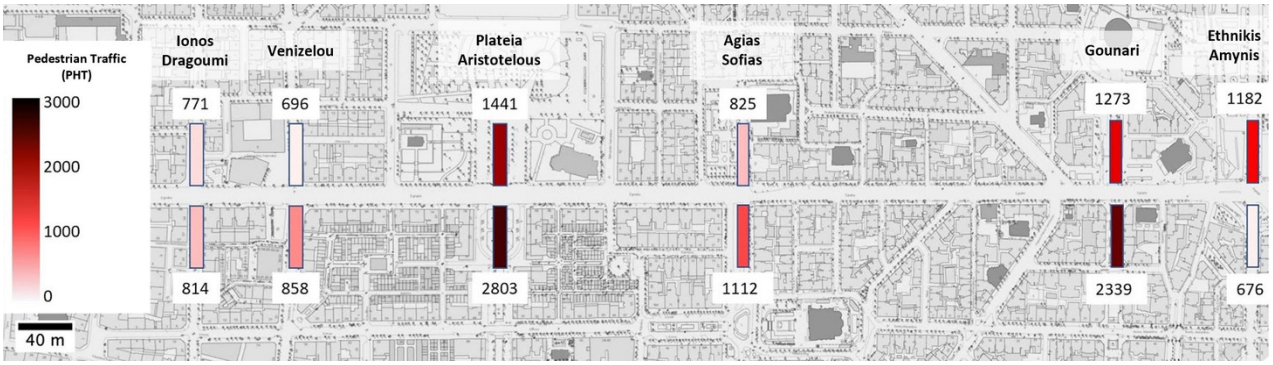

Figure 4.1: Pedestrian traffic volumes on the six main axes of Egnatia Corridor. Measurements were made during April 2019.

For the six axes we investigated, a total of 24,748 pedestrians were counted on a single day of the week, from 14:00 to 15:00 and from 17:00 to 18:00. Of these six axes, the ranking frommost frequented to least frequented, for the hour that each axis had the most pedestrian traffic, was as follows:

1. Aristotelous Square (28.7%)
2. Gounari Axis (24.4%)
3. Agias Sofias Street (13.1%)
4. Ethnikis Amynis Street (12.5%)
5. Ionos Dragoumi Street (10.7%)
6. Venizelou Street (10.5%)

56.9% of the total pedestrians measured between 14:00-15:00 and 17:00-18:00 were walking on the south side of Egnatia. All the axes had more people on the south side of the street except for Ethnikis Amynis, where 60.7% of the foot traffic was on the north side.

This inequality between the north and south sides of Egnatia is likely due to the location of shops and businesses. The two avenues with the greatest difference in pedestrian activity between the north and south sides were Plateia Aristotelous and the Gounari Axis, shown in Appendix C2 and C4. Both axes have a multitude of shops and businesses south of Egnatia as the axes continue to the sea, possibly making this area more attractive to citizens and tourists alike.

As previously stated, Ethnikis Amynis had more pedestrian traffic north of Egnatia, which is likely due to its proximity to Aristotle University. Most citizens observed in this area during informal interviews and pedestrian countings were young adults, further reinforcing our conclusion. Days of the week, weather, and time of year are likely to affect pedestrian activity, so the reliability of these data may be limited.

4.2 Current Economic Condition of Egnatia

In this section, we present commercial building vacancies along the Corridor and relate it to Metro construction, pedestrian traffic, and Metro stops. We also talk about how new metro stops might develop economic activity along the Egnatia Corridor.

Metro Construction continues to have a negative impact on commercial businesses, particularly along the north side of Egnatia. Construction and commercial buildings locations on the Egnatia Corridor between Ionos Dragoumi and Agias Sofias can be seen in Figure 4.2, while all commercial building vacancies between Aristotle University and Plateia Dimokratias can be seen in Appendix B1.

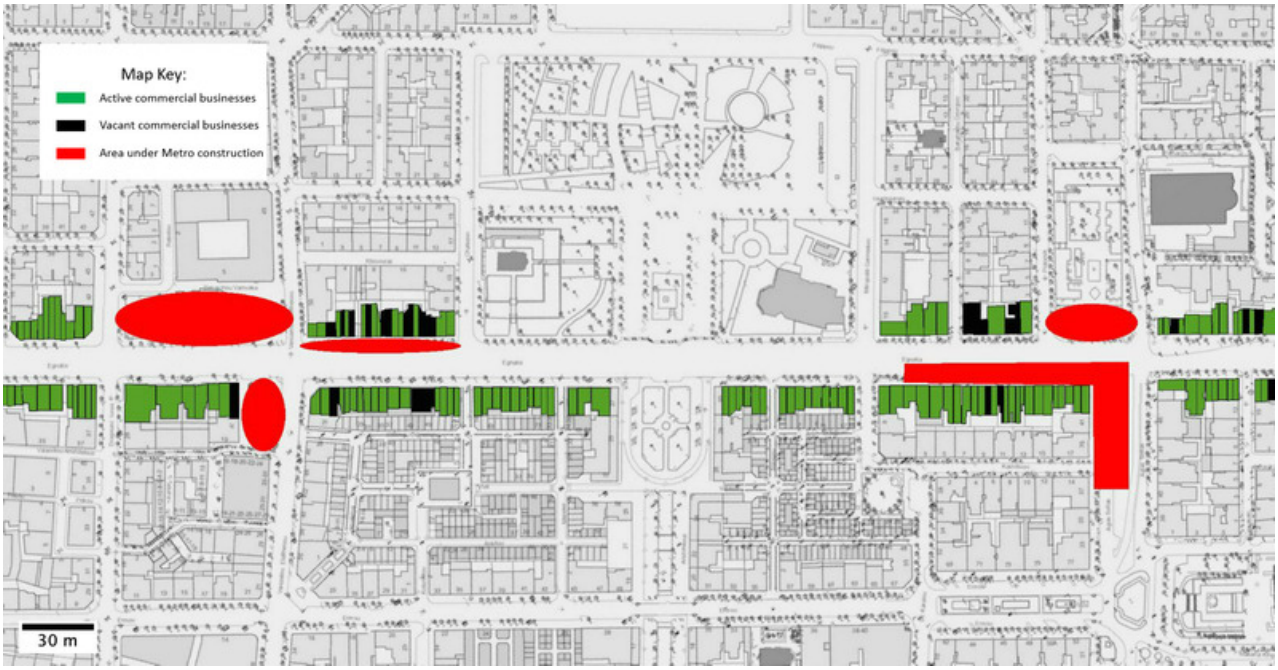

Figure 4.2: Commercial building vacancies and construction along the Egnatia Corridor between Ionos Dragoumi and Agias Sofias. Data was gathered in April 2019.

The construction on the Egnatia Corridor, due in large part to the building of the Metro system, is having adverse effects on commercial businesses along the Corridor. Metro construction can be seen between Venizelou and Chalkeon Street on the northern part of Egnatia (Figure 4.2). Of the fourteen store fronts on the northern side of Egnatia between Venizelou and Chalkeon, eight lie vacant (57.1%). This vacancy rate contrasts the entire segment of the Corridor between Aristotle University and Plateia Dimokratias, where only 63 of the 401 businesses are vacant (15.7%). This suggests a correlation between vacancies and construction, as the Venizelou Station has been in progress since 2006 (Balkan Hotspot, 2019). The construction has caused limited access to shops via sidewalks and results in them not being visible from the Corridor, possibly decreasing pedestrian activity to these businesses.

In contrast, between Agias Sofias and Plateia Aristotelous on the south side of Egnatia, shown in Figure 4.2, most of the businesses near the construction site are mostly occupied. We believe this is due to the northern sidewalk of Egnatia being closed to construction, forcing pedestrians to cross the street and walk along the south sidewalk until the next city block. As a result, businesses in this area experience higher pedestrian traffic, promoting enough economic activity to remain operational. Construction on the south side of the Egnatia Corridor also began later than the aforementioned site, starting between 2011 and 2014, leading us to believe that both the intrusiveness and duration of construction determines the impact on commercial businesses. The difference between the north side and south side can be seen in Figure 4.3.

Figure 4.3: Charts comparing Vacant Commercial Buildings on the North and South Side of Egnatia. Data was gathered April 4, 2019.

New Metro stations present opportunities for increased economic activity. Commercial businesses on Egnatia located near the new Metro stations can experience economic growth after the Metro is completed. According to a case study focused on the impacts of the Metro on land use in an eastern neighborhood of Thessaloniki, 85 percent of the citizens interviewed predicted that enterprises near the Papafi station will experience an increase in clients after the Metro is completed (Roukouni et al., 2012).

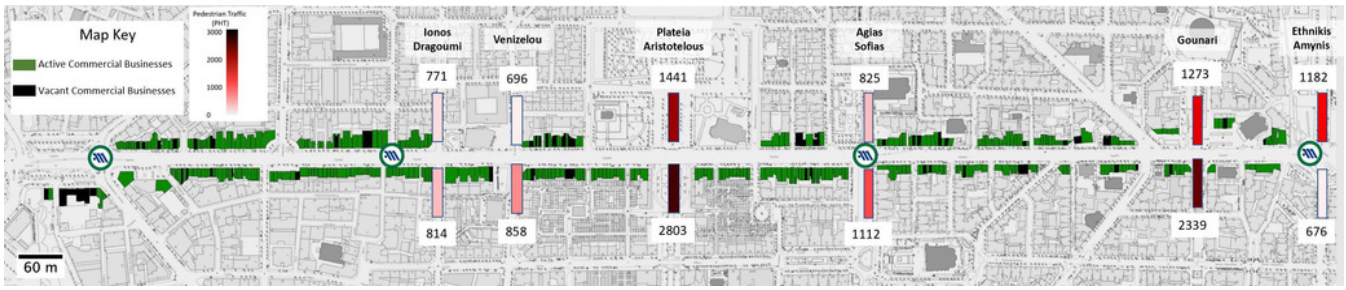

Figure 4.4: Charts comparing Vacant Commercial Buildings on the North and South Side of Egnatia. Data was gathered April 4, 2019.

In addition, a study in Athens found that businesses located 100 meters away from the stations saw an increase in activity, as well as growth in pedestrian activity and the redevelopment of the urban environment in that area (Tzouvadakis et al., 2007).

The Plateia Dimokratias Station, in particular, could be a catalyst for improvements in economic and pedestrian activity, resulting in a possible revitalization of green space and city image. As its name implies, this station is located in Plateia Dimokratias, which many pedestrian respondents said was their least favorite part of Egnatia. The station is also situated near neighborhoods, including the Dioikitirio Neighborhood that lies north, whose axes experienced less pedestrian traffic than the other six intersections studied. With similar past events and studies conducted in Thessaloniki showing positive results, the new station could revitalize the area's businesses along Egnatia and experience economic and cultural development after construction is finished.

4.3 Historical Preservation

In this section, we will explore the historical dimension of complexity for Egnatia and how experts and pedestrians perceive these ancient aspects of the Corridor.

Completion of the Metro construction presents opportunities to strengthen the historical character of Egnatia. As seen in Figure 4.5, Egnatia Corridor is the location of many historical sites, as the road has been in continuous operation for over two millennia. In addition to the Galerius Arch, Rotunda, and historical statues in Plateia Aristotelous, there are many more lesser known buildings, such as the Ottoman Era mosques, Byzantine Era churches, and Hotel Vienna that all have historical significance to them. The construction of the Metro is currently obscuring these historical monuments, such as the Venizelou Station blocking the 15th century Ottoman Hamza Bey Mosque shown in Figure 4.6.

