ASSESSING THE WALKABILITY PRINCIPLES: THE CASE STUDY OF MEHMETÇİK BOULEVARD

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ABSTRACT

ASSESSING THE WALKABILITY PRINCIPLES: THE CASE STUDY OF MEHMETÇİK BOULEVARD

Walkability is defined as the action of the human being to go from one place to another. The streets are one of the most important parts of the built environment and their using by pedestrians increases urban consciousness and social ties. The quality of walkability varies according to the location, usage, and character of the public space. Walkability issue has become more important due to urban growth and an increase in vehicle usage in today's' cities. Increasing walkability in a city increases livability.

The aim of this thesis is to assess the walkability quality of urban streets considering walkability principles. In this context, the thesis aims to investigate the principles that affect walkability in urban centers and considering walkability principles to examine the built environment characteristics and pedestrians' usage of a street through a case study. The thesis also attempts to offer recommendations for creating more walkable spaces.

For these purposes, firstly, the definition and importance of the concept of walkability are examined. Secondly, walkability principles of the streets in urban centers are established. Thirdly, Mehmetçik Boulevard, which is located in one of the sub-centers of İzmir and used intensively during the day, is evaluated according to the walkability principles. In this study, the walkability quality of the boulevard is examined and assessed in the context of diversity, accessibility, safety, street quality, comfort, and legibility principles. Finally, as a result of the literature study and the case study, recommendations are provided to increase walkability quality of Mehmetçik Boulevard, and as well as for urban streets of other cities.

Keywords: Walkability, walkability principles, urban design, urban streets, İzmir

ÖZET

YÜRÜNEBİLİRLİK İLKELERİNİN DEĞERLENDİRİLMESİ: MEHMETÇİK BULVARI ÖRNEK ÇALIŞMASI

Yürünebilirlik, insanın bir yerden bir yere gitme hareketi olarak tanımlanmaktadır. Sokaklar yapılı çevrenin en önemli kısımlarından biridir ve yayalar tarafından kullanılması şehir bilincini ve sosyal bağları arttırmaktadır. Yürütülebilirliğin kalitesi kamusal alanın konumuna, kullanımına ve karakterine göre değişmektedir. Kentsel büyüme ve günümüz şehirlerinde araç kullanımındaki artış nedeniyle yürünebilirlik sorunu daha da önem kazanmıştır. Bir şehirde yürünebilirliği arttırmak yaşanabilirliği arttırmaktadır.

Bu tezin amacı, yürünebilirlik ilkeleri dikkate alınarak kentsel sokakların yürünebilirlik kalitesini değerlendirmektir. Bu bağlamda tez, kent merkezlerinde yürünebilirliği etkileyen ilkeleri araştırmayı ve yürünebililik ilkelerini göz önünde bulundurarak yapılı çevre özelliklerini ve yayaların sokak kullanımını vaka çalışması ile incelemeyi amaçlamaktadır. Ayrıca tez, daha fazla yürünebilir alan yaratmak için öneriler sunmaya çalışmaktadır.

Bu amaçlar için öncelikle yürünebilirlik kavramının tanımı ve önemi incelenmiştir. İkincisi, kent merkezlerinde caddelerin yürünebilirlik ilkeleri oluşturulmuştur. Üçüncüsü, İzmir'in alt merkezlerinden birinde bulunan ve gün içerisinde yoğun olarak kullanılan Mehmetçik Bulvarı, yürünebilirlik ilkelerine göre değerlendirilmiştir. Bu çalışmada Mehmetçik Bulvarı'nın yürünebilirliği, çeşitlilik, erişilebilirlik, güvenlik, sokak kalitesi, konfor ve okunaklılık ilkeleri bağlamında incelenmiş ve değerlendirilmiştir. Son olarak, literatür çalışması ve vaka çalışması sonucunda, Mehmetçik Bulvarı'nın ve diğer şehirlerdeki kent sokaklarının yürüme kalitesini artırmak için önerilerde bulunulmuştur.

Anahtar Kelimeler: Yürünebilirlik, yürünebilirlik prensipleri, kentsel tasarım, kent sokakları, İzmir

To my parents

Selman and Neriman BAĞCI…

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CHAPTER 1

INTRODUCTION

1.1. Problem Definition and Aim

Walking is the simplest, cheapest and least destructive form of transportation for environment that people use in their daily lives. Movement and accessibility in the urban space are accomplished by walking. Although walking is the main right of people, there are some limitations restricting the pedestrian movements such as conditions of built environment and improper planning practices.

There has been a huge discussion and researches about creating walkable communities and improving walkability. Some strategies and solutions have been implemented to solve some problems such as obesity crisis and a lack of central city vibrancy to traffic congestion, environmental injustice, and social isolation (Forsyth, 2015:1). While some of the discussions focus on implementation challenges, the others attempt to provide contribution to theoretical knowledge.

According to Southworth (2005) one of the main challenges in achieving walkable places is that cities have mainly automobile-oriented development patterns. Although the concept of walkability has gained importance recently, there are still some shortcomings which should be developed in transportation planning at all scales, from local streets to regional arterials (Southworth, 2015:246). Because, walking is not just a mode of transport, it is more than it which should be designed regarding the comprehensive planning decisions, social needs and infrastructure requirements. Therefore, the focus is on large to small scale planning projects to improve the overall health of a community.

Burden (2001) stated that researchers generally do not focus on elements of livability like walking, cycling and basic urban activities and they do not consider them as a part of dimensions of a livable city. More researches and studies should be done in

order to increase walkability term. On the other hand, there are various definitions of walkability which are described by different point of views. Defining walkability for a variety of social contexts is a significant challenge. Caplan and Nelson (1973) claimed that the lack of knowledge makes hard to develop the theory to guide application. All of the information about walkability is not under the same framework that makes the researches in the piece rather than as a whole which causes a gap between literature and implementation (Choi, 2012:246).

The main purpose of this study is the assessing walkability quality of urban streets considering walkability principles and development of recommendations for walkable streets. With this aim the main question of the thesis is:

- How can we assess the walkability quality of urban streets?

To answer this question, the research poses other sub-questions. These are:

- What is walkability?
- What are the principles of walkability?
- How can we examine the walkability principles on a particular street?
- How can we improve the walking quality of urban streets?

To reach the answers of these questions, it is aimed to investigate the concept of walkability in the literature and previous researches. Accordingly, it is aimed to build an information pool about principles of walkability. Moreover, walkability quality of one of the boulevards in İzmir is examined through walkability principles.

İzmir is the third's biggest city in Turkey in terms of population, has a slogan that is ''A living city, a city to live in (Yaşayan şehir yaşanacak şehir)'' emphasizing the reputation and future goals of the city (Eylemer, S., & Memişoğlu, D., 2015). It might be hard to quantify the value of an official city slogan. Since, every year, the city decides to update it's in an effort to improve life standards, business and tourism through different applications. Walkability and livability index in İzmir are high compared to most of the cities in Turkey (Appendix A), but it has been facing some problems caused by urban sprawl, growing pollution, and automobile usage that decrease the walkability comfort and quality.

EMBARQ Turkey, İzmir Development Agency (İZKA) and İzmir Metropolitan Municipality have started to work on projects in order to increase the walkability comfort especially in historical areas of İzmir. Despite the practical efforts in İzmir to increase the

quality of life of the city, more researches are needed on walkability of the urban streets, particularly at the neighborhood level. In the literature, walkability studies are usually made on historic and pedestrian streets, so focusing on a neighborhood area in the urban center can bring a new perspective. Therefore, Mehmetçik Boulevard where is located in one of the urban centers in Karabağlar, has a mixed land use that combines residential, commercial and public places, is selected as a case study.

1.2. Method

Qualitative and quantitative methods are used to assess walkability comfort and quality of urban streets for this thesis. Firstly, the thesis studies the concept of walking, the positive impact of walkability and researches on walkability to determine principles affecting walking behaviour and methods that can be applied to measure the walkability quality of the area. Secondary data sources obtained from online resources and library are used as data for all literature research part.

In this thesis, a case study approach is used and Mehmetçik Boulevard is selected as the case study area. The boulevard has various advantages and as well as disadvantages in terms of walkability but there has been no study focusing on walkability quality of Mehmetçik Boulevard yet. Therefore, it is worth to examine the existing situation and potentials of this boulevard in order to increase walkability quality and pedestrian comfort on the boulevard and the surroundings.

Secondly, the boulevard is investigated and analyzed according to walkability principles that were determined through deeply literature research as mentioned above. In the first step of analysis part, the quality of the public place was measured through observation, analysis of site survey and photography methods; in the second step, the individual responses of the users in the case study area were measured. Finally, evaluation of the case study area is made to offer recommendations for the case study area.

Based on the objective evaluation method to measure the quality of place, walkability principles are determined under 6 main principles (diversity, accessibility, safety, street quality, comfort, and legibility), and sub-components of those principles are specified. Regarding the main principles of walkability and these sub-components,

questions and statements by using a 3-point Likert scale are prepared to analyze the users' perceptions about the environment (Appendix B).

In the subjective evaluation method, the results of the survey conducted with the users in the study area were questioned about the reactions of the individuals to the walking action in the selected study area. As a result, the responses given by the users are compared with SPSS program by using correlation and chi-square analysis model. Thus, besides the questioning of spatial quality and walkability in the study area, the effect of public place quality on walkability is also tested.

1.3. Structure of Thesis

This study consists of 6 main chapters, including introduction. Chapter 2 focuses on the theoretical background of the walkability to examine the concept and approaches of walkability. In the first section, it explains the definitions and benefits of the walkability. In the second section, various perspectives for walkability and researches with case are examined to provide summary of the major findings from walkability literature.

Chapter 3 provides a conceptual framework described through principles comes from literature research in order to analyze walkability quality of the neighborhoods. These principles are composed of 6 main principles which are diversity, accessibility, safety, street quality, comfort and legibility principles. The main purpose of this part is to categorize the principles affecting walking and assess the walkability quality of the case study area.

Chapter 4 gives information about the research method, study area and its surroundings. Firstly, research tools and methods of analysis walkability principles are explained. Research tools part explains the methods used in this thesis in order to understand walkability term in the literature and to measure walkability quality in the case study area. Then, general information about Mehmetçik Boulevard follows it to analyze the problem and potentials of the street through its general character and fragments in the boulevard.

In Chapter 5, analysis of walkability of Mehmetçik Boulevard is discussed. It assesses the walkability quality of the bouelevard, distinguishes different walkability fragments and examines the positive and negative features of the boulevard by using different methods and analysis according to the principles that determined above.

Chapter 6 gives the essence explanation about the walkability quality of Mehmetçik Boulevard in the direction of comparative, indicative and conclusions, and offers suggestions about the Mehmetçik Boulevard and the other cities in Turkey regarding the walkability principles in the field of urban design. General structure of the thesis is also demonstrated in the Figure 1.1.

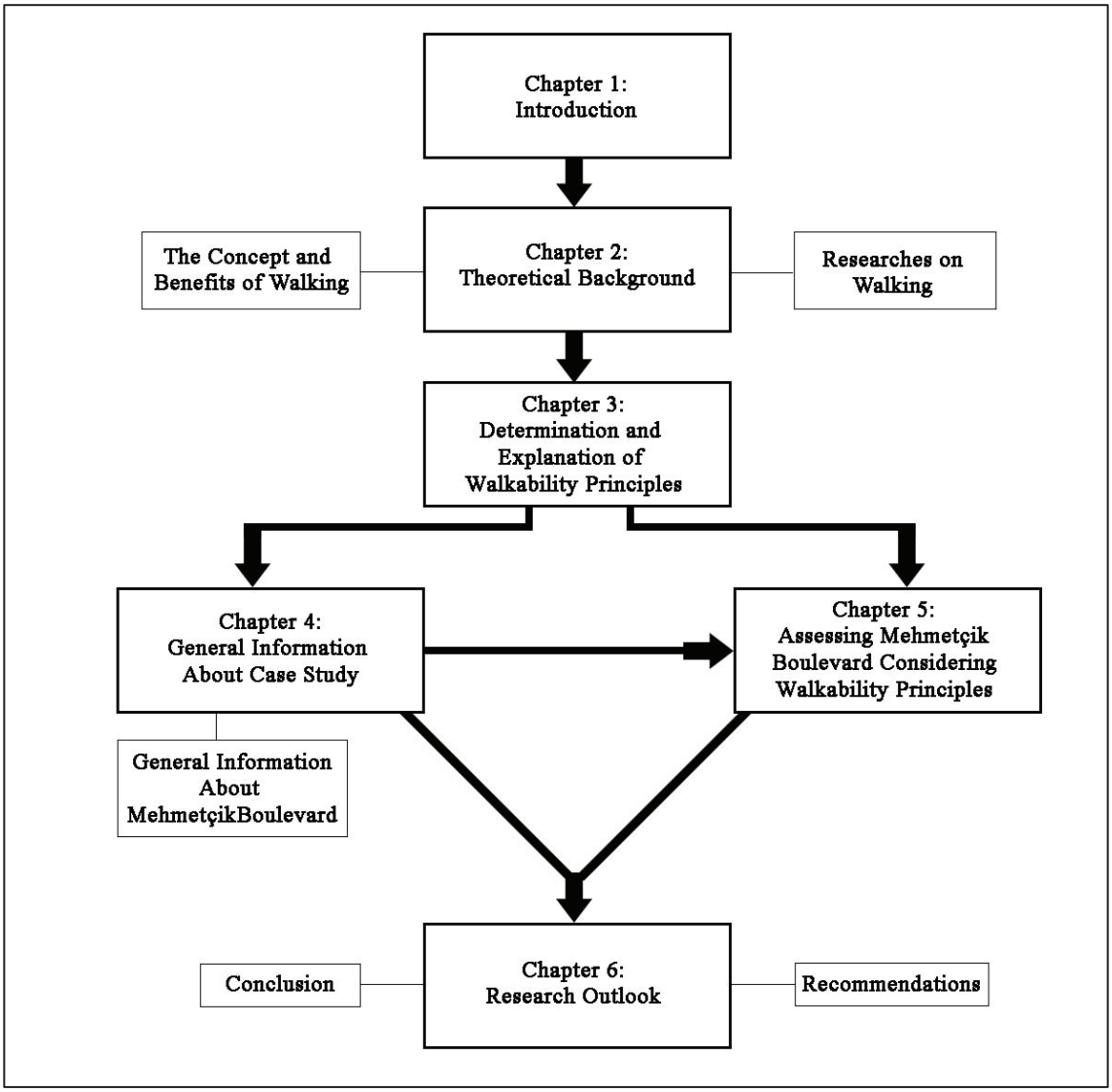

Figure 1.1. General structure of the thesis

CHAPTER 2

CONCEPTS AND APPROACHES

In this chapter, the concept and benefits of walking are examined. Then, principles of walkability are ranked and described. Finally, walkability researches with case studies are examined to determine what kind of methods and tools can be applied to assess walkability quality of the case areas.

2.1. The Concept of Walkability

The mode of transportation is changing quickly, but the only thing that does not change about mobility is the right of walkability. Walking is the oldest and basic form of transportation (R. Retting and S. Schwartz, 2017:5). The concept of walking is defined by Litman (2018) as ‘‘*walking is nearly universal human activity that provides mobility, exercise, and pleasure*’’. Although the definition can be seen quite simple, the meaning behind it is comprised of several concepts that range in large fields.

To understand walkability, it is important to comprehend the environmental and intuitive factors as a whole. Abley (2005) claims that the definition of walkability which comes from different technical disciplines such as engineering, planning, and health through their own terminology and jargon, is also understood in the different point of views by societies. Therefore, walkability can be seen as a common point among professional fields, but also the perception of the walkability is varied regarding the social structure.

Walkability basically can be defined as how practical, safe and pleasant walking is in a particular area (Boyle & Lehman, 2007:5). Similarly, and more clearly, Southworth (2005:248) defines walkability as ‘‘*the built environment that supports and encourages walking by providing pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in*

journeys throughout the network''. These definitions mainly focus on how important physical environment, design elements and social structure of the area to contribute walkability in different perspectives.

2.2. Benefits of Walkability

A walkable environment is a place where is more convenient and collective for people to walk between destinations rather than to use other types of transportation (Shay E., Spoon C., Khattak A. J., 2003). Walking is both important in and of itself and as an evidence of dynamic urban areas where has compact, dense, and transit structure with social attraction. Therefore, walking and the walkable environment has various benefits. Walkability which is a humanitarian approach increases livability, ensures safety with a convenient circulation of the pedestrians and also considers the public interest depends on the uses of the applied roads (Shuhana et al., 2012). Economic, social, environmental and physical improvements are provided by the pedestrianization projects.

First of all, walkability has been taken attention and seen as a keyword in order to increase people's health especially during the last ten years (G.J. Andrews et al., 2012). Recent researches have indicated that obesity and health problem has dramatically increased in the cities facing the problems of urban sprawl, car dependency, environmental degradation (H. Bahrainy, H. Khosravi, 2013). Walkable communities provide the opportunity to incorporate more activity into daily life, by walking to and from work or school, taking a stroll to local places and public spaces which also promotes more active, healthier, happier and sustainable lifestyles for their residents. Indeed, walkable neighborhood increases social bonds between residents which provides oriented community development through social interaction on the street.

Secondly, the walkable neighborhood increases safety, because community members meeting in active transportation create a street-level activity which has effects on actual and perceived safety (Tiwari, 2014). One of the key elements of walkability is to create a safe and healthy built environment through traffic design elements, traffic calming measures, and vegetation in order to maintain actual safety for the community (R. Rafiemanzelat and et al., 2017). Moreover, walkability supports independence for people of all ages and abilities and contributes to a greater quality of life for everyone, so streets can be more accessible and pleasant for all citizens. As noted in the social cohesion part above, both actual safety and perceptions of safety influence the decision to walk.

This may occur thanks to ‘‘*eyes on the street*’’ and a sense of social trust, both of which can be supported by features that encourage activities in the public spaces (Jacobs J. , 1961). If citizens feel safer, more people walk more often and communities benefit in multiple ways. In this way, perceived safety can be increased which help to crime prevention and public safety (L. Wood et al., 2010).

Thirdly, from an environmental point of view, increasing walkability decreases car dependency, so this choice brings lots of positive outcomes such as decreasing CO2 emissions and minimizing air and noise pollution since residents can feasibly walk to everything they need on a day-to-day basis (McAslan, 2017:52). Indeed, designing walkable environment provides more spaces in the public places to build green infrastructure features at the neighborhood or site scale, including greenways, rain gardens, riparian buffers, bioswales, pervious pavement and green streets (M. G. Kramer, 2014).

Lastly, recent researches which have been carried on by American Planning Association indicated that walkable environment has a positive effect on the economy (American Planning Association, 2014). Similarly, C. B. Leinberger and M. Alfonzo (2012) have ranked the economic benefits of walkability into four main categories as economic performance, effects of near walkable urban places, lower transportation cost, and social equity. More walkable places have attractive social life and vibrant streets which increases the commercial performance in the area. Walkable communities support the local business environment and increase its appeal to customers. It also affects the house demand and values, since walkable communities tend to be more desirable to individuals and businesses, they are often associated with higher property values. On the other hand, it affects the attraction between other nearly walkable urban areas, so accessibility between the places can be higher that makes the places more desirable to live. Improved walkability can also decrease expenses associated with owning a car. Residents who walk to work or other places around their living area instead of driving may save on gas and have lower transportation costs and higher transit access. Also, social profile of the neighborhood can be associated with the walkability rate of the area. Some works which were done about the relationship with social profile and walkability notice that indicators such as income, education, and unemployment point to the value of the neighborhood which is related with the accessibility of the place (Leinberger C. B. and Alfonzo M., 2012).

Walkability has various benefits on people's life and environment as ranked above. Determining whether people choose to walk within a walkable community for health, transportation, social interaction, safety, economic reasons or for recreational purposes can have a large impact for the city planning and public health professions to build more livable places regarding the city character and cultural habits (S. Shamsuddin, 2012).

2.3. Researches on Walkability

As the walkability literature has shown, there are many studies about walkability. Depending on the purpose of the research, discussions of walkability vary according to time, space and social structure. Therefore, there is no one specific description of walking or walkability to define and measure this topic. In this part of the thesis, researches on walkability will be examined into two sections: theoretical studies and researches with case studies. For both parts, 17 articles, reports or theses were examined to provide a summary of the major findings from walkability literature.

In the following part, only the theoretical part of the 10 studies that are most cited and presented in addition to related to the purpose of this thesis was examined. Then, 6 walkability principles were determined to use in the context of this thesis (see in Chapter 3). On the other hand, as a focal point, case methods and tools of the researches with case studies were examined for the rest 7 studies to analyze and understand what kind of methods can be applied to measure and determine the level of walkability in the public spaces.

2.3.1. Theoretical Studies

Pro-pedestrian solutions involving the concept of walkability are becoming more and more popular around the world, the researchers apply different approaches to reach a walkable environment. The literature indicates that principles affecting the walkability are examined into two main titles which are the physical and perceptual nature of the urban built environment (design criteria) and individual characteristics (pedestrian' perception) (Tekel A. and Özalp Y., 2016). Physical environment characteristics and perception of individuals can not only be measured objectively by observing the physical

environment, but also subjectively (Ewing and Handy, 2009). These physical principle characteristics can be classified as all of the urban design qualities (objective) and individual responses (subjective).

Ewing and Handy (2009) described conceptual framework of walking behavior into three main indicators which are physical features, urban design qualities, and individual reactions in order to create a guide for researchers while they focus on the relationship between physical features of the street environment and walking behavior (Figure 2.1). In this part of the thesis, under the light of Ewing and Handy' (2009) research and regarding the literature examination, three main perspectives for walkability which are walkability and physical environment, pedestrian' perceptions and walkability in urban design will be focal points to reach the answer of factors influencing walkability.

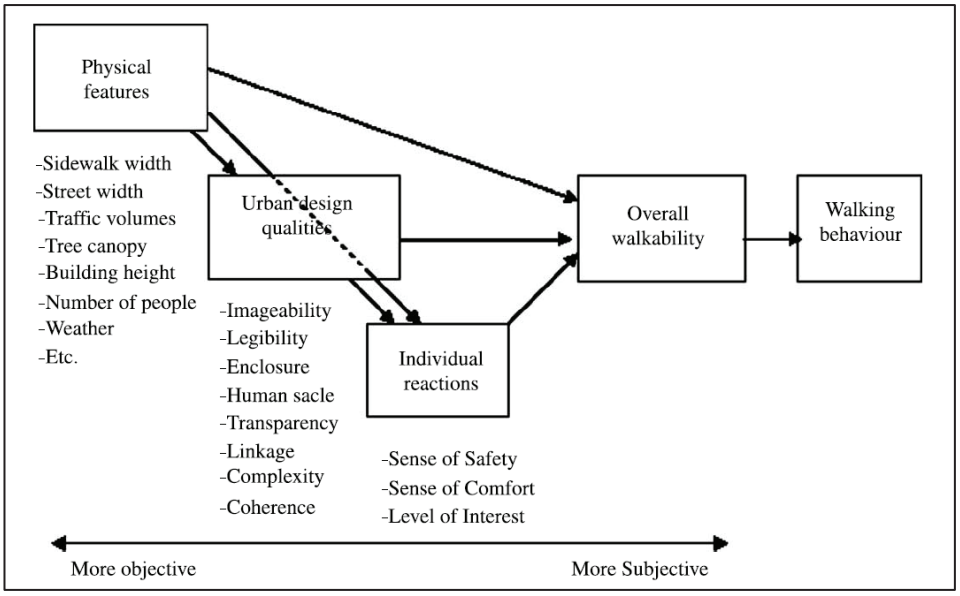

Figure 2.1. Conceptual framework of walking behaviour (Source: Ewing and Handy, 2009:67)

Definition of the built environment has been introduced in different perspectives by different scholars. Generally, the built environment is known as a manmade surrounding that provided by planners, designers, and professionals related to the urban design for human's activity which includes interdisciplinary elements. Therefore, there is a strong relationship between the built environment and walking.

Cervero and Radisch (1996) who are researchers in the department of city and regional planning, investigated the effect of New Urbanism design principles on both non-work and commuting travel through comparing the selected two neighborhoods in distinctly different but characteristically similar such as income profiles, freeway and

transit service levels, and geographic locations. Studies demonstrate that even both neighborhoods have similar characters, the rate of non-motorized trips are higher in the neo-traditional neighborhood rather than suburban community because compact, mixed-use, and pedestrian-oriented development effects the type of trip inducing higher shares of access by foot and bicycle (Cervero and Radisch, 1996).

In a similar way, Shriver (1997) conducted a survey of four Austin, Texas neighborhoods in order to analyse the influence of environmental design on pedestrian travel behavior. Scholar categorized walkable environments based on three wide features: transportation system, land use, and urban design. Shriver made a point of the street network through analyses of accessibility via measurement directness and route options with the variables such as block lengths, number of intersections, sidewalk system including street pattern, length of pedestrian and bicycle paths and transit accessibility. These variables are also be related to land use of the neighborhood defined as number and variety of destinations that can be walking distance and possibility. Shortly, all these articles which are mentioned above, simply state that traditional or compact neighborhoods have more walkable rates due to mixed-land use and density than modern neighborhoods.

Saelens and et al. (2003) claimed that transportation, urban design, and planning have a strong relationship between physical environment and individuals' walking and cycling for transport, so they made a comparison between different neighborhoods to understand the correlation between transport choices and built environment variables. In their research, glossary of transportation and planning terms relevant to walking and cycling for transport was composed regarding the community design and land use variables related to transport choices which can be ranked as city planning, connectivity, employment density geographical information system (GIS), land use mix, new urbanism, proximity, residential density, smart growth and urban design. In this part of the thesis, explanations related to the diversity is to be ranked as below which was taken from their research (Saelens and et al., 2003; 81):

- ''*Employment density*'': The number of employees or jobs per unit of land area (e.g., acre).

- ''*Land use mix*'': In a specific area where hold different types of uses for physical space, including residential, office, retail/commercial, and public space. Zoning ordinances that effect political decisions in local level controls the land use of the area.

- '*Residential density*': The number of residential dwelling units per unit of land area (e.g., acre).

On the other hand, there are some researches focused on the relation between walkability and street quality in detailed. Pikora et al. (2003) and Brownson et al. (2009) examined potential environmental factors influencing walking and cycling based on published evidence and policy literature, interviews with experts and Delphi study that is made in three rounds questionnaires. In the Pikora and his colleagues' study, four features are determined as a framework of influences on non-motorized transportation: function, safety, aesthetic, and destination (Figure 2.2). During the other rounds of the study, relative importance of each element within each feature and each item within each element are indicated. For instance, under the 'functional' feature, 'walking surface' is one of four influential elements, while 'path type' and 'surface type' are two of five items that are key attributes of walking surface that affect walking in a locality (T. Pikora et al., 2003:1698). Based on their study, walking surface, streets, traffic and permeability are determined as a functional element which effects to the walking behavior in the local neighborhood. Additionally, Pikora et al. (2003) mentioned the importance of traffic control devices, traffic speed, traffic volume under the feature of a functional factor; and crossing aids, crossings, lighting, verge width, and surveillance in the safety feature which reflects the safe physical environment for people regarding their needs. They emphasize the two main elements of safety: personal and traffic safety which can be called as perceived and actual safety as well (Figure 2.2).

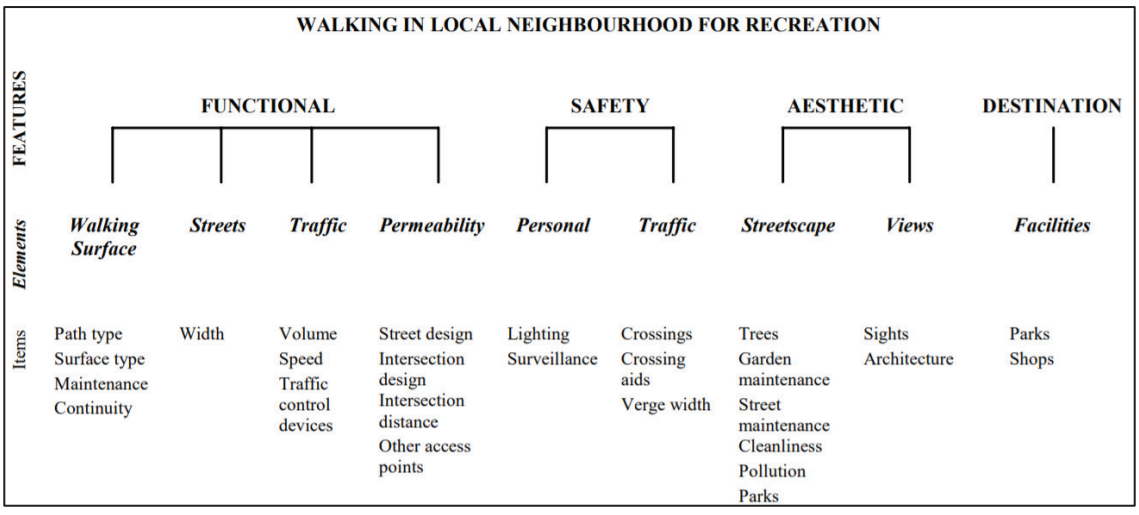

Figure 2.2. Physical environmental factors influencing walking for recreation in the local neighborhood (Source: T. Pikora et al., 2003:1698)

In another study was conducted using by Delphi method, Brownson and his colleagues found that population density, land-use mix, access to recreation facilities, street pattern, sidewalk coverage, traffic, crime and other (slope, greenness/vegetation, coastal location, dogs, street lighting, trees, transit, regional accessibility, bike paths and shoulders, and neighborhood themes/patterns) were determined as main variables affecting walkability in the neighborhood (Brownson and et al., 2009).

In an attempt to test the relationship of safety and security with walking in historic urban spaces, Abdulla, et al (2017) found that walkability, safety, and security are important factors as much as physical environment in order to determine how walkable place is. Because, in the public spaces, pedestrians are affected by safety criteria whether they use the space, or to avoid it. After both quantitative and qualitative methods to gather information and literature research, Abdulla and his colleagues divided subtitles of safety and security in historical public spaces into three parts: personal safety, traffic safety, and safety in law enforcement. Personal safety is consisting of perceived and actual safety which are mainly about traffic design elements, street furniture and sense of safety. If the street is well-lit and to be equipped with the guiding signals and public phones, people feel safe on the street even though at night thanks to the low crime rate, and these make the public area more preferable and comfortable for individuals. Indeed, traffic safety elements such as traffic calming regulations and traffic control elements have a huge effect on safety in public spaces. In addition to street design, the legal regulations increase the perception of security. For example, visible police presence and CCTV cameras directly reduce and prevent the tendency to commit a crime (Abdulla, et al., 2017).

In another research from Southworth (2005) who studied the place of walkability in literature and the main criteria of the walkable environment, ranked six criteria for the design of a successful network:

1. ‘‘Connectivity of path network, both locally and in the larger urban setting
2. Linkage with other modes: bus, streetcar, subway, train
3. Fine grained and varied land use patterns, especially for local serving uses
4. Safety, both from traffic and social crime
5. Quality of path, including width, paving, landscaping, signing and lighting and

6. Path context, including street design, visual interest of the built environment, transparency, spatial definition, landscape, and overall explorability'' (Southworth, 2005:249).

Also, Saelens and et al. (2003) claimed that there is not enough study about the impact of crime rates of walking/cycling for transport, since safety is defined as one of the main factors in neighbourhood environment influence. Therefore, more comprehensive investigations are suggested to reach more knowledge about non-built environment influences on individuals. Indeed, psychosocial correlates of physical activity should be another focus such as variables as self-efficacy, perceived benefits, perceived barriers, social support, and enjoyment of physical activity. Because perceptions of the neighborhood can be a particularly important reason for residents while they decide which community to live their daily lives and as well as in their public lives.

Southworth (2005) defined safety as the best understood and most fully developed and aspect of walkability is pedestrian safety. Although recently developed of safety perception, there is still some lack of implementations to prevent injury or death for pedestrians and bicyclists. Therefore, he claimed that most European countries thanks to many improvements that have been made in pathways, signing, regulations, education, traffic calming, and enforcement in better condition than the United States. He clearly advocates that some safety considerations, such as crossing times for people of varied mobility, handicapped needs, placement and length of crosswalks, traffic speeds, pedestrian and traffic control signing and signals, sidewalk width, sidewalk condition, path surveillance or 'eyes on the street' and night lighting, need to be formulated for safety from traffic and street crime in order to improve on this issue (Southworth, 2005).

