URBAN FORM AND WALKABILITY: THE ASSESSMENT OF WALKABILITY CAPACITY OF ANKARA

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ASLI AK

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN
CITY AND REGIONAL PLANNING

JUNE 2018

Approval of the thesis:

URBAN FORM AND WALKABILITY: THE ASSESSMENT OF WALKABILITY CAPACITY OF ANKARA

Submitted by **ASLI AK** in partial fulfillment of requirements for the degree of **Doctor of City and Regional Planning in City and Regional Planning Department, Middle East Technical University** by,

Prof. Dr. Halil Kalıpçılar
Dean, Graduate School of **Natural and Applied Sciences**

Prof. Dr.Çağatay Keskinok
Head of Department, **City and Regional Planning**

Prof. Dr. Müge Akkar Ercan
Supervisor, **City and Regional Planning Dept., METU**

Examining Committee Members:

Prof. Dr. Ayda Eraydın
Department of City and Regional Planning, METU

Prof. Dr. Müge Akkar Ercan
Department of City and Regional Planning, METU

Assoc. Prof. Dr. Hediye Tüydeş Yaman
Department of Civil Engineering, METU

Prof. Dr. Aysel Odabaş Uslu
Department of Landscape Architecture, Ankara University

Assoc. Prof. Dr. Feray Koca
Department of City and Regional Planning,
Muğla Sıtkı Koçman University

Date: 25.06.2018

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Aslı Ak

Signature

ABSTRACT

URBAN FORM AND WALKABILITY: THE ASSESSMENT OF WALKABILITY CAPACITY OF ANKARA

Ak, Aslı
Ph.D., Department of City and Regional Planning
Supervisor: Prof. Dr. Müge Akkar Ercan

June 2018, 395 pages

Walkable cities are one of the major requirements of sustainable and livable cities. From the 1960s to nowadays, contemporary cities have been shaped and developed through an automobile-oriented planning which neglects of public transport users, pedestrians and cyclists, promotes urban sprawl leading to a high-costly infrastructural investments. Based on privately owned car-oriented transportation policies and rapid urbanization dynamics, cities grow fast by sprawling with uncontrolled building densities, while increasing environmental pollution, raising social and economic inequalities, public health problems, causing destructive effects on agricultural productive lands, open green spaces and forest lands, natural wild life. All these problems threaten economic, social, environmental and ecological sustainability of cities. This research mainly argues that there is a strong relationship between urban form and walkability capacity of a city or urban environment. It aims to show that walkability of cities should be studied, planned and designed based on three major scales: macro scale, meso scale and micro scale. By identifying the key walkability parameters of each scale, it seeks to develop a walkability assessment approach to develop more sustainable urban forms at macro, meso and micro scales. By using Ankara as the case study and focusing two neighborhoods in the city, it assesses the walkability capacity of urban environments at different levels. By using the walkability assessment method on the two different districts –Kavaklıdere and Çukurambar- and two main mix-used streets of these districts with different urban form qualities, it also shows the different walkability capacity of urban form at meso and micro scales.

Keywords:
Walkability, urban form, urban design, walkability parameters, Ankara, Kavaklıdere, Çukurambar,

ÖZ

KENTSEL BİÇİM VE YÜRÜNEBİLİRLİK: ANKARA'NIN YÜRÜNEBİLİRLİĞİNİN ÖLÇÜMLENMESİ

Ak, Aslı
Doktora, Şehir ve Bölge Planlama Bölümü
Tez Yöneticisi: Prof. Dr. Müge Akkar Ercan

Haziran 2018, 395 sayfa

Yürünebilir kentler, sürdürülebilir ve yaşanabilir kentlerin temel gerekliliklerinden biridir. 1960'lardan günümüze, çağdaş kentler toplu taşım, yaya ve bisiklet kullanıcılarının göz ardı edildiği, arabanın ön planda olduğu bir planlama yaklaşımı ile geliştirilmiş ve biçimlenmiştir. Özel araba sahipliliğinin hakim olduğu ulaşım politikaları ve hızlı kentleşme dinamikleri, kentlerin yayılarak, kontrolsüz yapılaşma yoğunlukları ile hızla gelişmesine yol açarken, çevre kirliliğinin, toplumsal ve ekonomik eşitsizliklerin, toplum sağlığını tehdit eden kitlesel hastalıkların artmasına, verimli tarımsal arazilerin, açık yeşil ve orman alanlarının, doğal yaşamın yok olmasına neden olmaktadır. Bütün bu sorunlar, kentlerin ekonomik, toplumsal, çevresel ve ekolojik sürdürülebilirliğini tehdit altına almaktadır. Bu doktora tezi, kentin ve kentsel çevrenin yürünebilirlik kapasitesi ile kentsel form arasında güçlü ilişki olduğunu iddia etmektedir. Yürünebilir kentlerin değerlendirilmesinin, planlanmasının ve tasarlanmasının kent bütünü (macro), kentin alt parçaları (meso) ve sokak (micro) ölçeklerinde yapılması gerektiğini göstermeyi amaçlamaktadır. Bu araştırma, yukarıda belirtilen üç farklı ölçekte yürünebilirlik ölçütlerini belirleyerek, daha sürdürülebilir kent formlarını kent bütünü, kentin alt parçaları ve sokak düzeyinde geliştirebilmek için bir yürünebilirlik değerlendirme yöntemi önermektedir. Ankara kent bütünü özelinde, kentin iki farklı bölgesinde geliştirilen yürünebilirlik değerlendirme yöntemini kullanarak farklı ölçeklerdeki yürünebilirlik kapasitesini ölçmektedir. Ayrıca, söz konusu değerlendirme yöntemiyle, kentsel form nitelikleri farklı özelliklere sahip Kavaklıdere ve Çukurambar bölgeleri ve bu iki bölgenin karma kullanımlı iki ana caddesi üzerinde, kent parçası ve sokak ölçeklerinde kentsel formun yürünebilirlik kapasitelerindeki farklılıkları ve ortaklıkları göstermeye çalışmaktadır.

Keywords:
Yürünebilirlik, kentsel biçim, kentsel tasarım, yürünebilirlik ölçütleri, Ankara, Kavaklıdere, Çukurambar

To my dear son and daughter, Arman & Aylin AK

ACKNOWLEDGEMENTS

I am heartily thankful to my supervisor, Prof. Dr. Müge Akkar Ercan, for her patience, continuous support and encouragement with invaluable guidance, comments, and ideas from the initial to the final level, which enabled me to accomplish this thesis. I could not have imagined having a better advisor and mentor for my Ph.D study.

Besides my advisor, I would like to thank the committee members of my TIK meetings: Prof. Dr. Ayda Eraydın, Assoc. Prof. Dr. Hediye Tüydeş Yaman for their patience, transmitting their professional worldview and support in overcoming numerous obstacles I have been facing through my research.

My sincere thanks also go to the rest of committee members, Prof. Dr. Aysel Odabaş Uslu, and Assoc. Prof. Dr. Feray Koca for their attendance, comments and suggestions.

A special thanks to my mommy for supporting me throughout my life and unexplainable thank to my dad who carefully and lovingly take care his grandkids and encouraged me until I accomplish my thesis.

I would like express appreciation to my beloved wife Siyavuş Ak who always inspired, encouraged and fully supported me during the completion of the thesis. With a special mention to my lovely son and daughter, Arman and Aylin, who have contributed to my long-term work.

Words cannot express how grateful I am to my brothers and sisters for supporting me spiritually throughout writing this thesis and my life in general.

A very special gratitude to my daughter-in-laws who lovingly away from their families look after little Aylin and provide me with peace of mind to accomplish my work.

Last but not the least, I would also like to thank all of my friends who supported me in writing, and incented me to strive towards my goal.

Thanks for all your encouragement!

TABLEOFCONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

CHAPTER 1

INTRODUCTION

1.1 Research problem and emergence of the notion of 'livability'

Ignoring important parameters of the walkability in cities (on macro-meso scales) threatens fast growing cities, leading to the development of uneven, unsustainable and non-livable urban environments accompanied with social, economic and environmental inequalities. These urban environments suffer from an ***automobile-oriented planning*** which neglect of public transport users, pedestrians and cycliststhat enhances urban sprawl. The car-oriented planning approach brings about not only a significant deal of highly costly infrastructural investments shaping cities based on privately owned car-oriented transportation policies but also causing less investment on the public transportation investments that ultimately cause the increasing environmental pollution and raising social and economic inequalities in cities. Along with this car-oriented rapid urbanization, cities grow as a form of sprawl with uncontrolled building densities, threatening agricultural productive lands, open green spaces and forests lands, as well as natural ,wild life that they contain, all of whihc are significant economic, environmental and ecological livelihoods of cities. Contemporary cities, developing without a compact form, usually bring about the problems such as high costs of managing and providing urban services (public transportation, waste collection, emergency services, etc.), declining city centers, while making new uncontrolled sub-centers as clutters of residential and commercial uses rather than creating small-city and urban district forms made up of a balanced and mix-used urban envrionments. Contemporary cities that fail in providing an integrated transport network system cause decrease of connectivity, accessibility and consistency, leading to the development of unsustainable urban patterns and urban living forms. The uncontrolled urban sprawl in contemporary cities increases distances between destinations, ultimately neglecting human-scale accessible urban environments. Promotion of mono-funcional usages in such fast growing cities also decreases the development of sub-centers accommodating diversity and variety in terms of urban functions accessible by walking or cycling.

All these harmful problems that cities are faced with are mostly result from car-centric development leading to traffic congestion, air pollution and loss of public space with negative effects on social, economic and environmental development and citizens' quality of life. Functionalism and the subsequent automobile-focused planning -after the 1950s- have resulted in unsustainable and unhealthy cities, both socially and environmentally. Cars as an instrument of freedom have become a gas-belching, time-wasting and life-threatening prosthetic device and decrease quality of life and livability in cities. In Ankara City, together with the presence of lively neighborhoods in the inner city, such as Kavaklıdere, Gazi Osman Paşa and pedestrianized streets of Kızılay, the public space and street network in Ankara have been deteriorated due to the recent policies of Ankara Metropolitan Municipality. The boulevards, such as Atatürk Boulevard, Inönü Boulevard, have turned into motorways by the recent car-oriented inner-city transportation projects.

Cars became the city's dominants. This has negatively affected the vitality and livability of city centers. On the one hand, traffic congestion particularly in city centers became one of the prominent problems of cities. On the other hand, city centers and their public spaces have transformed to less safe and comfortable vicinities for pedestrians. The expansion of suburbs and building suburban shopping centers far from these city centers have also discouraged people to use commercial, entertainment, cultural and leisure activities in city centers. As a result, traditional city centers triggered to decline their vitality and livability (Kazimee, 2002:1-2). Rapid urban growth and decentralization have caused to appearance of multi-centers with less diversity and connectivity. For instance, in Ankara City, along with the urban decentralization policies, the Central Business District (CBD) including Ulus, Sıhhiye, Kızılay and Gazi Osman Paşa- has been losing economic and social vitality. In addition, oil-drop development of the city (sprawl towards all directions since the 2000s) and less connectivity of newly-developed centers fail to provide an integrated transport system, reduce the accessibility capacity of Ankara for passengers, inflate car use, discourage short trips on foot or bike, thus decreases the quality of life. Ankara developed from a *core dependent* urban entity to an arrangement of *open growth*. That is, instead of developing based on major urban plans, it did so to have a shapeless city footprint. Consequently, Ankara pattern became dispersed, fragmented, and discontinuous due to sprawl in every direction on the periphery, especially in the South, South-West, West, North and North-West directions.

Along with the thoughts of planners such as Clarence Perry who believed that social and economic segregation is a normal procedure, cities started to grow via segregated functional, social and economic enclaves and zones. Hence, large mono-functional buildings and land uses started to be preferred in modern urban planning, while people want to live in a more walkable and bikeable places rather than places which attract more corporations, biotech clusters and aerospace clusters. High-densed city centers and development of suburban areas with segragated usages have caused to promotion of unbalanced density throught the cities, which is against dimensions of livability and walkability. For Ankara, expansion of city center toward periphery areas due to the saturation of city center and filling of the gaps between transition zones have caused an imbalance in the *built form density* first along the development corridors of the city to the direction of north, south, east and west, and then the newly growing sub-centers in the decentralized parts, such as Çayyolu, Yaşamkent, İncek, Doğu Kent. Although *Ankara* seems to be a dense city, its urban macro-form *lacks the main properties of urban compactness including density*, *consistency, and mixed usage parameters.* In fact, there is a lack of intensity in some sub centers caused by a lack of interconnectivity between the center and sub centers. As a result, density excessively increases in the main city centers rather than in poly-centers. While the multifunctional parameter of the cores and the existence of an interconnected road network between them are essential for the livability of the city at macro and meso scales.

Decentralization of residential areas, development of low-density –mono-functional-residential areas in new development zones lead people to decide firstwhere they want to live, then they move there and look for a job. Hence, increasing distance between home and job has become the main problem of many cities. In Ankara, for example, one of the major problems which decreases the livability of the city is increasing the average distance between residential and working, dependancy to private cars, and traffic congestion on the main arteries of urban fabric, such as Atatürk Boulevard, Çetin Emeç Boulevard, Eskişehir Road, and Istanbul Road. In fact, Ankara and similar cities have forgotten human scale at three scales; i.e. macro, meso and micro scales; and it is very hard to perceive the city. Planning mainly focuses on vehicle movement and economic reasons rather than people's movement. Infrastructural investments are mostly concentrated on making wide roads, more corporations rather than facilities for pedestrian movement, which is unsustainable particularly for local governments. Dependency of transportation system on highways and poor public transportation services has increased the use of private cars, decreased walkability capacity and livability of the cities.

The emergence of this car-oriented urban development in cities and realization of the lost value of livability and walkability by communities triggered the notion of 'livability' in the 1960s. Livability as a notion mainly aims to promote the presence of pedestrians and the use of public transportation vehicles instead of private cars within cities. So, livability -oriented activism evolved in the United States (US) and around the world in the 1960s (Figure 1.1). It started developing with the discussions of Jane Jacobs, William Whyte and Kevin Lynch whose main idea was the enrichment of pedestrian life in cities through 'visual' and 'functional' elements. Additionally, Jane Jacobs (1961) put forth the superiorities of 'density' and 'diversity' in increasing sociability and 'livability'. Afterwards, Lynch and Jacobs led light on 'Townscape movement' to assess the importance of street evaluation by examining 'urban form', 'use of street' and 'urban experience'. Lynch (1960) put forward the techniques of 'cognitive mapping', based on people's mental images of the city. These thoughts changed the way of looking at cities through emphasizing on making human-based cities rather than car-centric. Similar to many cities throughout the world nowadays, Amsterdam, Copenhagen, and Barcelona have implemented different strategies to develop sustainable, livable, and walkable urban environments.

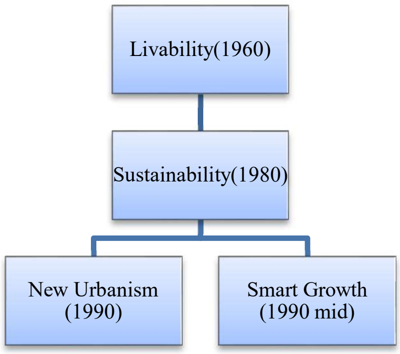


Figure 1.1, The relationship between the notion of livability, sustainability and New Urbanism and Smart Growth (Ghadimkhani, 2011)

Congress for the New Urbanism (CNU) and Smart Growth have also advocated the notion of livability in urban space during the last three decades. CNU, in the 1990s, headquartered in San Francisco and has become the most influential urban design movement of the US. It aims to improve community 'livability' and recapture the qualities of traditional American cities and towns by producing pedestrian-oriented streets, decreasing the effects of low-density sprawl (Kaiser, et al., 2006: 41).

The 'Smart Growth' in the mid-1990s targeted to revitalize older urban spaces, to promote more compact communities, and to halt suburban sprawl (Kaiser, et al., 2006:41, 42). Hence, these movements have started promoting to compensate lost quality of life in terms of physical, environment, economic and social cultural aspects. Today, these efforts are the main subject of urban planning & design in order to ensure livable, healthy urban places to future generations (Wheeler, 2001:14) (Figures 1.1, 1.2).

Livability refers to sustaining "long-time well-being or quality of life", to the environmental and social quality of an area as perceived by residents, employees, customers and visitors (Lambert, 2005:7; VTPI, 2010a:1-2). This includes 'safety and health' (traffic safety, personal security, public health), 'local environmental conditions' (cleanliness, noise, dust, air quality, water quality), 'the quality of social interactions' (neighborliness, fairness, respect, community identity and pride), 'opportunities for recreation and entertainment', 'aesthetics', and 'existence ofunique cultural and environmental resources' (such as, historic structures, mature trees, traditional architectural styles) (VTPI, 2010a:1.2).

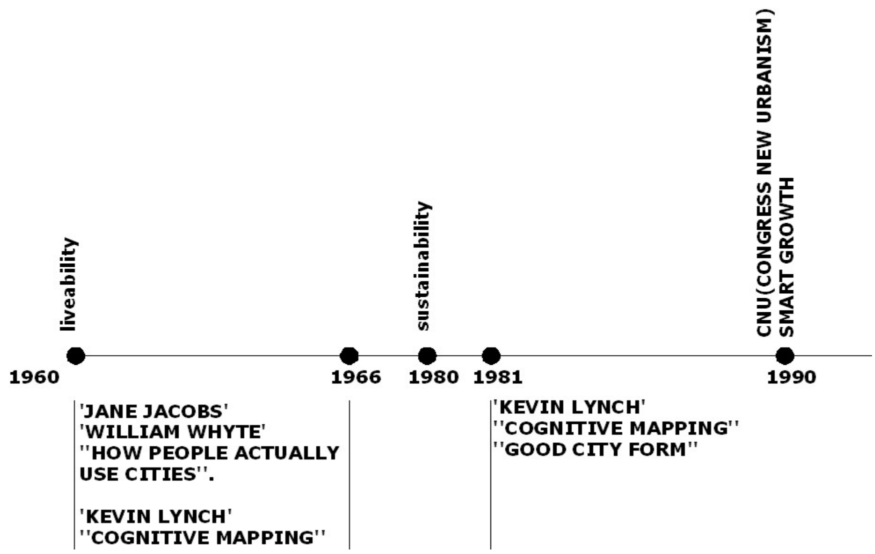


Figure 1.2, Livability, Sustainability, CNU, Smart Growth movements and their advocators, (Ghadimkhani, 2011)

1.2 Dimensions of livability

Livability has mainly three dimensions: physical, economic and environmental. There are a number of indicators to describe the physical dimension of livability. These are: *density and diversity, walkability, connectivity and permeability, qualified architecture and urban design, smart transportation and sustainability* (Akit, 2004: 4, 13-15). As far as *density and diversity* are concerned, they include 'physical diversity', 'economic diversity', and 'social diversity'. 'Physical diversity' refers to a variety in terms of urban physical elements, such as a variety regarding dwelling types, architectural styles, and land-use activities. 'Social diversity' signifies a mixture of people coming from different ages, family types and socio-economic status, while 'economic diversity' means a variety of building types with different property values. In this way, public spaces can be lively (Lambert, 2005:23-24).

Walkability is the second quality of livability in public space. It includes requirements needed to pedestrian convenience such as roadway conditions, land use patterns, community support, security and comfort (Litman 2011:26). It is defined according to various components at three different scales: macro, meso and micro scales. The characteristics which contribute to walkability at macro scale are: a large number of different housing forms, good environmental conditions, a high degree of adaptability to changing needs and socio-economic conditions, and access to open space for recreation and other functions. The macro scale parameters are evaluated in *transportation system characteristics* and *land development variables*main values. The macro scale criteria's can be evaluated at neighborhood, district, and corridor developments as the concern of the meso-scale analysis. Finally, micro scale walkability analysis is as *safety, orientation, attractiveness, comfort, diversity* and *local destinations*(Lambert, 2005; Kolody, 2002; LA-Walkability Checklist, 2008).

Walkability plays an important role to protect the environment, to decrease traffic congestion, to create social interactions, to promote mental and physical health, and to contribute economic vitality of urban space (Meenakshi, 2009:97). It also provides a variety of benefits for urbanites; including its contributions to *basic mobility, community livability, community cohesion, economic development, consumer cost savings, public health,* and *efficient land use* (Litman, 2011:1).

The third physical indicator of livability is *connectivity and permeability.* Both are related to the walkability capacity of open public spaces in cities. Connectivity and permeability can be examined in both *physical* and *perceptual* terms. Continuous physical pattern of a street or path without interruptions encourages pedestrians to walk, while street furniture (such as coherent height of light poles, and coherent canopies) can enforce a perceptual continuity and can create harmonious rhythm (Kolody, 2002:43; LA-Walkability Checklist, 2008:11; Litman, 2011:26). The fourth physical indicator is *qualified architecture and urban design.* These characteristics address to *attractiveness, comfort, legibility, green space and a sense of place*. *Smart transportation* is another physical indicator. It particularly contributes to walkability, as well as environmental and economic dimensions of livability (Akit, 2004:4, 14-15). Transportation network facilities, such as streets, provide people with the opportunity of movement and social interaction. Therefore, its quality directly influences livability (VTPI, 2010a:1-9).

The last physical indicator is *sustainability.* The main principles of sustainability are improving environment, economy and community aspects (Kaiser et al, 2006:41). Thus, it promotes the development of mixed-used, dense, affordable, continuous and walkable urban spaces which decrease the impact on environment and natural resources and so increase human wellbeing and city's livability (Akit, 2004:15, 56)

The environmental dimension of urban livability comprises a number of issues, one of which is to connect with nature. Increasing density of city centers and their growth regardless of green open space protection lead many inner city residents to move to the suburbs and to connect with natural environment (Wheeler, 2001:26-30; Lambert, 2005:25-26). This intention indeed creates a significant demand for suburban developments and urban sprawl while damaging natural environment and bringing about unsustainable cities. High cost of physical infrastructure investments also makes suburban developments unsustainable particularly for local governments. However, it is still possible to create livable urban environments in dense inner city neighborhoods by improving the quality of life and introduction of open green spaces, greenery places in buildings, and provision of necessary public amenities accessible by walking or public transport (Wheeler, 2001:26-30; Lambert, 2005:25-26). As today, preserving natural features and systems has become a common strategy through the planning and design concepts, like sustainability and livability, and the new planning and design streams, such as New Urbanism and Smart Growth (Kaiser and et al., 2006:41).

Affordability' and 'feasibility' are the two important terms to explain the economic dimension of livability (Lambert, 2005:18-19). Thus, the factors which are considered in the design of livable urban spaces aim to reduce the costs to the minimum level while increasing the affordability of people (Lambert, 2005:18-19). Likewise, the same factors in the design of livable urban spaces need to be feasible for local authorities. They can be categorized as wide range of housing types, styles and costs, mix use of activities to provide the new employment opportunities, increasing building and population density, and the use of walking, cycling and the public transit.

1.3 Key Arguments, Aims, Objectives and Research Question of the Study

1.3.1. The main arguments of the thesis: The importance of the relation between urban form and walkability at the macro, meso and micro scales

This thesis mainly argues that there is a strong relation between urban form and walkability capacity of a city or urban environment. It seeks to show that walkability of cities should be studied, and then planned and designed based on three major urban scales: macro-scale, meso-scale and micro-scale. According to the World Health Organisation (1948), health refers to "complete physical, mental and social well-being". Studies about the effects of urban form on health of the urban population have started to grow, and there is a demand to reveal the urban features that support public health. Urban form affects public health physically and mentally. As urban environments encouraging physical activities contribute to social capital or sense of community, this has become the main beneficial factor in mental health treatment. It is claimed that high value of social capital decreases because of social isolation and poor mental health (Giles-Corti, 2006). Walkability provides efficient land-use planning, which is the top subject of the Smart Growth, New Urbanism, Location Efficient Development and Transit Oriented Development discussions. It allows for the development of a compact urban form, which will lead to less waste of land and help to minimize distances between common destinations in order to be accessible by different transportation modes, such as walking, cycling and public transit. Hence, improving walkability also means preferring dense, mixed-use developments connected together, rather than sprawled, automobile-dependent urban developments (More Efficient Land Use Management, 2010: 1-2). In this sense, the key debate on the ***macro-level walkability measures*** is related to the dichotomy of compact and poli-nuclear urban form. On macro and meso scales, this study focuses on the parameters between walkability and urban form, and then it reviews a number of studies focusing on compact concentric and poly-nuclear urban form. The relation between urban form and walkability is investigated in two main parameters: urban network infrastructure and land use pattern. Thus, the main question of walkability assessment that comes to the fore is "How far the urban form is structured and developed through an interlinked network structure among the urban cells/nuclei". This research aims to show that strong relations between land use and transport facilities provide a better connection to the activities in the city, decrease the usage of private cars, and increase the quality of life. Additionally, it seeks to support the arguments that the compact city approach offers urban settlements with increased densities through infill of existing urban areas or redevelopment (urban intensification) and the compact polycentric pattern proposes multi centres with various living situations which ensure accessibility by public transit, foot or bicycle to city cores (Hyldebrand, 2000: 85). In the last fifteen years, advocators of the European spatial planning policy have offered compact polycentric cities as the most favorable strategy for facing the challenge of spatial development. Amsterdam is one of the ***compact po*****lycentric** cities in Europe, which maintains density not only in city centre but also in the surrounding district of the city (Zhou and Yu, 2011: 23-24). Its compactness makes all sections of the city accessible on foot or by bicycle. On the other hand, neighborhoods, suburbs or districts or new towns which have a compact urban form with high density of population, mix of land use, income groups, tenure groups and building types have a high capacity of walkability. Therefore, **compactness** (Black, 1996; Jabareen, 2006); **density** (Stead & Banister, 2001; Jabareen, 2006); **mixed land use** (Banister, 2001; Jabareen, 2006; Newman & Kenworthy, 1996; Jacobs, 1961; Cervero, 1998); **a variety in the built-up area** (small-lot family, multi-family, residential over retail and various commercial and institutional structures close together) and **walkability** (Litman, 2012) become important issues to examine in order to create sustainable, livable and walkable urban areas. This thesis seeks to study whether the mentioned parameters at meso scale have positive effects on accessibility and creating livable and walkable urban forms or not. Furthermore, urban form at micro scale has essential role in supporting non-motorized transportation modes, such as travel on foot or by bicycle. Additionally, it contributes to economic, environmental and social values. In contrast, urban forms based on car movement have discouraged adults and children groups from walking due to many reasons, such as the increasing concern of parents about their children‟s on unsafe streets.

1.3.2 Aims and Objectives of the Research and Research Questions

The research first aims to explain the notion of 'walkability' first at macro and meso scales, with main measures including *transportation system* and *land development* variables, and second at micro scale with main measures containing *safety, orientation, attractiveness, comfort, diversity, and local destination*. Studying Ankara, this research also seeks to understand the development history of Ankara and its public spaces, and how far the urban policies have tended to develop a walkable city. Afterwards, this study aims to examine the walkability level of Ankara city at macro scale, then that of two and on Tunalı and Çukurambar neighborhoods at meso scales. Then it focuses on the spatial characteristics of THS and MYS before an in-depth investigation of their walkability capacity and the factors affecting it. First, this thesis investigates one of the few pedestrian precincts that still exist in the CBD of Ankara despite the car-oriented planning policies: Tunalı Hilmi neighborhood (TN). This mix-used street, which is a considerably lively place with many pedestrian activities, has been impoverished and losing its capacity of walkability by the recent policies of Ankara Metropolitan Municipality. Thus, this research investigates how far Tunalı Hilmi neighborhood is walkable at meso and micro scales and what factors have affected its walkability. Nevertheless, it represents an important example in terms of its relatively better walkability level, compared to the second case of this research.

As the second case study, this thesis investigates Çukurambar neighborhood (ÇN). Being one of the important sub centers and neighborhoods of Ankara due to its location, Çukurambar is examined thoroughly in terms of walkability and livability at meso and micro scales. In contrast to THS, which has come into existence through time traditionally, this mixed use district was created as part of the renewal planning procedures in Turkey. Indeed, it is an example of squatter housing development rapidly transformed into a mix of luxury residential areas, governmental buildings, and business enterprises. In other words, its renewal period occurred just recently and it is still an ongoing process, it can be considered as a current mode of space production in Turkey. It is hoped that a study focusing on the two will allow for comparison of unexpected urban development and gradual development of urban context regarding walkability at meso and micro scales.

In the light of research on walkability assessment at macro, meso, and micro scales, the main question of this research are how far Ankara, particularly two case study areas –Kavaklıdere and Çukurambar, are walkable urban environments. To answer these questions, the research poses other sub-questions to answer. These are:

- What does 'livability' mean within the urban context?
- What are the dimensions (measures or criteria) of 'livability' in urban space?
- What does 'walkability' mean in urban public spaces?
- What are the measures or criteria of walkability in urban public spaces at macro, meso, and micro scales?
- How far Ankara city at macro scale and two case study areas –Kavaklıdere and Çukurambar at meso and micro scales, are 'walkable' regarding the criteria of walkability?
- What are the factors that affect the walkability of THS and MYS?
- What could be recommended for the mentioned case studies to improve their walkability?
- What are the general recommendations that can be derived to improve the walkability of public spaces similar to the study cases?

1.4 The reasons of selecting Çukurambar and Tunalı Hilmi Neighborhoods as the case study areas

Over the last twenty-five years, the urban development policies in Ankara have resulted in the decreasing livability of the city center. Along with the decentralization policies of the CBD, suburban developments started in the 1990s. While the CBD has expanded along the west corridor, Ulus (the historic city centre) and Kızılay have been losing their economic and social vitality. Nevertheless, some neighborhoods in the inner city, such as Kavaklıdere, Gazi Osman Paşa and Çankaya where some part of the CBD is located, still include prestigious commercial, business and residential functions and keep their economic and social vitality. This research has selected two case studies in Ankara: Çukurambar Neighborhood (ÇN) and Tunalı Neighborhood (TN) and their crowded streets; that is, Muhsin Yazıcıoğlu Street (MYS) in ÇN and

Tunalı Hilmi Street (THS) in TN. The first reason behind the selection of these two cases is that they give the opportunity of investigating the relation between urban form and walkability owing to their different urban form characteristics. On the one hand, the case of TN provides us with an opportunity to study a compact urban form, which has close accessibility to the main city center and ensures more alternative modes of transportation for pedestrians. On the other hand, the case of ÇN shows the urban form characteristics of a newly developed urban center that lacks some critical and important parameters of polycentric cities, such as interconnectivity, consistency and successful public transit system, which are necessary for ensuring and increasing walkability of the sub-centers and the city. Thus, it gives the opportunity to discuss the walkability level in inner-city areas and on the other hand the area out of city center with having connectivity to the main centers.

The second reason of selecting these two case studies is that they represent two different ways of urban development manner: traditional and redevelopment. ÇN is an example of squatter housing site development, rapidly transformed into a luxury high-dense urban area. It makes the opportunity to analyze the effects of rapid urbanization and transformation projects in the current mode of space production in Turkey. On the other hand, it studies the impoverishment of walkability potentials of traditionally shaped sub-center of Ankara City-TN- by the recent policies of Ankara Metropolitan Municipality.

The third reason of the selecting these two cases is that they represent two characteristics of land use pattern: mono-functional usages in an urban area with high vertical density for ÇN and multi-functional usages in horizontally continued mixed-usage corridors for TN. ÇN exemplifies and shows how isolated buildings and gigantic business centres, where offices, trade centres, and residences are clustered together like in Next Level complex centre, and vertically densified urban areas negatively affect the walkability level. Therefore, it gives us with an opportunity to discuss the effects and relation of vertical and spatial density on the walkability concept. TN however exemplifies how horizontally continued mixed-use corridor can enhances the walkability level of urban environment.

Table 1.1, The reasons of the selection of two cases of the study. (Re: personl study)

	Tunalı Hilmi Neighborhood (TN)	Çukurambar Neighborhood (ÇN)
1.	It has a compact urban area near to inner city	It is far from main the city centers with having connectivity to them through congested highways. It makes the opportunity of the analysis of the properties of poly-centric city.
2.	It is traditionally shaped sub-centre	It is redeveloped as a sub-centre during the urban transformation planning procedures in Turkey
3.	It embraces variety of usages along its corridors indicating the characteristics of spatial density	It includes mostly mono-functional usages, high vertical density
4.	It includes small block size and high number of block per kilometre square and poses the properties of pedestrian oriented urban pattern	It includes large block size and less number of blocks per kilometre square and indicates car oriented urban pattern.
5.	They include prestigious street and have access to essential usages such as hospital, official buildings, and brand commercial, business and residential functions at meso scale. However, the results at micro scale analysis are different and this indicates the analysis of walkability at various scales.	

As the fourth reason, the selected two cases represent two different network pattern types. That is to say, ÇN represents a car-oriented street network pattern, whereas TN represents a pedestrian-oriented network pattern. Although some physical characteristics of TN have reduced the level of walkability of urban space due to weak planning and design policies concerning on walkability, TN, in general, relatively provides a much better pedestrian-oriented street network quality owing to the narrow shady streets, and the ratio of street width to the height of the buildings that make the area more walkable than ÇN. Moreover, with the increasing population density in ÇN, the existing street network will undoubtedly fail to accommodate the excessive demand of people. The last and common reason behind the selection of these two cases is that both cases include prestigious streets and have accessibility to essential daily usages such as official buildings, brand shops, restaurants, and hospitals (Table 1.1). Hence, this study aims to understand how far the two cases are walkable, and to identify the factors, which contribute to and hinder their walkability capacity in order to make urban planning and design recommendations for their improvement.

1.5 Research Methodology

This thesis studies Ankara city, as well as Çukurambar and Tunalı Neighborhoods regarding the major macro, meso and micro parameters of walkability. It is opted to study the walkability capacity of Ankara city and the two case study sites through the qualitative and quantitative methods by using various resources, such as charts, morphological maps, spatial analyses, visual documentation, archival documents, two surveys conducted in 2009 and 2015 with the users of the two case study areas. The first survey, which was carried out in 2009 with 56 respondents, focused on Tunalı Hilmi Street (THS) and its surroundings. The survey of 2015 was conducted with 110 participants and it focused on Muhsin Yazıcıoğlu Street (MYS) in Çukurambar. Generally, the data of the research are based on the four major sources of evidence. The first source of evidence includes documents which constitute written reports, books, articles, researches, formal studies or evaluations of the same site under study, articles appearing in the media and websites related to research subject. The second source of evidence is direct observation. Various spatial analysis maps are prepared and photos are taken to support the arguments of the research. The third source of evidence is the questionnaire held with the users of THS and MYS. The details about the research methodology are presented in Chapter 3.

1.6. Strucuture of the thesis

This research is made up of eight chapters, including the introduction chapter. Chapter 2 presents the major literature review on which the walkability parameters at macro, meso and micro scales are revealed and discussed. That is to say, this part of the research identifies the main attributes or components of walkability at macro, meso and micro levels. Chapter 3 explains the research methodology followed by this study in details. Chapter 4 focuses the historical development of Ankara and its evolution; then it investigates the relation between macroform of Ankara and walkability. Chapter 5 focuses on two case studies, i.e. Çukurambar and Tunalı Hilmi neighborhoods, their locations in Ankara, and the analysis of two case studies in terms of their meso-scale walkability dimensions; i.e., the current land-use pattern and walkability parameters of transportation system. Chapter 6 and Chapter 7 investigate the walkability capacities of the two major commercial streets separately in Tunalı and Çukurambar neighborhoods according to micro scale walkability parameters. Each chapter examines separately Tunalı Hilmi Street (THS) in TN and Muhsin Yazıcıoğlu Street (MYS) in ÇN through the major attributes of walkability (safety, orientation, attractiveness, comfort, diversity and local destinations) which are identified in the theoretical framework of the study. Finally Chapter 8 makes an overview of the thesis, presents the findings of the research at the macro, meso and micro scales. While the findings on the walkability assessment of Ankara is presented at the macro level, the findings on the two case studies –TN and ÇN, and THS and MYS- are presented in a comparative way at the meso and micro scales. This chapter also provides discussions of the findings regarding the walkability parameters on the literature and seeks to underline the differences and similarities between the case studies and the general accepted assumptions on the walkability literature. It also provides recommendations and presents the major theoretical and practical contributions of this research.

CHAPTER 2

THE HISTORY OF 'WALKABILITY' AND ITS MEASURES

This chapter aims to explain the history of walkability, define what walkability means, and underline the major merits and benefits of creating walkable and pedestrian-friendly streets for cities and urbanites. It also aims to identify and explain the criteria that will be used for the assessment of walkability capacity of a city at macro, meso and micro-levels or scales. This chapter first introduces the history of walking and walkability. Then, it explains what walkability is and its merits or benefits to individual, social and urban life. Later, it investigates the parameters which come forward for the assessment of walkability at different scales of urban space or city. These scales are: macro (city-level), meso (district or neighborhood level) and micro (a street scale or a combination of streets scale). The chapter ultimately presents a walkability parameter matrix at three levels of urban space.

2.1 The history of walking and walkability

Walking is a healthy and simple mode of transportation, and almost all groups of healthy people are able to walk. When considering walking as a concept, many complicated opinions come to the ground. For instance, for physiologists, walking is an aerobic exercise which activates large groups of muscles, while for sociologists, walking is a social activity which is specific to each person. In general, physical activity of the body starts after birth, and the growth of the body depends on physical activity.

The evolution of human body is based on physical activity. *Prehistoric humans* used to walk to survive and to remain alive. During the hunting and gathering period, the active lifestyle based on walking required a high total energy consumption and high level of exertion to which human bodies were adapted by having an abundance of muscle fibers with high oxygen capacity and little body hair and numerous sweat glands to allow efficient dissipation of heat from the body. After people settled down according to geographic lines, they started to survive based on agriculture, domestic animals, and growing plants (Zurawik, 2014: 81-84). From the first city in history, although different transportation means emerged and were discovered, walking became the main transportation mode to move from one part of the city to the other. The main change in human physical activity occurred in the *18th century* with the start of *Industrial Revolution* and development of steam engine. It caused an increase in the production capacity and physical exchange of products across populations. Afterwards, with the development of alternative transport modes and increasing urbanization, inactive lifestyle started to become dominant until the World War II (Zurawik, 2014:81-84).Together with alternative transportation modes, walking was also the basic transportation mode. However, cities in the early19th century were crowded and dirty, and there was less attention to building properties, their quality, safety and health. Thus, walkers were faced with noise and air pollution problem caused by industrial machines, street railways and poor water and air quality. As Jacob Riis (2009) documented book titled '*How the Other Half Lives',* public health advocates believed that this problem was related to the built environment and would affect people's health. Hence, they tried to reform cities with *suitable infrastructure system* through the implementation of a complete sewage and drainage system, to provide an *urban coding system* and to decrease *noise pollution*. All these attempts led to the creation of the concept of walkability in the 19th century (Perdue et al., 2003: 557-566).

The masterminds of this concept (walkability) were Ebenezer Howard, Fredrick L. Olmstead Jr., Daniel Burnham, John Muir, and Theodore Roosevelt, who believed in the relationship between green areas and human behavior. Based on this essential value, they tried to increase walking desire of people through new urban planning thoughts.

Hence, together with the implementation of new infrastructure, sewage, and drainage system, they tried to contribute to walkability by creating green areas in the cities. For instance, *'garden cities'* designed by Howard was composed of radial streets connecting various uses together and 'walkable elegant gardens' in the city center. Based on the fact that the city was methodically designed for safe walking or horse transportation, a safe environment was created for pedestrians (Hansen, 2008: 31-36).

Then, along with the thoughts of planners such as Clarence Perry who believed that *social* and *economic segregation* is a normal procedure, cities started to grow via segregated functional, social and economic enclaves and zones. After the World War II, with the expansion of *urban sprawling* with less regard to walkability, people started to live in cities depending on private cars. Hence, with the increase of the trip distance and the decrease in walking opportunities, physical activity decreased, while its related problems started to grow (Wheeler, 2001: 26-30; Lambert, 2005:25-26).

As a result, with the change in the physical environment, problems emerged. Jan Jacob and Lynch revealed that these problems cannot be solved only through solutions related to physical environment. They argued that *social, economic* and *environmental* values should also be considered to solve these problems, which meant that a multi-dimensional approach was necessary to develop the walkability capacity of cities.

2.2 What is 'walkability'? What are its merits and benefits to urban life?

> *"A 'walkable community' is designed for people, to human scale, emphasizing people over cars, promoting safe, secure, balanced, mixed, vibrant, successful, healthful, enjoyable and comfortable walking, bicycling and human association. It is a community that returns rights to people, looks out especially for children, seniors and people with disabilities…"* (Burden, cited in VTPI, 2011c: 28)

Figure 2.1, 16th Street Mall Downtown Denver, ABD, 2016. (Re: www.denver.org)

‘Walkability’ is one of the most commonly discussed qualities of livability in public space. Walkability supports pedestrian travel in an area to make walking enjoyable. It requires pedestrian convenience in urban space, such as “roadway conditions”, “land use patterns”, “community support”, “security” and “comfort” (VTPI, 2010b: 32). This is not only important for protecting the environment and decreasing traffic congestion, but also for creating social interactions, promoting mental and physical health of people and contributing to economic development (Meenakshi, 2009: 97).

‘Walkability’ in public spaces provides a variety of benefits to urbanites including contributions to *basic mobility, community livability, community cohesion, economic development, consumer-cost savings, public health,* and *efficient land use*. First of all, walkable public spaces increase *basic mobility* of urbanites, especially the mobility of vulnerable groups, like disabled, elderly people, women with young children, and people with pushchairs. (VTPI, 2010a: 1). Secondly, walkability significantly contributes to *community livability,* which refers to the environmental and social quality of an area as perceived by residents, employees and visitors (VTPI, 2010a: 11).Walkable, attractive and safe public spaces ease and increase the interaction between people. In this sense, people living on streets with higher traffic volumes and speeds are less likely to know their neighbours, and show less concern for their local environment than those living on streets with less vehicle traffic (VTPI, 2010a: 11). Walkable environments also strengthen social life, as residents in walkable communities are more likely to know their neighbours, are politically active, trust others and are actively engaged in social life (VTPI, 2010a: 12-14; Leyden, 2003: 3-4). Thus, walkability has a positive effect on the development of livable communities and neighborhoods.

> *A 'livable' neighborhood can be defined as one that is pleasant, safe, affordable, and supportive of human community. Key elements of community 'livability' often include an attractive, pedestrian-oriented public realm; low traffic speed, volume, and congestion; decent, affordable, and well-located housing; convenient schools, shops, and services; accessible parks and open space; a clean natural environment; places that feel safe and accepting a diverse range of users; the presence of meaningful cultural, historical, and ecological features; and friendly, community-oriented social environments*(Wheeler, 2001: 5).

Walkability also contributes to *community cohesion (social interaction)*, which refers to "the quality of relationships among people in a community" (Forkenbrock and Weisbrod, 2001, cited in Litman, 2009: 11). Community cohesion is indicated by "the frequency of positive interactions, the number of neighborhood friends and acquaintances, and their sense of community connections, particularly among people of different economic classes and social backgrounds" (Forkenbrock and Weisbrod, 2001; cited in VTPI, 2010a: 11). Walkable public spaces enrich the possibilities of developing community cohesion as they enable community members to meet and interact with each other frequently and this helps the creation of social cohesion within the community.

Additionally, walkability provides *economic* contribution to the urban life and the life of urbanites. On the one hand, walking makes commercial areas more attractive as walkable commercial streets and public spaces enable pedestrians to survey goods slowly and carefully. Furthermore, the presence of pedestrian movement in such public spaces generally leads to stimulate other people. Thus, walkability especially in mixed-use main streets helps increase the number of users of such places, thereby increasing the livability of the commercial centres and their public spaces (VTPI, 2010a: 14).