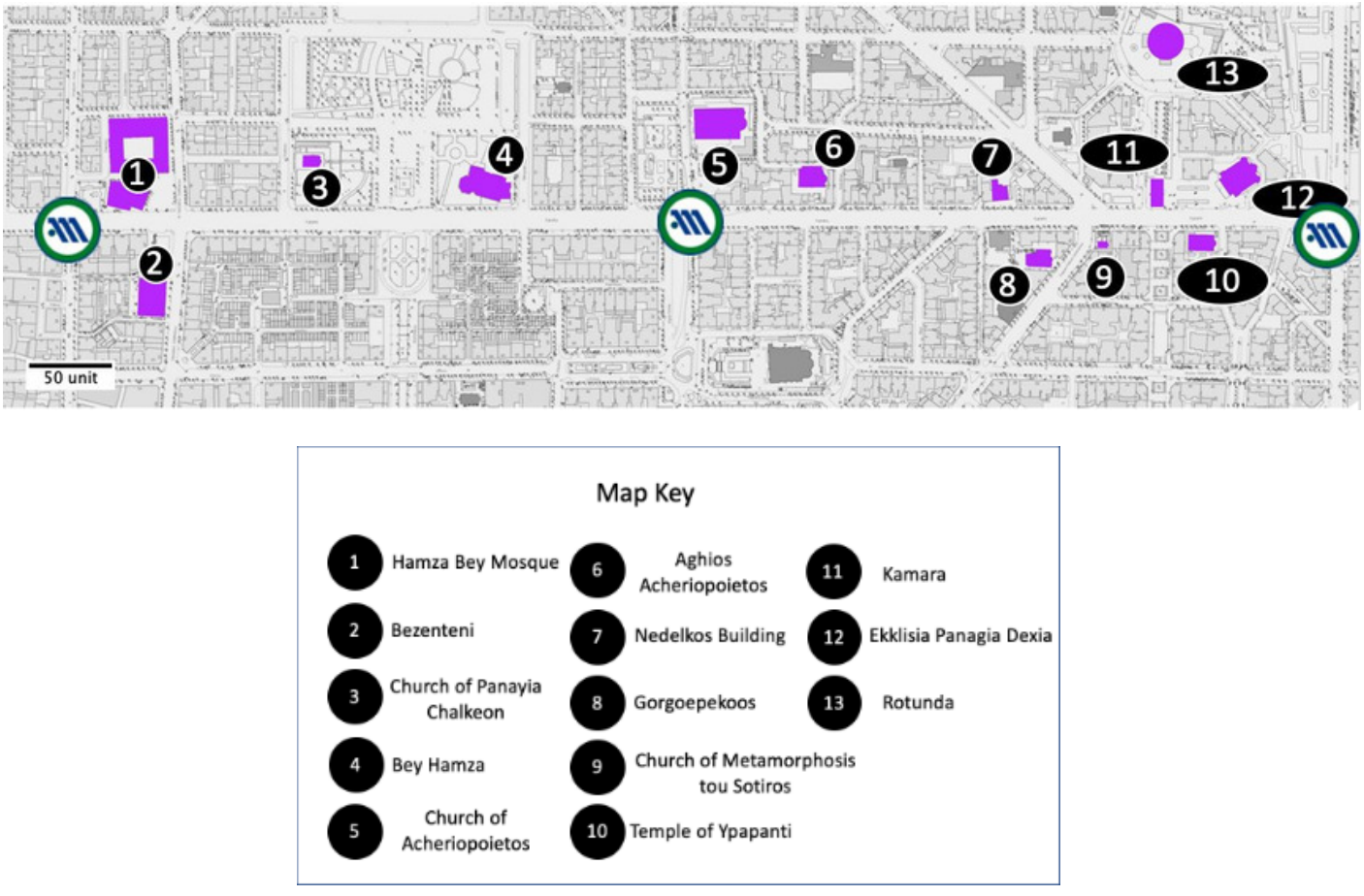

Figure 4.5: Map focusing on historical monuments near or on Egnatia with three future Metro stops (Venizelou, Agias Sofias and Ethnikis Amynis). Data was gathered in April 2019.

Figure 4.6: Hamza Bey Mosque Obscured by Construction.

Instead of mentioning the historical monuments, many citizens we interviewed mentioned words such as construction, crowded, and chaotic when they were asked about what one word they would associate with Egnatia. The fences, decreased sidewalk width, and excavation make traversing the area more difficult than it has been in the past. Georgios Mpasmadellis went so far to say that the Corridor is no longer attractive to citizens or tourists, and how he tends to avoid the street whenever he is leading tours or designing tour routes.

Historical monuments are still appreciated by experts and pedestrians alike, however. When pedestrians were asked about where they spend the most time or which location was their favorite along the Corridor, roughly 80% of the responses were either Plateia Aristotelous or the Kamara. These places feature historical sites such as the Arch of Galerius, Rotunda, and Roman Monumental Fountain. Expert stakeholders also view these structures as important to the city, especially the Byzantine and Ancient Greek structures (G. Dimarelos, personal communication, April 5, 2019). This shows that the appreciation for history still exists, even after years of construction obscuring monuments.

Once the Metro is fully operational, citizens and tourists will be able to take the Metro along the length of the Corridor to see the monuments of Plateia Aristotelous and Venizelou Street, as well as travel close-by to the Arch of Galerius and other historical sites. To increase the prevalence of the historical sites, new features could be implemented. The Metro stations will return to the city after their completion, so this public space close to many of the major historical sites on the Egnatia Corridor could strengthen its historical character further. The new Metro, Metro stations, and other new projects around the city could encourage tourists to visit Thessaloniki and the Egnatia Corridor in order to admire the historic street without the obstruction of construction.

4.4 Citizens' Image of Egnatia

In this part of the chapter, we analyzed the responses to the stakeholder questions to theorize the reason for the stakeholders opinions on the Corridor. We also explore possible alterations to Egnatia that might change their view of the street for the better. This data could ultimately serve as a window into the citizens' image of Egnatia.

Citizens share a similar, negative image of the Egnatia Corridor. A geographic map displaying responses to informal stakeholder questions over the area of study can be seen below in Figure 4.7.

Figure 4.7: Map of study area displaying citizen's image of Egnatia on Plateia Dimokratias, Plateia Aristotelous, Agias Sofias, and Gounari Axis. The larger circles correlate to more responses to a certain question. Data was gathered in April 2019.

When asked to describe Egnatia in one word, both citizens and expert stakeholders used words with negative connotations such as "crowded" or "traffic", while words with positive connotations such as "convenient" were not frequently mentioned. A word cloud of the frequency in responses can be seen in Figure 4.8, where words said most frequently are larger than words said with less frequency. The common use of words with negative connotations to describe Egnatia is an indicator that most citizens have a negative opinion of the Corridor.

Figure 4.8: Word Cloud for Citizens Image of Egnatia.

When interviewed, stakeholders and citizens were also asked to name their favorite, least favorite, and most frequented locations on Egnatia. Many people viewed the Gounari Axis and Plateia Aristotelous as their favorite spots along the Corridor. However, other stakeholders stated that they felt unsafe around the Kamara on the Gounari Axis, with one citizen who worked in Plateia Aristotelous remarking they "hated" the area around the Kamara. They also appeared to dislike the area around Plateia Dimokratias, with none of the citizens surveyed identifying the area as their favorite or where they spent the most time.

More people favor areas of the Corridor with large amounts of public and green space. A full map of green spaces along Egnatia Corridor can be seen in Appendix B0 and a map combining green spaces and pedestrian traffic data is shown in Figure 4.9.

Figure 4.9: Green spaces in relation to pedestrian volumes on the six main axes of Egnatia Corridor. Data was gathered in April 2019.

Pedestrian traffic data and citizens responses to informal interviews indicate that more people travel, favor, and spend time in larger public space areas such as Plateia Aristotelous and Gounari Axis. Specifically, the pedestrian data gathered shows Plateia Aristotelous and Gounari Axis to experience the highest pedestrian activity among all six intersections along the Corridor. As shown in Figure 4.7 above, citizens tend to gravitate towards areas with more public and green spaces along the Corridor. Citizens also voted areas with the highest public and green spaces to be their favorite, as seen in Plateia Aristotelous and Gounari Axis. In contrast, places that lack public and green spaces such as Plateia Dimokratias, the Railway Station, and Agias Sofias were voted to be citizen's least favorite areas along Egnatia. Additionally, Ionos Dragoumi and Venizelou experienced the least amount of pedestrian activity among all major six axes. This may be due to the lack of public and green spaces in this area, leading us to conclude pedestrians favor areas where there are more public and green spaces.

The completion of the Metro presents an opportunity to positively change the image of the Corridor. With Thessaloniki's new Metro being completed within the next three years, "Egnatia will not be the street it is today" (M. Zourna, personal communication, April 10, 2019). Currently, citizens' view of Egnatia is predominantly negative as shown in Figure 4.8, however, expert stakeholders feel positive about the Metro and the opportunities it will provide the Corridor. Konstantinos Haitoudis, from the Association of Real Estate Owners, mentioned he was "looking forward to see a more friendly environment on Egnatia, with less bus stops and a reduction in traffic and noise pollution". This serves as an example of how neighborhoods surrounding Egnatia will benefit from the implementation of the Metro. Giorgios Mpasmadellis also explained how he believes "the Metro will help Egnatia find its greatness again, turning Thessaloniki into another city."

Some of Thessaloniki's Metro stations will showcase archaeological excavations found during the construction (G. Mpasmadellis, personal communication, April 5, 2019). This can serve as an "opportunity to promote public transportation in the city and increase tourism on Egnatia" (M. Zourna, personal communication, April 10, 2019). An article about Athens focusing on its integration of archeological findings into their Metro stations said citizens felt a positive change in their life when using the Metro and acknowledging Greek culture while passing by (Leonard & Pournara, 2015). The same article described the Metro stations in Athens as "nodes of transportation and enlightenment", suggesting that the stations have positively influenced the city's urbanity. The Metro in Athens not only transformed the image of how citizens view the city but also improved the transportation infrastructure as well. With the integration of archaeological findings, Metro stations in Thessaloniki can develop economic opportunities along the Corridor due to the possible increase in tourism and pedestrian activity. The new Metro infrastructure in Thessaloniki could change the current image citizens of the city have about Egnatia into a more positive one, transforming the Corridor into the commercial hub it used to be in the past.

The image of Egnatia is very important because it is influenced by the different dimensions of complexity. Economic development, historical preservation, and transportation infrastructures are all part of the identity of a city. Maria Zourna, Head of the Department of Sustainable Urban Mobility, recalled positively how Egnatia used to be when growing up; “I remember living there with my parents when I was young, going to Egnatia to buy clothes, jewelry, shoes...it used to be the commercial hub of the city”. Many citizens, like Maria and Giorgos, want to see Egnatia not only return to its former commercially prosperous state, but to progress beyond that. Once the construction is finalized, public spaces, economic development, and sustainable modes of transportation are some of the opportunities Egnatia can benefit from. The new Metro can be the first step towards that image.

5. Planned Projects and Future Opportunities for the Egnatia Corridor

Photo by Marilyn Galdámez

Expert stakeholders shared their knowledge about future projects that could positively influence Egnatia Corridor. These projects are mapped in Figure 5.1. In this chapter, we analyze how these projects could improve functionality while also achieving benefits for the economy, historical character, and image of Egnatia.

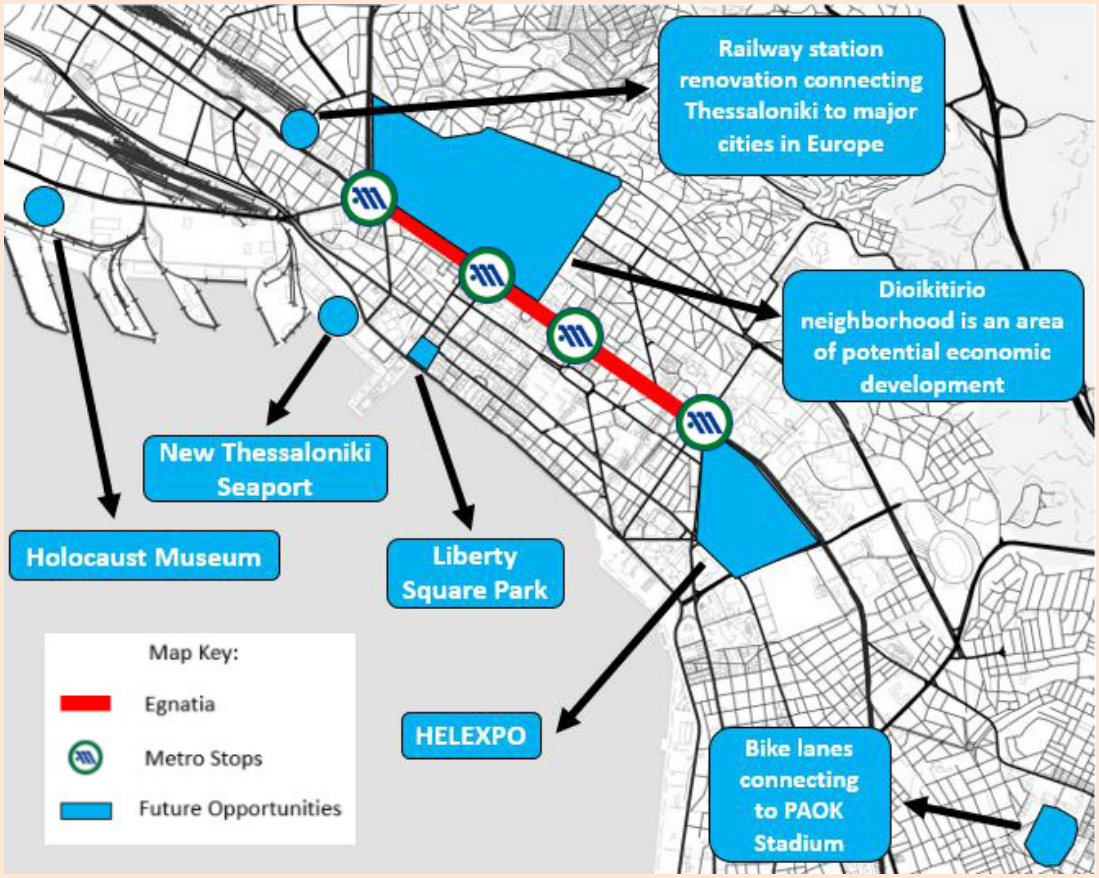

Figure 5.1: Future opportunities map of Thessaloniki with Egnatia highlighted in red.

Many upcoming urban development projects focus on mobility. In Thessaloniki, many projects in the future relate to mobility and the Metro, such as the port reconstruction, bike lane implementation, and HelExpo revitalization (G. Dimarelos, personal communication, April 5, 2019). All of these new projects could act together to increase the ability to transport goods and people, as well as re-invigorate the Egnatia Corridor directly and indirectly.