Physical activity of people and the city environment in where they live have a strong relationship. If a strong bond is created between them, it increases the accessibility, healthy living conditions, and social connections. For reaching this purpose, city planning decisions which come from a comprehensive plan should be followed from general to detail. Southworth (2006), in his article of 'Reclaiming the Walkable City', explained the three scales for the implementation of walkability in cities: the planning scale, the street scale, and the detailed scale. Planning scale provides general information about the city's conditions, directions and processing, local spatial development plans and estimated major investments like hospitals, schools, etc. Pedestrian access, road improvement, and

construction of streets are considered in street scale works. On the other hand, every element of detailed requirements like pavement surfaces, small architectural elements, street signs, and street trees are the main concerns of detail scale design.

A study conducted by Southworth and Parthasarathy (1997) provides an explanation about the suburban public realm and how physical planning can contribute the urban life to make it more livable and equal among for citizens and individuals. Writers claimed that public realm in suburban America is quite dismal and needs to be improved. For these reasons, two neotraditional neighborhoods were evaluated and some feedbacks were provided in order to restore the public realm. Regarding their assessment, usage of public open space, street design and circulation system, public transport access, and pedestrian access are the essential requirements of the successful public realm. The important factors are not the size or the form of the area, the crucial point is to create strong connections and accessibility between public spaces rather than disconnected neotraditional suburban area design.

In a much more detailed research study focused on walkability, Southworth (2005) mentioned about the six criteria for the design successful network. The first one is ranked as connectivity which determined by sidewalk and path connections, absence of significant barriers such as ''*the pattern of disconnected cul-de-sacs, dead-end streets, barrier arterials, and highways*''. A high density of intersections and small block sizes are given as some solutions against these problems by him. Because, although the neighborhood has high connections within itself, it does not have much meaning if not to be accessed surrounded neighbors. On the other hand, path context which is described as a most problematic and least developed of walkability criteria by him deserved to be considered on it more than the current situation. He claimed that post-industrial city has led people to choose enclosed and artificial activities such as shopping malls, vast parking lots, and so on. Instead of this individual orientation, people should be courage to enjoy the moment in social and public life through the visual richness of the built environment, comprehensive street design, transparency of fronting structures, visible activity, landscape elements, lighting and views. In this way, pedestrians have the opportunity to socialize in public spaces. Research and studies have been done so far show that pedestrians prefer to compact and well-connected ways and neighborhoods if they have this option rather than the modern street pattern.

Brownson and et al. (2009) mentioned factors which are influenced physical activity based on research of Pikora and colleagues (2003), and Ramirez and colleagues (2006). Regarding these literature researches, factors are divided into five main categories: functional, safety, aesthetic, destination, and others. In the functional part, walking surface is defined as availability and accessibility of competitive transport alternatives and infrastructure. ''*Availability and accessibility of facilities or natural features for activity and availability of local government funds for parks and recreation facilities*'' are examined under the destination part. Related with the comfort, they defined the presence of attractions and comforts as well as the absence of a physical disorder in streetscape views. Moreover, ''*the presence of integration between residential and commercial land uses in dense population areas*'' is mentioned a permeability part (Brownson and et al., 2009).

Another leading research of walkable environments comes from Ewing and Handy (2009), purposed to link specific physical features to urban design quality ratings by a panel of experts for a sample of commercial streets. Researchers composed a conceptual framework which is about physical features of the environment and walking behavior, are ranked from more objective factors to more subjective in order to organize walking behavior scheme. These factors are 'physical features, urban design qualities, and individual reactions. Each factor is described with the different elements, for instance, imageability, legibility, enclosure, human scale, transparency, linkage, complexity, and coherence are the main indicators of urban design qualities part. The same method is also applied to other factors. In this way, important insights were offered into characteristics of the street environment with the contribution of more abstract urban design qualities regarding the walkability.

Table 2.1 on the following page provides a summary of the major findings which were heavily cited walkability categories in the literature correlated with purpose of this research about the relationship between design criteria and pedestrian's perception. Major agreements and disagreements in relations between walking and physical environment are only intended to highlight, besides there may be additional categories and variables that are not included. Among the included research, six main walkability principles were found.

Table 2.1. Theoretical studies on walkability

References	Subject of the Study	Literature Findings	Suggested Principles
Cervero and Radisch (1996: 140-141)	Investigation the effects of New Urbanism design principles because of automobile-oriented city structures.	- land use - number of blocks - street pattern	- Diversity - Street Quality
Shriver (1997:65)	Evaluation of neighborhood environment through survey and comparison of physical activity and weight status of the residents in 2 neighborhoods	- mixed land uses - street pattern - pedestrian facilities (presence of sidewalks, crosswalks, and walking trails)	- Diversity - Street Quality
Ewing and et al. (2003:4)	Measurement of urban sprawl and testing correlations between sprawl and transportation outcomes by combining many variables.	- density - land use	- Diversity
Pikora et al. (2003:1698-1696)	Presentation of development of a framework of the potential environmental influences on walking and cycling based on published evidence and policy literature.	- interaction design/distance - kerb type - other access points - path continuity/design /location/maintenance/surface/width - street design/type/width - trees - maintenance - traffic control devices - traffic volume/speed - crossings - lighting - motivations	- Street Quality - Safety

Brownson and et al. (2009:516)	Assessment of the impact of the built environment on physical activity through interview or questionnaires, observational measures, and archival data sets.	- population density
		- land-use mix
		
		- street pattern
		- sidewalk coverage
		- other (e.g., building design, public transit, slope, greenness/vegetation)
		
		- Walking surface
		  - Availability and accessibility of competitive transport alternatives and infrastructure (e.g., transit, sidewalks)
		- Facilities
		  - Availability and accessibility of facilities or natural features for activity
		  - Availability of local government funds for parks and recreational facilities
		
		- Streetscape views
		  - Presence of attractions and comforts as well as absence of physical disorder
		  - Presence of integration between residential and commercial land uses in dense population areas
			- Diversity
			
			- Street Quality
			
			- Accessibility
			
			- Comfort

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Table 2.1 (cont.)

Abdulla et al. (2017:169)	Investigation of the effectiveness of walkability in traditional urban spaces and analysis of the correlation between walkable, a safe and secure environment.	<u>Personal Safety</u> - Street is well-lit - There are signals to help pedestrians cross in busy streets - It is scary to walk even in daylight - There are public places for emergency use - Crime rate makes it unsafe to walk there even during the day - Crime rate makes it unsafe to walk there at night. <u>Traffic Safety</u> - Drivers exceeding speed limit - Drivers consider pedestrian safety - Crossings with traffic lights <u>Safety in Law Enforcement</u> - People not carrying weapons - Visible police presence - Visible CCTV cameras - Test safety method by VR	- Safety
B. E. Saelens and et al. (2003:81-84)	Evaluation of neighborhood environment through survey and comparison of physical activity and weight status of the residents in 2 neighborhood.	- residential density - land use mix-diversity - land use mix-access - Safety (traffic, crime, animals, etc.) - Phycological correlates of physical activity - Land use mix-access - Street connectivity	- Diversity - Safety - Accessibility
Southworth (2005:249-251)	Assessment of pedestrian needs in urban and suburban environments depending on the performance dimensions and criteria for a walkable environment.	- Safety both from traffic and social crime - Crossings - Handicapped needs - Placement and length of crosswalks - Traffic speeds - Pedestrian and traffic control signing and signals - Night lighting - Connectivity - Linkage to other modes - Path context	- Safety - Accessibility - Legibility
Southworth and Parthasarathy, (1997:22)	Evaluation of new urbanism guidelines by examining their application in two neotraditional developments and proposing a research agenda in order to increase information data.	- Public open space - Street design and circulation systems - Public transport access - Pedestrian access	- Accessibility
Ewing and Handy (2009:67)	Comprehensively and objectively measurement of subjective qualities of the urban street environment.	- linkage - complexity - imegeability - legibility - enclosure - human scale - transparency - coherence	- Accessibility - Legibility - Comfort

Walkability principles were determined regarding the literature review to assess the walkability comfort of the case study area (Figure 2.3). In this way, six main principles came forward: diversity, accessibility, safety, street quality, comfort and legibility.

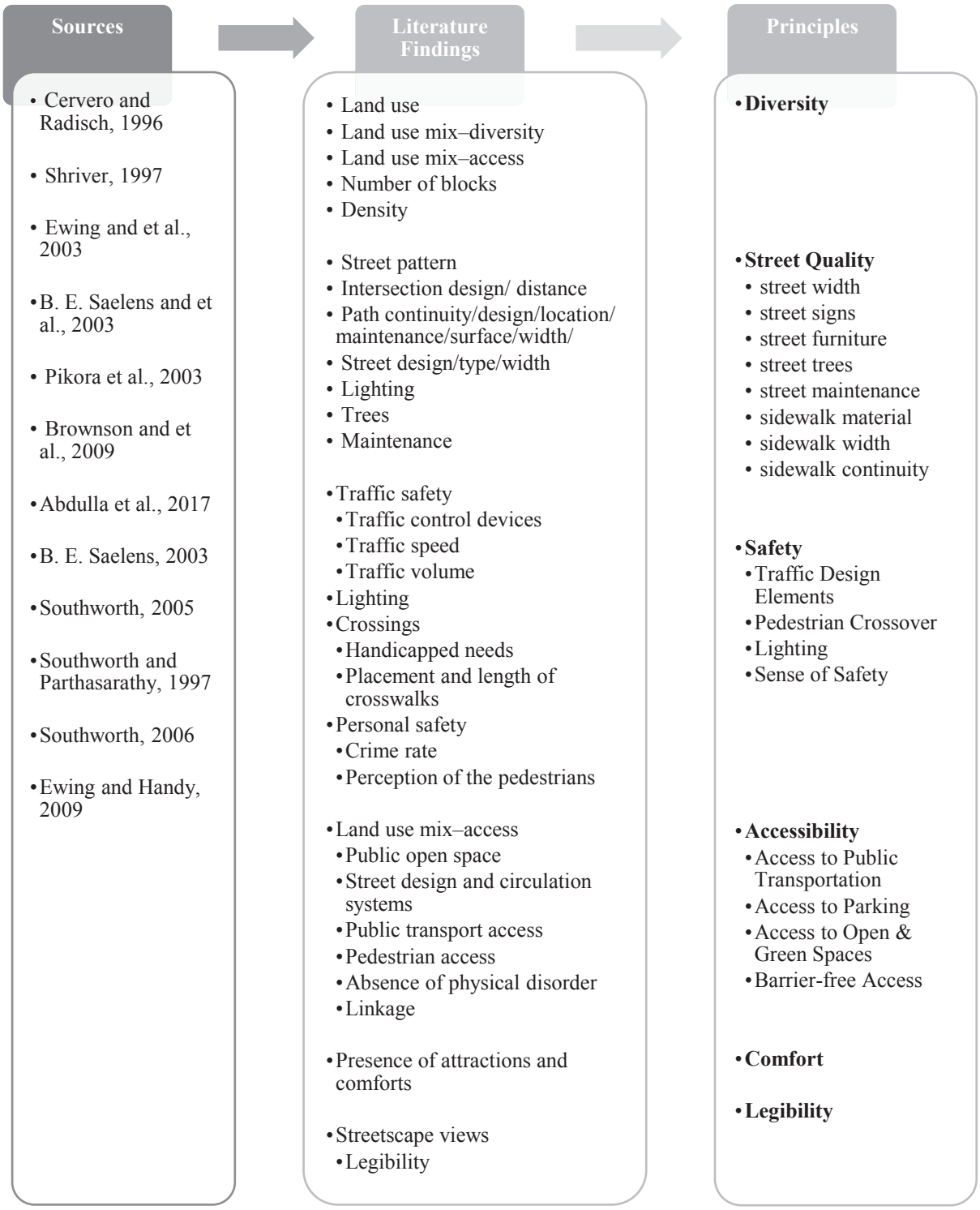

Figure 2.3. Walkability principles regarding the literature review and purpose of the thesis

2.3.1. Researches with Case Studies

One of the major goals of this research has been to assess urban streets considering walkability principles, but it should be also noted how these changes can be shown in the selected case study area. There is no specific or ‘‘accepted’’ way in general to measure walkability rate of the spaces in the literature, but each research determined their ways to analyze walkability of the streets or neighborhoods. In this part, researches with case studies in the literature will be examined to understand different perspectives to measure walkability in different places.

In a detailed research study, Blečić and et al. (2016) examined factors associated with pedestrians' perception of walkability. They collected 18 observable street attributes (Table 2.2) and a synthetic subjective perception of walkability for the entire street network of the city of Alghero in Italy that was divided into 408 street segments. After interpretation of the results, they determined that ‘‘*useful sidewalk width’’*, ‘‘*objects of architectural, urban and environmental attractions*’’, ‘‘*density of shops, bars, services, economic activities*’’, ‘‘*vehicles-pedestrians separation*’’, ‘‘*bicycle track*’’, ‘‘*opportunity to sit*’’, ‘‘*shelters and shades*’’, ‘‘*car roadway width*’’, and ‘‘*street lighting*’’ are the most highly significant attributes associated with the perceived synthetic walkability regarding to results of regression analysis.

Simon and et al. (2012) selected four examples in three geographical areas in Hong Kong to show obstacles and potentials to improving liveability and walkability. The main purpose to choose these four neighborhoods is to determine and measure walkability and apply them to the other districts and areas in Hong Kong in the future by varied aspects. Firstly, site reconnaissance was carried out in the four study areas to get a sense of the quality of the walking facilities and the pedestrian environment in each of the districts. Then, local surveys were conducted by various team members. In each district, four different routes (shortest walk, next best walk, visitor walk, and pram walk) were determined to represent an array of challenges and characteristics. While doing this, route description, walking time, distance and energy and scorecard was carried out for each walk. Also, the scorecard was assessed in terms of connectivity, obstacles, wayfinding, physical features, and walking conditions. After evaluation of local surveys, the main

problems were identified and recommendations were offered to improve walkability districts in Hong Kong.

A study conducted by Ackerson, (2005) provides an example to evaluate neighborhood walkability near middle schools in terms of infrastructure amenities that provide pedestrian safety and evaluation of walkability through comparison of student transportation behavior in four neighborhoods in Springfield and Bend, Oregon. Firstly, they compared the density and types of intersections for school neighborhoods to show route options. Secondly, the walkability audit instrument was used in the streets within 800 meters of each middle school to rate pedestrian safety. Finally, students' actual routes to school were compared with the shortest possible route. According to the results of multiple walkability indicators in this study, despite the high walkability safety score, two facts were found: dead-end streets reduce the walkability and students tend to take the shortest route.

Bereitschaft (2017) continues the use of the case study methodology by comparing the walkability of six neighborhoods. The researcher explained inequity in neighborhood walkability at the micro-scale level by qualitatively examining six streetscapes in Pittsburgh, Pennsylvania. Quantitative Walk Score which was developed by Ewing et al. through five such elements as 'urban design qualities': imageability, enclosure, human scale, transparency, and complexity was used as a method in this study. Also, the scholar utilized two additional elements to these five design qualities: ''*tidiness*'' and ''*safety and sensations*''. After observations made during the walking surveys, a quick visual comparison was made between specific walkability elements across multiple neighborhoods.

In another article that tested pedestrians' satisfaction of comfort based on their walking experience, Zakaria and et al. (2014) conducted a questionnaire survey based on randomly selected visitors as respondents in three zones in Kuala Lumpur City Center and Jalan Bukit Bintang. The questionnaire was designed into three measurements including comfort, connectivity and accessibility, and safety by using five Likert Scale format. As a conclude of the study, problems and recommendations were explained regarding the results of surveys and observations.

Farnian (2014) mentioned factors which are influenced the physical configuration of Yüksel Street in Ankara based on lifestyle, locational, urban design and personal

factors. The researcher also divided each factor into subtitles, for example, lifestyle factors consist of three supporter elements such as individual issues, group issues, and regional and environmental issues. In this way, she tried to establish a theoretical frame concerning the concept of walking and walkability and investigating practical features of them in urban space by case study method. Various maps, photographs, direct observations, questionnaires and interviews were used to evaluate walkability level, and potentials of the case study area for recommendations in the future.

As the scale classification, Li (2015) studied to impact of the environmental variables on walkability depend on scale differences such as top macro-scale environmental variables and top micro-scale environmental variables that came from literature review. This research used three data collection methods: walkthrough surveys, passive observations, and archival and secondary data to evaluate environmental variables impacting walkability on Main Street in Downtown Fort Worth. As the summary of the research, scholar suggested that which environmental variables that affect walkability and how do these environmental variables impact the walking experience of pedestrians in the context of Main Street Fort Worth.

A different method used to define and assess walkability in research has been the use of case studies. Researchers examine and compare the different study areas in terms of environmental characteristics. Table 2.2 presents the summary of findings from walkability researches with case studies and suggested principles

Table 2.2. Summary of findings from walkability researches with case studies and suggested principles

Reference	Aim of the Study	Examined Case/s	Research Tool	Suggested Factors or Measures
Civic Exchange, 2012 *''Walkable City, Living Streets''*	Importance of walkability and how to increase walkability in Hong Kong.	Four examples in three geographical areas in Hong Kong where are Victoria Harbourfront-Central, Victoria Harbourfront-Tsim Sha Tsui, Mong Kok, Ma On Shan	Local survey method was used: -Route description -Walking time, distance and energy recording -A simple score-card for route assessment	Walkability score card was determined by five aspects: - Connectivity - Obstacles - Wayfinding - Physical features - Walking conditions

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Table 2.2 (cont.)

Blečić and et al., 2016 ''*Factors of Perceived Walkability: A Pilot Empirical Study*''	To determine which urban features and design characteristics of the streets are most strongly correlated with a qualitative synthetic perception of the quality and walkability of streets.	The city of Alghero in Italy which is divided 408 homogeneous street segments	Direct and on-street survey method was used.	- Useful sidewalk width - Objects of architectural, urban and environmental attractions - Density of shops, bars, services, economic activities - Opportunity to sit (benches, etc.) - Shelters and shades - Car traffic direction - Car roadway width - Speed limit - Bicycle track (cyclability) - Degree of integration with surrounding Space - Vehicles-pedestrians separation - Street lighting - Sidewalk degree of maintenance - Street-level parking - Physical car-speed reducers (hump, raised crossings, traffic islands, mini roundabouts) - Non-physical car speed reducers (traffic lights density, enclosure) - Crossings density - Road type
Ackerson, 2005 ''*A GIS Approach to Evaluating Streetscape and Neighborhood Walkability''*	To evaluate neighborhood walkability near middle schools in terms of infrastructure amenities that enhance pedestrian safety.	Four neighborhoods in Springfield and Bend, Oregon (zone-based assessment)	Three tools were used: -A walkability audit -Household survey -Geographic Information Systems (GIS)	- Intersection characteristics and density - Road classifications - Land-uses - Walkability safety ratings - Students routes
Farnian, 2014 ''*Reclaiming Pedestrian-Oriented Places to Increase Walkability in City Center The Case of Yüksel Street, Ankara*''	To establish a theoretical frame concerning the concept of walking and walkability and investigating practical features of them in urban space.	One street: Yüksel Street in Ankara	A case study method was used.	- <u>Life style factors:</u> -Individual issues -Group issues -Regional and environmental issues - <u>Locational factors:</u> - Mixed land-use and neighborhood public spaces -Pathway characteristics continuity and connectivity -Integrated transport network with walking - <u>Urban design factors:</u> - Imageability -Legibility - Enclosure -Human scale -Transparency -Complexity - <u>Personal factors:</u> - Sense of safety -Sense of comfort -Level of interest -Lighting

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Table 2.2 (cont.)

Bereitschaft, 2017 ‘‘*Equity in Microscale Urban Design and Walkability: A Photographic Survey of Six Pittsburgh Streetscapes’’*	To explore inequity in neighborhood walkability at the micro-scale level by qualitatively examining.	Three pairs of neighborhoos in Pittsburgh	Quantitative Walk Score method was used.	Imageability Enclosure Human Scale Transparency Complexity Safety & Sensations Tidiness
Zakaria and Ujang, 2014 ‘‘*Comfort of Walking in the City Center of Kuala Lumpur*’’	To determine pedestrians' satisfaction of comfort based on their walking experience.	Three neighborhoods in Kuala Lumpur city center	A questionnaire survey conducted on randomly selected visitors as respondents	- Comfort - Connectivity and accessibility -Safety of walking
Li, 2015 ‘‘*Study of Environmental Variables Affecting Walkability: Learning from Main Street in Downtown Fort Worth’’*	To study the impact of the environmental variables on walkability on Main Street downtown Fort Worth.	One street: Main Street in Downtown Fort Worth’	Quantitative methods were used: -Walkthrough survey (with 25 users) -Observation techniques -Graphic Information Systems (GIS)	- <u>Macro Scale</u> -Land use -Density -Connectivity -Accessibility -Crime -Street Pattern -Motor Vehicle volume and speed -Public open space -Proximity -Strengths of centers -Block size -Presence of sidewalk and lateral separation -Number of blocks -Number of intersections - <u>Micro Scale</u> - Street trees / street furniture -Lighting -Seating -Signage -Building front proches -Public art -Microclimate -Terrain and slope -Visual complexity -Buffers -Noise -Sidewalk condition -Safety -Windows facing the street

CHAPTER 3

WALKABILITY PRINCIPLES

The concept of walkability has taken an important place in the field of urban design in recent years. The researches on walkability discuss the qualifications of a walkable place within the context of physical environment characteristics and perception of pedestrians. Considering the definitions in previous chapters, principles of walkability is categorized into five main components as diversity, accessibility, street quality, safety, legibility and comfort, all of which includes both physical and perceptual characteristics. These principles are divided into subheadings within themselves. (Figure 3.1.) The principles describe the design elements of a pedestrian-friendly community.

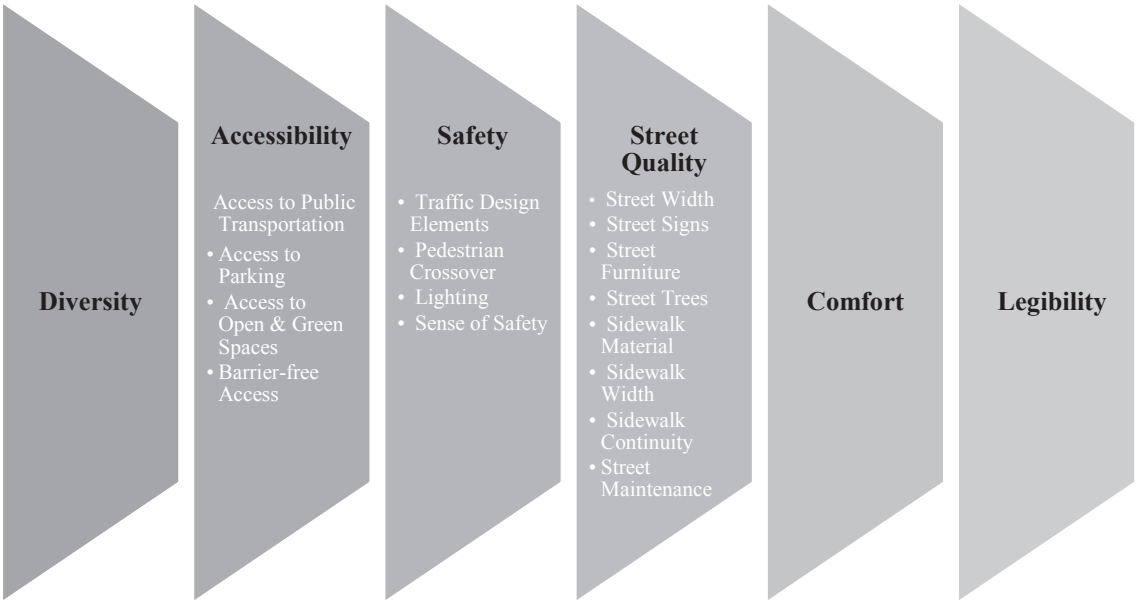

Figure 3.1. Six main principles of walkability and their subcategories

3.1. Diversity

Mixed land use, which is important for walkability, is defined in the literature as a mixture of commercial, residential and industrial land uses within a given geographical area rather than separating the use of housing from non-residential uses. By smart growth advocates, mixed land use is often more narrowly defined as the variety of land uses that serve the needs of the local population (Newland, 2015).

On the other hand, advocates of the new urbanism trend emphasize the necessity of mixed uses due to the pedestrian-oriented design feature that improves social capital. People living in such neighborhoods have more chances to meet and talk to their neighbors. For this reason, many experimental studies examined the effect of walkability and mixed use on the neighborhood (Kevin M. Leyden, 2003; Kadali and Vedagiri, 2015; Frank et al., 2006; Humpel et al., 2002).

Mixing commercial facilities, single family housing, and multifamily housing have for centuries enabled residents to walk to multiple near-home destinations (Frank and et al., 2006). As mentioned at The Image of the City book, Lynch (1960) also underlines fundamental functions of the city forms as circulation, major land-uses, and key focal points. While these criteria play an important role in the differentiation of the land, they increase the need and desire of pedestrians for walking in the bigger scales.

Land use character has the noteworthy impact on pedestrian attitude at crosswalk areas with increment in the volume of vehicular flows. Design and evaluation of pedestrian facilities are ensured by the determination of land use characteristics that can be differentiated by the requirements and the behavioral characteristics of the pedestrians. Therefore, it is essential to understand how to build environment and land use character effect to the walking behavior on pedestrians. Moreover, Saelens et al. (2003) explain land use mix as

‘‘*The level of integration given area of different types of uses for physical space, including residential, office, retail/commercial, and public space. Land use is controlled by zoning ordinances that reflect political decisions most often made at the local level.*’’ (Saelens and et al., 2003:81).

Likely, urban diversity and the scale of the area influence both the observed patterns of diversity and their interpretation. Furthermore, it is crucial to make an analysis

of urban diversity in a multi-level approach in a detailed micro scale and macro scale in order to get a more comprehensive perspective. For instance, a neighborhood is observed a homogeneous land use on one zone, and on the other zone has a heterogeneous character which changes the walkability perception on a bigger scale. In this case, which can be common in urban areas and developing planning regions, the comprehensive approach provides the possibility to percept different scales and the relations among them, and look for interrelations and common patterns.

Studies have mostly considered the impact of land use mix on health with improving levels of physical activity due to reducing levels of obesity, and neighborhood character that offer a more active lifestyle. In the research of Frank and et al. (2006), shorter distance to central services and facilities that reduce the travel time and courage people to walk, and mixed land use are all related with non-automobile trip demand, more walking, and active transport options.

Supporting Frank and his colleagues, Humpel et al. (2002), found that the built environment is correlated with recreational physical activity. If the built environment offers more possibility to walk and proximity among public spaces and residential zones are created strong, people prefer to walk more, in this way walkable mixed-use neighborhood increases the psychological and physical health individually and provides a more safe and comfortable neighborhood atmosphere through the participation of public life and trust feeling in the social life (Kevin M. Leyden, 2003).

3.2. Accessibility

Accessibility is a function of proximity to destinations and the directness of routes to those destinations. Creating an accessible neighborhood which is one of the fundamental dimensions of urban design, provide easy access to streets for everyone and ensure the availability facilities that can support for usage of the elderly and the disabled people. Access to public spaces should be regulated through convenience, and accessibility to open and green areas. In this part of the thesis, accessibility will be examined into four parts: access to public transportation, access to parking, access to open and green spaces, and barrier-free access.

3.2.1. Access to Public Transportation

Urban transportation is one of the most important target sectors for creating more sustainable, walkable and livable cities. If the rapid urbanization and increasing population that require access to business activities, education, employment, and recreational opportunities are taken consideration, the essence of urban planning transportation infrastructure should provide easy and comfortable access to the other facilities (Murraya et al., 1998).

In Washington, the report of Guidelines for Providing Access to Public Transportation Stations (2011) which conducted by Transit Cooperative Research Program claimed that the most important factor affecting pedestrian access is distance which changes regarding the density of land use in the surrounding area. As known, the reasonable maximum walking distance for pedestrian access to high-capacity transit have been assumed as 800 m but pedestrians mostly walk more than 800 m to access public transportation. Regarding the research team, there are four essentials to consider when designing pedestrian access to a station:

• ‘‘*Directness and speed of route’’*: Creating direct walking routes with minimum obstacles

• ‘‘*Safety and security*’’: Pedestrian route should be secure and visible to see other road users, especially during the night. Crossways is also important particularly on the busy roads.

• ‘‘*Pedestrian-friendly design*’’: ‘‘Lighting’’, ‘‘building setbacks’’ and ‘‘orientations’’, and ‘‘sidewalks’’ should be designed at a “human scale” to increase perception of environment by pedestrians.

• ‘‘*Information*’’: Wayfinding information should be located to reach local destinations. (Guidelines for Providing Access to Public Transportation Stations, 2011:61)

Similarly, Southworth (2005) mentioned the importance of connectivity of a larger city and region through accessible links to other nodes within a reasonable distance and possibility. Therefore, the acceptable distance to the transportation stations should be 400 meters to 800 meters or a 10-20 minutes’ walk. While acknowledging that this

requirement would improve the walkability of an environment, in reality, many places are not able to provide this distance to the citizens between home and the station. Therefore, it is more important to encourage that most destinations be within 800 meters of homes.

3.2.2. Access to Parking

Parking is one of the important elements of the street design which affects pedestrian behavior in both good and bad way. Although access to transit is becoming of a focus, access to parking is still seen as the needs of traditional settlements, new developments and the public areas.

In the Walkable City book, Jeff Speck mentions about the ten steps of walkability consisted of four main part which are ''*the useful walk, the safe walk, the comfortable walk, and the interesting park*''. In the useful walk part, he points out that minimum parking requirements for buildings and business led to the huge demand of under-priced parking. Therefore, Speck recommends consolidated parking for multiple buildings and business in returns of higher prices, especially for curb parking, and shares a number of successful examples.

Similarly, A.A. Zuniga-Teran et al. (2017) claims that the less parking provided thought to be more walkable and courage people to the physical activity through alternative transportation modes. That is way, in the conditions when the parking is necessary, these parking plots should be located behind the buildings and away from the street. In another research made by A.A. Zuniga-Teran et al. (2016) who recommends on-street parking that provides safety to pedestrian form traffic. Since, parking location is still recommended the place where is far away from the streets. Also, they contributed the design elements for parking in order to increase physical activity by reducing the amount of available parking. These categories can be ranked as below:

- Reduce parking footprint. Either do not build off-street parking or build parking lots at the side or rear of buildings leaving frontages free of surface parking
- Do not allow more than 20% of footprint area is used for off-street parking
- Do not allow parking lots greater than 0.8 ha

- For non-residential, provide carpool and/or shared-use vehicle parking spaces for 10% of parking, with signage and within 60 m of building entries
- Parking spaces are sold or rented separately from the dwelling units or square footage of non-residential
- Provide on-street parking on 70% of both sides of the streets
- Integrate parking in the building base
- If parking lots/garages cannot be avoided, surround these by small blocks (intersections occurring every 48 m or 160 ft)
- Surrounding areas of parking lots must have diverse services (e.g., shops, restaurants)
- Sharing parking between uses can significantly reduce the parking area requirements
- Screen or hide parking behind landscaping
- Locate parking and drop-off areas along secondary streets but within blocks of primary streets (A.A. Zuniga-Teran and et al., 2006:11-12).

3.2.3. Access to Open & Green Spaces

Access to open and green spaces in the urban areas and neighborhoods can be described as the availability of space dominated by vegetation, the size, proximity, and ease of access to the green spaces. Green areas are the organic systems that direct, limit, divide, function and combine the use of other areas in urban texture. Streets should have a permeable level of flow or case of access, regulated through physical barriers, convenience, and accessible to the landscape. When the settlement plans of the cities are examined, it is noteworthy that the green spaces are effective in improving the quality of the cities and improving the quality of life.

Regarding the research from A.A. Zuniga-Teran and et al. (2016), although open and green spaces have benefits in terms of physical and physiological health on human and ecology, greenspace category received the weak score among other categories in the research. Therefore, they tried to identify the main standards of green spaces regarding literature research (Handley et al., 2003; Jacobs, 1961; Zuniga-Teran, 2015). Basically, design elements of green space can be ranked below:

- Include a small greenspace (2 ha or 4.9 acres) within walking distance of homes (1/4 mile or 400 m), and encourage small shops on its boundaries, including food trucks.
- Provide a grassy play space (0.40 ha or 1 acre) safeguarded from traffic with dwelling units overlooking the space within 100 m from homes.
- Provide o civic space (plaza) located in a central location also surrounded by small retail (A.A. Zuniga-Teran and et al., 2016:6).

