

Investigation of the Change of Edirne City Centre Texture in Historical Periods by Space Syntax Method



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Abstract: Urbans are spaces where human activities and lifestyles are formed and where structural, physical and social elements interact with each other. These spaces are complex and dynamic systems that reflect the historical, cultural, economic and political context of the city. They enable people to facilitate and sustain their housing, work, educational, entertainment and social activities. They also include structural elements such as green zones, infrastructure and transportation systems. Urban morphology, on the other hand, examines the formation of the texture and components of urban space and the change of these components over time. The aim of this study is to reveal the accessibility and legibility of the street network of Edirne city center in different historical periods through the integration values of the street network in different historical periods with Space Syntax, which is a morphological analysis method, and simultaneously to reveal the space-use relationship in the context of the historical background of the city. In the context of the study, a historical background reading has been made in order to understand the changes in the urban fabric. Within the framework of the historical process from the foundation of the city to the present day, significant breaking points of the city have been identified. Maps from the years 1855, 1918, 1947, 1975 and 2023 has been analyzed and the change of urban space has been tried to be revealed in the analysis.

Keywords: Urban morphology, space syntax method, historical background, pedestrian movement.

Tarihsel Dönemlerinde Edirne Kent Merkezi Dokusunun Değişiminin Mekân Dizimi Yöntemi ile Araştırılması

Özet: Kent, insan etkinliklerinin ve yaşam biçimlerinin şekillendiği, yapısal, fiziksel ve sosyal unsurların etkileşim içinde olduğu mekanlardır. Bu mekanlar, insanların barınma, iş, eğitim, eğlence ve sosyal etkinlikleri gerçekleştirdikleri mekânların yanı sıra yeşil alanlar, altyapı, ulaşım sistemleri gibi yapısal unsurları da içermekle birlikte kentin tarihi, kültürel, ekonomik ve politik bağlamını yansıtan karmaşık ve dinamik sistemlerdir. Kent morfolojisi ise kentsel mekânın doku ve bileşenlerinin oluşumu ve bu bileşenlerin zaman içerisinde geçirdikleri değişimleri incelemektedir. Bu çalışmanın amacı, morfolojik bir analiz yöntemi olan Mekân Dizimi (Space Syntax) ile Edirne kent merkezinin farklı tarihi dönemlerdeki sokak ağının bütünleşme değerleri üzerinden erişilebilirlik ve okunabilirliğinin analiz edilmesi ve eş zamanlı olarak kentin tarihsel arka planı bağlamında kentsel mekân değişiminin sosyal yapı ve kullanım şekillerine olan ilişkisinin ortaya konulmasıdır. Çalışma kapsamında kentsel dokunun değişimini anlamak adına ilk olarak tarihsel arka plan okuması yapılarak kentin kuruluşundan günümüze kadar olan önemli kırılma noktaları belirlenmiştir. Sonuç olarak, kentin kırılma noktaları olarak belirlenen 1855, 1918, 1947, 1975 ve 2023 yıllarına ait haritalar üzerinden mekân dizimi analizleri yapılmış olup mekânsal yapının tarihsel süreç içerisindeki değişimi yaya hareketleri ve mekân-kullanım ilişkisi bağlamında ortaya koyulmaya çalışılmıştır.

Anahtar Kelimeler: Kent morfolojisi, mekân dizimi, tarihsel arka plan, yaya hareketleri

1. INTRODUCTION

The urban textures we live in are a spatial area where people produce social relations, interact with each other, and where daily life is maintained at socio-spatial scales. Cities, like a living organism, are in constant change and transformation. The formation of the texture and components of urban space, the changes of these components over time and the study of the relationships that define their configurations have been the subject of urban morphology. In analysing the complex structure of the urban form, in addition to its physical formation, social and social phenomena should also be examined in the context of historicity. The historical background of a city and the reflections of social, socio-economic, cultural and political factors can be read through the morphological structure of the urban form. Understanding and making sense of space, examining the components that make up the space and revealing these issues with data has been an important research area where various studies have been carried out since the formation of cities and a subject that has been addressed within the framework of different disciplines. Historical city centres, which are generally the oldest, historical and cultural significance of a city, carry the traces of various cultures and periods by providing information about the architectural structures, street textures, monuments and other historical features of the city.

Edirne, located in the Thrace region in northwestern Turkey, is situated on the Ergene basin. Edirne, neighbouring Greece to the west and Bulgaria to the north, is a border city and has had a strategic importance throughout history due to its geographical location. Located at the junction of the trade routes between East and West, the city has become an important trade centre due to this feature. The geographical location of the city has made it open to the interaction of different cultures, as well as providing the city with a rich historical and cultural accumulation. The city centre, which has an important place with its historical and commercial areas, shopping streets, important public buildings and touristic places, is a lively and dynamic centre as it has important architectural works belonging to the Ottoman period such as Selimiye Mosque, Edirne Clock Tower, Üç Şerefeli Mosque, Edirne Bedesteni as well as lively streets such as Saraçlar Street where cafes, restaurants and shopping places are concentrated. Edirne city centre, which has a history dating back to ancient times, has witnessed many wars and physical changes in the historical process due to its strategic location by hosting many civilisations. How the effects of these changes have changed the urban form constitutes the main backbone and starting point of the article. The analyses made with the Space Syntax method, which is an important morphological method in understanding these stages of change, guide the way.

2. METHOD

The historical development of the Edirne city center and the underlying reasons for these historical turning points constitute the two-stage systematic structure of the article. In examining the spatial development of the city, which dates back to antiquity, the progression of the city from its foundation to the Roman era, the Byzantine period from AD 395, the Ottoman conquest in 1361, and subsequent Ottoman and Republic eras, have been delineated based on historical maps obtained from archival sources and relevant books and articles. In the second stage of the study, maps from the years 1855, 1918, 1947, 1975, and 2023 have been utilized to serve as a basis for space syntax analyses. Through these analyses, the study attempts to elucidate the development axes and dynamics of the Edirne city center, as well as the urban development directions and physical changes affecting pedestrian mobility, which in turn influence urban dynamics and economic parameters.

Space Syntax, which is the main analysis of the study, is a method developed in 1970 by Bill Hillier and Julienne Hanson to analyse spatial relations at various scales and to investigate the relationship between space and society [1]. According to Kropf, the theoretical basis of the space syntax method, which aims to understand the spatial structure of settlements through a series of analytical methods, is the analysis of the relationship between spatial structure and the general function of human movement [2]. Hillier and Hanson (1984) define space syntax as a method that analyses the built environment and the relationship between space and human movements. Space syntax, which deals with the built environment from the perspective of the inhabitants and designers, is an important basis for

understanding the past and present structure and presenting various inferences in the design studies to be carried out [3]. Space syntax analyses the spatial relations of settlements based on their physical characteristics. Since it is difficult to express complex spatial relationships, it is necessary to use abstract models or maps that represent the spatial system. The street system is the most important element of a city that enables people to meet each other and move from one place to another. Urban areas such as streets, avenues, roads, boulevards, paths, pavements, bridges and stairs, other than squares, shape a grid or network, or in other words, a potential movement pattern. In this context, urban space can be represented as linear elements. In this context, the Space Syntax method works with the concepts of "convexity" and "axiality". (Figure 1).

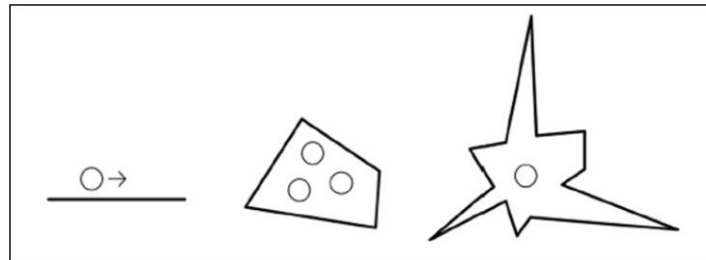


Figure 1. (from left to right) representation of the way people usually move along a line; convex area where users see each other and interactions take place; the range of visibility, which has a different shape depending on the location of the observer (izovist) [4]

Hillier (1988) defines convex space as "a space in which all points (locations) within that space can be connected with others without going beyond the boundaries of the space" [5]. When creating convex maps, depending on the form of the settlement, spaces outside the buildings or spaces that determine the boundaries of the buildings are defined. These spaces, which usually overlap with roads, can be gradually identified and analysed through classifications such as size/smallness, width/narrowness [3]. Axial maps consisting of axial lines, used as a method in this study, represent the longest visibility distance in the context of movement within a convex area. In other words, axial lines represent the way people move linearly on a road network. Axial lines are drawn according to the longest viewing distance of a moving person looking in different directions from his/her current position. For this reason, axial maps, which are also described as visibility axes, show movement paths and direction changes by representing the longest and shortest sight lines [3]. People always walk in a straight line instead of a curved line in order to minimise the distance. Therefore, axial lines representing a person's movement behaviour simplify the complex urban environment and connect people's perception of space and movement behaviour [6]. (Figure 2)