Upcoming projects include the completion of the Metro to increase the sustainable transportation around the city of Thessaloniki. The city is exploring the possible implementation of bike lanes as well, attempting to shift bicycle routes to two parallel routes of Egnatia, in order to help overall pedestrian activity (K. Danadiadou, personal communication, April 12, 2019). In addition, renovations to the HelExpo International Trade Fair could include the implementation of a park and ride system near the new Metro, encouraging various modes of transportation to be taken on a single journey (K. Danadiadou, personal communication, April 12, 2019).

Giorgos Dimarelos, Deputy Mayor of Urban Resilience & Development Programs, also envisions a future Egnatia with two traffic lanes per direction, a designated bus lane, and biking provisions. All of these new systems would act together to increase the ability to transport goods and people as well as revitalize the Egnatia Corridor in terms of all four dimensions of complexity.

Experts see the potential for cross-benefits between completion of the Metro, newly uncovered archaeological sites, growth in tourism, and real estate development. Many of the expert stakeholders we conversed with had positive outlooks towards the future of Egnatia. Giorgos Mpasmadellis stated that “when fences are removed, trees are planted, etc. Egnatia will find again its old grandeurs, as it was before”. This optimistic view is evident with the quantity of projects around the Egnatia Corridor to be started and completed soon. These include the completion of the Metro in 2022 and the commencement of construction on the Holocaust Museum in Summer 2019.

Due to Metro construction at all four stations, many archaeological discoveries have been found. According to Mpasmadellis, the archeological sites discovered during the excavation will be some of the most important ones in Europe, which could lead to more tourism and attention on an international level for Thessaloniki. In addition, the public spaces around the stations will return to the city after the Metro stations are completed. This could result in many opportunities, depending on how well the land is used and how the image of the neighborhoods the stations are located in reflect the citizens who live or work there (M. Zourna, personal communication, April 10, 2019).

These new projects are forecasted to further increase real estate opportunities as well. Many investors are purchasing abandoned buildings around Egnatia, including ones with historical or cultural significance, such as the Vienna Hotel and the old City Hall. Mpasmadellis stated that “Investors see what we do, that Egnatia Street will be another street in 2020”. These investors see the new opportunities brought on by these future projects, and that Thessaloniki’s increase in tourism will require additional housing to accommodate the influx of tourists.

Sustainable transportation integration could be the focus of future urban planning projects with many cross-benefits. Plans are already in place towards furthering sustainable transportation efforts around Thessaloniki. Before the start of new projects, according to Katerina Danadiadou, Head of the Department of Urban Planning, Thessaloniki needs to redefine the character of Egnatia for alternative modes of transportation. Some ways of refining the character could include the completed Metro, the broadening of pedestrian crossings, or the possible implementation of more bike lanes.

Maria Zourna emphasized the importance of public transportation to achieve many goals, such as limiting parking spaces as a solution to reduce car traffic and enforcing paying for parking. This would allow people to find spots and increase the reliability of bus lanes. She went on to predict that the Metro will take on much of the transportation load. Zourna believes that Thessaloniki is not cyclable yet, and that project fundings of 1.5 million euros would be necessary for cycling.

A new focus on sustainable transportation could also have unexpected effects, such as the creation of jobs to fill the need for more transportation positions (Wang, 2015). When taken into account with the benefits mentioned above, a possible focus on sustainable transportation could improve Thessaloniki, with everything from employment of its citizens to ease of transportation. Sustainable transportation projects could bolster Egnatia further, encouraging sustainable transportation over private transportation.

The Διοικητήριο (Dioikitirio) neighborhood above Egnatia presents a prime opportunity for investment and tourism.

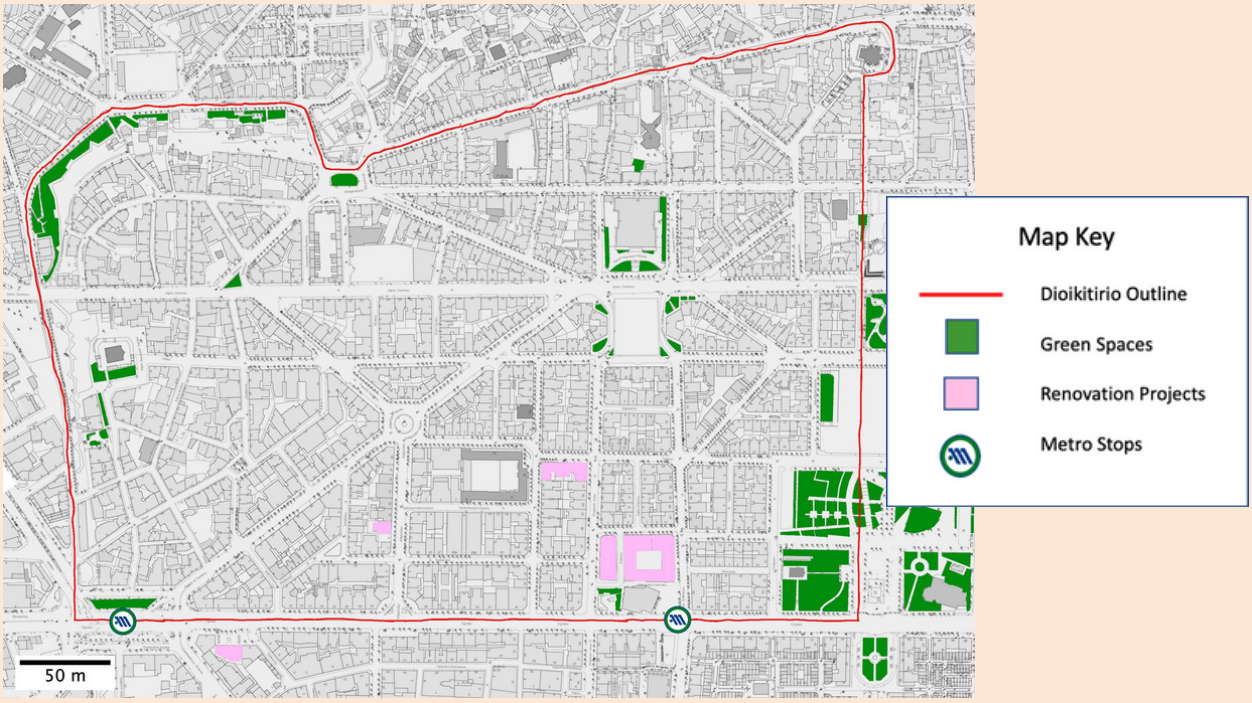

Figure 5.2: Map of Dioikitirio neighborhood with green spaces, renovation projects, and future Metro stops. Data was gathered in April 2019.

Several experts we interviewed pointed to the Διοικητήριο (Dioikitirio) neighborhood on the north side of Egnatia as an area poised for economic revitalization. Currently, pedestrians appear to be either avoiding or having difficulty accessing both Ionos Dragoumi and Venizelou accessways (Figure 4.1). Such low pedestrian volumes may be related to the high amounts of construction attributed to the surrounding areas (Figure 4.4). Low volumes could also be a result of limited green space in this area (Figure 4.9). Georgios Mpasmadellis also indicated that residential prices are less expensive in this area.

Investors in the past have purchased abandoned factories around the Dioikitirio neighborhood, but are now moving towards more historically and culturally significant buildings, such as the old City Hall. This building is the largest in Thessaloniki and contains the largest parking lot in the city. In our interview with Mpasmadellis, he mentioned that an Israeli company is in the process of purchasing this building to turn it into a 250 room, five-star hotel.

Metro construction will end in 2022 and with it the northwestern area will have increased access to the center of the city. New modes of transportation will be available, with a Metro stop located on Venizelou street and construction no longer limiting access to the Egnatia Corridor. Mpasmadellis sees potential for vacant buildings in this area to be transformed into hotels and other housing, given the tremendous growth of 2.7 million overnight stays in the past nine years. Katerina Danadiadou believes “hotels are good investment opportunities”, while Giorgos Dimarelos also commented that “Investment funds are more interested in the area north of the Corridor, since it’s cheap”.

Urban planners can use such information to anticipate higher activity in the northwest area. The new infrastructure for tourists and pedestrians alike could support and encourage the reinvigoration of the currently underdeveloped Dioikitirio neighborhood. With the new projects occurring, especially the Holocaust Museum and Metro, Mpasmadellis predicted an even further increase in tourism soon. The investment into the less expensive neighborhood in between Plateia Dimokratias and Plateia Aristotelous is appearing to be a promising option for investors. Public-private partnerships could play an important role in economic and public space developments near the new Metro stations. Maria Zourna emphasized that partnerships and coordination between the public and private sectors will be necessary in order to enhance social cohesion. Social cohesion can determine how the assets of the city are developed, with better communication producing beneficial outcomes for both parties. With the promise of the Dioikitirio neighborhood, there still exists opportunities for coordination between the private and public sectors before moving forward with new projects.

Several experts saw the need to plan features around Metro stations that could improve this area, and reflect the neighborhood the station is situated in. Possible new features could include the integration of local artists’ artwork into the city, an increased integration of green space, or an expansion of the bike share system that already exists, Thessbike. All of these personalize the area around the station, which could lead to a greater sense of social cohesion within the communities. Giorgos Dimarelos stated that land returning to the city after the Metro station construction is completed would benefit from many different viewpoints and opinions.

Any change to the area will have a positive or negative impact on the people who frequent Egnatia Corridor or the commercial business owners nearby. Understanding both groups concerns or ideas will ensure that these impacts will be predominantly positive.

Closing Thoughts

This project aimed to help the city of Thessaloniki move toward a more integrated understanding and vision of the Egnatia Corridor, one that recognizes and leverages its complexity. The fieldwork of this study produced new data about commercial vacancies and pedestrian activity along the Egnatia Corridor that could be useful to the city in the future.

We hope that this study helps clarify potential opportunities and ideas on the Egnatia Corridor. With thoughtful urban planning, it's feasible for Egnatia to surpass the conditions present before the Metro construction. Improving the Corridor is only possible with open connections between the citizens, urban planners, and the public and private sectors. We also hope that the research and maps developed could act as a case study for other cities working on similar projects, providing an understanding on how dimensions of complexity can define a city.

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Appendix A: Stakeholder Questions

A0 Introductory Scripts for Stakeholder Questions.

For Walking Tour and Formal Stakeholder Questions:
Hello, we want to first thank you for taking time out of your day to speak with us. We are a group of students from Worcester Polytechnic Institute, in Massachusetts, United States, and we are investigating into the Egnatia Corridor. We are trying to learn about the different aspects of the Corridor and its current conditions for the Major Development Agency of Thessaloniki. We also want to find out stakeholder opinions on future visions for the Corridor and what they want to see. The end goal is to develop visual maps based on observations and responses from meetings, like this one, that display the different dimensions of complexity (defining features) of the Egnatia Corridor that can be used in future urban planning efforts.

For Informal Stakeholder Questions:
Hello, we are students working with the Major Development Agency of Thessaloniki and would like to ask some questions about the Egnatia Corridor.

A1 Formal Stakeholder Questions

1. What areas, buildings, or infrastructures are important to the historical aspects of Thessaloniki? These historical aspects could include historical monuments and their functionality.
    a. Are these areas being used properly? Are they just sitting there or are they being advertised and attracting people?
2. Another aspect we are focusing on is functionality. Functional aspects could include transportation (such as bikes, pedestrians, and bicycles), public spaces, and green spaces. What areas, buildings, or infrastructures are important to the functional aspects of Thessaloniki?
    a. How frequently do people use these public spaces?
    b. What are some areas of improvement for the transportation methods listed above?

3. We are also focusing on the economic aspects of Thessaloniki. These economic aspects could include real estate, commercial land use, tourism, etc. What areas, buildings, or infrastructures are important to the economic aspects of Thessaloniki?
    a. What economic opportunities do you see for Egnatia?
4. These urbanity aspects could include the personal identity of neighborhoods, the landmarks within those communities, the relationship between the infrastructure and the people living there, etc. What areas, buildings, or infrastructures are important to the urbanity aspects of Thessaloniki?
    a. What is the first thing that comes into mind when you think of Egnatia?
    b. What is your favorite part of Egnatia in terms of aesthetics (looks)?
    c. Where on Egnatia do you like to spend the most time?
5. What current urban planning projects do you know about along the Egnatia Corridor?
6. With the current, proposed, and future projects, what changes do you see happening on Egnatia?
7. Are there any projects you wish would be implemented, but haven’t yet?
8. Are there any documents that are available to use in relation to (the dimension of complexity the stakeholder is associated with)?

A2 Informal Stakeholder Questions.

1. What is the first thing that comes into mind when you think of Egnatia?
2. What is your favorite part of Egnatia in terms of aesthetics (looks)?
3. What is your least favorite part of Egnatia in terms of aesthetics (looks)?
4. Where on Egnatia do you like to spend the most time?