On the other hand, according to research in UK., 30 minutes of physical activity in the open air every day can reduce the risk of stroke, heart disease, obesity, some types of cancer and diabetes (Wentworth, 2016). Also, Natural England has developed an Accessible Natural Greenspace Standard (ANGSt) to provide local authorities with a detailed guide as to what constitutes accessible green space. ANGTs recommends the distance people should live from certain types of green spaces and the size of the green spaces in conjunction with distance to homes (ANGSt Land Use Consultants, 2008). Regarding the standard, all people should have accessible natural green space:

- of at least two hectares in size, no more than 300m (five minutes' walk) from home
- at least one accessible 20-hectare site within 2km of home
- one accessible 100-hectare site within 5km of home
- one accessible 500-hectare site within 10km of home (ANGSt, 2008:12)

3.2.4. Barrier-free Access

The public spaces, which include various activities, are important urban spaces that provide communication and interaction between people. In order to ensure that disabled have equal rights with all individuals living in the city and that they can live an unhindered life and participate in social life, urban public spaces should be designed in accessibility standards.

Regarding Design Manual for A Barrier- Free Built Environment Report which was published by Organisation for Development Education in 2004, a barrier-free environment defined as ''*a space that allows for free and safe movement, function and*

access for all, regardless of age, sex or condition'' (p. 2). Although a barrier-free environment is a basic right for all, "universal design" or "design for all", which are basically described as no differences between people, have taken their places in the literature and practice with the development of the technology and the design standards. Universal design, which was developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers, led by Ronald Mace in the North Carolina State University, is a holistic philosophy and against the separation of disabled from society (S. Burgstahler and et al., 2007). The universal design reinforces this perspective with seven basic principles (led by R. Mace, 1997:29):

1. ''*Equitable Use:* The design is useful and marketable to people with diverse abilities.
2. *Flexibility in Use:* The design accommodates a wide range of individual preferences and abilities.
3. *Simple and Intuitive Use:* Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. *Perceptible Information:* The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. *Tolerance for Error:* The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. *Low Physical Effort:* The design can be used efficiently and comfortably and with a minimum of fatigue.
7. *Size and Space for Approach and Use:* Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.''

3.3. Safety

Undoubtedly, safety is one of the main components of walkability. Pedestrian access is preferred only when it is safe from a physical and social perspective. Well-designed roads, standardization of pedestrian crossings, enough and clear traffic design elements improve public health as well as improve social relations, and increase

commercial volumes in and around pedestrian ways. Traffic design elements, pedestrian crossover, lighting and sense of safety criteria will be examined in safety part of the thesis.

3.3.1. Traffic Design Elements

Traffic design elements are very important in terms of streamlining pedestrian and vehicle traffic and creating physically safe streets. Physical security is ensured by pedestrians at the intersections and arrangements to ensure safe movement on the streets. Measures should be taken to increase the safety of vehicle roads as well as the regulation of pedestrian roads, so traffic design elements will be examined into two parts: regulations on roadway and signalization system for both pedestrians and drivers. In this way, healthy and safe streets can be provided for all.

The tension between vehicle speeds and the safety of pedestrians, cyclists and people traveling in public transport should be balanced in order to make urban roads safer (Dumbaugh and Li, 2011). Therefore, the importance given to studies related to traffic calming has increased in recent years (Vanderschuren and Jobanputra, 2009).

Traffic calming which is simply described as a traffic management method that improves the safety of all road users and vehicles by using urban design tools to improve the quality of life. Regarding the Federal Highway Administration, traffic-calming devices can be grouped within the following general categories as ‘‘*bumps, humps, and other raised pavement areas’’*, ‘‘*reducing street area where motor traffic is given priority*’’, ‘‘*street closures’’*, ‘‘*traffic diversion*’’, ‘‘*surface texture and visual devices*’’ and ‘‘*parking treatments*’’ (East-West Gateway Council of Governments, 2014).

As seen in Figure 3.2., there are different ways to decrease traffic speed on the way in order to ensure more safe roads for both drivers and pedestrians. Speed reduction has important benefits that increase the quality of life and walkability comfort for society at large scale. These methods are useful to extend roadside borders to the road through pavement expansion or green band placement. In this way, small passing along the road to help reduce vehicle speeds; the width of the vehicle road narrows, the vehicle speed slows and the pedestrian crossing distance is shortened (Kaygısız, 2012).

Figure 3.2. Traffic calming toolbox - examples of possible traffic calming treatments from right to left: choker and bulb-out/curb extension
(Source: C. Gables, n.d.)

Another important point about traffic design elements are pedestrian and traffic control signing and signals. Regarding Traffic Signs Policy Paper prepared by London Department of Transport in 2011, traffic signs are extremely valuable for the driver, pedestrian and passengers in traffic. These traffic lights and signals determine the regularity of people and vehicles in traffic. On the other hand, as seen in Figure 3.3, traffic signs and signals can be designed in harmony regarding the character of the city or neighborhood.

Figure 3.3. Example of sign design & wayfinding
(Source: R. Lang, n.d.)

3.3.2. Pedestrian Crossover

Pedestrians use the pedestrian crossing in the road crossing is very important for traffic flow and security. It is a problem for pedestrians to cross the road, especially on large and divided highways. According to the Turkish Highways Traffic Law, at each intersection, corners are accepted as a natural pedestrian crossing. Even if it is not indicated by a sign, vehicle drivers should pay attention to pedestrians and give the first pass right to the pedestrians in right or left turns (Road traffic law Md. 53/d). In order to increase pedestrian traffic and traffic safety on such a road, pedestrian crossing should be two-parted to minimize pedestrians' exit from each point, so the pedestrians should stand on the central island and control the other direction.

Considering that the movement of the pedestrian may determine the distances; ensuring the shortest access or connection to the place to be accessed facilitates pedestrian movement. Jacobs (1993) recommends that urban street connections should be at most 300 feet (about 90 meters) apart. On the other hand, design criteria for all pedestrian crossings for all have been specified in Road and Traffic Safety Congress for Sustainable Transportation book which was prepared by Department of Traffic Planning and Implementation of Gazi University Institute of Science and Technology in 2015. These criteria can be listed as follows:

- Pedestrian crossings should be level to facilitate the movement of persons with disabilities.
- Transition safety for disabled should be increased by using different textures or voice signals on the floor covering in these areas.
- The ramps providing the connection to the sidewalks should be tilted in three directions.
- In pedestrian crossings with light control, traffic sign lamps should have a illuminated pedestrian figure for the hearing impaired and a sound (acoustic) warning sign for the visually impaired.
- In places with uncontrolled pedestrian crossings, drivers must be warned for 20m advance passage to ensure safe use of obstacles. The pedestrian crossing should also be warned by pedestrian crossing and handicapped signs, and should be well lit.

- Buttons for pedestrian crossings should be at most 120cm in height.
- Elevators, escalators, platform lifts moving on the stair slope should be arranged depending on the characteristics of the area for comfortable use of the disabled at the lower and upper gates.

3.3.3. Lighting

Perceived security can be an obstacle in front of the walking and creating walkable communities, especially during night time in urban centers (Shumi and et al., 2014). People who concern about perceived dangers, might change their travel behavior by not going out alone during the night or avoiding certain areas or routes. Regarding Pedestrian Planning and Design Guide (2008:4-6) which is prepared by New Zealand Transport Agency explained personal security issues in three general areas:

- Legible environments should be designed to guide pedestrians for seeing and understanding their surroundings.
- Pedestrians should able to see each other, especially other pedestrians.
- Alternative routes should be provided to pedestrians in case of avoiding potentially dangerous situations.

The places where social relations strong is accepted safer than desolate places. The multifunctional places provide liveliness through day and night usage which provides a solution to the security problem. Residential areas and mixed-used which includes also night activities increase the activity and observation level in the area. Lighting is another important factor in ensuring security. The lighting elements used in urban spaces are used to provide illumination of the place in terms of security and protection when it is dark, as well as to make objects, fountains, sculptures, buildings and other visual objects to be highlighted visually and to contribute in a decorative sense. Adequate and good quality of lighting is important for the activities in the place as well as for the security of the place (Appleyard, 1981). Provide a comfortable walk to pedestrians during night-time should be the main purpose for a healthy and safe environment. In particular, it is necessary to illuminate the corner points, intersections, collection points and lighting groups in the pedestrian zones.

On the other hand, lighting is important in terms of legibility of the city centers. The people in the city should be able to recognize the environment in which they live and read the city plan easily. During the night-time in the urban public spaces, urban lighting should highlight the character of the city including the identity of the city, the beauty of the exhibition, the attractiveness of the history, cultural, social, monumental, architectural values (Sözen, 2000). Creating a space perception and memory in the city is vital for the image of the city. Especially at night, creating this memory and perception is made possible by the power of lighting.

3.3.4. Sense of Safety

People perceived some places as dangerous or safe regarding the character of the built environment and the usage of the area. Fear is, particularly, a response to the physical elements in the place (Hutchings, 1994). The need for psychological security is about feeling in control of the environment. When the pedestrians have knowledge and experience about the environment and perceive the area is vibrant and safe, they feel more comfortable avoiding being lost socially and physically (Marcus C. C. and Francis C., 1997). Also, according to Kaya the need for psycho-social security in place can be decreased by easy location, easy access, easy orientation, getting personal space, strengthening responsibility, defining the sovereignty, avoiding loneliness, eliminating the crowd, providing privacy are related to the social and physical characteristics of the place (Gür, 1996).

Jacobs (1961), in her book of ‘‘*Eyes on the Street study*’’ emphasizes the importance of the environment on the pedestrian scale for safety. Jacobs argues that the combination of physical and functional diversity in the neighborhood and the different methods of use make the place felt more secure. The way in which Jacobs manages the work is when the individual, who is the user of the space, can be seen in an open place around the environment, what is the nature of a factor, is clearly governed, is managed in a possible way. Similarly, in the event of a possible attack, the area of use and intensity of the area is increasingly being considered from those who receive assistance from the environment and can be asked for help. The existence of commercial activities, distribution of social facilities and public transport stops and routes take place together by making the nature of the place feel safer (Jacobs J. , 1961).

In most of the studies, it is stated that the physical characteristics of the built environment are the main factors that reduce or increase crime (Abdulla and et al., 2017; R. Tiwari, 2014; Villaveces and et al., 2012). Crime rates have a strong influence on walking trips. Alfonzo (2005) argues that urban design practices that lead to physical fear and fear of crime should be avoided to ensure security, diversity and human density in land use will increase the sense of security. Indeed, keeping in mind that the fear of crime is associated with the feeling that no one can be seen or heard by anyone in the place where the crime exists, the existence of other people should have a positive effect on the sense of security.

3.4. Street Quality

Streets are the public places where people live together, where public life, sharing, transportation, and mobility emerge since the time when social life was adopted. Therefore, the streets should be arranged in a functional and aesthetic manner for all in order to increase walkability and public sharing. In other words, the streets have to be organized with quality and sustainable management approach and with a healthy urban approach. In this part, street width, street signs, street furniture, street trees, sidewalk material, sidewalk width, sidewalk continuity, and street maintenance will be examined under the title of the street quality.

3.4.1. Street Width

The capacity of a road, depending on the traffic and control conditions, is the hourly maximum of the road platform, a uniform strip segment or the vehicle or people that can reasonably pass from a point within a given time frame (Kayacı, 2015). Therefore, calculating the people and vehicle number in per hour, and the location and character of the street should be taken consideration while designing a road and street. Careful design of streets can satisfy concerns regarding parking, safety, walkability and traffic congestion. Regarding Kayacı (2015), the following steps should be followed in the preparation of classification stages for urban roads:

- Preparation of maps showing the current and future pedestrian and vehicle traffic volume in the city's road network
- Preparing maps showing the geometric standards of the city's road network
- Preparation of city's accident maps
- Preparing maps showing the land use of the city
- Preparation of the city's road legal speed and V85 speed map
- Speed, junction types and intermediate distances, pedestrian mobility, traffic volume and geometric standards review
- Preparation of new speed and road functional map according to the elimination of discrepancies

On the other hand, new developments must provide off-street parking solutions, which can only be accessed from the side or rear of the development (S. Deng and X. Ye, 2016). As seen in Figure 3.4, pedestrian ways must be segregated and cycle lanes should be incorporated. In some cases, frontage access might need to be restricted and on-street parking can be allowed; or in other cases where the traffic is dense on-street parking should be discouraged (LADCP, 2014).

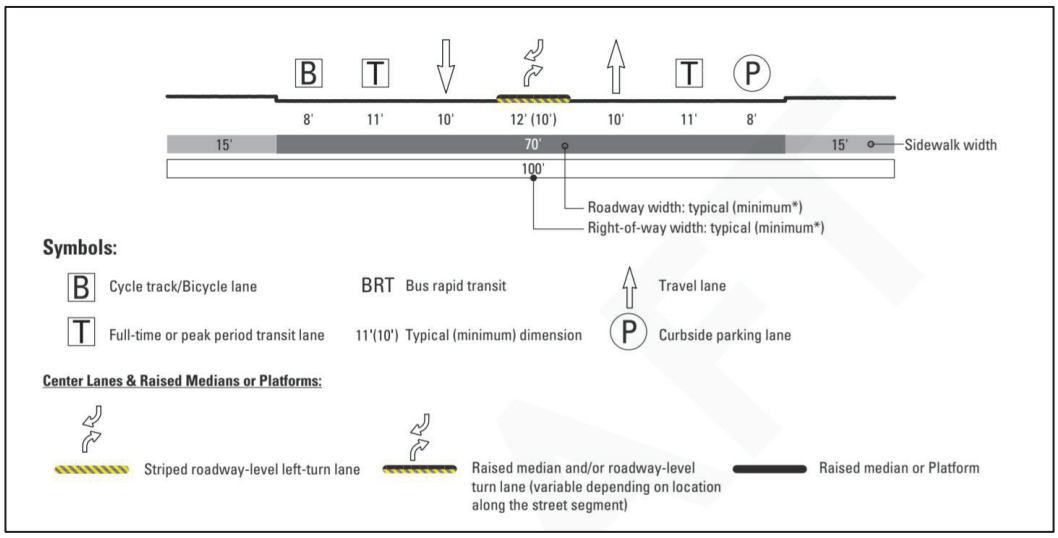

Figure 3.4. Legend for complete street cross sections (Source: LADCP, 2014)

3.4.2. Street Signs

The presence of peaceful and well-designed places in the city is one of the important perceptions that attract people to the cities. Visual pollution and incompatible

signs that create confusion are the driving factors in perception against the city. Regarding Lynch (1960) the city must be legible and recognizable. A legible city can be easily distinguished and grouped in a simple way. While legibility and permeability are not only important features of a beautiful city, but it is particularly important in urban scale considering the circles of size, time and complexity (Lynch, 1960).

The identity of a city is provided by its physical and social structuring, as well as its natural beauties. Urban design is one of the most important determinants of urban identity. An entire street in the city can be brought to a brand new, aesthetic and urban culture worthy of identity and quality with urban design elements. The cities, which have gained meaning with the sense of urbanity and sense of belonging, establish this meaningful connection with the successful designs and bring positive interactions (Yılmaz T., Yazıcıoğlu I., Şavklı F., 2012). Regarding the Design Guidelines for Commercial Facade Improvements which was prepared in 2003 by the Philadelphia City Planning Commission for the Department of Commerce summarized the design guidelines that ranked as below:

- Improve the quality of physical alterations to commercial corridor.
- Enhance the quality of pedestrian experience along a commercial corridor by providing a pleasant shopping experience for business patrons.
- Enhance economic investment for business and property owners.
- Protect and conserve neighborhood architectural character.
- Promote community awareness of the physical environment.
- Encourage flexible and individual creativity rather than anonymous uniformity (Design Guidelines for Commercial Façade Improvements, 2003:1).

For example, a study conducted in Turkey, the street arrangements, the colours of the commercial signage and the boards, the signboards hanging on the facades and sidewalks/pedestrian roads, exhibitions, tables and chairs have been tested by using virtual spaces. The results showed that the streets with single colour plates were more favorable and more preferred for shopping than the streets where multi-colored plates were found (Çubukçu E., Özcan N. S., Özkan A., 2014). With the same purpose, In September 2006, São Paulo's mayor, Gilberto Kassab, passed the so-called "Clean City Law," outlawing the use of all outdoor advertisements, including on billboards, transit,

and in front of stores (Figure 3.5). No longer covered in homogenous and imposing signs, the unique character of São Paulo was able to resurface (Kohlstedt, 2016).

Figure 3.5. Before and after images by Marcelo Palinkas of the São Paulo City Council (Source: Kohlstedt, 2016)

3.4.3. Street Furniture

Street furniture is the objects that facilitate the individual and social life of the city within the urban texture, provide communication between the individuals, give the space a certain meaning from a functional and aesthetic point of view, and have different qualities and quantities, define and complete the space (Güremen, 2011). Also, urban furniture has a cultural and social importance on daily life in terms of urban identity. City furniture in each city should be designed and produced regarding the urban identity of the place, and a city furniture coordination commission should be provided to establish a common language among the existing urban furniture (Güneş, 2005).

Street furniture has great importance not only for functional purposes but also for their exhilarating effects on urban life. User groups and their expectations, usage purposes, historical features of the place, habits, ergonomics, durability, and aesthetics play an important role in all kinds of urban furniture used in urban outdoor spaces. Regarding the Aksu (2012), urban furniture can be classified as follows according to their functions:

- Floor coverings (different materials regarding the purpose)
- Resting units (benches, chairs, group seating elements)
- Lighting elements (road illuminators, field illuminators)
- Signs and information signs (routers, locators, information boards)
- Limits (limiters, deterrents, pedestrian barriers, traffic barriers)

- Water element (ornamental pools, fountains)
- Top cover elements (stops, shades, pergolas)
- Sales units (kiosks, exhibition pavilions, kiosks)
- Art objects (sculptures)
- Playground elements
- Other items (garbage cans, flower beds, bicycle parking spaces, challenge hours, plant items, flag poles, etc.)

On the other hand, the usage of street furniture can be diversified and shaped by the users according to their usage purposes thanks to modern urbanization approaches. The concept of urban furniture is an issue that keeps up to date. In the cities where socio-economic and cultural level is increasing, the requests and suggestions of the users are at the forefront in a design process. For Example, in the Netherlands in the district of Lombok in the city of Utrecht, Pop-Up which was designed by Carmela Bogman and Rogier Martens, provides different alternative of public needs. When the furniture pumped out is works as a changeable furniture by creating private spaces in public spaces through providing different heights to create bench seats, tables, and even a stage. As seen in the Figure 3.6, it should be ensured that the street furniture material selection should be robust and, if necessary, can be dismantled and renewed.

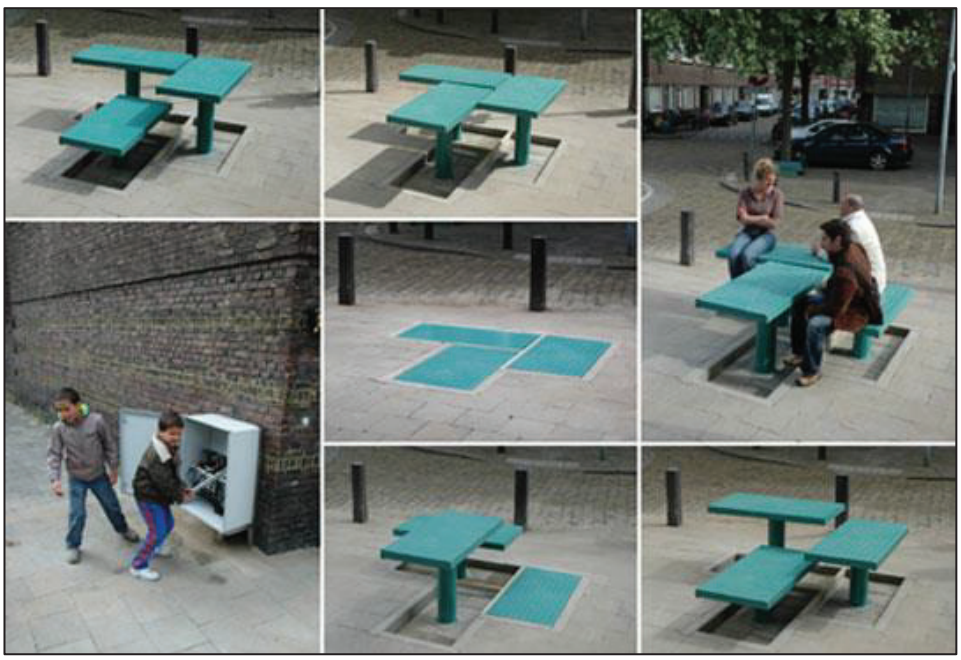

Figure 3.6. Different usage of Pop-Up street furniture (Source: J. Boer, 2010)

3.4.4. Street Trees

It is accepted that street trees have a very important function in urban centers in order to improve the quality of life of the people, to improve the visual aesthetics and ecological aspects of the city, to reduce the amount of carbon dioxide released and to store carbon (Tuğluer M. and Gül A., 2018). Therefore, the hard, solid, dull and lifeless appearance of the material forming the landscape, such as stone, asphalt, concrete, iron, is brought to a more natural and human-like condition with materials that show a lively, soft and warm appearance like plants. For instance, in Vietnam, many of the capital's 29,600 trees are dying, posing safety risks to drivers during the rainy season regarding the statement of city' construction department, so the municipality of Hanoi cut down the first 500 trees of 6,700 green trees in the city centre (Kurfürst, 2016).

As seen in Figure 3.7, before the process, well-planted urban roads seem to have an important place in the urban landscape as complementary to the organic integrity as the continuation of the green areas of the city and the green passages connecting them. Therefore, it is necessary to provide certain principles and methods in planning, design and application as well as providing maintenance and protection of street trees which bring the fourth dimension to urban life.

Figure 3.7. Hanoi's Streets in Vietnam before and after 500 trees were uprooted in 2005 (Source: Saigoneer, 2015)

On the other hand, in the technical viewpoint of street trees, dendrological characteristics such as size, shape, color, and texture should be taken into consideration as well as adaptation to environmental conditions and placed in accordance with the intended use for localization and usage of plants in public spaces. In this way, aesthetic and functional designs can be made and the desired result can be reached. For example, planting trees frequently or infrequently allows them to reach the level of comfort for the human body by creating semi-shaded, semi-sunny spaces (Whyte, 1980). Green elements, canopies, windbreakers, and various street furniture should be used to protect from bad weather. These elements, however, should not restrict the passage and visibility of pedestrian crossings, road and street use.

3.4.5. Sidewalk Material

A sustainable and resilient sidewalk is one that has been designed to suit the local context (N. Hidayat and et al., 2011). Sidewalks can be damaged by climate and weather variation, and it is necessary to plan for and consider local seasonal needs in the design. Priority should be given to the choice of material which can be used as solidness, smoothness of the surface, and non-slip material in pedestrian spaces.

The materials should be selected to be durable, do not cause injury and can be dismantled and renewed if necessary. In particular, surface covering on street stairs, ramps, pavements, and pedestrian crossings should be covered with durable and non-slippery materials that will not cause an accident (Bassuk N., Evans M., Trowbridge P., 1990).

Walking patterns can be influenced by different colours and paving patterns like tinted or porous concrete, pavers, asphalt, granite, and cobblestones (D. R. Smith, 2006). For instance, a lot of number of traffic accidents happened in the Times Square area in the summer of 2009, so the city's Department of Transportation decided to close off Broadway to vehicles and created temporary pedestrian-only spaces with different sidewalk materials and street elements instead (Howarth, 2017). Amount of pedestrian space was extended to the double amount and activity zone was designated to improve the pedestrian traffic flow in the area. The successful change was observed that the city decided to make it permanent (Figure 3.8).

Figure 3.8. A view of Times Square before and after its transformation from traffic-choked throughway to broad pedestrian plaza in 2009.
(Source: Hämäläinen, 2015)

3.4.6. Sidewalk Width

Sidewalk width is determined based on the location in the city, the population in the area of influence, land use and user density. For instance, sidewalk width is wider in the urban centers, where combine different functions, pedestrian flows are concentrated due to their functional attractiveness and transportation point. According to the guidebook 'Urban roads - Design criteria for preventive barriers on sidewalks (2012)' published by the Turkish Standards Institute; pedestrian width should be at least 1.50 meters. Also, ideal pavement characteristics are as follows:

- In cases where pedestrian pavements are not required, a banquet of 0.75-2 meters wide should be made. Pedestrian paths should be described at least 2 meters wide on both sides of the motorway in the district connection, intra-regional collector, inland and service roads.
- Pedestrian pavement on roads with no front yard structure should at least 2.50 meters wide; in intense pedestrian traffic where has commercial, office, public offices in the central business district characteristics, pedestrian sidewalk width should be at least 5 meters.
- If the road width is not suitable, the pavement width can be reduced to 3 meters. However, in new arrangements on roads in residential areas open to urban development, the width of the pedestrian sidewalk cannot be less than 1 meter.

Pedestrian pavements in the city are key for a comfortable and safe pedestrian access. According to Project for Public Spaces (PPS), the walking lane on the pedestrian walkway should be at least 2.50 m, and 4 people could easily pass along side by side (Hepcan and et al., 2006). On the other hand, regarding Boston Complete Streets Design Guidelines (Figure 3.9):

''*If the sidewalk runs along an adjoining wall, hedge, fence or other vertical element, an additional 1½ to 2 feet of width is necessary to accommodate the human tendency to maintain a clear distance from such obstructions. Depending on the circumstances, it may be best to simply leave this 1½ to 2-foot buffer area unpaved to allow for access to underground utilities just outside the sidewalk. When it comes to street side of a sidewalk, there is a minimum of 1.5 to 2.0-foot buffer area should be left adjacent to the back of the curb''*. (Boston, Complete Streets Design Guideliness, 2013:41)

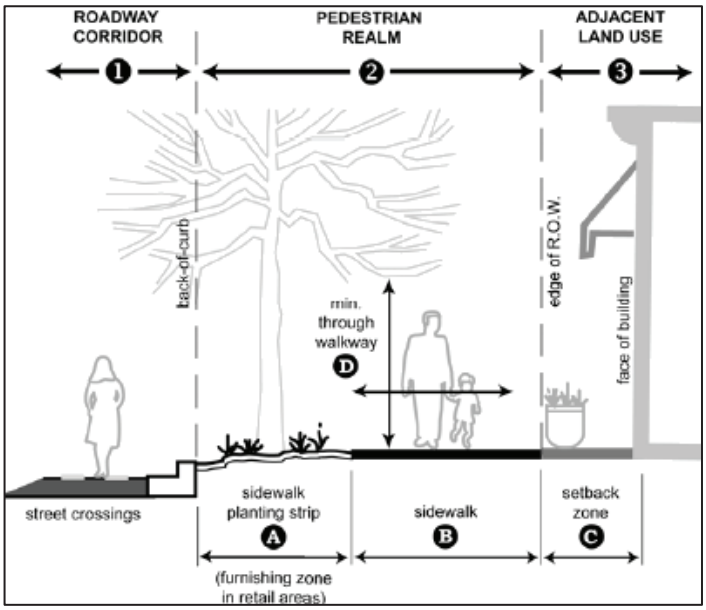

Figure 3.9. Impact of buffers, sidewalk width, and setback of adjacent land to the pedestrian friendliness (Source: Litman, 2019)

3.4.7. Sidewalk Continuity

As mentioned in previous parts, sidewalk continuity can be evaluated with the combination of all physical and aesthetic aspects as a whole. A well-connected sidewalk contributing the social and public life allows people to choose multiple paths without any obstacles including wrong located street furniture and elements. In the book of The Death and Life of Great American Cities, Jane Jacobs says:

''*The sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers. Nobody enjoys sitting on a stoop or looking out a window at an empty street. Almost nobody does such a thing. Large numbers of people entertain themselves, off and on, by watching street activity*''
(Jacobs, 1961:276).

Hepcan and et al. (2006) made a research to measure challenges and opportunities in comfortable and safe pedestrian circulation in nine streets in İzmir. Regarding the results of their research, they found that Factors such as sidewalk widths, living street elements (trees, street pots etc.) and car parking on sidewalks are the most important negative factors affecting pedestrian access. In this context, they have identified recommendations for the improvement of public places and pedestrian continuity. These can be listed as follows (2006):

- Basic principle in pedestrian design; The pedestrian should be safe, comfortable and also shortest way from one point to another should be provided for street continuity.
- There should be no obstacles (pauses, advertisement-billboards, electric pylons, garbage containers, vehicles, shop products, etc.) that will prevent pedestrian movement on the sidewalks and / or endanger its safety.
- The planting of the pedestrian pavements within the pedestrian networks to be formed in accordance with the technique will make an important contribution to the formation of the urban green network system in addition to the functions it will provide.
- Public transportation positively affects the continuity of pedestrian access, as it will lead to a reduction in the number of private and moving private cars, as well as many benefits of highlighting public transport systems.
- The width of the sidewalks is a very important factor affecting pedestrian access. Pavement widths do not only affect pedestrian access positively or negatively, but also play a role in reducing or increasing the effectiveness of problems caused by other living and non-living street elements. Therefore, pedestrian pavement widths should be adjusted according to standards.

For example, Copenhagen, where is known as a good example of pedestrian city, is extending its growing pedestrian street network and connectivity (Makovsky, 2002). Despite the certain inherited characteristics of city pattern such as narrow medieval street

grid, the city has worked continuously to improve the quality of street life (G. Wang, 2011). ”Strøget” which was Copenhagen’s main vehicle street turned into a pedestrian street in 40 years, also known as the world’s longest pedestrian street with 3,2 km length (Makovsky, 2002). City planners have taken numerous small steps to transform the city from a car-oriented place to a people-friendly one. About the evaluation of the city, a Danish architect and co-author of ‘‘*Public Spaces-Public Life*’’ Jan Gehl says “*In Copenhagen, we have pioneered a method of systematically studying and recording people in the city*” (Pedestrian Cities/Quality of Life, n.d.). In this way, they have designed the city as pedestrian-friendly and made it accessible for all (Figure 3.10).

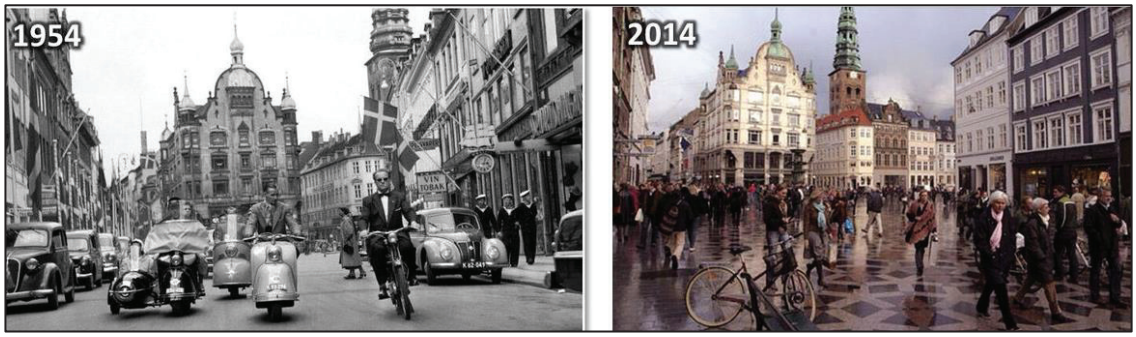

Figure 3.10. The World’s longest pedestrian street ‘‘Strøget’’ in Copenhagen
(Source: The World’s longest Pedestrian Street ‘‘Strøget’’, n.d.)

3.4.8. Street Maintenance

Protection and maintenance of street furniture and infrastructure elements in public places are important in terms of ensuring the quality of the life and continuity of the pedestrian network. The continuity of social activities and user satisfaction in urban places are possible with a healthy and clean environment. It is important to consider the importance of environmental health in urban areas by providing good health conditions for all urban people, ensuring its continuity in an organized manner and taking precautions in case of threatening human health. Because a neglected place has visible signs of decay and irregularity. A well-maintenance place has a regular order which does not indicate the traces of wear in time which makes people more comfortable on the way (Ewing and et al., 2006).

As well as general maintenance of streets, air pollution, visual pollution and environmental pollution are existed in urban places where mixed use and vehicle traffic

is used extensively which cause the formation of unhealthy environments and reduce the use of space by disturbing users. In urban areas, it is important to ensure that environmental cleanliness is ensured in order to reduce the air pollution, not to create visual confusion, and to place the outdoor usage units between the street element in the amount that will meet the need according to the feature of the spaces in a way that will not prevent the circulation of the pedestrian road. Waste bins which are not sufficient for the place cause contamination of the area, and excess and unnecessary places cause confusion. In both cases, visual pollution occurs. According to the criteria of attractiveness and comfort of the place, a place with interesting street scenes and destinations is constituted by walkable environments, pedestrian roads, sidewalks are well maintained and clean; equipped with landscapes, landscapes, works of art, historical buildings or artefacts that will attract the attention of pedestrians in public space (Krambeck and Shah, 2006).