Walkability provides *consumer cost savings* as well. Instead of taking public transport or driving a car, people can save the costs of transportation in walkable streets and public spaces (VTPI, 2010a: 8).

Walkable streets also contribute to *public health*, which refers to the "overall health and well-being of people in a community" (Safety and Health Costs, 2009, VTPI, 2010a: 2). Walking is a fundamental activity for physical and mental health. As it provides people with the opportunity to do physical exercise, it protects them from a number of diseases, such as heart disease, hypertension, stroke, diabetes, obesity, osteoporosis, depression, and some types of cancer (VTPI, 2010a: 12). Likewise, walking protects people from mental diseases, through loneliness and depression reduction, neighborliness promotion, confidence promotion and hence advancement of people's life quality (Mental Health, 2006, WHI: 3).Many chronic diseases have significantly started and increased at the turn of the 21st century with the decreasing physical activity and increasing obesity. It is directly related to the environment which discourages physical activity and encourages food consumption. Hence, the discussions over the relationship between environment and public health are increasing, such as the debates in American Journal of Health (Giles-Corti, 2006).

According to the World Health Organisation (1948), health refers to 'complete physical, mental and social well-being'. Studies about the effects of urban form on health of the urban population have started to grow, and there is a demand to reveal the urban features that support public health. Urban form affects public *health physically and mentally*. As urban environments encouraging physical activities contribute to social capital or sense of community, this has become the main beneficial factor in mental health treatment. It is claimed that high value of social capital decreases because of social isolation and poor mental health. Hence, walkable urban forms contribute to health due to the creation of opportunities for physical and social activities (Giles-Corti, 2006).

Finally, walkability provides *efficient land-use planning*, which is the top subject of the *Smart Growth, New Urbanism, Location Efficient Development and Transit Oriented Development* discussions. It allows for the development of a compact urban form, which will lead to less waste of land and help to minimize distances between common destinations in order to be accessible by different transportation modes, such as walking, cycling and public transit. Hence, improving walkability also means preferring dense, mixed-use developments connected together, rather than sprawled, automobile-dependent urban developments. Efficient land-use planning also supports economic value by decreasing public sub-structure and service costs (More Efficient Land Use Management, 2010: 1-2).

-Urban Macroform andWalkability: The Major Attributes of Walkability

Walkability assessment has various ways and dimensions. It is possible to analyse and assess the walkability capacity of urban spaces at different urban scales or levels with respect to a variety of parameters. For instance, quality of routes, accessibility and pertinent facilities should be taken into consideration for site valuation. For the assessment of the walkability of a street, qualified sidewalks and adequate crosswalks are important. At community level, local destinations, continuity and quality of connections are critical, while a macroform strategy accompanied by land-use and comprehensive transport planning policies come to the fore at the city level to attain a walkable city. Walkability analysis and a planning approach to create a walkable city and urban spaces need to be considered at three different scales: macro, meso and micro scales. At macro level, based on the macro-structure of the city or city region, walkability assessment may consider whether all transportation networks and services operate efficiently to create walkable and compact urban spaces (or centres/towns/sub-centers). On the other hand, macro-structure provides other qualities which depend upon the city's overall form and development pattern rather than the micro-structure within. For instance, the characteristics which contribute to walkability at macro scale are: a large number of different housing forms, good environmental conditions, a high degree of adaptability to the changing needs and socio-economic conditions, and access to open spaces for recreation and other functions (Hyldebrand, 2000:55-75). At meso-scale, the constituent parts of the city and their role within a specific city form, their relation with transport networks and to the location of nodes (i.e. access to public transport and to local services and facilities by walking and cycling) can be analyzed. At micro scale, there are more detailed issues such as the quality of routes, sidewalks, and crosswalks. These criteria at macro, meso and micro scales can be valid for any kind of city and can accordingly be expected to be applicable regardless of what the macro, meso or micro-structure of a city is.

This chapter has opted to understand and analyze the walkability capacity of a city at these different scales. The literature review on the issue of walkability shows that the parameters of walkability vary according to these different scales. They also sometimes overlap. This section intends to examine walkability parameters according to first macro and meso scales, and then micro scale. The following three sections explain the walkability parameters at macro, meso and micro scales.

2.3 Macro-level walkability measures

Macro-level walkability analysis is concerned with the region, metropolis city, and city and town-level properties. The key debate on the macro-level walkability measures is related to the dichotomy of ***compact and poli-nuclear urban form***. Which parameters are important at the macro scale to achieve a walkable urban form? And, which parameters should be developed to attain a walkable compact city or multi-nuclear urban form? In order to elaborate this discussion in the literature, I have focused on macro level walkability parameters and then reviewed a number of studies focusing on compact concentric and poly-nuclear urban form.

At macro scale, the achievement of a walkable urban area is related to urban network infrastructure and land use pattern. To achieve a walkable urban form and to change the travel behavior in a sustainable manner, it is critical to develop ‘macro’ land-use policies and to invest in public-used facilities. Thus, *‘’How far the urban form is structured and developed through an interlinked network structure among the urban cells/nuclei?* and *“How urban transport technology changes the mobility pattern and affects the urban form?’’* are the questions which come to the fore.

In order to achieve the best results from the evaluation of walkability parameters at macro scale, comparing cities with regard to their common properties, such as cities with similar population size and similar amount of open land area, will reveal their advantages and disadvantages and help us grasp new results in our assessment. (Frey, 1999:54-55) As a result, it becomes easier to put forward which city models, transport patterns and the geometries are more suitable for the application of walkable and sustainable patterns(Frey, 1999:56).

Generally, the relation between urban form and travel behaviour and walkability at macro scale is divided into two main values: ***transportation system characteristics***and ***land development variables*** (Lawrence and Engelke: 14) (Table 2.4).

Transportation system indicates the street network of a city and its design, transit systems, and systems designed for non-motorized users. The main value of *transportation system* is accessibility, which affects the placement of activities or the *land use pattern*(Chirapiwat, 2005: 12).Additionally, ***land use development*** indicates the spatial arrangement of the environment. It includes commercial and residential density, the combination of uses over a given area, and the design of the sites and buildings (Lawrence and Engelke: 47). Sustainable city should have the population of 25,000 with a medium density (over 40 people per ha) and mixed land use and sustainable transportation network. The population should have accessibility to public transit corridors, services, green areas, and daily activity destinations. Land use pattern and transportation network are in mutual relation to each other (Chirapiwat, 2005: 12). This relationship is complicated with different mutual effects. For example, land use pattern addresses to daily activity patterns and it influences travel patterns and thus transportation network (Chirapiwat, 2005: 12). Hence, strong relations between land use and transport facilities provide a better connection to the activities in the city, decrease the usage of private cars, and increase the quality of life. This paradigm would create a better environment by shifting people's travel patterns to a more sustainable urban transportation network (Banister, 2007) (Figure 2.2).

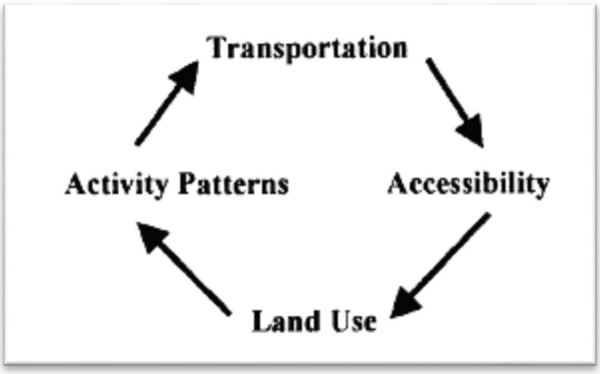


Figure 2.2, Transportation and land use relation. (Chirapiwat, 2005: 12)

2.3.1 Transportation System

Transportation network is crucial to the development of a country, a region and a city's business district. The meso-scale characteristics with a hierarchy of various provision centres and different connections between them and the macro-scale properties are related to each other as overall city form accessibility affects connectivity at micro scale (Frey, 1999: 70). Hence, macro-structure models are analysed with respect to "configurations and development patterns of the city region".

The dominant trends in shaping urban form and transportation network pattern are relevant for European and North American cities, whereas cities in developing countries have had different accessibility patterns and timing in terms of the changes in the means of mobility. In developed cities, walking and transit-oriented urban forms are still the dominant means of transport. For example, Stockholm has a transit-based corridor development and sub-centers. Likewise, in Oslo, Frankfurt and several British cities, walking and transit systems are encouraged while private car usage is significantly discouraged. In New York, San Francisco and Melbourne, it is possible to observe a combination of walking, transit and automobile cities (Newman and Kenworthy, 1996).

Parameters contributing to the Transportation System:

A sustainable transportation system not only ensures the movement of people but also contributes to economic, environmental and social conditions (Bian, 2002:

3).Sustainable transportation system is concerned with *environmental, economic* and *social* parameters which directly affect the development of a country, a region and a city's business district and the quality of life (Bian, 2002: 23)(Table 2.1).

Table 2.1, Sustainable transportation parameters and its contributions

Sustainable transportation parameters and its contributions
Social Ensures accessibility needs of individuals and societies regarding safety, security, and equity values
Economic Introduces *economically valuable and affordable* alternatives to different groups of people through a combination of various types of transportation
Environmental Decreases emissions due to sustainable modes of transportation and land protection

Firstly, sustainable transportation contributes to ***social parameters*** because it ensures the basic accessibility needs of individuals and societies regarding safety and security. In addition, it contributes to *equity* criteria by introducing various levels of mobility choices for different economic groups of people. Furthermore, it develops a more stable infrastructure with less environmental decay (Sustainability Peer Exchange, 2009: 2).

Secondly, sustainable transportation is ***economically valuable and affordable*** because it offers various types of transportation modes addressing different groups of people (Sustainability Peer Exchange, 2009: 2). The affordability of the transportation system for maintenance and sustainability of the transportation system is important, which makes the transport system economically viable and socially inclusive (UNESCAP, 2012:13). It operates efficiently and supports a strong, vibrant and diverse economy by introducing a cost-efficient infrastructure.

Thirdly, it supports the ***environment*** due to the fact that it decreases emissions, the consumption of non-renewable resources, and the use of land. It also limits noise intrusion under levels approved by communities (Sustainability Peer Exchange, 2009:2).

2.3.1.1 Social value of Transportation System Supporting Walkability:

Transportation system is in direct relation with the opportunities created for walking and biking in a city. However, today, transportation system planning has been transformed to a car-oriented network pattern rather than a walkable and transit-oriented pattern (Lawrence and Engelke: 71). In this section, I will discuss the transportation system properties with a view to social values of *accessibility*, and *equity*parameters.

A. Accessibility:

The main and first parameter in the assessment of the social value of the transportation system is accessibility, which affects walkability at macro scale. It refers to access to public transport and local facilities through various modes of transportation which facilitate approachability to the development centres (Frey, 1999: 54-56).

A planning, based on easy accessibility, improves alternative transportation modes, ensures more accessible land use patterns, and expands more resource-efficient solutions (TDM, May 2015). Thus, in the analysis of city models at the macro scale in terms of walkability, mobility and access to facilities by walking, cycling and public transport becomes more important.

Accessibility (access) refers to the ability of people *to access desired destinations* (TDM, May 2015), and it is divided into three types: Accessibility to ***daily destinations, to public transit stations,*** and to ***green areas***. The first is accessibility to *daily usable destinations* such as access to goods, services, and various land uses and optional destinations and their travel time. Daily walking is vigorous and is counted as *obligatory transportation,* and incidental destinations are accepted as *optional activity*. The second is access to *public transport stations*. It is evaluated by the distance and travel time to public transit stations. The third is accessibility to green urban areas (Lawrence and Engelke: 14, 47-8).

Accessibility at macro scale can be analyzed through the assessment of the relationship between city form and transportation system. The evaluation of city models in terms of sustainability can be done based on social, economic and environmental factors. Generally, compact cities are more sustainable, but it is not possible to state that the compact city as a sustainable city will help its performance. Therefore, the idea of the 'ideal' city should not be applied to the existing city. It should be taken into consideration that each existing city has its special physical form, socio-economic condition, land use pattern and so forth (Hyldebrand, 2000: 110).

A pedestrian can access to his or her daily needs within 600m radius, which equals to a 10 minute-walking distance, so city forms which have easy access and which support public transport are more acceptable (Hyldebrand, 2000: 110). The linear, regional, and star city forms expand along transport routes, but all of them are faced with traffic problems (Figure 2.4). ***Star city*** form is concentrated at a central point. Hence, as a city, in which all transport networks stretch to the single core, transport lines become more congested. Additionally, ***radial city form***, due to expansion into the city, also eventually causes congestion in the inner ring area and city core. Hence, these city forms cause not only traffic problems but also problems in easy application of daily activities. On the other hand, the ***polycentric city form***, which will be discussed in section 2.4 of this chapter, does not have congested traffic in a single core due to a number of lines crossing at a number of nodes. As a result, polycentric city configuration ensures a dispersed transportation rather than a concentrated one, and so provides equal access to various urban destinations(Figure 2.4).In this form, traffic congestion is relatively small because none of the city cores grow too large. Thus, it can be concluded that a transport network system which does not rely on a single core will work better. It becomes clear that city cores will not grow extremely high due to the existence of multi-centers(Hyldebrand, 2000: 111)(Table 2.2).

Hence, equal access to provision centers and at the same time easy accessibility of the neighborhoods around nodes to public transits (10 minute-walking distance) will contribute to walkability. Additionally, the existence of gridiron city pattern in a polycentric city form will serve the facilities to all parts of the city equally, which improves its functionality further (Hyldebrand, 2000: 111).

Table 2.2, The advatage of polycentric city in field of accessibility

Polycentric city is more accessible because
It is not dependent on a single core.
It has dispersed transportation rather than concentrated one.
It has equal access to various destinations, provision centers and public stations.
None of its city cores grow too large.
Its urban area develops along the transport network and transport nodes.
Secondary centers are placed along the transport line connecting the primary nodes.

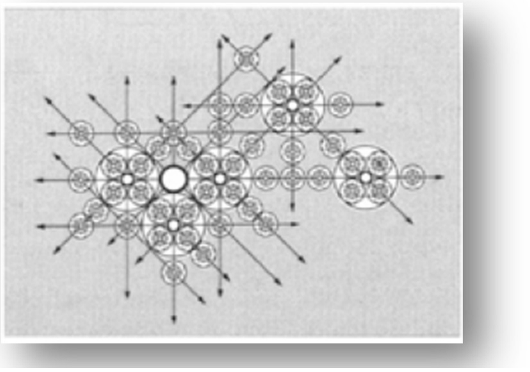


Figure 2.3, The regional city with transport grid, primary and secondary cores in a polycentric urban form. (Hyldebrand, 2000: 111)

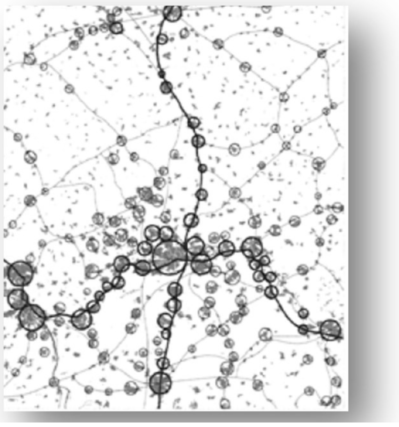


Figure 2.4 The macro-structure of the Rhine-Main region in Germany with a polycentric urban network where two linear developments are strong. (Hyldebrand, 2000: 188)

Further, there will be hierarchy in the structure of the provision centres, and so the transport systems and the nodes. Hence, as it is shown in the figures below, this causes an urban structure with dense **primary** cores of development at nodes crossing more than one transport line and **secondary** centers at transport stops crossing on transport lines (Hyldebrand, 2000: 112)(Figures 2.3 and 2.5).

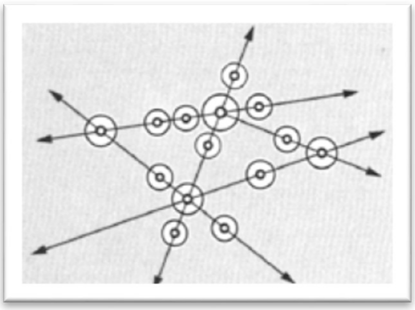


Figure 2.5, Degrees of compactness of the regional city as a polycentric urban form. (Hyldebrand, 2000:112)

B. Equity:

Equity in transportation system means that public transportation system should be provided for ***all social groups of people in an equal manner***. Additionally, transportation system plannings should aim to raise service quality provided for low income groups of people (TDM, May 2015). In line with this definition, the following questions must be posed: Do the transportation system plannings and policies make the accessibility of lower- income people groups better? How is the quality of public transit services for people who are non-drivers? Are transportation prices suitable for all people from different economic groups? Do transportation services maintain cost minimization?

2.3.1.2 Economic value of transportation supporting walkability:

Land-use patterns, which are more accessible and resource efficient, contribute to economic value. In this sense, *compact land use patterns increase accessibility, decreases transportation cost, and raises economic productivity* (See the Figure below). On the other hand, dispersed developments increase the cost of infrastructure, and transit and public services, so they do not contribute to economic productivity (TDM, May 2014) (Figure 2.6).

2.3.1.3 Environmental value of transportation supporting walkability:

A sustainable transportation takes precautions to decrease fuel consumption to contribute to a country's economic parameters by saving energy, to reduce the dependency on foreign countries, and to damage the environment less. High amount of energy can be saved in transportation. Additionally, sustainable transportation modes are environmentally-friendly and are adopted with native sources.

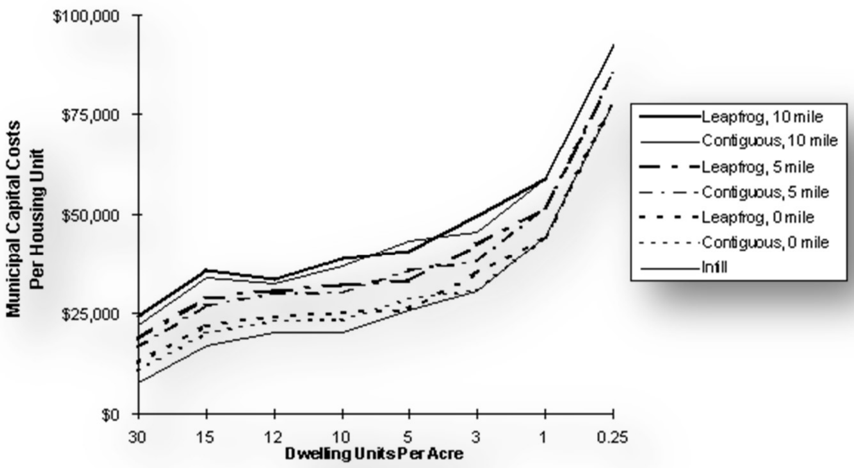


Figure 2.6, The relation between density and economic productivity. (It indicates how much the density increases the capital cost decrease.)

2.3.2 Land Use Development

Land development pattern is a macro-scale parameter of urban form which indicates the proximity degree between origins and destinations and which affects travel behavior directly. Land development pattern influences travel behavior in two main parameters: *density and land use mix.*

2.3.2.1 Density

Density, as the first parameter of land development, can be evaluated at macro scale. Density affects travel demand greatly because high level of density decreases trip lengths, reduces car ownership (by reduction of the need for a car), raises mode choice options by increasing capability of walking and biking to closed destinations, increases the feasibility of the mass transit, and so contributes to travel behaviour. It has become clear that high level of density increases opportunities for *walking, cycling, and transit use*. Additionally, it causes low car emission by decreasing the vehicle miles traveled, low level of car ownership due to less need for a car, and high rates of transit use.

Density can be measured in four ways: *population and employment density, built form, and sub-centers density*. ***Population density*** refers to the number of residents per unit area, and ***employment density*** measures the number of employees per area. Population and employment density affect the level of work and non-work travel demand. ***Built form density*** addresses the density of built and residential area per hectare;and***sub-centers***density is known as the density of most dense centers(Lawrence and Engelke: 76).

a. Density and Transit Use

As discussed above, density is as a parameter which contributes to the feasibility of mass transit and transit oriented design. High value of density firstly increases accessibility of transit stations for definite groups of people living in a particular radius around the station; secondly, high-dense urban areas decrease transportation costs by reducing trip lengths and times (Lawrence and Engelke: 83).

b. Density and Walking:

In examining the relation between density and non-motorized transportation, it becomes clear that high level of density increases propensity to walking and biking by decreasing the distances between destinations and by providing easy accessibility to transit stations (Lawrence and Engelke, 2014: 83).

2.3.2.2 Mixed Use

Land use mix is the second parameter for land development. It refers to the diversity of the land use within a given geographic area. It affects transportation corridors and travel behaviour due to the proximity of distance between destinations (Lawrence and Engelke, 2014: 72-75).

2.4 Mono-nuclear versus poli-nuclear city

Urban form of cities can be classified as ***mono-nuclear***and***poly-nuclear***. 'Unite center' urban form is an intensified one-city center, while 'multi-center' urban form connects different centers together. Therefore, *accessibility and availability of centers through appropriate transportation mode, existence of density in transportation routes* and *density in sub-centers*ensure success of a multi-nucleated city pattern. In fact, with the increase in population and needed activities, 'a concentration/decentralization strategy is applicable to create balanced sub-centers which are connected properly in a sustainable infrastructure with various transport modes (Khodabakhshi, 2011: 2).

2.4.1 Compact City

In the late 19th century, the negative effects of industrialization influenced Western cities. The immigration of people living in village to cities resulted in a significant increase in population density in city centers. Gradually, this caused the degradation of quality of life, environmental pollution, and increase in land prices in city centers. Consequently, people started to draw to periphery areas, which had low land prices and high level of air quality (Khodabakhshi, 2011: 1-6).

The promotion and development of residential suburbs caused the rise in car dependency, and simultaneously pollution and decay in the city centers. Therefore, planning experts started to develop dense urban quarters in brownfield areas instead of green areas. In addition, they aimed to protect recreational and open spaces, encouraged the use of public transportation, walking and cycling in order to revitalize the existing city centers by using the livability and walkability parameters of the cities (Hofstad, 2012: 2-7).

Thus, decreasing livability and sustainability in downtowns led to urban decentralization. The changes in urban form and function of the cities to high value of city density actually led to the creation of the interest of urban experts in this urban phenomenon (Khodabakhshi, 2011: 1-6).For some reasons, some researchers agree with the intensified city idea, while the other groups reject it. The advocators of compact city pattern put forward some profits as *shorter distances reducing traffic congestion and contributing to air quality, supporting economic diversity, and the* *assistance of an active and livable environment.* The opposing groups introduce some negative aspects of highly dense city pattern as *more traffic due to its usage of diversity that degrades environment quality, increase in land prices due to the importance of closeness to city center, and crowded spaces which decrease peace and privacy feeling*(Khodabakhshi, 2011: 1-6).

2.4.2 Compact city evaluation

Compact city is “a city that must have a form and scale appropriate for walking, cycling, and have efficient public transportation with a compactness that encourages social interaction.” Compact city evaluation embraces three basic parameters: ***size, capacity and network pattern***. **Size** and **capacity** are complicated values, which depend on local variables. Generally, density is mathematically defined as the division of building floor area to total urban area [Building floor area / total urban area]. The best density value of a building in a size can be no greater or smaller. Compactness value of city is connected to local parameters, and so there is little evidence to define a suitable size, which can be extended in various scales from neighborhood to region or any other cases (Khodabakhshi, 2011: 1-6) (Figure 2.7).

Furthermore, it can be evaluated through countable density parameters in *six* main values including density of ***population or social*** (number of persons per hectare),***built form***(density of built and residential area per hectare),***sub-centers***(density of most dense centers),***housing***(persons of housing), ***employment density*** (number of employees per area), and ***functionality***value (intensification ofurban usage) (Khodabakhshi, 2011: 1-6).

It is accepted that the obvious changes in proportion between various factors result in excessive density. According to an empirical study implemented in Tokyo, it became clear that suitable capacity is the one that introduces crucial urban facilities and utilities and forms the balance between supply and demand values; otherwise, it will be as unsustainable city. In fact, reasonable value of compactness of the city, or tolerance density of the city ensures the maximum advantage and does not damage the environment (Khodabakhshi, 2011: 1-6).

Density decreases the negative social, economic and environmental impacts of urban sprawling, minimizes travel distance and energy consumption, protects green area and contributes to achieving sustainable development (Biyun Zhou and Lan Yu, 2011: 3,6-7) (Figure 2.7-8).

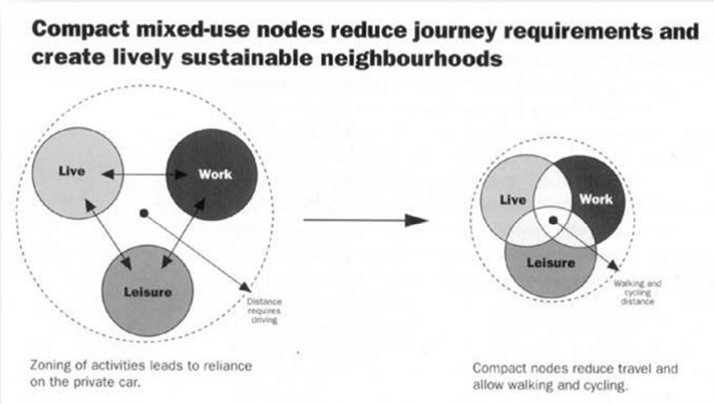


Figure 2.7,How compact mixed-use nodes contribute to walkability concept. (Landman, 2003: 8)

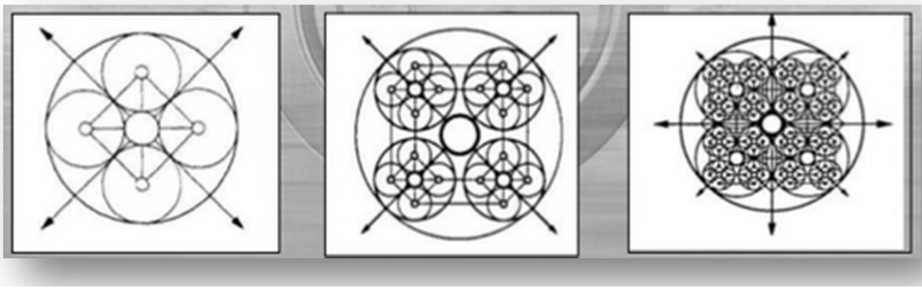


Figure 2.8, Compact city model in *district, town* and *city.*(Richard, 1997:2)

2.4.3 Transportation Network System

In contrast to low-dense urban development, compact urban development is capable of having mixed land uses with easy access to public transits. By encouraging a compact development appropriate to the use of non-motorized transportation and efficient public transport facility, compact evolvements promote walking travel behavior and discourage car dependency (Hyldebrand, 2000: 110).***Network pattern*** of compact city grows around centers including social and commercial activities close to ***public transit nodes*** and forms focal points around neighborhoods. (Richard, R., 1997: 2/39) (See the Figure below). Additionally, existing residential density around transit stations makes public transport ***economically viable***. In this sense, sufficient numbers of people near transit stations make the public transportation vehicles beneficially usable. In many countries such as US, Spain, and Italy, people tend to use private car because of high number of people living in suburban area and the crucial distance between town and countryside (Chetria et al., 2013: 77-85; Monbiot, 2011) (Figure 2.9).

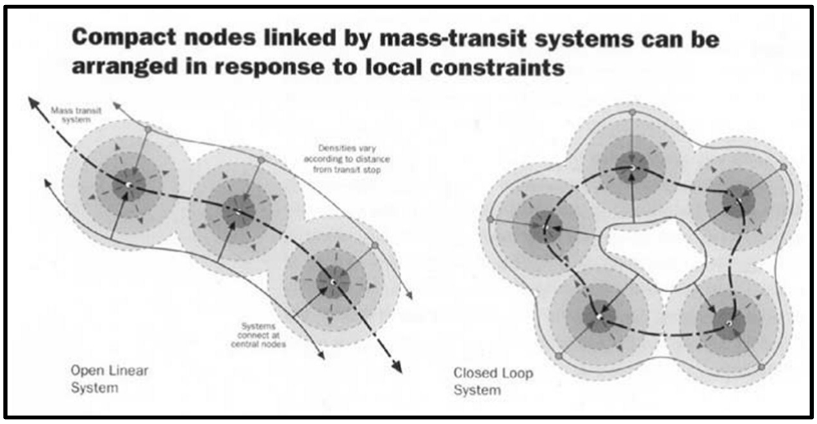


Figure 2.9, Compact nodes linked by mass-transit.(Richard, 1997: 2,38)

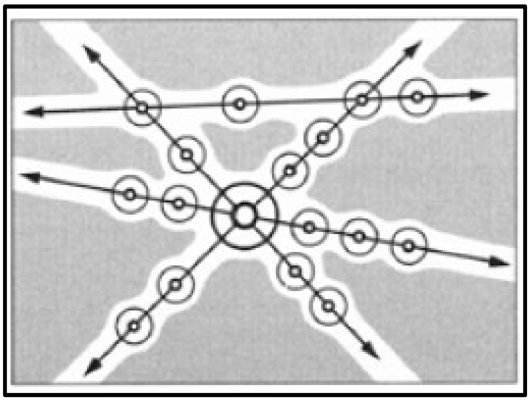


Figure 2.10, Polycentric net or regional city pattern. (Hyldebrand, 2000:85)

Compact city form is evaluated in two sections: ***polycentric and monocentric urban patterns***. Firstly, the ***polycentric pattern*** simply indicates a mixture of smaller and larger cores or a composition of various urban patterns such as the combination of linear and star urban pattern. The ***compact polycentric pattern*** proposes multi centers with various living situations which ensureaccessibility by public transit, foot or bicycle to city cores (Hyldebrand, 2000: 85) (Figure 2.10).

In the last fifteen years, advocators of the European spatial planning policy have offered compact polycentric cities as the most favorable strategy for facing the challenge of spatial development. Amsterdam is one of the ***compact polycentric***cities in Europe, which maintains density not only in city center but also in the surrounding district of the city (Zhou and Yu, 2011: 23-24) (Figure 2.12). The city tries to accommodate increasing population in a restricted area; it uses ***city park system*** in the compact city center and sprawling areas. Hence, the city center and the periphery areas are dense urban areas combined with green lands. (Hines-Elzinga, no date: 2) Its compactness makes all sections of the city accessible on foot or by bicycle (Sustainable living in a compact city, 2009: 5) (Hines-Elzinga:2). Without this accessibility strategy, various groups of people living in one neighborhood would not be able to access to work opportunities in other centers unless they have private cars (Cyprian Agukoronye, 1985: 121-122) (Figure 2.11).

Figure 2.11, Left: Model of the completely developed Zuidas (Netherlands) placed in a photo; Right: Street view of Zuidas, Netherlands, 2015. (Re: Google map)

Secondly, in ***monocentric*** urban areas, most business and entertainment and retail activities are concentrated in a central business district (CBD), so people are able to access to various facilities with public transportation vehicles (Agukoronye, 1985: 121-122) (Figure 2.12).

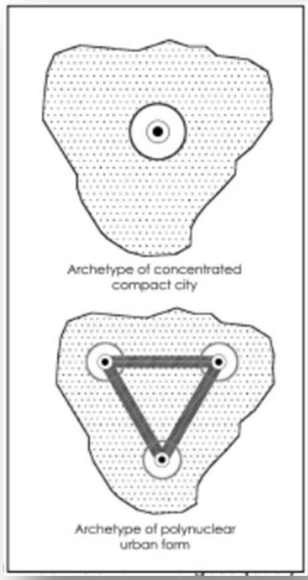


Figure 2.12, Monocentric and Polycentric Models

In this model, the closeness to CBD is in direct relation with building rents, density and population number. Thus, proximity to city center affects economic values dramatically as high-rise buildings are situated in city center and the low-rise buildings in the suburbs. Monocentric model with its concentrated employment opportunities has been criticized because of the difficulties created by high amount of congestion (J. Arnott and McMillen, 2006: 74). For instance, Edinburgh is a compact concentric city regulated by the UK government and is known as the sustainable urban form. Yet, it is faced with congestion problems in transferring people to facilities concentrated in city center in a radial transportation network (Dr Allison Orr, 2006).

To conclude, achieving a well operating, comfortable and economically feasible transportation system requires a viable network, which supports public transport and which takes population density, construction and form of the city into consideration (Hyldebrand, 2000: 27).

2.4.4 Land Development

As I discussed in the former sections, land development pattern is a macro property of urban form, which indicates the proximity degree between origins and destinations and which affects travel behavior directly. In this sense, low dense, single-use land development forms, which raise distance between trip origins and destinations, strengthen car dependence and discourage access by walking and biking. In other words, they are against walkability concept.

2.4.5 Evaluation of Barcelona and Madrid in terms of compactness

After 1959, with industrialization and start of urbanization, interregional migrations started to grow. Two metropolitan cities of Spain, Madrid and Barcelona, affected the whole Spanish urban system and had a dominant demographic value (Figure 2.13).

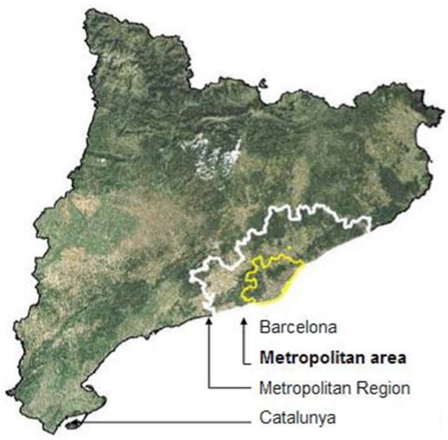


Figure 2.13, Barcelona -Spain region boundary map.

The industrialization and physical growth of Madrid and Barcelona between the years of 1986-2004 have led to the creation of contrasting urban forms in these two cities: mononuclear form for Madrid and polynuclear form for Barcelona. Satellite imagery analysis indicates obvious differences between their morphological parameters. Urban activity of Madrid is concentrated in central region with high amount of spatial and demographic intensification in the city center; while Barcelona includes more compact central region which is strongly connected with peripheral area usage. It is noticeable that due to intensified Madrid city center, there is crucial expansion toward periphery area, while this is minimal in Barcelona (Burns et al., 2007) (Figure 2.14 and 2.15).

	Number of municipalities	Area (km²)	Population (2001)	Occupied resident population (POR)	Local workplaces (LTL)
Madrid	609	27.581	5.793.964	2.613.219	2.528.350
Barcelona	227	4.796	4.539.749	2.020.133	1.903.291
Valencia	152	6.347	1.746.928	719.767	662.263
Sevilla	60	6.842	1.424.843	486.429	454.432
Bilbao	104	2.675	1.106.024	433.985	386.626
Zaragoza	267	15.084	771.854	325.390	312.701
Málaga	26	1.656	726.946	259.292	244.357

Figure 2.15, Comparative indicators of metropolitan cities of Spain. (Burns et al., 2007)

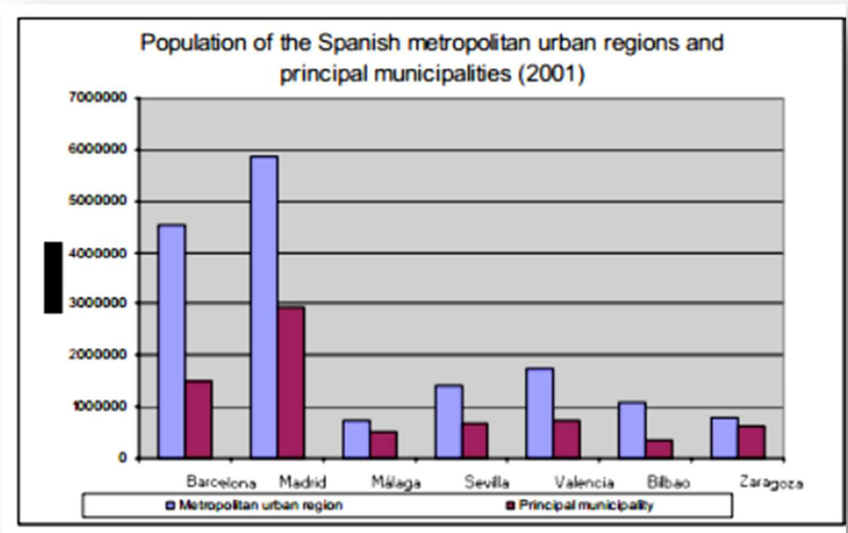


Figure 2.14, Population of metropolitan urban regions of Spain (2001).(Burns et al., 2007)

According to the information obtained from Spain Municipality, easy accessibility between home and work is an effective factor in spatial movement of Madrid andBarcelona. The controversial point is the capture of parameters, which define the difference between core and peripheral areas. There may be criteria such as the necessity of existence of municipalities and administrative buildings or other specified land usage in city center as well as area of city center. For instance, with the combination of this information with territorial analysis of land activities and grouping of the various activities, it is possible to recognize the core area from fringe areas or define multi-center urban areas (Burns et al., 2007)(See the table indicating parameters of Spain and demographics).

The analysis of the core and peripheral areas of Madrid and Barcelona indicates that during the 1986-2004 periods, there was the intensification of residential, industrial and commercial use in morphological core than in the periphery areas for Madrid, while Barcelona included less concentration of mixed-use activities in the core area. In this sense, Barcelona with polynuclear urban form has the area of 100 km^2 for its central area, while this value reaches 600 km^2 in Madrid owing to a mononuclear urban structure. Hence, it becomes clear that according to the spatial configuration of Barcelona, various uses are concentrated in both core and peripheral centers, which are connected together economically, socially and physically (Burns et al., 2007) (Figure2.16).

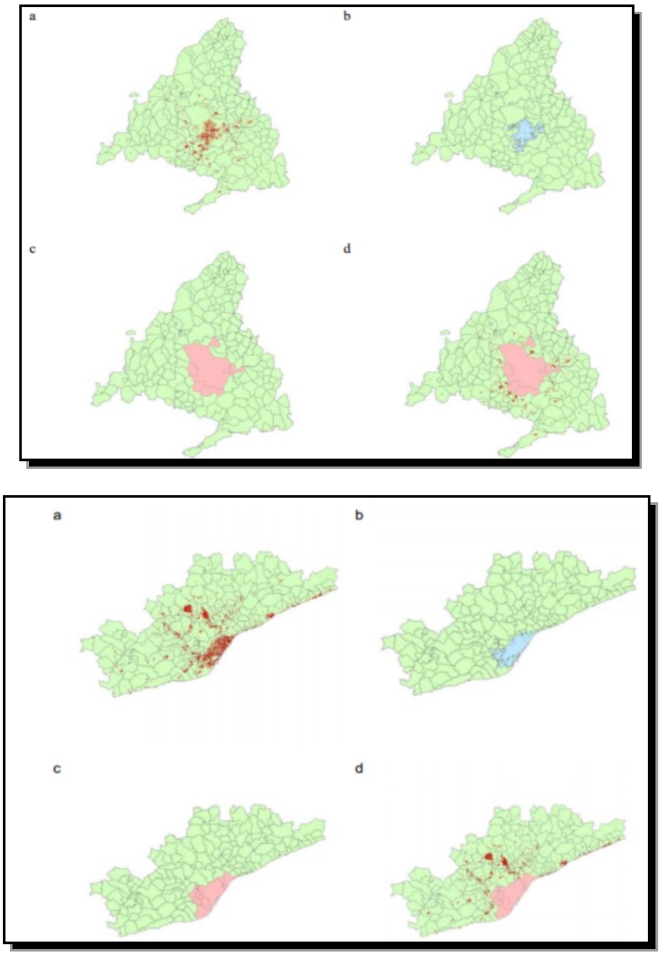


Figure 2.16, Above: Determination of the core and peripheral areas of Madrid; Below: Determination of the core and peripheral areas of Barcelona. (Burns et al., 2007)

In urban network analysis, not only physical connectivity parameter but also social and economic correlation becomes important (Gomez et al., 2012: 3). Like London, at a smaller scale, Barcelona has a plural centrality urban form with the system of ‘’urban villages’’ linked together. The centers should be connected according to the three-dimensional values of sustainability. That is, the centers should be joined together not only physically with minimum energy consumption, but also there needs to be economic and social network. Together, *in multi centrality pattern, the existence of spatial correlation rather than the creation of hierarchy between locations are preferred.* In this sense, inter-accessibility between areas with combination of social and economic interaction contributes to reduction of travel distance from all points to all other points in the layout. For Barcelona, physical, social, communication, and economic network between historic and new centers is important (Gomez et al., 2012: 7-8). Hence, increase in density in each of the ‘urban villages’ within the built area and so the reinforcement of multiple-centered urban form contribute to reduction of automobile use (Biyun Zhou and Lan Yu, 2011: 3,6-7)(Figure 2.17).

According to the research implemented about ‘European street network evolution’

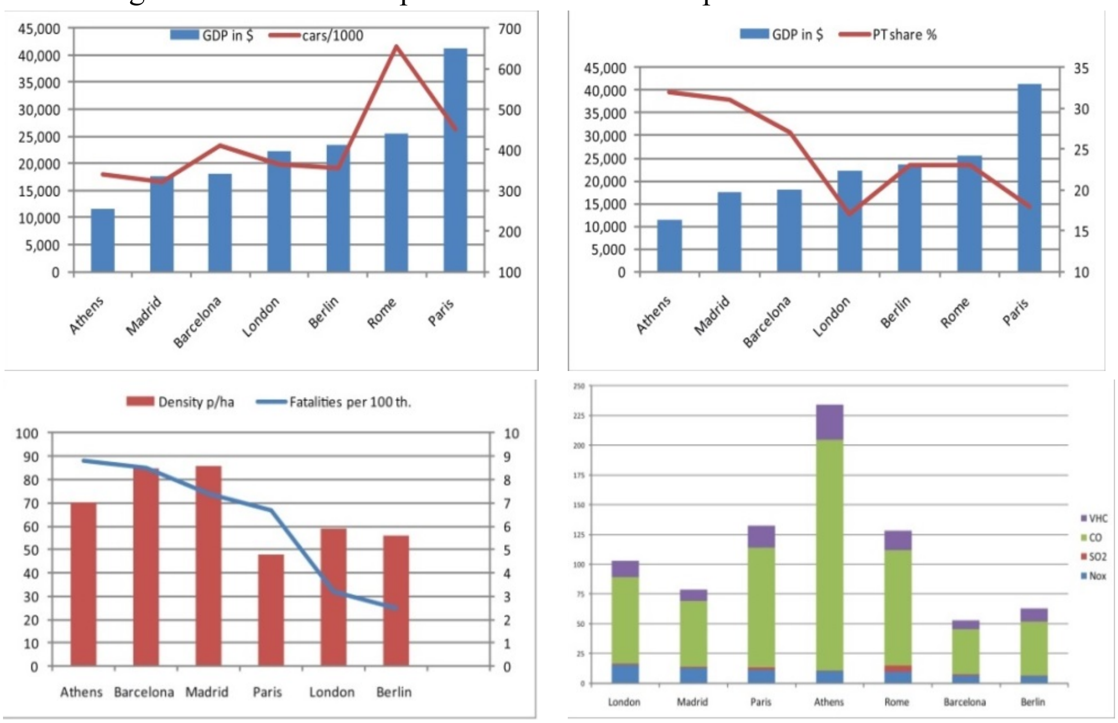


Figure 2.17, Comparison of Barcelona and Madrid in, left above: Car ownership and related expending; Right above: Public transit (PT) and related expending; Left below: Density and accident fatilities; Right below: Emission of pollutants from personal transport.

for the case of Barcelona and Madrid, it becomes clear as seen in the figure below that because of their urban density, transit use in these cities is high. Because of the presence of density and mixed land uses in appropriately connected street patterns, there is further walking and cycling opportunities in urban areas. Due to less traffic congestion in Barcelona, as the following figures indicate, despite higher number of cars in comparison with Madrid, pollutant production and air pollution for Barcelona are the lowest (Grammenos, 2011).