Appendix B: Instruments and Protocols

B0: 3.1.1 Expert Formal Stakeholder Interviews

Instruments:

- Survey Questions
- Map of Egnatia Corridor
- Computer
- Notebook
- Pencil

Protocol:

1. Ask participants for permission to transcribe any comments they say and use as a possible source in our paper and final deliverable. Give the participants the option to remain anonymous, as well as give a brief summary of complexity and urbanity in terms of our project. (approximately 5-10 minutes).
2. One facilitator leads the interview, asked questions, and for clarification when needed. The other team members transcribe the participant's responses and comments, in addition to asking questions related to stakeholder comments. Everyone should remain cognizant if the stakeholder mentions ideas or opportunities not covered by the questions. (approximately 15-30 minutes).
3. Thank participants for taking time out of their day to answer our questions. (approximately 5 minutes).

Expert Stakeholder Questions:

See Appendix A1

B1: 3.1.2 History Focused Stakeholder Interviews.

Instruments:

- See Appendix B0

Protocol:

1. See Appendix B0

Historical Interview Questions:

- See Appendix A1

B2: 3.1.3 Vacant Commercial Buildings.

Instruments:

- Pencil
- Geographic Information System (GIS) Software map of Egnatia
- Cell phone camera

Protocol:

1. Arrive at Ethnikis Amynis where the team members divide into two pairs, one pair walking on the north side of the Corridor, and the other pair on the south side.
2. Use the GIS maps of Egnatia printed out to record vacant commercial building locations. The lots with vacant commercial spaces should be marked with an "X" and the lots with active commercial spaces should be marked with a "✓". If a building is segmented into multiple business, then the lots have to be divided accordingly.
3. Take photos of vacant commercial spaces.

All of these steps will be conducted within the same three hour time frame.

B3: 3.1.4 Pedestrian Traffic.

Instruments:

- Traffic Analysis Spreadsheet (Appendix E0)
- Pencil

Protocol:

1. Using the spreadsheet shown in Appendix E0 as a guideline, there should be two people analyzing an intersection. One team member should be on the northern side of the major axis street (Egnatia in this case) and the other on the southern side. Each member should focus on pedestrians passing by that are heading towards or away from the Egnatia Corridor (inbound or outbound). If the intersection is large and requires the combined effort of four people, a similar process will unfold with two people on either side of the axis street instead of one.
2. Each team member counts the number of pedestrians that pass by, on either side of the road, and correctly marks the direction of pedestrians. Each pedestrian should be counted with a tally mark. Counts are broken up over 15 minute intervals over one hour total of counting. Counts should be made over two hour intervals, preferably during times of the day where the highest levels of traffic are expected. (1 hour)
3. Team members should switch positions with each other during the second hour of counting, and follow the same outline formatted in Step 2. (1 hour)

4. Between the two team members there will be counts for both directions of pedestrian travel over two hours. Repeat Steps 1-3 for any additional intersections that need a pedestrian traffic count.

B4: 3.1.4 Sustainable Infrastructure.

Instruments:

- GIS software

Protocol:

1. Use existing GIS layers (City of Thessaloniki, 2019) and display bus routes on a geographical map which focuses on the Egnatia Corridor.
2. Add Metro stops, bus routes, and green spaces in different layers on top of a developed base map using the outline provided in Appendix B8.
3. Overlay all layers to create an accurate 'sustainable infrastructure' geographical map that contains Metro stops, bus stops, and green spaces along Egnatia Corridor.

B5: 3.1.5 Informal Stakeholder Interviews.

Instruments:

- Survey Questions
- Pencil
- Notebook
- Map of Egnatia

Protocol:

1. Ask participants permission to interview them and ask permission to quote any comments they say for use in our final paper and/or final deliverable. Give the participants the option to remain anonymous as well (approximately 1 minute per stakeholder).
2. Ask stakeholders the questions and gain a more personal point of view for our final deliverables. (approximately 1 minute per stakeholder).
3. Thank participants for taking time out of their day to answer our questions. (approximately 1 minute per stakeholder).

Informal Stakeholder Questions:

See Appendix A2

B6: 3.1.6 Analyze Data

Instruments:

- GIS software
- Microsoft Word
- Microsoft Excel

Protocol:

1. Organize stakeholder responses and observations from Objectives 1.1-1.5 into a Microsoft Word document.
2. Analyze responses and observations with a focus on the historic dimension of complexity along the Corridor. Separate out the corresponding information into its own document so data can be compared and contrasted to existing maps developed by the MDAT. This allows us to potentially add additional historically significant points to a geographical map.
3. Repeat Step 2 with a focus on stakeholder responses regarding future planned projects for the Egnatia Corridor.
4. Create separate maps for the historic dimension of complexity and sustainable infrastructure (sustainable infrastructure completed in Appendix B4).
5. Take the counts from the pedestrian traffic data and determine the peak hour factor, peak rates in each direction, and total entering volumes for each intersection using the spreadsheet shown in Figure E0 in Appendix E .
6. Display results geographically with a heat map using GIS software, indicating larger pedestrian traffic volumes with shapes in darker shades of red.
7. Quantify the responses of informal stakeholders and organize the number of responses to each question for each named location. Geographically represent the responses by using circles that correspond to each question that will go at the indicated location of the citizen. Use different colors to differentiate responses to different questions. The more citizens that answered the same location for a certain question, the larger the circle should be. Overlay circles on a blank geographical map developed in Appendix B8.
8. Count the total number of commercial buildings analyzed and sum the number of vacant commercial buildings. Establish an overall percentage of vacant commercial buildings along the Egnatia Corridor. Use process outlined in Appendix B8 to create a map where vacant commercial building lots are black, visually representing the vacant areas.
9. Analyze responses from informal stakeholders yielding the frequency of which a common word was mentioned by different stakeholders. Then create a word map that displays the citizens' image of city.
10. Display future projects named by expert stakeholders that relate to the Egnatia Corridor using a map of Thessaloniki, obtained from Thessaloniki GIS.

B7: 4.2 Formal / Informal Stakeholder Questions

See Appendix A1 and B0 for Formal
See Appendix A2 and B5 for Informal

B8: 4.2.2 Create Maps

Instruments:

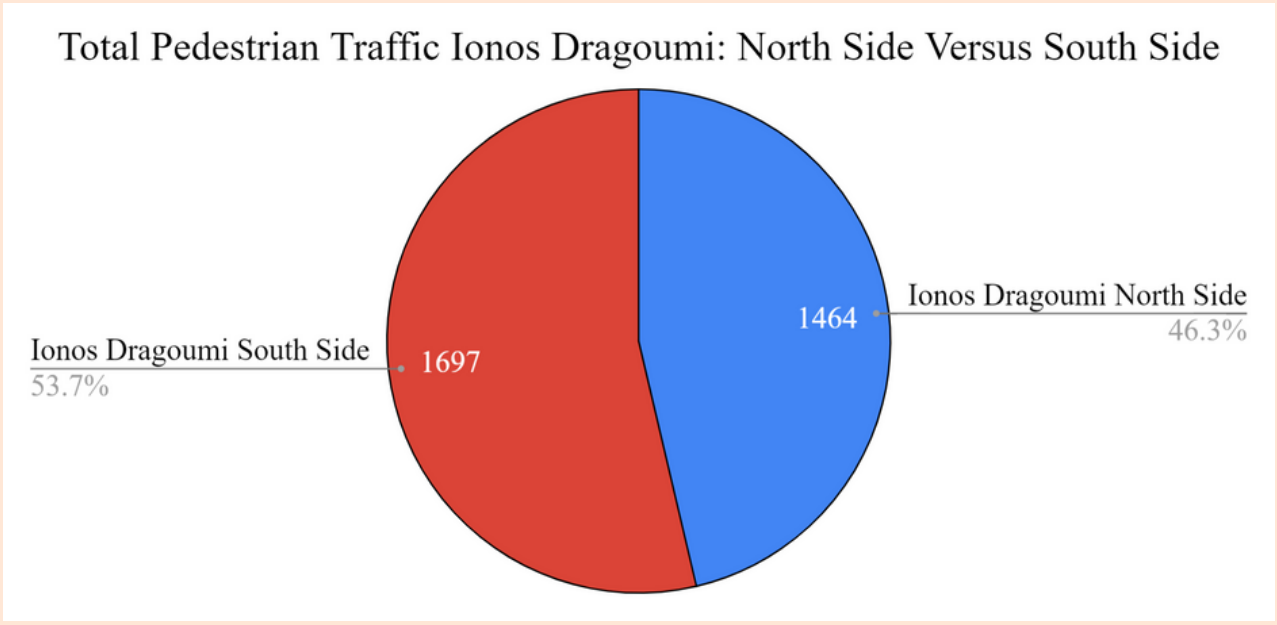
- Pixlr
- Polarr
- ImageJ
- Microsoft PowerPointl

Protocol:

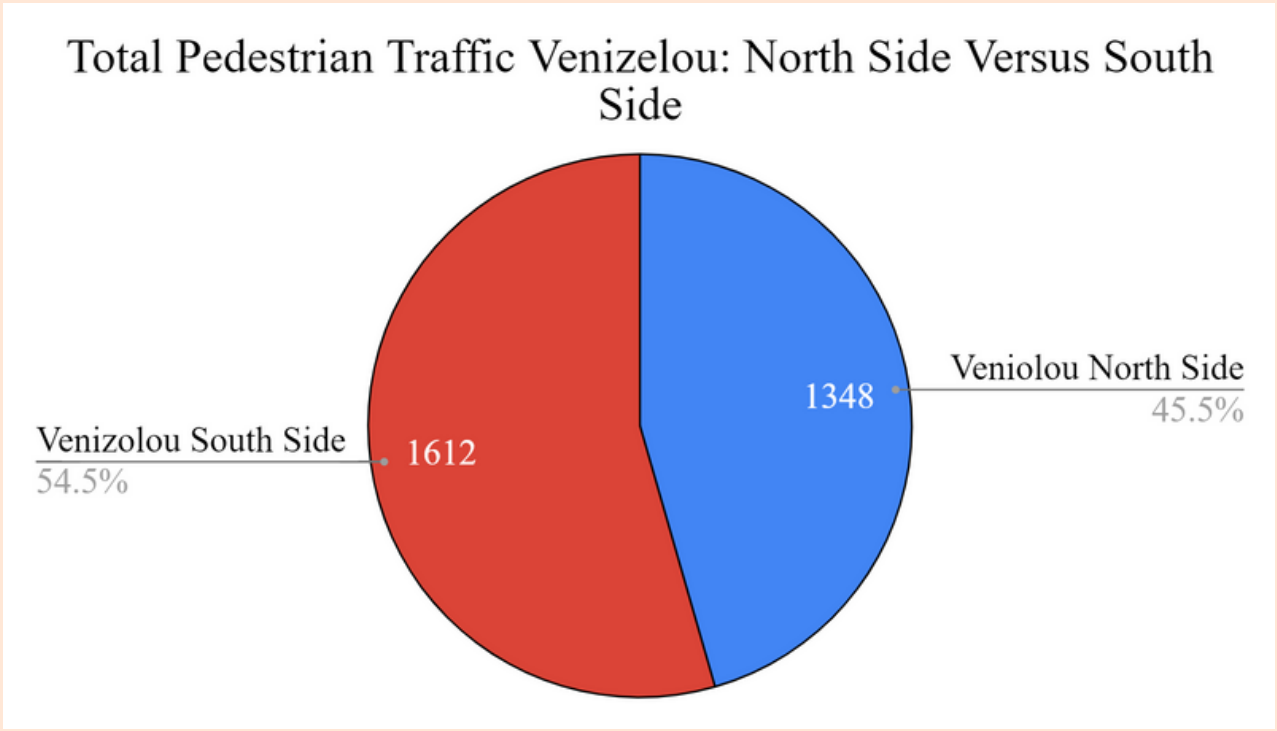
1. Take snips from the Thessaloniki GIS Map.
2. Create a 4000 x 4000 pixel canvas on Pixlr. Make each of the snips a new layer on the canvas and piece the layers together so that each of the snips are aligned. Then, merge the layers into one.
3. Save the canvas and reduce the image size to 2000 x 2000 pixels.
4. Repeat steps 1-3 until you have enough images to piece together the desired map.
5. Create a new 6000 x 6000 pixel canvas on Pixlr. Make each of the new images a layer on the canvas and piece the layers together so that each of the images are aligned. Then merge the layers into one.
6. Rotate the map on Polarr 34.67° or any degree to get the desired orientation. Crop the image to fit desired area of focus. Save the map, as this will be the base map for all other maps.
7. To change the color of base map to grayscale, convert the map on ImageJ using the Image tool from RGB-color to 32-Bit and back to RGB-color.
8. Upload the final map to ImageJ. Open ROI manager, use the polygon selection tool to outline desired areas. Add desired areas to the ROI manager and use the Fill and Draw tools to highlight desired areas on map.
9. Save ROIs to create masks to be layered on multiple maps.

10. Repeat steps 8 and 9 for each of the data sets that are going to be displayed geographically.
11. Overlay masks onto desired maps.
12. Open the Analyze tool on ImageJ set the global scale to be 3 Pixels/meter. Add scale to desired location on the map and save.
13. Use shape and fill tools in Microsoft PowerPoint to create desired map keys. Screenshot and save the final key.
14. Open the completed map with scale on Pixlr. Open the map key as a layer, place on desired location and merge the layer on the map. Save the map with the highest resolution possible.