3.5. Comfort

The goal of walking as a mean of transport is getting from an origin to a destination as quickly and as comfortable as possible. Walking as leisure is an activity in itself. The pedestrian's goal is not to reach a destination as quick as possible but to enjoy the trip. Therefore, the criteria of the pedestrian comfort basically can be aligned that the extent to which the pedestrian environment is ''*easy, pleasant, protected, relaxed, sheltered and untroubled''* (Cambra, 2012).

Well-designed places meet the requirements of the user in the most appropriate way, as well as being used effectively, they are the places of trust and satisfaction and they support the walkability. Pedestrian comfort including physical (presence of elements to protect from climatic conditions, traffic calming elements, height of buildings, pavement width, street landscape etc.) and psychological (noise, odour etc.) needs of pedestrians should be provided in order to make streets more livable.

According to Jan Gehl, the livable city consists of livable areas. The quality of an area is assessed by being in the right place and having sufficient place. Characteristics of livable urban areas can be ranked as below (Nazifoğlu, 2016):

- Areas where people can access the design elements for shadow or sun needs while walking,
- Reduction of strong winds in the area,
- Little or no mechanical noise,
- The voices from people indicate that they have a good time,
- The boundaries where other activities appear and can be accessed,
- Comfortable seating and attractive ornaments,
- The absence of physical threat is to provide psychological peace.

Protection from climate conditions is an essential element that provides comfort. In countries with very hot climates, shadow elements on the facades or public places to help protect from the sun in an urban public place; In countries with cold climates, sunlight-enhancing designs play an important role in making the users feel comfortable. The presence of comfortable and adequate seating is another factor that provides comfort in a public place. Street furniture is also closely related to the comfort of the user such as whether the garbage cans are sufficient in the place. On the other hand, noise control should be taken into account through design elements (buffer with street trees, etc.) in the pedestrian zone in order to increase the feeling of comfortable of users.

3.6. Legibility

Legibility is defined as characteristics that help to stimulate place in the mind. The animation in the mind is expressed as the quality that makes the place different, and memorable. Physical elements and arrangements create different sensations and long-term effects, making the space memorable (Ewing and Handy, 2009; Ewing and et al., 2006). The places without character do not give the opportunity to users to revitalize the place in their minds. The existence of significant buildings, reference points, panorama, the square, bus stops, and marina facilities are perceived as strong references. The complexity of the place and the identifiableness of the sign elements changes the legibility. Legibility of place can be increased by the presence of physical elements which will be the reference point of the street and pedestrian roads, which facilitates orientation and direction finding. Legibility is important in the context of meeting the security needs in the place and affects walkability.

On the other hand, legibility is defined as ‘‘*In the process of way-finding, the strategic link is the environmental image, the generalized mental picture of the exterior physical world that is held by an individual. This image is the product both of immediate sensation and of the memory of the past experience, and it is used to interpret information and to guide action.*’’ (Lynch,1960:5). Because legible environments contain relatively simple, coherent, understandable, organizable elements (Lynch, 1960), people can easily and quickly obtain information about places with legibility elements. According to Lynch (1960), if an environment is so legible, it is easy to create an image in the mind. Lynch also proposes that these mental maps consist of five elements in order to analyse the legibility. These elements, which define his book of ‘‘*The Image of The City*’’, are the boundaries, the paths, the districts, the nodes, and the landmarks (Figure 3.11).

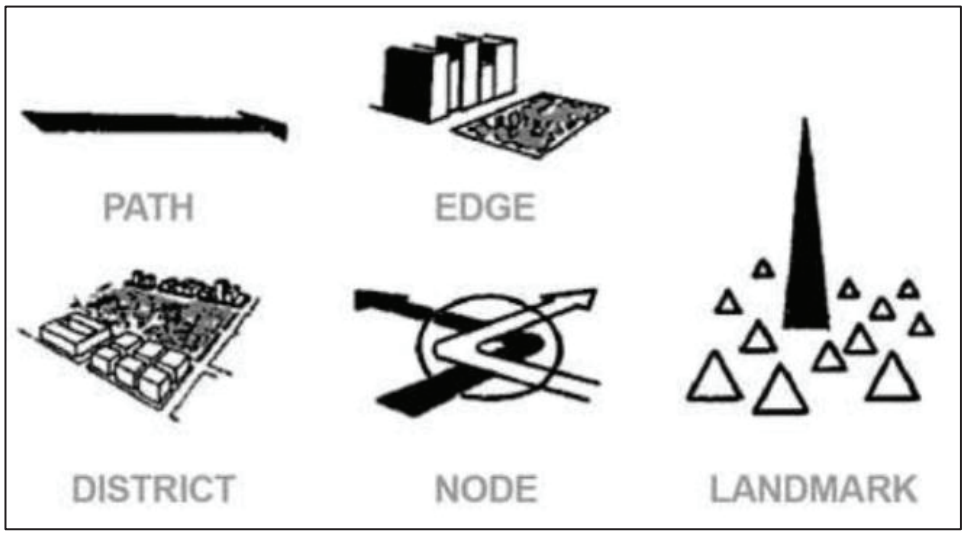

Figure 3.11. Original illustrations of Lynch’s city design theory from ‘‘The Image of the City’’ (Source: Eric Corey, 2013)

3.7. Summary of Walkability Principles from Literature Review

As much of literature, surrounding walkability suggests, there is neither one way nor a set a structure to explain what principles constitute a walkable environment and which methods should be followed to increase walkability comfort. In spite of these varieties, in this part of the thesis, walkability principles and their requirements were examined and ranked in previous parts according to the purpose of the thesis and characteristics of the case study area. Table 3.1 provides a summary of major findings from the walkability literature.

Table 3.1. Summary of walkability principles from literature review

	Elements	Literature Findings
Diversity		- Shorter distance to central services and facilities that reduce the travel time and courage people to walk, and mixed land use are all related with non-automobile trip demand, more walking, and active transport option (Frank and et al. 2006).
Accessibility	**Access to Public Transportation**	- Acceptable distance to the transportation stations should be 400 meters to 800 meters or a 10-20 minutes' walk (Southworth, 2005).
	Access to Parking	- Parking plots should be located behind the buildings and away from the street. - Provide on-street parking on 70% of both sides of the streets. - Screen or hide parking behind landscaping (Zuniga-Teran et al., 2017).
	Access to Open & Green Spaces	- Include a small greenspace (2 ha) within walking distance of homes (400 m), and encourage small shops on its boundaries, including food trucks (Zuniga-Teran, 2015).
	Barrier-free Access	- The design is useful and marketable to people with diverse abilities. - The design accommodates a wide range of individual preferences and abilities. - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.' - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. - The design minimizes hazards and the adverse consequences of accidental or unintended actions. - The design can be used efficiently and comfortably and with a minimum of fatigue. - Appropriate size and space are provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility (R. Mace, 1997:29).
Safety	**Traffic Design Elements**	- Regulations on roadway - bumps, humps, and other raised pavement areas - reducing street area where motor traffic is given priority - street closures - traffic diversion - surface texture and visual devices - parking treatments (The Federal Highway Administration, 2003) - Signalization system for both pedestrians and drivers - Pedestrian and traffic control signing and signals (London Department of Transport, 2011)
	Pedestrian Crossover	-Urban street connections should be at most 90 meters apart (Jacobs, 1993). -In pedestrian crossings with light control, traffic sign lamps should have a illuminated pedestrian figure for the hearing impaired and a sound (acoustic) warning sign for the visually impaired. -In places with uncontrolled pedestrian crossings, drivers must be warned for 20m advance passage to ensure safe use of obstacles. The pedestrian crossing should also be warned by pedestrian crossing and handicapped signs, and should be well lit (Road And Traffic Safety Congress For Sustainable Transportation Book by Department of Traffic Planning and Implementation of Gazi University Institute of Science and Technology, 2015).
	Lighting	- Legible environments should be designed to guide pedestrians for seeing and understanding their surroundings. - Pedestrians should able to see each other, especially other pedestrians. - Alternative routes should be provided to pedestrians in case of avoiding potentially dangerous situations (Pedestrian Planning and Design Guide by New Zealand Transport Agency, 2008:4-6)

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Table 3.1 (cont.)

	Sense of Safety	- Combination of physical and functional diversity in the neighborhood and the different methods of use make the place felt more secure. - The existence of commercial activities, distribution of social facilities and public transport stops and routes take place together by making the nature of the place feel safer (Jacobs, 1961). - High crime rates have a bad influence on walking trips (Alfonzo, 2005).
Street Quality	**Street Width**	The following steps should be followed in the preparation of classification stages for urban roads: - Preparation of maps showing the current and future pedestrian and vehicle traffic volume in the city's road network - Preparing maps showing the geometric standards of the city's road network - Preparation of city's accident maps - Preparing maps showing the land use of the city - Speed, junction types and intermediate distances, pedestrian mobility, traffic volume and geometric standards review - Preparation of new speed and road functional map according to the elimination of discrepancies (Kayacı, 2015).
	Street Signs	- Improve the quality of physical alterations to commercial corridor. - Enhance the quality of pedestrian experience along a commercial corridor by providing a pleasant shopping experience for business patrons. - Enhance economic investment for business and property owners. - Protect and conserve neighborhood architectural character. - Promote community awareness of the physical environment. - Encourage flexible and individual creativity rather than anonymous uniformity (Design Guidelines for Commercial Façade Improvements, 2003:1).
	Street Furniture	- City furniture in each city should be designed and produced regarding the urban identity of the place, and a city furniture coordination commission should be provided to establish a common language among the existing urban furniture (Güneş, 2005).
	Street Trees	- Green elements, canopies, windbreakers, and various street furniture should be used to protect from bad weather. - Street trees should not restrict the passage and visibility of pedestrian crossings, road and street use.
	Sidewalk Material	- Surface covering on street ladders, ramps, pavements, and pedestrian crossings should be covered with durable and non-slippery materials that will not cause an accident (Bassuk N., Evans M., Trowbridge P., 1990).
	Sidewalk Width	- Pedestrian width should be at least 1.50 meters. -In cases where pedestrian pavements are not required, a banquet of 0.75-2 meters wide should be made. Pedestrian paths should be described at least 2 meters wide on both sides of the motorway in the district connection, intra-regional collector, inland and service roads. -Pedestrian pavement on roads with no front yard structure should at least 2.50 meters wide; in intense pedestrian traffic where has commercial, office, public offices in the central business district characteristics, pedestrian sidewalk width should be at least 5 meters. -If the road width is not suitable, the pavement width can be reduced to 3 meters. However, in new arrangements on roads in residential areas open to urban development, the width of the pedestrian sidewalk cannot be less than 1 meter (Urban roads - Design criteria for preventive barriers on sidewalks by the Turkish Standards Institute, 2012).
	Sidewalk Continuity	The pedestrian should be safe, comfortable and also shortest way from one point to another should be provided for street continuity. - There should be no obstacles (pauses, advertisement-billboards, electric pylons, garbage containers, vehicles, shop products, etc.) that will prevent pedestrian movement on the sidewalks and / or endanger its safety.

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Table 3.1 (cont.)

	Sidewalk Continuity (cont.)	- The planting of the pedestrian pavements within the pedestrian networks to be formed in accordance with the technique will make an important contribution to the formation of the urban green network system in addition to the functions it will provide. - The width of the sidewalks is a very important factor affecting pedestrian access. Pavement widths do not only affect pedestrian access positively or negatively, but also play a role in reducing or increasing the effectiveness of problems caused by other living and non-living street elements. Therefore, pedestrian pavement widths should be adjusted according to standards (Hepcan and et al. 2006).
Comfort		Characteristics of livable urban areas can be ranked as below (Nazifoğlu, 2016): - Areas where people can access the design elements for shadow or sun needs while walking, - Reduction of strong winds in the area, - Little or no mechanical noise, - The voices from people indicate that they have a good time, - The boundaries where other activities appear and can be accessed, - Comfortable seating and attractive ornaments, - The absence of physical threat is to provide psychological peace.
Legibility		- Physical elements and arrangements create different sensations and long-term effects, making the space memorable. - The places without character do not give the opportunity to users to revitalize the place in their minds. - The existence of significant buildings, reference points, panorama, the square, and bus stops are perceived as strong references (Ewing and Handy, 2009; Ewing and et al., 2006).

CHAPTER 4

CASE STUDY: MEHMETÇİK BOULEVARD IN İZMİR

In this chapter, the methodology of the research that is the case study approach is explained. Additionally, the background information about the study area and studies focused on the Mehmetçik Boulevard are presented.

4.1. Research Method for Case Study Area

The research of the case study consists of mainly two parts: data collection and data analysis. In the first part, data collection is described in detail. In the next part, methods for analysing the walkability principles are described through statements, questions and research tools in order to explain how case study area is examined.

Data collection includes mainly four parts: literature review, site survey, interviews and questionnaires. Quantitative and qualitative data are used to understand the walkability and to examine the characteristics of Mehmetçik Boulevard. Online resources and materials from the library are used for in-depth research. It is demonstrated in Figure 4.1.

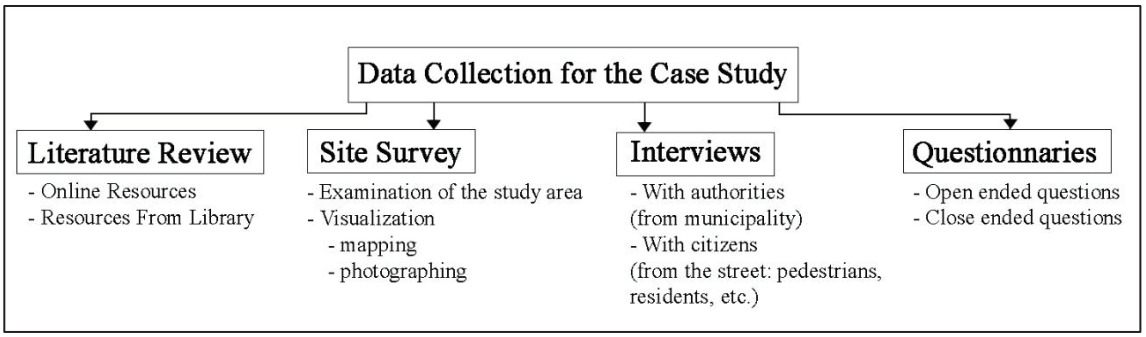

Figure 4.1. The scheme indicating the data collection

Data collection for the case study is described as below:

- *Literature review of case study area*, journal articles, books, conference papers, announced competitions, technical reports and published research works related to the walkability are used as the data supplied from online resources and the library.
- *Site survey and observations* are done to examine the positive and negative factors that affect the walkability quality of Mehmetçik Boulevard. The investigation followed by mapping techniques and taking several photographs.
- *Interviews* were conducted to get different ideas, comments and demands about Mehmetçik Boulevard with the authorities from municipality and citizens, pedestrians, residents, workers in the study area. In this way, it is aimed to understand and analyze different opinions in order to reach an objective and general view.
- *In the questionnaires part*, two types of questions are used as open-ended and close-ended (Appendix B). *Open-ended questions* are defined as free-form survey questions that allows a respondent to answer in open text format such that they can answer based on their complete knowledge, feelings, and understanding which means that response to this question is not limited to set of options offered (Urša Reja et al., 2003). On the other hand, *close-ended questions* and *statements* that leave survey responses limited and narrow to the given options are formed as Likert-type scale and multiple-choice questions in this thesis. Respondents were asked whether they agree or disagree with a statement regarding Likert-type scale questions. Options are separated into three parts as agree, neither agree nor disagree, and disagree which can be used to analyze results (Joshi et.al., 2015). With the Likert-type scale and multiple-choice questions, it is aimed to get clear answers from participants about the specific questions.

For the analysis of the case study, the thesis investigates and analyzes walkability principles which are diversity, accessibility, safety, street quality, comfort, and legibility. Analysis of the data was made through mapping technique, interpretation of the results and comparison of the literature findings and current situation of the case study area. Data collection and data analysis of walkability principles for the case of Mehmetçik Boulevard are indicating in table 4.1.

Table 4.1. Data collection and data analysis for case study area

Formulation / Principles	Data Collection	Data Analysis
Diversity	- Literature review - Photographing - Observation - Interview - Questionnaires: - Survey Question: 'What is your purpose of using the street?'	- Mapping - Land use map - Interpretation of the results of survey question - Comparison of findings from literature and current situation of the boulevard
Accessibility	- Literature review - Photographing - Observation - Interview - Questionnaires: - Survey Statements: 'Transportation to the public transport is convenient from the boulevard.' 'Parking on the boulevard restricts the movement of pedestrians.' 'The boulevard is accessible and usable for disabled citizens.'	- Mapping - Stations of the public transit modes -Parking plots along the boulevard - Open & green areas - Solid-void - Interpretation of the results of survey question - Comparison of findings from literature and current situation of the boulevard
Safety	- Literature review - Photographing - Observation - Interview - Questionnaires: - Survey Statements: 'There is no traffic intensity on the boulevard.' 'Traffic signs are sufficient in terms of pedestrian and vehicle flow.' 'Traffic calming measures (ramp, information, lighting) were taken on the boulevard in terms of safety of the pedestrians.' 'There are enough pedestrian crossings on the boulevard.' 'The pedestrian crossings are in the right place.' 'Night lighting is sufficient for the citizens.' 'There is a noise problem on the boulevard.' 'The boulevard is safe at night.'	- Mapping - Traffic design elements and pedestrian crossovers - Lightening map - Interpretation of the results of survey question - Comparison of findings from literature and current situation of the boulevard

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Table 4.1 (cont.)

Street Quality	- Literature review - Photographing - Observation - Interview - Questionnaires: - Survey Statements: 'The boulevard width is wide enough in terms of vehicle traffic.' 'The signs and information elements of the shops on the boulevard do not disturb the citizens aesthetically.' 'Street furniture (bank, trash can, etc.) is sufficient.' 'Street furniture does not prevent the movement of the pedestrians.' 'There are enough trees and green spaces on the road.' 'The trees and pots do not prevent the movement of the pedestrians.' 'The texture of the sidewalk has a comfortable structure for walking behaviour.' 'The texture of the sidewalk has appropriate criteria for the use of elderly, disabled people and children.' 'The width of the sidewalk is sufficient.' 'Adherence and continuity are provided between the sidewalks.' 'The street is clean and well maintained.' - Survey Questions: 'What do you think about the extension of the sidewalk width? If it is positive, which part of the sidewalk of the boulevard should be extended?'	- Mapping - Street width map - Street elements map - Sidewalk width map - Interpretation of the results of survey question - Comparison of findings from literature and current situation of the boulevard
Comfort	- Literature review - Photographing - Observation - Interview - Questionnaires: - Survey Question: 'Which part of the boulevard is more uncomfortable for the pedestrians? (rest places, architectural elements protecting pedestrians from climatic conditions, etc)? (F1, F2 or F3)'	- Interpretation of the results of survey question - Comparison of findings from literature and current situation of the boulevard
Legibility	- Literature review - Photographing - Observation	- Comparison of findings from literature and current situation of the boulevard

SPSS (Statistical Package for the Social Science) is used for the evaluation and demonstration of the close-ended questions results. In detailed, visualized and distinguished results prepared by SPSS program are shown in Chapter 5.

Open questions, solicit the other person's thoughts, feelings, and/or interests and can be answered in ways that are more diverse and expansive (Ursa Reja et al., 2003). 3 open-ended questions were asked to the respondents. These are: ''Which part of the boulevard is more uncomfortable for the pedestrians?'', and ''What do you think about the extension of the sidewalk width? If it is positive, which part of the sidewalk of the boulevard should be extended?''.

The survey consists of 60 questionnaires were selected from different users in terms of age, gender, education and occupation to create variety in the study area. 3 main age intervals were determined; people between 16-30 years old, 31-60 years old and older than 61 years old. Most of the questionnaires were done during working days, only 7 of them was conducted on Saturday. Also, the time interval for questionnaires was chosen during the day when daily life is as usual on the boulevard.

Table 4.2. Time schedule of questionnaires

Number of Questionnaires	Date	Day	Time Interval
10	30.08.2018	Thursday	09:30 – 15:00
9	03.09.2018	Monday	15:30 – 20:30
8	04.09.2018	Thursday	16:30 – 20:00
10	07.09.2018	Friday	15:00 – 18:00
7	08.09.2018	Saturday	11:00 – 15:00
9	07.06.2019	Friday	10:30 – 17:30
7	11.06.2019	Tuesday	11:30 – 18:30

Table 4.3 shows the respondent's distribution according to the age, gender and the reason for being on the street to analyze the results in different views. As seen in Table 2, 32 questionnaires were conducted with males and 28 questionnaires were conducted with females. Also, the usage frequency of the boulevard is demonstrated according to the age interval. In general, 25 % use every day, 18% use in weekdays, 19 % use 1-2 times in a month, 25 % use 1-2 times in a week and 18 % use 3-4 times in a week (Figure 4.2).

Among these people, people who are between 16 and 30 years, generally use the boulevard for meeting purpose 1-2 times in a month; people who are between 31 and 60 years, use the boulevard with 47 % percentage for working purpose; and people who are 60 and over years, use the boulevard for residential and shopping purpose (see Table 4.3 and Figure 4.2). It is shown the strong connection using purpose and usage frequency regarding to the age interval.

Table 4.3. Respondent profile

		16-30	31-60	61 +	Number	Percentage (%)
Gender	Female	11	12	5	28	45 %
	Male	8	16	8	32	55 %
	Total	**19**	**28**	**13**	**60**	**100 %**
Education	Primary School	1	6	4	11	18 %
	High School	5	19	6	30	50 %
	University or Higher	13	3	3	19	32 %
	Total	**19**	**28**	**13**	**60**	**100 %**
Reasons for Visiting	Resident	5	4	6	14	22 %
	Working	1	18	1	20	33 %
	Meeting (cafe or restaurants)	12	3	-	15	25 %
	Shopping	1	3	6	10	20 %
	Total	**19**	**28**	**13**	**60**	**100 %**

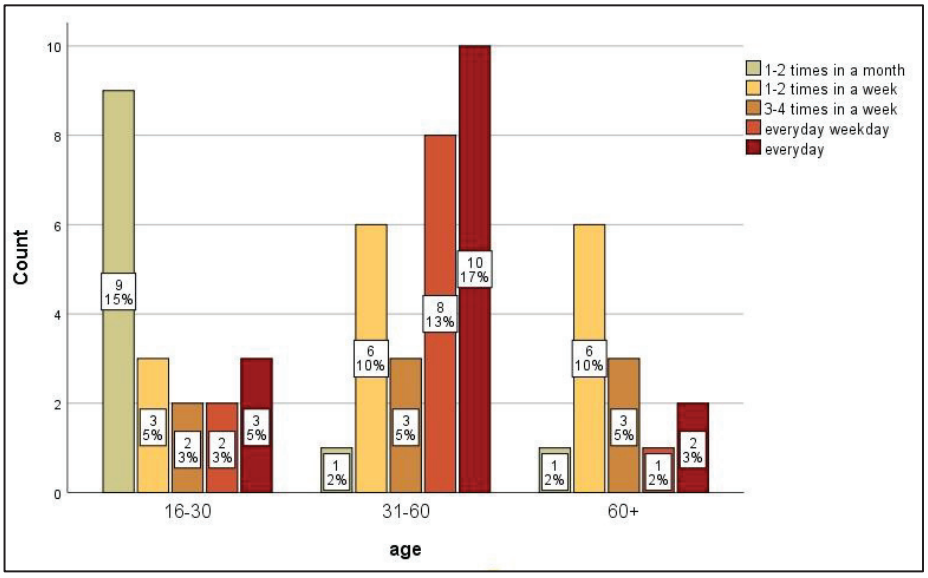


Figure 4.2. Usage frequency of the boulevard according to the age interval

4.2. General Information About Mehmetçik Boulevard

In this part of the study, planning regulations and locational features of the case study area is examined. In the second section, the essential features of Mehmetçik Boulevard are investigated in detailed scale.

4.2.1. Location of the Study Area and Surrounding Uses

Mehmetçik Boulevard, which is in Karabağlar District, is located in the southern part of İzmir Bay. Although Mehmetçik Boulevard is located within the boundaries of Üçkuyular Neighborhood in Karabağlar District, it was within the borders of Konak District till 2008. After this change, Karabağlar District has taken the title of the biggest central district of İzmir and increased population density through its spatial and environmental development (Figure 4.3).

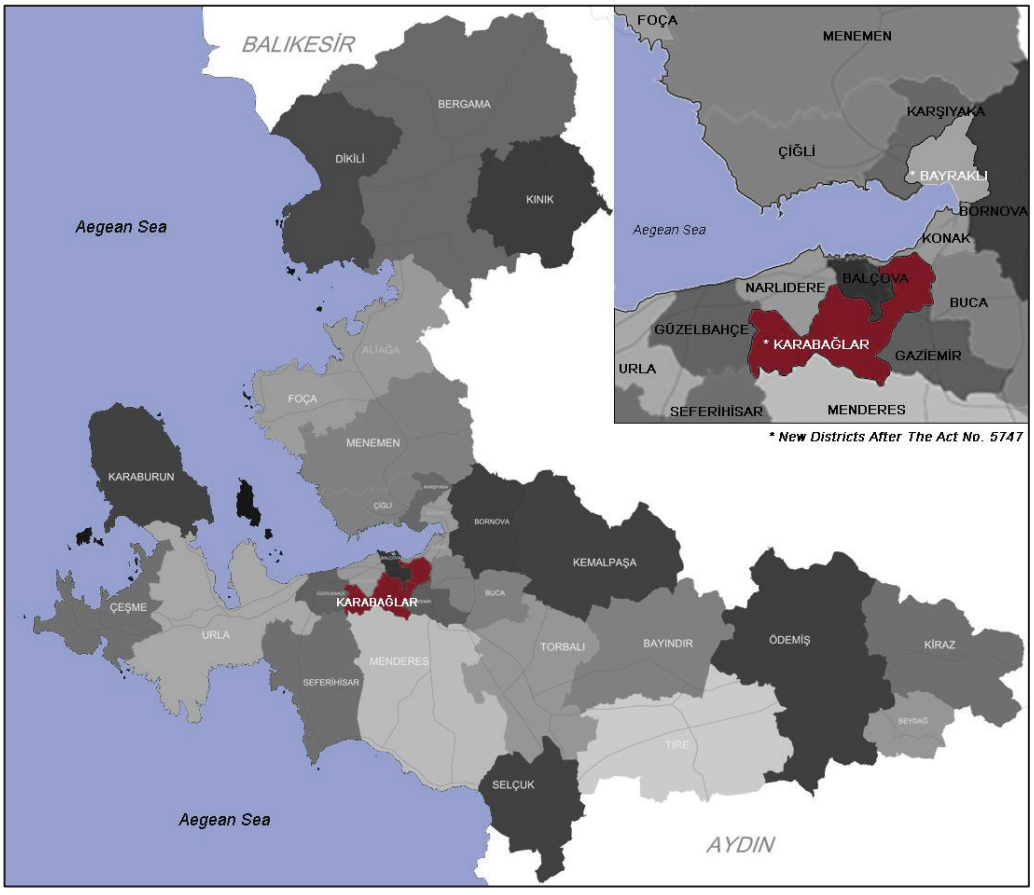


Figure 4.3. İzmir Metropolitan Municipality Boundaries Map (prepared by S.Bağcı)
(Source: Base map is from İzmir Metropolitan Municipality website
http://www.izmir.bel.tr/tr/BuyuksehirSinirHaritasi/125/212)

The location of Karabağlar has gained importance as a bridge between east and west part of İzmir due to the strong public transportation connections such as metro, tram and public bus stations in the Üçkuyular Square, and buses and minibuses terminal to Çeşme and Karaburun Peninsula (Figure 4.4). Moreover, Üçkuyular Ferry is located close distance to the case study area. This area, which is used intensively throughout the day, has being exceeded the carrying capacity, causing traffic congestion especially at Üçkuyular Square and highway exits, so this situation brings some negative aspects to the case study area and its surroundings. If the necessary infrastructure is not provided, it is predicted that it will lead to bigger problems.

When the relationship between the area and the coast is to be examined, İnciraltı Recreation Area and Urban Forest, which was constructed in 2006 west part of Üçkuyular Ferry Pier, constitute the most used open spaces of İzmir. Similarly, Mustafa Kemal Coastal Boulevard Project was started to construct in April 2017, but it has been used actively nowadays. With this project, it is aimed to strengthen the relationship between the city and the sea and to increase the usability of the tram line.

The area accommodates also important public buildings around it. İzmir Democracy University is located on the east side of the case study area and Economy University is on the south side of Balçova. In addition, Dokuz Eylül University Hospital are located in Balçova in the north.

In addition, at the beginning of the 2000s, shopping malls were started to be built on the western side of the highway that increases the usage intensity of the area. Over time, the value of the area has increased and functions such as the number of shopping centers, eating and drinking places, sports halls in the area have increased. In addition to the existing shopping malls, the construction of Istinye Park Shopping Mall is almost finished in the vacant plot where were previously bus terminal, parking lot and bazaar.

Especially in the last 20 years, there has been high demand for uses of the area around Karabağlar, İnciraltı, and Balçova. Along with the high population density and increasing investments, the livability criteria of the area are observed to change. The study area it does not have sufficient infrastructure to handle this density and resists the developing environmental conditions. For this reason, Mehmetçik Boulevard needs to be improved in terms of pedestrian and traffic flow. Excessive vehicle density and the

increase of commercial places within new projects have led the people in İzmir to indoor activities rather than outdoor activities. Pedestrian movements are restricted in the streets and public places because of the insufficient interventions. If the investments in the urban centers continue to increase, infrastructure needs of the neighborhoods increase.

Figure 4.4. Current general layout, main roads and general land-use patterns around Mehmetçik Boulevard (prepared by S. Bağcı)

4.2.2. Street Network Around the Study Area

Streets around Üçkuyular Square have different characteristics in terms of land use, topography, residential types and road structure. Therefore, different types of streets were chosen for examination of the area character to reach the question why Mehmetçik Boulevard was determined as a study area. These streets are İnönü Street on the eastern part, Gürsel Aksel Boulevard on the south-eastern, 65/11. Street and 65/12. Street on the western part connected to the Mehmetçik Boulevard and finally Deniz Feneri Street on the north-western part reached to the seaside (Figure 4.5). Street network around the study area is explained as below:

- İnönü Street is a long street and the busiest one during the day compared the others in this case. In the studied part of the street, buildings have 8 or 9 floors and

commercial usage on the ground floor. Even if both sides of the street have defined sidewalk, vehicle way has 4 lanes which bring the dense usage on the street.

- Gürsel Aksel Boulevard has different structure regarding the topography, residential type and the usage. The beginning of the boulevard which touches to the Mehmetçik Boulevard, has level differences till Demokrasi University. That is why, access between two points of the boulevard supplied by street stairs for the pedestrians. From the University of Democracy, level differences are not continued on the road and there is a sub-residential trade for daily use up to İnönü Street. When passing the other part of the Boulevard, residential usage is observed, despite the stadium construction. Yet, it is predicted that after opening the Göztepe Stadium, there will be condensation in the use of the street and around.
- In contrast to the streets on the eastern part of the square, the streets in the west have more calm usage. Even if the beginning of the 65/11. Street is used as commercial purposes on the ground floor and average of the building height is 4 floors.
- 65/12 Street is totally pedestrianized that makes the area more comfortable for pedestrians. So, these two streets have more neighborhood feeling than the other parts of the area. Nevertheless, the shortest connection between the square and sea was been providing on Şehit Binbaşı Ali Resmi Tufan Street which is used as a tramway now. So, 16. Street and 19/1.
- Street on the eastern part and Deniz Feneri Street on the western part are the closest access way to the seaside from the square. Entrance from Mithatpaşa Street to the Deniz Feneri Street is started to be used as a waiting place for the passengers, after moving the stops of public transportation vehicles because of the İstinye Park construction site. Since, Deniz Feneri Street is not preferred as a transition way.

Also, it is revealed that Mehmetçik Boulevard has a different character in itself. The fragmentation and diverse features of the boulevard will be explained in detail in the following parts of the chapter.

