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Morphological and Socioeconomic Effects of the Physical Borders on the Settlements within the City: The Case of Yeni Sahra Neighborhood and Sahrayicedit Neighborhood

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Abstract

In this study, it is aimed to research the reasons and solutions of socioeconomic differences between Yeni Sahra Neighborhood and Sahrayıcedit Neighborhood which are neighborhoods of one of the important transportation axes (D-100 highway) in Istanbul, on the same north-south line. Some of the elements in city have a negative impact on settlement and integration by creating a physical boundry. When re-uniting the separate parts of the city, attitude should not be to connect them with weak ties. Providing more substantial integration would be the main attitude of this study. Yeni Sahra Neighborhood and Sahrayıcedit Neighborhood are two districts, shaped and bordered by a physical urban boundary. In this study, the morphologic structure of two neighborhoods, the socio-economic differences of the inhabitants and whether these are under the physical boundary effect will be investigated, then solutions and suggestions will be established. The spatial step of the research will be done with space syntax theory and axial maps of both fields will be created by using the DepthmapX/2019 program and potential points of these areas will be determined. This method will be used to determine whether the existing connections are in the right places and the new areas will be detected for new urban leaks. After the problems are identified, solution and suggestions will be established.

Keywords: Physical boundary, integration, space syntax, urban morphology, urban leak

1. INTRODUCTION

The physical boundaries in cities may plow through the lowest-income areas, physically dividing neighborhoods and financially devastating communities. They divide cities socioeconomically and morphologically. "*Unfortunately instead of connecting us to each other, highway planners separated us*" said Walker in 2016. The neighborhoods, which are physically separated from each other in the city, emerge as local identities, lifestyles and physical structures in urban life depending on certain values, beliefs, traditions, economic or social structures. The rapid transformation of today's cities and the rapid disintegration of urban textures have brought about debates over the concepts of region and border creates urban space. Formerly continuing regionalization and forms of social segregation have continued to build the spatial formations of cities, while in today's cities new boundary concepts have emerged as well as the boundaries and neighborhoods that are spatially shaped by humans and societies.

Based on this, the answers to these research questions will be investigated in this research: How the physical boundaries affect the settlements socioeconomically and morphologically in the selected area? Is it possible to reunite the segregated neighborhoods, by creating organic connections with breaking physical boundaries from the right spots?
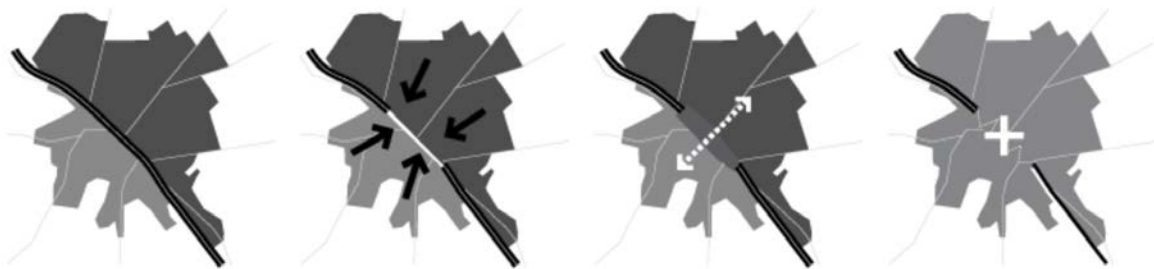
Figure 1. The graph of two separate settlements disintegrated by the borders and homogenize the heterogeneous structure by breaking these boundaries, prepared by the author

2. THEORETICAL BACKGROUND

2.1. Boundaries

The concept of border, which is often met in nature, philosophy, geography, and architecture on political, economic, social and spatial scales, plays an important role in people's daily life and their relations with the structural environment. The borders are multi-layered elements and shape the spatial organization of the urban environment. They differentiate between different social, economic and political groups, and in some cases, they play a unifying role. Although the idea of separating societies from each other is not new, according to Breitung's work in 2009, this idea was first started to be deliberately created by forming physical boundaries, after the 1970s. In terms of political geography, concepts such as borders, regions, and sovereignty are discussed in terms of region, topography, landscapes and communities locally (Breitung, 2009). The cities are shaped and understood by the social,