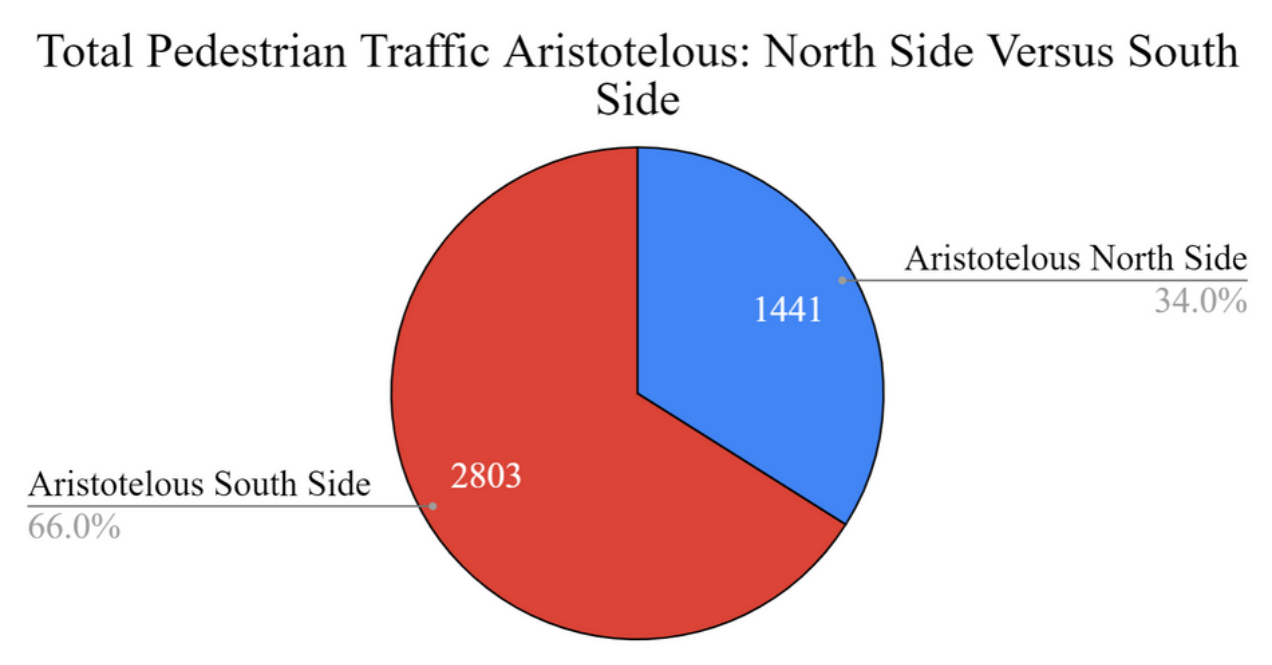
Appendix C: Pedestrian Count Graphs



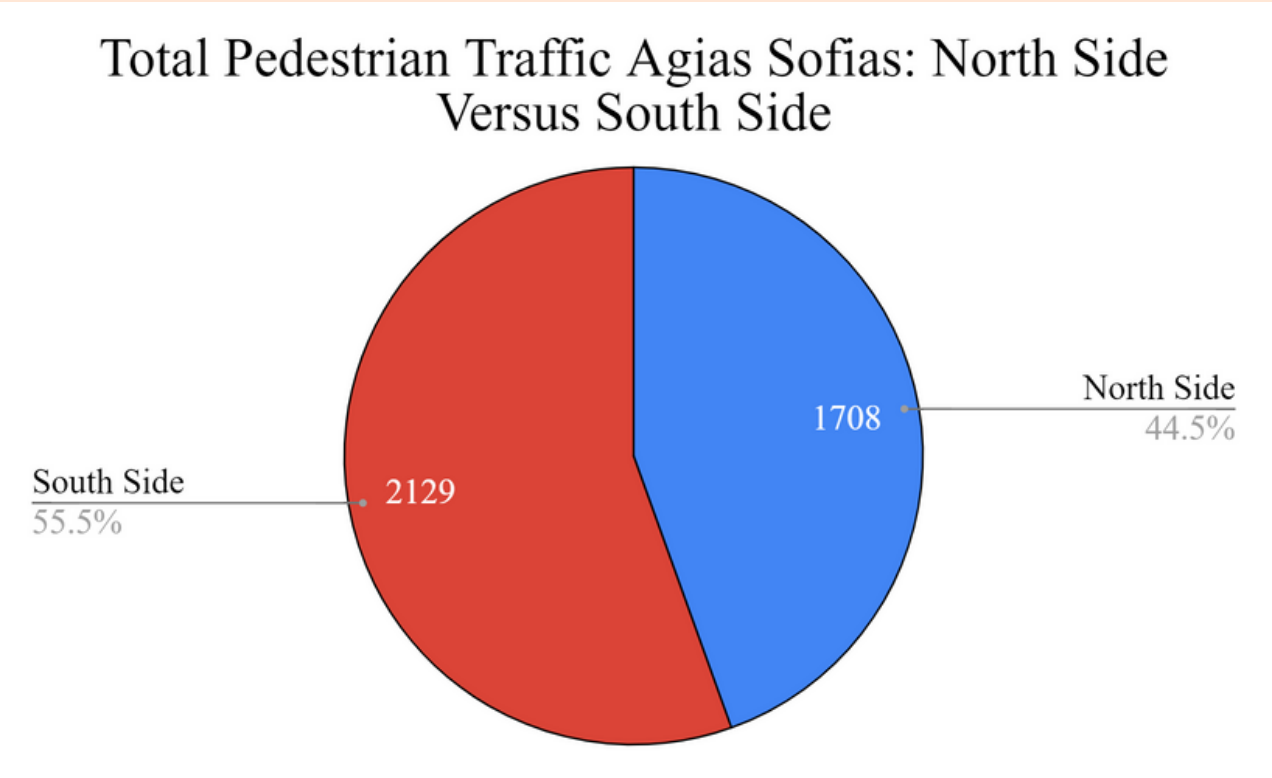
C0: Foot Traffic Comparison of Ionos Dragoumi Street (14:00-15:00 and 17:00-18:00 Combined).



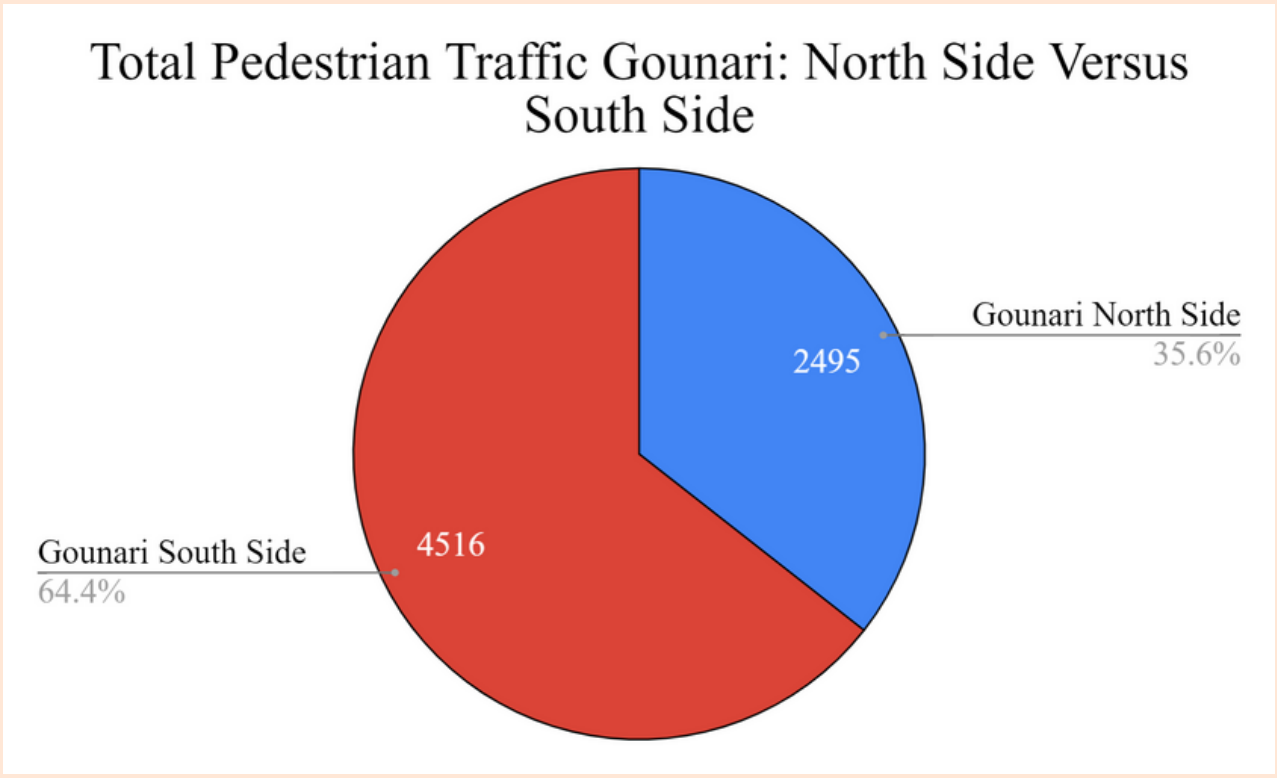
C1: Foot Traffic Comparison of Venizelou Street (14:00-15:00 and 17:00-18:00 Combined).



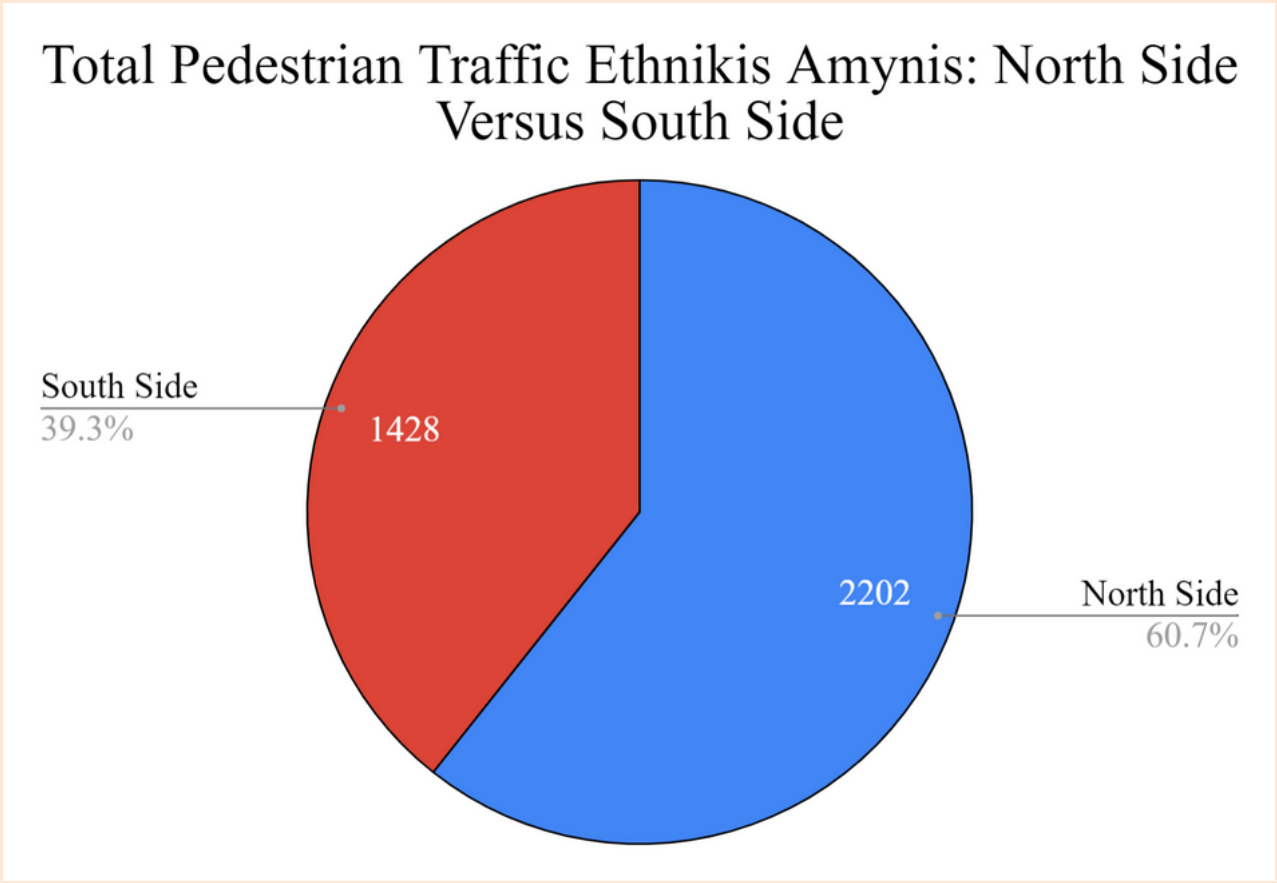
C2: Foot Traffic Comparison of Aristotelous Axis (14:00-15:00).