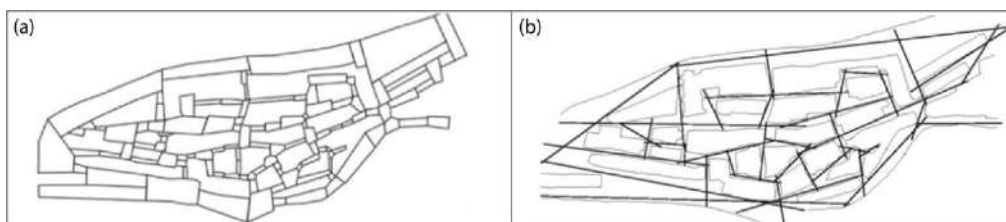


Figure 2. (a) Convex Map (b) Axial Map [7]

An axial map analyses spatial configuration through three important concepts: connectivity, integration (global and local) and intelligibility. In axial maps, all axial lines are connected to each other and are valued according to the number of axes they are connected to. Connectivity shows the degree of connection of each street with the streets that directly intersect each other. In this direction, the value of a street with many connections is high, while the value of streets with few connections is low. Highly connected axes can also be defined as the routes that people choose to move between urban areas [8]. At the same time, the higher the connectivity of an axial line within the urban system, the higher the number and variety of shops and shopping centres on the axis.

In the space syntax method, the integration value is a criterion that defines the depth of a space to all other spaces in the system. In this way, the areas in the system can be ranked from the most integrated to the most segregated. Since the integration distribution reveals the movement pattern in urban areas, the mobility of an area can be analysed in advance. Integration analyses are divided into two categories: global and local; Global integration describes how a street relates to all other streets in a given spatial system. The fewer the direction changes from a street to reach other points in the system, the higher the global integration value of the street. In this context, the length of the axial line and its connection with other lines increase the integration value in direct proportion [8]. Most of the urban neighbourhoods and suburbs in today's urban settlements have their own shopping areas. For this reason, local integration analyses are used since local city centres are not sufficiently emphasised in global integration analyses. In the analyses, integration values are expressed in a colour scale from blue to red. Red axial lines mean the most integrated axes, i.e. the axes with the most movement, while blue axial lines mean the most segregated axes, i.e. the axes with the least movement. Correlations between global and local integration values reveal the comprehensibility of the urban system (Figure 4).

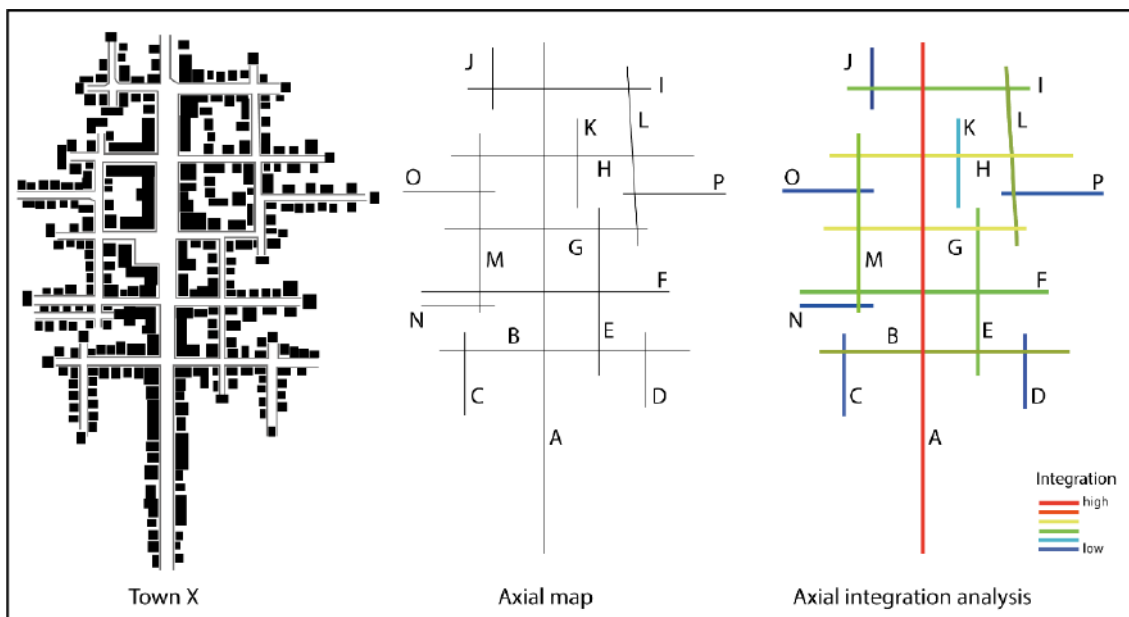


Figure 3. Axial map of settlement X and axial integration analysis [8]

Another analysis in the space syntax method is segment analysis. Thanks to axial maps, potential movement in urban spaces can be estimated. However, axial maps are insufficient both in determining semi-continuous lines and in expressing topological differences in the third dimension such as height. In order to overcome this deficiency, segment maps are developed based on analysing the intersection/junction points of the streets in the urban system according to the connection angle. With segment analysis, accessibility can be measured according to different metric distances and segment relationships of streets are reconstructed as the radius changes. Depending on the study, the distance can be analysed from 400 m, which refers to pedestrian movement, to 2000 m and above, where peripheral roads are seen. Choice analysis represents the shortest routes chosen by pedestrians and reveals the movement potential and thus urban routes [9]. The higher the applied metric radius, the more clearly the ring roads and motorway network will be read [3].

In the light of these methodical explanations, it is aimed to reveal the accessibility and legibility of the street network of Edirne city centre in the historical process through the integration values with the Space Syntax method. At the same time, in order to understand the causes of pedestrian movements and the land-use relationship, the historical background from the emergence of the city to the present day has been examined simultaneously and associated with the results of the analysis. In this way, strong or weak streets within the system will be read more clearly and the reasons will be explained.

3. SPATIAL CHANGE OF EDİRNE HISTORICAL CITY CENTRE AND ITS SURROUNDINGS

Edirne is located in northwestern Turkey on the highway line connecting Turkey to Europe and has a surface area of 6,279 km². The city is located on the plain where the rivers Meriç, Tunca and Arda meet and has 9 districts, namely Lalapaşa, Süleoğlu, Merkez, Havsa, Meriç, Uzunköprü, İpsala, Keşan and Enez. Neighbouring Greece and Bulgaria, the city is also a border city [10]. The study area is limited to the centre of Edirne, which has a surface area of approximately 955 km² and includes 21 neighbourhoods in total (Figure 6).