political, economic, and physical boundaries drawn by the citizens. Router boundaries such as roads, routes, and bridges; the borders with the separation areas such as doors, barriers, walls, fences, divide the city into different social and economic categories and create different behaviors on both sides of the border (Diener and Hagen, 2012). The physical images defined by Lynch (1960) emerge from the behavior of the urbanist in shaping the environment around social life. The regional factors that make up the boundaries that divide the urban space into parts are effective creates urban texture. According to Simmel (1997), the boundary is not a spatial phenomenon with sociological consequences, but a sociological phenomenon that shapes itself spatially. In this context, the lines that divide the modern city into pieces can leave different social influences such as control, power symbol, local government, identity and belonging in the city beyond their physical functions (Breitung, 2011). The samples were divided into two sub-titles to explain simply. The study will continue with the examination of these two sub-titles: natural boundaries, artificial boundaries.

2.1.1. Natural Boundaries

Natural boundaries can be forests, natural parks, rivers, valleys, hills, and others. The first example is from Vusimuzi in South Africa (Figure 2). There is a hill in between the two settlements and while left parts of the city were shaped like a slum, the right side looks like one of the wealthy gated communities of the city. The second one is from Rio de Janeiro in Brazil (Figure 3). The Santa Marta favela, on a hill, watching completely different social group's settlements like wealthy housing and tall office buildings. And in between them, there is a hill and natural green areas to separate them. The economical division is not the only result of these boundaries. In some cases, there is only morphological or economical segregation too.
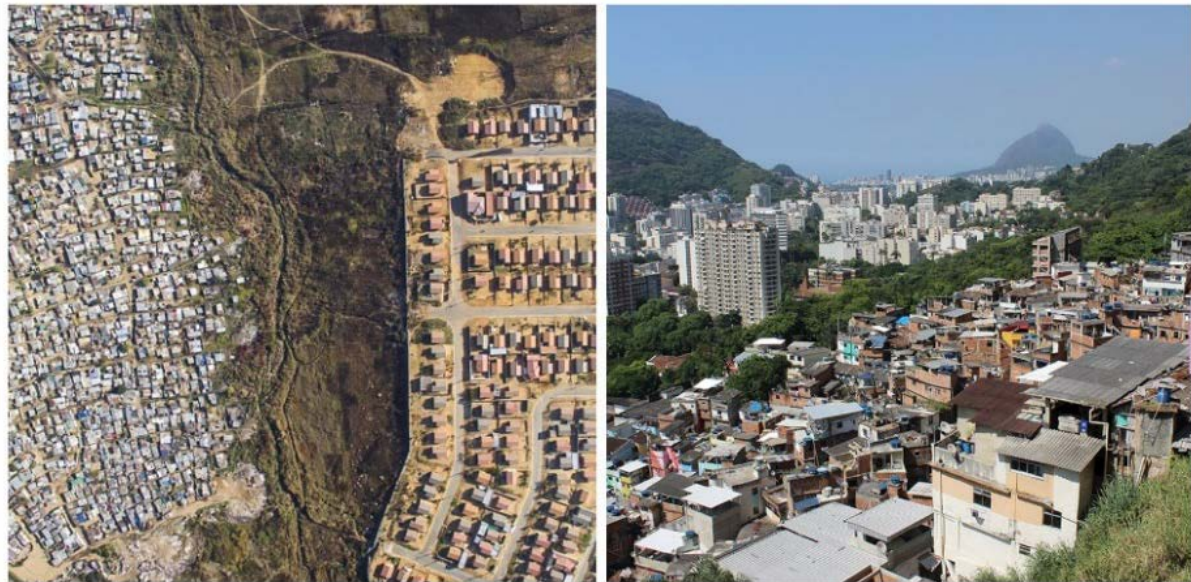
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Figure 2. (Left) Vusimuzi in South Africa (Mailonline, 2016)   Figure 3. (Right) The Santa Maria favela from Rio de Jenairo in Brazil (Urban Divides, 2018)

2.1.2. Artificial Boundaries

Artificial boundaries can be highways, roads, railways, parks, walls, gates and so on. Artificial boundaries divide the city into different, dynamic and irregular regions. Unlike the boundaries in nature, these borders have political, economic and social meanings

(Waterhouse, 1993). The cities are shaped and understood by the social, political, economic, and physical boundaries drawn by the citizens.