2.5 Meso-level walkability measures

2.5.1 Urban form and travel behavior

Urban form has essential role in supporting non-motorized transportation modes, such as travel on foot or by bicycle. Additionally, it contributes to economic, environmental and social values. In contrast, urban forms based on car movement have discouraged adults and children groups from walking due to many reasons, such as the increasing concern of parents about their children's on unsafe streets (Giles-Corti, 2006). It is confirmed that neighborhoods with 'low density, poorly connected street networks, and poor access to shops and services have low walking level (Giles-Corti, 2006). In this sense, a number of research studies have been conducted to develop new urban form strategies which provide more walkable urban space opportunities, along with public transit choices, as alternative to the strategies of car-dependent urban space production. Researchers like Macintyre et al. (2002) believe that '*both material infrastructure (urban form) and the collective social functioning'* determine the urban features which provide healthy urban forms for urban society:

- Physical properties of the environment
- Home, work and other urban environments used in people's daily activities
- Public or private services which facilitate daily lives of people
- The socio-cultural properties of the neighborhood. (McDonald et al., 2008: 3)

Likewise, the relationship between urban form and travel behaviour is important because of three major reasons:

1) To*understand the relationship between urban form and non-motorized transportation*,
2) To indicate the *complexity of travel behaviour* which is related to not only urban form, but also socio-economic and demographic values affecting travel patterns, and
3) To clarify the *patterns which support walkability.*(Lawrence and Engelke, 2014:16)

To obtain a walkable urban form, it is critical to invest in public transit infrastructure. Yet, this isn't not adequate to change the travel behavior into a sustainable way. It desires 'macro' land use policies as well as 'meso-scale' neighborhoodlayout standards. These principles could supplement and aid the transport network. Major activities have to be properly related to each other. People should get to their daily destinationsthrough public transit system or by walking or cycling in aneasy manner. As Kennedy et al. (2005) expresses, "The devil is in the details, and the details start with the design of streets and neighborhoods". Consequently, there may be a move to deliver back a number of the spatial traits of traditional neighborhoods, and these movements describe this new approach as the neo-traditional community layout.

Friedman et al. (1994) declare that the neo-traditional neighborhoodlayoutmightlessen the necessity to travel by personal motorized vehicles. It ensures dense mixed-use areas with a well-defined road network for pedestrians and bicycles. In order to decreas the rate of cars, streets are designed accordingly.

In addition to the neo-traditional neighborhood design, the relationship between walkability and urban form at meso-scale is examined by other researchers. Newman and Kenworthy (1996), for example, focus on New Urbanism; Jabareen (2006) advocates neo-traditional design approach, while Arth (1999) suggests 'New Pedestrianism' approach and so on. The following section examines these approaches to neighborhood design. All these approaches aim to develop more pedestrian-friendly environments. By examining these approaches, this section aims to reveal the common design parameters (Table 2.3).

Table 2.3, The recent design approaches and their design principles to create walkable neighborhoods or urban districts. (Newman and Kenworthy, 1996; Jabareen, 2006; Arth, 1999)

New Urbanism	The urban system is defined through a transit system, a high-density urban form and mixed land use. Features: • Compact and mixed development • Density averaging at least 15 units/ha • A variety in the built-up area (small-lot family, multi-family, residential over retail and various commercial and institutional structures close together) • Dwelling within a five-minute walk from the centre • An elementary school in 1.6 km radius • Highly connected street networks • Minimum parking lots • Parks and playgrounds not more than 200 m from each dwelling (Schiller et al., 2010)
Urban village	A settlement created on a green field or brownfield site, or out of an existing development. Features: • High density • Mixed use • Mix of housing tenures, ages, and social groups • High quality • Being based on walking (Jabareen, 2006)
Transit oriented developments (TODs)	Same as "Transit village", "transit-friendly design" and "transit supportive development" Features: • Walkable and mixed-use neighborhoods (within 600 meter walking distance) • Urban street pattern with great street connectivity (Cervero, 2008) • Corridor-based urban form with TOD foci • Compact, mixed-use development around transit stations • Pedestrian-friendly design • Parking availabilities (cars and bicycles) • Parking access management (Appropriate parking standards, structured parking facilities and on-street parking issues should be considered)
Pedestrian-friendly design	• Land use functions along streets • Pedestrian routes along the street network • Narrow streets • Accessible streets from every point and visible • Short and direct routes for pedestrians and cyclists (Guiding Principles for Creating Transit Station Communities, Puget Sound Regional Council)
New pedestrianism	A settlement designed as either car-free or having car access to the houses with pedestrian lanes in their front. Features: • Walking and cycling are encouraged with tree-lined pedestrian lanes with 5 meters width and a smooth side for cycles, skaters and others. • Car circulations are served on a separate network (http://michaelearth.com/introspective.htm)

2.5.2 Key parameters at meso scale

Livable and walkable urban areas should have an urban form, which supports both walking and public transport systems. There has been a shift from mobility-oriented analysis (i.e. the evaluation based on quantity and quality of physical travel) to accessibility-based analysis (that considers a variety of impacts and options) in transport planning. This type of analysis places people in the centre of the analysis rather than the cars and improvement of non-motorized and public transit modes (Litman, 2012).

According to the 1990 Green Paper on the Urban Environment of the European Commission, traditional high density and high accessibility patterns of European urban forms provide a good quality of life, and cultural and environmental benefits. The compact city approach offers urban settlements with increased densities through infill of existing urban areas or redevelopment (urban intensification). The following parameters and design ideas can be revealed from the recent sustainable urban forms: neighborhoods, suburbs or districts or new towns which have a compact urban form with high density of population, mix of land use, income groups, tenure groups and building types, and a high capacity of walkability. Therefore, **compactness** (Black, 1996; Jabareen, 2006); **density** (Stead & Banister, 2001; Jabareen, 2006); **mixed land use** (Banister, 2001; Jabareen, 2006; Newman & Kenworthy, 1996; Jacobs, 1961; Cervero, 1998);**a variety in the built-up area** (small-lot family, multi-family, residential over retail and various commercial and institutional structures close together) and **walkability** (Litman, 2012) become important issues to examine in order to create sustainable, livable and walkable urban areas. These five parameters have positive effects on accessibility and create livable and walkable urban form.

As examined in macro-scale walkability assessment, the relationship between urban form and travel behaviour at meso scale is also divided into two main values: ***transportation system characteristics*** and ***land development variables*** (Table 2.5).

2.5.2.1 Transportation system

Transportation system is the first value in urban meso scale which affects travel behaviour. It is mainly evaluated in three dimensional values of sustainable transportation including *social, economic*, and *economic* icons. In addition, the social dimension of transportation system is determined through the parameters of *accessibility and equity*.

The social value of transportation system

A. Accessibility

The first factor of social value of transportation system is **accessibility**. Accessibility, as a key factor of 'walkability' at meso scale, is determined via the examination of the distance between home and a variety of destinations. The first is accessibility to ***daily usable destinations***, such as access to goods, services, and various land uses and *optional destinations* and their *travel time*. Daily walking is vigorous and counted as obligatory transportation and incidental destinations are accepted as optional activity. The second is access to ***public transport*** stations. It evaluates the distance and travel time to public transit stations. The third is access to ***green urban areas*** (Lawrence and Engelke: 14, 47-8).

People are not interested in walking more than 10 minutes to reach the places that satisfy their daily needs. (Lambert, 2005: 14) According to the 'accessibility' standards of Time Saver Standards, maximum walking distance in general is between 400m and 800m (i.e., between 5 and10 minutes). Figure 23 shows the recommended and critical distances from home to different activities to create a walkable street pattern. It is mostly possible in interconnected street pattern (Figure 2.18).

Accessibility affects physical activity regarding the parameters of *''network pattern, network connectivity, and separated biking and walking systems''* (TDM, May 2015; Lawrence and Engelke: 50) (Figure 2.25).

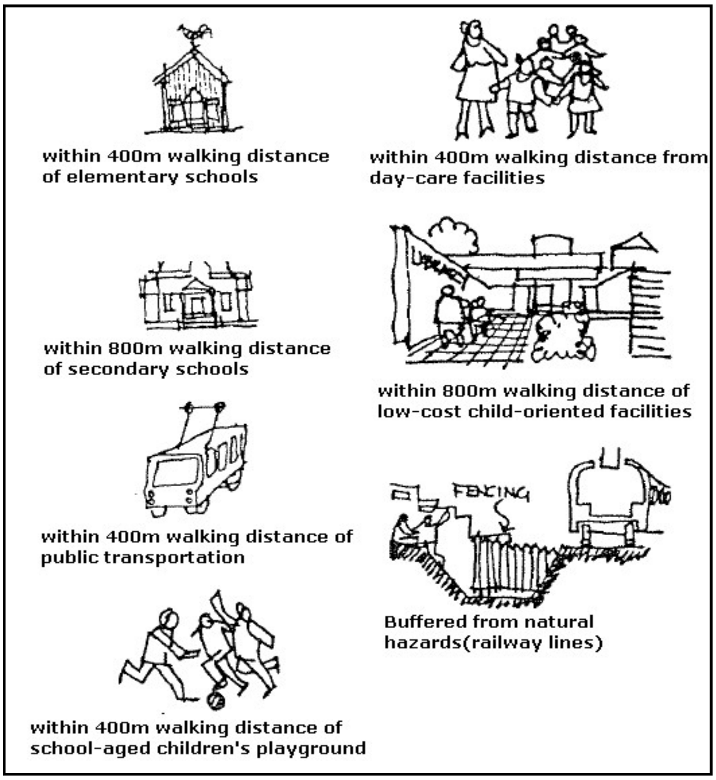


Figure 2.18, The standard distances between home and community facilities to be accessible on foot (De Chiara, Panero & Zelnik, 1995: 2007)

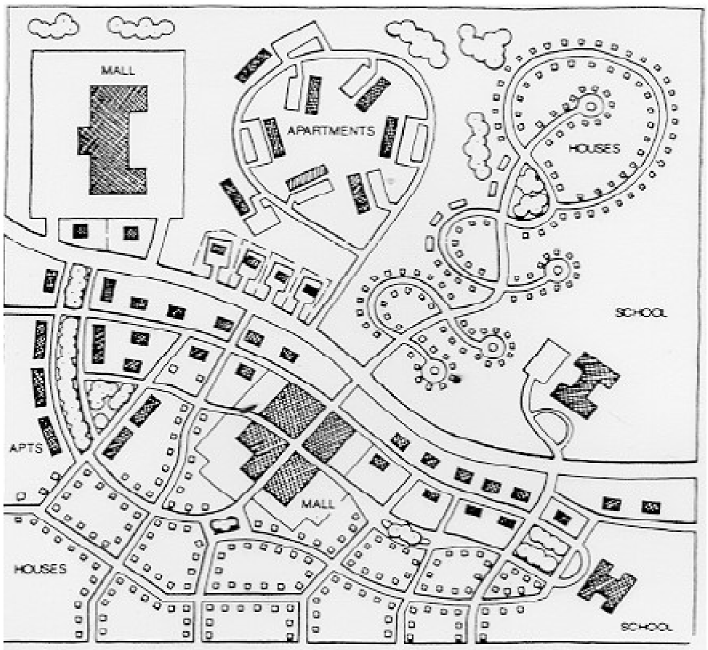
A.1Network pattern

The closeness of destinations in a network pattern influences mode choice and trip frequency in a positive manner. Networks can be interconnected at a high or low level. Interconnected street patterns is a simple system in which traffic flows in parallel streets equally, *alternative travel trip routes* are ensured for pedestrians and bike users, *trip distance* is decreased due to high value of intersections (Lawrence and Engelke, 2014: 14,47; Eriksson et al., 2012).

Particularly, grid-iron street pattern is highly interconnected and has potential to create more pedestrian-friendly streets than other types of street patterns (Preiss and Shapiro, 2002: 3; Kolody, 2002: 50; Lambert, 2002: 20; Marshal.S,2005: xii, 77, 238, 243, 247; Bentley, 2002: 21) (Figure 2.19).

Network patterns with low connectivity are *hierarchical* and *curvilinear* patterns.They include *less intersection* per unit area, *long trip* distances, *less* *alternative tripmodes, high car speed,* and *less pedestrian safety*. Therefore, they decrease the desire to walk. Walking becomes almost impossible in suburban areas where long distance of destinations is combined with heavy T intersections (Lawrence and Engelke, 2014: 14, 47-8) (Figure 2.19).

Disconnected Network



Connected Network

Figure 2.19, Connected and disconnected network pattern (Lawrence and Engelke, 2000:48)

Southworth and Owns (1995, cited in Kolody, 2002: 50) identify five types of street patterns: grid-iron, fragmented parallel, warped parallel, loops and lollipops, and lollipops on a stick (Figure 2.20).

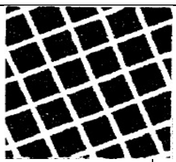
				
Grid-iron	**Fragmented parallel**	**Warped parallel**	**Loops and Cul-de-Sacs**	**Lollipops on a stick**

Figure 2.20, Five types of street pattern classified by Southworth and Own (1995) (Kolody, 2002: 50)

A.2 Network connectivity

One of the factors that increase walkability is connectivity of the street network. As explained above, high connectivity of the network provides high level of accessibility and walkability. (Southworth, 2005) Connectivity, being the fundamental measure of accessibility, may differ due to the different spatial structure of a place; even two different locations at the same place may have different accessibilities. (Jean-Paul Rodrigue et al., 2006) Research has mainly focused on **road network, street connectivity, block size and density** in evaluating the effects of built environment on travel choice (thereby walking). Ozbil et al. (2009), Chow (2014), and Dill (2004) found that communities which have neighborhood accessibility due to high street intersections would promote walking.

A grid network provides the simplest street pattern and is often emphasized as the preferred model in neo-traditional neighborhood design (Figure 2.19). It increases walkability by providing a better sense of direction. Street connectivity indicates how densely the streets are connected with each other. Block length is measured in a grid form, where shortest blocks provide more direct travel (APTA Sustainability and Urban Design Program, 2011).

When the streets are interconnected in a system of small blocks, it becomes possible to reduce car travels by between 10-40%. Litman (2012) gives the example of accessibility on grid network. As seen in Figure 16, it is shown that with short and connected roads, multiple routes are created, which results in direct connections between destinations. This helps transit ridership to increase encouraging pedestrians and cyclist through these routes (Litman, 2012) (Figure 2.21).

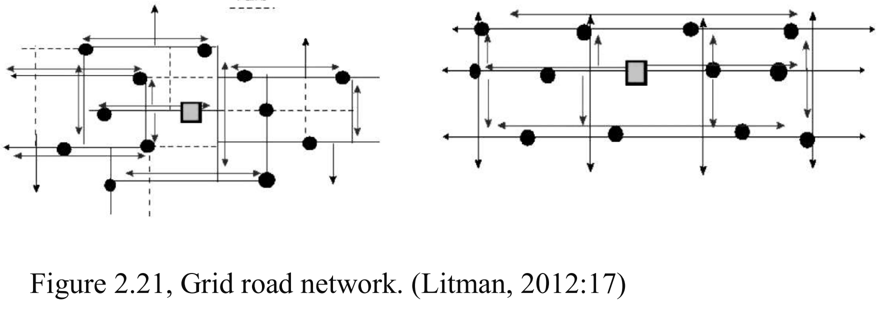


Figure 2.21, Grid road network. (Litman, 2012:17)

The destinations shown in the above figure can be reached by walking because the origin is located in the centre of roadways and the destinations are located together. This results in an increasing accessibility of urban space (Litman, 2012). Yet, circuitous routes, cul-de-sacs and dead ends decrease walkability, ending up with a decreased number of transit ridership (APTA Sustainability and Urban Design Program, 2011).

Every trip starts and ends with walking. Therefore, creation of pedestrian-friendly environments is important for livable districts. Pedestrian routes should be short, continuous, direct and convenient (Transit Oriented development Best Practices Handbook, City of Calgary, 2004). Walking distance is usually 400 to 600 meter radius of a transit station, bus stop, commercial core of a neighborhood, schools, etc(Transit Oriented Development, Best Practices Handbook, 2004).. There are a number of methods which measure intensity of connectivity within an urban network system. Connectivity index is one of them. Litman (2012) introduces and uses "**connectivity index**" to evaluate the network connection of destinations. The connectivity value of a predetermined and bounded urban area is found by dividing the number of roadway links by the number of roadway nodes. This index can also be used for non-motorized transport modes. High index stands for increased choice of travel and more direct connections. Litman (2012) evaluates the connectivity index of a simple box, a four-squared grid and a nine-square grid. The results are 1.0, 1.33 and 1.5, respectively. Litman (2012) claims that a minimum of 1.4 is needed for a walkable urban environment. If this rate is more than 1.4, this means that the walkability capacity of a place is high. However, if this rate is less than 1.4, this means that the walkability capacity is low. As mentioned above, the cul-de-sacs and dead ends reduce the index value.

Litman (2012) also pointed out that different people and groups have different accessibility needs, and so planning should reflect every group's needs. In Table 2.4, Litman (2012) shows different groups' tendencies to use certain modes rated from 3 (most important) to 0 (unimportant). Different locations and activities have different accessibilities: some areas might be automobile-oriented with low pedestrian access, while some might be transit-oriented having good walkability conditions and high quality transit services. He argues that it is appropriate to analyze the accessibility of a particular destination taking different groups into consideration (Litman, 2012) (Table 2.4).

Table 2.4, Importance of Transportation Modes Groups

Groups	walking	cycling	driving	Public transit	taxi	Air travel
Adult commuters	2	1	3	2	1	1
Business travelers	2	0	3	2	3	3
College students	3	3	2	2	0	1
Tourists	3	2	3	2	2	3
Low-income people	3	2	2	3	2	0
Children	3	3	2	1	0	1
People with disabilities	3	2	1	3	2	2
Freight delivery	0	1	3	0	1	1

Besides Litman's connectivity index, Bertolini (1999) examines the distance between points of access into the neighborhood, the number and lengths of blocks, and the lengths of cul-de-sacs. He states that suburban developments mostly contain cul-de-sacs, create big blocks, and lack connectivity.

In a study by Song and Knaap (2004), connectivity was calculated using five different approaches:

- **Intersection connectivity (IC)**: It is the number of street intersections divided by sum of the number of intersections and the number of cul-de-sacs. The higher the ratio, the greater the internal connectivity.
- **Blocks Perimeter (BP):** It is the median perimeter of blocks. The smaller the perimeter, the greater the internal connectivity.
- **Blocks:** It is the number of blocks divided by number of housing units. The fewer the blocks, the greater the internal connectivity.
- **Length of Cul-De-Sac:** It is the median length of cul-de-sacs. The shorter the cul-de-sacs, the greater the internal connectivity.

- **External Connectivity (EC):** It is the median distance between access points in feet. The shorter the distance, the greater the external connectivity". (Song and Knaap, 2004: 214)

Three measures of accessibility are also recommended by Song and Knaap (2004): distance to commercial uses, distance to a bus stop, and distance to a public park. Each is measured as the median distance from the centroid of every single-family parcel in the neighborhood to the centroid of the nearest commercial use, bus stop, or public park.

Pedestrian access is determinant in defining walkable and transit-friendly environments. Therefore, in the study, it was measured by the percentage of single family homes that are within walking distance (0,402336 km = 1/4 mile).

- **Pedestrian_Commercial:** It is the percentage of single family dwelling units within 1/4 mile of all existing commercial uses. The higher the percentage, the greater the pedestrian access.
- **Pedestrian_Transit:** It is the percentage of single family dwelling units within 1/4 mile of all existing bus stops. The higher the percentage, the greater the pedestrian access. (Song and Knaap, 2004: 215)

In a study by Kim (2007), New Urbanism examples were examined in order to reveal their connectivity schemes and make comparisons. The researcher investigated different measures of street connectivity in the literature and developed a table consisting of different measures (Table 6). In the study, Kim (2007) used several measures from the literature as Reach and Directional Distance (Peponis et al., 2006), *street density* (total street length in a given area), *block density* (total number of blocks in a given area), and *connected intersection* (total number of connected intersections in a given area). Reach is the "total street length that can be reached as we walked in all possible directions from a given origin up to a certain distance threshold" (Kim, 2007: 092-02). It is argued that if the street network is denser, then there are plenty of destinations that a person can reach, resulting in an increase in non-motorized transport in the area. "Directional distance is measured in direction changes" (Kim, 2007, 092-03) (Table 2.5).

Table 2.5, Street connectivity measures in the planning literature (Kim, 2007)

Block length (mean)	Cervero and Kockelman (1997)
Block density	Cervero and Kockelman (1997), Cervero and Radisch (1995), Frank et al. (2000)
Connected intersection ratio	Allen (1997), Song (2003)
Street density	Handy (1996), Mately et al. (2001)
Pedestrian route directedness	Hess (1997), Randall and Baetz (2001)
Walking distance	Aultman-Hall et al. (1997) (mean, maximum, percent of homes meeting the minimum standard)

Rodrigue et al (2006) analyzed different indexes to measure network connectivity. Table 7 summarizes these indexes. **Detour** index is used to measure the efficiency of the networks. The closer the detour index gets to 1, the more the network is spatially efficient. **Network density** is calculated by dividing kilometer of links by square kilometer of the surfaces. The higher the value, the more the network is developed. **Beta index** measures the level of connectivity- number of links divided by number of nodes. **Gamma index** shows the connectivity that considers the relationship between the number of observed links and the number of possible links (Table 2.6).

Table 2.6, Indexes to measure network connectivity (Derived from Jean-Paul Rodrigue et Al., 2006)

INDEX	**SYMBOL/FORMULA**	**DEFINITION**	**EXPLANATION**
DETOUR INDEX	DI=DT/DD	Measure of the efficiency of a transport network in terms of how well it overcomes distance or the friction of space. "For instance, the straight distance (DD) between two nodes may be 40 km, but the transport distance (DT), that is, the real distance is 50 km. The detour index is thus 0.8 (40/50). The complexity of the topography is often a good indicator of the level of detour" (Rodrigue, 2006:64).	The closer the detour index gets to 1, the more the network is spatially efficient. Networks with a detour index of 1 are rarely- if ever- seen, and most networks would fit on an asymptotic curve getting close to 1, but never reaching
NETWORK DENSITY		The territorial handhold of a transport network in terms of km of links (L) per square kilometre of surface (S).	The higher it is, the more a network is developed.

Table 2.6, (Continued)

BETA INDEX		Measures the level of connectivity in a graph and is expressed by the relationship between number of links (€) over number of nodes (v).	Trees and simple networks have beta index values less than 1. More complex networks have a value greater than 1. Complex networks have a high beta index.
GAMA INDEX		A measure of connectivity that considers the relationship between the numbers of observed links and the number of possible links.	The value of gamma is between 0 and 1, where a value of 1 indicates a completely connected network and is extremely unlikely in reality.

Some of these different indexes will be used in this study to analyse different aspects of connectivity in different neighborhoods.

Another method mentioned in Rodrigue et al. (2006) analyses the relationship between connectivity and density of traffic. It would be helpful to use a graphic as in Figure 20 to show different population densities and/or activity densities in different transport distances of 5, 10, 15 and 20 minutes. (Figure 2.22)

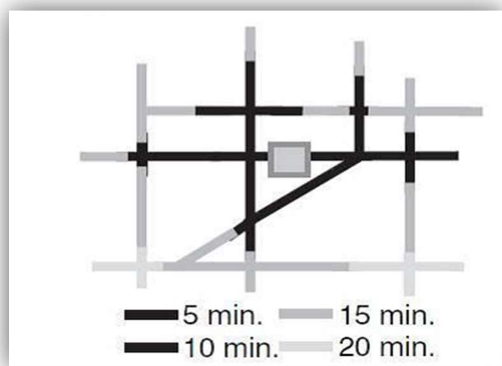


Figure 2.22, Transport distances and density. (Jean-Paul Rodrigue et al., 2006)

A.3 Separated walkingand biking system

Urban planning policy should include bicycle network to connect destinations and overcome cycling hazards in a community. Additionally, special route should be devoted to cycling in the roads, which have low level of traffic. Therefore, with primary effort, it is possible to ensure various cycling opportunities (Litman, 2016).

The bicycle network should connect various destinations in a grid of 0.5 kilometers to provide safe bicycle accessibility. Separated cycle routes should access to a college or employment center, multi-usage centers, or public transit stations. In addition, there should be adequate parking facilities to provide security for bicycle users at their destinations. Parking facilities is divided into long and short-term facilities. Long-term parking facilities with protection from weather conditions are needed at employment centers, schools, residences, and transportation terminals. In addition, short-term parking facilities should be provided at commercial and recreation centers. All bicycle facilities should have common properties such as visibility, security, weather protection, and adequate clearance (Litman, 2016). Bicycle parking facilities for various usages are demonstrated in the below table:

Table 2.7, Needed bicycle parking facilities for various usages (Litman, 2016)

Land Use	Bicycle Spaces Required
RESIDENTIAL	
Single family / two family	N/A
Apartment / Townhouse	1 per unit plus 6 space rack at each building entrance.
COMERCIAL	
Hotel / Motel	1 per 15 rooms.
Office, retail sales of goods and services, restaurants, research establishments, laboratories	1 per 250 m^2
Shopping Centre	1 per 250 m^2
INDUSTRIAL (ALL)	1 per 950 m^2
INSTITUTIONAL	
Hospitals	1 per 500 m^2
Schools	All levels: 1 per 10 employees
Elementary	1 per 10 students
Junior Secondary	1 per 8 students
Senior Secondary	1 per 8 students
College	1 per 5 students
University	1 per 5 students (full time, max. attendance)
Churches	1 per 50 members
Library / Museum/ Art Gallery	a per 100 m^2
Personal Care / Nursing Home / Group Home	1 per 15 dwelling units
Correctional Institutions	1 per 50 beds
CULTURAL AND RECREATIONAL	
Community Centre	1 per 80 m^2
Stadium, Arena, Pool, Exhibition Hall, similar places with spectator facilities	1 per 100 m^2 of surface area
Gymnasium, Health Spa	1 per 80 m^2 of surface area
Bowling Alley, Curling Rink	1 per 2 alleys or sheets

Integration of the function of cycling and transit is an essential factor because that transit system is effective in long trips in busy corridors, while cycling is usable for short distance trips with multiple stops. In this sense, bicycling and public transit could work together properly. While transit stations are accessible within a 10-minute walk or 400 meters, cycle routes provide accessibility to cyclists with three to four times the walking distance in the same time. Another supporting approach is to accommodate bicycles on transit vehicles. This provides the opportunity of the use of bicycle at both ends of the journey (Litman, 2016) (Figure 2.23-24).

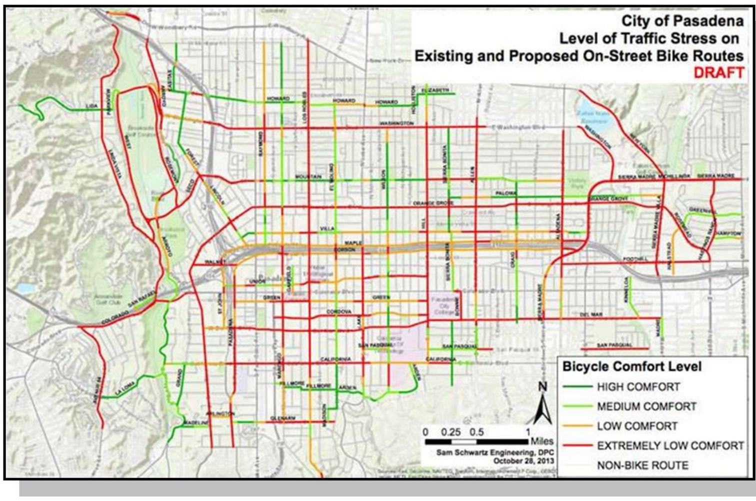


Figure 2.23, Pasadana, California, Bicycle Network. (U.S. Department of Transportation, 2016)

Figure 2.24, Bikeshare system in Pasadena. Residents and visitors can pick up a bike at any station, ride to their destination, and drop off the bike at any open dock. The system will allow unlimited, short-term access to bikes 24 hours a day, 365 days a year.

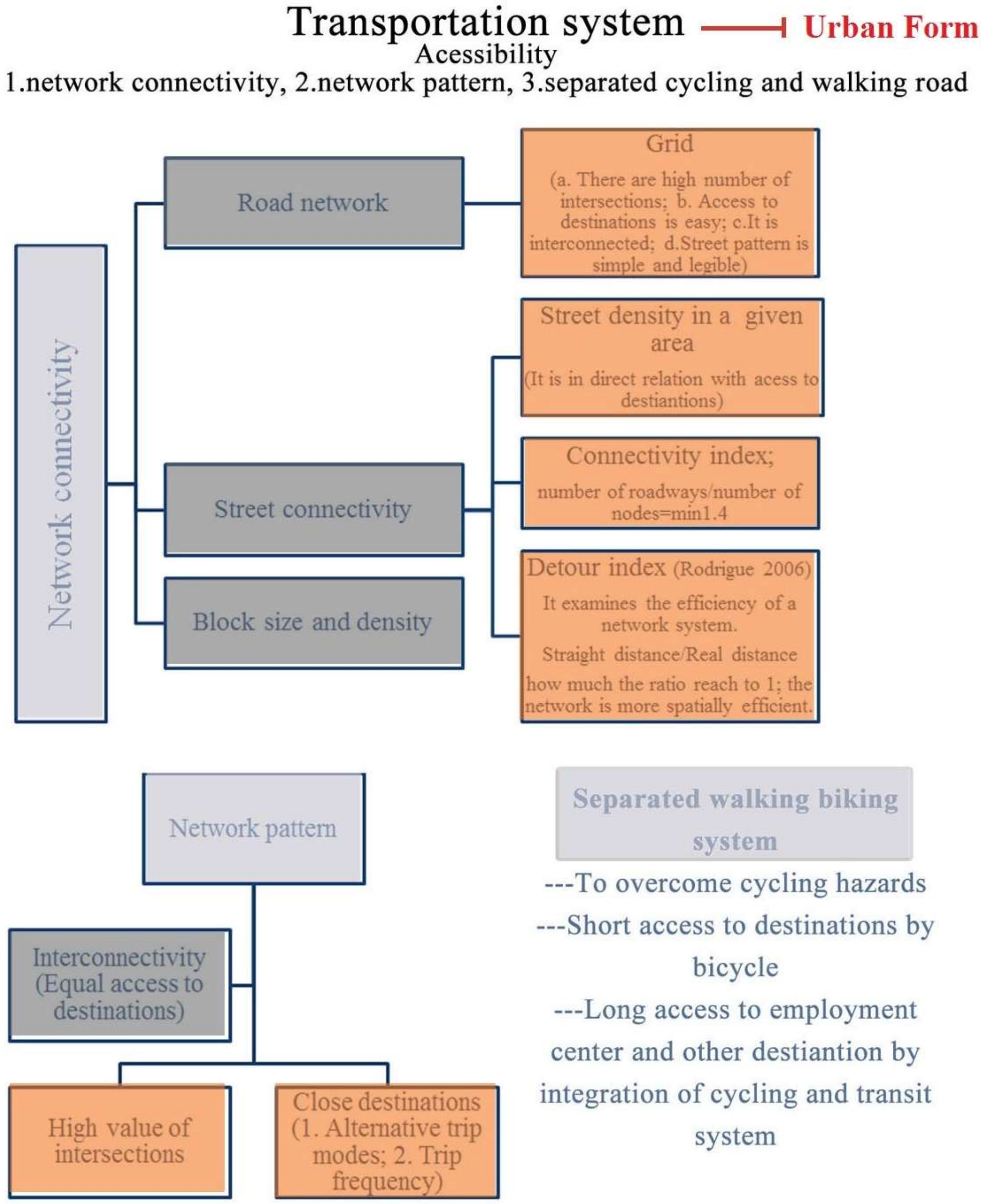


Figure 2.25, Accessibility parameters of walkability

B. Equity

Equity, justice or *fairness* refers to the distribution of benefits and costs in an equal manner to be fair and suitable. Transportation planning decisions can have significant and diverse equity impacts, and transportation equity investigation may be difficult due to existence of various groups of people, complicated evaluation relations and various equity impacts. Transportation equity is divided into three major categories including *horizontal equity,vertical equity regarding income and social class, and vertical equity with regard to mobility need and ability* (Litman, 2016).

Horizontal equity

Horizontal equity, which is called fairness or egalitarianism, means that equal individuals and groups get equal facilities with equal costs.

Vertical equity regarding income and social class

Vertical equity (*social justice*, *environmental justice* and *social inclusion*) is related with distribution of facilities between economically and socially disadvantaged groups. In this sense, affordable modes, discounts and singular services for economically and socially disadvantaged groups are provided (Litman, 2016).

Vertical equity with regard to mobility need and ability

This is concerned with distribution of transport facilities between all groups of users including those with special needs. This refers to a universal design or inclusive design, which meets the needs of travelers with mobility impairments. Disadvantaged groups of people are divided into three main groups including *low Income, non-driver/car-less and disabled groups*. Transport policies and planning decisions should support access options used by disadvantaged people through three recommendations including *making policies for creation of more accessible, multi-modal communities, transportation facilities for transit and non-motorized users and pedestrians and special mobility facilities for disabled groups of people* (Litman, 2016).

Smart Growth Equity Impacts

Ewing and Hamidi (2014) explored the development of a sprawl index to reflect development density, mix, centricity and roadway connectivity and to determine the effect of smart growth on equity. It becomes clear that more compact, multi-modal smart growth development patterns increase *combination of various groups of people, and create opportunity for* disadvantaged groups of people to access to education and employment opportunities easily.

Economic and environmental values of transportation system

This topic is discussed in the related section on macro-level walkability assessment measure.

2.5.2.2 Land development pattern

As the second main value, *land development patterns* also affect travel behaviour. Lawrence and Engelke (2014: 14-15) identified three values to assess the walkability capacity of an urban space: density, diversity and aesthetic values. ***Density*** is the first essential value which decreases trip distances and contributes to walking desire. Segregated uses increase travel distances between residential, commercial, and work zones and decrease walking travel method. ***Diversity*** value is the second factor which influences trip distance between destinations. ***Aesthetic* value** is the third factor referring to the subdivision of land development, which affects travel behaviour. Aesthetic considerations create attractive or unattractive environments for nonmotorized travel.However, within the context of this study, aesthetic value is examined in the micro-scale. The following sections explain density and diversity values.

a. Density

For neo-traditionalists, density is an essential parameter which contributes to walkability by guaranteeing walking, bicycling, and transit use opportunities. There is a strong relationship between density and the urban character. High density and integrated land use foster social interaction, reduce travel time and energy, and produce more livable environments. Density in meso-scale is determined in three aspects: *population, employment* and *built formdensity* (Lawrence and Engelke, 2014: 76).

Density defines compactness of a city or urban form, and it contributes to good accessibility to facilities by reducing the need to travel, improving public life and increasing social interaction. For Rogers (1995), compact cities which are economically strong, well-governed and designed promote diverse activities.

Urban compactness can be shaped horizontally and vertically by means of density. This is a diverse relationship. If the density is low, a large amount of area with open spaces and roads is needed. This kind of urban form, in return, increases walking distances and results in urban sprawl. By contrast, high density decreases the amount of area needed for different activities and increases walking capacity. The current trend is to stance towards density in favor of medium to high densities.

Density is also an essential factor in the decision making process of transit systems. In high density urban areas, the transit usage increases. (Transportation Research Board of the National Academy, 1996) In a low-density area, however, high-capacity transit systems become unattractive, and therefore, huge investments are wasted. (Gordon & Richardson, 1997) Balcombe and York (1993) argue that higher densities would provide more space for people rather than cars because the car ownership would decrease by promoting higher densities and efficient public transport systems. As density increases and the mixed land use gets constant, people tend to walk, use bicycles or public transit systems in reference to areas with low density (Jabareen, 2006).

Empirical studies show that increase in density level decreases automobile emission levels. Density contributes to the *decrease in gasoline consumption, air quality*, ease of access to transit stations and thereby walkability. Lawrence and Engelke (2014) conducted a study on both central and peripheral regions of the cities in Asia, Europe, and North America in order to understand and prove the relation between density and car use. It becomes clear that density directly affects car usage and *gasoline consumption* (Lawrence and Engelke, 2014: 77) (Figure 2.26).

High level of density, however, contributes to *access to transit* in a *short distance* and increase in the number of transit users. This is primarily due to the existence of *various stations accessible in a particular radius* around the station, which causes an increase in the number of transit users, and *reduction in their transportation cost* in a *reduced period*. Transit users are also the groups of people who prefer to walk, so short access to transit stations contributes to walkability (Lawrence and Engelke, 2014: 83).

Stead and Banister (2001) claim that by increasing urban density, it is possible to save land for urban development, to reduce travel, to use energy more efficiently, to increase accessibility to the public transport modes, to provide more local employment, to create concentrated service facility clusters that will reduce the private car usage, and to promote walking and cycling. They suggest 40 dwellings/ha (similar to London) as the ideal density.

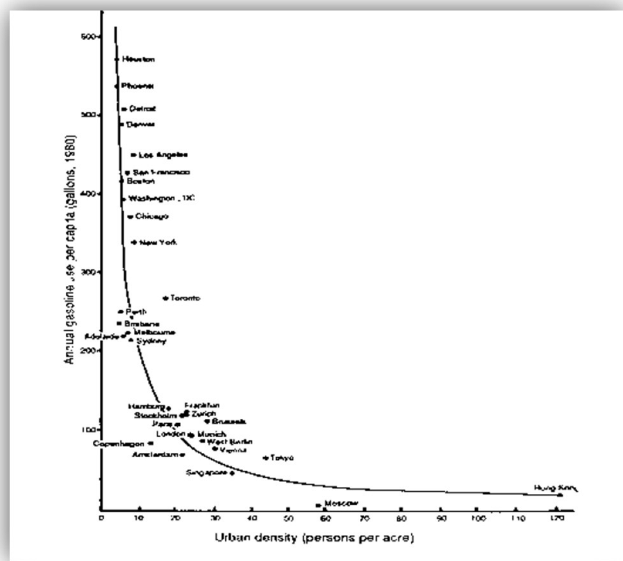


Figure 2.26, Gasoline consumption of cities in Asia, Europe and North America according to density variable. (Lawrence and Engelke, 2014: 77)

A neighborhood with a focus on a transit station, which provides a higher intensity uses such as residential, office, retail, etc., encourages people to use public transit and walk (Transit Station Area Principles, 2011; Palm Train Transit Design Manual, 2004). High concentration of people living and working around 800 m of a station increases the ridership levels. RTD Transit Access Guidelines of Denver (US) recommends that household densities of 3 to 5 dwelling units/ m^2 (10 to 20 dwelling units/gross acre) and employment densities of approximately 6 jobs/m^2 (25 jobs/gross acre) close to a transit station would support frequent and high capacity transit service. (RTD Transit Access Committee, 2009) Cervero (1998), who conducted a statistical comparative research study on different cities, found that every 10% increase in population and employment densities results in an increase in transit use by between 5% and 8% (factors such as income, parking supply and so on are controlled). Similarly, Pushkarev and Zupan (cited in Çalışkan, 2004) found that an average of 30 dwelling units/ha is required by sufficient rail transit demand in downtown. Residential density between 18 and 45 units/ha is stated as necessary to sustain transit ridership (Çalışkan, 2004).

A study on nine stations in Chicago region revealed the relationship between the ratio of dwelling units per acre and the percentage of commuters walking or using bicycles to the station. (RTD Transit Access Committee, 2009) A strong grid pattern, sideway connectivity, the presence of commercial services, and high residential density have been found as the key walkability factors in the area. RTD Transit Access Committee (2009) also found that if it is easy to cross streets or there are different street amenities, people tend to walk.

It is possible to increase density of urban areas over time by re-using vacant lots, existing low-density uses or parking lots. This should be achieved by phasing plans with flexible strategies that would meet the community needs in the future (Transit Oriented development Best Practices Handbook, 2004).

Litman (2012) claims that density (the number of people or jobs per ha) and clustering (people and activities located together) tend to increase accessibility. A neighborhood where housing, retail, offices and transit services are located together would provide high accessibility as seen in Figures2.27 and 2.28(Litman, 2012).

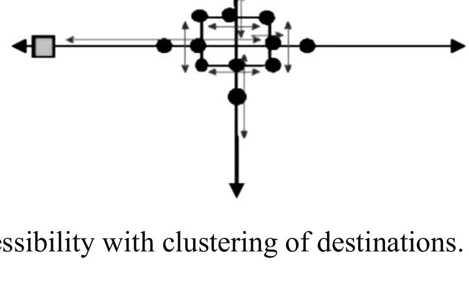


Figure 2.27, Accessibility with clustering of destinations. (Litman, 2012: 15)

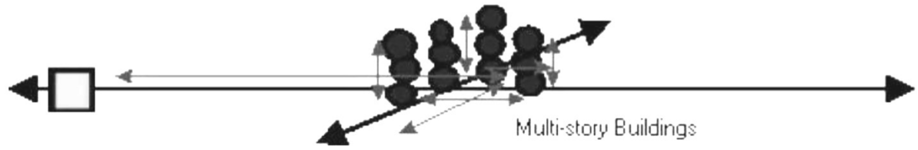


Figure 2.28, Accessibility with vertical clustering. (Litman, 2012:16)

The relationship between density and accessibility might become complex because they might result in increase in traffic congestion. This problem should be overcome by promoting walking, cycling and transit with the design principles explained above.

In land use planning, distance to the CBD is used as a significant factor in reducing the car usage. This consequently affects the oil consumption and climate change outcomes. A study conducted in Melbourne shows that less fuel is consumed in Melbourne compared to Hong Kong because of being a walking and denser city. In addition, good-quality public transport which provides more than one option–train, tram or bus- served the city by reducing car usage. (Newman, 2008) Newman (2008) who studied the link between the activity intensity and public transport access parameters found that the transit usage increases as people live closer to the transit facilities.

b. Diversity

There is a close relationship between physical, social and economic diversity of urban space and walkability. '***Physical diversity***' refers to a variety in terms of urban physical elements, such as **a variety regarding dwelling types, architectural styles and land-use activities.** '***Social diversity***' signifies a **mixture of people at different ages, family types and socio-economic status**, while '***economic diversity***' means a **variety of building types with different property values**. The presence of such diversity in urban space is important in terms of bringing different groups of people together, and therefore, making them use urban public spaces. In this way, public spaces can be lively and livable (Lambert, 2005: 23-24).

Diversity has different impacts on the walkability of public spaces in residential sites and commercial centers. A neighborhood with a variety of dwelling types, for example, allows people of different ages, ethnicity, family types and socio-economic status to live together and therefore lets them interact with each other on a daily basis, and strengthens the personal and civic bonds that are essential for creating livable communities. Likewise, shops and services that provide many basic daily needs of residents do not only create local employment opportunities, but they also add visual interest for pedestrians, and thus increase walkability of public spaces (Lambert, 2005: 23-24).

Additionally, the presence of a variety of open public spaces in a neighborhood, such as playgrounds, nature preserves, squares and plazas, is another important factor, which increases the walking activities in urban space (Crowhurst-Lennard, 1987, cited in Lambert, 2005: 23-24).

There are a number of methods which measure the intensity and diversity of activities within an urban network system, such as space-syntax method (Hillier, 2008; van Nes, 2011).**The place-index**, on the other hand, is the measure for the intensity and diversity of activities in the surroundings of the transit station. This is defined within a walkable distance of 800 meters from the main pedestrian entrance to the transit station. The **variables** are: **the number of residents in the area**, the **number of workers per each of the four economic clusters (retail/hotel and catering, education/health/culture, administration and services, industry and distribution)** and **the degree of functional mix**. In this context, the node-place model identifies the differentiation and intensification of activities around the transit station (Bertolini, 1999).