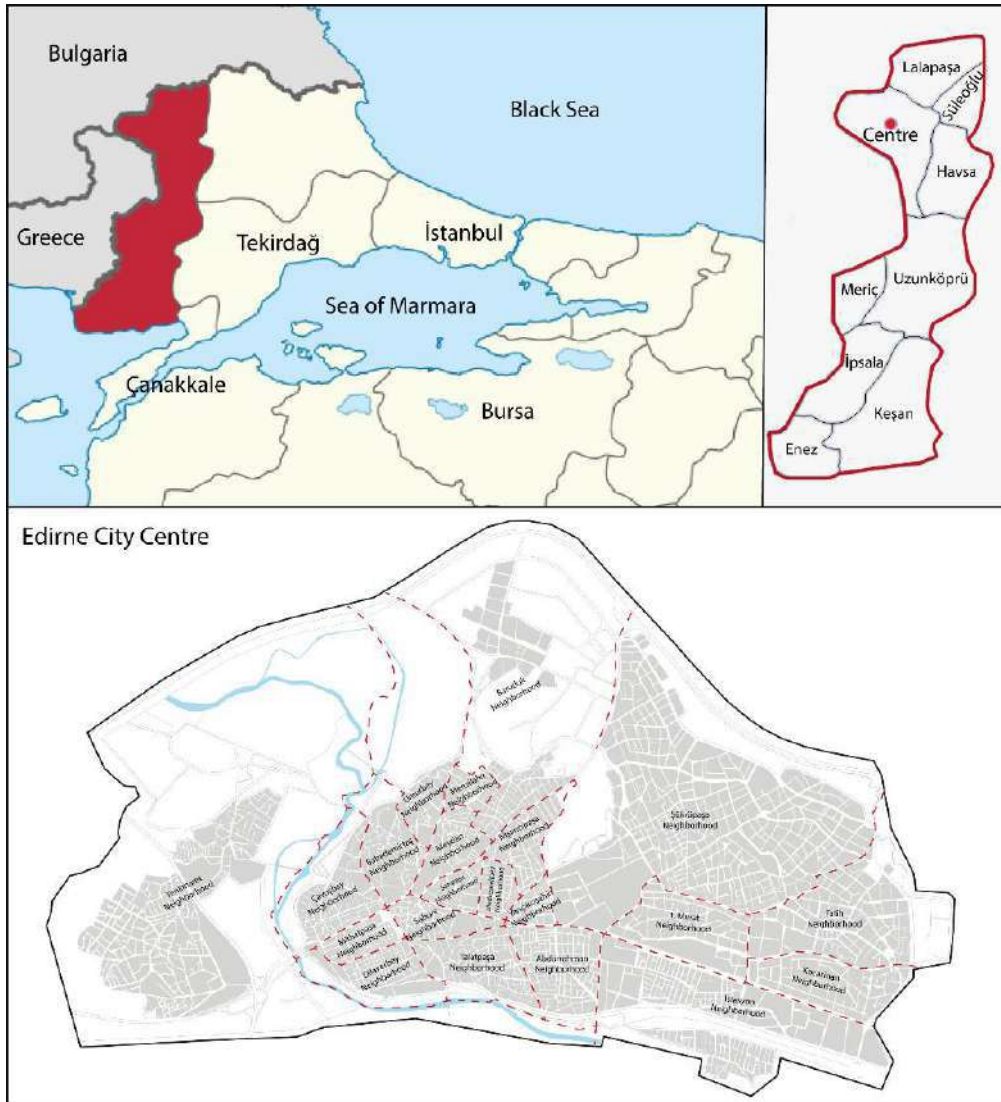


Figure 4. Location of Edirne on the top left, districts of Edirne on the top right and the city centre of Edirne, which is the study area, below

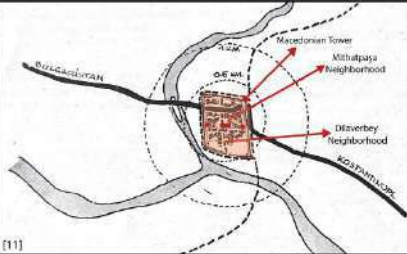

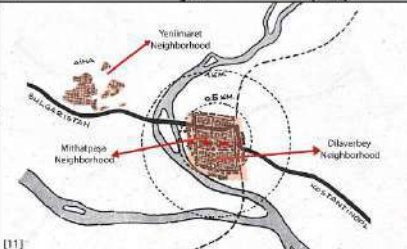

It is known that Edirne, which has a history dating back to the early ages, was founded in the 7th century BC by Thracian tribes, a branch of Turks migrating from Central Asia, under the name "Öski Damak (Old City)". However, according to various sources, the settlement of Öski Damak corresponds to the village of Üsküdar in Bulgaria rather than today's Edirne. For this reason, "Odrisya", founded by Odris, one of the largest Thracian tribes at the confluence of the Meriç and Tunca rivers, is accepted as the first settlement and market area established within the borders of Edirne [11]. After the death of Kotys, the king of Odrisya in the 4th century BC, the Thracians, who could not continue their existence for long, began to disperse and came under the sovereignty of various kingdoms [12].




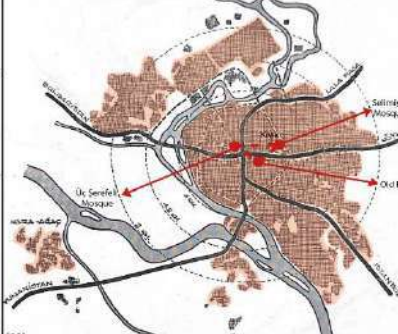
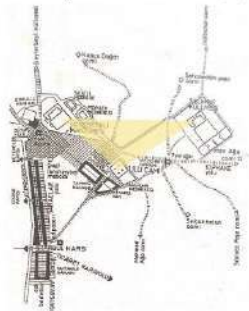






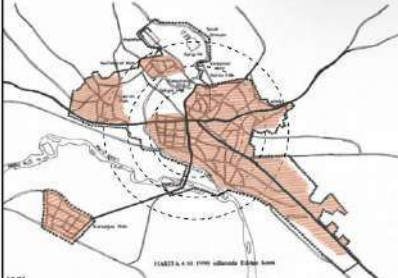


4. EDIRNE URBAN DEVELOPMENT AND SPACE SYNTAX ANALYSES

Edirne came under the sovereignty of Rome as a result of the Roman invasion in 46 AD. The formation of the city centre is observed during the Roman Emperor Hadrianus period between 117- 138 AD. Orestia, which was a town in its period, attracted the attention of Hadrian due to its strategic location and named the city Hadrianopolis, which means the city of Hadrian [13]. Hadrianopolis, which is located in a very favourable region in terms of trade, military and agriculture, experienced its brightest periods in the II. and III. Centuries AD [14]. The city, which was exposed to many wars as of the IVth century, was surrounded by walls by Hadrianus in the face of the wars. This walled settlement is the Kaleiçi district of Edirne, which today consists of two neighbourhoods, Mithatpaşa and Dilaverbey Quarter [13]. Hadrian built "Edirne Castle", in other words, a "Castrum" in order to protect the city against external forces. In this context, Edirne Castle was built entirely in accordance with the Roman Castrum plan [14].

Conquered in 1361 by the Ottomans, Edirne's spatial structure in the XIVth century is known to have had an area of approximately 100 hectares and to have consisted of the present-day Kaleiçi settlement and the town named Aina, which is located around the present-day Yeniimaret Neighbourhood [15]. The area where Üç Şerefeli Mosque is located today and its surroundings were used as the trade and market area of the city. Basically, the spatial structure of the city in the 14th century was characterised by a two-centred structure, namely inside the castle (administration/settlement centre) and outside the castle (Aina settlement-market area-trade centre) [16]. Since it is located on the historical Roman Road (Via Egnatia) extending from the Adriatic to Istanbul, it has been an important focal point for local and foreign merchants throughout history [13]. In terms of spatial development, the city did not show much development from the second century until this period, but it is known that there were spatial regressions from time to time during the urbanisation process as it was exposed to many wars, attacks and invasions due to its location. According to Özdeş's urban development maps, unlike the II century, the occupancy of the areas within the city walls increased (Table 1).

Table 1: Spatial development of the city since its foundation [16, 17, 18, 19, 20, 21, 22, 23, 24]

<p>Edirne in The Late 2nd Century</p>  <p>(11)</p>	<p>Edirne Castle [17]</p>  <ul style="list-style-type: none"> - Approximately 50 hectare - The brightest era - Edirne Palace based on Roman Castrum plan - Double-centred structure (inside and outside the castle)
<p>Edirne in The Early 14th Century</p>  <p>(11)</p>	<p>Edirne Macedonian Tower [18]</p>  <ul style="list-style-type: none"> - Approximately 100 hectare - Aina Town connected by a bridge to Kaleiçi

<p>Edirne in The Late 15th Century</p>  <p>[11]</p>	<p>Old Palace [19]</p>  <p>New Palace [20]</p>  <ul style="list-style-type: none"> -Approximately 350 hectare -1361 the conquest of Edirne -Edirne became capital city -1368 Old Palace (Sarayı Atık) was built -1399 Yıldırım Mosque was built -1443-1447 Üç Şerefeli Mosque was built -1450 New Palace construction was started - Spatial development began to expand outwards from the castle
<p>Edirne in The Late 17th Century</p>  <p>[11]</p>	<p>Edirne City Center Commercial Area [16]</p>  <ul style="list-style-type: none"> -Approximately 850 hectare -One of the largest cities in Europe - Selimiye Mosque was built - Trade axis between The Selimiye Mosque, The Old Mosque and The Üç Şerefeli Mosque - The neighbourhoods of Kıyık and Karaağaç were formed - The city expanded to north-east
<p>Edirne in The Late 19th Century</p>  <p>[11]</p>	<p>Historical Edirne Train Station [21]</p>  <p>Edirne in the 19th Century [22]</p>  <ul style="list-style-type: none"> -Approximately 750 hectare -1829 The Russo-Turkish War -1832 Pandemic -1854-55 Crimean War -1878- The Russo-Turkish War -Began to lose its economic and military dominance -Invasions negatively affected the city -Decrease in population - Re-appearance of city's military identity - Karaağaç expanded westwards (unplanned urbanization)
<p>Edirne in The Early 20th Century</p>  <p>[11]</p>	<p>Kaleiçi after Great Fire of Edirne [23]</p>  <p>London Asphalt from newspaper [24]</p> <p>Trakya'yı canlandırarak büyük bir kandamarı Lüleburgaz - Edirne asfalt yolu yapılıyor Tekmülî 8 milyon liraya mal olacak olan bu yasa Trakya'nın kalkınma hareketinde geniş bir rol oynayacaktır</p>  <ul style="list-style-type: none"> -Approximately 600 hectare -1903 Dilaver Bey's city plan -Decrease in population because of Balkan Wars -1940 Ernst Egli Edirne city plan -1947 Gündüz Özdeş Edirne city development plan -Constuction of London Asphalt
<p>Edirne in The Late 20th Century</p>  <p>[13]</p>	<p>Edirne city view from Üç Şerefeli Mosque [22]</p>  <p>Saraçlar Street- 1978 [22]</p>  <ul style="list-style-type: none"> -1966 first development plan -Construction of mass housing projects -Trakya University established -Construction of TEM highway -City expanded northward and eastward