Figure 5. (Left) Highway separation in Brazil (Design Context, 2012)   Figure 6. (Middle) Agricultural areas as a buffer zone in South Africa (Mailonline, 2016)   Figure 7. (Right) City wall in Dubrovnik (Urban Divides, 2018)

In Brazil, the highways separate the poor and rich settlements (Figure 5). In South Arfrica, between the settlements is an agricultural area as a buffer zone to prevent any confrontation possibilities of two sides (Figure 6). In Dubrovnik, the division does not represent economic segregation. This time the boundary segregates the old and the new. Dubrovnik's city wall divides the old city center from the new settlement (Figure 7). These physical boundaries have also been used to divide societies, especially in countries like America. It is already known that these urban elements prevent the formation of a heterogeneous structure within the city and this has been deliberately used. For many years they have used borders to keep Hispanics, Asians, Blacks, and Whites away from each other because of political and racist attitudes of governments (Badger and Cameron, 2015) (Figure 8).
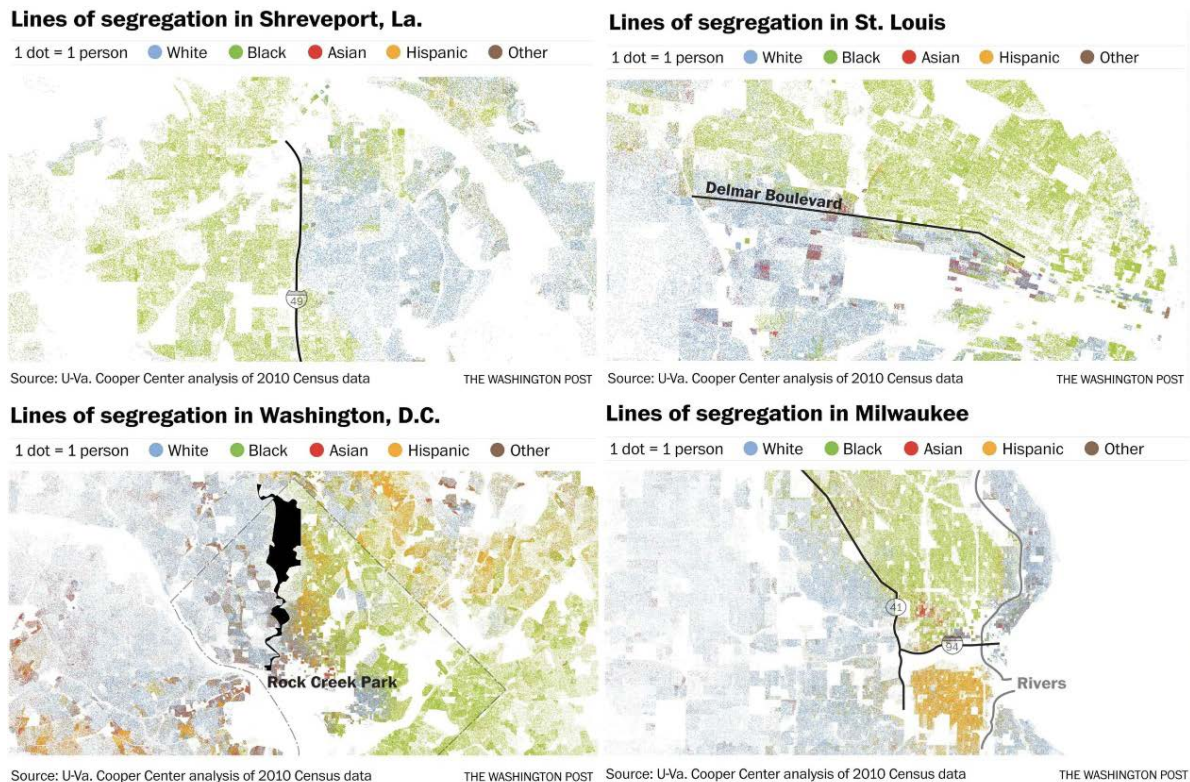
Figure 8. Different states from America (Badger and Cameron, 2015)

Vol. 1, No.1, January 2020, pp. 46-58 I Cilt 1, Sayı 1, Ocak 2020, s. 46-58
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2.2. Intervening Boundaries

It is possible to eliminate or reduce the social, cultural, economic and morphologic reflections created by the boundaries formed within the city. The interventions can be on an urban scale, or they can be completely regional. In order to determine the impact area of this intervention, it is necessary to analyze the problem area in detail and evaluate each case in its context. In order to intervene in the boundaries formed in the city scale, the samples which were applied in the literature were used. Among these examples, the ones using the Space Syntax technique were selected.