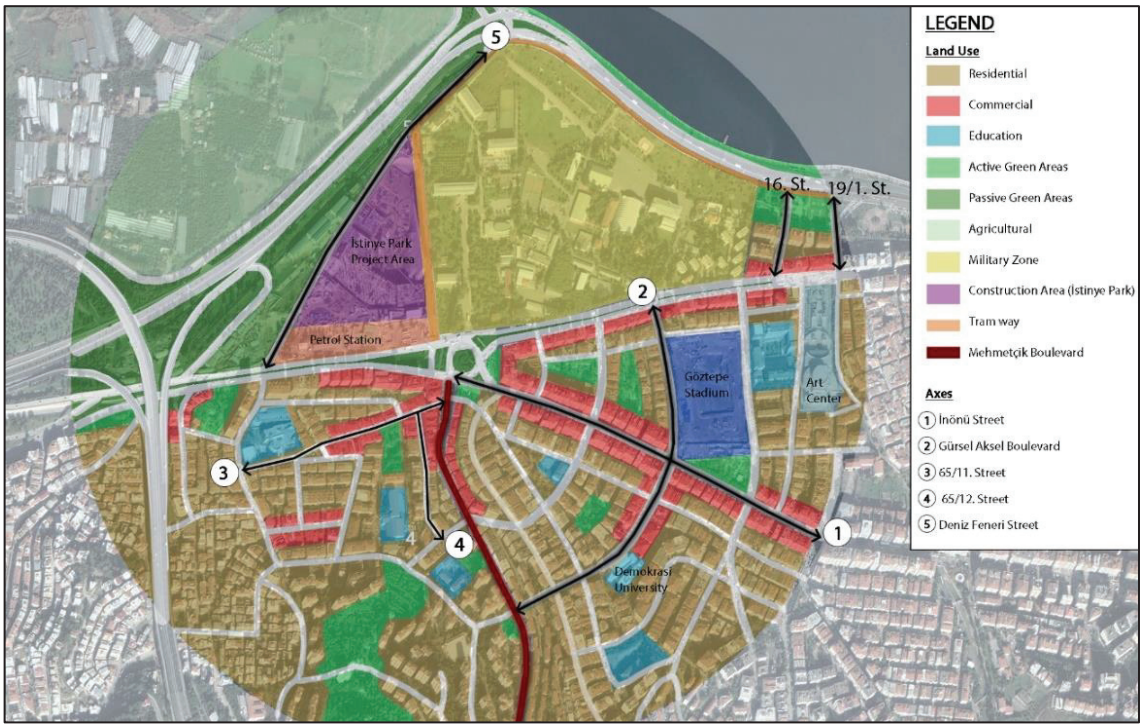


Figure 4.5. Main axes and ground floor land use around the study area

4.2.3. General Characteristics of the Study Area

Mehmetçik Boulevard starts at Üçkuyular Square in the north part and ends at the main public bus terminal in the south part. In the north, the boulevard joins İnönü Street which is a long street starts at Üçkuyular Square and ends at İnönü Square in Konak. Üçkuyular Square and the beginning of the boulevard are the most busy and attractive part of the case study area in terms of transportation facilities, commercial uses and public uses. The fact that there are metro and tram stations around the square also makes the region crowded. On the other hand, the boulevard ends in the south with the Fahrettin Altay Bus Station where is a main starting point of the public buses. In some respects, it can be said that Mehmetçik Boulevard is a long corridor which connects to the important transportation facilities (public buses, metro, and tram) into each other.

In the east-west axis, Mehmetçik Boulevard is located between Üçkuyular Neighborhood in the east part and Fahrettin Altay Neighborhood in the west part where have residential and mix-used land character. On both side of the street which starts at the Üçkuyular Square and ends at 11. Street and 65/8. Street; the ground floors of all buildings on the boulevard are used for commercial purposes, while the upper floors are used for residential. After this segment, there is a slope difference on the road between the east

and west part. This slope difference on the road starting from the first junction continues until the third junction. The distinctive difference on the road has created a sharp disconnection with the wall of fortification between two sides. On the west side, the Oyak Housing Site that is a completely residential character is observed; on the eastern side, the ground floor has daily commercial function in some parts, while the other floors are the residential. Yet, as mentioned above, there is no connection between these parts because of the slope. After this segment which starts with the third junction on the boulevard, there is no slope differences on the way, and both sides have residential character. However, the residential area on the west is a residential area for military officers, so access to this residential area is limited with the security measures.

The case study area which has mostly residential daily commercial facilities differentiate into each other as physically, topographically and socially and it causes the altered pedestrian movements (Figure 4.6).

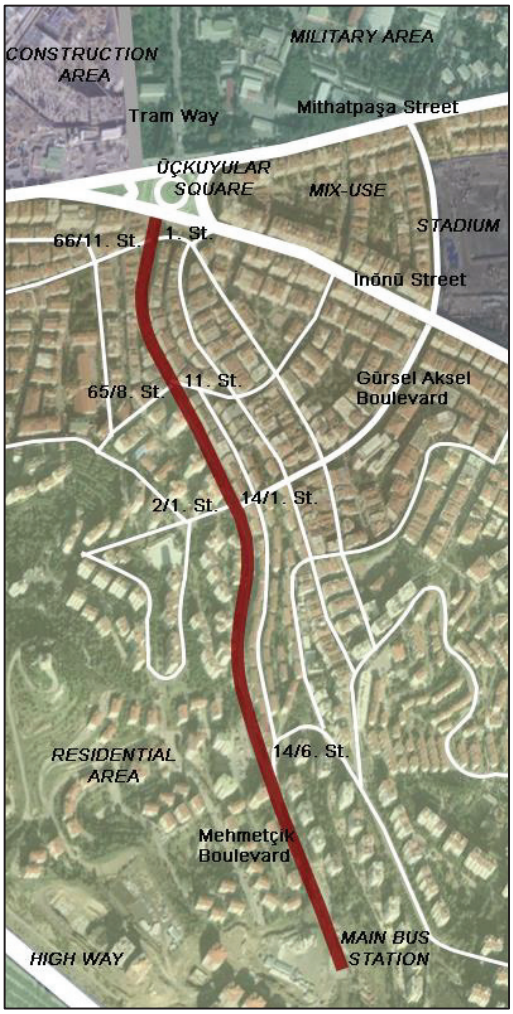


Figure 4.6. Current general layout, main roads and general land-use patterns around Mehmetçik Boulevard in detailed Scale (prepared by S. Bağcı)

Mehmetçik Boulevard has different characteristic features which can be divided into 3 fragments in terms of land use, street and pedestrian way division, slope differences on the way and social functions (Figure 4.7).

Fragment 1 (F1) starts from İnönü Street in Üçkuyular Square continues until the first crossroad in the boulevard. It is the busiest and most used part of the boulevard through commercial land use on the ground floor and proximity to public transport (metro, tram, etc.) that makes this fragment most attractive part and on the other hand, the most problematic fragment in terms of traffic intensity, congestion and sidewalk parking that reduces the continuity of the boulevard in terms of pedestrian and traffic flow.

Fragment (2) starts from the first junction in the boulevard, to the third junction. As mentioned in the previous section, it is the only fragment that the east-west connection cannot provide due to the topographic differences on the road, so it makes different feedbacks from both sides of the boulevard. Although commercial functions are observed in the eastern part, the western part is entirely a residential area. In the same way, even though there are parks on the street in the eastern part, this is not seen in the western part.

Fragment (3) starts from the third junction, up to the bus terminal. Unlike the second fragment, this area has no level difference on the way. It is also the quietest area in the boulevard, as the east-west sides are the completely residential character. On the other hand, parking lots are defined, pedestrian paths are more clearly designed.

These three fragments are used in the following chapters to evaluate walkability quality and determinants in deeply with comparison and analyze each of the characteristics. In this way, it is better to understand the walkability quality of the boulevard for different fragments in positive or negative ways.

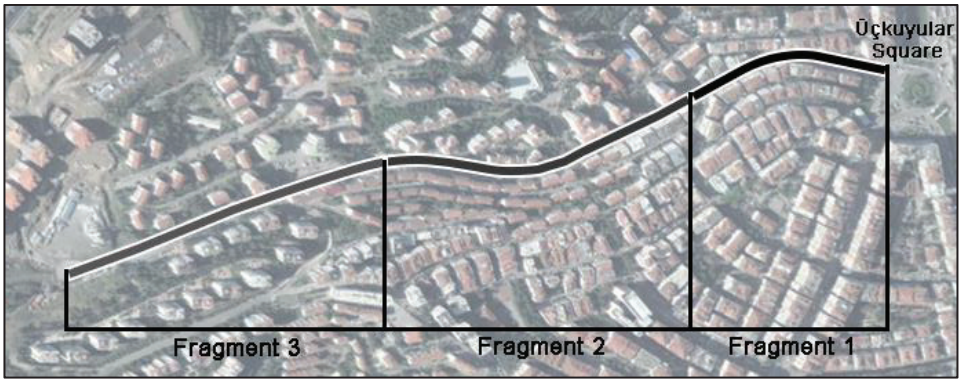


Figure 4.7. Fragmentation of Mehmetçik Boulevard (prepared by S.Bağcı)

CHAPTER 5

WALKABILITY EXAMINATION OF MEHMETÇİK BOULEVARD

In this part of the thesis, walkability principles explained in Chapter 3 are examined for Mehmetçik Boulevard in detail. Questionnaires, photographing and mapping techniques through examination and observation of the study area are used for defining the physical characteristics and pedestrian perceptions on the field. Firstly, each principle of walkability is investigated in order to determine the walkability comfort. Then, different fragments of the street described in Chapter 4 are comparatively evaluated.

5.1. Diversity on Mehmetçik Boulevard

Mehmetçik Boulevard has different activities and functions in different fragments (Table 5.1 and Figure 5.1). Entrance of the boulevard (F1) is the most attractive part in terms of daily usage and facilities. These various usages make an alternative form of transportation types more viable through public transport and walking. Eighty-six (86%) percent of ground floor usage in F1 constitutes commercial functions that are shops, restaurants, and cafes, while the first floors are residentials. Among this percentage, sixty-six (66%) percent of ground floor usage constitutes shops for daily use such as for food products, textile, jewellery, hairdresser, stationery, pharmacy, and veterinary. Cafe and restaurant usage for resting and meeting forms twenty (20%) percent of total ground floor land use. On the other hand, residential usage is fourteen (14%) percent of the total which is the lowest degree in three fragments. Because, the first fragment has a strong connection with İnönü Street and Üçkuyular Square are used intensively during the day and provide various public transportation modes such as metro, tram and bus stop.

The western part of F1

The eastern part of F1

Figure 5.1. General views from F1

F2 has more balance in terms of the distribution of land use among these fragments. The shops of grocery, hairdresser, pharmacy and car rental constitute twenty-four (27%) percent of the total ground floor land use. Also, the residential usage of the whole buildings is sixty (68%) percent (Table 5.1).

On the other hand, daily shops in F2 only serve the eastern side of the boulevard. The level difference on the vehicle road does not allow any connection between western and eastern parts (Figure 5.2). Topographic difference creates two different zones in this fragment of the boulevard; while the eastern side has mixed land use, the western side is totally residential usage. Oyak residential area covers most of the west side of the boulevard. Therefore, the western part is only used for transition purposes and access to residences. Only Cemil Midilli Park provides a public space to residences and pedestrians using the western part.

Oyak Residential Site

Daily shops

Figure 5.2. General views from F2 (Western part on the right side – eastern part on the left side)

The easiest going fragment in the boulevard is the F3 with twelve residential buildings, six daily commercial shops on the west side and two parks. There are no level differences on the road in this part, but the west side belongs to the residential area for military officers (military residences) and the other side is residential area, so it makes the fragment calmer and safer zone in terms of higher security precautions and wider road and sidewalk width (Figure 5.3).

Figure 5.3. General views from F3

Table 5.1. The classification of the ground floor land use according to the fragments

	F1		F2		F3		Total	
	#	%	#	%	#	%	Number (#)	Percentage (%)
# shops	33	66 %	11	27 %	6	33 %	50	**46 %**
# cafes & restaurants	10	20 %	2	5 %	-	-	12	**11 %**
# residences	7	14 %	27	68 %	12	67 %	46	**43 %**
Total	**50**	**100 %**	**40**	**100 %**	**18**	**100 %**	**118**	**100 %**

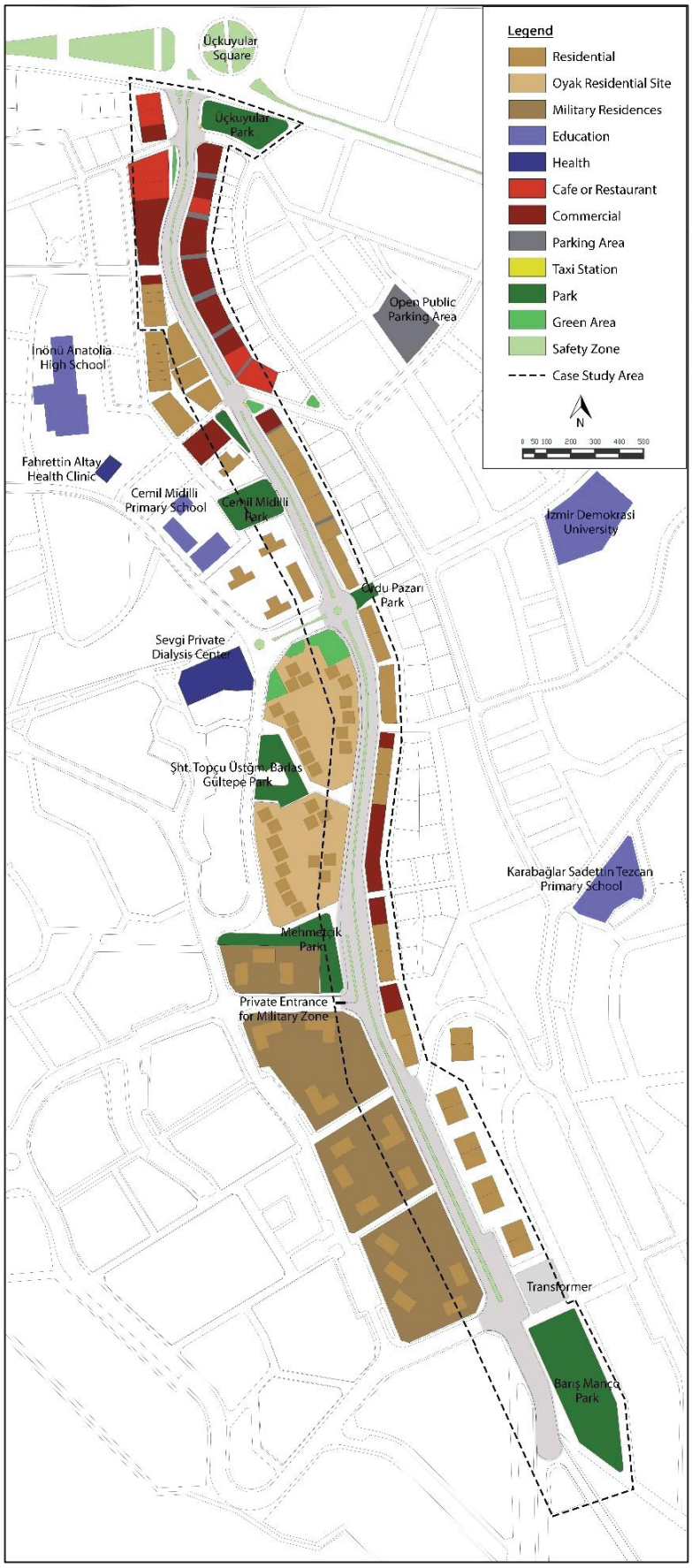


Figure 5.4. Current land use pattern for ground floor (Prepared by S. Bağcı)

Figure 5.5. Building height (Prepared by S. Bağcı)

5.2. Accessibility on Mehmetçik Boulevard

Creating an accessible neighborhood which is one of the fundamental dimensions of urban design, provide easy access to streets for everyone and ensure the availability facilities that can support for usage of the elderly and the disabled people. The connection of public spaces should be regulated through physical barriers, convenience, and accessibility to open and green areas. In this part of the thesis, accessibility and connectivity will be examined into four parts: access to public transportation, access to parking, access to open and green spaces, and barrier-free access.

5.2.1. Access to Public Transportation

Mehmetçik Boulevard has metro, tram and bus facilities, and also has two taxi stations. Üçkuyular metro station has four different entrances around Üçkuyular Square, one of them is located at the beginning of the Mehmetçik Boulevard. On the other hand, the tram station across the boulevard is two minutes distance to the study area by walking. In terms of sea transportation Üçkuyular Ferry Station is 2,4 km away from to the study area. The most powerful public transportation in the boulevard is public buses which have their main station at the end of Mehmetçik Boulevard in F3. There are three bus stops in F1, four bus stops in F2, three bus stops in F3. Yet, all bus stops do not have proper design and some bus stops do not have shelter or utility objects like noting informative sign which makes them invisible (Figure 5.6).

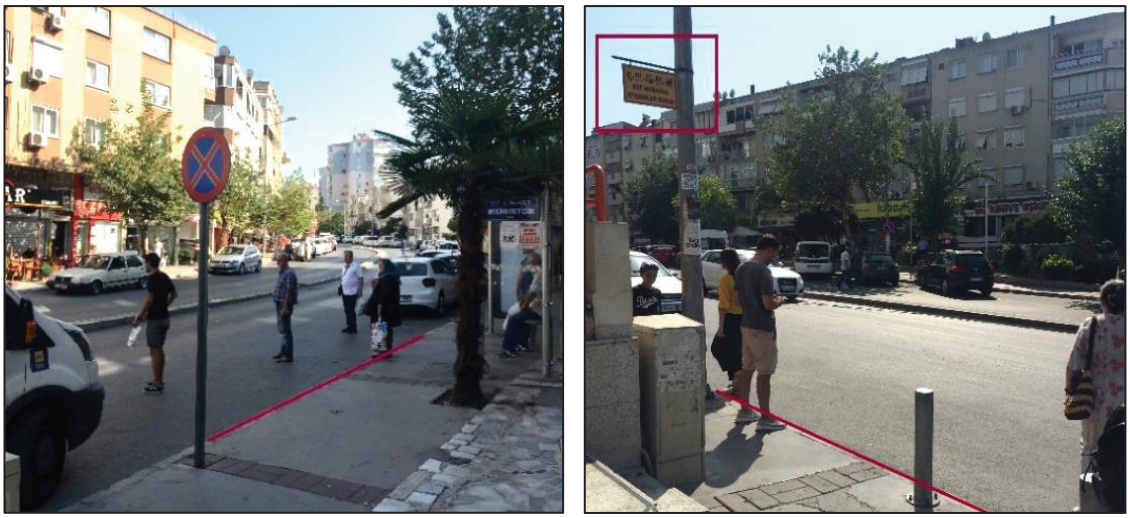


Figure 5.6. Problematic bus stops in F1

One of the primary advantages in the case study area in terms of accessibility is that public transportation is convenient from the boulevard. For the assessment of 'public transportation', one related question was asked to the respondents. The statement is *whether transportation is convenient from the boulevard***.** Regarding this statement, majority of the respondents agree that public transportation is convenient from the boulevard.

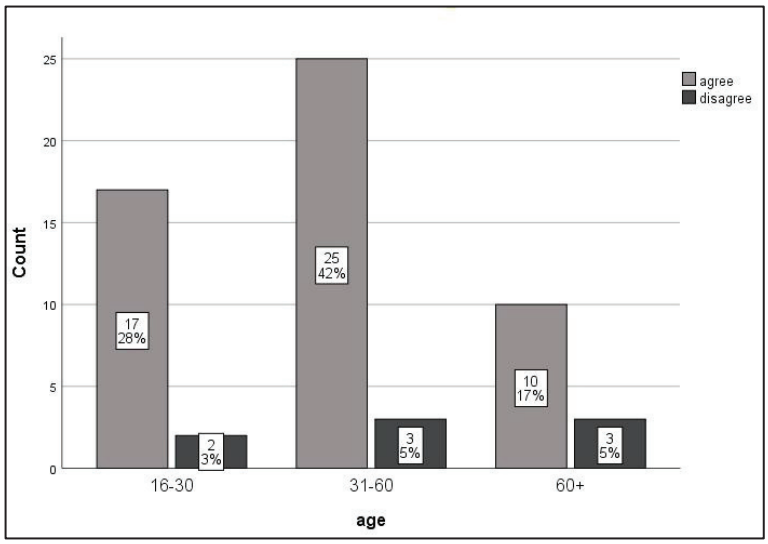


Figure 5.7. The distribution of the results for the statement that *public transportation is convenient from the boulevard*

5.2.2. Access to Parking

In the case study area and the around, there is no public parking lot for the users or residents. This situation brings some repercussions behind it like parking on the street or on pedestrian ways (Figure 5.10). Especially, first fragment faces with this problem more than the other fragments. Pedestrian density and traffic jam are observed high in this part because of vibrant commercial usages and accessible location to the other public transportation modes. The waiting time of the vehicles and the parking on the street narrows the width of the road. On the other hand, there is no specific parking plot along the boulevard or behind it. Therefore, vacant places between the buildings are used as a parking lot by drivers (Figure 5.8, image on the left side). Also, on-street parking and parking on the pedestrian way are the other problems that restrict the pedestrian' and vehicle' movements.

Parking problem in F3 is less than F2. The reason for it is the character differences among these fragments. Narrow roads and lack of connection on the east-west side of the boulevard in F2 does not give opportunity the on-street parking, even if the drivers tend to do it. On the other hand, F3 has a lower density than the other fragments have well-designed pedestrian ways and separated parking lots, also the width of the street is enough for both pedestrians and drivers. Therefore, there is no parking problem in this part of the boulevard (Figure 5.8, image on the right side).

Parking between buildings in F1 Separated street parking in F3

Figure 5.8. Different parking styles in the case study area

One related question was asked to the pedestrians in order to investigate between parking on the street and pedestrian movement. The statement is *whether parking on the boulevard restricts the movement of pedestrians*. More than half of the respondents agree that parking on the boulevard restricts the movement of pedestrians.

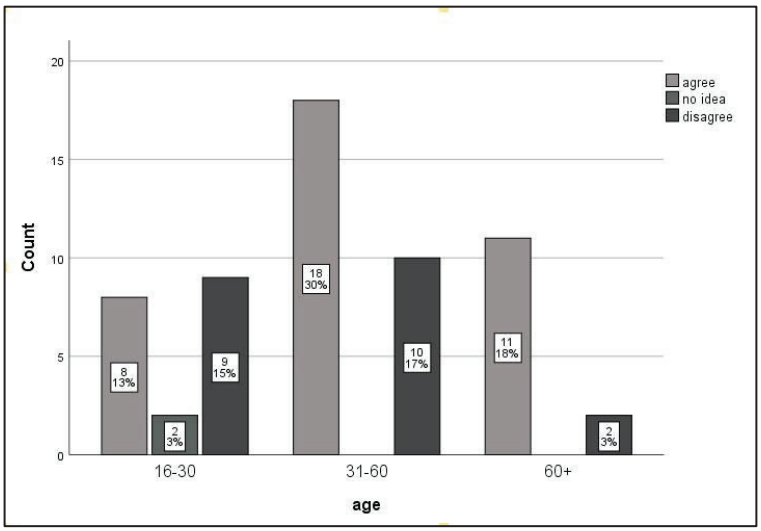


Figure 5.9. The distribution of the results for the statement that *parking on the boulevard restricts the movement of pedestrians*

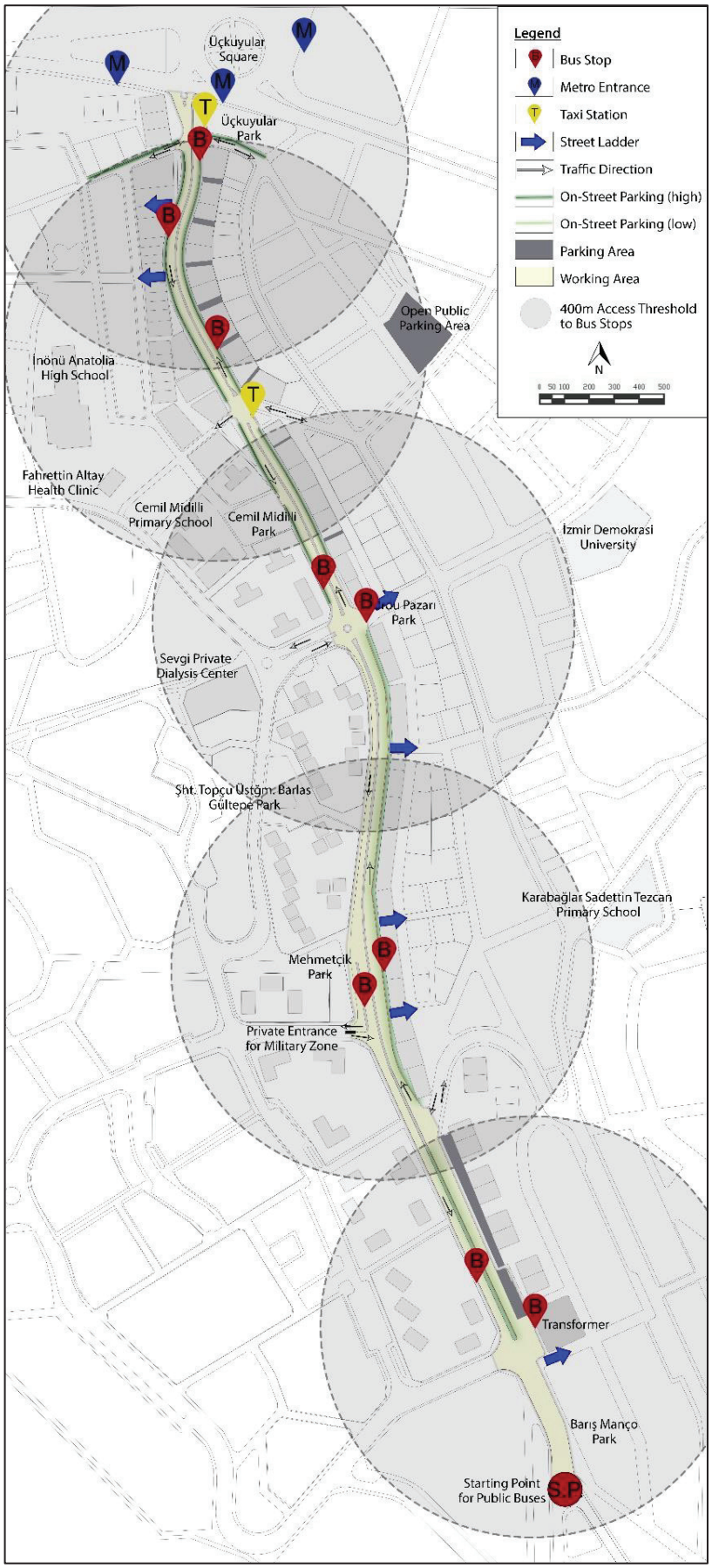


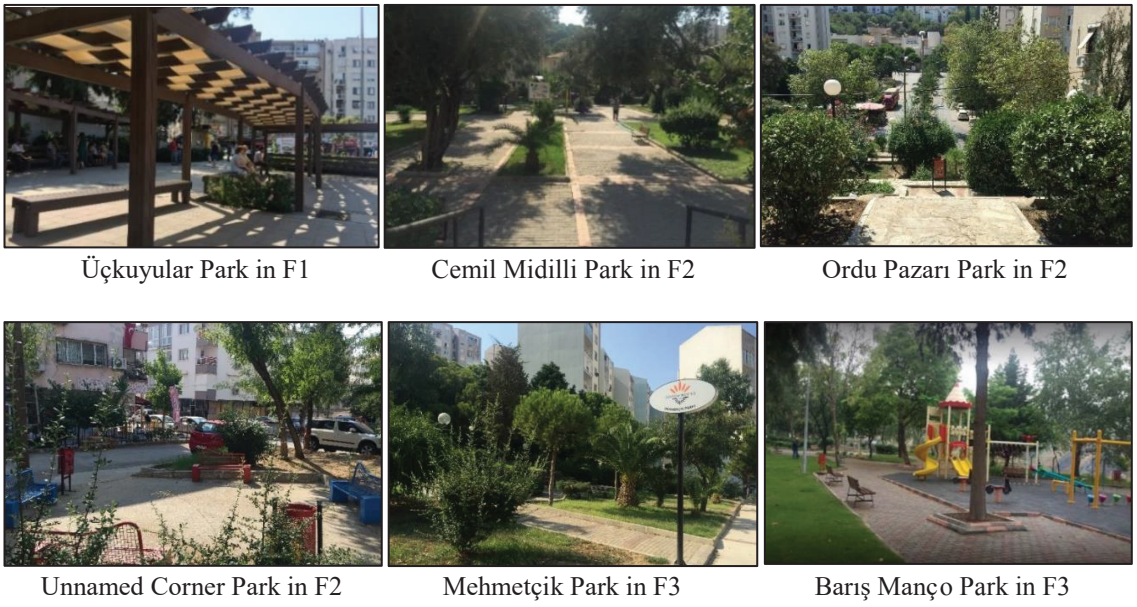
Figure 5.10. Current transportation facilities and traffic condition (Prepared by S. Bağcı)

5.2.3. Access to Open & Green Spaces

Along Mehmetçik Boulevard, there are six different parks positioned in different fragments (Figure 5.11). Üçkuyular Park which is located the entrance of the boulevard and close to Üçkuyular Square is the most used and busy one among these parks through public transportation facilities surrounded it and the importance of the location. This park is known well by citizens and also used as a meeting point during the day intensively.

Cemil Midilli Park which is the biggest one and located near the Cemil Midilli Primary School, so the park generally serves to the students and residents around the area. But access to Cemil Midilli Park and the unnamed park are provided from the western part of the F2 due to topography on the middle of the vehicle way. Ordu Pazarı Park is located in the eastern part of Fragment 2 on terraces because of topographic differences, but the park needs to be maintained and regulated. Although, the park is positioned in the middle of F2 with a landscape view, it is not perceived clearly by users.

Mehmetçik Park next to the military residences and Barış Manço Park at the end of F3 have playgrounds for the children and are mostly known and used by residents. Considering that Mehmetçik boulevard is surrounded by residential and commercial facilities, these public spaces are the only places to take a breath in the neighborhood (Figure 5.12).



Üçkuyular Park in F1 | Cemil Midilli Park in F2 | Ordu Pazarı Park in F2

Unnamed Corner Park in F2 | Mehmetçik Park in F3 | Barış Manço Park in F3

Figure 5.11. Parks and open-green spaces in the case study area

Figure 5.12. Solid void and green areas map (Prepared by S. Bağcı)

5.2.4. Barrier-Free Access

The results of the direct observation reveal that the width of sidewalks, pavement texture, height of pavements, information and orientation sign and lighting are inappropriate and insufficient for disabled in all fragments. Also, there are no ramps for disabled citizens on the street stairs, especially in F1 and F3 (Figure 5.13). On the other hand, in F2 slope differences, narrow sidewalks and the trees planted at wrong places on the sidewalks do not give the right of passage for disabled users.

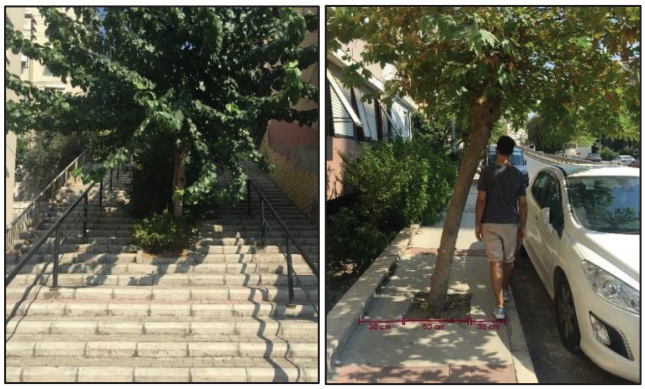


Figure 5.13. Transition problems and missing design elements for all

One related statement was asked to the pedestrians in order to comprehend their perceptions about the usage of the area for disabled. The statement is *whether the boulevard is accessible and usable for disabled citizens***.** Regarding this statement, more than half of the respondents agree that the boulevard is not accessible and usable for disabled citizens.