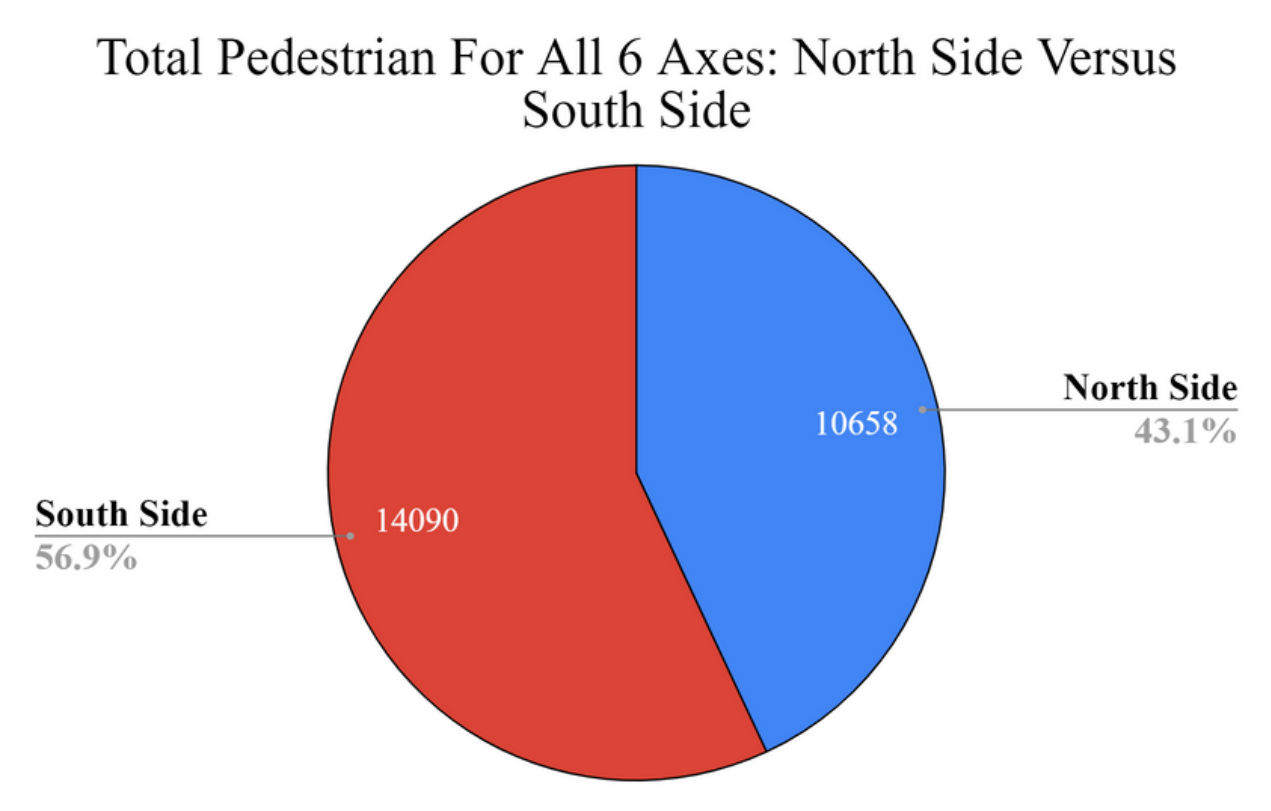
C3: Foot Traffic Comparison of Agias Sofias Street (14:00-15:00 and 17:00-18:00 Combined).



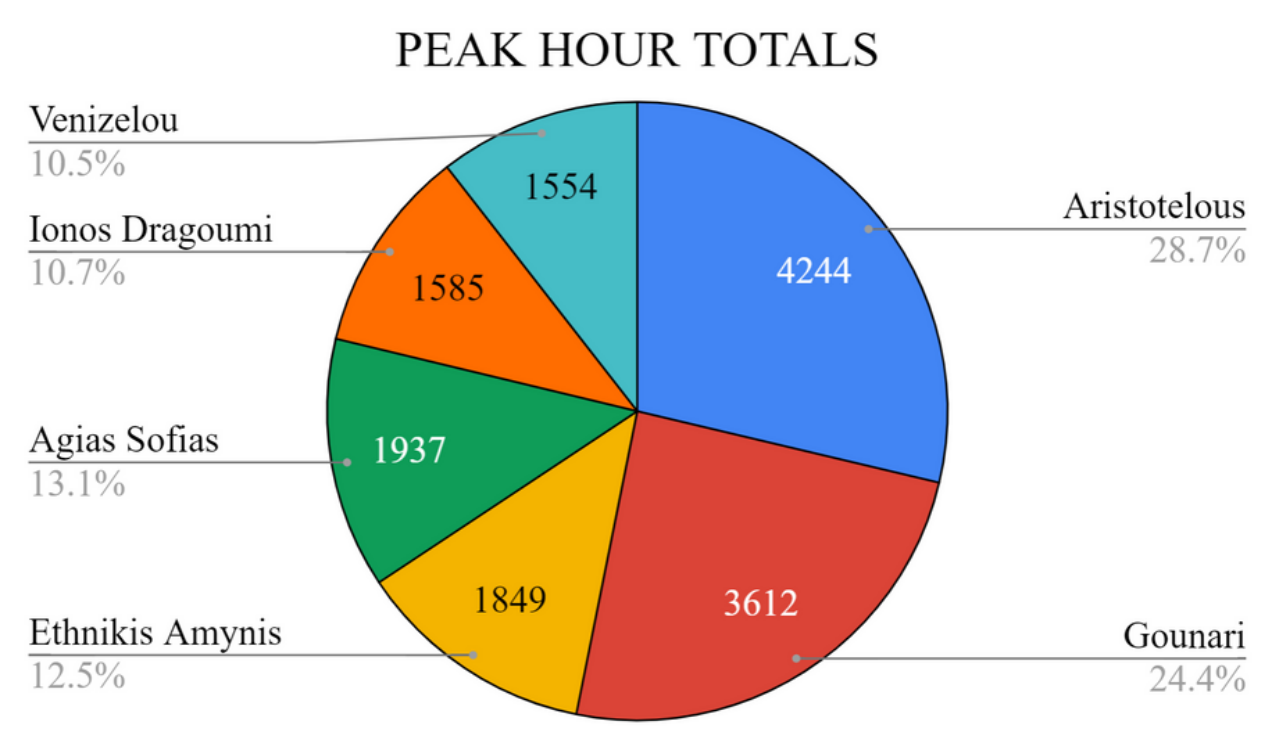
C4: Foot Traffic of Gounari Axis (14:00-15:00 and 17:00-18:00 Combined).



C5: Foot Traffic of Ethnikis Amynis Street (14:00-15:00 and 17:00-18:00 Combined).



C6: Foot Traffic Total of All 6 Axes (14:00-15:00 and 17:00-18:00 Combined).



C7: Peak Hour Foot Traffic Count Totals.

Appendix D: Maps

a) Plateia Dimokratias to Venizelou Street

b) Venizelou Street to Agias Sofias Street

c) Agias Sofias Street to Ethnikis Amynis Street

D0: Functionality map showing green spaces, current bus stops, and future Metro stops from Plateia Dimokratias to Ethnikis Amynis.

a) Plateia Dimokratias to Venizelou Street

b) Venizelou Street to Agias Sofias Street

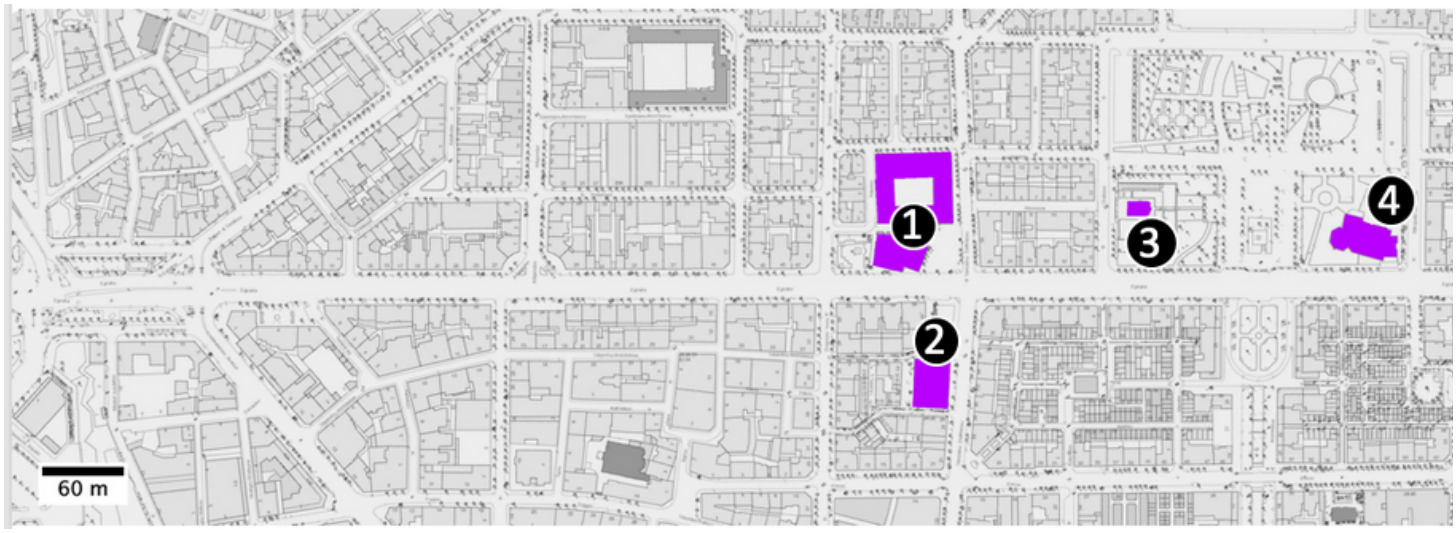
c) Agias Sofias Street to Ethnikis Amynis Street

D1: Commercial Building Vacancies Maps.

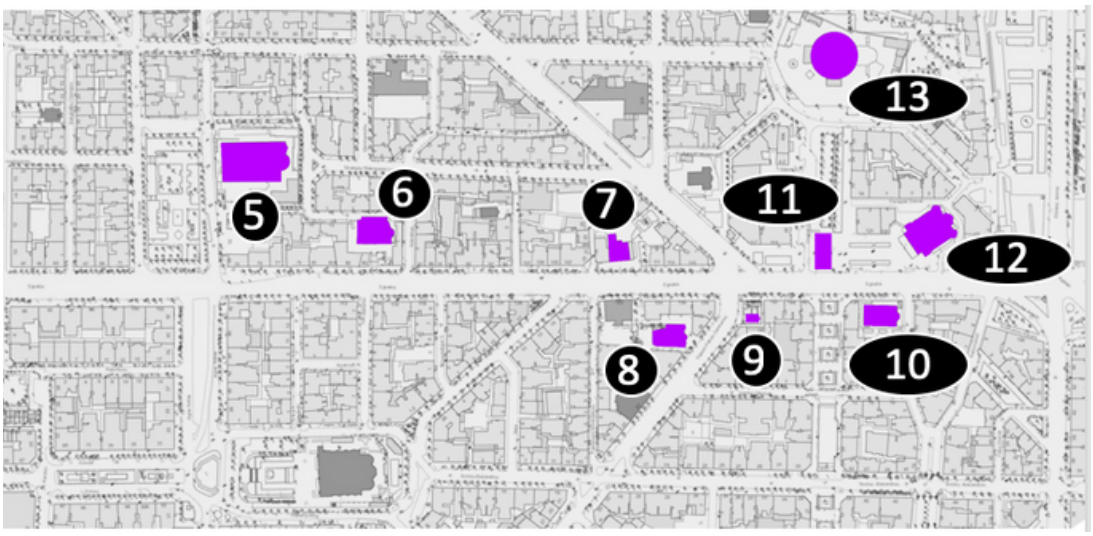
a) Plateia Dimokratias to Plateia Aristotelous

b) Agias Sofias to Ethnikis Amynis

D2: Citizen's image of Egnatia map from Plateia Dimokratias to Ethnikis Amynis.