In addition to social and economic diversity, physical diversity has a great impact on walkabilty capacity of a neighborhood as well. A greater mix land-use functions would increase the percentage of walking trips. The type of uses (residential, retail or office) affects walkability because people tend to walk farther between the station and residential or employment and retail services. The mixed land-use clusters around transit stations also increase diversity of land-uses.

Mixed land-use is defined as "integration of land use by increasing activities" and it is the balance of residential and non-residential land-use functions (Çalışkan, 2004).**Three categories of mix land-use can be identified: i) number and ratio of the facilities provided; ii) horizontal mix of land uses; and iii) vertical mix of uses.** While the first indicator is related to the degree of the variation in supply of services and facilities, horizontal mix of uses implies the individual developments of different uses within an urban area. The vertical mix of uses, on the other hand, refers to the urban characteristic of 'living over the shops' (Çalışkan, 2004: 18) (Table 2.8).

Table 2.8, MIX-OF-USES variables

MIX-OF-USES variables
- PROVISION OF FACILITIES o Number of key facilities for every 1000 residents o Ratio of residential to non-residential urban land
- Horizontal mix of uses o Percentage of sectors containing four or more key facilities o Percentage of sectors containing all key facilities
- Vertical mix of uses o Living over the shop: area of retail space that includes accommodation (as a percentage of total retail space) o Mixed residential and commercial uses: number of flats in commercial buildings (as a percentage of all built flats)

Mixed land use provides many services within an area, reducing the need to travel and the private car trips for commuting, shopping or leisure trips. It is assumed that all facilities and amenities are to be located together: housing, jobs, services, facilities, recreational areas and so on (Jabareen, 2006).

Jacobs (1961) claims that in dense and diversified areas, people tend to walk. As the urban area gets intensely diversified and has high density, walking increases even if people use their private car or public transportation system to come to that settlement. Jacobs (1961) argues that to have a diversified urban area, the buildings in that area should be at different ages, and should accommodate different people and different businesses. The district should serve different functions to provide different activities for the people in different times. There should be options enhancing social relations resulting in economic development. The density should be high. These characteristics would provide diversity, which would end dullness and homogeneity in the area (Jacobs, 1961; cited in Jabareen, 2006).

A greater mix of uses facilitates the use of non-motorized transport and public transit modes. In a study by Song and Knaap (2004), two measures for land use mix are proposed: the actual mix of non-residential land uses in the neighborhood and the mix of zoned non-residential land uses. In the first measure, acres of commercial, industrial, and public land uses in the neighborhood are divided by the number of housing units. With this approach, we found a ratio that indicates the land use mix. The second measure also reveals a ratio, which is found by dividing acres of land zoned for central commercial, general commercial, neighborhood commercial, office commercial, industrial, and mixed land uses by the number of housing units. The higher ratio represents the greater land use mix (Song & Knaap, 2004). Places of different activities and services can also be calculated from maps.

2.6. Micro-level walkability measures

Walkable public spaces have five major attributes: safety, orientation, comfort, diversity and local destinations (Lambert, 2005; Kolody, 2002; Department of City Planning of Los Angeles, 2008). (Figure 2.29) These attributes of walkability are not haphazardly chosen. The key assumption behind these attributes is that walkable public spaces are those which are safe, attractive, comfortable and well-connected to its surroundings and local destinations, and those that accommodate diversity. The following sections explain each of these attributes in detail.

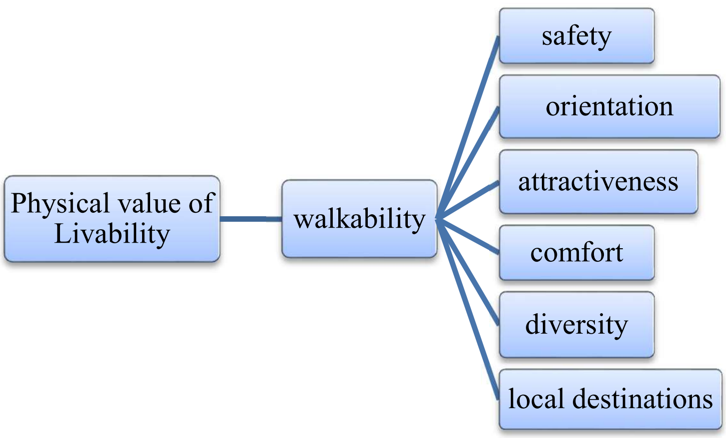


Figure 2.29, Walkability attributions. (Ghadimkhani, 2011)

2.6.1 Safety

Safety is an important quality of walkable public spaces. It can be created by physical design methods and other complex factors which prepare safety. Thus, urban spaces must be not only physically, but also perceptually safe. In general scale, the safety problem is a complex and multi-faceted; whether pedestrians or drivers, people on the streets can feel 'safe' or 'unsafe' vary in many different ways. A comprehensive approach to promote the public safety therefore needs to include initiatives to improve 'actual' and 'perceived' safety on many different fronts (Lambert, 2005:19; Wheeler, IURD, 2001:38-39) (Figure 2.30).

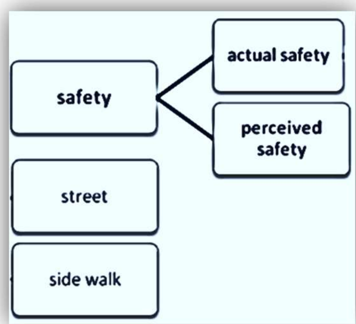


Figure 2.30, Safety is evaluated in actual and perceptual aspects in both street and sidewalk. (Lambert, 2005:44-45 and personal rendering)

2.6.1.1 Actual safety

Actual safety' means a 'safety' achievable through safe physical properties in urban spaces. It can be achieved in streets and sidewalks through different ways. One should note that street is a three-dimensional entity with its all components, such as vehicular road, sidewalk, street furniture and buildings. It is not only used as a part of a transport network, but it is used for many activities. Rapaport (1987:81) defines these activities as: 'non-pedestrian movement' which includes the movement of vehicles, 'dynamic pedestrian activities' which includes people walking and running, and 'static pedestrian activities' which includes people standing and waiting. As such, Gehl (1987) defines three categories of pedestrian activities in urban public spaces: necessary activities, optional activities, and social activities. Necessary activities include those that are more or less compulsory, such as going to work, shopping, waiting for a bus or a person, running errands. The activities in this group are necessary, because their incidence is influenced only slightly by the physical framework; they take place throughout the year, under nearly all conditions, and are more or less independent of the exterior environment; and the participants have no choice. Optional activities, however, happen if there is a wish to do so and if time and place make it possible. Taking a walk to get a breath of fresh air, standing around enjoying life, or sitting and sunbathing are the examples of activities within this group. These activities take place only when exterior conditions (such as weather and place) are optimal. That is, these activities are especially dependent on exterior physical conditions. Finally, social activities are all activities that depend on presence of others in public spaces, such as children at play, greetings and conversations, communal activities of various kinds, and passive contacts (i.e., simply seeing and hearing other people).

All these activities should be considered when considering the safety in streets (and thus in public spaces). Street pattern, traffic calming measures, lightening, continuous pavement, pedestrian enclosure, separation, floor quality, street crossings, and vehicle mix become important elements which influence actual safety in streets (Lambert, 2005: 19-22; Kolody, 2002: 44-45; LA-Walkability Checlist, 2008: 7-66). The following sections elaborate these elements of actual safety in streets.

2.6.1.1. a Street Pattern

Southworth and Owns (1995, cited in Kolody, 2002:50) divide street patterns into five types: grid-iron fragmented parallel, warped parallel, loops and lollipops, and lollipops on a stick (Figure 2.20).

Street patterns are evaluated through configuration of sreet and shape of intersections. Continuous, connected street pattern, such as grid or modified grid (Neo-Traditional Street Types), developed in the 1930s, is more walkable, because it includes shortest trips and highest amount of paved surface; it also ensures pedestrian's accessibility to parallel streets in a short time. It makes easy approchability to public services. It is also safer, as the intersections slow car speed

(Preiss and et al, 2002: 3; Kolody, 2002: 50; Lambert, 2002: 20; Marshal, 2005: 77, 238, 243, 247; Bentley, 2002: 21).

Some claim that grid-iron pattern is less safer than curvlinear pattern because of its intersections. Also they claim that, in residential area, cul-de-sacs is more preferable. However, circuitous and complex street patterns, such as dead-end cul-de-sacs and curvilinear streets that are combined with low-density development patterns, make urbanites to use car in order to reach to their destination. Thus, they are against walkability and safety of pedestrians. Together with all discussions, New Urbanism and Smart Growth approaches claim that grid or modified grid street pattern increase walkability and livability. However, 'Institute of Transportation Engineers' Traditional Neighborhood Development do not have a clear opinion about the best street pattern; they believe that many other factors, such as street width, may affect safety level of pedestrians (Preiss and et al, 2002:3; Kolody, 2002: 50; Lambert, 2002: 20; Marshal, 2005: 77, 238, 243, 247; Bentley, 2002: 21).

2.6.1.1.b Traffic Calming

*Traffic calming*is another important factor influencing safety on streets. It is found that speed usually causes serious accidents; therefore traffic calming measures become vital factors for pedestrian's safety (Çiçek, 2009: 23). On the other hand, *width of street, on-street parking* and *design details* are other supportive factors slowing down the traffic (Lambert, 2005: 21).

The street may be physically narrow or be perceived as narrow. Defining factors, such as parking, sidewalks and street trees, are effective factors in perception of the width of streets. As Greenbie (1981) indicates, wider spaces encourage drivers to increase their car speed, and this will reduce walkability and general safety of the streets. But, narrow streets, physically or perceptually, make drivers feel insecure, and therefore make them avoid acceleration of car speed (Lambert, 2005: 21).

On-street parking is another important instrument for traffic calming. It raises activity on residential and commercial streets, while providing comfort for shoppers, consumers, shop owners and traders. Street parking acts as a buffer between pedestrians and cars and contributes to pedestrian's safety (Lambert, 2005:15; Litman, 2009:14) (Figure 2.31).

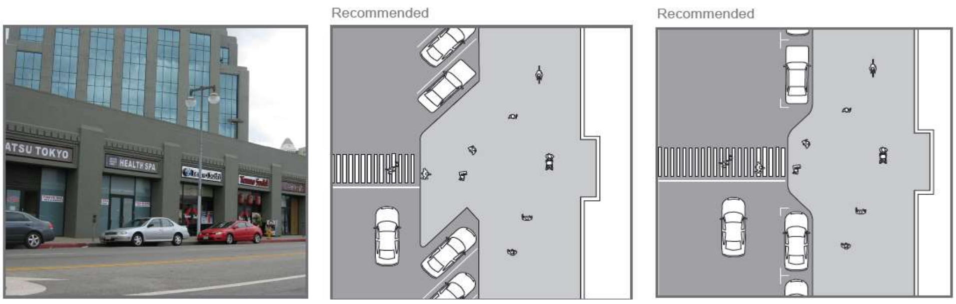


Figure 2.31, On-street parking and its effect on sidewalk width and street crossing. (LA-Walkability Checklist, 2008: 22)

Design details, such as '*raised or textured pavement at crosswalks', 'barrier effect (severance)'* are helpful for traffic calming. These measures slow traffic and permit non-motorized transport users to cross streets (Lambert, 2002:21; Çiçek, 2009:7).

2.6.1.1.c Lightening and visibility

Lightening and visibility are the third necessary factor for security offoot-travelers. 'Appropriate and adequate lightening' system contributes to driver and pedestrian's safety through increasing visibility. In addition, illuminations of park areas and crosswalks improve safety. The purpose of using 'appropriate lightening' is to provide 'glare-free' lightening systems which are also called 'dark sky' and are known as correct lightening systems (LA-Walkability Checklist, 2008:67)(Figure 2.32).

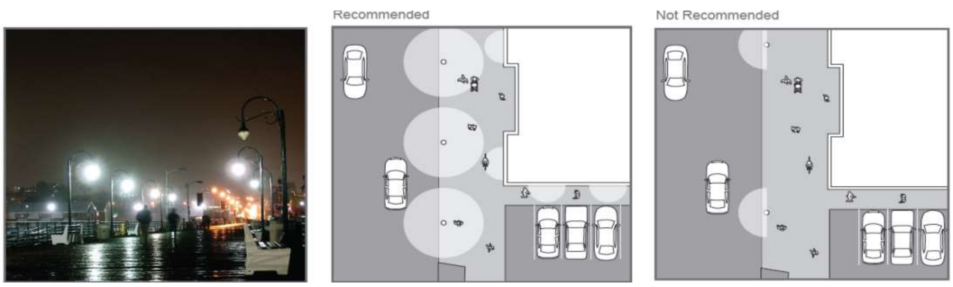


Figure 2.32, Parking areas and sidewalks illumination. (LA-Walkability Checklist, 2008:66)

2.6.1.1.d Continuous pavement

Continuous sidewalk pattern is an essential feature of a well-designed pedestrian system that increases 'walkability'. It enables pedestrians, especially those with physical disabilities, to move freely along the sidewalks. It can be strengthened physically and perceptually. The modifications on the physical pattern of sidewalks aim to remove all interruptions on the paths and therefore encourage pedestrians to walk. Perceptual continuity is provided by street furnishings, which create harmonious rhythm, such as coherent height of light poles and coherent canopies (Kolody, 2002:43; LA-Walkability Checklist, 2008, p.11; Litman, 2010:36).

As grid-iron street pattern is highly interconnected, it offers more continuous, therefore walkable sidewalks for pedestrians, compared to the neighborhoods based on cul-de-sacs, crescents, loops and lollipops street patterns. Of course, this does not mean that 'walkable' cities are only possible through grid-iron street pattern. For example, there are many historic centers in European cities with complicated street pattern. But their walkability is supported by other effective factors, such as human-scale dimensions; diversity and special landmarks (Preiss and Shapiro, 2002: 3; Kolody, 2002: 50; Lambert, 2002: 13; Marshal, 2005: 77, 238, 243, 247; Bentley, 2002: 21).

2.6.1.1.e Pedestrian enclosure

Pedestrian enclosure also effects pedestrians' safety, physically and perceptually. It is provided by paying a particular attention on *human scale, building orientation, and street furniture* factors (Lambert, 2005:15; Litman, 2010: 22, 24, 28) (Figure 2.33-35).

Human-scale standards refer to functional width of sidewalks, which could provide pedestrian movement and their activity. It is also related to building height, which should be determined according to sidewalk width (Lambert, 2005: 15; Litman, 2010: 22, 24, 28) (Figures 2.35). Appropriate sidewalk width is about 1.53 m which responses to minimum needs of urbanites, those walking, resting, biking, and skating. Unnecessary sidewalk widths lessen enclosure feeling. Nevertheless, the width of sidewalks should be also determined according to pedestrian volume (Figure 2.35).

Figure 2.33, Pedestrian enclosure by considering urban elements, building scale, orientation on enclosure sense. (LA-Walkability Checklist, 2008: 10)

Jacobs (1993) identify the ratio of height of buildings to street width as 1:2. In general, scale, appropriate sidewalk width enables pedestrians to realize the structure of the route, its use, and the entrance placements. In addition, appropriate sidewalk width enables different parts of the sidewalk function properly, and therefore, pedestrians can move freely (Lambert, 2005:15; Litman, 2010:22, 24, 28) (Figure 2.36).

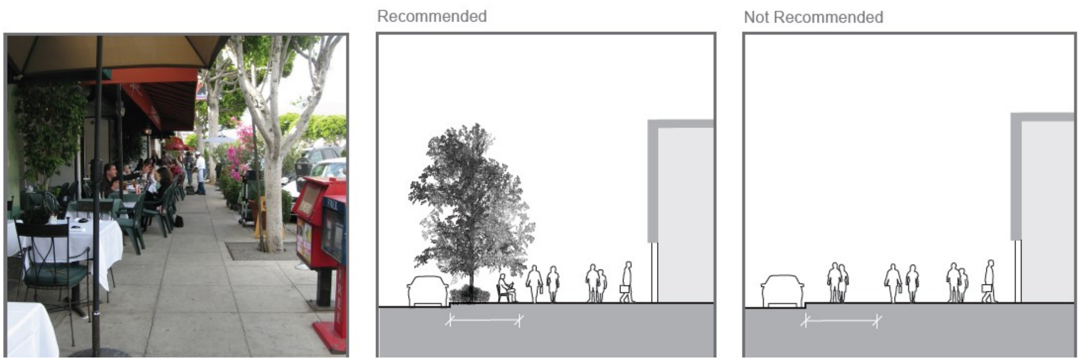


Figure 2.34, Perceptual continuity created by urban elements (LA-Walkability Checklist, 2008:11)

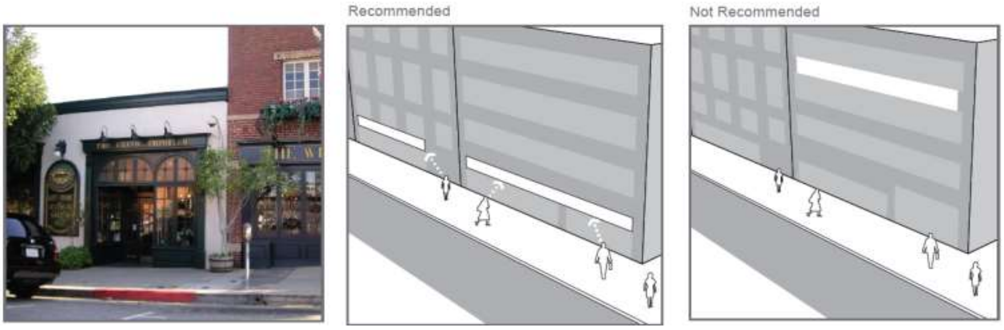


Figure 2.35, Perceptual building components according to human scale standards, (LA-Walkability Checklist, 2008: 66)

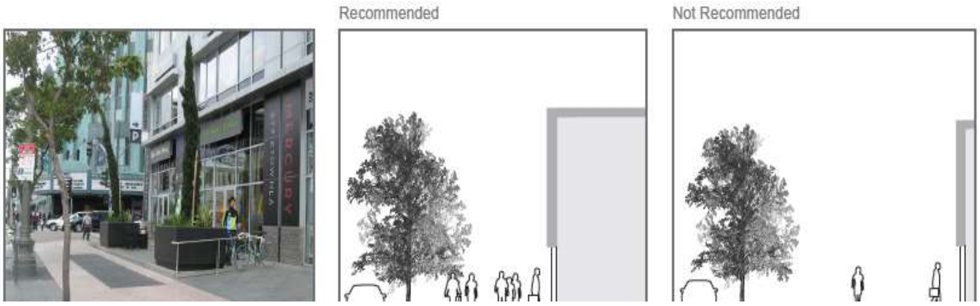


Figure 2.36, Adequate sidewalk width accordance to pedestrian volume, (LA-Walkability Checklist, 2008: 66)

Building orientation is also important in terms of creating pedestrian enclosure, thereby creating walkable streets. Building entrances, which consistently open to the same pedestrian realm, confine sidewalk and increase pedestrian enclosure (Lambert, 2005: 16) (Figure 2.37).

The last important component to create pedestrian enclosure is *street furniture*. Street trees and other street furniture act as a buffer between pedestrians and moving vehicles, and protect walkers from traffic noise and its danger (LA-Walkability Checklist, 2008: 10). Trees help to define pedestrian boundary by decreasing the proportion of building height to open space. They also make street narrower and so slow down the traffic. Furthermore, because of their benefits to pedestrian's safety and environment, they contribute significantly to 'walkability' (Lambert, 2005: 16) (Figure 2.38).

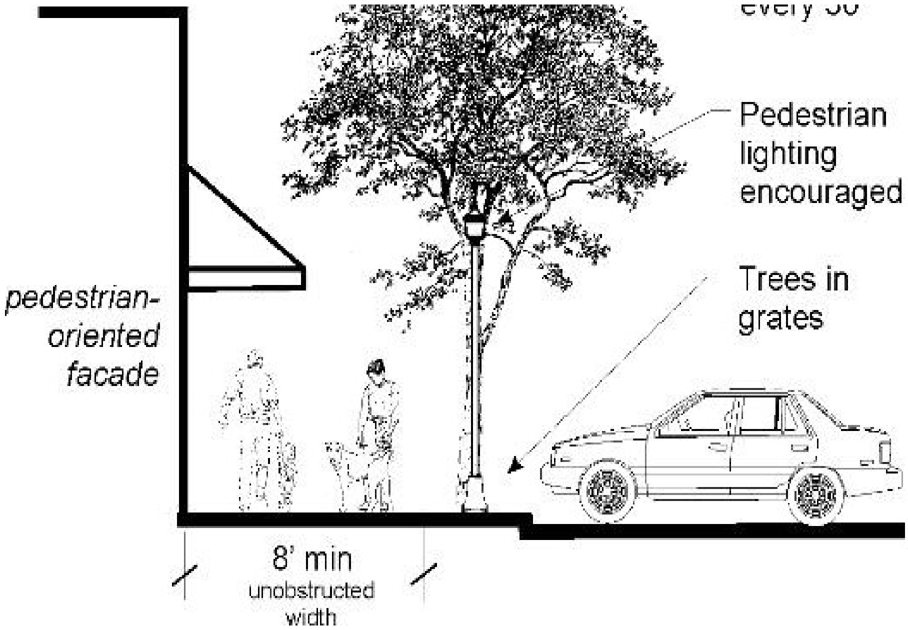


Figure 2.37, The relationship between building orientation, trees and street furniture in defining pedestrian realm (Parking Areas, Vehicle and Pedestrian Access, and Related Improvements, (Re:www.kirklandcode.ecitygov.net)

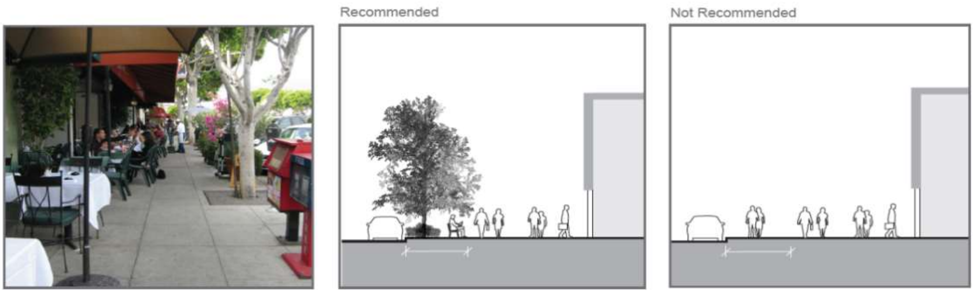


Figure 2.38, The role of street furniture in walkway enclosure.
(LA-Walkability Checklist, 2008:10)

2.6.1.1.f Separation

Separation is another component of actual safety of pedestrians. "Sidewalks, medians, boulevards, on street parking, and parallel routes that allow pedestrians to avoid arterials all work to separate people from vehicles" (Kolody, 2002: 45). Obvious limitation between pedestrian and vehicle area contributes to pedestrians' safety (Kolody, 2002: 45).

2.6.1.1.g Floor quality

Floor quality is another measurement which enhances the actual safety in sidewalks. Qualified floor of streets is important in terms of making walking more comfortable and pleasant for all groups of healthy and handicapped people. In this sense, not only the material of floorscape, but also sidewalk ramps with safe level variation, suitable parapets selected according to climate features are important in terms of creating safe sidewalks for pedestrians (Cengizkan Discourses in 708 Course, 2009 ; LA-Walkability Checklist, 2008:15, 31, 34) (Figure 2.39).

Figure 2.39, Sidewalks with high floor quality, and safe ramps in Denver, ABD (Re: www.deeproot.com last accessed on 03, 01, 2018)

2.6.1.1.h Street crossing

Street crossing is a crucial factor in safety evaluation. Short, safe, visible crossings which have connected two sides of the street physically and perceptually ensure security of pedestrians (LA-Walkability Checklist, 2008: 13, 17) (Figure 2.40).

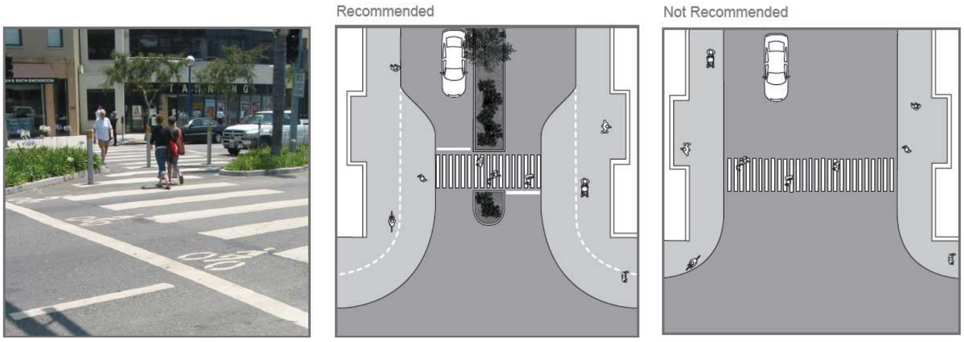


Figure 2.40, Mid-street crossing island and curbs extended out have decreased street crossing distance. (LA-Walkability Checklist, 2008: 17)

2.6.1.1.i Vehicle mix

The last factor related to actual safety is *vehicle mix.* The existent of big transportation vehicles, except from public vehicles which inevitably should be used, have negative effect on pedestrians' safety (Litman, 2010: 30).

2.6.1.2 Perceived safety

Perceived safety means the protection of pedestrians from the feeling of crime or the danger of vehicular traffic. Perceptual safety is different from physical safety. For example, the separation of sidewalk from vehicular route is the concern of physical safety, while the noise of cars on streets that makes people anxious is related to the perceptual safety (Evans, 2009: 365-385; Wheeler, 2001: 35, 38, 62).

Perceptual or physical safety is important for both pedestrians and drivers, but pedestrians as vulnerable groups are much more affected by safety issues. Safety is essential because it directly affects the tendency of people for walking. Otherwise they would not walk around neighborhoods. "The safer pedestrians feel on the street, the more they will use it" (Kolody, 2002: 44-45).

Jane Jacobs (1961), in her book "The Death and Life of Great American Cities", defines three main qualities necessary for perceptual safety as below:

i. A clear delimitation between public and private space
ii. Buildings oriented towards the street to provide 'eyes on the street' (Figure 2.41)

iii. Common use facilities to add more ‘eyes’ on the street (Jacobs. J, 1961: 35) (Figure 2.40).

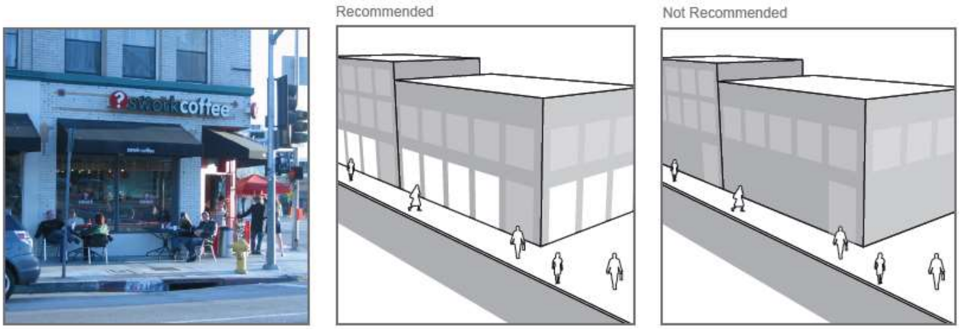


Figure 2.41, Shops which have a direct relation with streets provide ‘eyes on the street’ and create safety.(LA-Walkability Checklist, 2008: 60)

2.6.2 Orientation

Orientation is crucial part of safety and walkability, as it enables pedestrians, especially aged people, children and walkers with specific orientation problem, to realize public space network, to recognize the most important public places, to avoid from the fear of being lost and therefore, to have the tendency of walking (Bentley, 2002: 193, 206).

It is an essential factor for daily users of streets, except for those who are familiar with different parts of the street or have previous mental map about it (Bentley, 2002: 181; Burton and Mitchell, 2006: 64). The importance of orientation becomes clear, through ‘mental maps’, as claimed by Kevin Lynch, based on ‘paths’ and ‘nodes’. The survey of mental maps demonstrates important factors which influence intellectual maps. When pedestrians move along sidewalk, the path as line, and environment elements as nodes form their mental map. Path carries importance, because without having a simple ’public space network’, pedestrians will feel themselves lost in space. Nodes are also important because they define the place that walkers want to go.

Legible street pattern, landmarks (differentiation, *detailed building form* and *junctions,* and *singularity), continuity, built form and its location and architectural and environmental* featuresare effective factors in way finding of pedestrians

(Bentley, 2002: 174-180; Kolody, 2002: 44; LA-Walkability Checklist, 2008: 31; Burton and Mitchell, 2006: 61).

2.6.2.1 Legibility of street pattern and urban components

Legibility is the ability to perceive and understand a neighborhood plan through a quick look. Legibility of street pattern helps create a simple image in pedestrians' mind, encourage them to walk and find their destination quickly. Walkers are the slowest individuals of urban space, and they can walk and find their way through readable street pattern and urban components. Simple and regular street patterns which are highly connected and the placement of buildings around these street patterns make them more intelligible than irregular, complex hierarchical street patterns (Bentley, 2002: 193, 206 and Kolody.A.D, 2002: 44) (Figure 2.42).

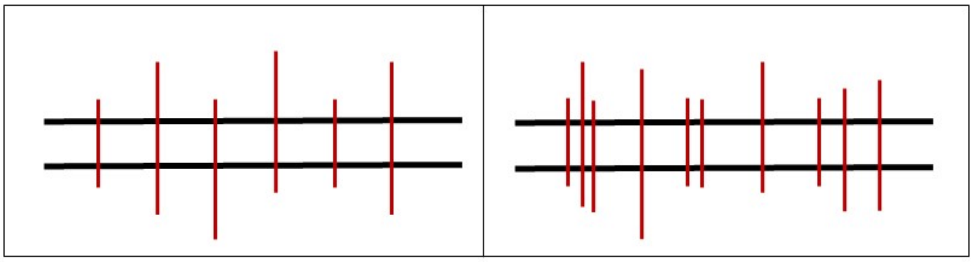


Figure 2.42, The street network which provides regular rhythm (left) and that which provides irregular rhythm (right) (Resource: Adapted from Rapoport (1977) in Eraydın, 2007, p.75)

2.6.2.2 Landmarks

Likewise, landmarks increase legibility of the environment, create a memorable and familiar image in pedestrians mind, and thus help pedestrians to realize where they are or whether they are in the right way or not (Kolody, 2002: 44). Built forms define 'nodes' in our mental map. Hence, *differentiation*, *detailed building form* and *junctions* and *singularity (sharpness of boundary, closure, wholeness, unity…), as suggested by* Kevin Lynch and Gestalt rules, help the formation of simple mental maps in people's minds and fix unforgettable landmarks in their memory (Bentley, 2002: 174-180,206; Eraydın, 2007: 77).

If urban components in public spaces are not in harmony, it becomes hard for people to remember all parts of such complicated urban elements. The level of differentiation therefore should be kept balanced (Bentley, 2002: 176). Likewise, detailed form of building and their junctions also contribute to legibility of the environment by defining landmarks in our memory (Bentley, 2002: 206). Moreover, singularity (sharpness of boundary, closure), as discussed by Kevin Lynch, is influential factor in specializing urban components. Banham (1969, cited in Bentley, 2002: 178-179) recalls them as “the qualities that identify an element, make it remarkable, noticeable, vivid, recognizable” (Figure 2.43).

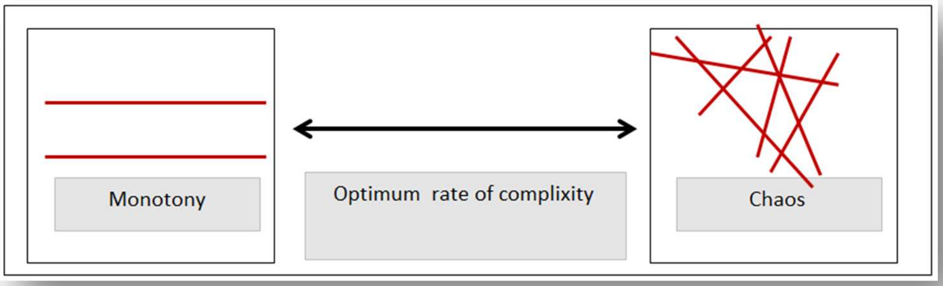


Figure 2.43, Level of differentiation (Resource: Adapted from Rapoport (1977) in Eraydın, 2007, p.72)

2.6.2.3 Continuity

Continuity refers to spatial enclosure of various parts of public space system (Bentley, 2002, p.112). *Continuity and differentiation* balance together (Bentley, 2002, p.176). Continuity in public space contributes to attractiveness and legibility of the environment. It is mostly possible in direct connections achievable in grid street patterns (Bentley, 2002:176) (Figure 2.43).

2.6.2.4 Built form and its location

The forms of the buildings and other urban elements, and their placement are important in terms of increasing legibility. The position and form of the urban elements should be selected carefully according to their characteristics and merits. In this way, everybody can perceive them and consequently they can contribute to the legibility of urban environment (Kolody, 2002: 44) (Figure 2.44).

Figure 2.44, The use of architectural features to achieve a continuity between different parts of the pedestrian way, Above: 32nd Street, NYC. (Re: nyc.streetsblog.org); Below: Santa Monica, ABD. (Re: www.nacto.org)

2.6.2.5 Architectural and environmental features

As far as *architectural and environmental* features are concerned, *building entrances* and *building orientation* are two important components. *Building entrances or the main entrances of public buildings* should be visible by everyone. Thus, the details of door and windows should be clear, and building entrances should be clearly seen by everyone. Landscaping or porches should not become obstacles against the visibility of building entrances. Likewise, building entrances should be easily accessible to pedestrians. Short and direct ways to building entrances are preferable. Also, for the accessibility of disabled people, building entrances should be without level variation or should have ramps. Hence, building entrances will be legible and accessible to all.

Building orientation is important in terms of accessibility of buildings from sidewalks. For example, approaching to the building through the façade which is occupied by commercial uses, or which is near to public services, is desirable (LA-Walkability Checklist, 2008: 31-37; Burton and Mitchell, 2006: 61) (Figures 2.45-47).

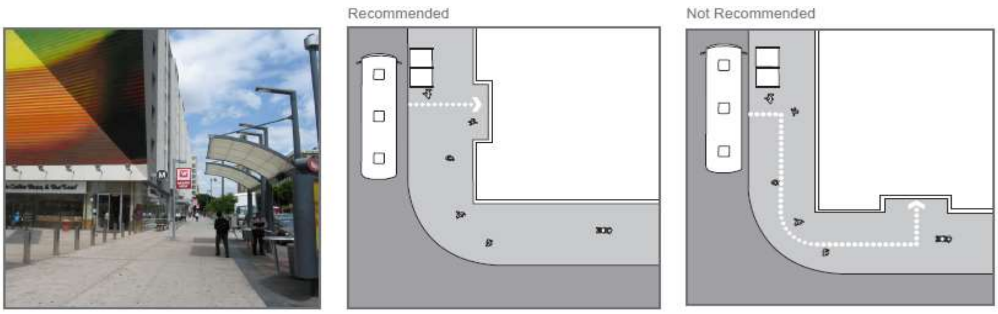


Figure 2.45, Building entrance near to public service. (LA-Walkability Checklist, 2008:32)

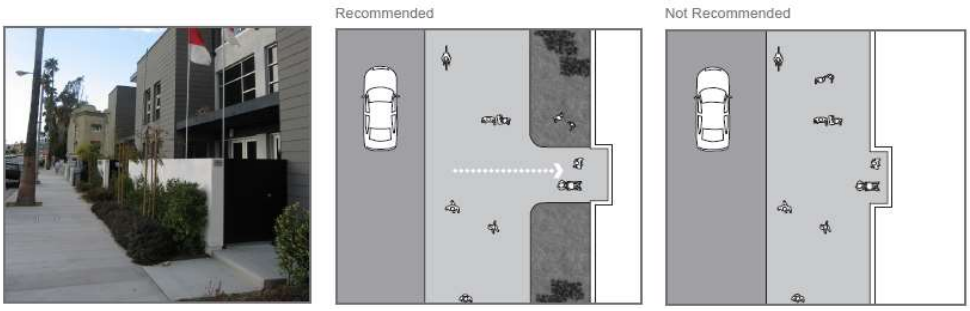


Figure 2.46, Well-defined building entrance (left and middle), and the building entrance which is not recommended (right).(LA-Walkability Checklist, 2008: 34)

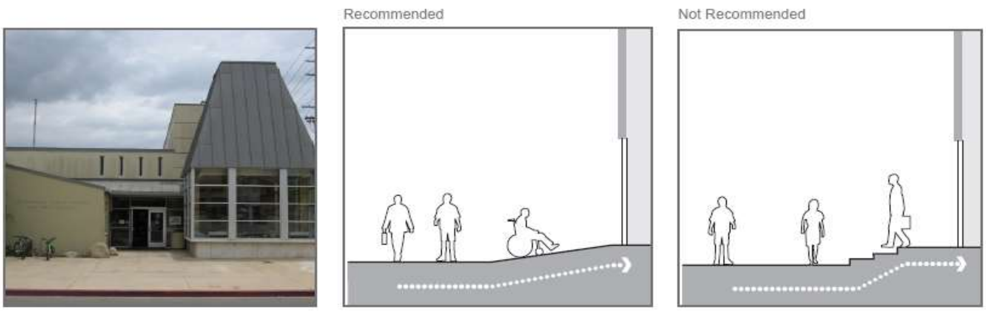


Figure 2.47, The use of ramp to be accessible by disable people (left and middle) and the building entrance which is not recommended (right). (LA-Walkability Checklist, 2008: 34)

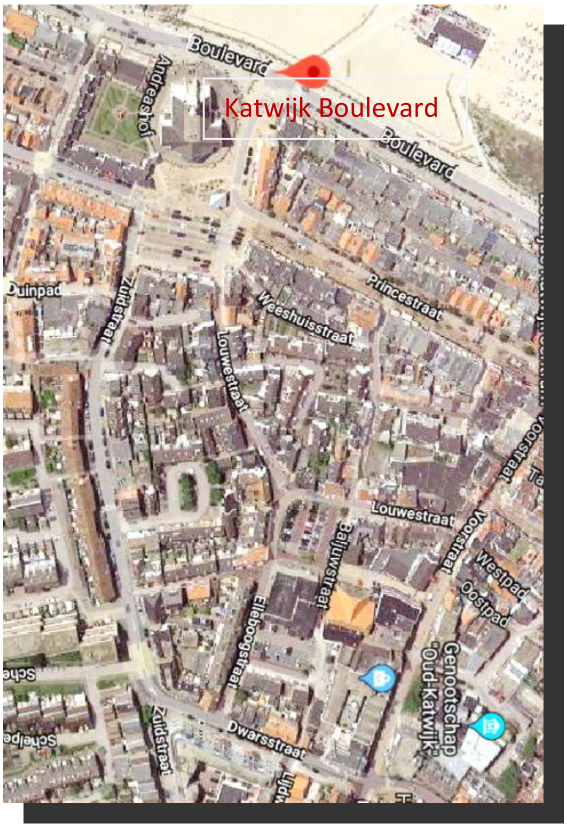


Figure 2.48, Katwijk Boulevard, Netherlands (Re: Google Earth, 2011; Bentley, 2002, p. 201)

Amsterdam's Nieuw Zuid plan, which was developed between the years of 1902 and 1920, provides a good example in terms of architectural and environmental features of walkability. The plan aims to produce a grid, connected street pattern, and to create successful commercial areas which are nourished by high pedestrian flows. Because of detailed built forms and architectural and environmental features, it is a legible city. Katwijk Boulevard, run along the coastal area of the city, accommodates cars, bicycles and pedestrians. It is a walkable street. Moreover, there is no grade separation in the boundary of sidewalk and street. The location of many special landmarks of the boulevard has also made it very legible (Bentley, 2002: 200-201) (Figure 2.48-49).

Figure 2.49, Views of Katwijk Boulevard, Netherlands.(Re: Google Earth, 2011)

2.6.3 Comfort

Lynch (1991) defines comfort regarding *physical* and *visual* aspects. He argues that during the mutual interaction between human and environment, urban spaces should be ‘physically usable’ and ‘visually understandable’ to pedestrians (Eraydın, 2007: 15). The absence of both qualities of urban space decreases comfort and safety feeling for pedestrians (Eraydın, 2007: 35).

Visual understanding is connected to the *Gestalt principle of orientation, and legibility*, which are discussed in previous parts of this chapter. The use of Gestalt rules to provide comfort for pedestrians has been applied in Italian cities. However, it is not put into practice all over the world and in most of the cities. We can only see these principles in covered public spaces, such as shopping centers, to create comfort for pedestrians (Akit, 2004: 19).

Physically usability is concerned with four factors, which make the comfort of walking for healthy, handicapped, early age and old age people. The first includes the preparation of public spaces that protect pedestrians from sun, rain, snow, ice, and wind. The second is possessing clean air which is mostly provided in cities with calm traffic. The third is safety (actual and perceptual) which makes pedestrians' comfort. It is identified with attention to *street pattern*, *traffic calming measures,lightning, continuous pavement, pedestrian enclosure, separation, street trees, floor quality, street crossings,design detail, clearseparation of walkways from vehicular traffic and eyes on street* factors which are discussed in safety part of this chapter. The last is accessibility which is essential factor to the comfort of both health and disabled peoples (Kolody, 2002: 44-45;Akit, 2004: 37; Lambert, 2005:19-22; Çiçek, 2009: 7; LA-Walkability Checklist, 2008: 10, 11, 13, 17, 22, 36, 66, 7).

2.6.4 Diversity

There is a close relationship between physical, social and economic diversity of urban space and walkability. 'Physical diversity' refers to a variety in terms of urban physical elements, such as a variety regarding dwelling types, architectural styles, and land-use activities. 'Social diversity' signifies a mixture of people coming from different ages, family types and socio-economic status, while 'economic diversity' means a variety of building types with different property values. The presence of such diversity in urban space is important in terms of bringing different groups of people together and therefore to make them use urban public spaces. In this way, public spaces can be lively and livable (Lambert, 2005: 23-24).

Diversity has different impacts on the walkability of public spaces in residential sites and commercial centers. A neighborhood with a variety of dwelling types, for example, allows people of different ages, ethnicity, family types and socio-economic status to live together and therefore let them interact each other on daily basis, strengthen the personal and civic bonds that are essential for creating livable communities. Likewise, shops and services that provide many basic daily needs of residents do not only create local employment opportunities, but they also add visual interest for pedestrians, thus increases walkability of public spaces (Lambert, 2005: 23-24).

Additionally, the presence of a variety of open public spaces in a neighborhood, such as playgrounds, nature preserves, squares and plazas, is another important factor, which increases the walking activities of urban space (Crowhurst-Lennard, 1987, cited in Lambert, 2005: 23-24).

2.6.5 Local destinations

The distance between home and destination is a key factor of 'walkability'. Because people are not interested in walking more than 10 minutes to reach at the places that satisfy their daily needs (Lambert, 2005: 14). According to 'accessibility' standards of Time Saver Standards, maximum walking distances in general is between 400m and 800m (i.e., between 5 and10 minutes). Figure 2.49 shows the recommended and critical distances from home to different activities to create walkable street pattern.

It is mostly possible in interconnected street pattern. Because, interrelated street pattern enables destinations to connect each other quickly and directly, distributes the traffic equally in many roads rather than a single arterial, and increases legibility. Particularly, grid-iron street pattern is highly interconnected and has potential to create more pedestrian-friendly streets than other types of street patterns. Thus, interconnected street pattern is advisable in terms of increasing accessibility and walkability of public spaces (Preiss and Shapiro, 2002: Kolody, 2002: 50; Lambert, 2002: 20; Marshal.S,2005: 77, 238, 243, 247; Bentley, 2002: 21).