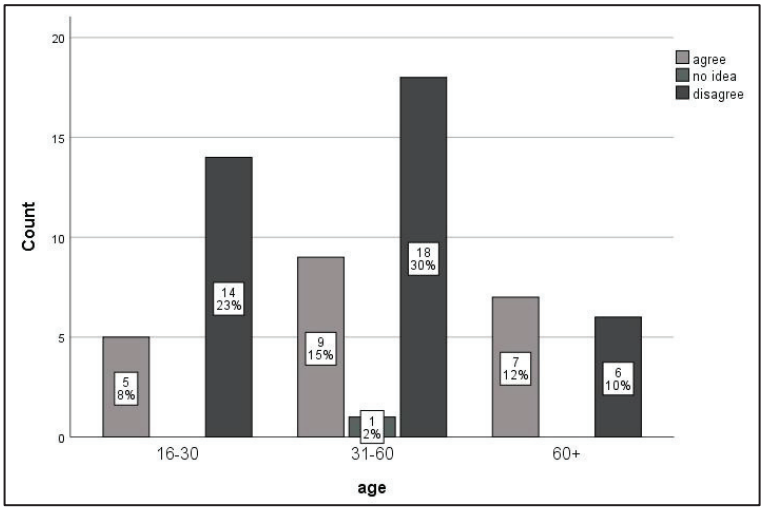


Figure 5.14. The distribution of the results for the statement that *the boulevard is accessible and usable for disabled citizens*

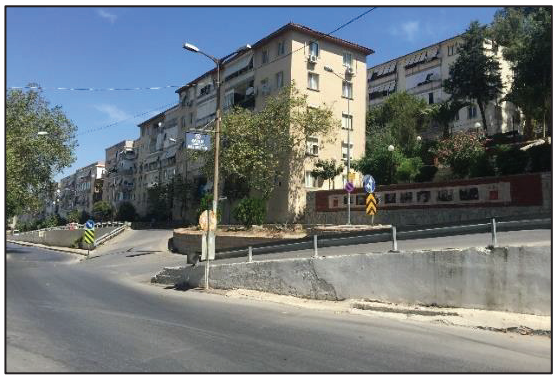
5.3. Safety on Mehmetçik Boulevard

As mentioned in Chapter 3, enhancing safety is a significant aspect to set a walkable environment. Traffic design elements, pedestrian crossover, lighting, and sense of safety are examined in the safety part. The following sections discuss each of these variables in details.

5.3.1. Traffic Design Elements

According to observations in the case study area, three junctions do not have enough traffic regulatory information signs and elements which cause danger for both pedestrians and drivers (Figure 5.15). Especially, junctions in F1 and F2 connect the collector streets to the boulevard and have level differences on the road. Traffic design of these parts is not enough and do not provide a safe environment for users. On the other hand, the junction in F3 almost does not any have traffic signs to led drivers and pedestrians. When these issues are combined with the topographic and physical characteristic of the study area, problems appear more visible and dangerous.

First Junction in the boulevard between F1 and F2



Second Junction in F2

Third junction in F3

Figure 5.15. Junctions in the study area

One related statement was asked to the users to examine traffic signs and the elements. The statement is *whether traffic signs are sufficient in terms of pedestrian and vehicle flow*. Surprisingly, almost half of the respondents agreed and the others disagreed with the statement. Especially, the majority of the respondents who are older than 60 years old, agree with the statement.

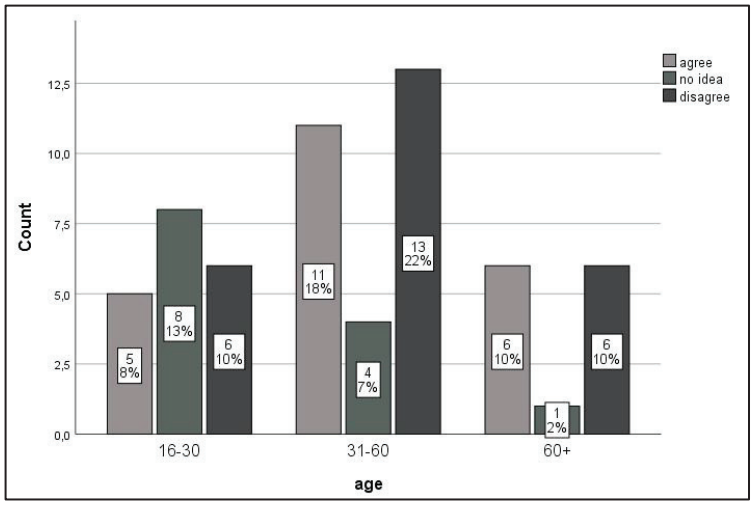


Figure 5.16. The distribution of the results for the statement that *traffic signs are sufficient in terms of pedestrian and vehicle flow*

Traffic calming devices, such as 'speed humps' and 'traffic circles' are not sufficient in the case study area (Figure 5.27). In F1 that has both traffic and pedestrian density higher than the other fragments, does not have any regulation to decrease vehicle speed. Only mid-street crossing island is located at the entrance of the boulevard in F1, but the boulevard needs more traffic calming devices to provide a safe environment for both drivers and pedestrians. On the other hand, the public buses which have the main starting point in F3, continue to their way without decreasing their speeds till F1. This situation brings some problems like the huge possibility of a traffic accident and insecure feeling for pedestrians.

One related statement was asked to the users of boulevard to examine traffic calming measures. The statement is *whether traffic calming measures were taken on the boulevard in terms of safety of the pedestrians*. Almost half of the respondents which has the majority from middle age interval do not agree with this statement. The other percentage of the answers almost equally split into two parts as agree and no idea.

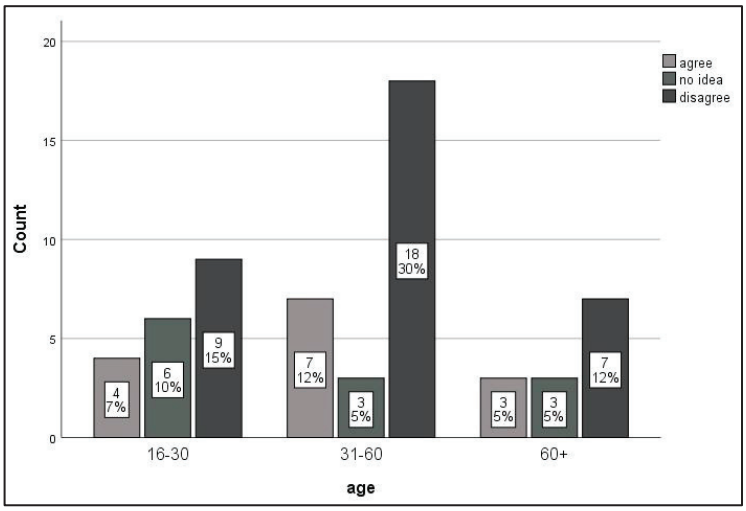


Figure 5.17. The distribution of the results for the statement that *traffic calming measures (ramp, information, lighting) were taken on the boulevard in terms of safety of the pedestrians*

On the other hand, in F1, there is a considerable traffic congestion problem in the rush hour that is between 17:00 and 21:00 (Figure 5.18). Especially, the schools around the case study area are one of the most important reasons through school buses and a high number of students. Also, between these hours, there is a noise problem on the boulevard which is quite disturbing for the users, residents and pedestrians.

Figure 5.18. Traffic intensity problem in the boulevard between 17:00 and 21:00

Two related statements were asked to the users of the boulevard to examine traffic noise and congestion for the case study area. The first statement is *whether there is noise problem in the boulevard*. Almost all of the users stated that the noise problem on the boulevard affects the feeling of comfort in every aspect. The other statement is *whether*

there is no traffic intensity on the boulevard. While majority of the respondents disagreed with the statement, twenty-one (%21) percent of the users agreed with it.

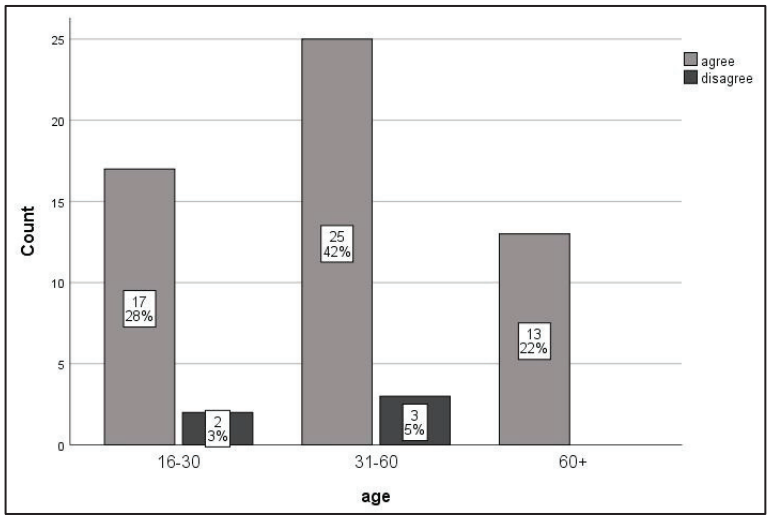


Figure 5.19. The distribution of the results for the statement that *there is a noise problem in the boulevard*

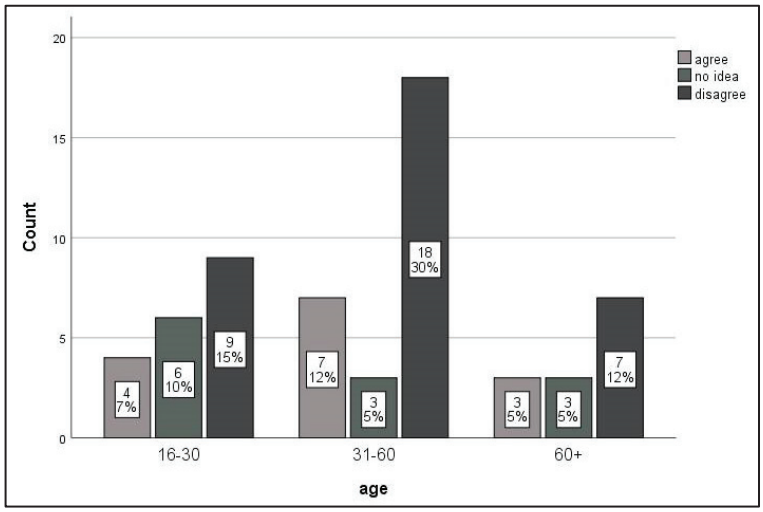


Figure 5.20. The distribution of the results for the statement that *there is no traffic intensity on the boulevard*

5.3.2. Pedestrian Crossover

Mehmetçik Boulevard does not have enough and defined pedestrian crossover yet. The only designed crossover is in the F1 which is around Üçkuyular Square. If it is considered that F1 is the most used fragment among the others, more pedestrian crossings should be designed on the boulevard. On the other hand, the topographic structure of F2 already does not allow to provide pedestrian crossings. F3 just has some crossings that

are not visible and the undefined places do not have any safe way for pedestrians (Figure 5.21-on the right side).

The only designed pedestrian crossover in the study area (F1) Undefined pedestrian crossovers (F2)

Figure 5.21. Pedestrian crossovers

Two related statements about pedestrian crossovers were asked to the pedestrians. The first statement is *whether there are enough pedestrian crossings on the boulevard*. While twenty (20%) percent of the respondent mostly consisting of people 31-60 years old agreed with the statement, seventy-five (75%) percent of the users did not agree with the statement.

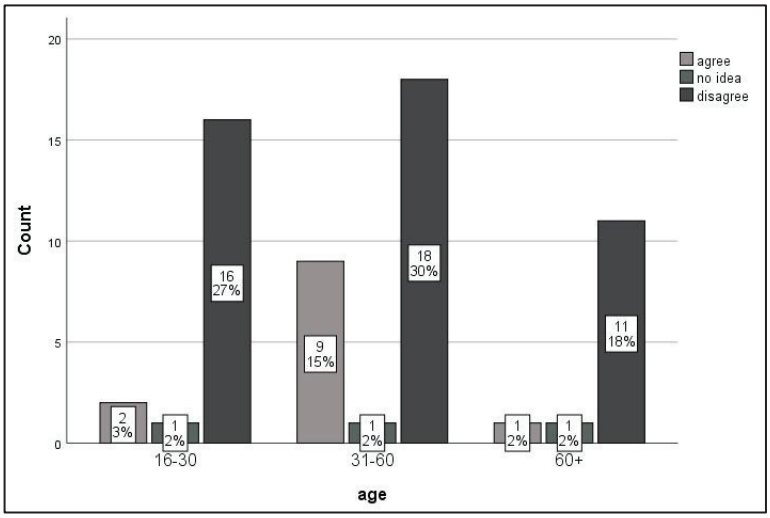


Figure 5.22. The distribution of the results for the statement that *there are enough pedestrian crossings on the boulevard*

The second statement is *whether pedestrian crossings are in the right place*. While majority of the respondents did not agree with this statement, twenty (%20) percent of the users agreed with it.

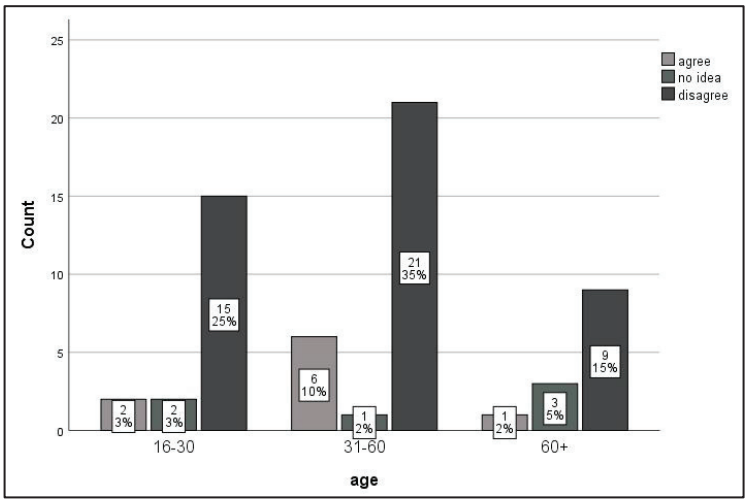


Figure 5.23. The distribution of the results for the statement that *the pedestrian crossings are in the right place*

5.3.3. Lighting

The results of the direct observation and the interviews reveal the lighting system is sufficient in F1, F2, and F3 (Figure 5.26). Fragments that do not have lighting system are the west side of the Oyak Residential Site part of F1 and military residences of F3. Because these parts have the lighting system in their borderlands close to the pedestrian ways which meet all needs of users on the boulevard.

One related statement that is *whether night lighting is sufficient for the citizens* asked the respondents. Almost all of the users among all of the age intervals stated that the lighting system of the boulevard is sufficient for the pedestrians.

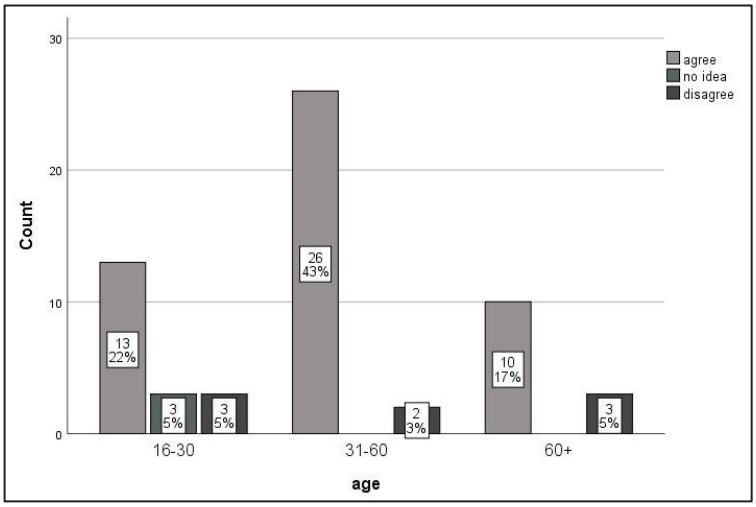


Figure 5.24. The distribution of the results for the statement that *night lighting is sufficient for the citizens*

5.3.4. Sense of Safety

According to the direct observations and the interviews on the boulevard, neither man nor woman does not have a negative perception about the sense of safety. Vibrant commercial usage in F1 and military residences in F3 are the most remarkable reasons to make boulevard safe in terms of feeling. F1 has a mixed land use character including 7/24 hours opened restaurants at the beginning of F1, also close to Üçkuyular Square, keeps active usage even during the night. Moreover, the street cameras around the square increase the sense of safety as a physical tool.

On the other hand, F2 and F3 have almost only residential usage including some daily shops, so this situation brings some positive perception about a sense of safety. As Jacobs mentioned, 'eyes on the street' is partially observed on the boulevard because of residential areas and residences interacting with the street. Also, west part of F3 has the military residences which has high-security precautions with guarding of the soldiers and street cameras. Therefore, residents and users around the boulevard continue their life both day and night without any doubts.

As for the views of the Mehmetçik Boulevard users, the survey participants were asked *whether the boulevard is safe at night*. Eighty (80%) percent of people stated that the boulevard is safe, and the rest of the users disagreed or did not express their ideas about the statement.

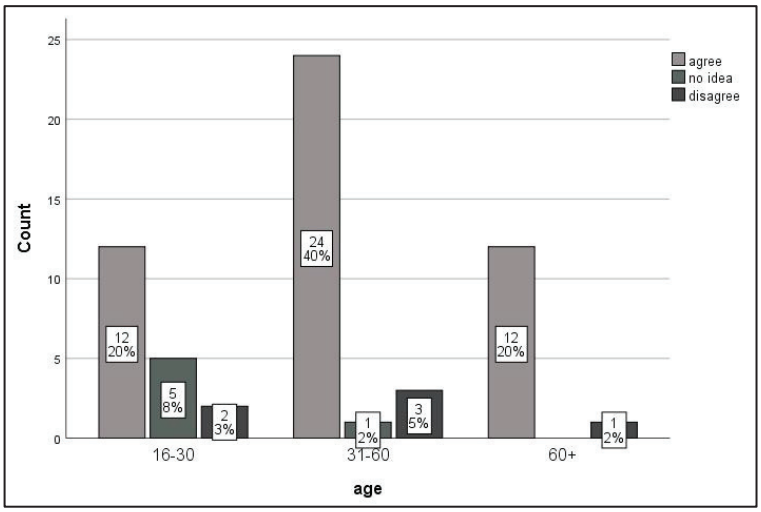


Figure 5.25. The distribution of the results for the statement that *the boulevard is safe at night*

Figure 5.26. Analysis of lighting, pedestrian crossover and traffic elements (Prepared by S.Bağcı)

5.4. Street Quality on Mehmetçik Boulevard

As explained in Chapter 3, street quality is quite important to understand how architectural and environmental features contribute to walkability on the street and pedestrian behaviours. In this section, street width, street signs, street furniture, street trees, sidewalk material, sidewalk width, sidewalk continuity and street maintenance are examined through observation, photographing and survey results.

5.4.1. Street Width

By measuring the street, it is observed that the street width of the F1 is not enough for the vehicle transition and pedestrian safety, but parking on the street decreases the traffic flow. Also, like F1, road width of F2 is 20 meters and F3 is between 24 and 28 meters. F3 is the most comfortable zone among the fragments (Figure 5.27 and Figure 5.28). On the other hand, road width of collector roads meeting the Mehmetçik Boulevard change between 12 meters to 17 meters.

Road width in F1

Road width in F2

Level difference on the road in F2

Road width in F3

Figure 5.27. Road widths

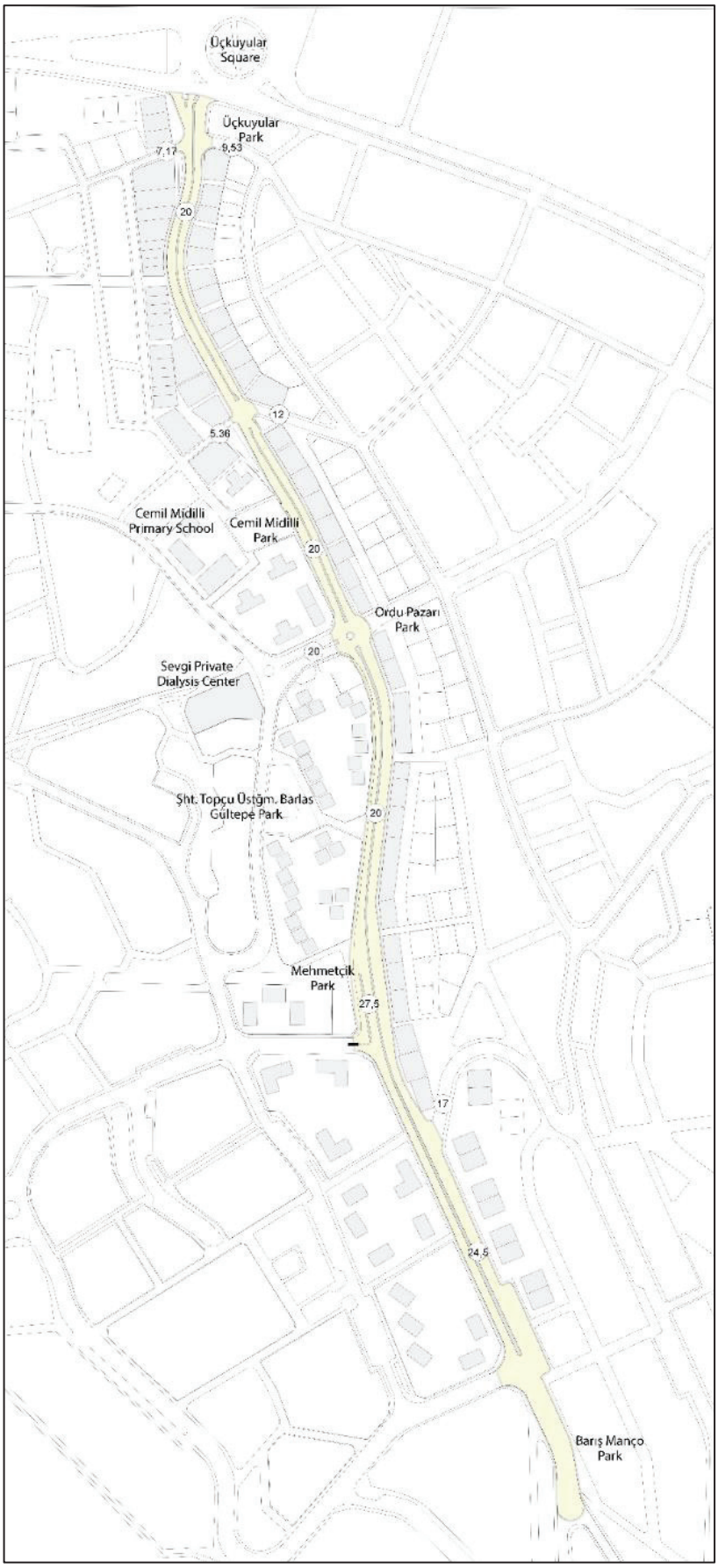


Figure 5.28. Road widths on Mehmetçik Boulevard (Prepared by S. Bağcı)

5.4.2. Street Signs

Ground floor usage of F1 is mostly commercial, and each one of them has different qualities and characteristics. The eastern and western facades of F1 are generally used as daily shops, cafes, and restaurants but the signs of these commercial places are not designed well and not integrated with each other. There is no harmony and a common language between them (Figure 5.29). The same situation is observed for the other daily shops of the boulevard in F2 and F3.

Figure 5.29. Street signs in F1

The survey participants were asked *whether the signs and information elements of the shops on the boulevard do not disturb the citizens aesthetically*. While half of the respondents agreed with the statement, thirty (%30) percent did not have any idea and twenty-five (%25) percent disagreed with it.

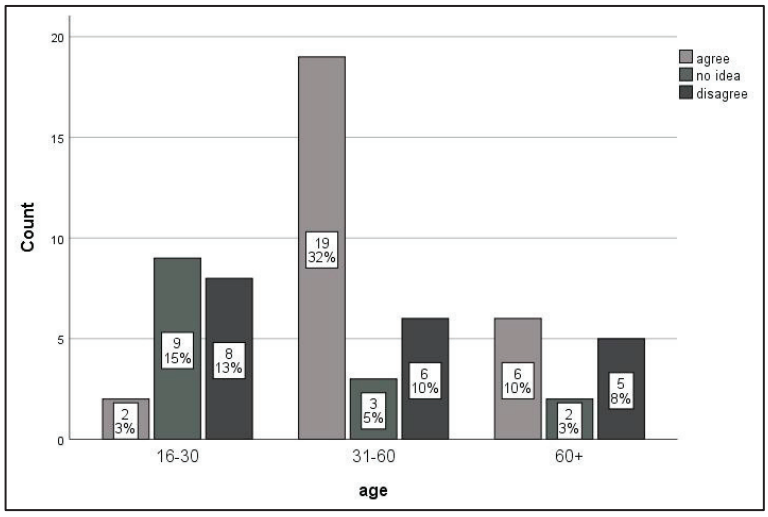
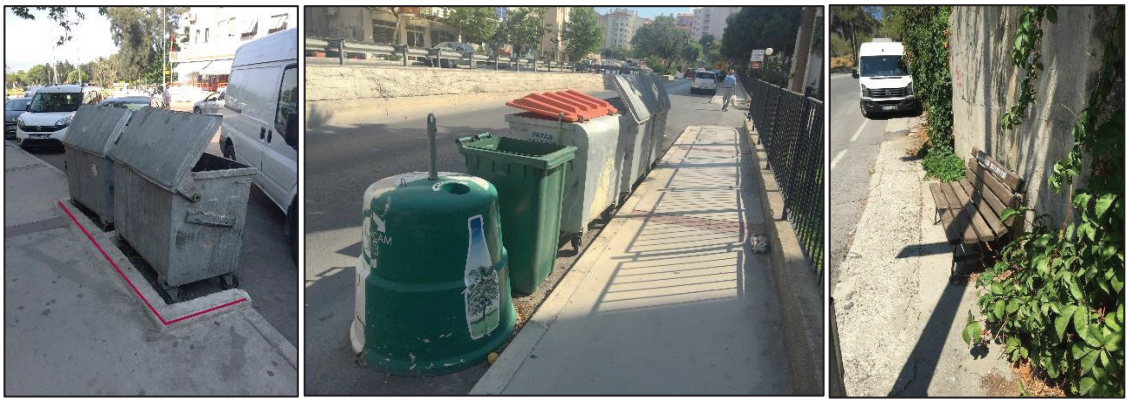


Figure 5.30. The distribution of the results for the statement that the signs and information elements of the shops on the boulevard do not disturb the citizens aesthetically

5.4.3. Street Furniture

According to the direct observations on the boulevard, street furniture is not properly located and not enough in number (Figure 5.44). Even if there are enough trash cans regarding user's demand, Boulevard does not have suitable design criteria for positioning the furniture. As seen in Figure 5.32 at the first image, the only separated openings for trash cans are located in F1. On the other hand, F2 and F3 do not have this kind of design differences along the sidewalk, so trash cans located on the road which leads to danger on the road and sidewalk due to the decline of the width of the road (Figure 5.31, middle image).

Also, street benches are not provided along the boulevard. The only street bench is located in F2 which does not used properly due to neglected surrounding of it (Figure 5.32, image on the left side). Therefore, people use the parks along the boulevard to compensate their needs.



Street trashes in F1 Street trashes in F2 The bench in F2

Figure 5.31. Street furniture

Two related statements were asked to them. The first one is *whether street furniture (bank, trash can, etc.) is sufficient*. Forty-five (45%) percent of people stated that street furniture is not enough, and forty-two (42%) percent of users agreed the statement.

The second statement is *whether street furniture does not prevent the movement of pedestrians*. While forty-six (%46) percent of respondents agreed with the statement, thirty-seven (%37) percent of the users did not agree with it.

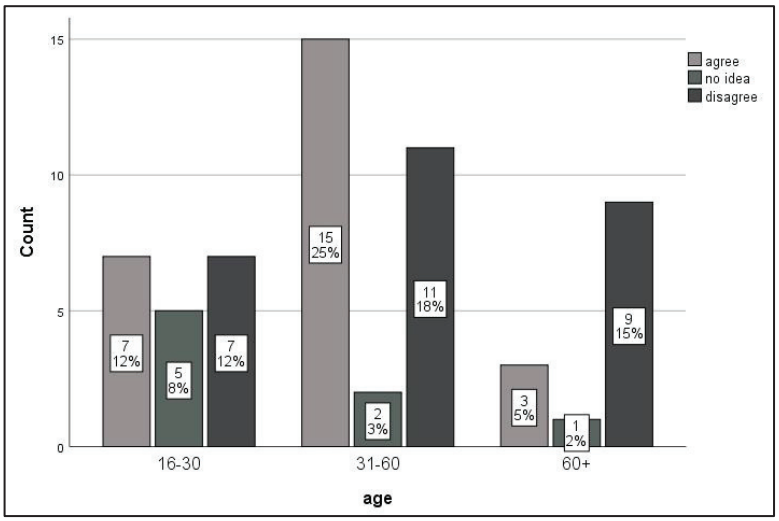


Figure 5.32. The distribution of the results for the statement that *street furniture (bank, trash can, etc.) is sufficient*

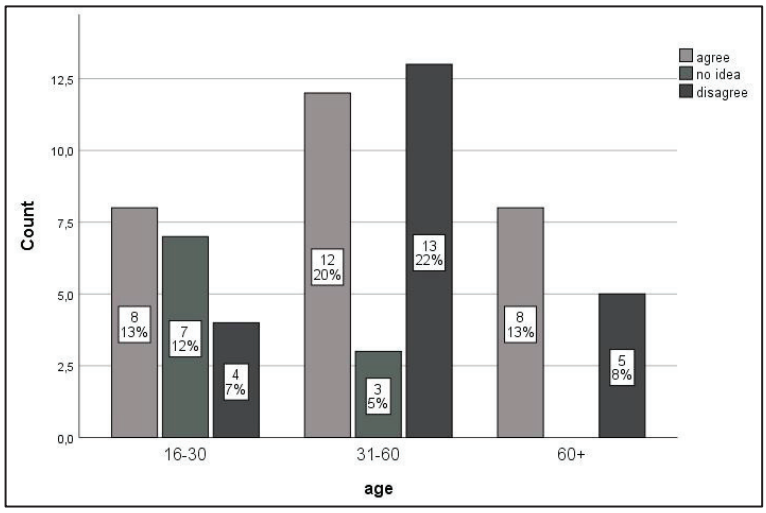


Figure 5.33. The distribution of the results for the statement that *street furniture does not prevent the movement of the pedestrians*

5.4.4. Street Trees

In F1, street trees are orderly located in both eastern and western side of the boulevard. These elements do not prevent the pedestrian movement and enough due to the pedestrian width. In F2, trees are located in both side like F1, but they continue just till the military residences in the western part. Problem is here the width of the sidewalk which is almost 2 meters and not enough for both pedestrians passing and positioning of the trees.

On the other hand, there are no trees in the western part of the F3 because of the military residences, but the trees in the border of military residences provide canopy to the pedestrian way as well.

Figure 5.34. Trees on and around the boulevard

For the evaluation of street trees of the case study area, two related questions were asked to pedestrians. The first question is '*whether there are enough trees and green spaces on the road*'. The great majority of pedestrians claimed that trees and green spaces in F1, F2 and F3are enough. Only eighteen (%18) percent of users did not agree with the statement.

The second question is "*The trees and pots do not prevent the movement of* the *pedestrians*''. While sixty-one (%61) percent of pedestrians disagreed with it, twenty-eight (%28) percent of users agreed.

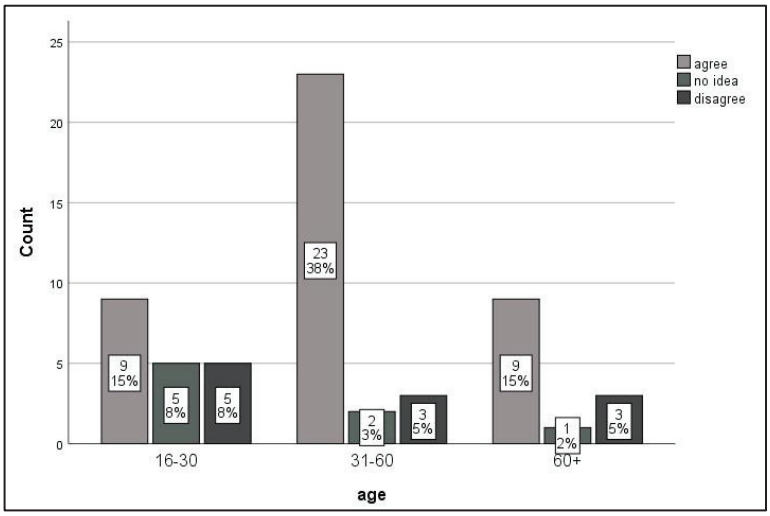


Figure 5.35. The distribution of the results for the statement that *there are enough trees and green spaces on the road*

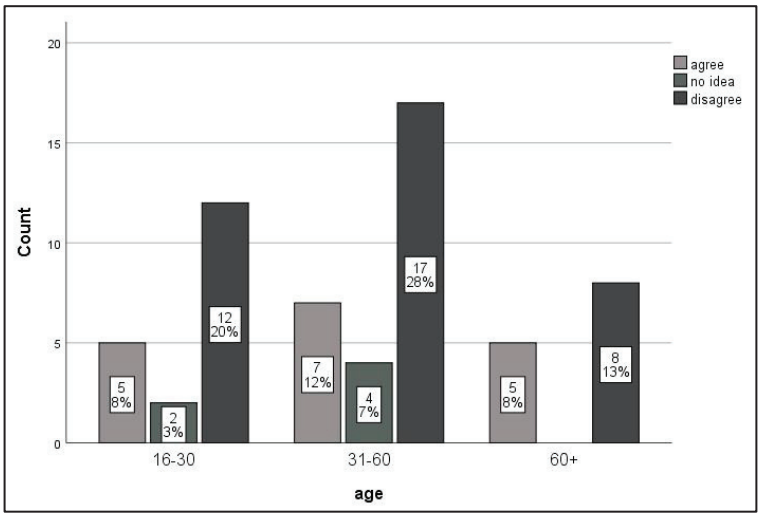


Figure 5.36. The distribution of the results for the statement that *the trees and pots do not prevent the movement of the pedestrians*

5.4.5. Sidewalk Material

Generally, the quality of the sidewalk material is quite poor in the case study area. Damaged pavement slabs, unsafe level variations of sidewalks, insufficient design elements affecting disabled movements and obstacles along sidewalks have made Mehmetçik Boulevard inaccessible for all (Figure 5.37). Also, impermeable pavement does not allow water to penetrate, forcing it to run off. It decreases the walkability comfort, especially during intensive rainfall.