After Murad I conquered the city, the city took the names "Edrenaboli" and "Edrene" instead of Hadrianopolis, and after the XVIIIth century, it started to be called "Edirne" [13]. After the conquest of the city, Murad I first converted two churches in Kaleiçi into mosques. These mosques are Halebi Mosque and Church Mosque. Due to the continuation of the Rumelia campaigns, the Akincılar Road, which is the axis connecting the city to the Balkans, has a special importance, so the town of Aina and its surroundings were built. In 1399, Yıldırım Mosque and Yıldırım Kulliye were built and a neighbourhood was established in this area [15]. Moving the state centre from Bursa to Edirne made the city more important and contributed greatly to the spatial development of the city. In this direction, the Old Palace (Saray-ı Atik), the first palace of the period, was built in the area where Selimiye is located today. In 1385, as a result of the expansion of the conquests towards the Balkans with the capture of Sofia, the city was secured and central organisation started to form. The importance given to the city gradually increased with the period of Yıldırım Bayezid. With the Imaret system, new neighbourhoods, namely Seferşah, Ortaimaret and Şahmelek, were added to the city outside the castle and the town of Aina was included in Edirne. Edirne, which entered a rapid construction process with the reign of Murat II, was an important commercial city and government centre. During this period, many mosques, madrasahs and bridges were built in the city. Between the years 1443-1447, Murat II built many mosques, madrasahs and bridges in the city. Murat II had the Üç Şerefeli Mosque, one of the important landmarks of the city, built between 1443 - 1447. The construction of the second palace, Saray-ı Cedid-i Amire (New Palace), was also started during the reign of Murat II. Edirne, which reached a surface area of approximately 350 hectares in the XVth century, shows a great urban development when compared to the spatial structure of the XIVth century. As it became the capital of the Ottoman Empire, the importance given to the city gradually increased and the city expanded from Kaleiçi to Sarayıçi, Kirişhane and Darphane and the urban area reached 1.5 km in diameter [13]. The city, which developed by continuously building new structures, became one of the big cities in Europe in the XVIth and XVIIth centuries [25].

The classical urban form of Edirne in physical terms started to be formed as of the XVIth century. From the XVIth century onwards, Edirne ceased to be a military base and started to become a settlement used by the sultans for recreation purposes. The location of Selimiye Mosque, which was built on Sarıbayır, the highest hill of Edirne during the reign of Suleiman the Magnificent, influenced the zoning plans to be made in the republican period and caused the mosque to become an important focal point. At the same time, the main streets and roads planned during the republican period were also shaped according to the location of the mosque [13]. With the construction of Selimiye Mosque, a triangular commercial axis started to form between Eski Mosque, Üç Şerefeli Mosque and Selimiye Mosque, and the city started to expand towards the northeast direction as of the 17th century [26]. Towards the end of the 17th century, with the establishment of Kızıyık and Karaağaç neighbourhoods, the city continued to grow by reaching an area of approximately 850 hectares. Structures such as Kanuni Sultan Bridge, Ali Pasha Bazaar, Rüstem Pasha Inn, Two Gate Inn, Sokullu Mehmet Pasha Palace were also built in this period [13].

As the Ottoman Empire gradually lost power in the XIXth century, wars and occupations started to affect Edirne negatively. Edirne was occupied by the French army in 1854-1855 during the Crimean War. "Osmond Map", known as the oldest plan of the city, was prepared by Osmond, an engineer serving in the French army. On the plan, the development of the city was analysed by dividing the city into two parts as Kaleiçi and outside of Kaleiçi. The plan, which gives information about the walls in Kaleiçi, also shows the street texture of Kaleiçi settlement and the locations of some monuments [26], (Figure 5).



Figure 5. 1855 The Osmont Map [27]

The map titled "Plan d'Andrinople" was made in the same year as the Osmont Map [27]. Due to being the oldest and most legible map of the city, this plan has been utilized as a base for interpretation in space syntax analyses (Figure 6).

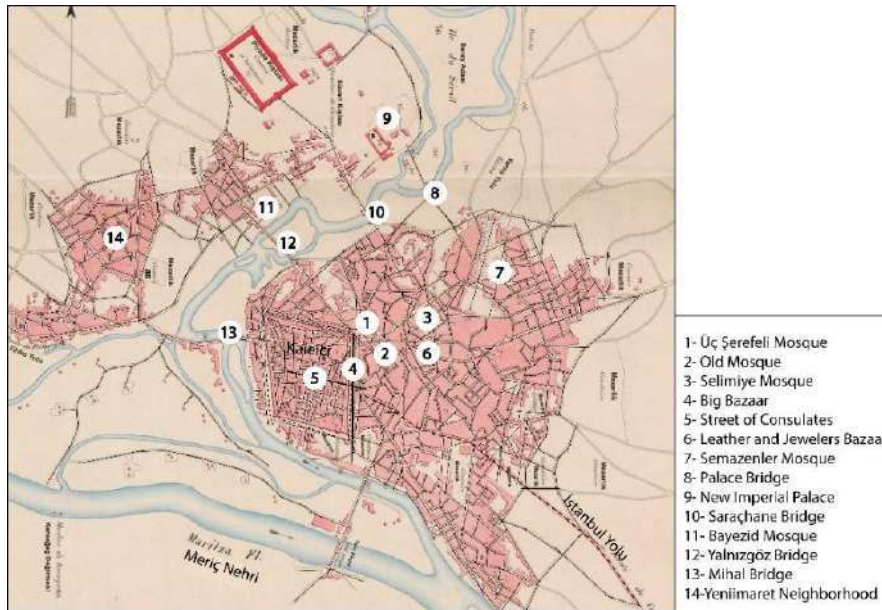


Figure 6. 1855 "Plan d'Andrinople" with important streets and landmarks, (Bayatlı, 2019)[28]

On the 1855 map, the locations of significant historical landmarks such as the Üç Şerefeli Mosque, Old Mosque, and Selimiye Mosque are evident. The Tunca and Meriç Rivers serve as natural boundaries, shaping the spatial development of the city. The spatial expansion of the city generally encompasses the Kaleiçi and northeastern surroundings, as well as the Yeniimaret and Yeni Saray areas in the west.

According to the space syntax analyses of the 1855 Edirne map, in local integration analyses, the most integrated axis is identified as Street 4, which houses the main market area, with a value of 3.716599. Another axis, indicated as number 5 on the map, which horizontally intersects the Kaleiçi settlement, emerges as the second most integrated street across the city, boasting the highest integration value. During that period, consulates were situated along this street. Both local and global integration analyses reveal Üç Şerefeli Mosque, Old Mosque, Selimiye Mosque, and their immediate vicinity as the most

integrated area of the city, forming its commercial center with bustling markets and bazaars. Additionally, Yeniimaret Neighborhood, the vicinity of Yeni Saray, and Semazenler Mosque area are observed as integrated zones within themselves. (Figure 7).

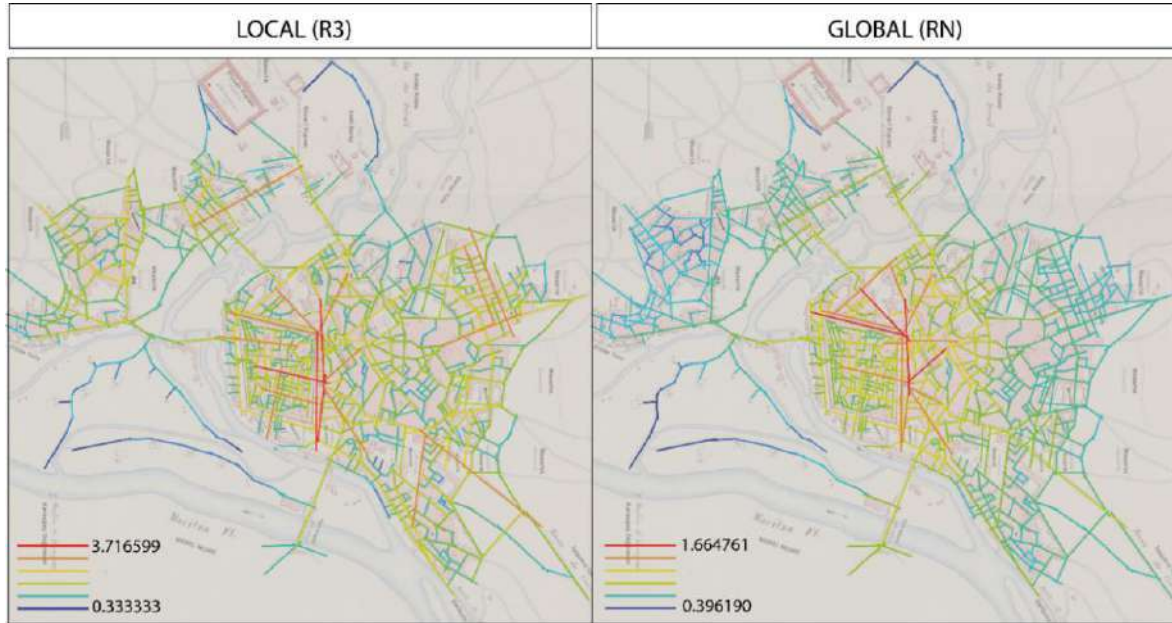


Figure 7. 1855 local integration analysis (left) and global integration analysis (right)

In 1878, Edirne was occupied for the second time by Russia. Following the wars, the city's military identity regained prominence, leading to the construction of military fortifications around the city perimeters starting from 1885. The fortifications built during this period, known as "tabyas," can be clearly observed on the map titled "Edirne City and its Environs," drawn by Mehmet Selami in 1884. On the map, apart from the city center, the significance of Edirne Palace, Karaağaç, the railway, and the station building, as well as the importance of the Meriç and Tunca Rivers influencing the city's development directions, are evident. Karaağaç, exhibiting irregular development towards the west, is characterized by settlements around Ortaköy Avenue. Ortaköy Avenue and Station Avenue emerge as two main axes in the Karaağaç settlement [26].