2.6.6 Conclusion

Walkability is one of the major qualities to create livable urban environments. It mainly requires pedestrian convenience on public spaces. As discussed in detail, walkable and pedestrian-friendly streets contribute to *basic mobility, community livability, community cohesion, economic development, consumer cost savings, public health,* and *efficient land use*. Therefore, the creation of walkable streets is crucial for cities. As summarized in Table 2.5, and explained in detail in this chapter, walkability has a number of attributes. By using these attributes, it is possible to assess public spaces how far they are walkable and to make recommendations to make them more walkable (Table 2.6).

Table 2.4, The attributes of walkability at macro scale

<table>
<tr><th colspan="3">THE MAJOR ATTRIBUTES OF WALKABILITY-Macro scale</th></tr>
<tr><td rowspan="3">TRANSPORTATION SYSTEM</td><td colspan="2">Social
A. Accessibility B. Equity</td></tr>
<tr><td>Sustainable transportation

*Effective and efficient integration of various modes of transportation

*More accessible land use patterns</td><td>Various social-economic groups of people get equal facilities</td></tr>
<tr><td>Economic
Compact land use patterns increase:
1.accessibilty
2.economic productivity
and
3.decrease transportation cost</td><td>Environment
Sustainable transportation modes,

1.save energy
2. less damage the environment
3.reduce dependency to foreign languages</td></tr>
<tr><td>LAND USE DEVELOPMENT</td><td>Density

Population density
the number of residents per unit area,

Employment density
the number of employees per area,

Built form density
the density of built and residential area per hectare,

sub-centersdensity is known as the density of most dense centers</td><td>Diversity

The diversity of the land use within a given geographic area. (the proximity of distance between destinations)</td></tr>
</table>

Table 2.5, The attributes of walkability at meso scale

<table>
<tr><th colspan="4">THE MAJOR ATTRIBUTES OF WALKABILITY-Meso scale</th></tr>
<tr><td rowspan="3">TRANSPORTATIO N SYSTEM</td><td colspan="3">Social
A. Accessibility B. Equity</td></tr>
<tr><td colspan="2">Network connectivity
1.road network
2.street connectivity
3.block size and density</td><td rowspan="2">-Horizontal equity
-Vertical equity
-Vertical equity with regard to mobility need</td></tr>
<tr><td>Network pattern
-Interconnected network patterns (a. ensure alternative trip modes, b. increase trip frequency)</td><td>Separated walking biking system</td></tr>
</table>

Table 2.5 (Continued)

	Economic	**Environment**
LAND USE DEVELOPMENT	**Density** *Decrease the need to infrastructure *Decrease trip distance *Increase social interaction *Increase tendency to PT use ***Population density*** the number of residents per unit area, ***Employment density*** the number of employees per area, ***Built form density*** the density of built and residential area per hectare,	**Diversity** -Physical -Social -Economic diversities

Table 2.6, The attributes of walkability regarding public spaces

THE MAJOR ATTRIBUTES OF WALKABILITY-Micro scale		
SAFETY	• **ACTUAL SAFETY** ○ Street pattern ○ Traffic calming measures ○ Lightening ○ Continuous pavement ○ Pedestrian enclosure ○ Separation ○ Floor quality ○ Street crossings ○ Vehicle mix	• **PERCEVIVED SAFETY** ○ Clear delimitation between public and private space ○ Building orientation towards street ○ The presence of common use facilities
ORIENTATION	• **LEGIBLE STREET PATTERN AND COMPONENTS**	• **LANDMARKS** ○ Differentiation ○ Detailed building form and junctions ○ Singularity
	• **CONTINUITY**	• **BUILT FORM AND ITS LOCATION**
	• **ARCHITECTURAL AND ENVIRONMENTAL FEATURES** ○ Building entrances ○ Building orientation	
ATTRACTIVENESS	• **SIMILARITY** • **PROXIMITY**	

Table 2.6 (Continued)

	• **COMMON GROUND OR COMMON ENCLOSURE** • **ORIENTATION** • **CLOSURE** • **CONTINUITY**	
COMFORT	• **PHYSICAL USABILITY** o Protecting pedestrians from climatic conditions o Possessing clean air o Possessing actual and perceptual safety o Being accessible	• **VISUAL UNDERSTANDING** o The principle of orientation o legibility
DIVERSITY	• **PHYSICAL DIVERSITY** • **SOCIAL DIVERSITY** • **ECONOMIC DIVERSITY**	
LOCAL DESTINATION	• **DISTANCES BETWEEN ACTIVITIES (HOME TO SHOPS, SCHOOLS, PLAYGROUNDS, ETC)** • **INTERCONNECTED STREET NETWORK**	

CHAPTER 3

RESEARCH METHODOLOGY

This chapter is about the research methodology that was used in this study. The research employs a case study approach as an investigation method. As mentioned before, first, this research aims to define the macro-level walkability criteria of a city and to examine Ankara's macroform via these criterias. In other words, it seeks to investigate the relation between macroform of Ankara and the walkability attributes at the macroform level. Second, it defines the main parameters of walkability at meso and micro scales, and it examines these parameters on two cases. The meso scale parameters focus on the neighborhood level assessment while the micro-scale parameters concentrate on the street level evaluation. The micro scale walkability analysis is adapted from writer master thesis *(Ghadimkhani, 2011)* and is integrated with the assessment of walkability at macro-meso scales during the study. The walkability measures at macro, meso and micro scales are defined in detail in Chapter 2. This chapter first explains the reasons to carry out the case study on two neighborhoods in Ankara that are Tunalı neighborhood (TN)[1]* and Çukurambar neighborhood (ÇN)[2]*; the second, the main structure of the thesis; third, the method followed by this research on walkability assessment of case studies.

3.1 The Reasons to carry out the Case Study on Tunalı and Çukurambar Neighborhoodsin Ankara

Since the early-1990s, the decentralization policies of the CBD, the suburbanization policies, the decreasing provision and service qualities of public transportation, and the increasing usage of private car in Ankara have resulted in the decreasing livability of the city center. While the Ankara's CBD has expanded towards the South, South-west, West and North corridors along Gölbaşı, Çayyolu, Eskişehir

[1]TN boundary in my thesis includes Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods.
[2]ÇN boundary in my thesis includes Çukurmbar and Kızılırmak neighborhoods.

Road, and Keçiören directions, Ulus (the historic city centre) and Kızılay have been losing their economic and social vitality. A significant number of prestigious commercial enterprises have moved from Kızılay to newly-built shopping malls on Eskişehir Road to the shopping malls in middle and high-income suburban neighborhoods, such as Çukurambar, Ümitköy, Çayyolu. Some neighborhoods in the inner city, such as Kavaklıdere, Gazi Osman Paşa and Çankaya where some part of the CBD is located, and include prestigious commercial, business and residential functions, however, still keep their economic and social vitality. Despite the presence of these lively neighborhoods in the inner city, the public space and street network in Ankara have been deteriorated due to the recent policies of Ankara Metropolitan Municipality. The boulevards, such as Atatürk Boulevard, Dumlupınar (Inönü) Boulevard, have turned into motorways by the recent car-oriented transportation projects. The usage of these boulevards and many other avenues in the city center has become more car-oriented, while pedestrians have been neglected and marginalized. The city center of Ankara is now far away from being walkable. There are a few places pedestrianized in the 1980s, such as Sakarya Street and its surroundings, Izmir Street, and Yüksel Street, and they are still pedestrian-dominant public spaces. The rest of the city center and its sidewalks, however, are becoming more and more occupied by cars and car users. The impoverished public transportation services have also encouraged people to use their private cars. All these factors have decreased the capacity of walkability in the city center and therefore decreased its livability.

This research has selected Çukurambar Neighborhood (ÇN) and Tunalı Neigbourhood (TN) and their crowded streets; that is, Muhsin Yazıcıoğlu Street (MYS) and Tunalı Hilmi Street (THS) as the cases to study. Firstly, Çukurambar Neighborhood is located at the geometric center and cross-section of the metropolitan city of Ankara, it is out of city center and has connectivity to main city center, secretariat of Turkish Treasury and Foreign Trade, Ministry of Social Security and Labor and Ankara Chamber of Commerce on its northern side. Before the urban regeneration, it consisted mainly of squatter buildings with low level of density. Recently, it has transformed to an appealing sub-center with high population density including luxury high storey residential areas, commercial, health and other usages. Together with high residential and business density it is faced with walkability problem. Additionally, MYS is its most popular street connecting two crowded Eskişehir and Çetin Emeç Roads. It is faced with walkability problem mostly because of high vehicular traffic decreasing safety of the pedestrians. Secondly, Tunalı Neighborhood is traditionally developed sub-center of the metropolitan city of Ankara, and has close accessibility to Kızılay, one of the main city centers. It is also known as prestigious neighborhoods of Ankara city and mostly address to high-income groups. THS, one of the major high streets and pedestrian-dominant precincts of Ankara, is its popular street. As TN and ÇN include various problems, they have been subject to a number of studies. By investigating particularly the walkability of Ankara and its two neighborhoods at macro, meso and micro scales, this research differs from other studies.

So, the first reason behind the selection of these two cases is that it gives opportunity to compare walkability level of a traditionally shaped sub-center (TN) and the ones (ÇN) which is formed during urban regeneration. Although urban regeneration in ÇN have increased its economic level but it faces serious difficulties decreasing its livability. Secondly, it ensures the possibility of discussion of urban planning measures which should be taken in a sub-center near to the main center and on the other hand the ones which is out of city center. So, it gives the opportunity to discuss the walkability level in inner-city areas and on the other hand the area of the out of city center with having connectivity to the main centers. The third reason of the selection of these two cases is that they introduce two various urban contexts: TN exhibits the characteristics of urban form with high, horizontal density with small block size, narrow and shady streets, whereas ÇN shows the urban form features with high vertical density on large block sizes and wide streets. Therefore, it gives opportunity to discuss the effects and relation of vertical and horizontal density and network pattern of the urban context on walkability concept. In this sense, it becomes important to understand how far the cases are walkable, and to identify the factors which contribute to and hinder their walkability capacity in order to make urban planning and design recommendations for their improvement.

3.2 Method of Analysis

This thesis studies Ankara city, as well as Çukurambar and Tunalı Neighborhoods regarding the major macro, meso and micro parameters of walkability. It is opted to study the walkability capacity of Ankara city and the two case study sites through the qualitative and quantitative methods by using various resources, such as charts, morphological maps, spatial analyses, visual documentation, archival documents, two surveys conducted in 2009 and 2015 with the users of the two case study areas. The first survey which was carried out in 2009 with 56 respondents focused on Tunalı Hilmi Street (THS) and its surroundings. The survey of 2015 was conducted with 110 participants and it focused on Muhsin Yazıcıoğlu Street (MYS) in Çukurambar. Generally, the data of the research are based on the four major sources of evidence. The first source of evidence includes documents which constitute written reports, books, articles, researches, formal studies or evaluations of the same site under study, articles appearing in the media and websites related to research subject. The second source of evidence is direct observation. Various spatial analysis maps are prepared and photos are taken to support the arguments of the research. The third source of evidence is the questionnaire held with the users of Tunalı Hilmi and Muhsin Yazıcıoğlu Streets (Table 3.1). 56 questionnaires were conducted with the user groups of THS. 9 questionnaires were conducted with people between 18-25; 31 questionnaires were conducted with people between 26-64; 8 questionnaires were conducted with people older than 64. 4 questionnaires were conducted with disabled people, and 4 questionnaires were conducted with parents or people who use pushchairs and those who are you children. 110 questionnaires were conducted with the user groups of MYS. 22 questionnaires were conducted with people between 18-25; 57 questionnaires were conducted with people between 26-64; 15 questionnaires were conducted with people older than 64. 8 questionnaires were conducted with disabled people, and 8 questionnaires were conducted with parents or people who use pushchairs and those who are you children. Cognitive maps are the fourth source of evidence used by this research for the case of THS (Table 3.1).

Table 3.1, Groups selected for questionnaires that were conducted on THS and MYS

	TUNALI HILMI STREET		**MUHSIN YAZICIOĞLU STREET**	
Age groups & vulnerable groups in terms of walkability	**Number of survey**	**Percentage (%)**	**Number of survey**	**Percentage (%)**
18–25 years old	9	16.07	22	20
26-64 years old	31	55.35	57	51.81
64 + years old	8	14.29	15	13.64
Disadvantaged groups	8	14.29	16	14.55
TOTAL	**56**	**100**	**110**	**100**

In this study, qualitative method provides insights into the problem, helps to develop which quantitative researches and information are necessary, and then interpret the data to give results usable in other researches. So, a combination of qualitative and quantitative method has great potentials in planning studies because problem setting and analysis become easier comparing to only quantitative method. It also makes potentials to analyze built form, human interaction, planning process, network pattern, accessibility, diversity and density, which are crucial parameters in urban analysis. For these very reasons, although only quantitative method less consumes the time, this research has sought to connect survey results of the research, results obtained from other researches such as Gazi University study (2013), population number, density calculations and other quantity and quality based examinations together to get the best results. It facilitates my wide range analyze to define the problem and propose solutions at the end of the study.

This study could be developed with implementation of walkability assessment software via qualitative and quantitative data obtained from this research. So, this research will make global walkability scoring production. Then all the obtained results could be interpreted by experienced researchers to get innovative outcomes. Moreover, recommendation section could be developed further and recommend touchable design proposals at macro-meso-micro scales.

In order to assess the walkability capacity of Ankara city, as well as Çukurambar and Tunalı Hilmi neighborhoods, the research identifies the main attributes or components of walkability at macro, meso and micro levels. In the first part of the analysis, the research investigates the historical development of Ankara and its evolution; then it investigates the relation between macroform of Ankara and walkability. These will be explained in fourth chapter. The second part of the analysis focuses on the location of case studies, their current land-use pattern and meso and micro level walkability dimensions of them. So, it investigates Tunalı and Çukurambar neighborhoods at meso scale with the main walkability parameters of *transportation system and land use development* (Tables 2.4-5). Then it assess walkability at micro scale on Tunalı Hilmi Street (THS) and Muhsin Yazıcıoğlu Street (MYS) through the major attributes of walkability (safety, orientation, attractiveness, comfort, diversity and local destinations) which are identified in the theoretical framework of the study.(Table 2.6)

This research has shown that creating walkable, sustainable and livable cities is not an easy task. There needs a comprehensive understanding, as well as an urban planning and design approach that also embraces the management policies of urban space, such as the public transport management strategies. Therefore, there needs such a comprehensive and integrated urban planning and design approach to support the development of Ankara and its sub-centers, and residential neighborhoods. One should also note that there needs a site-specific urban design strategies at meso and micro levels to improve the walkability levels of the urban space, depending on the physical, social, economic and environmental capacities and limitations. Therefore, each locality also needs to be studied individually to create sustainable and walkable urban spaces in Ankara city.

3.2.1 Questionnaires

The questionnaires of this research include both closed and open-ended questions. 'Closed questions' is a form of question which can normally be answered using a simple 'yes' or 'no', a specific simple piece of information, or a selection from multiple choices. As they provide limited choice, it is easier to draw statistical results afterwards. 'Open-ended questions' contrast with closed questions. They cannot be answered with a simple 'yes' or 'no', or with a specific piece of information, and which give the person answering the question scope to give the information that seems to them to be appropriate. "Open-ended questions are sometimes phrased as a statement which requires a response".

In the questionnaire, there are 18 questions that provide us with the opportunity to gather both to quantitative and qualitative data. Qualitative data is more difficult to analyze and draw statistical results than quantitative data. However, qualitative questions are likely to produce in-depth responses, and this is particularly required for a topic, like walkability. Furthermore, these responses are likely to give efficient information about the walkability capacity of the site.

The first three questions are meant to give quantitative information about the street usage. They are closed questions which are: “How often do you visit the street?”, “For what reasons do you use the street?” and “Which parts of the street do you use more frequently?”.

The next four questions are open-ended and qualitative. These are: “Where THS (or MYS) starts and ends?”, “Do you think, the case is a pedestrian-friendly street?”; “If yes, why it is a pedestrian-friendly street?” and “If no, why it is not a pedestrian-friendly street?”. They are not restricted with choices. Observers are free to provide their own answers.

In contrast to the last four questions explained above, there is a group of questions that provides checklists related to walkability capacity of the case. These concepts are: actual safety (including street pattern, lightning, continuous pavement, separation, floor quality, street crossing), perceptual safety, and comfort. With these questions, the purpose is to make people relate these concepts with the street. They are expected to make judgements based on three different choices: ‘agree’, ‘partially agree’, and ‘disagree’. As a result, it is possible to find out how far the case is found a walkable street by its users.

After these questions, individuals are asked to sketch a map of THS in order to understand people’s spatial knowledge and to analyze the street in terms of ‘orientation’ (more specifically, in terms of ‘legibility’ and ‘landmarks’).

There are 8 more open-ended questions that are expected to be answered freely. To understand ‘pedestrian enclosure’, seven questions are asked subsequently. These are: ”Which part of the street can you walk easier and more comfortably?”, “Which part of the street you can walk more difficult and uncomfortably?", "How the vehicular traffic disturbs the pedestrian movement?", "Do you think, some parts of the street should be pedestrianized?", "If yes, which parts of the street should be pedestrianized?", and "Do you think, some parts of the street's sidewalks should be widened?". The last open ended question is asked to see if there are more issues that the users would like to raise as a problem of the street.

In the questionnaire, there is another group of questions as checklists to understand the attractiveness of THS and MYS from the users' point of view. The concepts which are investigated are for THS and MYS: colorful, safe, comfortable, enjoyable, exciting, boring/monotonous, mysterious, intriguing, surprising, predictable, legible/clear, open/spacious, closed/suffocating, and peaceful. Again, with these questions the aim of the research was to make people relate these concepts with the streets. They are expected to make judgments based on three different choices: 'applicable', 'partly applicable', 'not applicable'. As a result, it is possible to find out whether THS and MYS are safe or unsafe, comfortable or uncomfortable, enjoyable or unenjoyable, boring/monotonous or exciting, mysterious/intriguing/surprising or predictable, legible/clear or confusing, open/spacious or closed/ suffocating, and finally peaceful or restless; and therefore attractive or not.

A copy of the questionnaire is provided in Appendix A of this thesis. The examples of cognitive maps obtained through the case studies are also provided in Appendix B.

3.2.2 Macro and Meso Level Assessment

In evaluation of macro and meso level walkability assessment, the relation between urban form and travel behavior and walkability is divided into two main values: *transportation system characteristics* and *land development variables*; they are separately discussed in macro and meso scales in Chapter 2.

Transportation system is evaluated in three main values including *social, economic, and environment values*. In this sense, transportation system properties at the shade of social values are discussed in terms of *accessibility, and equity* parameters in both scales.

Additionally, as a macro and meso property of urban form, *land development pattern* is investigated in two main parameters including: *density and land use mix.* Density is measured in three manners at meso scale: population, employment, and built form densities. Together with these three density parameters, sub-centers density is analyzed in macro scale analysis section**.**

The main and first parameter in assessment of social value of transportation system is accessibility which effects walkability at macro and meso scales. At macro scale, accessibility is analyzed through assessment of a) the relation between city form and transportation system b) the accessibility to local facilities, public transit stations and green areas. At meso scale, three types of accessibility are examined: i) accessibility to daily destinations, ii) accessibility to public transit stations, and iii) accessibility to green areas. So, for the general assessment of accessibility regarding mentioned parameters, the main assumption, questions, and research tools are presented in below table.

Table 3.2, Assessment of walkability at macro and meso scales in terms of accessibility

TRANSPORTATION SYSTEM **Social** **Accessibility**
_ Main Assumptions in macro scale: • City forms which make easy transport, especially support public transport, decrease the usage of private cars and are more walkable. • Polycentric city forms are more walkable because the city functions are not dependent on a single large core and distribute transportation lines along the city equally (Such as polycentric grid-iron city). • In a walkable city, urban pattern should provide accessibility to public transport, local facilities and green areas through various modes of transportation, such as walking, cycling and public transport modes • A walkable city is a city which have a connected network supported by public transit system and vehicular main arterials • Urban network should be connected physically, socially and economically (three dimensional value of walkability) **_ Main Assumptions in meso scale:** • Distance between transport line and stops should not exceed 600 meters (10-minute walking distance) to be accessible on foot • In a walkable neighborhood, network pattern should provide accessibility to public transport, daily facilities and green areas through various modes of transportation, such as walking, cycling and public transport modes
_ Main Questions at macro scale: • Whether the city function structure is dependent on a single core or not? • Whether there is a three dimensional connection between urban cells/nuclei?

Table 3.2 (Continued)

• Whether city configuration has a connected public transport corridors or not? • How far the urban form is structured and developed through an interlinked network structure among the urban cells/nuclei? • Whether all transportation network and services operate efficiently to create walkable and compact urban spaces (or centers/towns/sub centers)? **_ Main Questions at meso scale:** • Whether neighborhoods have accessibility to mixed land uses and green urban areas? • Whether public transit stations are accessible by neighborhoods through 600-meter walking distance?
_Research Tools at macro scale: • Evaluation of Ankara city form, its connectivity pattern and comparing it with successful city forms • Evaluation of research results about public transit priority obtained from other accepted investigations in some of European cities and compare of them with results obtained from Ankara city **_Research Tools at meso scale:** • A map showing case study pattern configuration and public transport stations including metro, bus, and dolmuş and surrounded neighborhood areas • Identification of distances between neighborhoods and public transport stations, daily land use activities and green areas • A map showing the land-uses which are accessible by walking from neighborhoods

In evaluation of accessibility at meso scale, ***'network connectivity, network pattern, and separated biking and walking systems'*** are the measures which are investigated. For assessment of ***accessibility*** parameter at the shade of social value of transportation system, the main assumption, questions, and research tools are presented in the Table 3.3.

Table 3.3, Assessment of walkability at meso scales in terms of network pattern

TRANSPORTATION SYSTEM **Social** **Accessibility- Network connectivity and Network Pattern (at meso scale)**
_ Main Assumptions: • Destinations in a network pattern should be close to each other to be easily accessible on foot • Network patterns should be highly interconnected to increase accessibility
Main Questions • How is the trip length, closeness and travel time between developed land uses or between neighborhoods and urban activities? • Which case studies have the more interconnected network pattern?
_Research Tools • Urban pattern map of case studies • A map showing distances between developed land uses to define the level of closeness

Physically ***separated biking and walking systems*** is another criterion of transportation system at meso scale, which effect physical activity properly. Transportation system separated to walking and cycling in urbanized cities is much rarer, so the increase of physical activity with walking and cycling has become essential topic in the literature.For assessment of *Separated Walking System* parameter at the shade of accessibility value of transportation system, the main assumption, questions, and research tools are presented in below table.

Table 3.4, Assessment of walkability at meso scale in terms of sepatared walking system

TRANSPORTATION SYSTEM **Social** **Accessibility- Separated Walking System (at meso scale)**
_ Main Assumptions: • Various destinations and stations of modes of transportation should be connected with separated bike lanes Table 3.4 (Continued) • Bike lanes should be legible and well-connected
Main Questions • Is there separated walking or biking system connecting other modes of transportation • Whether bike lanes are legible?
_Research Tools Discussion of the fact that whether there is biking system making accessibility to public transit system

Equity in transportation system defines that public transportation system should be provided for all social groups of people in an equal manner. It is assessed at macro and meso scales. For assessment of *equity* parameter at the shade of social value of transportation system, the main assumption, questions, and research tools are presented in table 3.5.

Table 3.5, Assessment of walkability at macro and meso scales in terms of equity

TRANSPORTATION SYSTEM **Social** **Equity**
_ Main Assumptions • Transportation system should provide equal facilities to various level groups of people at macro and meso scales

Table 3.5 (Continued)

• Public transportation system policies should give priority to non-driver people at macro and meso scales
_ Main Questions • Whether transportation system plans and policies at macro and meso scales make better the accessibility of lower- income and non-driver people groups or not? • Whether transportation prices refer to all economic groups of people or not? • Whether transportation services maintain cost minimization or not?
_Research Tools • Evaluation of research results obtained from other accepted investigations about Ankara and some European cities • Questionnaires • Direct observation in selected case studies to get results at meso scale

City form and land use patterns can influence economic evolvement at macro and meso scales. If both city forms and land use patterns are more accessible, and resource efficient, they contribute to economic value. In this sense, compact cities and land use patterns increase accessibility, decrease transportation cost, raise economic productivity. Urban patterns with all mentioned parameters and the use of sustainable modes of transportation will contribute to ***economic and environmental parameters*** in evaluation of transportation system of macro and meso level walkability. For assessment of *economic and environment* parameters, the main assumption and questions and research tools are presented in tble 3.6.

Density is measured in four manners: *population and employment density, built form, and sub-centers density*. **Population, employment and built form density are analyzed in both macro and meso scale; while sub-centers density is examined in macro level assessment.** ***Population density*** refers to the number of residents per unit area and ***employment density*** measures the number of employees exist per area. Population and employment density affect the level of work and non-work travel demand. ***Built form density*** address to density of built and residential area per hectare; andsub-***centers***density is known as density of most dense centers. For assessment of *density* at the shade of land use pattern criteria, the main assumption, questions, and research tools are presented in the Table 3.7.

Table 3.6, Assessment of walkability at macro and meso scales in terms of equity

TRANSPORTATION SYSTEM **Economic & Environment**
_ Main Assumptions at macro and meso scales: • City forms and land use patterns should be compact to increase accessibility, decrease transportation cost, raise economic productivity and less damage the environment. • Sustainable modes of transportation which are environment friendly and economically viable should be preferred. • Creation of residential, recreational and commercial usages near to public transit nodes make transportation economically viable.
_ Main Questions at macro and meso scales: • Is there appropriate infrastructure with a specific degree of urban compactness? • Whether housing and mixed land usages are intensified or dispersed? • Which modes of transportation is privilege? • Whether public transit nodes are supported with mixed land usages?
_Research Tools • Identification of most usable transportation modes in selected urban area • A map showing concentrated or decentralized urban pattern of selected areas at macro and meso scales • A map showing land usages of selected land use area at meso scale

Table 3.7, Assessment of walkability at macro and meso scales in terms of density

LAND USE PATTERN **Population-Employment- Built form- Sub centers Density**
_ Main Assumptions at macro scale: • A walkable city should be compact to make opportunities for walking, bicycling, and transit use • Compactness of a walkable city should not exceed its density tolerance which ensures maximum advantage and does not damage the environment • Walkable city should have the population of 25,000 with a medium density (over 40 people per ha) • A walkable city should have balanced density within urban context and have the properties of density, consistency and mixed usage • Newly developed urban areas and sub centers should include multi usages with required social infrastructures ensuring easily accessibility to city center • Expansion of the city not only should be with housing usages but also with required infrastructures **_ Main Assumptions at meso scale:** • Land use pattern should be compact and pedestrian oriented • single-use land development forms raise distance between trip origins and destinations, strengthen car dependence and discourage access with walking and biking and so are against walkability concept • As a supporting value of walkability, how much the interaction between destinations increases the accessibility cost to the places decrease • If the distance between settlement areas exceed 200m, it counted as dispersed urban area

Table 3.7 (Continued)

and decrease walkability • Employment density should provide well accessibility between residential and working areas
_ Main Questions at macro and meso scales: • Is the city and land use area compact with various usages? • Does compactness level support walkability or disturb it? • How is the medium and maximum density level of selected land use? • Whether housing usages are supported with social, employment, and commercial usages? • Whether sub-centers and local centers are well connected together or not? **_ Main Questions at meso scale:** • Is there easily accessibility between residential and working areas? • Whether neighborhood centers are legible and well systematized?
_Research Tools at macro scale: • Research results indicating density of cities of the world in comparing with case study areaInformation showing variation of density within the city • Research Tools at meso scale: A map showing distribution of density within selected urban area • A map showing variety of land usages within selected urban area

3.2.3 Micro scale assessment

Safety in THS and MYS is analyzed in actual and perceptual terms. Regarding 'actual safety', *street pattern, lightening, continuous pavement, pedestrian enclosure, separation, floor quality, and street crossings* are the measures, which are investigated. For the assessment of *street pattern*, the key question, which is sought to answer, is whether there is a continuous street pattern. The sub-questions to be answered and the research tools are presented in Table 3.8.

Table 3.8, Assessment of walkability at micro scale in terms of street pattern

Main question: Is there any continuous street pattern? **Sub-questions:** • Are there any direct and short travels with highest amount of paved surface? • Are the cases (THS and MYS) connected to parallel streets in near distances? • Which street pattern is in accordance with the cases and its surrounding? • Does the vehicular traffic concentrates on the cases or disperses to its parallel streets?
Research tools: • Street pattern map • A map showing distances between intersections • Direct observations (photographing) and Questionnaire

.

The cases are investigated whether any traffic calming program or tools are used to reduce car speed and volume. The sub-questions to be answered and the research tools are presented in Table 3.9.

Table 3.9, Assessment of walkability at micro scale in terms of traffic calming

Main question: Are there any traffic calming program or tools used to reduce car speed and volume? **Sub-questions:** • Are there any measures, such as low width of street, systematic on-street parking and useful design details, to reduce car speed in street? • Is there any measures taken, such as street trees, wide sidewalks and on-street parking, to make the perception of the cases as narrow? • Are there any design details, such as raised or textured pavement at crosswalks,barriers, which help decreasing car speed?
Research tools: • Map of street furniture location • Map showing sidewalk widths • Map showing means of separation • A map showing on-street parking • Direct observations (photographing)

Regarding *lightening,* sidewalks, street, crosswalks and park areas in the cases are investigated to understand the safety and security of pedestrians in darkness times. The main question which is sought to answer is whether the cases are visible enough along dark hours. The sub-questions to be answered and the research tools are presented in Table 3.10.

Table 3.10, Assessment of walkability at micro scale in terms of lightening

Main question: Are the cases visible along dark hours? **Sub-questions:** • Is there suitable and systematic night-time lightening system in sidewalks, streets, crosswalks, park areas and arrival points?
Table 3.10 (Continued) **Research tools:** • Lightening system map • Direct observations (photographing) • Questionnaire

Continuity in sidewalk pattern is examined physically and perceptually. In physical terms, the assessment seeks to answer whether the sidewalks of the cases are connected properly. In perceptual terms, the key question to be answered is whether the sidewalks give the sense of continuity. The sub-questions to be answered and the research tools are presented in Table 3.11.

Table 3.11, Assessment of walkability at micro scale in terms of continuity

Main question (physical continuity): Are the sidewalks of the cases connected properly? **Sub-questions:** • Are there interruptions along sidewalks? • If yes, what are the widths and qualities of intersections? Do the physical properties of intersections let early, old age and disabled people to cross? Are intersections adequately safe?
Main question (perceptual continuity): Do the sidewalks give the sense of continuity? **Sub-questions:** • Are street furniture and urban elements situated in suitable places and distances? • Has street furniture human scale standard? • Is there a harmonious relation between elements?
Research tools: • Street pattern map • Street furniture map • Map showing intersections on the two cases • Direct observations (photographing) and Questionnaire

Pedestrian enclosure is related to the actual walking realm of the cases. It is evaluated by the criteria of *human scale, building orientation,* and *street furniture.* The main questions, which are investigated, are whether the cases have a definite boundary; which reasons have caused the problem of clear limit shortage in THS and MYS; and whether in two cases pedestrian enclosure is sensible with attention to human scale, building orientation and street furniture. The sub-questions to be answered and the research tools are presented in Table 4-5. Regarding *building* orientation, the assessment is made in terms of the placement of building entrances. Thus, the key issues investigated are how all the entrances are connected together, and whether they define a boundary.

By narrowing the street, slowing down the traffic and separating pedestrian realm from moving car area, *street furniture* contributes to 'actual safety'. Trees and other greeneries have the main role in protection of pedestrians. Also, other street furniture (such as benches, bicycle racks, planter boxes, trees, mail boxes, brochure bins, trash cans, vending and coffee carts, and tables and chairs) have beneficial effect on pedestrian enclosure. Hence, for the examination of street furniture, their quantity and quality values will be presented. Therefore, the placement of trees and other street furniture along THS and MYS, their density, sparseness will be investigated. Furthermore, how far street furniture acts as a buffer between pedestrian realms and moving car area will be investigated. (Table 3.12)

Table 3.12, Assessment of walkability at micro scale in terms of Pedestrian enclosure

Main questions:

- Have the cases a definite boundary?
- Which reasons have caused the problem of clear limit shortage in the caes?
- Is pedestrian enclosure sensible with attention to human scale, building orientation and street furniture?

Sub-questions:

- Starting point of THS is definitely by Kuğulu Park; but why its end point is perceived as Esat intersection while it continues until Hacıoğlu Street?
- Regarding human scale analysis, how is the ratio of useful sidewalk to height of buildings?
- Does the size of sidewalks along two cases facilitate pedestrian movement and their activity?
- In which part of sidewalk, the sidewalk widths cause the utilization disturbance?
- In which part of walkway of the cases work properly?
- Does building entrances contribute to define the boundary of pedestrian walkway?
- Does existing street furniture act as a buffer between pedestrian realms and moving car area?

Table 3.12 (Continued)

- What are quantity and quality values of existent street furniture?
- Are they healthy?
- Is street furniture situated in suitable distances?
- Is the scale of street furniture in accordance with human scale standards?
- Is there harmonious relation between urban elements?

Table 3.12 (Continued)

Research tools: • Sidewalk width map • Building entrances map • Street furniture map • Sections of the cases (Ratio of building height to street width) • Direct observations (photographing) • Questionnaire

In relation to *separation*, on-street parking along THS and MYS is examined to understand the role of street parking as separator. The main question which is to be answered is whether on-street parking separates pedestrian realm from moving car area. The sub-questions to be answered and the research tools are presented in Table 3.13.

Table3.13, Assessment of walkability at micro scale in terms of separation

Main questions: Does on-street parking separate pedestrian realm from moving car area? **Sub-questions:** • Is parking cars area arranged systematically? • Do parking cars satisfy pedestrians' safety or disturb their movement? • Why street parking on the cases does not contribute to walkability?
Research tools: • A map demonstrating the placement of on-street parking • Direct observations (photographing) • Questionnaire

Regarding *floor quality,* the research investigates the pavements' material quality and their arrangement and seeks to understand whether different user groups (especially elderly, disabled people, and pushchair users) face with walking problems resulted from floor quality. The sub-questions to be answered and the research tools are presented in Table 3.14.

Table 3.14, Assessment of walkability at micro scale in terms of floor quality

Main questions: Is floor quality suitable for the use of elderly and disabled people, or users with pushchairs? **Sub-questions:** • Are level variations adequately safe? • Are floors without deformation or breaking? • Are floors without unusual obstacles or extended out elements?
Research tools: • Direct observations (photographing) • Questionnaire

Crossing is easy if quantity, placement, accessibility and visibility values of cross walks are taken into consideration, especially in MYS including high and speedy car traffic. Thus, these issues will be surveyed in terms of *street crossings*. The main question which is to be answered is whether there are adequate and safe street crossings. The sub-questions to be answered and the research tools are presented in Table 3.15.

Table 3.15, Assessment of walkability at micro scale in terms of street crossing

Main questions: Are there adequate and safe street crossings? **Sub-questions:** • Are there sufficient street crossings placed in proper distances? • Are street crossings well situated, accessible and visible?
Research tools: • A map demonstrating street crossings and accessibility of pedestrians • Direct observations(photographing) • Questionnaire

Regarding *perceptual safety*, the assessment focuses on the question of whether the presence of residential, commercial, administrative and business usages on the cases acts as 'eyes on the street', and therefore increases the perceptual safety. The investigation also takes into account whether the perceptual safety is perceived regarding the late times of the day. The sub-questions to be answered and the research tools are presented in Table 3.16.

Table 3.16, Assessment of walkability at micro scale in terms of perceptual safety

Main questions: Is perceptual safety provided in the cases? **Sub-questions:** • Is there clear delimitation between public and private space? • Are there adequate facilities which are open until late times and act as 'eyes on street'? • Does the presence of the residential population increase perceptual safety?
Research tools: • Land-use map • Direct observations(photographing) • Questionnaire

Regarding *orientation*, the investigation will focus on five measures: *legibility of street pattern, landmarks (differentiation*, *detailed building form* and *junctions,* and *singularity), continuity, built form and its location and architectural and environmental* features. In the analysis *of legibility,* themain issue to be investigated whether there exists a legible street pattern; in other words, whether there is a legible connection between the cases and side streets which are connected to it. For the investigation, in the case of THS, mental maps of Kevin Lynch are used. The users of THS are asked to draw mental maps for THS and its connected streets and see whether they are able to draw a simple pattern of the area. The sub-questions to be answered and the research tools are presented in Table 3.17.

Table 3.17, Assessment of walkability at micro scale in terms of Legible street pattern

Main questions: Is there a legible street pattern in the cases? **Sub-questions:** • Are there legible connections between the cases and side streets connected to it? • Are users of THS able to draw a simple pattern for it?
Research tools: • Questionnaire based on mental maps

Regarding *landmarks,* mental maps drawn by the users of THS and questionnaires for two cases are used. In mental maps, the nodes indicate memorable built forms, junctions and the paths demonstrate nodes which are caught when eye follow paths. If there are definite landmarks between harmonious urban textures, people have defined the especial nodes placed along the path. The sub-questions to be answered and the research tools are presented in Table 3.18.

Table 3.18, Assessment of walkability at micro scale in terms of landmarks

Main questions: Are there any memorable landmarks which contribute to pedestrians' orientation? **Sub-questions:** • Are pedestrians able to draw simple mental maps based on 'paths' and 'nodes'? (nodes will demonstrate memorable built forms) • Are there definite landmarks between harmonious urban textures? • Are there unforgettable landmarks in questionnaires?
Research tools: • A map showing street pattern and landmarks • Direct observation (photographing) • Questionnaires for two cases and mental maps for the case of THS

Regarding the level of *continuity*, the main issue which is investigated is whether different parts of public spaces in two cases are well-connected or not. The sub-questions to be answered and the research tools are presented in Table 3.19.

Table3.19, Assessment of walkability at micro scale in terms of continuity

Main questions: Is there a continuous pattern which makes different public spaces as a whole? **Sub-questions:** • How well various parts of public spaces are connected together? • What happens in connection points of different public spaces?
• Research tools: • A map showing street pattern and changing points • Sections from connection points and direct observation

Another measure to examine the legibility of THS and MYS are *built form* (i.e., buildings) and *their placement*. Some buildings, due to their form or/and position, become memorable for pedestrians and they contribute their orientation. The sub-questions to be answered and the research tools are presented in Table 3.20.

Table 3.20, Assessment of walkability at micro scale in terms of Built form and their placement

Main questions: Which buildings contribute to pedestrians' orientation?
Sub-questions: • Which buildings contribute to pedestrians' orientation due to their form? • Which buildings contribute to pedestrians' orientation due to their location? • Which buildings contribute to pedestrians' orientation due to their form and location?
Research tools: • A map showing memorable buildings according to the cognitive maps drawn by survey participants • Direct observation (photographing)

Regarding *architectural and environmental features, buildings entrances and their orientation* will be examined. In other words, the level of accessibility and visibility from public space will be examined. It is important whether the entrances of buildings are accessible and visible for pedestrians, especially for vulnerable groups. The sub-questions to be answered and the research tools are presented in Table 3.21.

Table 3.21Assessment of walkability at micro scale in terms of Architectural and environmental features

Main questions: Do the architectural and environmental features on the cases contribute to pedestrians' orientation?
Sub-questions: • Are building entrances adequately accessible and visible? • Are entrances of buildings accessible for early, old age, and disabled people, and pushchair users? • Do the building entrances look to the direction of public facilities?
Research tools: • A map showing visibility and accessibility of building entrances • Direct observation (photographing)

Table 3.22, Assessment of walkability at micro scale in terms of attractiveness

Main questions: How far THS is attractive for its users?
Sub-questions: • How far THS is colorful, enjoyable, safe, peaceful, comfortable, legible and spacious? • How far THS is boring/monotonous, predictable, mysterious, surprising, exciting and intriguing? • How far THS is spacious and suffocating?

Table 3.22 (Continued)

Research tools:
• A map showing similar and dissimilar buildings in terms of architectural style • Direct observation (photographing) • Questionnaires

Regarding attractiveness, this thesis examines the criterion of 'attractiveness' based on the assumption that a street is attractive, if it is colorful, enjoyable, legible, safe, peaceful, comfortable and spacious (Pehlivanoğlu, 2011). There are some qualities, such as predictable and monotonous versus intriguing, surprising, mysterious and exciting, which might be desirable to some extent, but not completely. Thus, the assumption of this thesis is that a street is attractive, if it is partly predictable, monotonous and boring, and partly intriguing, surprising, mysterious and exciting. If these qualities exist in an urban area with a high degree, the attractiveness of the space will be lessened. Finally, there are negative qualities, such as suffocating. If a street is suffocating, it will not be an attractive space. The sub-questions to be answered and the research tools are presented in Table 3.22.

Regarding comfort, the examination will focus on two main questions:

1) Are the cases 'physically usable'?
2) Are the cases 'visually understandable'?

To answer the first question, four factors which make the comfort of walking for healthy and vulnerable pedestrian groups are examined. These are: 1) whether public spaces includes architectural urban elements which protect pedestrians from rain, sun, snow, ice and wind; 2) whether it possesses clean air (which is provided by traffic calming); 3) whether it fulfills the conditions of actual and perceptual safety, and 4) it is an accessible space for particularly all pedestrian groups.

To answer the second question, 'visual understanding' is assessed how far a public space provides a good quality of orientation and how far it is legible for pedestrians. The sub-questions to be answered and the research tools are presented in Table 3.23.

Table 3.23, Assessment of walkability at micro scale in terms of comfort

Main question: Are the cases **'physically usable'?** **Sub-questions:** • Do the cases include architectural urban elements which protect pedestrians from rain, sun, snow, ice and wind? • Do they possess clean air (which is provided by traffic calming)? • Do they fulfill the conditions of actual and perceptual safety? • Are they accessible space for particularly all pedestrian groups? **Main question:** • Are the cases 'visually understandable'? **Sub-questions:** • How far the cases provide a good quality of orientation? • How far the cases legible for pedestrians?
Research tools: • Direct observation (photographing) and Questionnaire

'Physical diversity', as mentioned earlier, means a variety of urban physical elements, such as a variety of dwelling types, architectural styles, and land-use activities. 'Social diversity' refers to a mixture of people coming from different ages, family types and socio-economic status, whereas 'economic diversity' means a variety of building types with different property values. The presence of such diversity in urban space is important in terms of bringing different groups of people together and to make them use public spaces.

Regarding diversity, the key question which is investigated is whether there exists physical, social and economic diversity in the cases. The sub-questions to be answered and the research tools are presented in Table 3.24.

Table 3.24, Assessment of walkability at micro scale in terms of diversity

Main questions: Are there physical, social and economic diversity in the cases? **Sub-questions:** • For physical diversity, are there a variety of urban physical elements, such as a variety of dwelling types, architectural styles and land use activities? • For social diversity, does a mixture of people coming from different ages, family types and socio-economic status use the cases? • For economic diversity, are there a variety of building types with different property values on the cases?
Research tools: • Land-use map • Direct observation (photographing)

Regarding local destination, the assessment of connectivity between the cases and side streets become important. Here, the aim is to understand how well the cases can be connected to some local destinations, like shop, schools, commercial area. The sub-questions to be answered and the research tools are presented in Table 3.25.