a) Plateia Dimokratias to Plateia Aristotelous

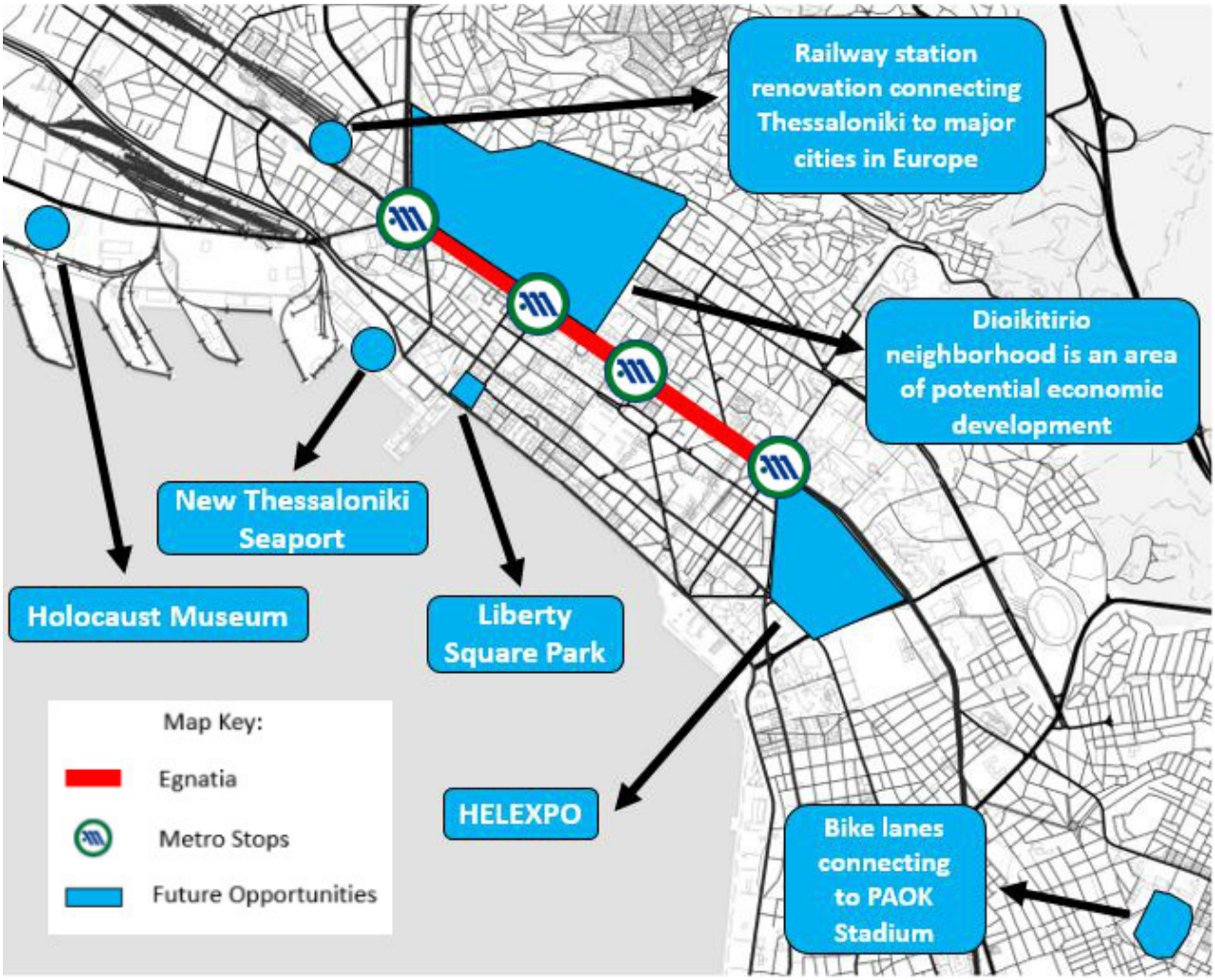


Map Key

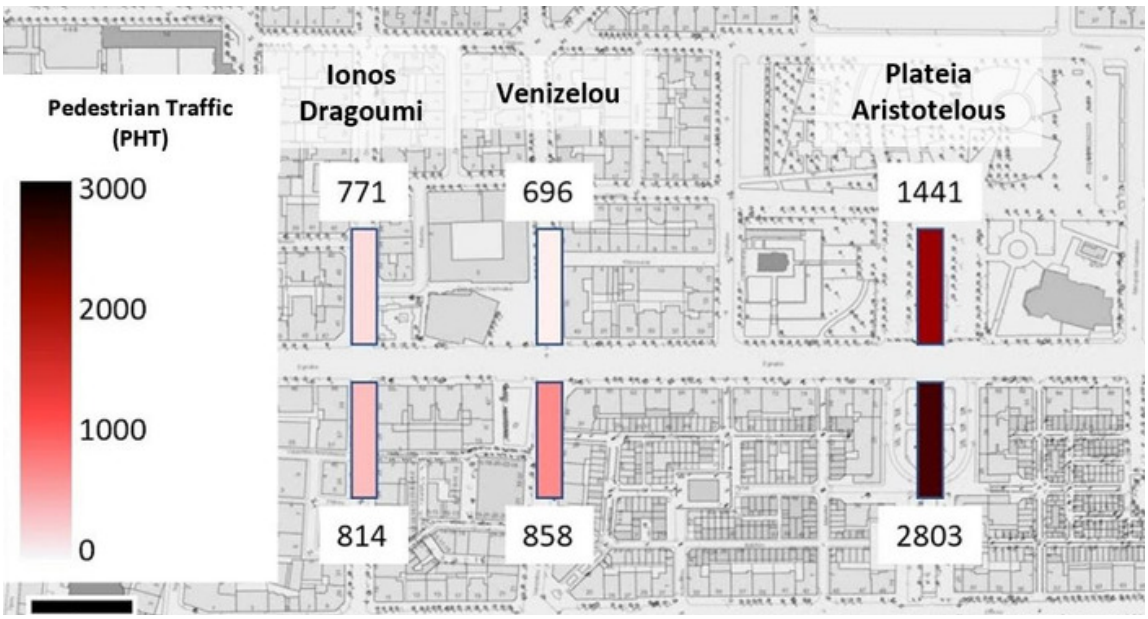
1	Hamza Bey Mosque	6	Aghios Acheriopoietos	11	Kamara
2	Bezenteni	7	Nedelkos Building	12	Ekklisia Panagia Dexia
3	Church of Panayia Chalkeon	8	Gorgoepekoos	13	Rotunda
4	Bey Hamza	9	Church of Metamorphosis tou Sotiros		
5	Church of Acheriopoietos	10	Temple of Ypapanti		

b) Agias Sofias to Ethnikis Amynis

D3: Historical monuments along and near Egnatia from Plateia Dimokratias to Ethnikis Amynis.



D4: Future opportunities map of Thessaloniki with Egnatia highlighted in red.



a) Plateia Dimokratias to Plateia Aristotelous

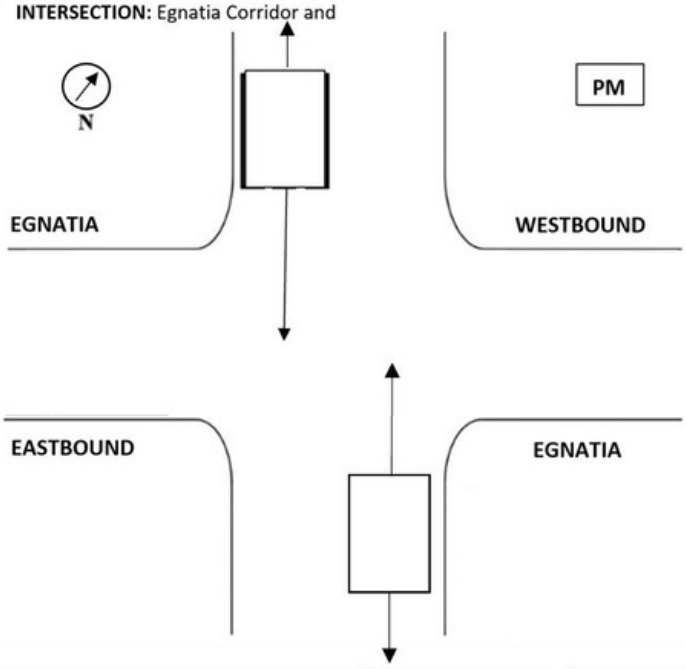
b) Agias Sofias to Ethnikis Amynis

D5: Pedestrian activity along the six major axes along the Corridor.

Appendix E: Traffic Analysis Sheets

CITY: Thessaloniki DATE: _____ DAY OF WEEK: _____

INTERSECTION: Egnatia Corridor and



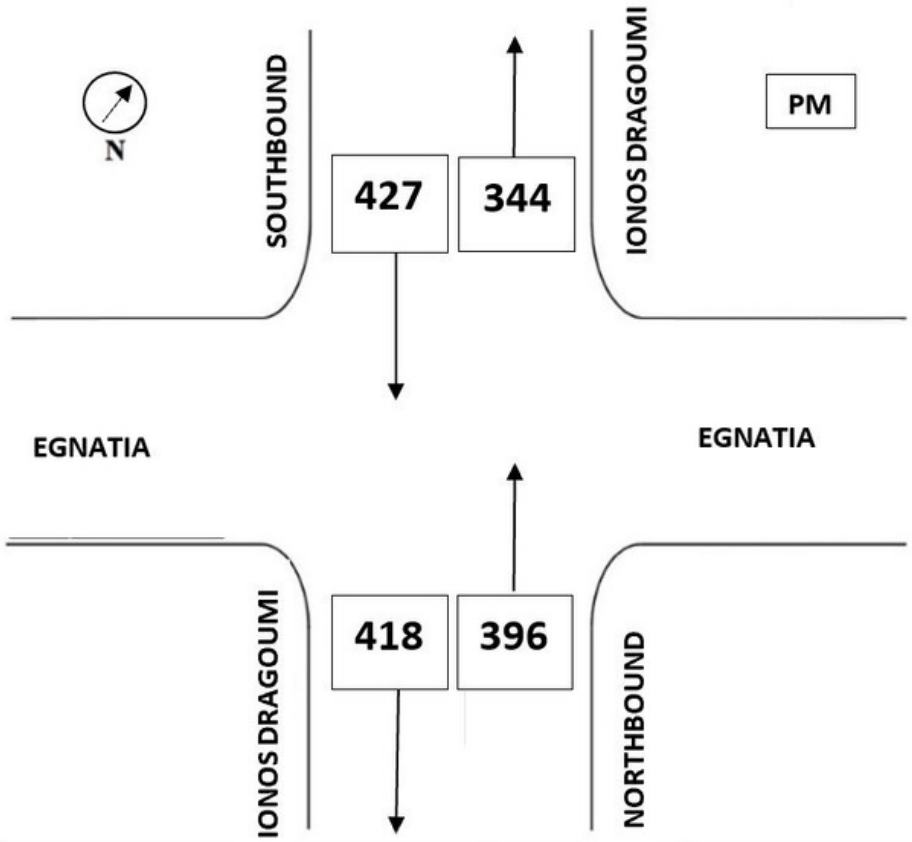
Interval	Northbound	Interval	Southbound
2:00 – 2:15 PM		2:00 – 2:15 PM	
2:15 – 2:30 PM		2:15 – 2:30 PM	
2:30 – 2:45 PM		2:30 – 2:45 PM	
2:45 – 3:00 PM		2:45 – 3:00 PM	

E0: Blank Egnatia Traffic Analysis Spreadsheet

Pedestrian Traffic Volume Over Peak Hour

Ionos Dragoumi and Egnatia Corridor

CITY: Thessaloniki DATE: 3/28/19 DAY OF WEEK: Thursday



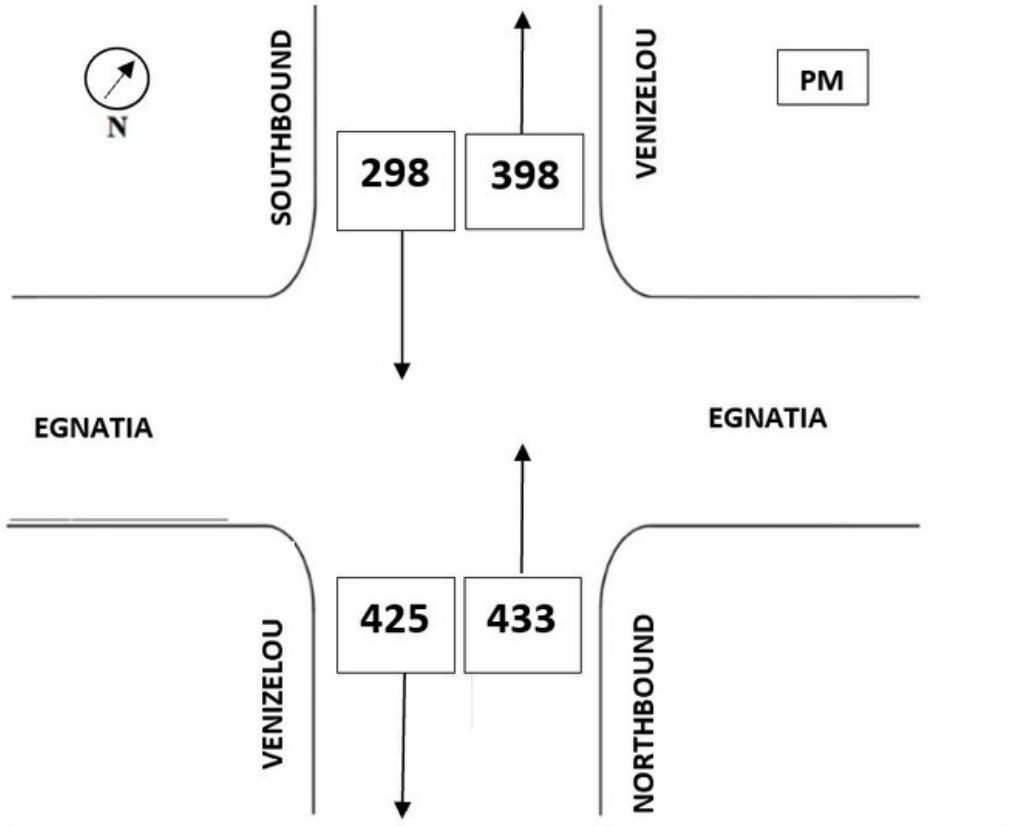
STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Ionos Dragoumi North Side	771	48.6%	2:00-3:00 PM
Ionos Dragoumi South Side	814	51.4%	PHF = 0.87 (Reliability Factor)
TOTAL	**1585**	100%	

E1: Pedestrian data sheet outlining Ionos Dragoumi and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.