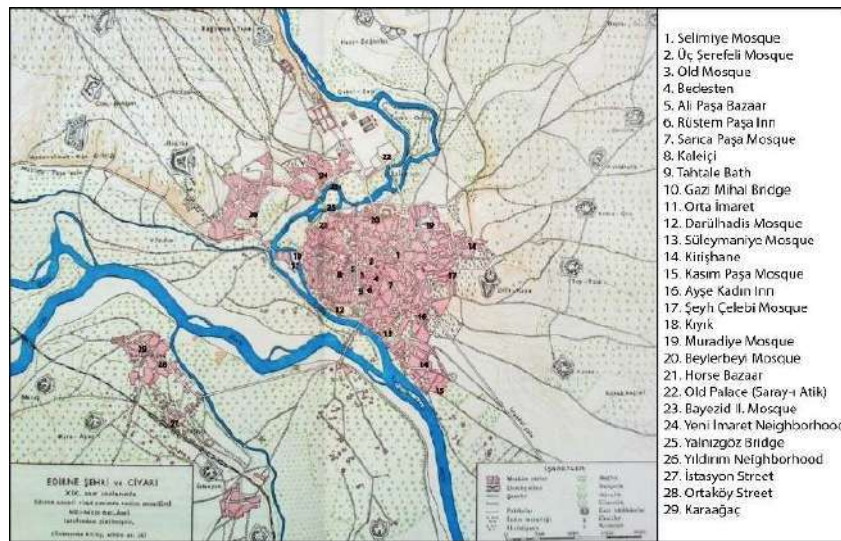


Figure 8. 1884 Mehmet Selami "Edirne City and its Neighbourhood" [27]

In 1903, a major fire broke out in the city, resulting in almost the entire neighborhoods located in Kaleiçi being burnt down. Dilaver Bey, who was the Mayor of Edirne at the time, commissioned French experts

to prepare a grid plan and perpendicular streets for Kaleiçi under the "Fire Site Plan and Building Regulation (Ebniye Kanunu)". Shortly after the preparation of Dilaver Bey's plan, the city entered a period of social decline with the outbreak of the Balkan Wars. The Balkan Wars led to a significant decrease in the city's population [26], (Figure 9).



Figure 9. 1903 Kaleiçi Dilaverbey plan (left), 1918 Edirne population distribution (right), (Bayatlı, 2019)[28]

After the war, the city contracted to approximately 750 hectares, with settlements decreasing primarily in neighborhoods such as Yıldırım Mahallesi, Sarayıçi, and Kirişhane Mevkii. However, no significant changes are observed in Kaleiçi and its surroundings [13].

As the 20th century unfolded, the impact of wars began to manifest in the city. The Balkan Wars, in particular, led to a significant decrease in the city's population, making the 1918 Edirne map crucial in this context [26]. Additionally, the Dilaver Bey plan, devised after the fire in Kaleiçi, is first observed on the 1918 map. Therefore, another map utilized in space syntax analyses is the 1918 Edirne map (Figure 10).

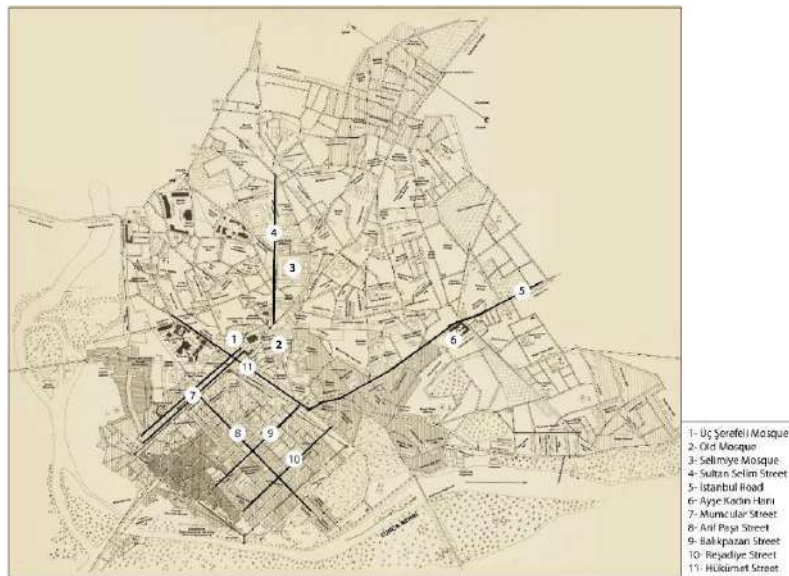


Figure 10. 1918 map with important streets and landmarks, (Bayatlı, 2019)[28]

In the 1918 map drawn towards the end of World War I, the grid plan of the Kaleiçi area is clearly discernible. The area that is darker shaded in Kaleiçi indicates traces of the fire. From the markings on the map, it can be inferred that Greeks reside in sparsely shaded areas, Armenians in horizontally shaded areas, Jews in densely and vertically shaded areas, and Muslims in unshaded areas. Although the Muslim population is minimal, it is known that there are Jewish and Armenian settlements throughout the city (Figure 10).

When examining the space syntax analyses of 1918, unlike 1855, it is observed that the Kaleiçi area appears more integrated in local analyses, indicating higher accessibility and pedestrian mobility. The most significant reason for this change stems from the grid-based Dilaver Bey plan implemented in the Kaleiçi area. Horizontally, Balıkpazarı and Reşadiye Streets, and vertically, Arif Paşa Street, are among the most integrated streets in Kaleiçi. Throughout the map, in terms of local integration analysis, the axis descending from Ayşe Kadın Hanı, with a value of 3.389751, and having the highest visibility, emerges as the most integrated street. Sultan Selim Street is another highly integrated street, characterized by numerous han (inns), markets, and bazaars. In global integration analysis, the streets most integrated are Hükümet Street in the city center, the axis between Üç Şerefeli Mosque and Old Mosque, and Mumcular Street. Integration values decrease towards the peripheries (Figure 11).

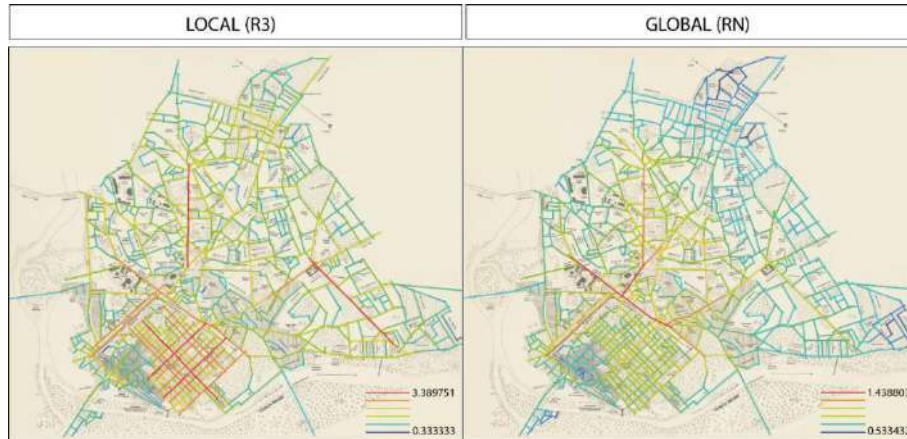


Figure 11. 1918 local integration value (left) and global integration analyses (right)

By the time the Republic period was reached, urbanization decisions were made, prompting the invitation of Prof. Ernst Egli to prepare the city's urban plans. Planning studies commenced in 1937, with consideration given to the terrain structure. The plan emphasized the joint evaluation of main roads and historical landmarks. Egli, by retaining the Selimiye Mosque in the city center, created an axis passing through Kaleiçi and connected this axis to the Edirne-Istanbul road. The Edirne-Istanbul road was widened, and as per this planning, existing structures were expropriated and demolished [11], (Figure 12). Another significant decision in Egli's plan was to design a peripheral road parallel to the Tunca River to provide direct transportation along the east and west axes. The road coming from Karaağaç Neighborhood splits into two branches, one passing under the Tunca River and the other crossing over the river with the help of a bridge, facilitating access to the city center [26].