Table 3.25, Assessment of walkability at micro scale in terms of local destination

Main questions: • Is there quick accessibility between common destinations? • What is the distance between common destinations?
Research tools: • Accessibility map • A map showing distances between common destinations • Direct observation (photographing)

CHAPTER 4

A WALKABILITY ASSESSMENT OF ANKARA AT THE MACRO SCALE

The city of Ankara including 25 districts is situated in the central part of Anatolia. The city is placed in a topographical structure similar to a *bowl* that is closed on three sides and has a straight opening toward its west corridor. After the proclamation of Turkish Republic in 1923, the city was redeveloped from a small commercial Anatolian city into the capital city of Turkey. The urban form and the macroform of the city have changed drastically from the 1920s until now. This chapter investigates the historical development of the city of Ankara during the period of urban development plan. First, it explains the street structure and characteristics of Ankara. Second, it examines the changes in the built form and population density, the street network and the size of the city in four planning periods. These are:

1) The Period of 1923-1950: Löcher City Plan and Jansen City Plan
2) The Period of 1950-1980: Yücel-Uybadin City Plan
3) The Period of 1980-2000: The 1990 City Plan by Ankara Metropolitan Bureau
4) The Period of 2000s: The 2015 Structure Plan (1986), Ankara 2025 Plan and 2023 Başkent Ankara Urban Development Plan

Third, this chapter assesses the walkability capacity of the city of Ankara at macro levels according to the criteria determined in Chapter 2.

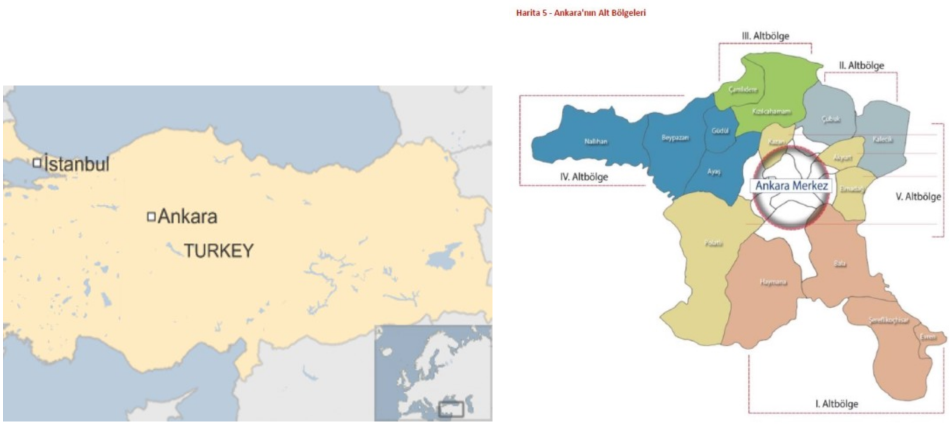


Figure 4.1, Left: Province of Ankara and its districts, (Re: Wikipedia.com); Right:Location of Ankara in Turkey, (Re: Google map)

4.1 History of Ankara Street Network

Under the influence of Islamic principles, cul-de-sac street patterns, due to provision of dead end streets and the parameter of providing better privacy, are preferred in Turkish cities. Thus, urban context of Ankara city was based on residential areas with a network pattern of cul-de-sacs connected to the city core, including various usages such as mosques and marketplaces. Furthermore, the streets were narrow to allow pack-animals to pass through. For turning of the animals, the streets did not intersect at right angles (Velibeyoğlu, 1998: 64).

At the end of the 19th century, the introduction of new modes of transportation,such as railroad and urban road (horse-cart), and the effect of western-style urbanization caused some changes in the urban image and social economic situations. These changes include the transformation of cul-de-sac street patterns into gridiron patterns, changes in residential areas and central functions, and an increase in the compactness level. Thus, the street networks started having geometrical rules and losing their semi-private character (Velibeyoğlu, 1998: 66).

After the War of Independence and establishment of Turkish Republic in 1923, the Western standards with a new manner started growing. The years between 1923 and 1927 are considered chaotic and uncontrolled in terms of urban growth in the city of Ankara. Hence, some competitions for the management of the Ankara's urban environment were arranged to achieve a Republic city model. In 1927, short and straight street networks compatible with topography properties were preferred as presented under Jansen's plan in line with the principles of Camillo Sitte. Furthermore, Jansen applied the Radburn layout, which was implemented in the residential street layout of German cities, to the residential areas of the city of Ankara. The aim of this layout was to contribute to the health and safety parameters by reducing traffic in residential areas. Thus, he proposed narrow and interrupted networks to reduce traffic and vehicle speed (Velibeyoğlu, 1998: 66-67).

In 1933, with the introduction of new building regulation, dead end streets were prohibited and the maximum width of the streets was defined as 9.50 m. In 1950, with the growth of population, it was permitted to increase building heights on essential streets. With the growth of population, economic problems, and risk of war, the attempts for creating a Turkish Republic city model were interrupted. Afterwards, the rapid urbanization, start of migrations to cities, traffic jams, and other related problems started growing. These very reasons led to the start of squatter developments with an irregular pattern. Thus, rapid transformation and social, economic and political changes had a direct effect on the street networks (Velibeyoğlu, ,1998: 68).

After 1950, due to an increase in urban growth and lack of public transportation, car ownership and use of private operators (dolmuş) started rising. After 1966, with the start of mass automobile production, car ownership drastically increased. For instance, while there were 3400 cars in 1945, the number of automobiles produced in the mid-1970 was 57.000 per year; and today it is 800.000 automobiles per year (Velibeyoğlu, 1998: 69). Tekeli (1971) suggests that the increase in car count was an essential factor in widening of the streets.

4.2 Transformation of Ankara Macroform

In evaluation of Ankara macroform, it is necessary to consider the transformation process of the core and periphery areas, and to find a theoretical dichotomy between the core and periphery parts (Çalişkan, 2014: 23).The core is the central part of the city, with properties differing from its surroundings. In other words, the core is the inner part, which is known as the heart of the urban entity. So, it is a valuable part of the city due to the fact that if you take the heart or core of something away, the remaining part will malfunction. On the contrary, the periphery area is the outer part of the city, known as the boundary, surface, border, edge, fringe, or margin. However, in determining the core and margin as a whole; the role of fringe part cannot be ignored (Çalişkan, 2014: 23-24).

The history of urban periphery area in Ankara dates back to the Roman Republic, in which the periphery area acted as a political boundary of the urban area, protecting the city from enemy entrance. Hence, the periphery area remained important due to its stable function as a means to control the city until the start of industrialization in the 19th century, after which political boundaries of cities lost their validity. The degradation of margin area continued until the 20th century and appearance of the concept of open city in the post-industrial era, with which periphery areas regained their prestige. Additionally, the modern capitalist city manifested itself, with obvious differences between core and periphery areas. As a result, the elite groups tended to live in the core of the city rather than the fringe area (Çalişkan, 2014: 24) (Figure 4.2). In developing/underdeveloped countries, due to economic incapability of the governments to plan the fringe areas, margin areas are shaped by local governments' planning, so the central cities maintain their dominance (Çalişkan, 2014: 24).

In Turkey, public and private housing financiers, which have promptly evolved in the last thirty years, have created an opportunity for transformation, from a core-dependent urban entity into an arrangement of open growth (Çalişkan, 2014: 26).

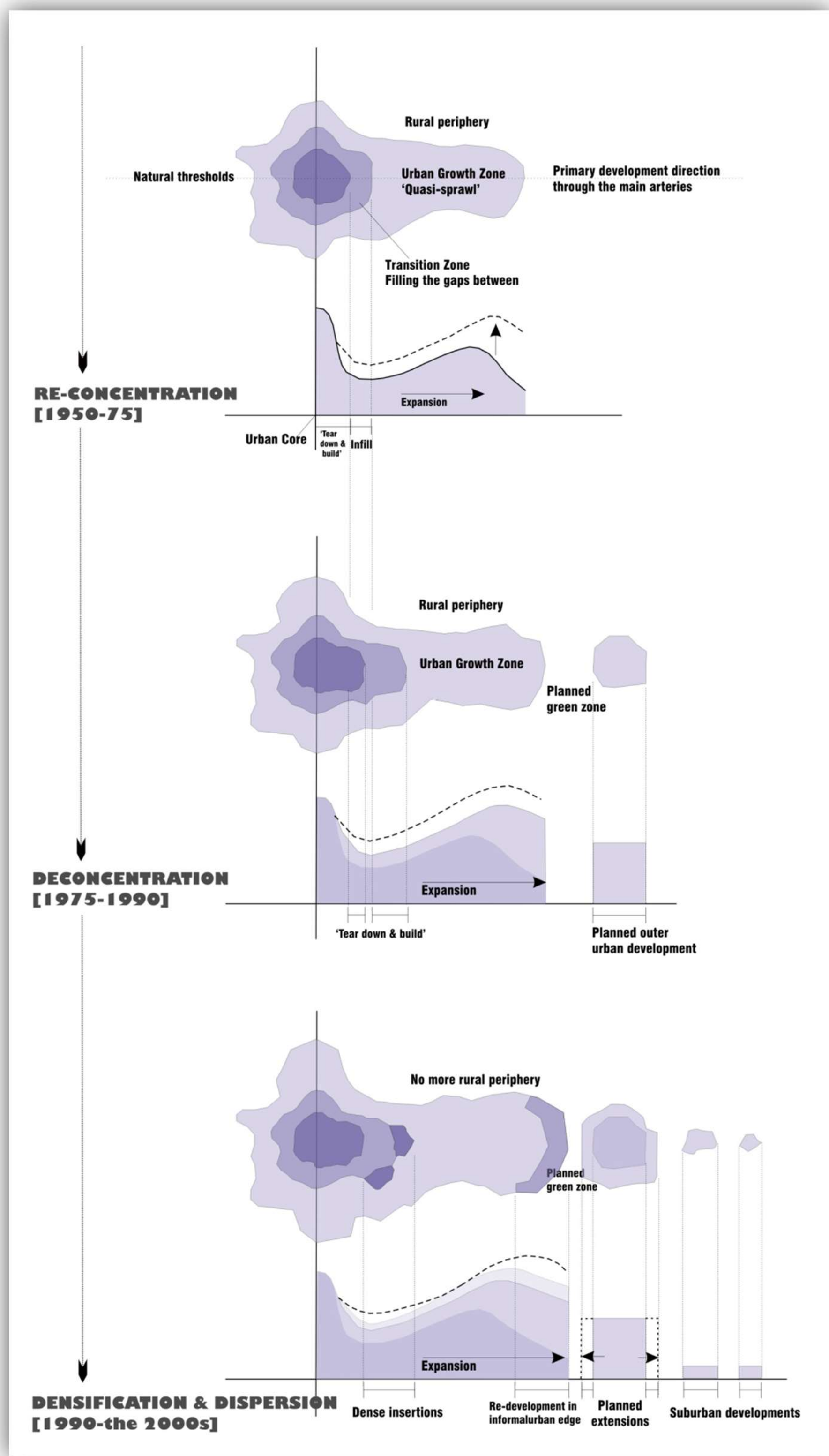


Figure 4.2, Evolution of urban structure, and its transformation during two periods in the case of Turkish metropolitan cities. (Çalişkan, 2014: 27)

In this sense, transport corridors started developing to ensure accessibility to surrounding development areas. Hence, highways became a tool connecting the city core with squatter and trivial industrial areas, instead of regulating the urban form. Therefore, instead of development of the city based on major urban plans, the city started developing along a shapeless city footprint. Additionally, with the increase of urban rent levels; single-family houses transformed into apartments and small retail facilities were placed on the first floors of apartment blocks in a dense urban fabric. The mentioned framework represents the first stage of Turkish city evolution, which started in the 1920s and ended in the 1950s (Günay, 2012: 6) (Figure 4.2).

The second stage of Turkish city evolution started in the 1950s and ended in the late-1970s. This period is characterized by the start and introduction of mass housing projects. Housing projects were resigned to housing cooperatives, so the average size of urban lands triggered expanding. During this period, the development of construction firms as a private sector was obviously realized. As a result, instead of multi-functional, large-scale urban context projects, mono-functional housing projects in periphery areas were developed (Günay, 2012: 6) (Figure 4.2).

The last stage coincides with the start of neo-liberal policies in the 1980s, and has continued to the present time. The housing projects in this period have been implemented by private sector and have continued their production; on the other hand, transformation projects, mostly in city core, started developing. After the mid of 1980s, when the 'Law of Development Amnesty' was enforced, the squatters located in transition areas entered into a transformation stage. In fact, dense urban areas were replaced with dense apartments, with inadequate social services. New types of multi-storey houses were built by private contracting firms or by the Housing Development Administration of Turkey (TOKI) without any public participation. The housing projects were implemented in all Turkish cities without consideration of different climatic and social conditions (Günay, 2012: 6) (Figure 4.2-4).

These processes have resulted in two types of fringe fragments: informal and formal peripheries. Informal developments included squatters developed in the natural edge of undeveloped urban areas of the city, while formal periphery areas were implemented by planned urban expansions and housing projects (Çalişkan, 2014, p. 29).

Figure 4.3, Squatter districts throughout the main outward arteries in the year of 1966 (Adapted from ministry of development affairs. 1966) (Çalişkan, 2014: 29)

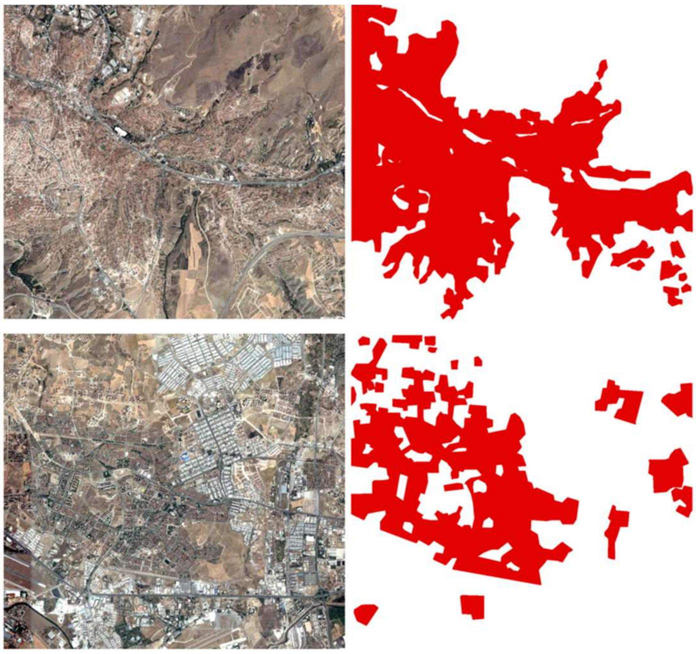


Figure 4.4, Peripheral profile of the city of Ankara, Above: Informal settlements; Below: Planned development. (Çalişkan, 2014: 31)

4.2.1 The Period of 1924-1950: Lörcher City Plan and Jansen City Plan

In the early 1920s, after the War of Independence, the Turkish Republic needed social and economic evolvement and spatial revival, as the urban tissue had been damaged during the war. Thus, the Lörcher Plan, during the period 1923-1928, was presented as an ideal city model for the city of Ankara (Günay, 2012: 6). The aim of this first plan, drawn up by Berlin architect Carl Christoph Lörcher, was to propose a compact pattern for the area around the central station and lay the foundations of a new city. However, as the plan proposed the concept of Garden City for the peripheral housing area of the city of Ankara and it was agreed that this proposition is against the concept of efficient land use, the plan could not be implemented (Günay, 2012: 6).

Afterwards, the Jansen plan, with the main aim of preserving the historical core and setting place for new developments in the fringe area of the city, was presented. The Jansen plan proposed an inward-looking, centralized plan for Ankara, which prescribed a semi-rural Anatolian city, rather than low-dense fringe urban contexts (Günay, 2012: 6) (Figure 4.5).

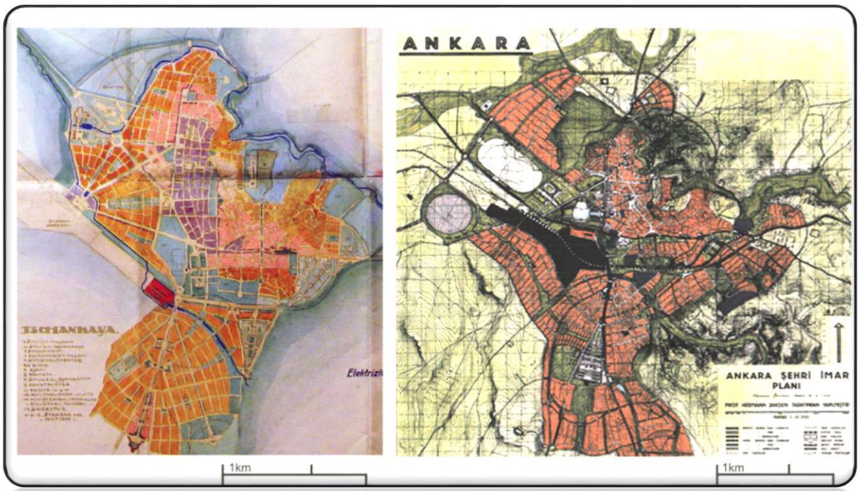


Figure 4.5, Plan schema of Lörcher plan (1924) and Jansen development plan (1932) for the city of Ankara.(Günay, 2012: 5)

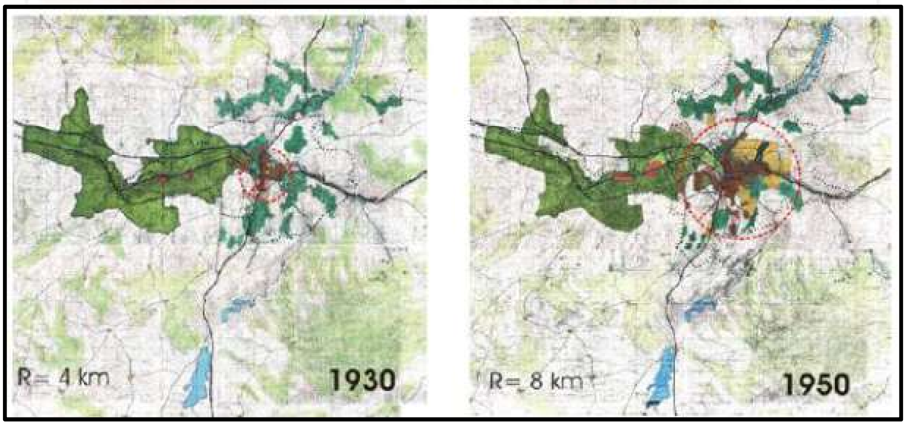


Figure 4.6, Above: Comparison of 1930 and 1950 Macroforms. (Tuçaltan, 2008: 96)

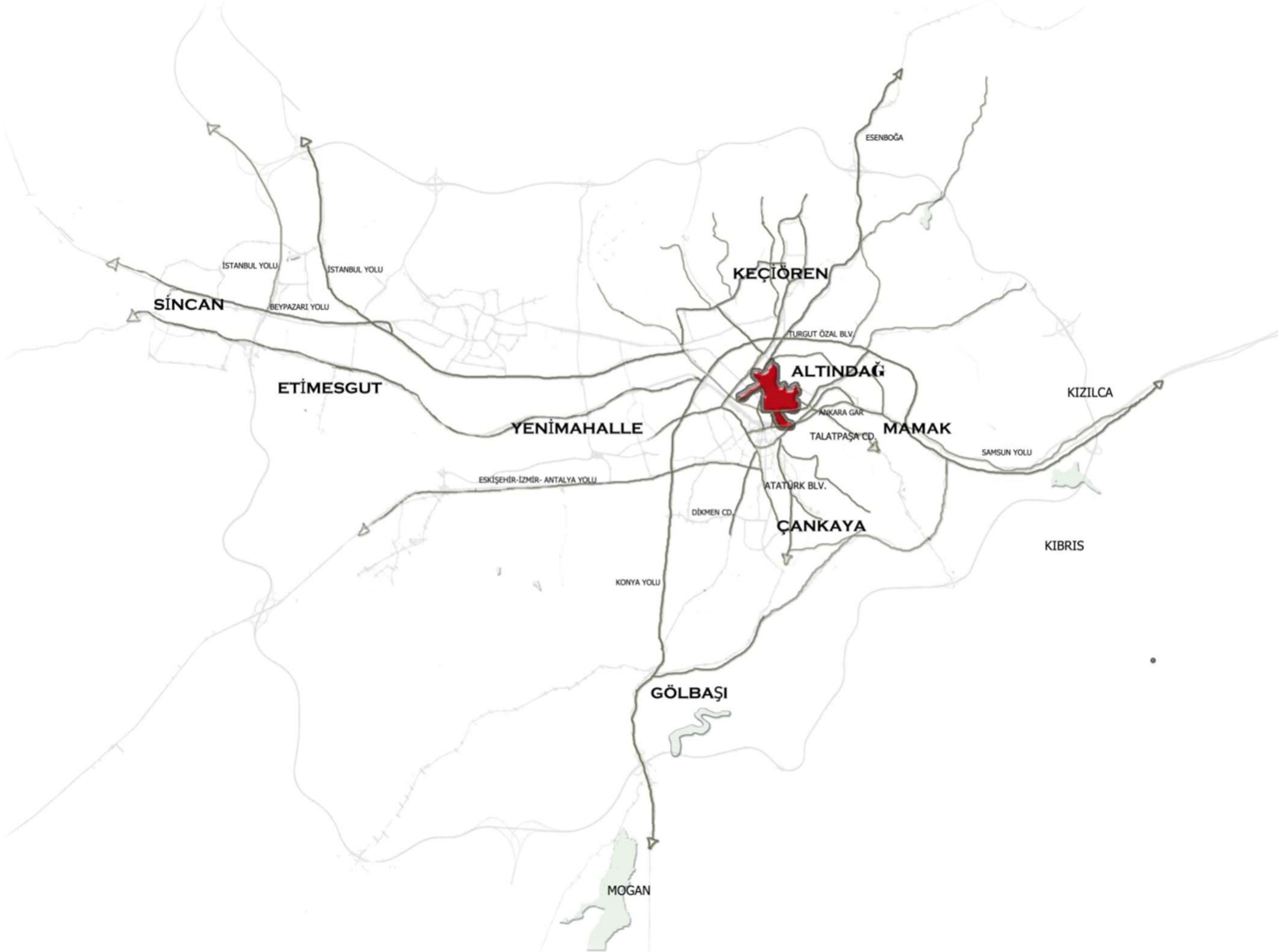


Figure 4.7, Ankara city core in 1930s. (Personal study and rendering)

Figure 4.8, Ankara city in 1950s. (Personal study and rendering)

4.2.1.1. The evolution of the city core of Ankara

In the mid-1920s, Ankara city included two types of urban context including dense Ottoman housing constructions, intensified around Ankara Castle, and the new development settlements with 4-5 levels, scattered between traditional housings. With the lowering of urban standards, the city core became denser and denses. In 1927, the urban density was known to be 248 people per hectare with the total population of 20-25 thousand. The various mixed land uses were mostly concentrated in the East, North, and South. Therefore, the historical evolution of Ankara indicates a linear expansion, starting from its urban core and continuing to the areas with a distance of 4-6 km to the city core (Chamber of Architects, 1970: 51) (Figures 4.6-8).

Kızılay was envisaged as the neighboring center of Ulus, first, by the Lörcher Plan (1923) and then by the Jansen Plan (1928). The Lörcher Plan foresaw the need for constructing infrastructure, roads, and public squares for the development of today's Kızılay. Especially, the idea of creating a number of sequential squares – Cumhuriyet-Kızılay Square, Sıhhiye Square, Zafer, Millet, Ulus, Lozan, Tandoğan Squares – in the Löcher Plan was also adopted by the Jansen Plan. In the Jansen Plan, Ulus was foreseen as the CBD, while Kızılay was envisaged as its neighboring center, including residential and administrative functions. Kızılay was seen as a center that would not affect the significance of Ulus as the CBD (Çakan, 2004: 26-27).

The intention of the plan was to centralize the railway station and to connect Ulus and Yenişehir (new city) to this center through Atatürk Boulevard. Here it can be claimed that the plan gave priority to the old center and aimed to protect its distinction. Furthermore, the other developments would not have a direct link with the center, but there would only be a ring road between the newly recommended areas (Günay, 2005:71-73). It was also targeted to evolve the neighboring core in terms of the traditional architecture style of the old center reflected in administrative buildings built in the new center (Günay, 2012: 6).

However, the proposed expansion in a circular form was replaced with a linear expansion along the West-East axis. In this transformation, Kızılay gained value as the neighboring center, while Ulus lost its importance as the central business district. Furthermore, the revitalization of central station through application of commercial areas in its vicinity was disregarded. On the other hand, the Northern part of the Castle, the vicinity of Hacı Bayram Mosque and Castle were re-constructed without paying attention to the traditional architecture style (Günay, 2005: 72-75).

4.2.1.2. The evolution of the size of city of Ankara

Due to the topographical properties of Ankara, the districts of Çankaya, Dikmen, Keçiören and Etlik are situated on the hills of Ankara at an elevation of 1100 meters and this has made Ankara's urban form similar to a bowl. This characteristic of the urban form has always caused problems in planning activities and the air pollution in the city (Tuçaltan: 93).

Due to the bowl shape of Ankara and determination of increase of air pollution in the city, without disturbing the radial form of the city, it was aimed to stretch Ankara toward Western corridor instead of the East and make new centers in the occidental section. Furthermore, it was targeted to avoid the influence of the time and architecture style on the newly developed government buildings (Günay, 2012: 6).

Both of the Lörcher Plan and the Jansen Plan featured a dense city form and introduced the foundations of the new core, as discussed previously. The plan proposed a compact city form, but not as a highly woven urban context which affects public health in a negative manner (Jansen, 1929: 139-140 cited in Çalışkan, 2004). Jansen (1929) also claims that urban extension should be in a way that would not increase the walking distances.

population was 75,000 and it was estimated the population would reach 300,000 in 50 years. In this sense, the vacant land with the areas of 400 hectares in the south, in a specific boundary, were devoted to the urban growth, to accommodate an increased number of population. Jansen (1929: 157-58) emphasizes the fact that urban settlements should not extend beyond the proposed urban boundary, because that it would cause growing of squatters in outer areas and disturbance of the urban context. Ankara achieved this value of populatio n in 1935 year, earlier than expected, so due to unpredicted increase of population, the usages and boundaries in the plan were revised and edited (Altaban, 1998: 46-53; Altaban, 1986: 130 cited in Çalışkan, 2004) (Figure 4.9).

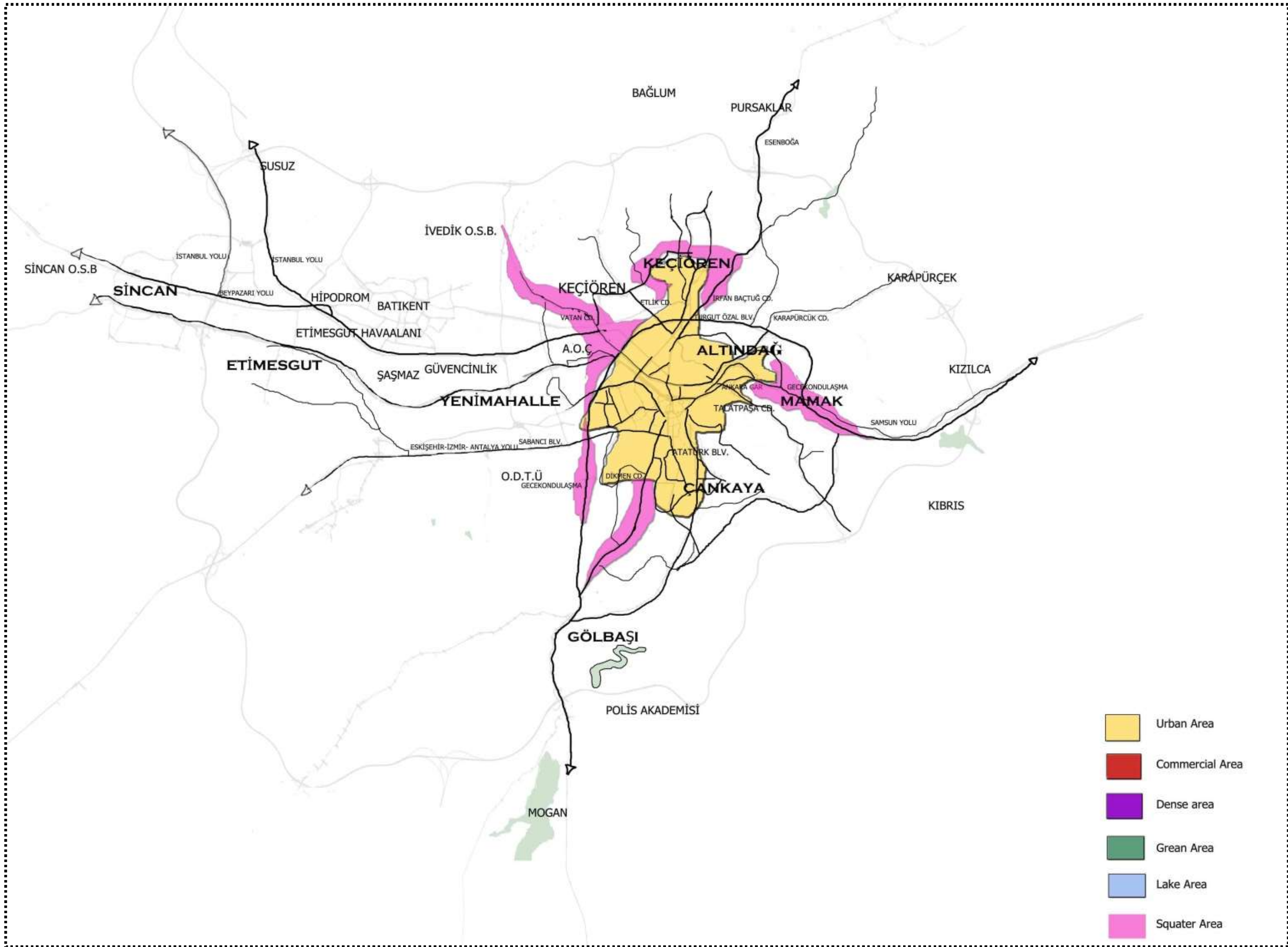


Figure 4.9, Ankara city size in 1950s. (Personal study and rendering)

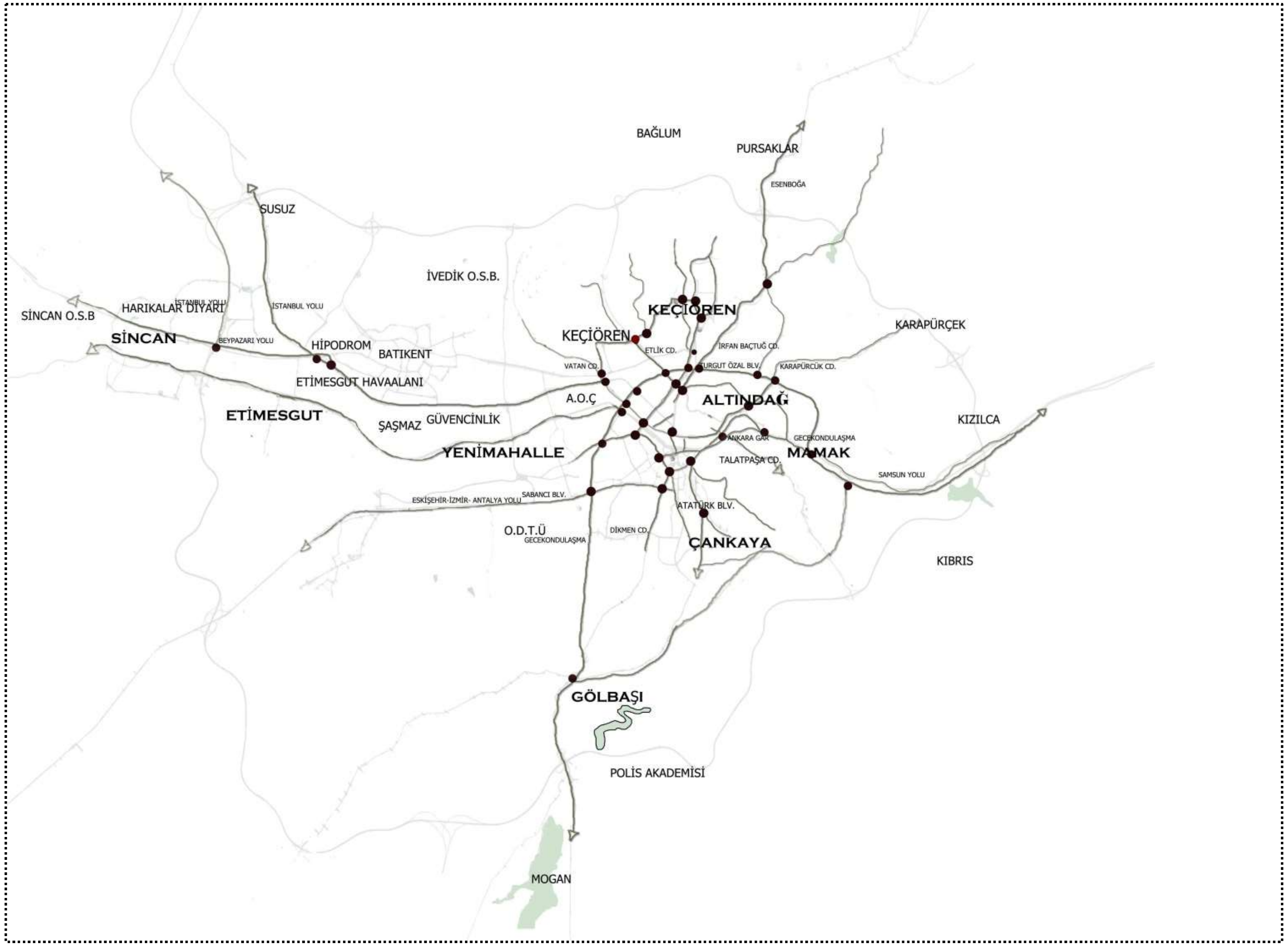


Figure 4.10, Ankara Network pattern evolution in 1920s. (Personal study and rendering)

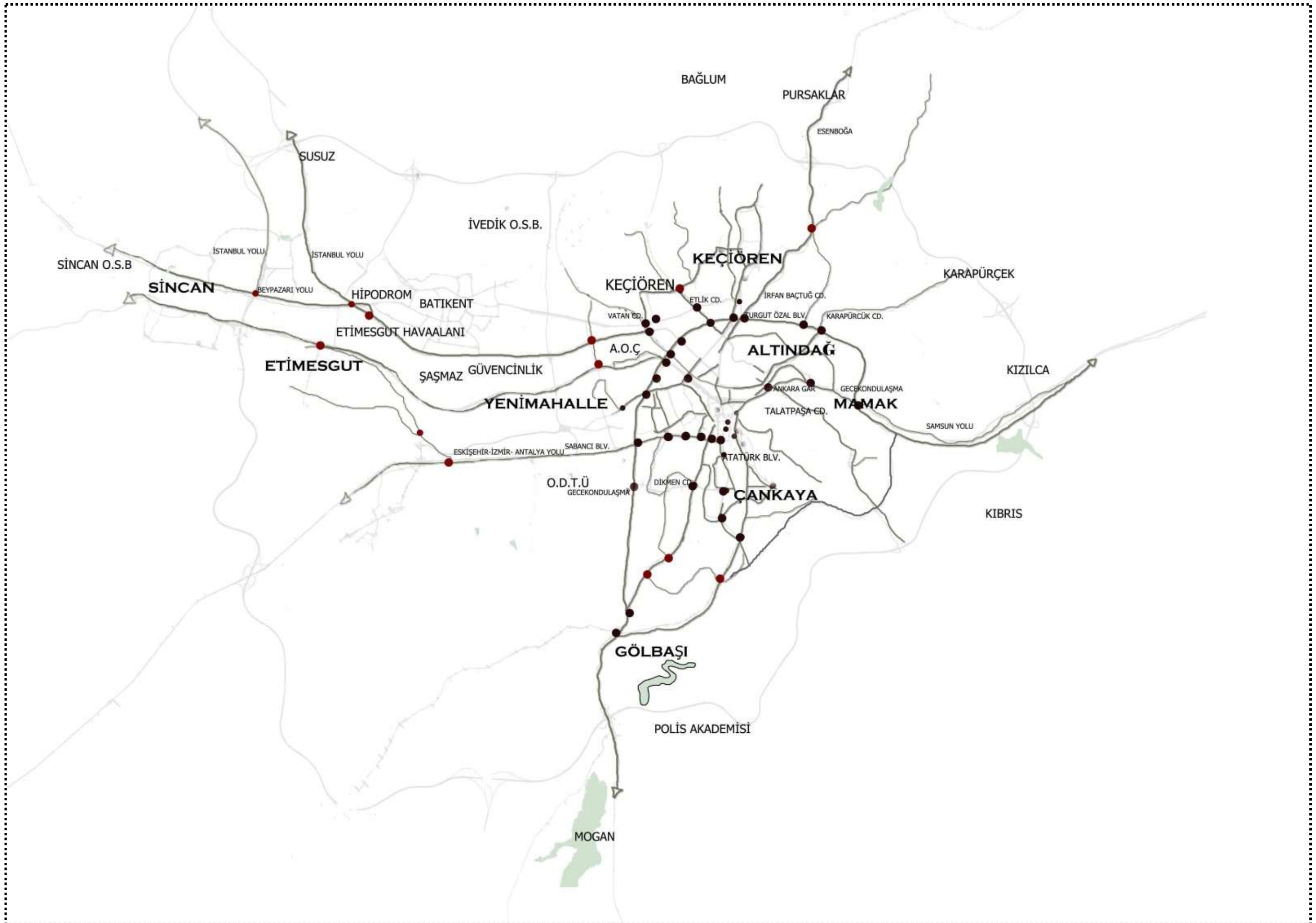


Figure 4.11,Ankara Network pattern evolution in 1950s. (Personal study and rendering)

4.2.1.3. The evolution of the street network of the city of Ankara

When Ankara became the capital city, physical and social structure of the city started changing. Until 1950, investments and physical developments were regulated by the government, and the feudal structure of society was dissolving and creating problems. Before 1930, accessibility in the city was enabled with "kaptıkaçtı" dolmuş, and suburb train. Before the transportation in Ankara was undertaken by the government, it was operated by a private company. In 1930, there was one car for 250 people, which was a little value. In 1929, the operation of trains with the name of "tenezzüh trenleri" connecting Mamak and Kayaş accelerated the squatter developments. During the period 1925–1950, Ankara's population increased severely and tripled. In this period, large administrative buildings, squares, parks, and boulevards changed Ankara's image. As of 1950, almost 34 percent of Ankara's people were living in squatters, covering 23 percent of Ankara's urban area. Additionally, there was one car for 123 people, which then, with the increase of car count to 9038, this value decreased to 71 people per car. (Figures 4.11-12)

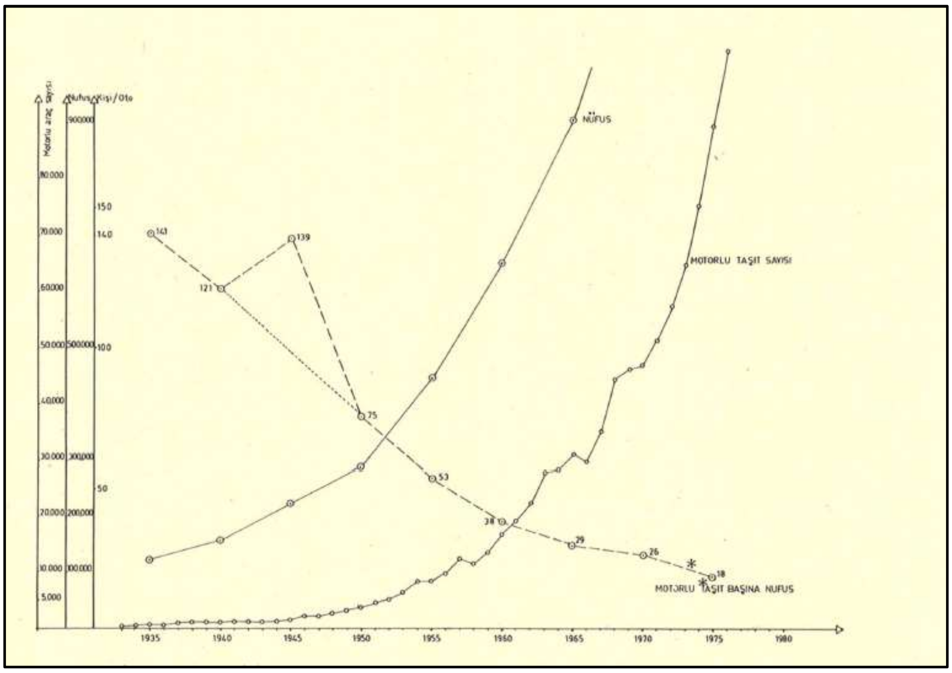


Figure 4.12, Ankara City Automobile numbers during 1935-1975. (TÜİK)

Some foreign firms seeking to implement transport-based projects made the first transport studies of Ankara. With such projects, although the existing roads sufficed for the existing number of cars, new roads, multi-storey junctions, and road tunnels were recommended. As a result, ring road junction and multi-storey projects started developing and this caused an increase in the motorized modes of transportation, but not at a problematic level (Elker et al., 1977: 29-30).

4.2.2 The Period of 1950-1980: Yücel-Uybadin City Plan

The period of 1950s indicates the stage of re-establishment of the Turkish political system and the start of associated economic problems. Furthermore, with modernization of agricultural products and migration of labor force to large cities, population of Ankara reached 455,000 by 1956. In 1957, the proposed plan by Uybadin was in accordance with the main idea of the Lörcher and Jansen Plans and their garden-city tradition; but due to high amount of density in the city center, the plan only aimed to systemize the partial developments built in city of Ankara. Hence, leap-frog development toward fringe urban areas was implemented in the city of Ankara due to the rapid growth in the city center (Çalişkan, 2014: 34) (Figure 4.12).

In 1959, 'Bölge Kat Nizamı-District Height Regulation' was proposed by the regulator and mayor of Ankara to the public. Although N. Yücel warned the governor about the negative results of this regulation, which would transform Ankara to a high dense apartment city, the law was approved in 1961. Thus, with the start of the development of buildings with double and triple heights, types of high-density apartment began developing. Even, some newly developed periphery areas were fully replaced with high-rise apartments. All these caused a concentration of settlements in CBD and a transformation of the urban image of the city of Ankara (Çalişkan, 2014: 34) (Figures 4.13, 4.20).

On the other hand, an increase in land prices resulted in the start of unauthorized development (squatters) around the main arterials of the city. By the mid of 1960s, squatter areas were accessible by low-income groups of people from working districts and from amenities close to the city core (Çalişkan, 2014: 36).