Pedestrian Traffic Volume Over Peak Hour

Venizelou and Egnatia Corridor

CITY: Thessaloniki DATE: 3/28/19 DAY OF WEEK: Thursday

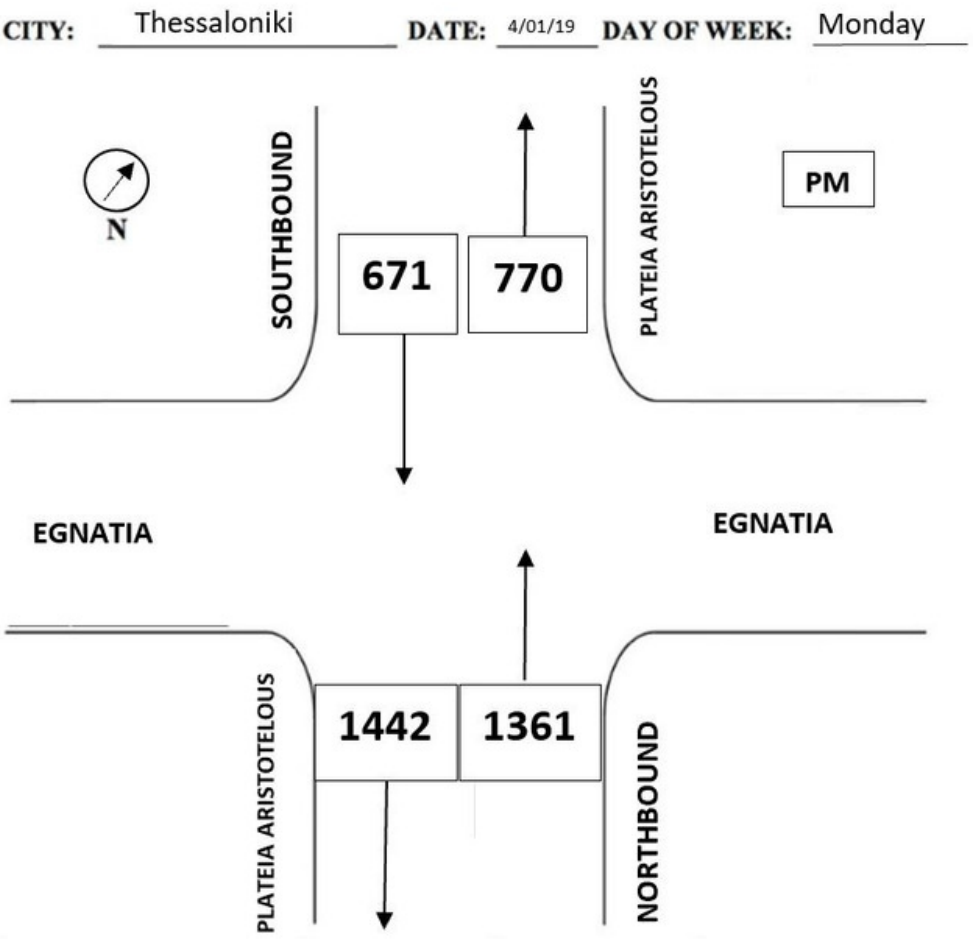


STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Venizelou North Side	696	44.8%	2:00-3:00 PM
Venizelou South Side	858	55.2%	PHF = 0.93 (Reliability Factor)
TOTAL	**1585**	100%	

E2: Pedestrian data sheet outlining Venizelou and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.

Pedestrian Traffic Volume Over Peak Hour

Plateia Aristotelous and Egnatia Corridor



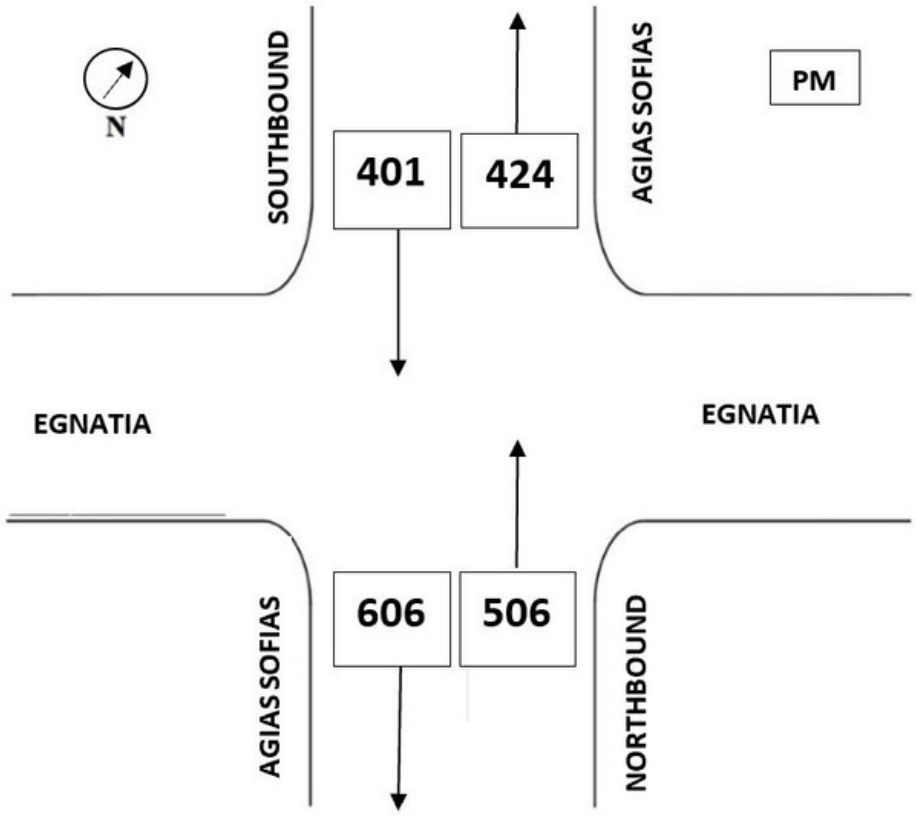
STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Plateia Aristotelous North Side	1,441	34.0%	2:00-3:00 PM
Plateia Aristotelous South Side	2,803	64%	PHF = 0.96 (Reliability Factor)
TOTAL	**4,244**	100%	

E3: Pedestrian data sheet outlining Plateia Aristotelous and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.

Pedestrian Traffic Volume Over Peak Hour

Agias Sofias and Egnatia Corridor

CITY: Thessaloniki DATE: 4/10/19 DAY OF WEEK: Wednesday



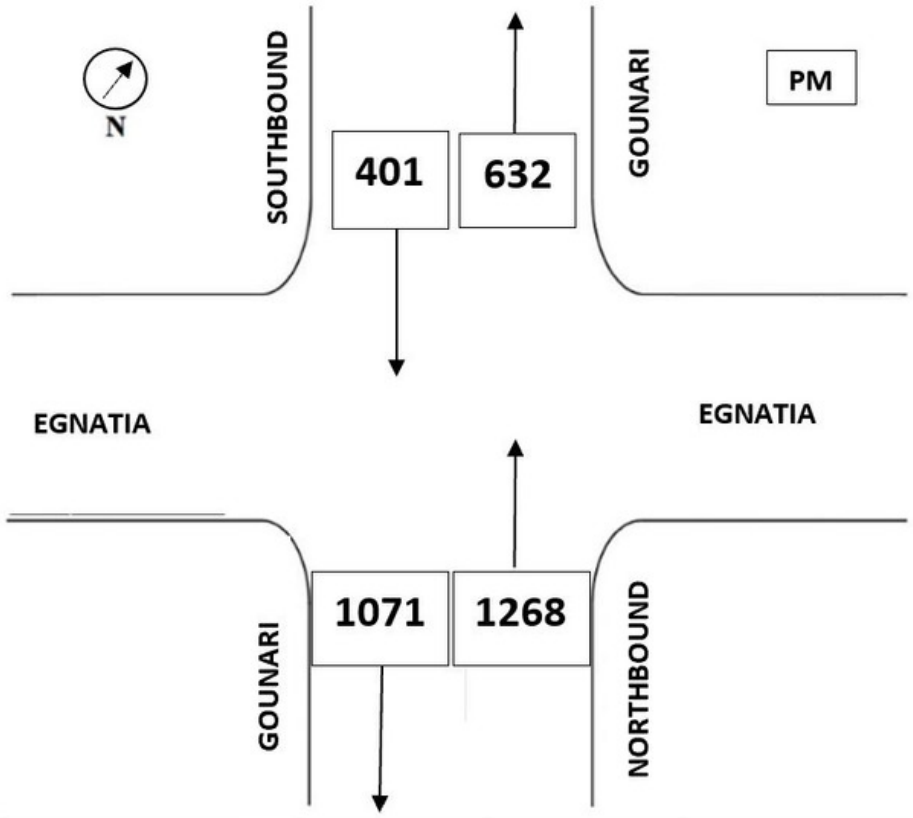
STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Agias Sofias North Side	825	42.6%	5:00-6:00 PM
Agias Sofias South Side	1,112	57.4%	PHF = 0.95 (Reliability Factor)
TOTAL	**1,937**	100%	

E4: Pedestrian data sheet outlining Agias Sofias and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.

Pedestrian Traffic Volume Over Peak Hour

Gounari and Egnatia Corridor

CITY: Thessaloniki DATE: 4/03/19 DAY OF WEEK: Wednesday

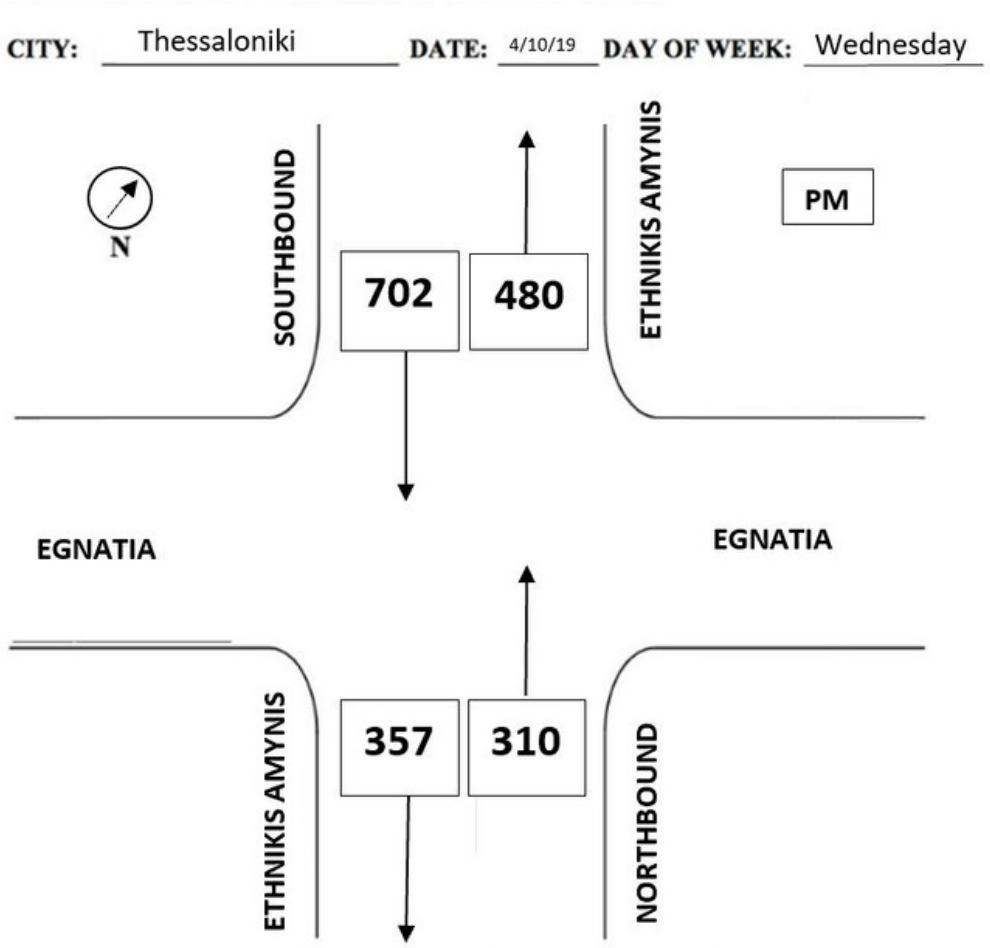


STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Gounari North Side	1,033	30.6%	5:00-6:00 PM
Gounari South Side	2,339	69.4%	PHF = 0.93 (Reliability Factor)
TOTAL	**3,372**	100%	

E5: Pedestrian data sheet outlining Gounari and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.

Pedestrian Traffic Volume Over Peak Hour

Ethnikis Amynis and Egnatia Corridor



STREET	VOLUMES	PERCENT OF FLOW	TIME OF COUNT (PEAK HOUR)
Ethnikis Amynis North Side	1,182	64%	2:00-3:00 PM
Ethnikis Amynis South Side	667	36%	PHF = 0.98 (Reliability Factor)
TOTAL	**1,849**	100%	

E6: Pedestrian data sheet outlining Ethnikis Amynis and Egnatia Corridor intersection. Detailed directional pedestrian traffic volumes, traffic percentages, and the peak hour factor (PHF) are shown.