Space Syntax is a theory put forward by Hillier and Hanson. They study to search the movement of individuals not only on urban scale but also on building scale, how they use spaces and how they occupy place in space. Space Syntax is a research method developed to theorize the relationship between individuals and communities with various spatial organizations (cities, regions, neighborhoods, buildings, and even landscape areas). According to the theory, the built environment is the result of the inevitable reflection of the social behavior of individuals. Therefore, this theory can be considered as one of the most suitable theories for architects and city planners who question and examine the interaction between the built environment and individuals. The consistent statistical relationship between the spatial voids and human configurational built masses means that spatial cognition is the ability to remember and form a space map. Relations between spaces mean spatial "configuration. In general, the first purpose of the studies in the space syntax in the form of floor plans or plans of urban fabric is examined in the built environment (Timmermans, 2005; Hillier, 1999; Al Sayed, 2014 and Carmona, 2014). With the book *"The Social Logic of Space"* published in 1984, Space Syntax theory has increased the use of architects and city planners in space studies. This theory is mostly used in studies on how much space features affect social activities and most of all to solve problems of pedestrians such as space perception and path finding (Schmitt and Hovestast, 2010).

Donegan, Silveira and Silva (2019) tried to emerge about the developments in two different neighborhoods in Joao Pessoa in Brazil, separated by physical boundaries. Physical boundaries reveal both the standards of urban life and morphological changes. The highways, which are designed for automobiles, have been effective in the disconnection of the city and the formation of different socio groups.

Figure 9. Aerial view of the Tambauzinho neighborhood in Joao Pessoa (Google maps, 2019)

D-100 highway, which was investigated in this study, was built before the two neighborhoods and formed as an extension of Kadıköy seaside settlement, while the new field in the north is mostly settled by a low income group from the inner regions. This status difference is reflected in the urban settlement pattern. In addition, the highway has caused these two groups to be non-coherent and unable to communicate for decades (IBB Şehir Haritası, 2019).

3. METHODOLOGY

In some cases, although neighborhoods are next to each other, the morphological and social-economical difference between them is visible. One of the factors that make this difference is the physical boundary that clearly distinguishes these two neighborhoods. Firstly, a literature review was conducted to gather information about physical boundaries, problems. and possible solutions. Then with the field study, the differences between these two neighborhoods were determined. Finally, using the space syntax method, axial maps of these two fields were created and solution suggestions were given through this mapping technique.

The focal point of architecture is human, and the basic discipline is space. The aim of architecture is to create environments that support people's needs and actions and the components that form these environments. In this context, it is necessary to reach a knowledge of how people and their environment interact with each other. The living space is a much more complex network of social relations than the physical definition. Therefore, to understand and explain the man-made environment, spatial elements and their relational characteristics can be expressed in the method of Space Syntax. While trying to understand and interpret the complex structure of the space, there is a search for a scientific and rational approach to investigate the relationship between humans and space and to show the invisible social information and meanings. This effort is intended to articulate the spatial qualities perceived by intuitions. In this context, graphical, numerical languages and techniques are at the forefront in recent years where science, rational and analytical thinking are at the forefront. Space Syntax seeks to answer the physical and complex structure of spaces and how to express this structure clearly (Hillier and Hanson, 1984). Three sequential measurements are made in the Space Syntax method. It is used for digital presentations of buildings and urban settlements. They are connectivity, control value, and integration. In this research, integration analysis will be integrated. This is a static global measurement. It is defined as the average depth of space towards other areas in the system. Places in the system are sorted from the most integrated to the most decomposed (Penn, 2003).

It can be said that the use of space syntax techniques in architecture to predict the possible effects of designs is extremely useful. In this way, it is possible to decide the spaces that are designed on the scale of the building or on the urban scale, and how the people living and moving in it use them. In the light of the concrete evaluations made by space syntax techniques, the designer can set up a strong link between the design and the space he uses and develop his design by this information or drop the possible problems in the case of a poorly designed space.