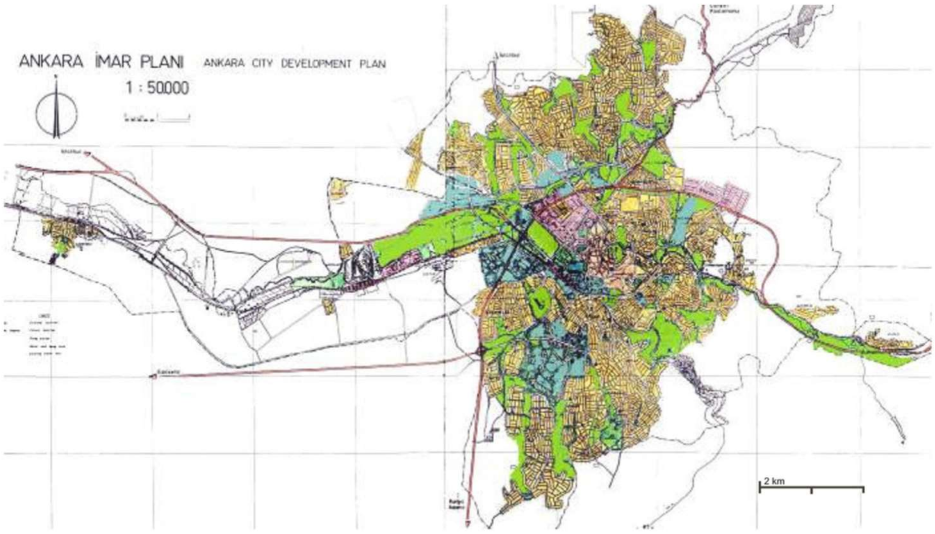
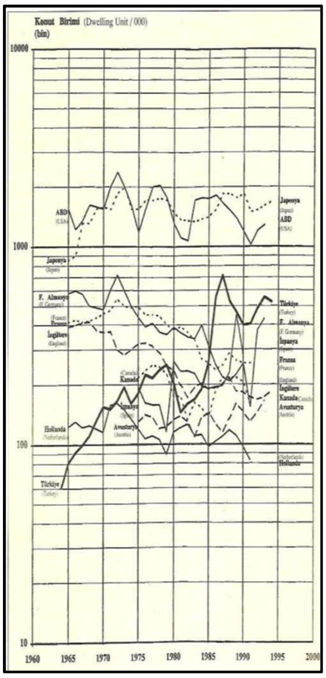


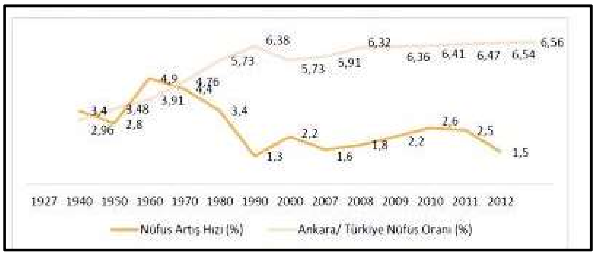
Figure 4.13, Yücel-Uybadin Plan schema (Günay,B.,2012: 7)

4.2.2.1. Changes in the built form and population density in the city of Ankara

"Expansion of urban population", as it is seen in the graphic of Ankara population growth rate, created needs for housing and public building and then, more investments in the construction sector. However, a high level of production was not feasible because of low level of capital and low public and private resources. Hence, during the late-1940s and the early-1950s, three measures were taken in order to support the construction sector in Turkey. The measures included the minimization of the building supply/production costs, reallocating rights to producers, and introduction of new methods in building production, such as use of concrete (tunnel block, etc.). Thus, as we see in the "housing production" graphic, low investment capacities and modest efforts with little public leadership caused a significant expansion of housing stock (after the mid-1960s) in urban areas, which was unprecedented throughout the world (Balamir, 1996) (Figures 4.14-17).

Figure 4.14, Transformation of peripheral areas of Ankara during the 1960s. (Çalişkan, 2014: 34)





Yıllar	1950	1965	1969	1989	1990	1991	1992	1993	1996	2006
m2/kişi	2,7	1,5	0,9	0,83	1,03	1,21	1,32	2,08	1,8	4

Figure 4.15, Left: Housing production in Turkey and some developed countries (Balamir, 1996); Right above: Popultation growth rate. (TÜİK (2013) cited in Ankara District Planning of Development Agency, 2014: 16);Right below: Green space per capita per year.(Ankara Environmental report (2011) cited in Ankara Development Agency, 2013: 138)

4.2.2.2. Changes in the core of the city Ankara

During this period, Ankara had an interconnected compact macroform with a population of 1,000,000 in an area of 14,000 hectares. Because of the fact that Ankara's history is made up of two stages, namely before and after the newly-founded Republic; it hasn't a *radio centric* urban form, radiating outward from a common center. Additionally, it has evolved based on a common core and network system related to the main core, known as *linear-concentric* urban form (Figures 16, 17). The main artery of this linear-concentric urban macro form is Ataturk Boulevard connecting Ulus-Samanpazarı and surrounding area to Çankaya Köşk District. Atatürk Boulevard has become more important once it has connected the newly developed administrative Yenişehir center on the South (Kızılay sub-center) to Ulus center on the North. During this period, transformation of Kızılay into an *administrative center (AC)and commercial center (CC),* Ulus started functioning only as a *commercial center (CC)*. Hence, people and pedestrian movement across this AC+CC started developing. Thus, with the growth of Ankara as a polycentric city, the importance of the connectivity of these AC-CC and CC with Ulus- Sıhhiye has increased the importance of this artery. In this sense, from Opera building to Sıhhiye, some official buildings and colleges were built. The buildings constructed were addressing to specific groups of people and causing traffic congestion on Ataturk Boulevard at specific times of the day (Ankara Architecture Branch, 1970: 50-53).

4.2.2.3. Changes in the street network of the city of Ankara

The city's population grew, between 1960 and 1970, by 64% and the number of people per car decreased from 71 to 41. Actually, the manufacturing of passenger cars and development of automotive industry in Turkey in 1970 was a factor in the increase of car count. After two additional companies were opened, the number of people per car further went down from 44 to 28. The City Traffic Commission, in order to prevent any possible traffic problems, imposed a restriction on the number of operating dolmuş and taxis in the city. This decision caused longer queues of passengers in minibus stations and an increase in the waiting time. The restriction was extended until 1975 and then 1980, making the number of cars in the city of

Ankara 52,217. In fact, there should have been restrictions not only for taxi and dolmuş, but also for car ownerships (Elker et al., 1977: 30).

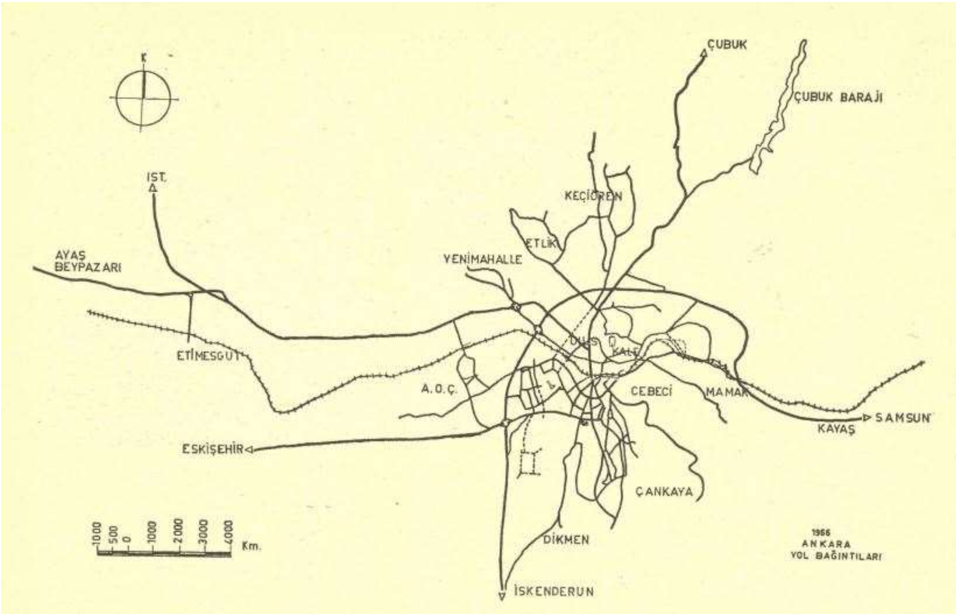


Figure 4.16, Ankara Network in 1955, (Ankara Traffic Problems, 1970: 50)

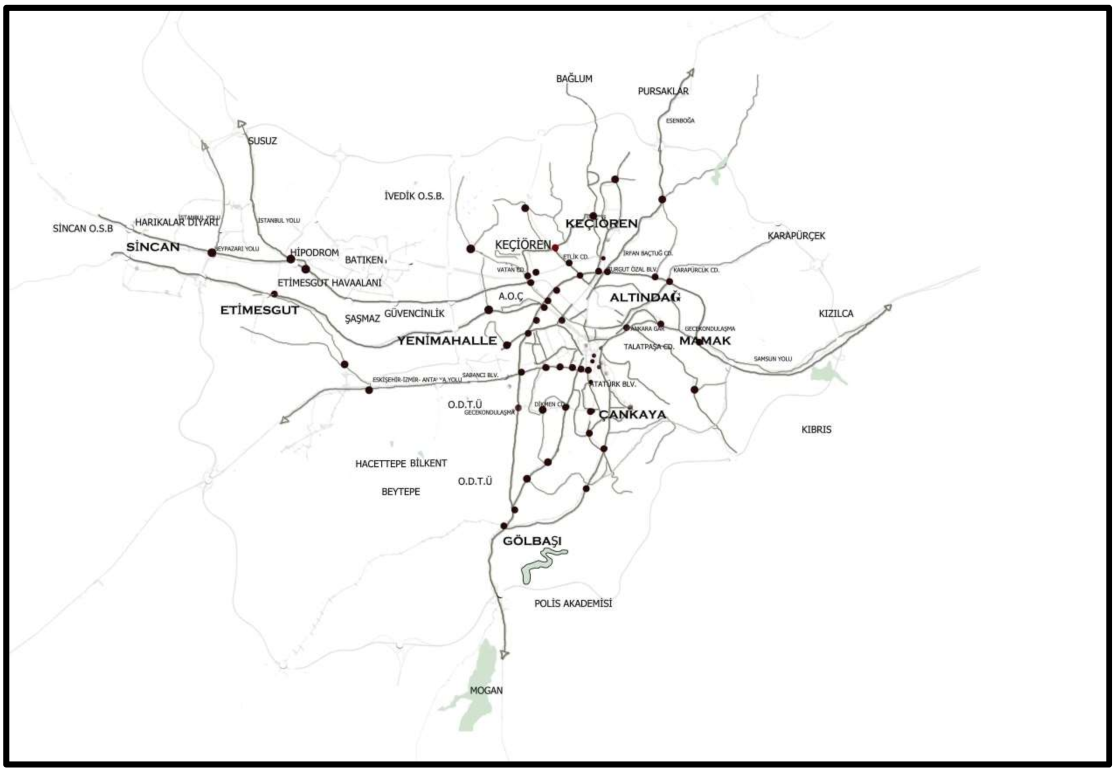


Figure 4.17, Ankara network in 1970 (Personal study and rendering)

4.2.3 The Period of 1980 – 2000: The 1990 City Plan by Ankara Metropolitan Area Master Plan Bureau

During the 1960s, almost sixty percent of people had to live in the unplanned areas of Ankara's inner city because the land prices in the planned areas of the inner city were high and low-income group could not afford living there. On the other hand, the development of apartments as a dominant trend and proliferation of vertical densification in the city core and increased air pollution in the inner city area emerged the need for a new master plan. As a result, the Ankara Metropolitan Area Master Plan Bureau (AMANPB), proposing a direction of future expansion for the city development, was introduced.

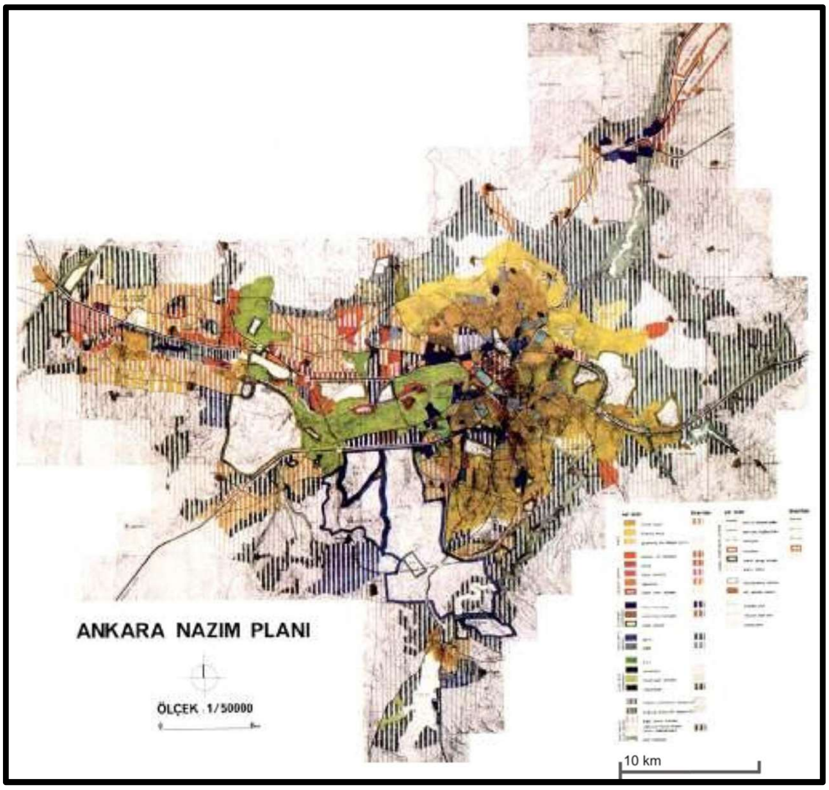


Figure 4.18, Structural schema of urban form by Ankara 1990 Plan, (Ankara municipality)

The major objectives of the plan affecting Ankara's macro plan were as follows: reducing environmental pollution, strengthening the relation between the building areas and natural environment, and minimizing investments in physical construction and administration costs. Therefore, this plan proposed a corridor based expansion to ensure linear development and reduce the continuing air-pollution problem. As a result, it was proposed to develop 12 various zones, in the periphery areas of the city of Ankara, to accommodate 48 percent of the population. Reproduction of mass-housing developments in the fringe areas, together with dense developments in the inner city, was the main disadvantage of this plan. All these caused a duality in the periphery areas of Ankara with low, medium to high-density urban pattern in the unplanned squatter areas, and high vertical density in the newly developed housing projects (Balamir, 1996) (Figure 4.18).

4.2.3.1. Changes in the size of the city of Ankara

In the 1990 Plan, a corridor-based development was proposed as the best alternative to solve the air pollution problem. These corridors would ensure flexibility of Ankara's urban form, making multiple centers through development toward North-West, West and South-West (Elker et al., 1977: 29-31). Thus, it increased the distance between the city center and developed areas, from 12 km to 19-25 km (Figure 4.19,20).

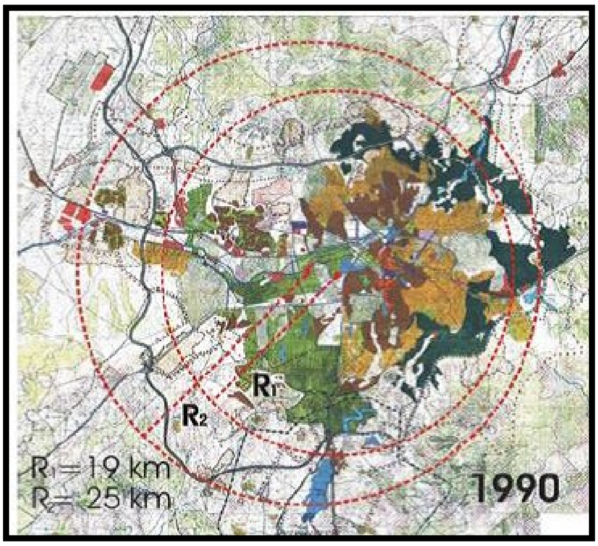


Figure 4.19, Left: Ankara city size in 1990; Right: Apartments in 1990

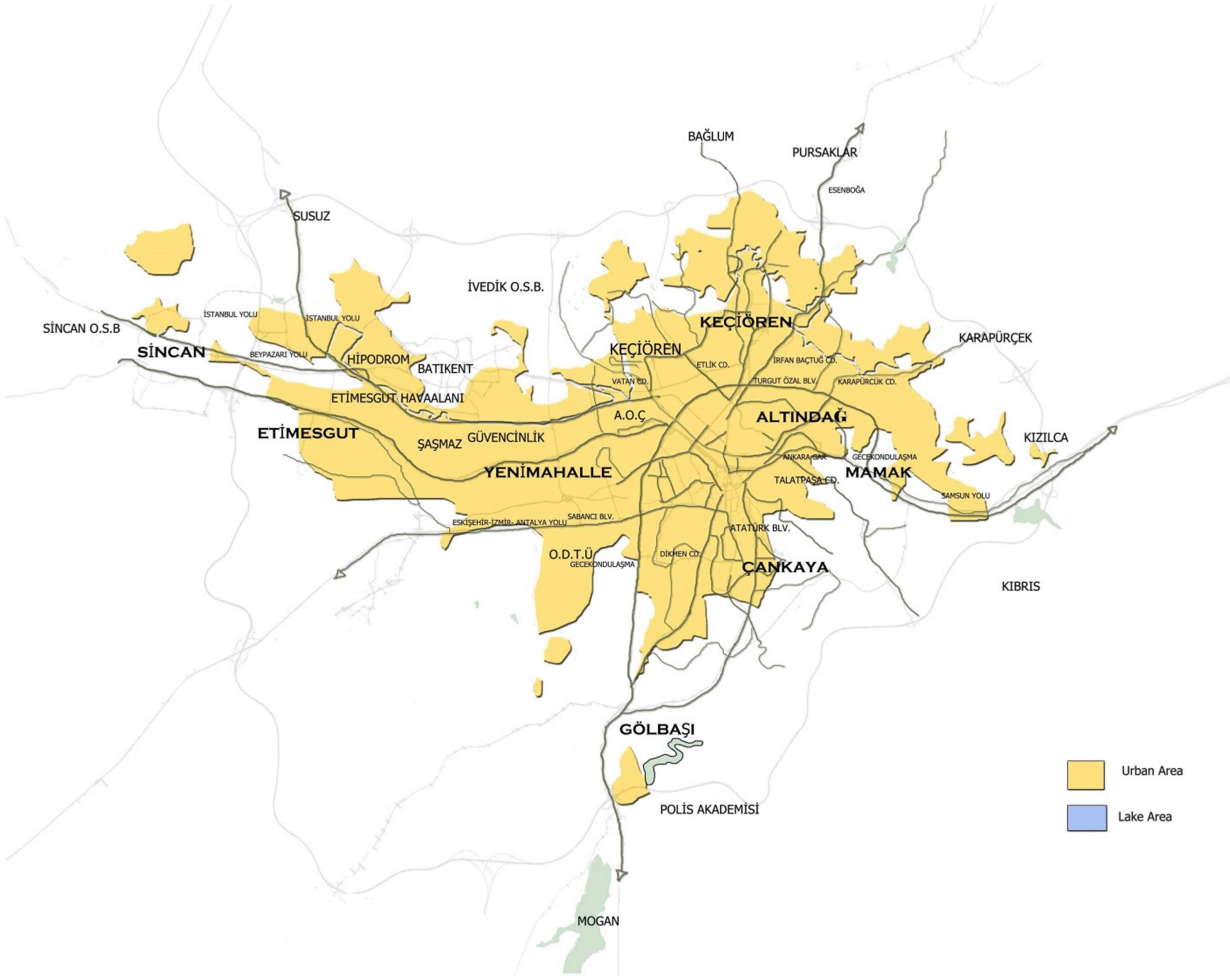


Figure 4.20, Ankara city size in 1970. (Personal study and rendering)

4.2.3.2. Changes in the density of the city of Ankara

The urban density of different regions during the relevant period was classified in three groups: low, medium and high-density. Although the current urban density was 140 people per hectare, the proposed urban density was defined as 200 people per hectare, which enabled preservation of the existing stable density in the inner urban areas.

It is essential that, the aim of mass-housing projects, triggered with Ankara 1990 plan, were not to form dense urban areas integrated with sufficient open spaces, rather to prefer making high-rise, high-densities urban areas. Thus, there formed a duality in the periphery urban areas, with low, medium and high dense areas in the urban squatters and urban spaces with high vertical density in the newly developed areas (Elker et al., 1977: 29-31).

4.2.3.3. Changes in the street network of the city of Ankara

In assessment of the relation between the number of cars and travelling methods, during the period 1970-1976, there is a rising transportation problem in the city of Ankara. During these six years, there is over 300% increase in the number of automobiles, which caused traffic congestion, parking problems, cars crossing sidewalk borders, and disturbance of the sidewalk continuity. Additionally, because of the limited number of public buses, passengers tended to use commercial transportation modes (such as dolmuş). Thus, it resulted in long wait times for travellers in dolmuş queues, overloading of dolmuş with passengers, and extra work load for dolmuş drivers. Therefore, the number of travellers per dolmuş rose from 186 in 1970 to 260 in 1976, indicating a 40% increase in the working capacity of dolmuş drivers. Furthermore, passenger count per taxi increased from 27 in 1970 to 37 in 1976, which corresponds to a 37% increase in the working capacity of taxi drivers. In addition, according to TUIK recordings for 1976, there were 71,186 automobiles in the city of Ankara. If 10,000, the total number of taxis and dolmuş, is subtracted from the total number of vehicles, it can be found that 85% (61,200) of the motorized vehicles in the city of Ankara were private cars (Elker et al., 1977: 29-31) (Figure 4.21).

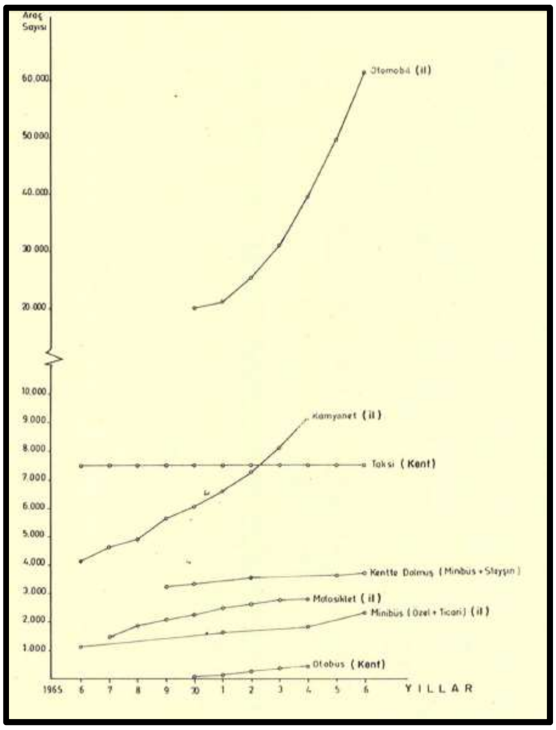


Figure 4.21, (Number of motorized transportation modes, (Elker et al., 1977: 29-31)

4.2.4 The Period of the 2000s: The 2015 Structure Plan (1986), Ankara 2025 Urban Development Plan (1997) and 2023 Başkent Ankara Urban Development Plan (2006)

With the enactment of the Law of Exemption of Development (1984) and the laws of squatter improvement plans in the 1980s and the 1990s, informal settlements in the city were legitimated. Therefore, the equal distribution of population and density was destroyed. In 1985, the Ankara Municipality asked Middle East Technical University to prepare a new development plan for the city in order to regulate the uncontrolled urban development and solve the problems of urban densification, air pollution, and transportation. The 2015 Structure Plan, prepared in 1986, promoted the idea of urban decentralization as the key urban planning concept of that period of time. Rather than a widespread decentralization, the 2015 Structure Plan envisaged the decentralization in the form of a *star* structure, accompanied with public transportation (Figure 4.24). Moreover, it gave priority to protection of green belt system, as an essential factor in reducing the air pollution (Günay, 2012: 9; Çalişkan, 2014: 37-38) (Figure 4.22-23).

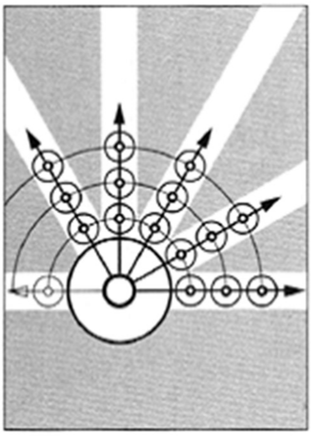


Figure 4.22, Copenhagen diagrammatic plan (Finger plan) with star city form. (Hyldebrand, 2000: 76)

As the city of Ankara faced with air pollution problems, due to highly dense inner city areas and increased car numbers, in 1985, a team of urban planners from Middle

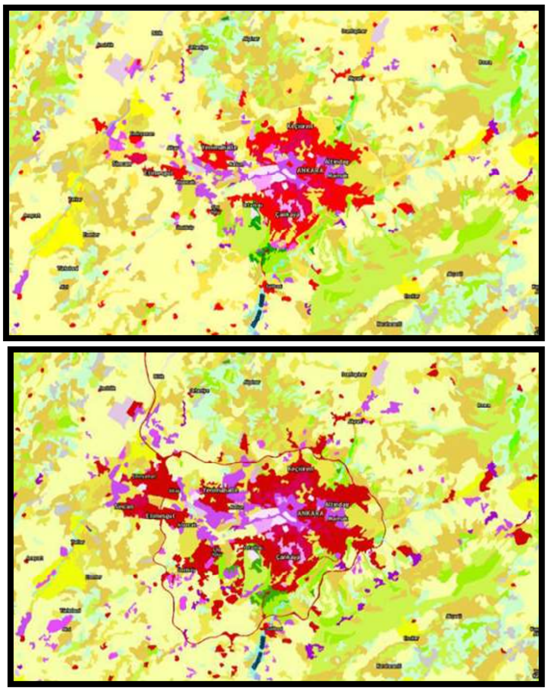


Figure 4.23, Above: Ankara macro-form in 1990, Below: Ankara macro-form in 2006, Europe Environment Agency cited in (Ankara District Planning by Development Agency, 2014:43)

East Technical University suggested a *linearly scattered urban structure in the shape of star (polycentric urban form)* rather than compact macro-form (Günay, 2012: 9). *Linearly scattered urban structure in the shape of star* (polycentric urban form) was the promotion of the Copenhagen development pattern (the late-19th and the early-20th century). The proposition mainly aimed to expand the city and improve the accessibility between the developed areas and city center. (Figure 4.24)

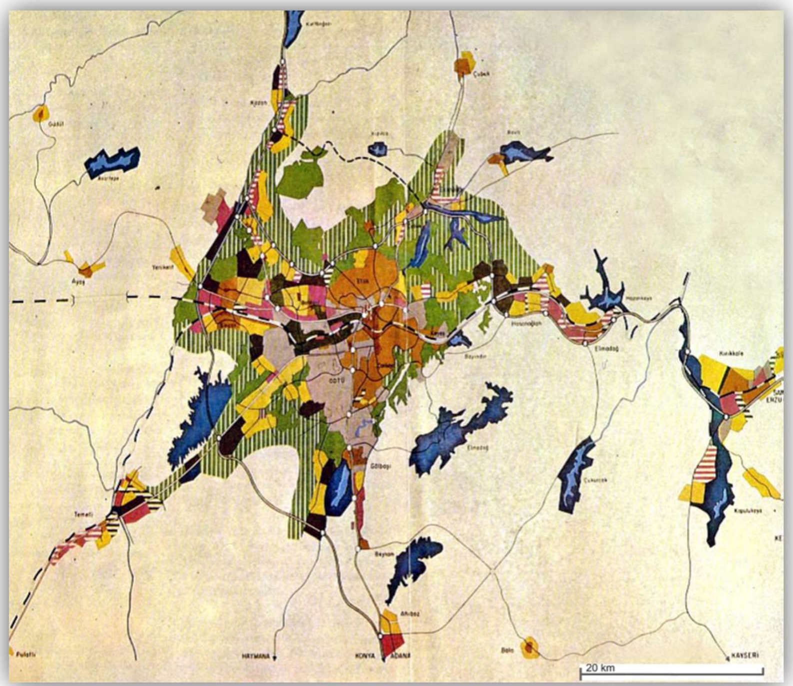


Figure 4.24, Urban macro-form schema of Ankara 2015. (Ankara District Planning by Development Agency, 2014: 43)

The 2015 Structure Plan of Ankara could not solve some of the city's problems, such as unbalanced population density resulting from increased car ownership and dispersed urban developments. Thus, the 2025 Ankara Urban Development Plan, prepared by the Ankara Metropolitan Municipality, aimed to redistribute the population of high dense urban areas to new sub-centers accessible by newly developed corridors (Günay, 2012: 10) (Figure 4.25). On the other hand, district municipalities carried out transformation plans to redevelop low-dense squatters into high-dense housing areas (Günay, 2012: 10). This accelerated uncontrolled urban sprawling, which is against the principles for a sustainable city, such as preserving the optimum size of the city and preservation of three dimensional (economical, environmental and social) connections between the core and periphery areas (Günay,2012: 10) (Figure 4.24-25).

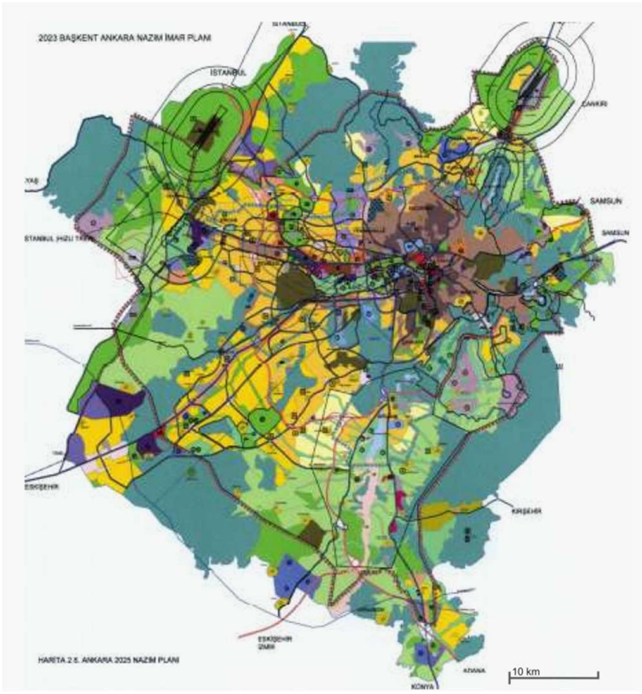


Figure 4.25, Ankara 2025 Master Plan Schema. (Günay, 2012: 10)

In the 2000s, application of urban transformation projects, by the Housing Development Administration of Turkey (TOKI), replaced illegal housing areas with the legal high-rise mass housing enclaves, especially at the fringe areas of Ankara. Then, Ankara 2023 Urban Development Plan, prepared by the Ankara Metropolitan Municipality, entered into force in 2007. (Çalişkan, 2014: 44-45). Its main aim was to tackle characteristics of urban compactness - density, consistency and mixed-usage - which are critical at the macro-meso scales of urban form (Günay, 2012: 10). The following section seeks to understand the positive and negative aspects of the current urban macro-form of the city of Ankara, based on the walkability parameters, mentioned in the second chapter.

4.3 The major macro-level attributes of walkability in Ankara

4.3.1 Social value of transportation system supporting walkability

4.3.1.1 Accessibility

As discussed in the literature review section, accessibility is the main and first parameter in evaluation of the social value of a transportation system, which effects walkability at the macro scale. It ensures easyapproachability to development centres, public transit system, and local facilities by means of various motorized and non-motorized types of transportation (Frey, 1999: 54-56).

Today, accessibility is the problem of many metropolitan cities and affects the life quality of people living in the city. Accessibility, as mentioned previously, is in direct relation with the economic and social parameters. Therefore, urban problems such as traffic congestion, and accessibility problems cannot be discussed without consideration of the related factors. For instance, in evaluation of the accessibility in terms of the economic and social criteria, it becomes clear that mostly low-income groups of people face with accessibility problems; however, they are ignored in urban planning decisions. In 1970, while 57% of high-income people, using their private cars, spent 20 minutes for access to their work, 26% of low-income people spent the same time for the same purpose. Furthermore, as high-income group of people tend to use their private cars, there is reverse relation between the income level and public transit use (Elker et al., 1977: 26-28).

At the end of 70s, the city of Ankara was decentralized mainly towards the west. In 80s, with the influence of the neoliberal (dominant capitalist regime) policies, it started to compete for making great projects of highways, office parks, shopping malls, and residences. These uses require empty and large areas that can only be found in the fringe and outer areas of big cities. The lack of a good connection between the main centre and newly developed sub centres as well as the dependency of numerous arterials on the main commercial and business centres of Ankara led those people who were in good economic condition and uncomfortable with waiting in long queues at public transit stops to prefer using their private cars (Figure 4.26).

This resulted in an increase in the number of cars and decrease in walkability (Cihangir, Çamur and Yenigül, 2009: 1046-1047).

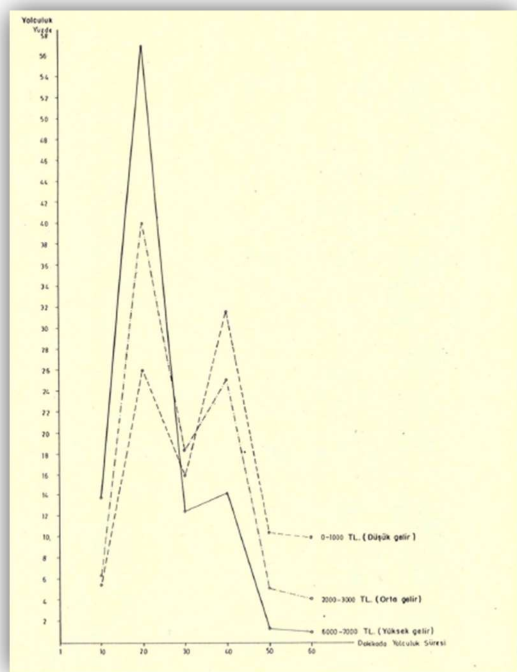


Figure 4.26, The relation between income level and travel time in the city of Ankara (Elker et al., 1977: 27)

A survey on the distribution of various modes of transportation, conducted by EGO, indicates that a large proportion of people (38.8%) living in the city of Ankara prefer using their private cars or taxi. Furthermore, 6.7% of respondents use Ankaray, metro and Banliyö, 34.4% use Dolmuş and Minibüs (Figure 4.27-28).

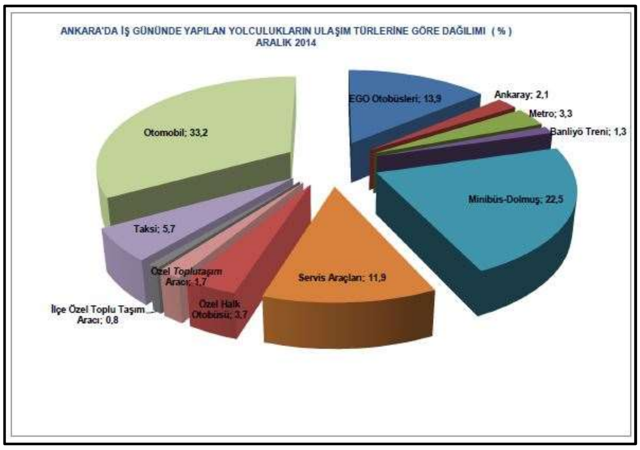


Figure 4.27, Accessibility in the city of Ankara by modes of transportation, (EGO, December 2014: 2)

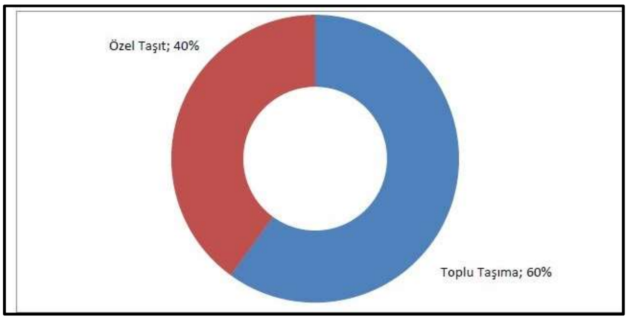


Figure 4.28, Traffic distribution by modes of transportation in the city of Ankara. (EGO cited in Ankara District Planning of Development Agency, 2014: 47)

On the other hand, surveys on traffic distribution, implemented by EGO, in Berlin, Madrid, London, and Vienna cities show that almost 33% of people use private cars while the other groups prefer public transit, walking, or biking. In addition, except for Madrid, people do not prefer using taxi. In fact, cities with an accessible urban network and sufficient public transit system are more walkable, so people do not prefer using their private cars. A comparison of the city of Ankara with the mentioned European cities apparently indicates that these cities have similar trends in terms of traffic distribution. However, in the city of Ankara, due to the dependency of transportation system on highways, the small share of the rail system (6.7%), and overuse of minibüs-dolmuş (34.4%), which has smaller passenger capacities compared to other means of public transit, traffic problems arise (Ankara District Planning by Development Agency, 2014, p. 44-46; Elker et al., 1977: 34) (Figure 4.29).

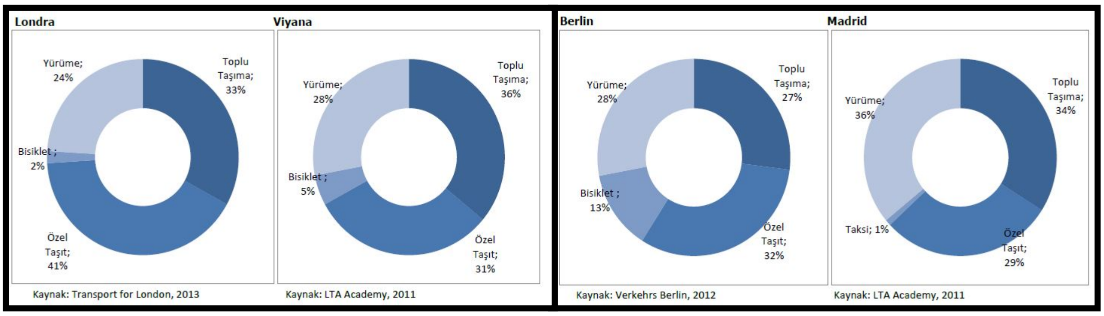


Figure 4.29, Traffic distribution by modes of transportation; Left: in London and Vienna; Right: in Madrid and Berlin. (EGO, cited in Ankara District Planning of Development Agency, 2014: 47)

Additionally, according to a surveyconducted by Eurostat (2013), the number of public transit vehicles per 1000 people in the city of Ankara is more than 4, which is higher than the other European cities. However, as mentioned above, Ankara's public transportation system highly relies on dolmuş while use of light rail system and non-motorized modes of transportation are not frequent. These very reasons cause traffic congestionand a decrease in the level of walkability in the city (Ankara District Planning by Development Agency, 2014: 46) (Figure 4.29).

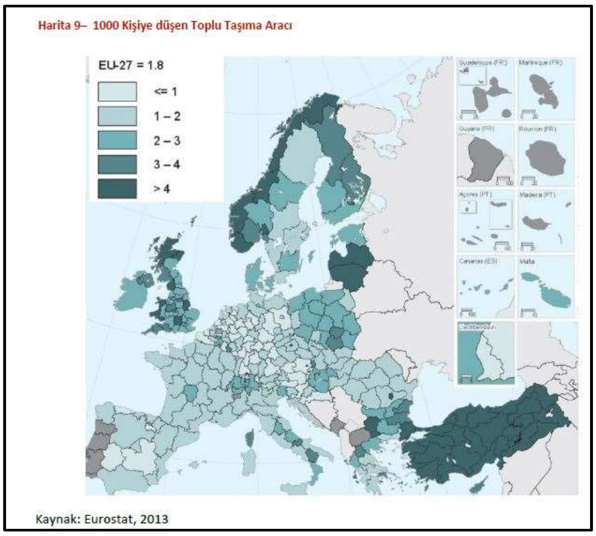


Figure 4.30, number of public transit vehicles per 1000 people. (Eurostat 2013), cited in Ankara District Planning of Development Agency, 2014: 48

The other cause of traffic congestion, especially in the main arterials of Ankara city, is dependency of the public transit system on the main city centers -Ulus and Kızılay- as there is low interconnectivity between all the cells. As a result, the failure to provide an integrated transport system with less reliance on the city center and to ensure an effective and efficient integration of various modes of transportation reduces the accessibility capacity of Ankara for passengers, inflates car use, discourages short trips on foot or by bike, and consequently decreases the quality of life.

4.3.1.2. Land Use Patterns

During the 1980s, with the influence of the neoliberal (dominant capitalist regime) policies, rapid changes were experienced in urban areas and the “urban sprawl” growth pattern emerged in Turkish metropolitan areas. This new metropolitan growth pattern includes low-density, leap frog, scattered and sprawling developments. As well, cities started to compete with and against each other for great projects of highways, office parks, shopping malls, and residences. Aforementioned uses require empty and large areas, which can only be found in the fringe and outer areas of big cities. Therefore, the city of Ankara was decentralized mainly towards the west. The idea behind this trend was to solve the air pollution problem of the city, which was caused by the over-dense development in the central area. That is to say, there has been a significant uncontrolled development in Ankara over the last 20 years, along with the rapid urbanization and urban sprawl (Cihangir, Çamur and Yenigül, 2009: pp. 1045-1046) This process has declined the diversity, livability, and economic vitality in the CBD of the city,Ulus and Kızılay. With the transfer of commercial uses to newly developed areas along the South, North, East, especially South-West and West corridors; the main function of the central business district (CBD) has left to some public institutions (such as ministries, municipality buildings, and service places), private education centers (language courses, university exams’ preparation courses, etc.), and a variety of commercial functions (traditional and modern) serving mostly low- and medium-income groups. Yet, high-income shopping has moved out of the city centers, Ulus and Kızılay, to the shopping malls concentrated along the main corridors out to the fringe. Now, the city has developed beyond the expectations of planners, with declining livability of the city core (Günay, 2012: 11) (Figure 4.33).

Urban sprawl means physically expanding urban areas with leaps and bounds, low-density urban areas. Hence, Ankara as a sprawling city lacks the properties of compact cities: high density, consistency and spatial mixture of functions. It is full of empty spaces that indicate the development inefficiencies and highlight the consequences of uncontrolled growth (Cihangir, Çamur and Yenigül, 2009: p. 1047). As a result, an uncontrolled polycentric urban growth disregarding a good connectivity between the main center and newly developed sub centers, or dependency of numerous arterials on the main commercial and business centers of Ankara, i.e. Ulus, Kızılay, Gazi Osman Paşa and Çankaya, has decreased the livability of the city.

.

Figure 4.31, Change of CBD and fringe areas in Ankara City, (Günay, 2012: 11)

4.3.1.3. Equity

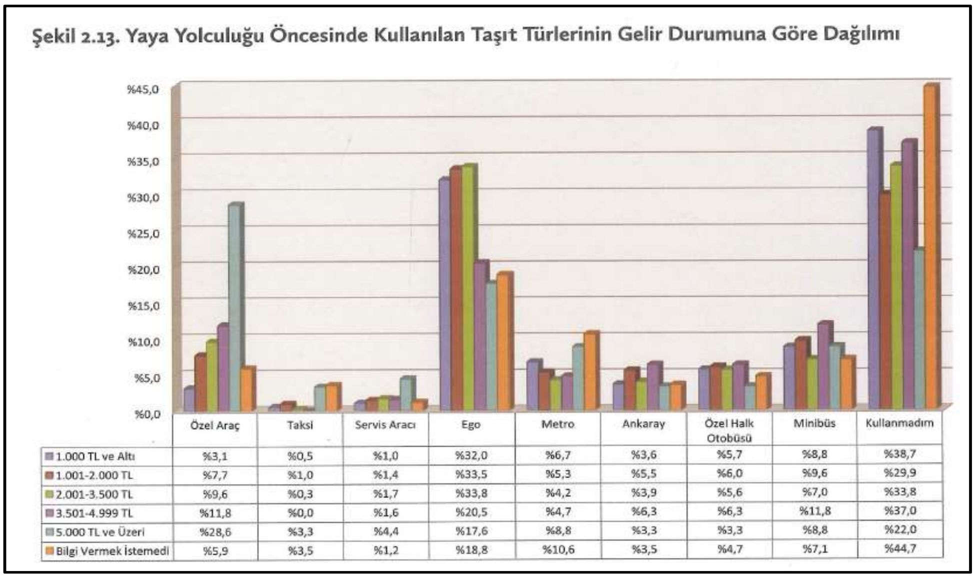
As mentioned before, the criterion of equity refers to people equally taking advantage of a transportation system, regardless of their social or economic group. Hence, the questions come to the fore are as follows: *Will Ankara's transportation system planning and policies make the accessibility better for lower-income groups or not? How is the quality of public transit services for people who are non-drivers? and finally, Are transportation prices adapted for all economic groups of people or not?*

The urban development process of Ankara as a capital city has started with the Lörcher Plan and the expansion of the city has become uncontrollable since 1950. At the beginning, it was a compact city and its transportation system was mostly based on public transit and walking system. At the end of 70s, due to the uncontrolled polycentric growth, lack of good connections between the main center and newly developed sub-centers, and reliance of numerous arterials on the main commercial and business centers of Ankara led those people who were in good economic condition and uncomfortable with waiting in long queues at public transit stops to prefer using their private cars. This resulted in an increase in the number of cars and a decrease in walkability (Cihangir, Çamur and Yenigül, 2009: 1045-1046).