Only properly designed pedestrian material is located at the welcoming place of the boulevard in F1. The reason of it is being close to Üçkuyular Square and the other transition points around the area. Also, it is obvious that sidewalk materials are distinguished from each other. Commercial places are separated their own zone with the sidewalk materials to open some places for sitting, eating and advertising regarding their needs. The rest of the sidewalk material includes different textures but without any special texture for the disabled.

F2 has only one type of sidewalk material. It is considered that the west and the east part of the boulevard is disconnected and the sidewalk width is narrow, there is no place and chance to extend sidewalk width. On the other hand, unlike other fragments, sidewalk material in F3 is mostly well-designed and connected although there is no design difference for the disabled.

Figure 5.37. Damaged sidewalk materials in the case study area

Two related questions were asked to the users. The first statement is *whether the texture of the sidewalk has a comfortable structure for walking behaviour*. Surprisingly, half of the people (%50) on the street claimed that the floor quality is enough. Forty-five (%45) percent of users did not agree with the statement and only five (%5) percent of respondents claimed that they do not have any idea.

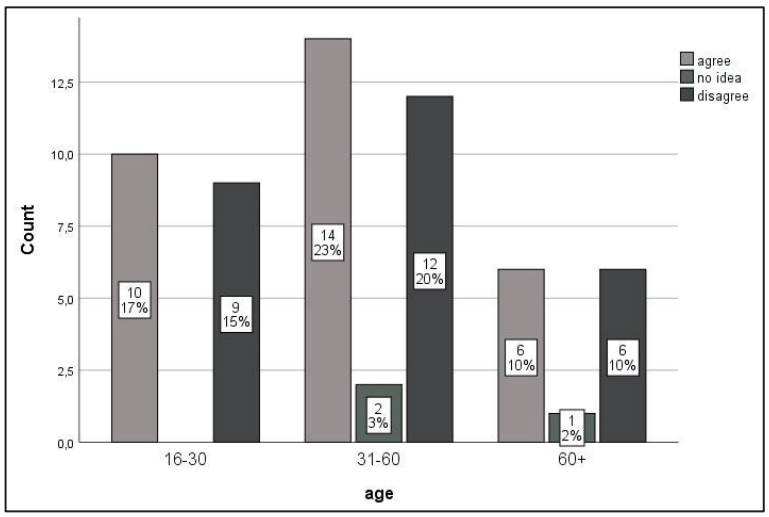


Figure 5.38. The distribution of the results for the statement that *the texture of the sidewalk has a comfortable structure for walking behaviour*

The second one is whether *the texture of the sidewalk has appropriate criteria for the use of elderly, disabled people and children*. Seventy (%70) percent of users disagreed with the statement, while twenty-five (%25) percent of users agreed with it. Only four (%4) percent of respondents stated that they do not have any idea. The results show that the quality of the floor is not suitable for all type of users on the street.

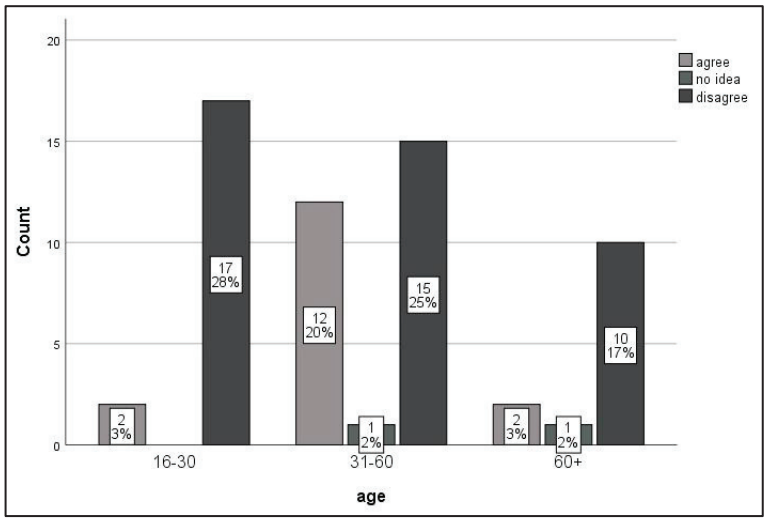


Figure 5.39. The distribution of the results for the statement that *the texture of the sidewalk has appropriate criteria for the use of elderly, disabled people and children*

5.4.6. Sidewalk Width

In F1, sidewalk width differs in different parts of the boulevard (Figure 5.42). Even the entrance of the F1 has the widest sidewalk width of the boulevard, the other parts in the fragment changes between 1,2 meters to 4,5 meters. This difference makes it hard to pass the comfortably especially in the crowded places as F1.

F2 and F3, the sidewalk widths are not equal, even in both sides of the fragments. While the width of the sidewalk on the west side of F2 changes between 1,2 meters to 1.8 meters, the eastern part of the fragment has various sidewalk widths between 1 meter to 3.75 meters.

Pedestrian widths on both sides of F3 are more equal than the other fragments changes between 1,5 meters to 2,25 meters (Figure 5.40). If it is considered that F3 is a residential area for military officers, literally, it is the most suitable, safe and regular fragment regarding the sidewalk width to use of pedestrians.

One related statement was asked to the users regarding the sidewalk width. The question is whether *the width of the sidewalk is sufficient*. Sixty-eight (68%) percent of users who are mostly in middle age group disagreed with the statement. On the other hand, twenty-eight (28%) percent of respondents agreed with it.

Sidewalk widths in F1

Sidewalk widths in F2 (east side – west side)

Sidewalk widths in F1 (west side – east side)

Figure 5.40. Sidewalk widths according to the fragments in the case study area

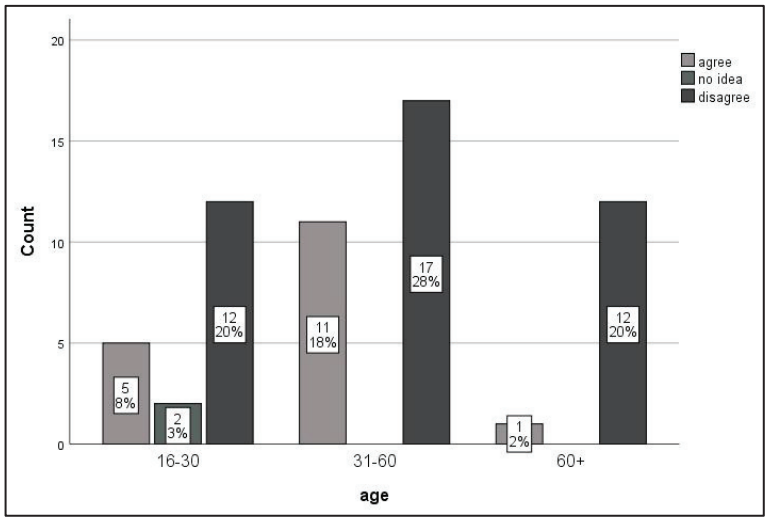


Figure 5.41. The distribution of the results for the statement that *the width of the sidewalk is sufficient*

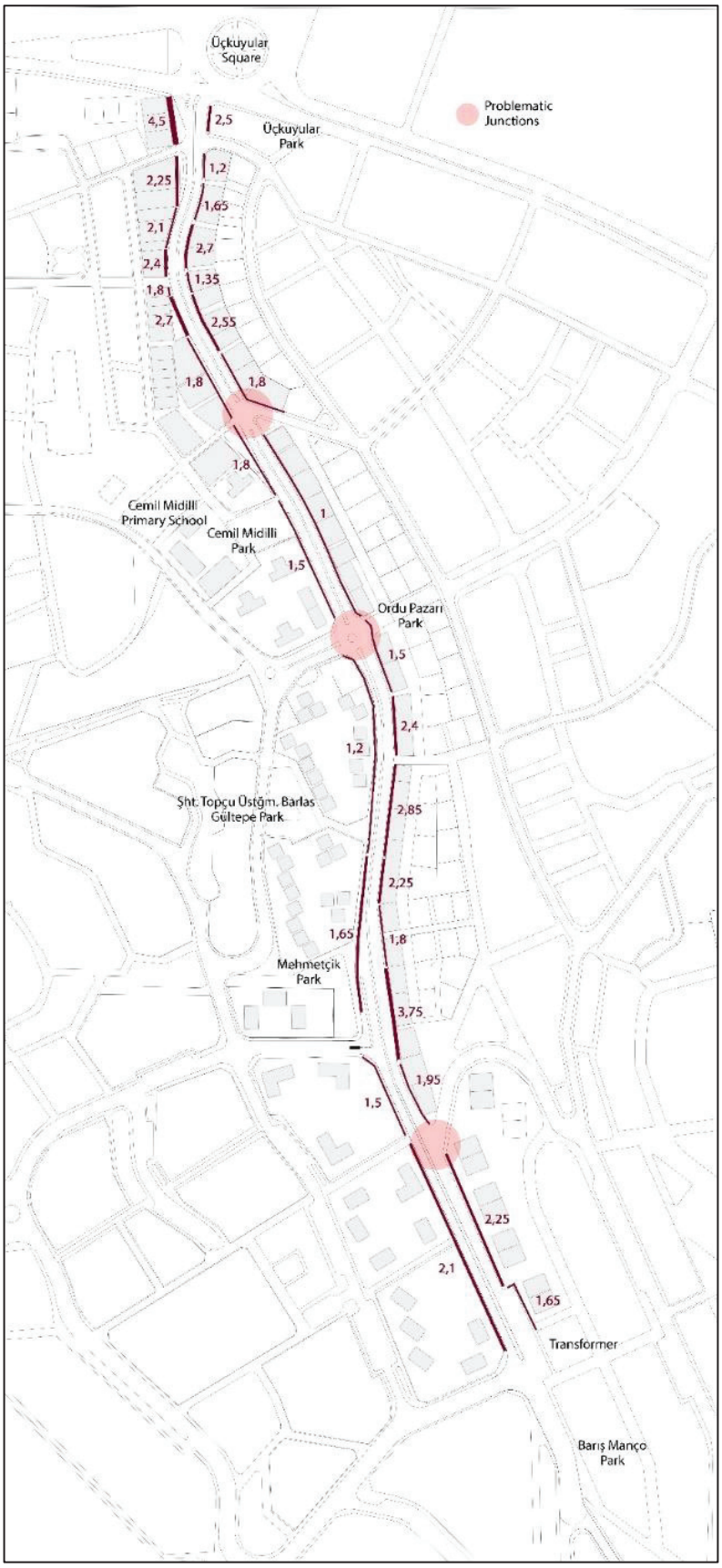


Figure 5.42. Sidewalk width and problematic junctions (Prepared by S. Bağcı)

Figure 5.43. Street furnitures on Mehmetçik Boulevard (Prepared by S. Bağcı)

5.4.7. Sidewalk Continuity

Continuity of sidewalk and pedestrians' enable of movement on Mehmetçik Boulevard is different in various parts of the street, but mostly not comfortable and continuous. F1 has a continuous and wide path, almost completely dedicated to pedestrian activities except sitting and eating places of the commercial places. The part of the boulevard where F1 with F2 are connected is the lowest quality of connectivity because of the taxi station and the inconvenient parking on the boulevard or on the sidewalk (Figure 5.44).

Moreover, in F2, two sides of the boulevard are not connected via a pedestrian overpass or anything else because of the level differences on the road. Even if the continuity of the pedestrian way works well on the one side of the fragment, it does not work properly from eastern side to western side.

On the other hand, although the continuity of the boulevard is interrupted with the public bus station in F3 which is on the way of high-speed vehicles, pedestrian movement is not affected by this situation due to enough street width and well-designed continuous sidewalks on both sides.

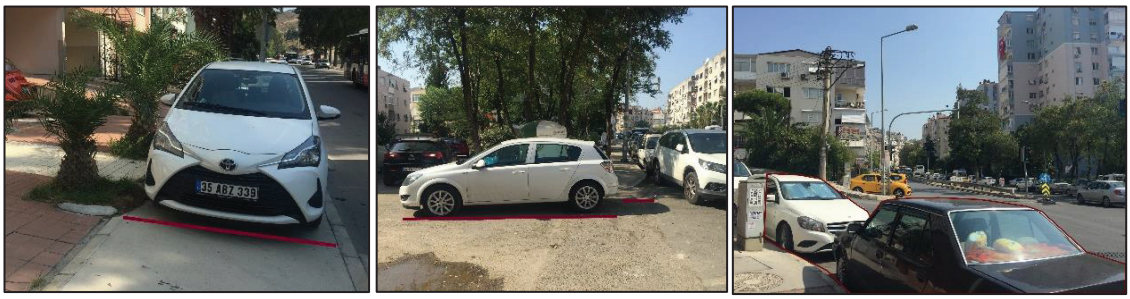


Figure 5.44. Obstacles to the sidewalk continuity

One related statement was asked the respondents. The statement is whether *adherence and continuity are provided between the sidewalks*. Only thirteen (%13) percent of respondents stated that they do not have any idea. While fifty-six (%56) percent of users disagreed, thirty-three (%33) agreed with the statement. Because, the boulevard is thought as a car-oriented place but the truth is that it is more than it. So, pedestrians are forced to use alternative or dangerous ways causing difficulties for children, the elderly and disabled people.

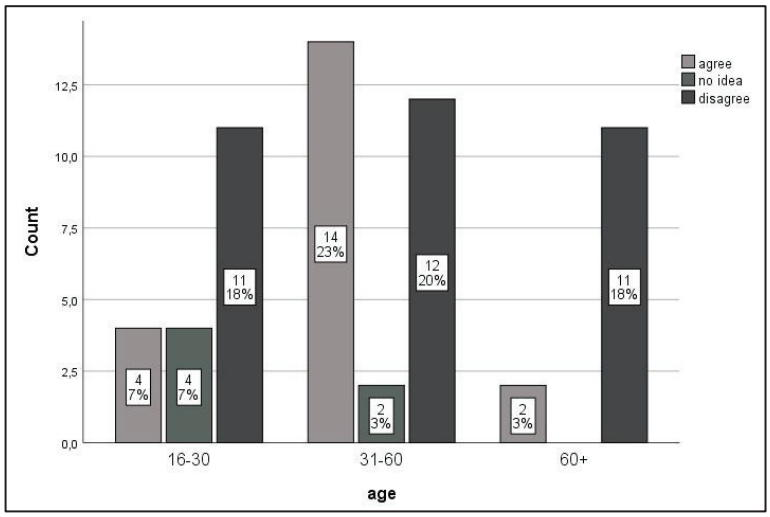


Figure 5.45. The distribution of the results for the statement that *adherence and continuity are provided between the sidewalks*

5.4.8. Street Maintenance

Generally, there is no significant problem about street maintenance in the case study area. Maintenance of the trees are regularly held by the municipality but some problems appear because of some residents who are responsible for vegetation trimming needed to maintain the visibility of traffic sign and clear lines of sight at intersections and driveways; and also, pedestrian movement on the sidewalk. Moreover, in some parts of the boulevard, it is observed that trash cans are used ragged by the surrounding commercial shops which cause environmental and visual pollution (Figure 5.46). Also, these shops leave their materials on the sidewalk that limits to the pedestrian movement.

Figure 5.46. Problems about street maintenance

One related statement was asked to the users regarding the street maintenance. The statement is whether *the street is clean and well maintained*. Sixty (%60) percent of users stated that the boulevard is clean and well maintained, but thirty-six (%36) percent of users did not agree with the statement.

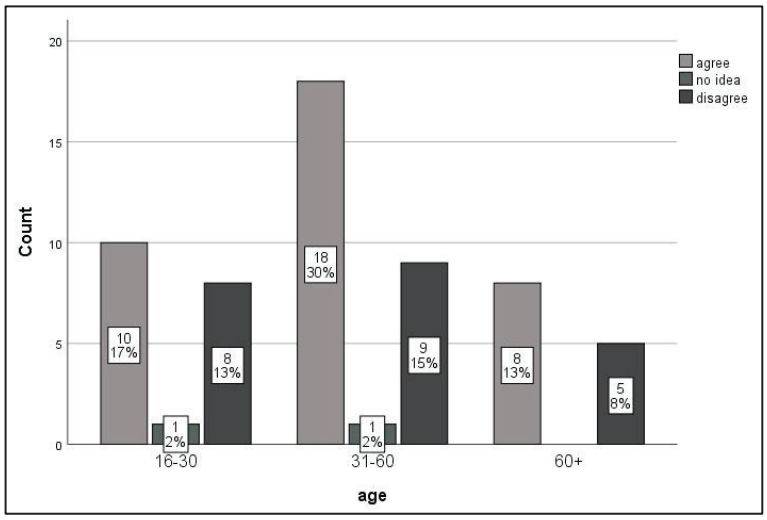


Figure 5.47. The distribution of the results for the statement that *the street is clean and well maintained*

5.5. Comfort on Mehmetçik Boulevard

Regarding the physical features of the boulevard, traffic design elements, informative signs, pedestrian crossovers are not enough and not designed well to reach healthy walkability behaviours as mentioned previous sections of this chapter. Even if most of the criteria are supplied in F1, junctions and the other fragments on the boulevard have some problems with physical safety. Especially, in F2, level differences on the road causes a weak connection between eastern and the western part of the boulevard, so it makes the uncomfortable feeling on pedestrians. The other problem is that the pedestrian crossovers are not specified clearly which makes the boulevard more dangerous for the users. On the other hand, all of the junctions on the boulevard has not enough informative signs and crossing facilities. Therefore, when looked the criteria about traffic design elements in the wider perspective, it can be said that the boulevard needs to be improved and redesigned in some parts.

As for the user's needs like protection from climate conditions and seating/resting elements on the boulevard, it is rather debatable. Even if some shops and some bus stops provide protection zones from the bad climate conditions, in general, the boulevard does

not have properly designed shelters as well the bus stops. On the other hand, the only public places on the boulevard for seating/resting purposes are located in the parks. It is observed that especially in F2, people use the higher sidewalk pavements for sitting and resting.

Regarding the visual features of the boulevard, the case study area is mostly unsuccessful. Boulevard is surrounded by multi-story buildings and the shops, so there is nothing special for pedestrians on the way to take their attention. People generally use the area for transition and shopping purposes, rather than pleasant journey. These factors make Mehmetçik Boulevard an unpleasant and uncomfortable boulevard.

The boulevard provides comfy feeling to the users due to the military residences in F3 and the usage of the land. Mixed land use along the boulevard provides a harmony of residential, commercial where those functions are almost physically integrated, and that provides pedestrian connections. Also, residential usage keeps the boulevard all day and night alive as a feeling with 'eyes on the street' expression by Jane Jacobs.

5.6. Legibility on Mehmetçik Boulevard

As mentioned in Chapter 3, legibility is defined as the ease with which city layouts are understood towards recall, perceive and organizes the elements into a pattern (Lynch, 1960:2). Lynch states legibility as representation of physical and spatial characteristic of the environment, so visual sensations are signals of orientation that reinforce legibility. This argument lays down as a condition that environmental aspects influence the spatial cognition which represents the physical structure.

Mehmetçik Boulevard where is a straight structure has different land use characteristics along both sides of the way. Therefore, users of the boulevard were observed to understand which parts of the boulevard they use most. Parks, military residences, level differences on the road, residential and commercial uses change the sensation of the users at varying levels. Only physical element taking pedestrians attraction is Atatürk memorial at the bus stop in F2, but the surrounding of the memorial needs to be maintained (Figure 5.48). Although there are no distinctive structures along the boulevard except Ataturk memorial, users perceive the area according to their own needs and priorities.

Figure 5.48. Atatürk memorial in F2

When considering their walking routes, it is obvious that most crowded places and high-intensity functions were specified on the routes. These places can be separated into three usage purposes regarding the user' perception: Üçkuyular Square and Cemil Midilli Park can be defined as public places where are mostly used by the pedestrians; mini shopping malls and the health clinic are mostly needed places for residents; and workplaces and metro/bus stops can be pointed out as an obligation that is supposed to be arrived and used in daily lives. It can be said that Mehmetçik Boulevard is not a legible place for the temporary pedestrians, but has some main spots for the regular users in terms of their needs in daily lives.

5.7. Comparative Evaluation

This section contains the comparison of the fragments in the case study area based on survey results. Since walkability comfort of Mehmetçik Boulevard is not the same at whole parts of the Boulevard due to land use, topographic and user differences.

Two related questions were asked to the users in order to thoroughly understand the user's preference, after observations, examination, and comparison of the fragments. The first question which gives the general idea about the boulevard *is this boulevard convenient and comfortable for the pedestrians?* While thirty-four (40%) people stated

that boulevard is convenient and convenient for the pedestrians, more than half of the respondents did not agree with this question (Figure 5.49).

The second and more specific question is *which fragment is easy to walk for pedestrians?* Almost half of the users which composes thirty-eight (%38) percent of them stated that F3 is the easiest fragment to walk. While twenty-five (%25) percent of people claimed none of the fragment, eighteen (%18) percent preferred F2 as a walkable fragment into these fragments. Also, other eighteen (%18) percent questionnaires opted F1 (Figure 5.50).

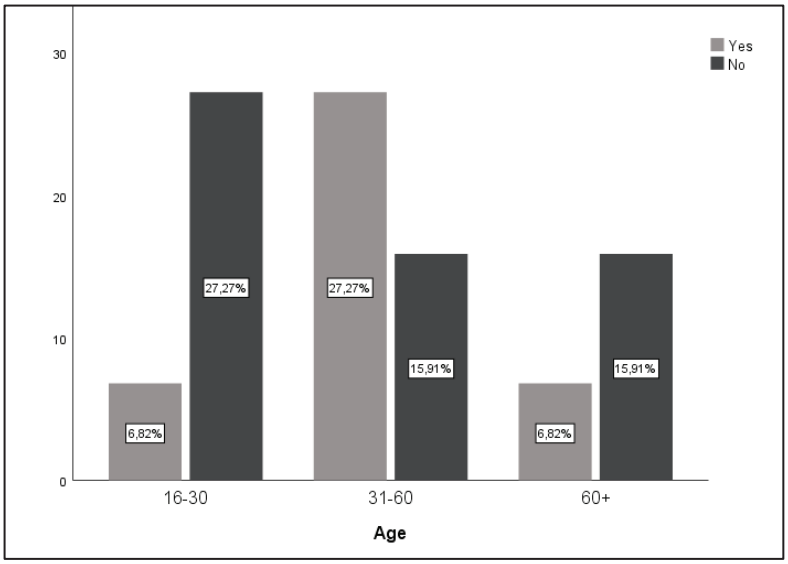


Figure 5.49. The distribution of the results for the question that is this boulevard convenient and comfortable for the pedestrians?

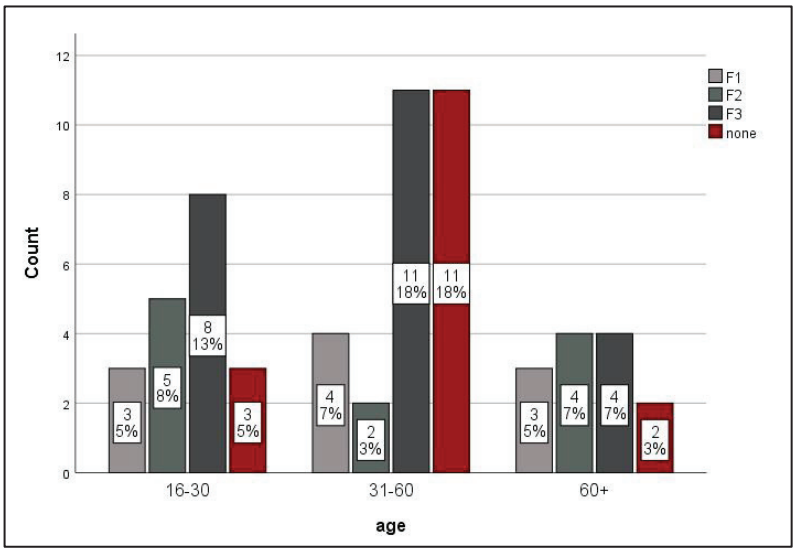


Figure 5.50. The results for the question that which fragment is easy to walk for pedestrians?

Potentials and problems vary in fragments of Mehmetçik Boulevard based on the results coming from the observations, survey results, and analysis in the case study area. Additionally, literature findings should be assessed on the case study area. Accordingly, in this part, the evaluation will be presented by comparing the findings of the case study with the findings of the literature (Table 5.2).

All fragments of the Boulevard have mixed land use, but F1 is the most diverse fragment through functions and density that courage people to walk more than the other fragments. The reason behind this result is that F1 has locational and user density advantage compared to the other fragments. Because, F2 and F3 have mostly residential land use, in spite of daily shops in these fragments. This difference makes these fragments quieter and more unpretentious than F1. Accordingly, F1 provides a more active environment for pedestrians in terms of diversity than other zones. On the other hand, F2 has level differences on the road cutting the fragment into two parts as the west and east part. There is no connection between the two sides. In spite of daily shops in F2, there is no commercial usage on the western part due to Oyak residential site. Therefore, the western part of this fragment is only used for transition. Although there is no level difference in F3, the same land usage on the western and eastern part of F3 is observed because of residential area for military officers on the western part and only residential usage and some daily shops on the eastern part. However, this situation does not affect the quality of walking in this fragment, on the contrary, pedestrians and residents feel and act more comfortable due to a safe, roomy and quiet environment. Also, this fragment has the potential to provide public spaces and attractive usages for its residents.

Regarding access to public transportation, pedestrian network within 400 meters threshold to bus stops are provided in all fragments of the boulevard. F1 is the closest fragment to the Üçkuyular Square and the central part has more public transportation alternatives than other fragments. On the other hand, there is no defined parking plot close to Boulevard, behind the buildings or away from the boulevard. Also, F1 and F2 do not have properly parking plot that causes the parking problem on the road and traffic congestion, especially during rush hours. Parking needs in F1 where has the intense traffic is provided in empty plots between the buildings that are not be hidden by landscape elements, so it causes aesthetically weak perception. Contrarily, F3 that is the only fragment has defined parking plots. Regarding the open and green spaces, the pedestrian network within 400 meters threshold to open-green areas are provided in all fragments of

the boulevard that provide easy access to public spaces where people can rest and spend time together. The most important physical dissimilarity among the fragments is the level difference on the road in F2 which makes the eastern and western side of the fragment completely disconnected. Therefore, it is significantly noticeable that F2 is the weakest fragment in terms of accessibility. In terms of barrier-free access, street elements and design of the boulevard is only acceptable for disabled people at the beginning of F1 where the boulevard meets Üçkuyular Square, but there are still some missing points such as informative signs and appropriate size and space. In other parts of the boulevard, there is no special arrangement for all users.

The safety is another important variable which affects the walkability of public space. There are quite important problems in all fragments about actual safety such as insufficient traffic control device, uncontrolled intersections, and undefined pedestrian crossover. Even if the only designed pedestrian crossover is located at the entrance of the boulevard in F1, more pedestrian crossings are needed to be located when considered the usage capacity of the case study area. The traffic situation and traffic element at all intersections are more complicated compared with other actual safety problems, therefore its safety situation contains more risks for pedestrians and drivers. As to the vehicle traffic, especially in F1, insufficient traffic control elements at junctions create additional conflicts that produce additional signal phases, thus, increasing the intersection size and the evacuation times so that the traffic lights' planning per intersection becomes more complicated and has a higher potential for accidents. In terms of perceived safety, the existence of commercial activities, distribution of social facilities and public transport stops and routes are provided in the boulevard that makes the boulevard attractive and alive. Also, the boulevard does not have a specific problem that affects the pedestrian' or user' behaviors, especially, the military residences located in F3 gives more feeling safety to the residents and users than other fragments. Moreover, the lighting system is enough in each part of the boulevard according to standards that make the boulevard safe at nights.

Street quality contains different factors such as street width, street sign, street furniture, street tree, sidewalk material, sidewalk width, sidewalk continuity, and street maintenance. The busiest fragment F1 does not have enough street width to carry all of the traffic flow on the boulevard, unlike F3 which has the widest street width despite the fact that it is the calmest fragment. On the other hand, street trees on the sidewalk in F2,

located inappropriately on the sidewalk which blocks the pedestrian flow and do not provide enough place for disabled. Moreover, street trash on the road decreases the used part of the road which is already divided and not enough for the vehicles. Moreover, the quality and maintenance of sidewalk material are poor might cause some accidents. Sidewalks, like roadways, should be designed to serve all users in each fragment of the boulevard. In most parts, surfaces that are not slip-resistant are especially difficult for people who use wheelchairs or walking aids to travel across. Materials, except F1, that are not visually consistent (neglected materials) can make it difficult for pedestrians with vision disabilities to distinguish the difference between a change in color and pattern on the sidewalk and drop off or change in level. Therefore, F1 and F2 do not have enough capacity to provide a comfortable walkable environment in terms of street quality when all of the factors considered as a whole.

The feeling and degree of comfort are dependent on surroundings, the situation and the individual. Firstly, pedestrians feel more comfortable when walking is safe and secure. Although there is no specific problem in terms of perceived safety in all fragments of the boulevard, there are quite important problems about actual safety such as insufficient traffic design elements that might cause some accidents in the future making pedestrians uncomfortable. On the other hand, comfort feeling is strongly related to weather conditions, but the boulevard does not have any shade elements to protect pedestrians from different weather conditions such as hot summer days or rainfall. In F1, even some bus stops do not have shelter or protection elements, also the structure of trees is weak do not provide canopies. In terms of function and aesthetic value of trees, F3 has more advantage than the other fragments. Shade trees are the only elements providing shadow in summer days, but they cannot provide any protection during rainy days. Also, all fragments do not have specific street elements in order to provide pleasant passage like shelter, seating elements, and street art. The benches are only provided in parks along the boulevard, in other parts such as along the sidewalk, street seating is not be provided, so people have to change their directions to the open and green spaces if they need to rest or spend time with their friends. Finally, visual attraction on the boulevard is poor that lead people only pass from somewhere to somewhere rather than a pleasant journey.

Üçkuyular Square and Cemil Midilli Park are perceived as strong references where people gather and spend time together due to the accessible locations and user's needs. The boulevard does not present various qualities to show legibility characteristics

for pedestrians. There are no memorable physical elements to attract users except Atatürk memorial in F2, so users recognize places only for their needs, not because of aesthetic pleasure. On the other hand, the level difference in F2 decreases the pedestrians' perception about the environment.

Table 5.2. Evaluation of literature findings and walkability on Mehmetçik Boulevard regarding walkability principles

	Elements	Literature Findings	Case Study Findings
Diversity		- Shorter distance to central services and facilities that reduce the travel time and courage people to walk, and mixed land use are all related with non-automobile trip demand, more walking, and active transport option (Frank and et al. 2006).	- High variety of land use in F1 courage people to walk more than the other fragments - Both sides of F2 is not connected due to topographic differences on the road, so western part of the boulevard need more public spaces.
Accessibility	**Access to Public Transportation**	- Acceptable distance to the transportation stations should be 400 meters to 800 meters or a 10-20 minutes' walk (Southworth, 2005).	- Pedestrian network within 400 meters threshold to bus stops are provided in all fragments of the boulevard.
	Access to Parking	- Parking plots should be located behind the buildings and away from the street. - Provide on-street parking on 70% of both sides of the streets. - Screen or hide parking behind landscaping (Zuniga-Teran et al., 2017).	- There is no defined parking plot close to Boulevard, behind the buildings or away from the boulevard. - On-street parking on 70% of both sides of the boulevard is only provided in F1 but road width is not enough for it. - Parking plots between buildings, especially in F1, are not specified by design or landscape elements.
	Access to Open & Green Spaces	- Include a small greenspace (2 ha) within walking distance of homes (400 m), and encourage small shops on its boundaries, including food trucks (Zuniga-Teran, 2015).	- Pedestrian network within 400 meters threshold to open-green areas are provided in all fragments of the boulevard.
	Barrier-free Access	- The design is useful and marketable to people with diverse abilities. - The design accommodates a wide range of individual preferences and abilities. - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.' - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. - The design minimizes hazards and the adverse consequences of accidental or unintended actions. - The design can be used efficiently and comfortably and with a minimum of fatigue. - Appropriate size and space are provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility (R. Mace, 1997:29).	- Design of the boulevard is only acceptable for disabled people at the beginning of F1 where the boulevard meets Üçkuyular Square, but there are still some missing design elements such as informative signs and appropriate size and space for the sidewalk. - In other parts of the boulevard, there is no special arrangement for all.