Figure 12. 1940 Ernst Egli Edirne plan [27]

In the plan, while preserving the existing street pattern of Kaleiçi, some roads were widened, and main routes were established. The created main routes are discernible on the plan. Around the Old Mosque, historical heritage and existing plots were preserved, resulting in an amorphous structure. Egli, who also conducted planning on settlement areas, created a square with commercial and social spaces in front of the Üç Şerefeli Mosque and planned a stadium surrounded by green areas to the south of the city. Overall, Egli demonstrated an approach aligned with the city's terrain structure, preserving existing road axes and evaluating areas divided by roads as plots without undergoing re-parcellation in some regions [26].

Gündüz Özdeş's study titled "Preparation Study for the Edirne Urban Plan" in 1951 provided a significant foundation for future urban planning. The construction of the road extending from Istanbul to London in 1938, known as the London Road, passing through the city center, represents one of the crucial turning points in spatial development. Gündüz Özdeş's 1947 Edirne Map, being the clearest depiction of the London Road, served as a basis for space syntax analyses (Figure 13).

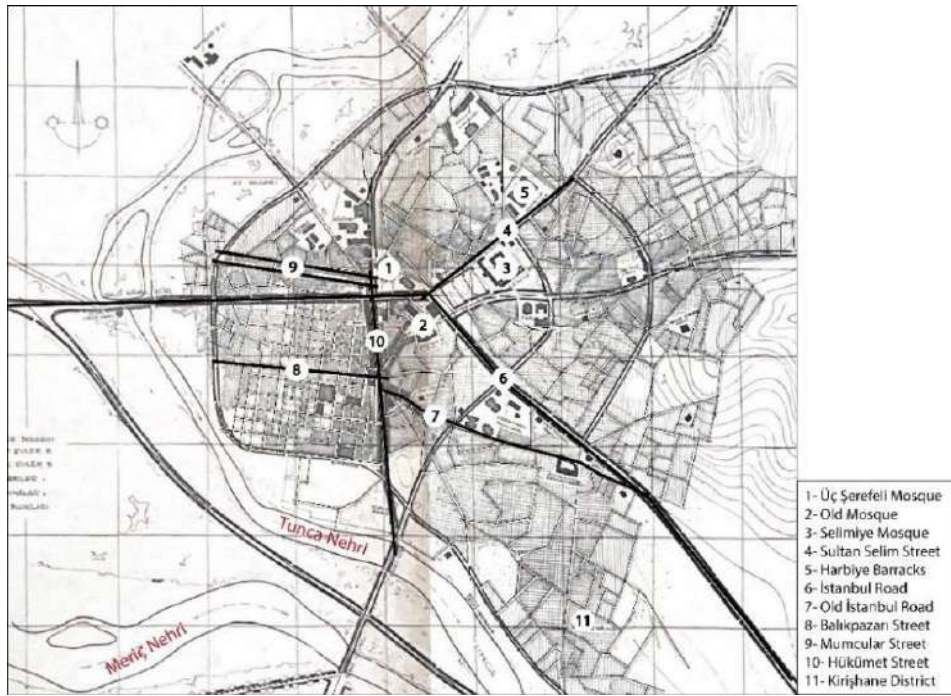


Figure 13. 1947 map with important streets and landmarks [11]

In the 1/8000 scale plan, the Istanbul-Bulgaria highway passes through the center of the city. Additionally, there is another road parallel to this highway that passes between the Tunca and Meriç rivers. In Özdeş's plan, the area between the Old Mosque and the Municipality Square is designated as the city core, from which five main axes radiate outwards. Historical buildings, official structures, and commercial buildings are indicated on the plan, while residential areas are depicted as dense, sparse, or with few housing units. Similar to Egli's plan, the road coming from Karaağaç splits into two branches, one leading to Kaleiçi and the other to the Selimiye Mosque. The rivers on the plan serve as boundaries, and the city's planning extends up to the rivers (Figure 13).

In the space syntax analyses of the Özdeş Plan, the London Road (Istanbul Road), Sultan Selim Street, and Hükümet Street (Saraçlar Street) are seen as forming the backbone of the city, constituting the most integrated streets in both local and global integration analyses. In the local integration analysis, the portion of the Istanbul Road above Kaleiçi has the highest integration value, with a value of 3.578552. In the global integration analysis, the entire Istanbul Road is clearly seen as fully integrated. With the construction of the new Istanbul road, the integration values of the axis descending from Kaleiçi and Ayşe Kadın Hanı have decreased compared to previous periods. The division of Kaleiçi settlement by the Istanbul Road and the separation of Mumcular Street from the Kaleiçi settlement have significantly reduced their integration values (Figure 14).

In the analyses of 1855 and 1918, it was observed that the further towards the city periphery, the integration value decreased. However, in the analyses of the Özdeş Plan, due to the newly added main roads, there is no significant decrease in integration values as one moves towards the periphery, indicating a higher level of integration with the city. The Kirişhane District and its surroundings emerge as the least integrated area in the system.

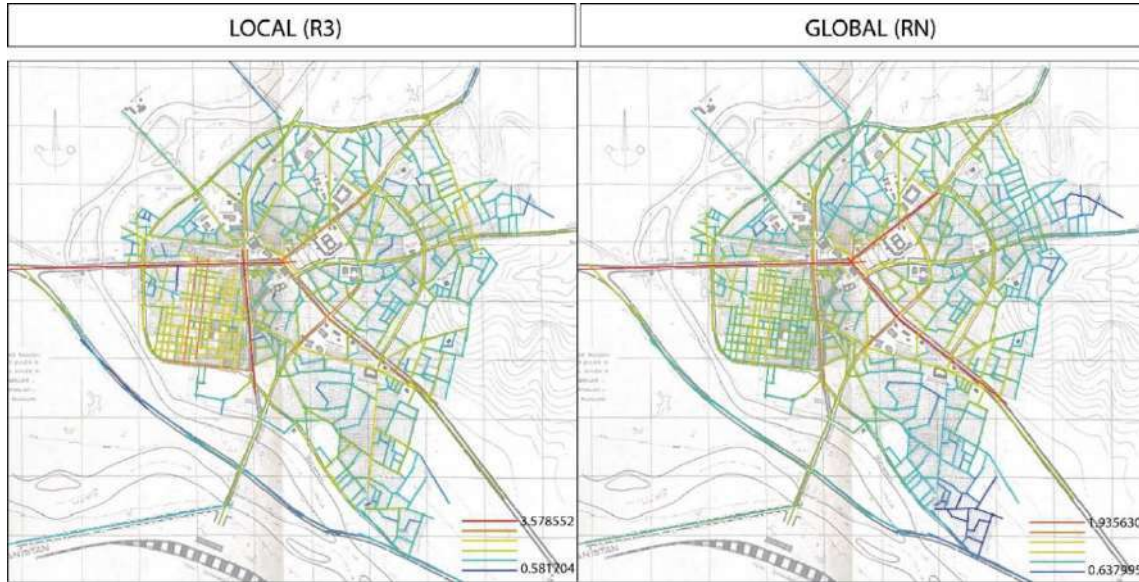


Figure 14. 1947 local integration analysis (left) and global integration analysis (right)

As of 1950, urban development activities accelerated, and demolitions began in line with Özdeş's recommendations and Egli's plan. The most significant development in the structuring of the urban space occurred in 1966 with the preparation of the urban plan. In this plan, parcels were combined and enlarged, mainly encompassing conservation area decisions. By the 1970s, due to the ongoing rapid urbanization process, multi-story buildings were constructed. According to the additional urban plan of 1975, the city expanded linearly along the London Road, planning new residential areas and an industrial zone to the east of the city [25]. Since the urban plans made during this period were not accessible, only the 1975 Edirne Map, which focused solely on the city center, was used as a basis for space syntax analyses (Figure 15).