Accessibilities configured by the urban grid are categorized into potential to-movement (integration) as a measure of centrality in the system, of how easy it is to access all other spaces from one space, and seen to relate to the flow of visitors and potential through-movement (choice) as a measure of betweenness in the system, of how likely a certain route

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might be chosen as a shortcut within a origin-destination, and was seen to related to flows of inhabitants (Hillier, 1999). Accessibilities are measured by graph analysis, each spatial entity representing a node. In axial analysis each contact between lines of potential movement forms a connection. Integration relates to the mean-depth of one space to all other spaces in the system, forming a justified graph in which each spatial change represents a depth level: segregated spaces present deeper graphs, whereas integrated spaces are shallower, reaching other spaces with few level changes. Choice is measured by the likeliness of one space being chosen as the shortest route between sets of origin-destination. For Choice measures one value is deposited for each possible decision for different routes to be taken, thus measures vary according to the system size. Normalized values of accessibilities were created to compare systems of different sizes. Areas with positive correlations between integration and choice at different metric scales presented more diversity of activities and people, and were better embedded within the wider urban fabric (Yang and Hillier, 2012). These findings reinforce the role of the grid promoting certain types of uses and as a mechanism to help bring people and activities together.

Considering community perception of urban areas, different traffic levels related to qualities of community life. Exceedingly high vehicular movement and wide avenues impacted on people having less local community bonds and feeling more vulnerable. High fluxes tended to sever the street, dividing both sides and weaken local urban life. This aspect was also considered as a spatial limit, according to Lynch's (1960) analysis of the image of the city.

4. CASE STUDY

Istanbul is one of the largest cities in Turkey. It has a very complex structure in terms of urban planning with its settlement distributions and connecting elements. Especially in recent years, an increasing population has exceeded the capacity of the city, city planning has put a more difficult situation. The regions, which were considered as outside of the city 20-30 years ago, are now considered the center due to the rapid growth of the city. Similarly, multi-lane highways, which have the character of inter-city road, have started to gain the quality of the city roads by shifting the city center to the outside. This has led to the formation of multi-lane roads that divide the settlements in the city with sharp lines. The D-100 Highway is located on the Anatolian side of Istanbul and it is a large road to divide the city apparently. Kadıköy and Ataşehir are two of the districts that are separated by this highway. The chosen area for this study is Sahrayıcedit Neighborhood and Yeni Sahra Neighborhood which are next to each other, but they are separated by a physical boundary. They are nearly the same size but in two different densities and typologies. Sahrayıcedit Neighborhood belongs to Kadıköy and it consists of four-twelve story apartment blocks. Yeni Sahra Neighborhood belongs to Ataşehir and there are both some two-four story apartments and the rest of it consists of squatter houses. As the buildings in the Yeni Sahra Neighborhood are low-rise, the density of the building is higher than the density of the Sahrayıcedit Neighborhood. This situation affects the amount of green and open areas that the citizen can use. As can be seen on the map (Figure 11), the parking areas in the Sahrayıcedit Neighborhood are more than three times the park areas in the Yeni Sahra Neighborhood. This situation increases the possibility of using open and green spaces and have positive effects on quality of life.

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Figure 10. General information about Sahrayıcedit Mahallesi and Yeni Sahra Mahallesi,

prepared by the author (Atlas Big, 2019)

Figure 11. Green space distribution of selected areas, prepared by the author (Atlas Big, 2019)

It will be useful to examine the urban fabric of these two neighborhoods more closely and to see their differences in socioeconomical and morphological terms. (Figure 12). The D-100 highway was built before these neighborhoods were established. The southern part of the road began to form before the northern part. Due to the physical threshold created by this highway, the northern section is more organic and slum-like. It is easily seen that Sahrayıcedit Neighborhood is more rigid and has regular order in urban planning. The roads are large and spacious, while the building is not congested. Each city block was planned to form a green backyard in the middle of the blocks, thus preventing the structures from shadowing each other. On the other hand, In Yeni Sahra Neighborhood has a very dense and irregular layout in general. The roads are quite narrow, and the open areas of the buildings seem quite