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Table 5.2 (cont.)

Safety	**Traffic Design Elements**	- Regulations on roadway - bumps, humps, and other raised pavement areas - reducing street area where motor traffic is given priority - street closures - traffic diversion - surface texture and visual devices - parking treatments (The Federal Highway Administration, 2003) - Signalization system for both pedestrians and drivers - Pedestrian and traffic control signing and signals (London Department of Transport, 2011)	- No bumps, humps, and other raised pavement areas in all parts of the boulevard. - Traffic diversion is not provided by road for buses and cars because of insufficient width of the road. - Pedestrian and traffic control signing and signals are only provided at the beginning of the F1. In other parts, these elements are not designed well and safely.
	Pedestrian Crossover	-Urban street connections should be at most 90 meters apart (Jacobs, 1993). -In pedestrian crossings with light control, traffic sign lamps should have a illuminated pedestrian figure for the hearing impaired and a sound (acoustic) warning sign for the visually impaired. -In places with uncontrolled pedestrian crossings, drivers must be warned for 20m advance passage to ensure safe use of obstacles. The pedestrian crossing should also be warned by pedestrian crossing and handicapped signs, and should be well lit (Road And Traffic Safety Congress For Sustainable Transportation Book by Department of Traffic Planning and Implementation of Gazi University Institute of Science and Technology, 2015).	- The boulevard does not have defined and well-designed pedestrian crossing according to standards for all except at the beginning of the boulevard where Üçkuyular Square and F1 meets.
	Lighting	- Legible environments should be designed to guide pedestrians for seeing and understanding their surroundings. - Pedestrians should able to see each other, especially other pedestrians. - Alternative routes should be provided to pedestrians in case of avoiding potentially dangerous situations (Pedestrian Planning and Design Guide by New Zealand Transport Agency, 2008:4-6)	- Lighting system is enough in all fragments of the boulevard according to standards.
	Sense of Safety	- Combination of physical and functional diversity in the neighborhood and the different methods of use make the place felt more secure. - The existence of commercial activities, distribution of social facilities and public transport stops and routes take place together by making the nature of the place feel safer (Jacobs, 1961). - High crime rates have a bad influence on walking trips (Alfonzo, 2005).	- Combination of physical and functional diversity in the neighborhood is enough. - The existence of commercial activities, distribution of social facilities and public transport stops and routes are provided in the boulevard. - Military residences in F3 and security cameras in F1 provide security feelings for pedestrians on the boulevard.

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Table 5.2 (cont.)

Street Quality	**Street Width**	The following steps should be followed in the preparation of classification stages for urban roads: - Preparation of maps showing the current and future pedestrian and vehicle traffic volume in the city's road network - Preparing maps showing the geometric standards of the city's road network - Preparation of city's accident maps - Preparing maps showing the land use of the city - Speed, junction types and intermediate distances, pedestrian mobility, traffic volume and geometric standards review - Preparation of new speed and road functional map according to the elimination of discrepancies (Kayacı, 2015).	- Street width is not enough in F1. It causes a traffic jam in rush hours and possible to increase this problem in the future because of ongoing projects.
	Street Signs	- Improve the quality of physical alterations to commercial corridor. - Enhance the quality of pedestrian experience along a commercial corridor by providing a pleasant shopping experience for business patrons. - Enhance economic investment for business and property owners. - Protect and conserve neighborhood architectural character. - Promote community awareness of the physical environment. - Encourage flexible and individual creativity rather than anonymous uniformity (Design Guidelines for Commercial Façade Improvements, 2003:1).	- Street signs in the boulevard are not designed aesthetically. - There is no harmony and common language between street signs.
	Street Furniture	- City furniture in each city should be designed and produced regarding the urban identity of the place, and a city furniture coordination commission should be provided to establish a common language among the existing urban furniture (Güneş, 2005).	- There is no street furniture on the boulevard except street bins.
	Street Trees	- Green elements, canopies, windbreakers, and various street furniture should be used to protect from bad weather. - Street trees should not restrict the passage and visibility of pedestrian crossings, road and street use.	- The number of street trees in the boulevard is enough, but the structure of the trees is not suitable to provide a canopy and restrict the bad weather. - Street trees in F2 restrict the pedestrian movement because of insufficient sidewalk width and wrong localization of the trees.
	Sidewalk Material	- Surface covering on street ladders, ramps, pavements, and pedestrian crossings should be covered with durable and non-slippery materials that will not cause an accident (Bassuk N., Evans M., Trowbridge P., 1990).	- Sidewalk materials in each part of the boulevard not durable and well-designed for all users.

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Table 5.2 (cont.)

Street Quality (cont.)	**Sidewalk Continuity**	The pedestrian should be safe, comfortable and also shortest way from one point to another should be provided for street continuity. - There should be no obstacles (pauses, advertisement-billboards, electric pylons, garbage containers, vehicles, shop products, etc.) that will prevent pedestrian movement on the sidewalks and / or endanger its safety. - The planting of the pedestrian pavements within the pedestrian networks to be formed in accordance with the technique will make an important contribution to the formation of the urban green network system in addition to the functions it will provide. - The width of the sidewalks is a very important factor affecting pedestrian access. Pavement widths do not only affect pedestrian access positively or negatively, but also play a role in reducing or increasing the effectiveness of problems caused by other living and non-living street elements. Therefore, pedestrian pavement widths should be adjusted according to standards (Hepcan and et al. 2006).	- There are some obstacles (pauses, electric pylons, garbage containers, vehicles, shop products) that restrict pedestrian movement except in F3. - The planting in F2 restricts the pedestrian movement. - The width of the sidewalk is not enough in F2 and in some parts of F1.
Comfort		Characteristics of livable urban areas can be ranked as below (Nazifoğlu, 2016): - Areas where people can access the design elements for shadow or sun needs while walking, - Reduction of strong winds in the area, - Little or no mechanical noise, - The voices from people indicate that they have a good time, - The boundaries where other activities appear and can be accessed, - Comfortable seating and attractive ornaments, - The absence of physical threat is to provide psychological peace.	- Only Üçkuyular Square and parks along the Boulevard are used for resting and gathering purposes. Other than these there is no street furniture on the way to provide comfortable passage for pedestrians. - In F1, especially in rush hours, the boulevard is noisy because of traffic density and intensively usage of the daily shops, cafes, and restaurant.
Legibility		- Physical elements and arrangements create different sensations and long-term effects, making the space memorable. - The places without character do not give the opportunity to users to revitalize the place in their minds. - The existence of significant buildings, reference points, panorama, the square, and bus stops are perceived as strong references (Ewing and Handy, 2009; Ewing and et al., 2006).	- There are no memorable physical elements to attract users except Atatürk memorial in F2. - Users recognize places regarding their needs, not because of aesthetic pleasure. - Üçkuyular Square and Cemil Midilli Park perceived as strong references.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

Walkability is more than just acting from one place to another; It is one of the most important necessity for human and urban life, which supports a high quality of life by easy access, socialization, healthy life, and rich environment. The reason for the existence of cities is people, and thus the criteria of quality of life affect the behaviour of people in cities as well as in urban areas. Many researchers who are interested in pedestrian safety and walkability care about issues affecting walkability, believe that walking is a good exercise, or that walking is better for the environment than driving. On the other hand, creating a people-oriented street increases the social bonds and economic life. When people-oriented streets are examined, where walking is safe and enjoyable, and traffic is not intense, it is seen that these streets are more efficient in terms of social and economic development.

Studies that have been conducted so far have found that historic areas and complex street patterns are more convenient to walk and encourage pedestrians. However, today' cities problem is that although the principles related to walking have been tried to apply in the built environment and neighborhood scale, there has not been enough success. On the other hand, the pedestrians' quality of life declines because of safety and access problems when the connection between pedestrian ways along the main roads and in the neighborhood areas are not been met enough well. While the walkability quality of each public place varies according to its physical, geographic and social differences, there are general strategies and regulations that should be implemented in all scales in order to increase the quality of life and walkability quality. These recommendations are listed as follows:

- Definition of walkability should be developed comprehensively by supported policies, programs, regulations and people.

- Development patterns of the cities should be planned in a comprehensive way for both local and city scale.
- Public transportation system and linkage with other modes should be improved.
- Parking lots should be located behind buildings, or in parking garages.
- Actual and perceived safety in the public areas should be provided through the design of street pattern and design elements that creates a more alive and social environment.
- At neighborhood and urban scale, pedestrian linkages should be provided or developed that enhances the lively community along with outdoor activities.
- Quality of path, material on the floor, street landscape, and street furniture and lighting should be designed and located well and enough regarding the capacity of the area.
- All of the design elements and street furniture should be designed in a useful and readable way for people with diverse abilities and disabilities.
- The aesthetic quality of the public spaces should be provided by combined of various elements such as the quality of the architectural and landscape design, the variety of views and vistas, and the arrangement and maintenance of elements in the public realm.

In the case of Mehmetçik Boulevard which is a mixed-use neighborhood area in urban center has some advantages and disadvantages in terms of walkability. This research deduces that although walkability quality of Mehmetçik Boulevard is poor that affects the pedestrians' safety and movements in their daily lives, walking demand is high. The most important reasons behind this outcome are that entrance of Mehmetçik Boulevard located in a multi-transition area in the urban center which is used intensively by pedestrians and vehicles during the day and the different and unconnected fragments of the inside of it. The boulevard and the around it has a huge risk of exceeding the carrying capacity through the new projects, if essential precautions are not taken.

On the other hand, fragments in the boulevard demonstrate different attributes in terms of land-use, topography, and usage which causes the decreasing of connectivity among them. Besides that, the most significant issue of all fragments is the actual safety problem such as insufficient traffic elements and designs. The Boulevard that does not offer a pleasant passage due to unattractive quality is used as a transition corridor in order

to provide necessities by pedestrians. Even if the built environment and topography are hard to change after the established system and the layout, but the quality of life can be improved by small touches and the design elements. All these problems, firstly, should be considered on a large scale through interactions surrounded by the area and then, in a smaller scale, boulevard should be upgraded by small-scale policies and designs.

As overviewed by this research, case study results and literature findings are examined in the case of Mehmetçik Boulevard mentioned in detail in Chapter 5. Regarding the findings from the research, some necessary interventions should be applied on the boulevard to increase walkability quality and safety; and in the future, it might be an example to the other neighborhoods and urban centers where walkability quality needs to be increased. Recommendations are ranked in terms of walkability principles as diversity, accessibility, safety, street quality, comfort, and legibility as below and shown in Figure 6.1:

Diversity

- In addition to daily commercial uses, public areas can be increased, especially in F2 having disconnected eastern and western side.
- Necessary arrangements should be provided by predicting the demand for changing residential usage on the ground floor to commercial usage.

***Accessibility* (A)**

- Access to public transport is one of the key factors in measuring the accessibility of the area, so it could be provided by a continuous and safe pedestrian network.
- Insufficient parking lots decrease the pedestrian connectivity and used road width, so parking lots should be located in F1 and F2 according to design standards.
- On-street parking should be well managed and regulated. If it would be necessary, it can be charged higher to prevent long-duration parking (Figure 6.3).
- Street parking should be eliminated within pedestrian crossings (Figure 6.3).
- The opportunities of amenities for the disabled, such as pavement texture, curb ramps, the height of pavement, information and orientation sign, and lighting, have to be provided to make the boulevard accessible for all users.

- Street stairs should be redesigned adding the ramps according to design criteria in F1 and F3 (A).

***Safety* (S)**

- Traffic calming elements such as speed humps, raised pedestrian crossings, mid-street crossing island (in F1) bulb outs, narrow lanes for vehicles, and reduced sightlines for drivers by using trees should be introduced into F1 and F2 to decrease speed of vehicular traffic.
- Interaction between vehicle and pedestrian traffic can be managed in different ways like 'speed management', 'soft separation' through use of lines and different coloured materials instead of kerbs and bollards, etc.
- Traffic design elements should be properly placed in the junctions for creating a safe environment for all users in F1, F2, and F3 (S).
- The sidewalk width should be widened to create space for street furniture and other amenities for pedestrians in F2. Also, a buffer can be created in F1 between pedestrians and moving vehicles by the use of landscape and street furniture such as benches, bus shelters, and pedestrian lighting, etc. (Figure 6.1).
- Pedestrian crossovers should be designed and specified in all fragments. Traffic design elements such as marking, signage, and lighting can be incorporated into pedestrian crossing to make them visible to moving vehicles during the day and night (6.2).

Street Quality

- Street width of the F1 should be taken consideration and widen to prevent the traffic jam, especially during the rush hours.
- Sufficient street furniture, such as benches, bollards and bins, etc. should be located into the public spaces to increase comfort level of citizens. Also, street furnishings should be utilized to create a consistent rhythm (i.e., the consistent height of light poles or consistent shade pattern of trees).
- Garbage bins should be located properly, especially in F2 where the road width is narrow, on the street without obstructing the vehicle flow and pedestrian movements. So, new design methods can be applied on sidewalks.

- Sidewalks in the all fragments should be paved with smooth surfaces and well compacted to provide comfortable and safe environment for citizens with varied ages and physical abilities.
- Damaged pavement, especially in F1, slabs and disharmonious materials should be improved regarding the street character.
- Sidewalk material can be distinguished into two parts by different materials where is separated for outdoor cafes and transition area.
- Street signs aesthetically should be regulated regarding the design criteria.
- Street trees should be closely planted incorporated shade producing street trees. They may be interspersed with existing or proposed ones. Also, planting should complement character of the built environment, pedestrian movement or views.

***Comfort* (C)**

- Design elements of the bus stops should be improved to provide shelter and visible informative signs.
- Starting and waiting point of public buses in F3 where is the southernmost of the boulevard should be defined and redesigned to provide a readable and safe place for users (C).
- Overhead architectural features should be included, such as awnings or cornice elements that provide shade and reduce heat gain.
- Level differences between vehicle road and the sidewalk should be decreased to create more comfortable access for all users or ramps should be located where sidewalk and road meet.

***Legibility* (L)**

- The attractiveness of the street, especially in all segments of the boulevard, can be increased by street art, landscape elements and street furniture.
- Design solutions can be provided for the wall on the middle of the vehicle way in F2 and facades inF1 can be made them coordinated and consistent to promote street legibility in pedestrian mind (L).

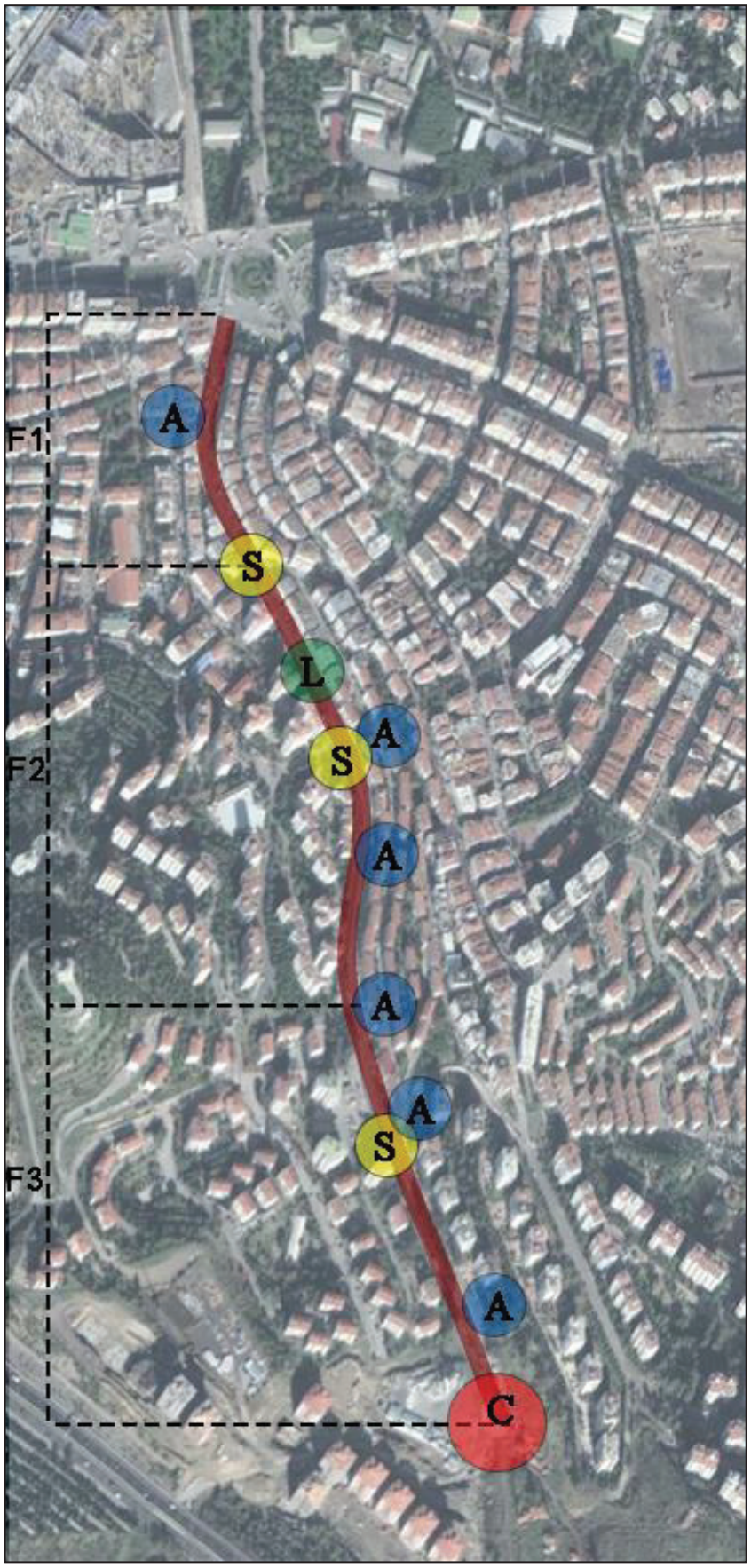
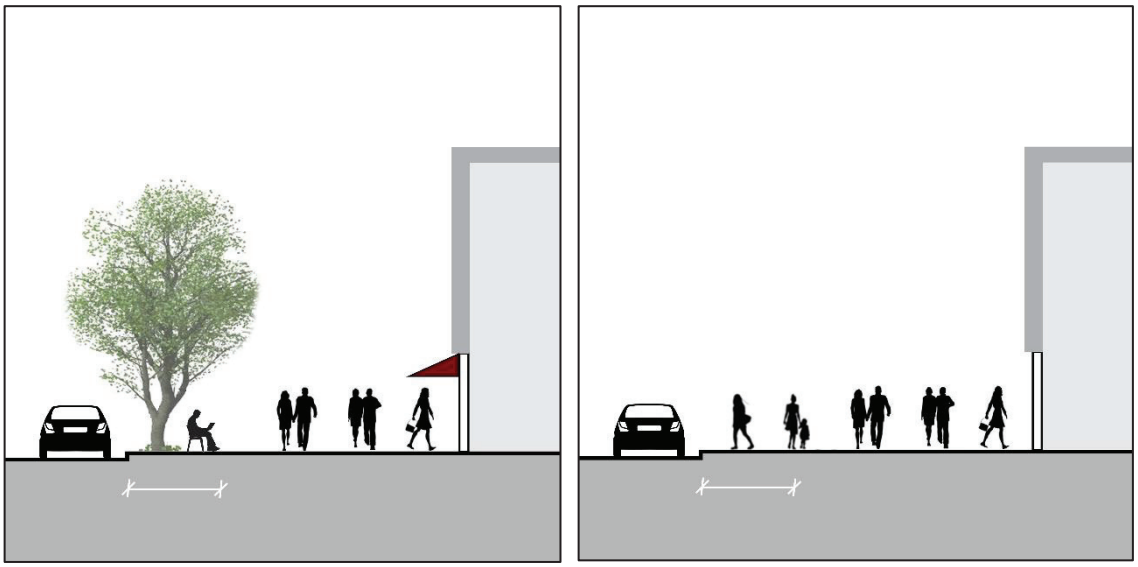


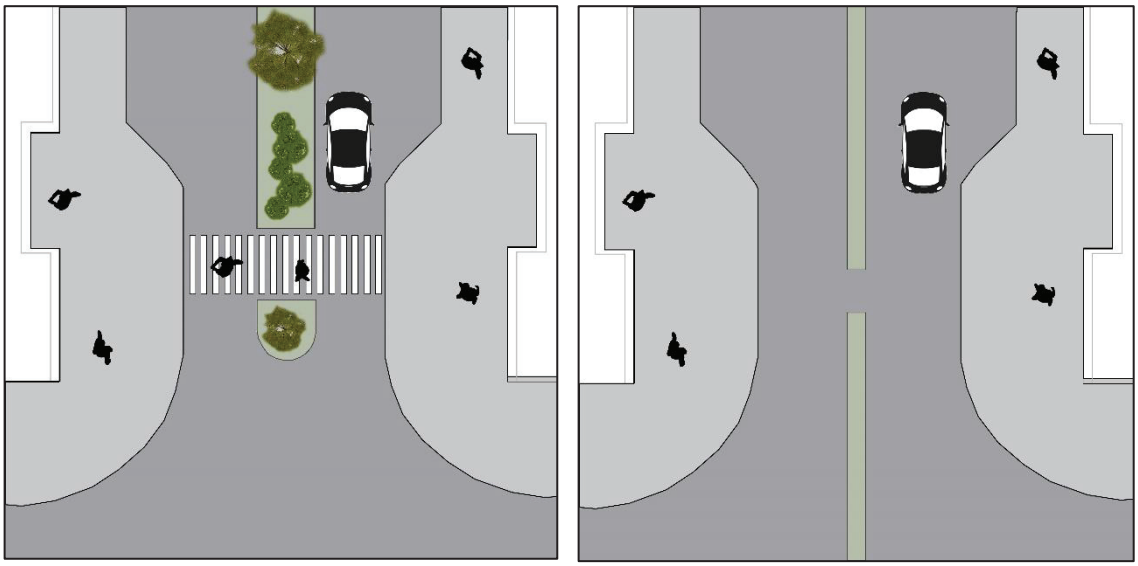
Figure 6.1. Recommendations to increase walkability quality in the case study area



Recommended Not Recommended

Figure 6.2. Landscape elements and street furniture can be used to increase walkability comfort (Prepared by S.Bağcı)

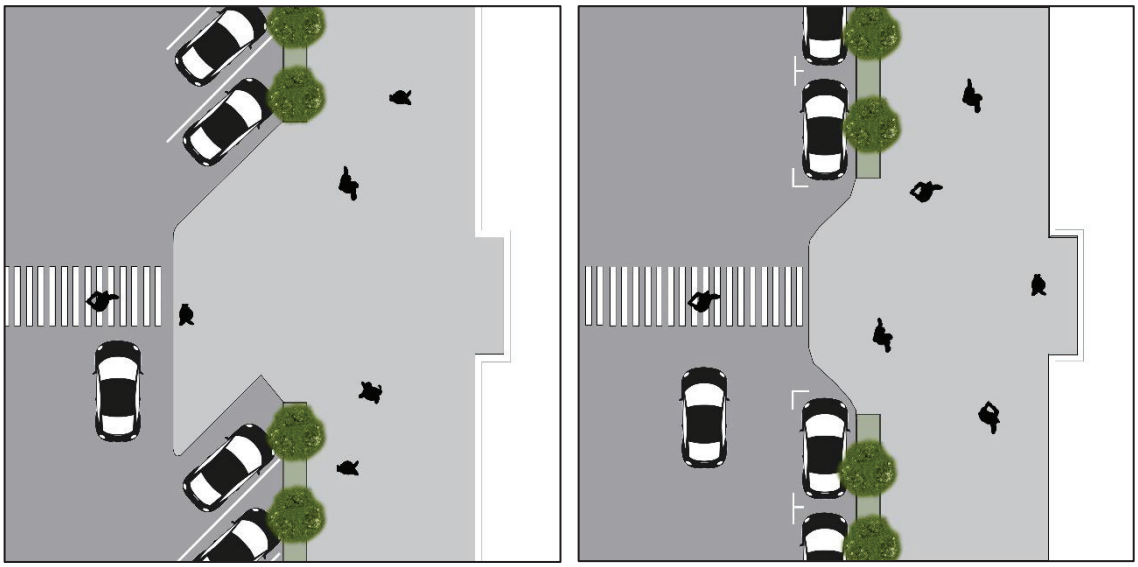
Figure 6.3. Creating a buffer between pedestrians and moving vehicles by the use of landscape and street furniture.
(Source: Schmitt, 2016)



Recommended Not Recommended

Figure 6.4. Pedestrian crossings and mid-street crossing island can be used to increase safety (Prepared by S.Bağcı)

Figure 6.5. Example of walkable street design with pedestrian crossing and street elements (source: Jorge de la Torre Architect, 2012)



Recommended Recommended

Figure 6.6. Proper on-street parking provide a safe environment and courage to walkability (Prepared by S.Bağcı)

Figure 6.7. Example of walkable street with regulated parking plots and street elements (Source: Sprague, 2017)

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APPENDIX A

QUALITY OF LIFE INDEX

Table A.1. Quality of life index in the mid-year of 2019 for Asia Region
(Source: Asia - Quality of Life Index 2019 Mid-Year, retrieved from Numbeo, n.d.)

	City	Quality of Life Index	Purchasing Power Index	Safety Index	Health Care Index	Cost of Living Index	Traffic Commute Time Index	Pollution Index	Climate Index
1	Abu Dhabi, United Arab Emirates	170.00	104.73	89.39	68.74	63.74	27.15	49.14	43.89
2	Mangalore, India	169.96	65.71	74.15	79.02	24.25	33.04	30.80	66.65
3	Tokyo, Japan	169.65	98.37	80.61	80.91	90.60	38.33	43.09	85.26
4	Muscat, Oman	168.04	81.61	77.15	58.71	50.93	18.53	37.98	67.22
5	Bursa, Turkey	163.79	43.30	77.34	79.27	36.83	33.84	42.85	93.39
6	Doha, Qatar	162.42	115.33	88.31	73.09	62.43	31.37	62.01	36.03
7	Limassol, Cyprus	160.35	79.79	67.35	51.21	62.31	17.09	52.82	95.74
8	Dubai, United Arab Emirates	158.39	100.61	83.34	65.93	68.85	39.61	52.25	50.27
9	Tel Aviv-Yafo, Israel	153.53	82.26	71.70	73.61	83.74	35.78	45.09	93.88
10	Taipei, Taiwan	152.34	80.61	85.03	86.55	60.68	33.08	50.87	84.38
11	Riyadh, Saudi Arabia	149.19	103.37	71.73	65.47	49.78	29.95	68.57	44.45
12	Singapore, Singapore	146.09	88.84	72.30	71.07	80.23	41.30	32.06	57.45
13	Jeddah (Jiddah), Saudi Arabia	144.35	93.98	65.65	56.97	50.85	31.00	70.53	66.17
14	Izmir, Turkey	143.61	46.70	73.46	72.26	34.24	39.06	61.62	96.88
15	Seoul, South Korea	143.34	86.13	71.03	83.18	84.48	41.45	49.23	68.39
16	Nicosia, Cyprus	142.75	61.29	71.44	51.33	62.56	25.43	60.63	86.01
17	Islamabad, Pakistan	140.51	37.06	69.53	64.53	20.60	31.89	46.87	76.91
18	Ankara, Turkey	130.86	46.51	59.67	67.70	35.69	35.85	70.57	91.49
19	Pune, India	128.83	73.51	62.97	67.16	28.27	43.27	72.58	74.32

APPENDIX B

QUESTIONNARIE

Table B.1. The questionnaire of the case study of Mehmetçik Boulevard

Seda BAĞCI Yüksek Lisans Öğrencisi İzmir Yüksek Teknoloji Enstitüsü Mimarlık Fakültesi Şehir ve Bölge Planlama Bölümü – Kentsel Tasarım		**Dr. Nursen KAYA EROL** Tez Yöneticisi İzmir Yüksek Teknoloji Enstitüsü Mimarlık Fakültesi Şehir ve Bölge Planlama Bölümü – Kentsel Tasarım			
Anket No:		**Tarih:**		**Saat:**	
A. GENEL BİLGİLER					
1. Cinsiyet		Erkek		Kadın	
2. Yaş					
3. Eğitim Durumunuz		İlkokul	Ortaokul	Lise	Yüksek Öğrenim
4. Mesleğiniz					
5. Nerede Yaşıyorsunuz?					
B. ARAZİ KULLANIMI					
6. Caddeyi kullanım amacınız nedir?					
Gezme - dolaşma	Alışveriş	Geçiş alanı olarak kullanma (ev, okul, vs)			
Kamu binalarının kullanımı	Buluşma (kafe, restaurant kullanımı)	Çalışma (iş yerinin çevrede bulunması)	Diğer…		
7. Ne kadar sıklıkla caddeye geliyorsunuz?					
Ayda 1-2 kere	Haftada 1-2 kere	Haftada 3-4 kere	Haftaiçi her gün	Her haftasonu	Her gün
8. Caddeye hangi ulaşım aracı ile geliyorsunuz?					
Toplu taşıma ile	Özel araç ile (Park yeriniz: ……)		Yürüyerek		
9. Sizce bu caddde yayalara uygun bir cadde mi?		Evet		Hayır	
10. Caddenin hangi bölümlerinde daha zor yürüyorsunuz?		Bölge 1		Bölge 2	Bölge 3
11. Caddenin hangi bölümlerinde daha rahat ve konforlu yürüyorsunuz?		Bölge 1		Bölge 2	Bölge 3
C. YÜRÜNEBİLİRLİK ÖLÇÜTLERİ –Katılıyorum, Bir Fikrim Yok, Katılmıyorum olarak değerlendirilecektir.					
		Katılıyorum		**Bir Fikrim Yok**	**Katılmıyorum**
Ulaşılabilirlik	**13. Caddeden toplu taşıma araçlarına ulaşım rahattır.**				
	14. Yol üstü parklanmalar yaya geçişlerini engellemektedir.				
	15. Sokak çocuk, yaşlı ve engelli vatandaşların erişimi için elverişlidir.				

(cont. on next page)

Table B.1 (cont.)

Güvenlik	**16. Caddede trafik yoğunluğu yaşanmamaktadır.**			
	17. Trafik tabelaları yaya ve araç akışı açısından yeterli düzeydedir.			
	18. Cadde üzerinde yayaların güvenliği açısından hız kesici önlemler (rampa, bilgilendirme, ışıklandırma) alınmıştır.			
	19. Caddede yeterince yaya geçidi vardır.			
	20. Yaya geçitleri doğru yerlere tasarlanmıştır.			
	21. Caddede gürültü problemi vardır.			
	22. Gece ışıklandırılması yeterli düzeydedir.			
	23. Gece güvenli bir caddedir.			
Sokak Tasarımı	**24. Cadde genişiliği araç trafiği açısından yeterli genişliktedir.**			
	25. Cadde üzerindeki dükkanların tabela ve bilgilendirme unsurları estetik açıdan rahatsız etmemektedir.			
	26. Sokak mobilyaları (bank, çöp kutusu, vb.) yeterli sayıdadır.			
	27. Sokak mobilyaları, yayaların hareketini engellemeyecek şekilde tasarlanmıştır.			
	28. Yol üzerinde ağaç ve yeşil alanlar yeterli sayıdadır.			
	29. Ağaç ve saksılar yaya geçişini engellemeyecek şekilde düzenlenmiştir.			
	30. Yaya yolunun dokusu yürüme için rahat bir yapıya sahiptir.			
	31. Yaya yolunun dokusu yaşlılar, engelliler ve çocukların kullanımı için uygun kriterlere sahiptir.			
	32. Yaya yolunun genişliği yeterli düzeydedir.			
	33. Yaya yolları arasında bağlılık ve süreklilik sağlanmıştır.			
	34. Sokak temiz ve bakımlıdır.			
Görüşler	**35. Sizce caddenin en çok kullanılan ve ilgi çeken yerleri nerelerdir?**			
	36. Konu ile ilgili başka eklemek istedğiniz bir şey var mı?			