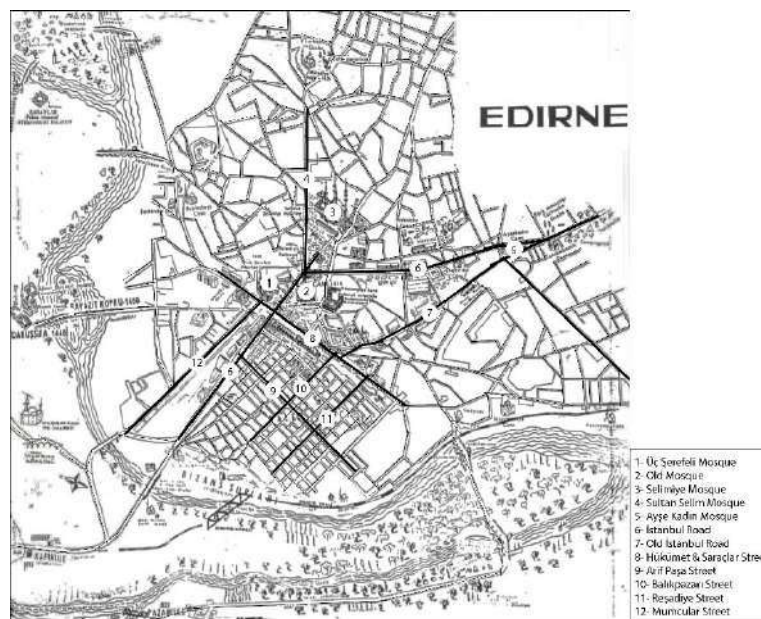


Figure 15. Important streets and landmarks on the 1975 map [29]

In the 1975 map, significant changes are not observed in the city center. It appears that the existing street layout and parcel structure of the city are preserved. During this period, there was a significant increase in demand for the Kaleiçi settlement, leading to a considerable rise in its value [26].

Similar to the analysis in the Özdeş Plan, in the 1975 Edirne map, Istanbul Road, Saraçlar Street, and Sultan Selim Street are the most integrated streets. With an integration value of 3.246087, Saraçlar Street emerges as the most integrated street in the local integration analysis. Due to the organization of roads within the urban planning, the integration value of Kaleiçi has increased again. Arif Paşa, Balıkpazarı, and Reşadiye Streets are main roads with high integration values. With the expansion of the city to the east, the integration value of the axis descending from Ayşe Kadın Mosque, now known as Uzun Kaldırım Street, has also increased within the system (Figure 16).

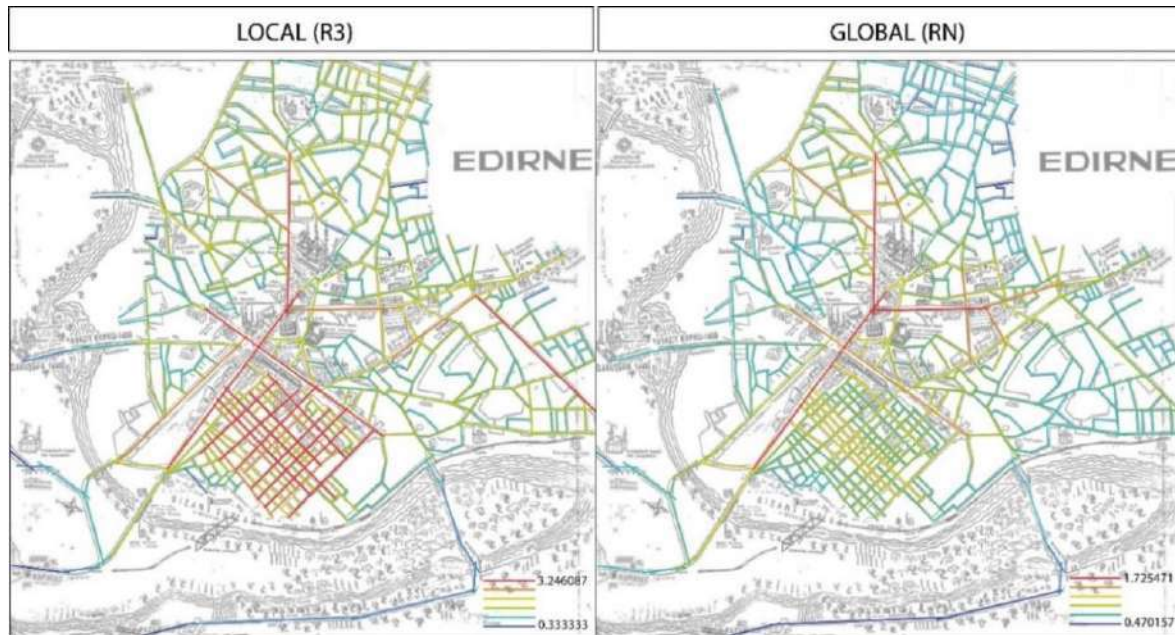


Figure 16. 1975 local integration analysis (left) and global integration analysis (right)

In the 1980s, the establishment of Trakya University marked a significant threshold in the eastern expansion of the city, with urban development continuing towards the Ayşekadın region on the Istanbul side. Concurrently, due to the increase in population and corresponding housing demand, the inadequacy of the 1966 urban plan led to the preparation of a new zoning plan spanning 20 years, initiated in 1984. Moreover, in the 1990s, the construction of the TEM highway in the northeast direction of the city redirected its development trajectory towards the north [25]. Simultaneously, the proliferation of cooperative initiatives amid neoliberal policies led to the construction of collective housing projects in the vicinity of I. Murat Mahallesi, henceforth referred to as Cooperative Houses. Despite the 1984 zoning plan being devised to span two decades, the emergence of significant urban voids within the city and the formation of new concentrations in the northern part prompted the necessity for a new zoning plan in 2003 [13].

Subsequently, a series of urban plans were implemented, including the 2005 revised urban plan, the 2007 conservation-oriented urban plan, and the 2015, 2016, and 2017 urban plans. Through these plans, the city expanded towards the TEM highway in the north and towards the Istanbul side in the east, ultimately taking its present form. In line with this, space syntax analyses were conducted using the 2023 urban plan to examine the city's existing urban fabric and the relationship between space and land use. The 2023 urban plan reveals the city's development towards the northeast along Atatürk Boulevard. Preserving the urban core to a large extent, the city has reached the present day, with the original settlement area of Kaleiçi and its boundaries discernible on the 2023 map (Figure 17).

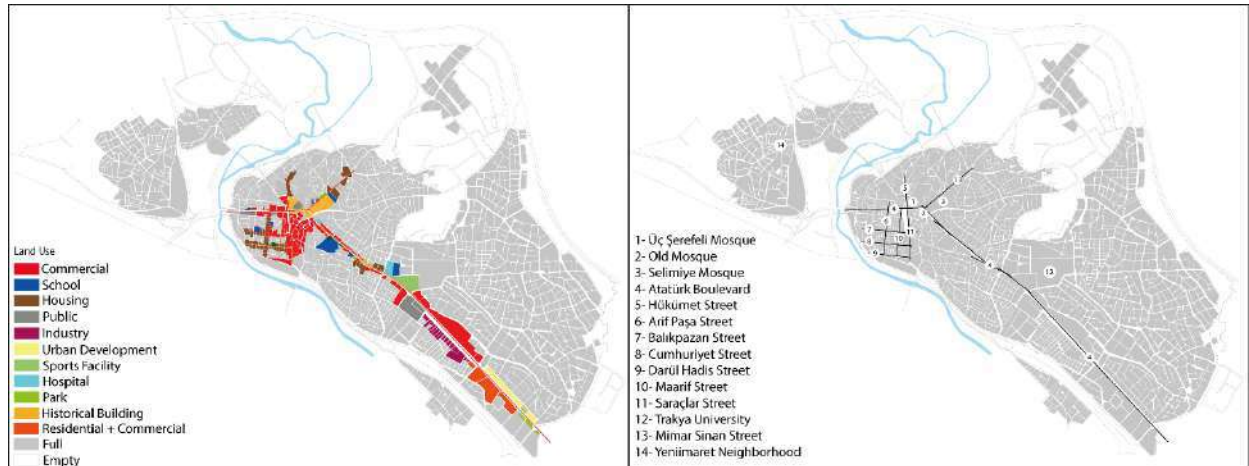


Figure 17. Study area land use analysis (left), important streets and landmarks

Previous period maps indicate that Atatürk Boulevard, Saraçlar Street, Hükümet Street, Balıkpazarı Street, Arif Paşa Street, and Sultan Selim Street (nowadays known as Mimar Sinan Street) emerge as streets with high integration values in local integration analyses, consistent with earlier maps. These streets, dense with historical and religious structures, also serve as areas with a high concentration of commercial units such as inns, markets, passages, and shops. Saraçlar Street, which is closed to traffic today, hosts numerous dining and various shops, attracting tourists and serving as a hub for shopping, resulting in high pedestrian traffic throughout the day. The urban development areas spreading eastward with the construction of universities and shopping malls have proportionally increased the integration value of Atatürk Boulevard. In local integration analysis, Atatürk Boulevard stands out as the most integrated street with a value of 3.774766. Atatürk Boulevard, formerly known as the London Road, accommodates various facilities including universities, schools, hospitals, shopping centers, sports facilities, and historical buildings (Figure 18).