inadequate. It is possible to read the differences in the street structure of both neighborhoods. In the Sahrayıcedit Neighborhood, there is a rule about street widths. There are pavements for pedestrians and there are gardens between buildings and roads to protect the apartments from the noise of vehicles. But none of these appear in the other neighborhood. There is not an order or any pavements for pedestrians, and apartment quality is very low.
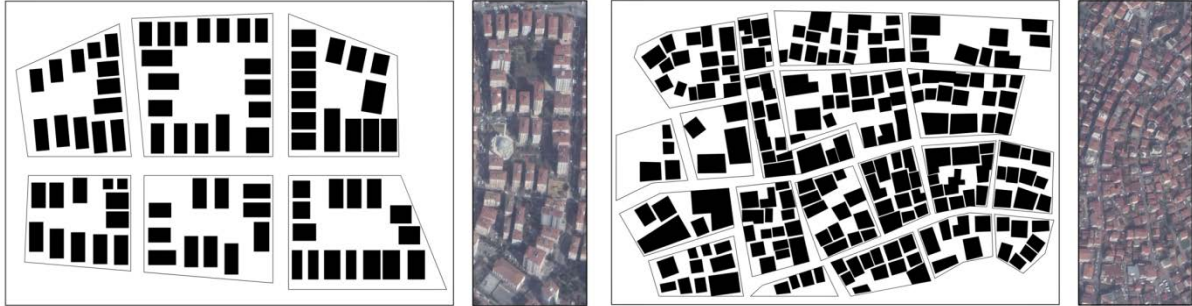

Figure 12. The urban fabric of selected areas, prepared by the author. The left one is from Sahrayıcedit Neighborhood, the right one is from Yeni Sahra Neighborhood, prepared by author

Lastly, for the study, it was tried to infer about their liveability by comparing the real estate values of these neighborhoods. Chart (Table 1) was prepared for this study by taking the average of the rent, collected from some web sites where give the rental information of all cities and neighborhoods in Turkey. The chart shows the average number of four types of apartments for different neighborhoods. The result of the study may give some clues about the quality of life of the residents so there is so much rent difference between houses with similar characteristics.

Table 1. Real estate values of selected areas, prepared by the author (Sahibinden, 2019).
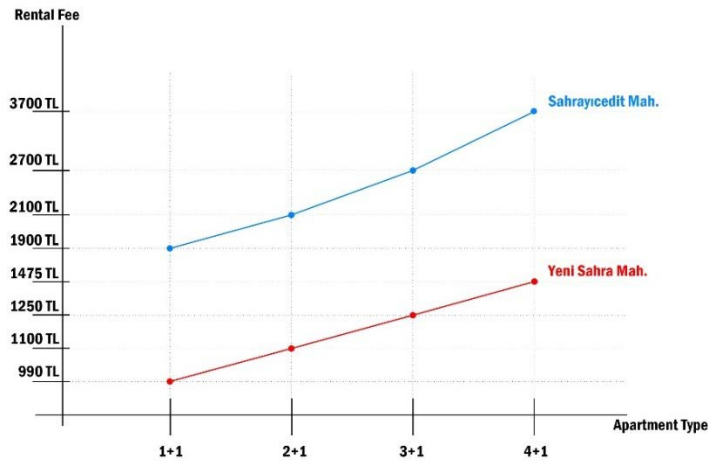
After all the information about the selected area, it is possible to claim that although these two neighborhoods are next to each other, the morphological and socio-economical difference between them is visible. One of the factors that make this difference is the physical boundary that clearly distinguishes these two neighborhoods. With the help of using the space syntax method, axial maps of these two fields were created. They are created on a computer-based Space Syntax program whose name is DepthmapX/2019. In this analysis, the integration data of the roads in the settlements were determined. The red color represents the highest integrated paths, while the blue color represents the lowest values. In the First Axial Map (Figure 13), there is an integration relationship if there was no connection between the