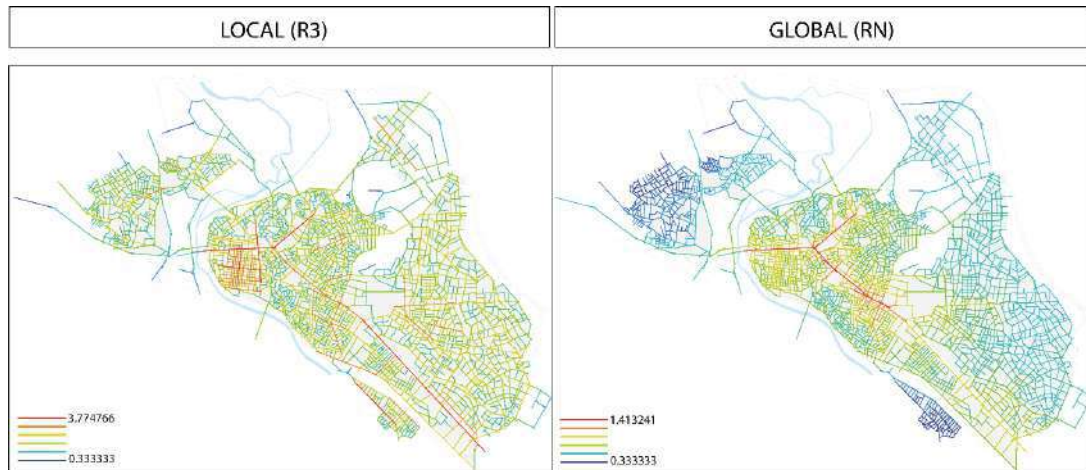


Figure 18. Local integration analysis for the year 2023 (on the left) and global integration analysis (on the right)

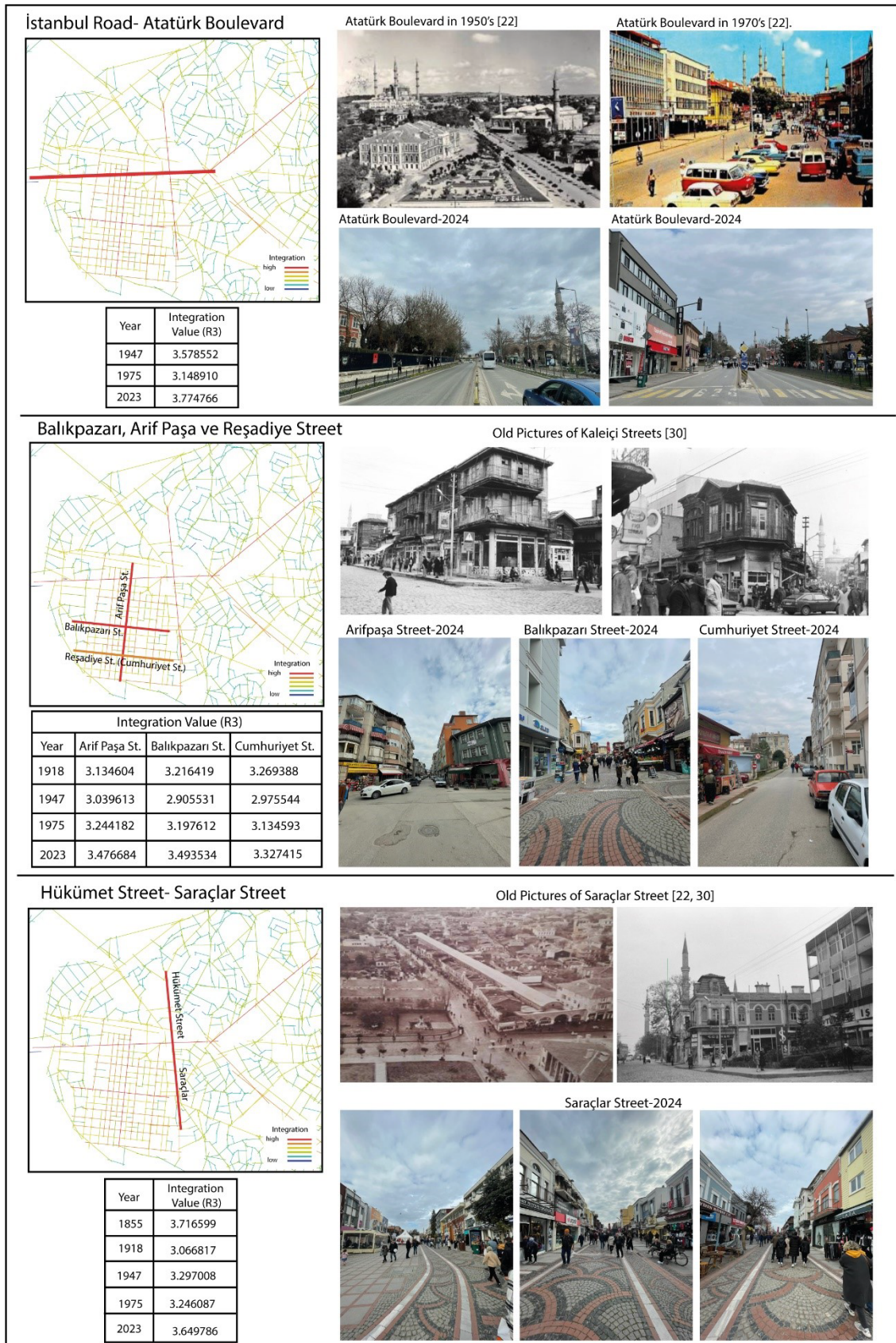
In the urban context, local integration analysis reveals the presence of integrated subgroups within the city. Conversely, the global integration analysis demonstrates a decrease in integration value as one moves away from the urban core. Notably, Yeniimaret Neighborhood, connected to the urban core via bridges spanning the Tunca River, exhibits a discernible trend of gradual detachment from the city over time. This observation underscores the dynamic nature of urban spatial configurations and the evolving patterns of connectivity within the urban fabric.

5. SYNTHESIS AND EVALUATION

This study delves into an examination of the spatial evolution of Edirne's urban center across distinct historical epochs juxtaposed with its contemporary spatial configuration. The research endeavors to discern how the urban landscape has transformed over time and elucidate the resultant implications on pedestrian dynamics, drawing upon a comparative analysis of space syntax. Through meticulous space syntax analyses conducted on maps dating back to 1855, 1918, 1947, 1975, and 2023, the study unveils the interplay of local and global integration, the intricacies of urban connectivity, and the shifting spatial dynamics across different epochs. Moreover, these space syntax analyses unveil insights not only into the evolutionary trajectory of urban spaces but also underscore the dual significance of street networks, locally and globally, within the urban fabric.

According to the results of space syntax analysis, Istanbul Avenue (Atatürk Boulevard), Balıkpazarı, Arif Paşa, Reşadiye Streets, Hükümet Street, Saraçlar, and Mimar Sinan Avenue have been identified as streets and avenues with consistently high integration values across all historical periods. Moreover, significant historical junctures have played a pivotal role in shaping the spatial development of the city. In this regard, notable events such as the reconstruction of the Kaleiçi settlement according to a grid system following a fire, the establishment of Istanbul Avenue traversing the city center in 1938, and the subsequent urban development along this thoroughfare stand out as crucial turning points influencing the city's spatial evolution.

Table 2. Comparison of streets with high integration values by years [22, 30, 31, 32]





The research outcomes underscore the enduring coherence of the road network surrounding the urban nucleus of Kaleiçi and its proximate environs across successive historical epochs, thereby elucidating the considerable degree of integration inherent within the urban core. Conversely, the emergence of novel urban development zones and associated road networks in the city's northeastern quadrant during the 20th century has failed to achieve complete assimilation with the central urban nexus. The spatial transformation of Edirne's city center throughout historical epochs serves as a testament to the evolution of the city's socio-economic framework and cultural identity. The perpetuity of main thoroughfares and streets, elucidated by the analytical findings, mirrors the city's enduring essence across temporal phases. These arterial routes, focal points of intense commercial activities, exert a significant influence in sculpting the urban economic landscape, societal interactions, and pedestrian dynamics. However, pivotal moments that punctuate the city's spatial development impact not only its physical infrastructure but also intricately interwoven social and economic dynamics. For instance, the post-fire reconstruction of Kaleiçi engendered not merely physical reconfiguration but also precipitated a reconstitution of settlement patterns and pedestrian movement.

The study, while examining the spatial evolution of the city throughout its historical trajectory, holds an instructive value for future planning and design decisions through the utilization of space syntax methodology. The main arteries identified as the most integrated streets through space syntax analyses, due to their role in shaping the urban memory and backbone by accommodating numerous historical, religious structures, and various commercial units over time, constitute crucial urban dynamics to be considered in forthcoming urban design and planning endeavors. In this context, space syntax, as a morphological analysis method, not only plays a significant role in elucidating spatial structures and relationships and comprehending pedestrian movements but also contributes to the formulation of strategies for the city's future development. It stands as a pivotal morphological analysis method in deciphering the developmental dynamics of urban spaces and shaping planning and design decisions geared towards the future.

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