two neighborhoods. But in today's conditions, there is a single point of connection. When the existing connection point is placed in the analysis, the integration between the two neighborhoods is strengthened compared to the past; but it does not seem to be strong enough (Figure 14). As a matter of fact, as a result of the field analyses, it was realized that the two neighborhoods were not heterogeneous and their socioeconomical and morphological differences were determined. Therefore, in this study, it is investigated if it can be increased the integration by breaking down the physical limit further. Two potential points were selected according to topographic and geographic aspects and they were placed on the analysis. According to the field study, the two connection points are identified as axes where transportation is dense. These routes, which are suggested as both pedestrian and vehicle routes, have suitable axles that can be connected in the other neighborhood. The final axial map will be analyzed according to these additional connections and how the integration values will change. After the last intervention, it was seen that the integration values between the two neighborhoods increased slightly (Figure 15).
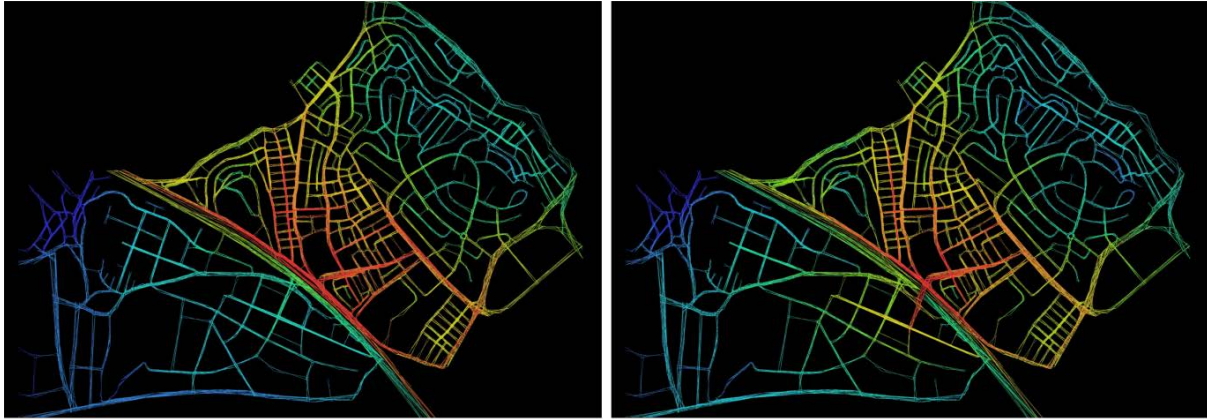
Figure 13.(Left) Integration relationship - if there was no connection between the two neighborhoods, prepared by the author. Figure 14. (Right) Changing integration values when a single connection is included in the analysis, prepared by the author

Figure 15. Changing integration values when the additional connection is included in the analysis, prepared by the author

5. CONCLUSION

At the beginning of the study, the problem was determined, and the research subject was determined. How the physical boundaries in the city divide the settlements into two and what the consequences of this division are investigated. For this purpose, the literature review was done and cities dealing with this problem were identified in the world. The area where the study will be carried out was selected as a result of field research. Through this method, the E5 highway on the Anatolian side of Istanbul has been determined as the physical boundary element and the Sahrayıcedit Neighborhood and Yeni Sahra Neighborhood on both sides of this border have been detected as problem areas. In the rest of the research, analyses were conducted to recognize the problematic area. Population density, green area distribution, urban texture, and real estate value analysis are some of them. As a result of the researches, sociological and morphological differences between these two neighborhoods were determined. After this stage, the research question was brought up again and possible solutions were considered. Is it possible to reunite the segregated neighborhoods, by creating organic connections with breaking physical boundaries from the right spots? The Space Syntax method was used to search for the answer to the problem, and the axial maps of these two neighborhoods were drawn by using the Depth Map program. The aim here is to determine the integration value of the neighborhoods and to investigate how the existing integration value can be increased. What is important is not the integration values within the neighborhoods, but how the integration relationship with each other can be strengthened. For this reason, an axial map was created as if there was no connection between the two neighborhoods. When the connection point in the current situation is included in the system, it is determined that the integration value is increased. This situation shows that when we increase the number of connections between neighborhoods, the value of integration will increase. On the last map, the suggestion points have been added to the system and the integration value has increased.

As a result, some inspiring potential solutions have been attained because of the studies conducted through the Depth Map program. The analysis shows that when two different detached settlements begin to be merged from certain points, they are candidates for more heterogeneous and more integrated settlements by sharing the existing potential. Of course, it is not known whether the implementation of the result of this study through the program gives the same results in real life.

The reintegration of the two settlements, which have been separated from each other for years, is quite a complex issue. However, it is aimed to form a basis for possible solution policies. In the study, we have seen how physical boundaries disintegrate urban textures in the result of the study we have seen we had to tear the boundaries to unite the parts.

Conflict of Interest
There is no possible conflict of interest in this article.

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