An evaluation of the process of increase in the car count indicates that during the period 1925–1950, Ankara's population drastically increased and tripled. In this period, large administrative buildings, squares, parks, and boulevards changed Ankara's image. In 1950, almost 34 percent of Ankara's people were living in squatters, covering 23 percent of Ankara's urban area. Additionally, there was one car for 123 people, which then decreased to 71 people per car (Elker et al., 1977: 25-30).

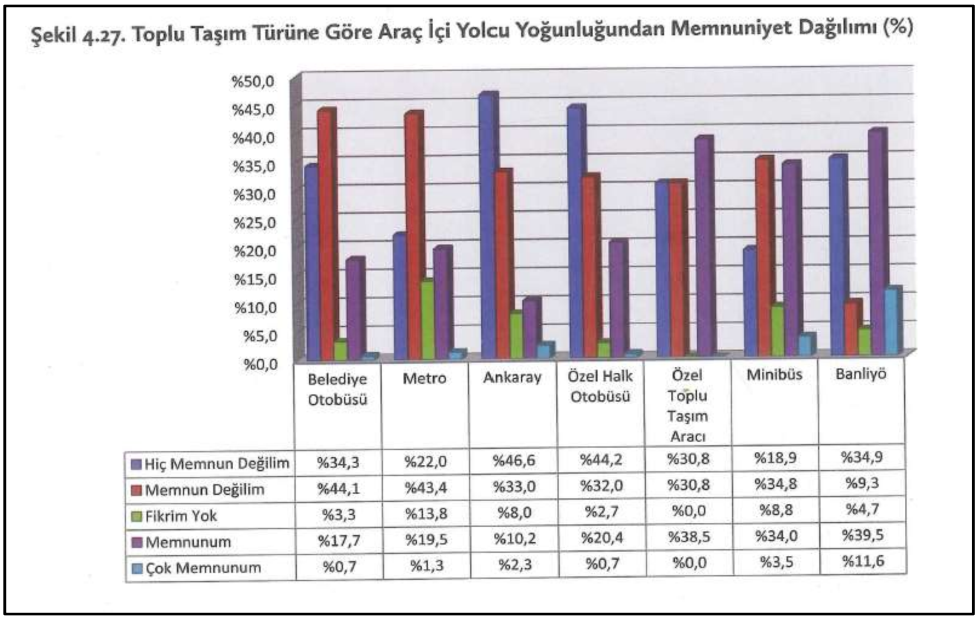
The city's population grew, between 1960 and 1970, by 64% and the number of people per car decreased from 71 to 41. After two additional companies were opened, the number of people per car further went down from 41 to 28. The City Traffic Commission, in order to prevent any possible traffic problems, imposed a restriction on the number of operating dolmuş and taxis in the city. This decision caused longer queues of passengers during the period 1970-1980 and an increase of the car count up to 52,217 in the city of Ankara. By 1976, there is over 300% increase in the number of automobiles, which caused traffic congestion, parking problems, cars crossing sidewalk borders, and disturbance of the sidewalk continuity. According to the results of an assessment, passenger count per taxi increased from 27 in 1970 to 37 in 1976, which corresponds to a 37% increase in the working capacity of taxi drivers. In addition, the number of travelers per dolmuş rose from 186 in 1970 to 260 in 1976, indicating a 40% increase in the working capacity of dolmuş drivers.

In 1970, while 57% of high-income people spent 20 minutes for access to their work, 26% of low-income people spent the same time for the same purpose (Elker et al., 1977: 25-30). Today, groups with a monthly income of TRY 5,000 or more (28.6%) use private cars while people with a monthly income of TRY 1000-3500 use the EGO bus system (Gazi University, 2013: 50) (Figure 4.32).



	Özel Araç	Taksi	Servis Aracı	Ego	Metro	Ankaray	Özel Halk Otobüsü	Minibüs	Kullanmadım
1.000 TL ve Altı	%3,1	%0,5	%1,0	%32,0	%6,7	%3,6	%5,7	%8,8	%38,7
1.001-2.000 TL	%7,7	%1,0	%1,4	%33,5	%5,3	%5,5	%6,0	%9,6	%29,9
2.001-3.500 TL	%9,6	%0,3	%1,7	%33,8	%4,2	%3,9	%5,6	%7,0	%33,8
3.501-4.999 TL	%11,8	%0,0	%1,6	%20,5	%4,7	%6,3	%6,3	%11,8	%37,0
5.000 TL ve Üzeri	%28,6	%3,3	%4,4	%17,6	%8,8	%3,3	%3,3	%8,8	%22,0
Bilgi Vermek İstemedi	%5,9	%3,5	%1,2	%18,8	%10,6	%3,5	%4,7	%7,1	%44,7

Figure 4.32, Distribution of the types of vehicles before the pedestrian journey according to income status.(Gazi University, 2013: 24).



	Belediye Otobüsü	Metro	Ankaray	Özel Halk Otobüsü	Özel Toplu Taşım Aracı	Minibüs	Banliyö
Hiç Memnun Değilim	%34,3	%22,0	%46,6	%44,2	%30,8	%18,9	%34,9
Memnun Değilim	%44,1	%43,4	%33,0	%32,0	%30,8	%34,8	%9,3
Fikrim Yok	%3,3	%13,8	%8,0	%2,7	%0,0	%8,8	%4,7
Memnunum	%17,7	%19,5	%10,2	%20,4	%38,5	%34,0	%39,5
Çok Memnunum	%0,7	%1,3	%2,3	%0,7	%0,0	%3,5	%11,6

Figure 4.33, Satisfaction with vehicle travel compared to public transport type
(Gazi University, 2013, p. 61)

In an assessment on the quality of public transit services for non-drivers, it becomes clear that the population growth, limitations of the public transportation system, and the tendency of high-income groups (40%) to use private cars have increased the time spent by those people with low and moderate incomes (60%) throughout the public transit system. Therefore, as it is seen in the diagram, 34% of dolmuş passengers,17% of bus users and 39% of Ankaray passengers are satisfied with the public transit quality and passenger congestion therein (Figure 4.33).

With an evaluation of the prices applied in the public transit system, based on a research by Gazi University (2013); it becomes clear that 65.4% of metro passengers, 79.6% of Ankaray passengers, 53.7% of minibus passengers, 76.2% of private bus passengers, and 78.4% of municipality bus passengers are not satisfied with the ticket prices. Consequently, except for the minibus system, various socio-economic groups of people are not satisfied with the public transit prices (Gazi University, 2013: 61) (Figure 4.34).

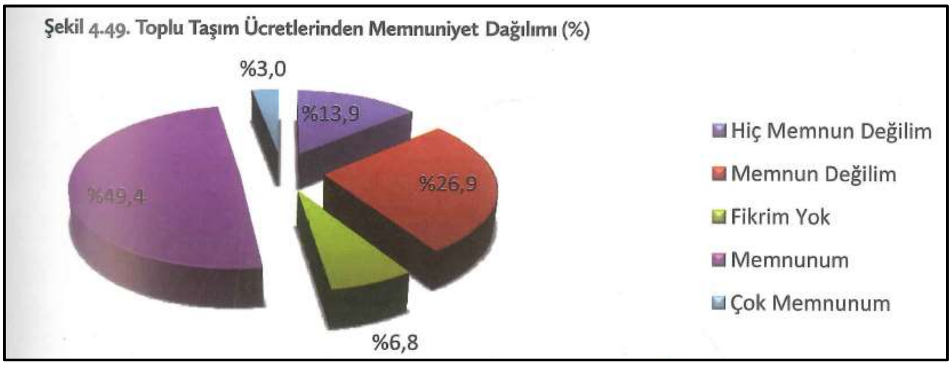


Figure 4.34, Satisfaction with public transportation charges.(Gazi University, 2013: 50)

4.3.2 Land use development

As mentioned in the literature review section, land development patterns at a macro scale demonstrate the degree of proximity between origins and destinations. These patterns directly influence travel behaviour in two main parameters: density and land use mix.

4.3.2.1 Density

Ankara’s density is measured in four aspects: ***population, employment, built form, and sub-centres density***. *Population density* refers to the number of residents per unit area and *employment density* measures the number of employees per area. Population and employment densities affect the level of work and non-work travel demand. *Built form density* refers to the density of built and residential area per hectare; and *sub-centres* density is known as the density of most dense centres.

Population density

In the foundation period of Ankara, following the structural administrative arrangements, the development process of the city first started with the Lörcher Plan in 1925, then continued with the Jansen Urban Plan in 1932 and Yücel Ubaydin Plan in 1957. 1990 Ankara Metropolitan Planning Bureau Plan, Ankara 2015 Structural Plan Proposal and 2025 Ankara Metropolitan Area Development Scheme are the other planning studies that have influence on today’s macro form of the city (Cihangir Çamur and Yenigül, 2009: 1046-1047) (Figures 4.35-36).

Plan	Approval	Existing Population	Existing Urban Area (hectare)	Plan Year	Proposed Population	Proposed Plan Area (hectare)
Lörcher Plan	1925	6 000	280	-	15 000	700
Jansen Plan	1932	75 000	300	1978	300 000	1500
Yücel-Uybadin Plan	1957	455 000	5 720	1987	750 000	12 000
1990 Ankara Master Plan (Ankara Metropolitan Planning Bureau)	1982	1 200 000	22 500	1990	2,8-3,6 (million)	43250
Ankara 2015 Structural Plan Proposal	-	2 300 000	31 000	2015	4,5-5,5 (million)	210000
2025 Ankara Metropolitan Area Development Scheme	-	2 800 000	45 000	2025	6,5-8 (million)	200000
2023 Ankara Master Plan	2007	3 528 806	81 000	2023	7 568 500	850000

Figure 4.35, Population Change of Ankara City in Time, (TÜİK population statistics)

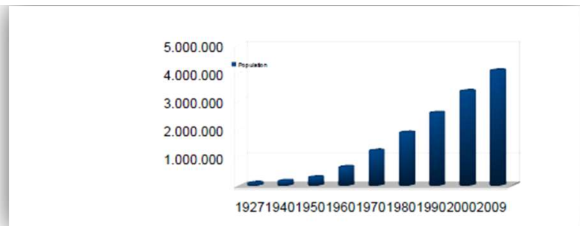


Figure 4.36, Population change of Ankara, (Cihangir, Çamur and Yenigül, 2009: 1047)

The Ankara Metropolitan City became the capital of Turkish Republic on 13rd October 1923. Since then, it has grown rapidly. Its social and spatial structure has changed completely, mainly due to the changes in its administrative structure. The population of the city increased more than hundred times between the years 1920 and 1995. Therefore, although in 1923 it was a small Middle Anatolian city with a population of 30,000 (107 people/Ha), by 1927, the population had grown up to74,553 (250 people/Ha), by 1960 to 650,000 (113 people/Ha), and by 1940s to 220,000 (154 people/Ha) (Cihangir, Çamur and Yenigül, 2009: pp. 1046-1047).Then, in 1956,squatter settlements, with the average density of 124 people per hectare,occupied 3,650 hectares of the periphery areas. At the end of the 70s, with the congestion problems in the main cells, the city was decentralized, mainly, to the west (Ankara District Planning of Development Agency, 2014, p. 51).After the 2000s, the urban transformation projects came on the agenda and squatter areas, especially along the South-West corridor, became the focus of many investments and transformation projects. Additionally, squatter areas in the Northern and Eastern Ankara remained rather unattached and untransformed (Tuçaltan, p. 155). By 2008, the population of the city of Ankara had reached more than four million. During these years, the uncontrolled urban sprawl in all directions of the city, especially towards the South, South-West and North, have caused a continuous decrease in the population density until now (Figures 4.35-36).

Built form density

Mainly, the “density” or “condensation” of a city can contribute to walkability of the city if its magnitude corresponds to a compact city. Uncontrolled urban development and regeneration projects result in an unbalanced built-form density and affect livability negatively. For clarification of this effect, let’s assume a one-hectare urban area in the city of Ankara, where no regeneration project has been applied, containing two-floor buildings with a small garden, as stipulated in the Jansen plan. If we assume there are 24 parcels in one hectare of urban land and one family with 5 members per floor, there will be 24 x 2 x 5 = 240 people per hectare. Today, however, with the application of regeneration projects in Ankara, and other Turkish cities as well, two-floor buildings are replaced with seven-floor buildings on the same parcels. Hence, if we assume each family has three members and there are three apartments on each floor, there will be 24 x 7 x 3 x 4 = 2016 people per hectare. As it is seen, the regeneration projects lead to a 4.5-fold increase in the density to 4.5 on the same parcel area of urban context (Bilsel, 1977-03(152)).

In 1923, Ankara was a compact Middle Anatolian city with 280 Ha built form area and a population density of 107. As mentioned in the section for population density in this chapter, after Ankara became the capital of Turkish Republic, it started growing rapidly. Then, Kızılay was envisaged as the neighboring center of Ulus, first by the Lörcher Plan (1923) and then by the Jansen Plan (1928). Hence, the mono-centric urban form of Ankara has transformed into a linearly concentrated one.Its social and spatial structure has completely changed, mainly due to the changes in the administrative structure (Çakan, 2004: 26-27; Cihangir Çamur and Yenigül, 2009: 1046-1047). During the period 1927-1960, with rapid growth of built areas, population density changed as follows: 250 P/Ha in 1927, 154 P/Ha in 1940s, 140 P/Hain 1950, 124 P/Ha in 1956, and 113 P/Ha in 1960. Expensive land prices, densification in the city center, and economic problems resulted in urban sprawling, starting with squatter developments (1956) and continuing with housing and transformation projects (1980s). In this sense, as the results indicate, the creation of low to high-rise urban areas caused an unbalanced urban density and a decrease in the average population density. In 1980,high-rise housing projects in the inner city areas caused an increase in the population density up to 200 P/Ha. Afterwards, the high densification, traffic congestion and air pollution problems increased decentralization mainly towards the western side. Hence, while in 1980 the population density was 200 P/Ha, in 1991 it was 130 P/Ha, in 1991 50 P/Ha and in 2008 49 P/Ha (Cihangir Çamur, and Yenigül, 2009: 1046-1047). As Bilsel (1977) states, the high value of densification caused agglomeration of urban development in a restricted urban area, and then dispersion of urban areas around the city. Hence, the uncontrolled decentralization resulted in filling the gaps and urban transition (UT) zones, which are necessary for continuation of the legally established uses (Bilsel, 1977) (Figure 4.37). As a result, the rapid urbanization and uncontrolled urban sprawl led to a decrease in the compact city parameters: density, consistency, and mixed usability.

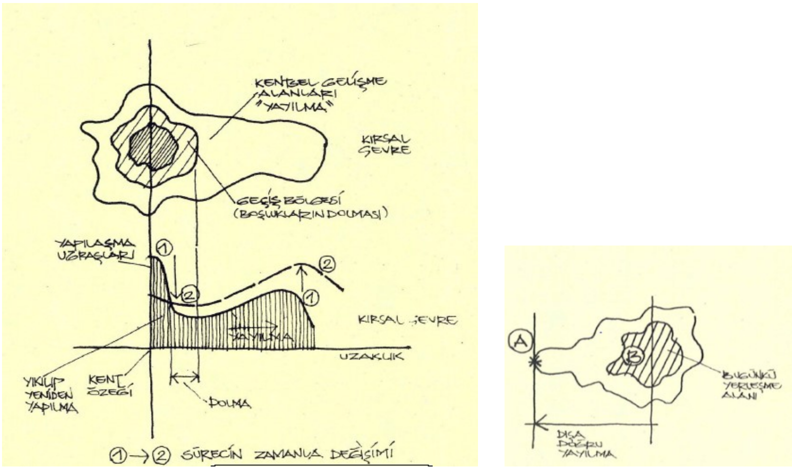


Figure 4.37, Above: Saturation of city centre and outer development of Ankara; Below: Filling of transition zones in urban development of Ankara. (Bilsel, 1977-03(152))

Sub-centres' density

Ankara had a core-dependent macro-form, but as discussed previously, during the period 1950s-1975s, known as the first stage of city development; migration to big cities, rapid urbanization, traffic congestion, and other related problems triggered squatter developments with an irregular pattern (Figure 4.41). Hence, instead of development of the city based on major urban plans; the city began developing along a shapeless city footprint. Furthermore, highways became a tool, connecting the city core to the squatter and trivial industrial areas.

The second stage of Turkish city evolution, in the late 1970s, started with introduction of mass housing projects. During this period, instead of multi-functional large-scale urban context projects, mono-functional housing projects in the periphery areas were preferred.

At the last stage, the approval of 'Law of Development Amnesty' and implementation of transformation and housing projects by the Housing Development Administration of Turkey (TOKI) and private sectors increased the vertical density in 1980s.Therefore; dense urban areas were replaced with dense apartments, accompanied by social services. It resulted in two types of fringe fragments: informal (squatter developments) and formal (planned housing projects) peripheries, with a low-high density urban pattern (Figure 4.38). Hence, although Ankara is a dense city, its macro-form fails to meet the main properties of urban compactness: density, consistency and mixed usage.

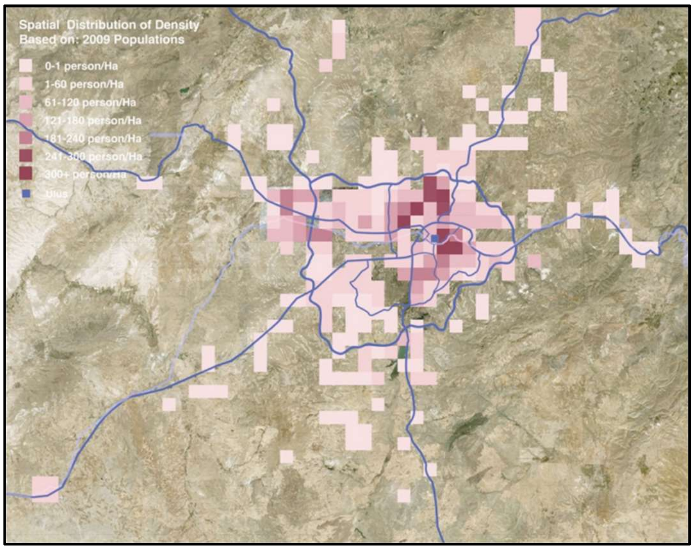


Figure 4.38, Distribution of Density over the Urban Geography of Ankara.
(TÜİK 2009) cited in Yaşar,2010: 53

After 1985, the city has totally lost its well-defined and legible border; while in the 1955s or even in 1970s, the boundaries of the city were much clearer. In fact, urban sprawling of Ankara city in every direction on the periphery, especially to the South-West (Çayyolu-Ümitköy) and West (Eskişehir road), has transformed it into more illegible, dispersed, fragmented and discontinuous city (Figure 4.42). Today, rather than compactness; lack of continuity, nuclearity, concentration, clustering, and proximity are the spatial characteristics of the urban form of Ankara under the effect of this disordered urban sprawl (Figure 4.38, 43).

Hence, when sub-centers are examined in terms of the variety of usages per square meter and the distance between them, it is seen that there is a largedistance between the mono-functional usages of sub centers, such as Yaşamkent sub-center. Therefore, there is a lack of intensity in sub-centers, caused by lack of interconnectivity between the center and sub-centers. As it can be seen, the multi-functionality of the cores and interconnectivity between the functions are essential factors in increasing the livability level of a city, at macro and meso scales. In this sense, sub-centers should be considered as a smaller-scale city, involving all the facilities of a city (Figure 4.39-40).

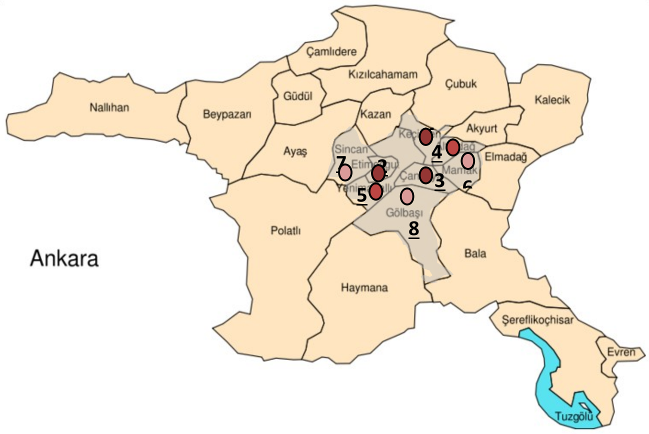
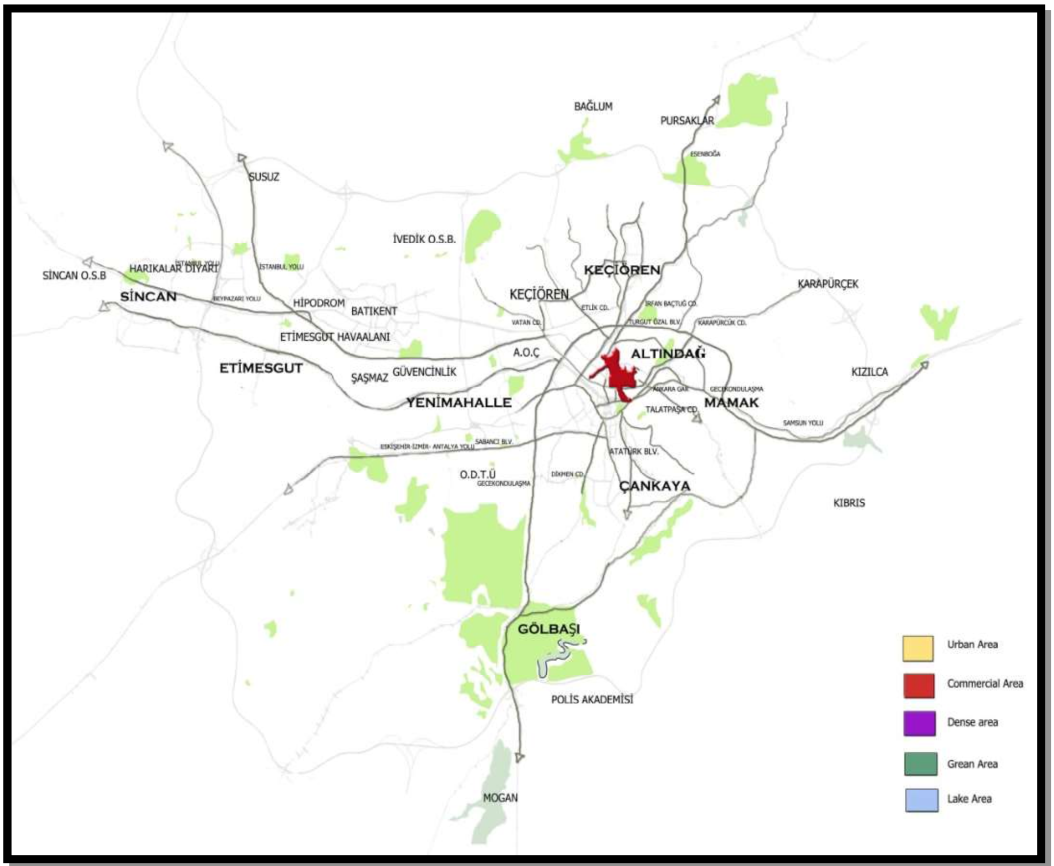


Figure 4.39, Distribution of Population by districts, Personal study accessed from. (Ankara Municipality, 2000: 195)

In addition, average population density in sub-centers of the city of Ankara is 163 per/km^2, ranging between 16 per/km^2 and 3541per/km^2. According to the table, the highest population density belongs to the district of Keçiören, due to the implementation of transformation projects and replacement of squatter areas with high-rise apartments there. However, Mamak district, with both squatter and transformed areas, has a low population density (Ankara Municipality, 2000: 195) (Figure 4.40).

	TOPLAM NÜFUS	YÜZÖLÇÜMÜ	NÜFUS YOĞUNLUĞU (KİŞİ/ KM^2)
İL TOPLAMI	4007860	24521	163
ALTINDAĞ	407101	167	2438
ÇANKAYA	769331	268	2871
ETİMESGUT	171293	49	3496
GÖLBAŞI	62602	735	85
KEÇİÖREN	672817	190	3541
MAMAK	430606	471	914
SİNCAN	289783	344	842
YENİMAHALLE	553344	274	2020

Figure 4.40, Distribution of Population by districts, Personal study accessed from. (Ankara Municipality, 2000: 195)



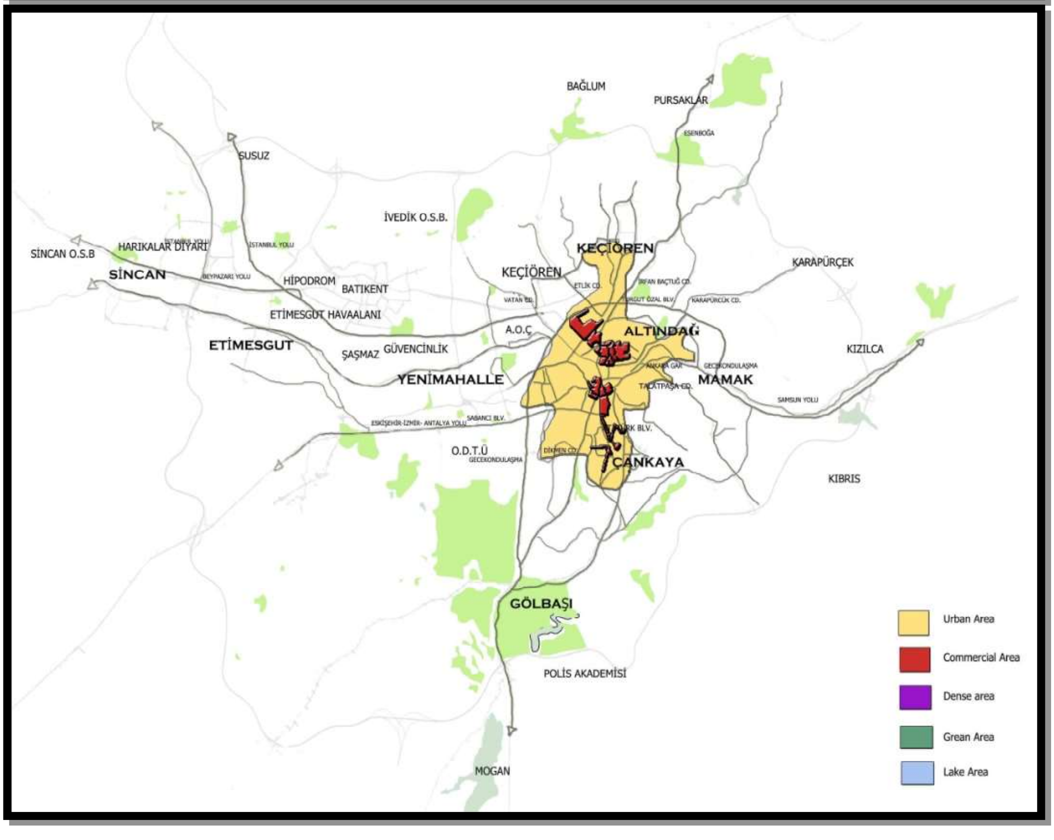
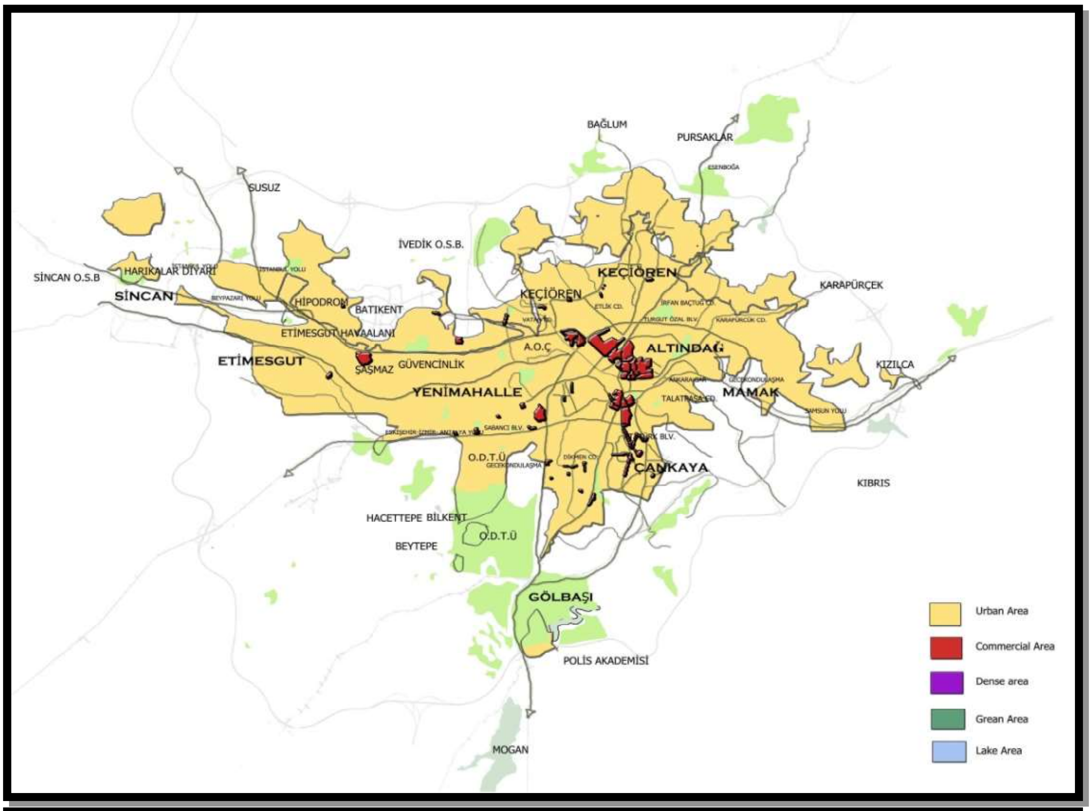


Figure 4.41, The Evaluation of Ankara Macro-form in above:1920, below: 1950 (Personal Study and rendering)



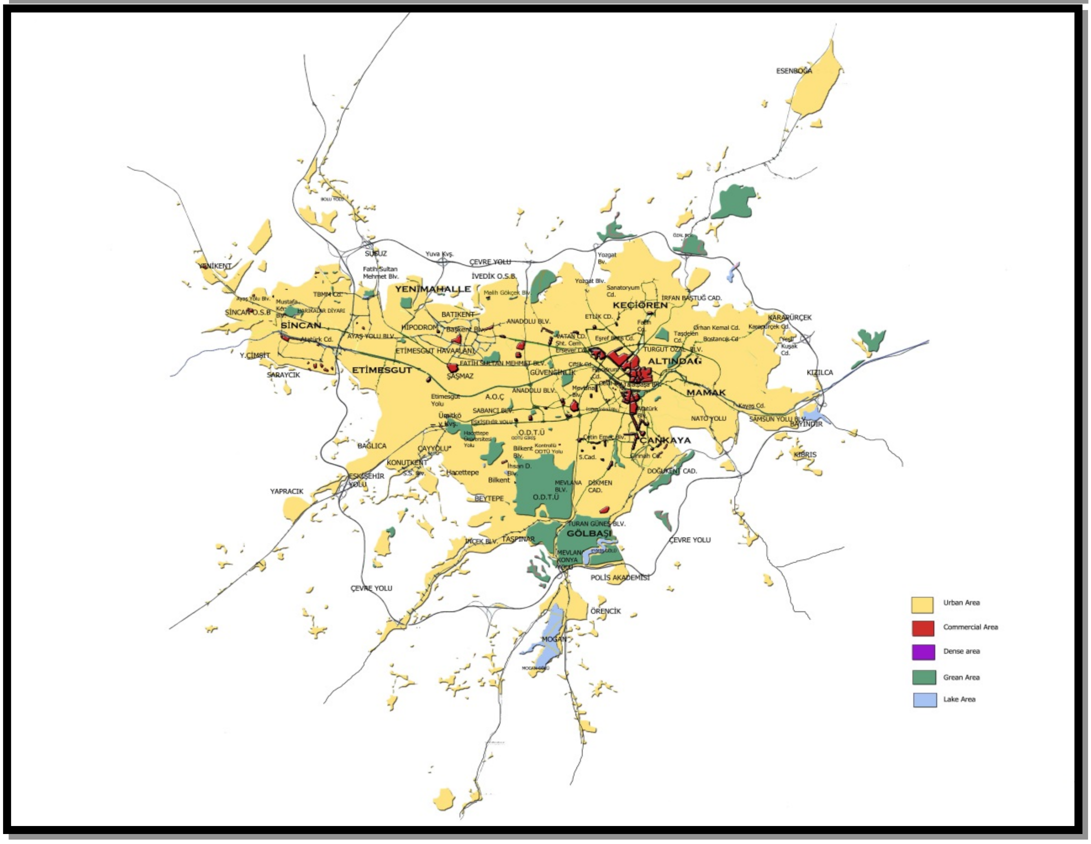


Figure 4.42, The Evaluation of Ankara Macro-form in above:1970, below:2005
(Personal Study and rendering)

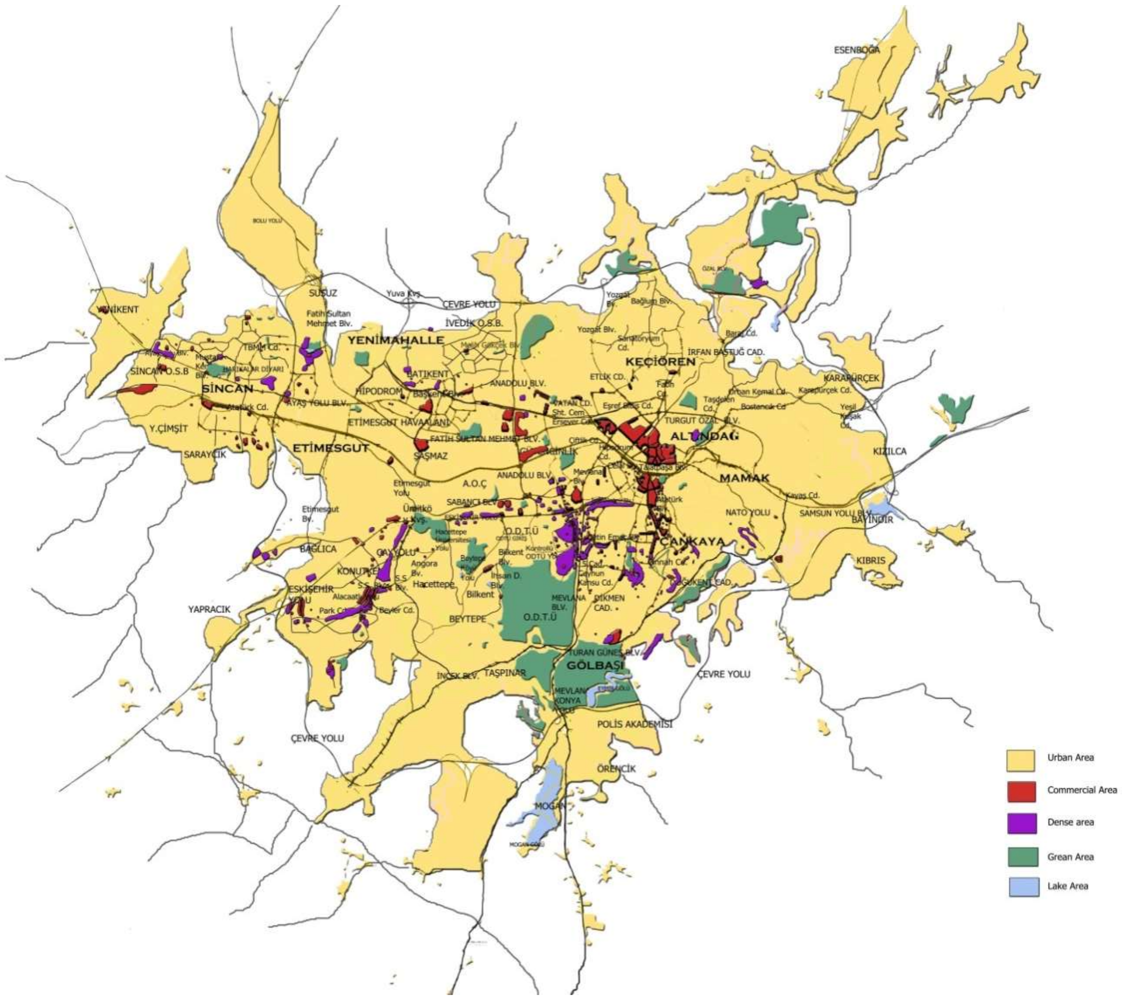


Figure 4.43,The Evaluation of Ankara Macro-form in 2015.(Personal Study and rendering)

Table 4.1, Analysis of urban properties comparing to years.

Urban form	Urban density	Population density & # of cars per people	Depth of control	Date	Settlement Type
-Mono-centric (Ulus as the city core) -Inward looking -Planning the connection of Ulus with new center with Atatürk B. **1950s** -Squatters contain 34% of people and cover 23% of the urban area -Start of multi-storey projects	140 p/ha	20-25 thousand 250 people per car	4 km	1932-1956	Low-density low-rise housing (detached villas in garden city model-environment) in the main body of the new city. 
-Linear-concentrated urban form -Extensive and dense core city - Kızılay: administrative center (AC) & Ulus : Commercial center (CC) -Start of vertical intensification in the inner city -Start of unauthorized development - Population increase by migration	189 p/ha	455000 71 people per car	15 km	1957-1974	High-density, high to medium-rise coarse grain housing settlement pattern. Apartment buildings at individual parcels within typical narrow rectangular building blocks. 
-Quasi linear extension -Unbalanced development -High rise (vertical density) urban pattern in inner city -Decrease in the rate of urbanization after 1970s	200 p/ha	41 people per car Passengers per taxi: 27 in 1970 and 37 in 1976 300% increase in automobile count in 1970-1976	25-30 km	1975-1985	 Low to high-rise, high density patchworks of road bounded housing clusters.
-Linearly scattered, Star shaped development -Decentralization to corridors, to periphery green edges	130 p/ha		35-40 km	1986-1996	 Medium to high-density modernist housing with courtyard type common space encouraging open system development
- Multi-nuclear, dispersed development - Inner densification -Unbalanced population density -Continuity of transformation projects -Medium-low dense in fringe urban areas -Corridor & Urban galaxy	50 p/ha	4 million	60 km	1997	 Medium to low density mid- and high rise development -not exactly coded by the plan-.
	40			2006- 9	

Employment density

Before the decrease of quality in the city center and start of the decentralization phase in the 1980s, Ankara had a more compact character. Nevertheless, an outward urban growth, especially toward the South, South-West, West, and North-West corridors and having a car-dependent urban pattern have increased the total trip per capita. Additionally, decentralization, development of low-density and mono-functional-residential areas in newly developed zones and increase of the average distance between residential and working areas have decreased the walkability.

Until 2000, the employment density were stable (1.1 jobs per hectare), and approximately 26% of work trips were done by walking or cycling. After 2000, the job density has sharply increased to 3.4 (jobs per hectare), three times the previous value.

Hence, while European Cities have historically expanded to a medium to high-density urban pattern, Ankara has grown at a limited scale, with a high vertical density of urban fabric. This has increased the average distance between residential and working areas; on the other hand, lack of a connected and integrated network system has resulted in traffic congestion at the main arteries of urban fabric, such as Atatürk Boulevard, Çetin Emeç Boulevard, and Eskişehir Road. As it can be seen in the table below, these very reasons have led to a reduction in the number of trips to work by walking and cycling (Çalişkan, 2004: 197; Elker et al., 1977: 51).

Table 4.2, Car ownership, usage and their relation to transit, (Çalişkan, 2004: 198)

City	% of Total Passenger km on Transit	% of Work Trips on Transit	% of Work Trips by Walking and Cycling	Transit Service Level (vehicle km of service per person)	Road Supply (meters per person)
Ankara 1985	77	68	21	7.01	1.95
Ankara 1992	66	52	32	9.00	NA
Ankara 2003	58	54	18	11.04	1.87

An evaluation on employment ratio in the metropolitan city of Ankara demonstrates that the districts of Çankaya, Keçiören and Yenimahalle have the highest rates. In this assessment, among the fields of service, industrial and agriculture sectors, it is clear that the districts of Altındağ, Sincan and Gölbaşı have the highest employment rates in the industrial sector. The reason can be the close location of Sincan *Organized Industrial Zone* to the district of Sincan, and existence of small industrial enterprises in the district of Altındağ. Additionally, in the service sector, the districts of *Çankaya, Etimesgut, Yenimahalle* and *Keçiören* are the main sources of employment while Gölbası, Altındağ, Mamak and Sincan feature the lowest values (Figures 4.45-48).

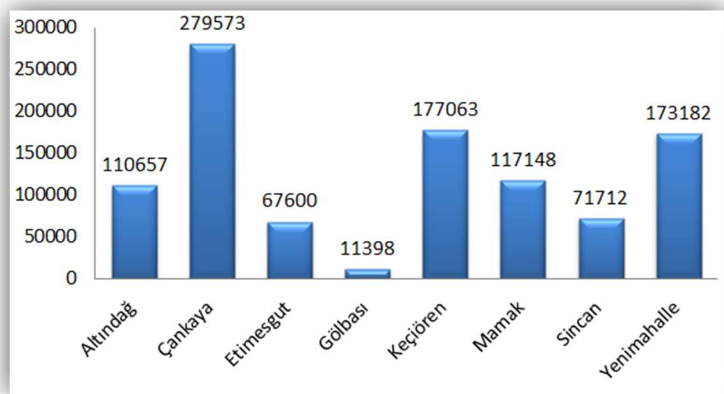


Figure 4.44, Ankara Provincial Labour distribution by districts. (Ankara Municipality, 2000: 227)

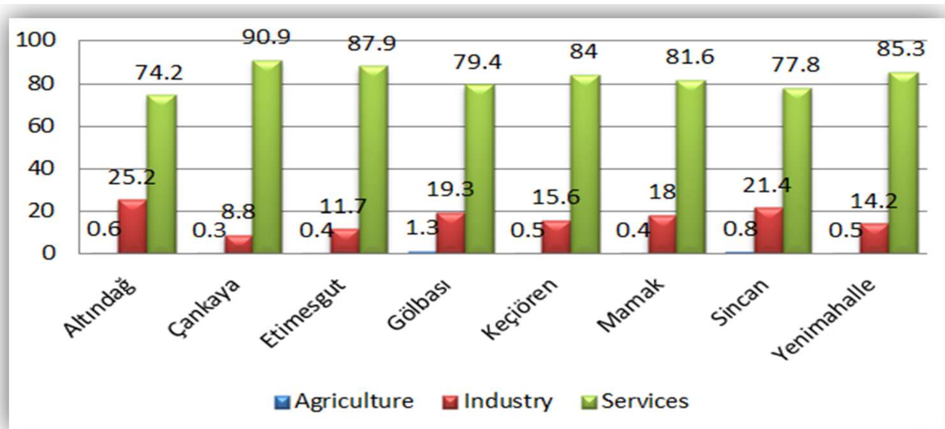


Figure 4.45, Employment sector distribution by districts. (Personal study based on the data retrieved from (Ankara Municipality, 2000: 227))

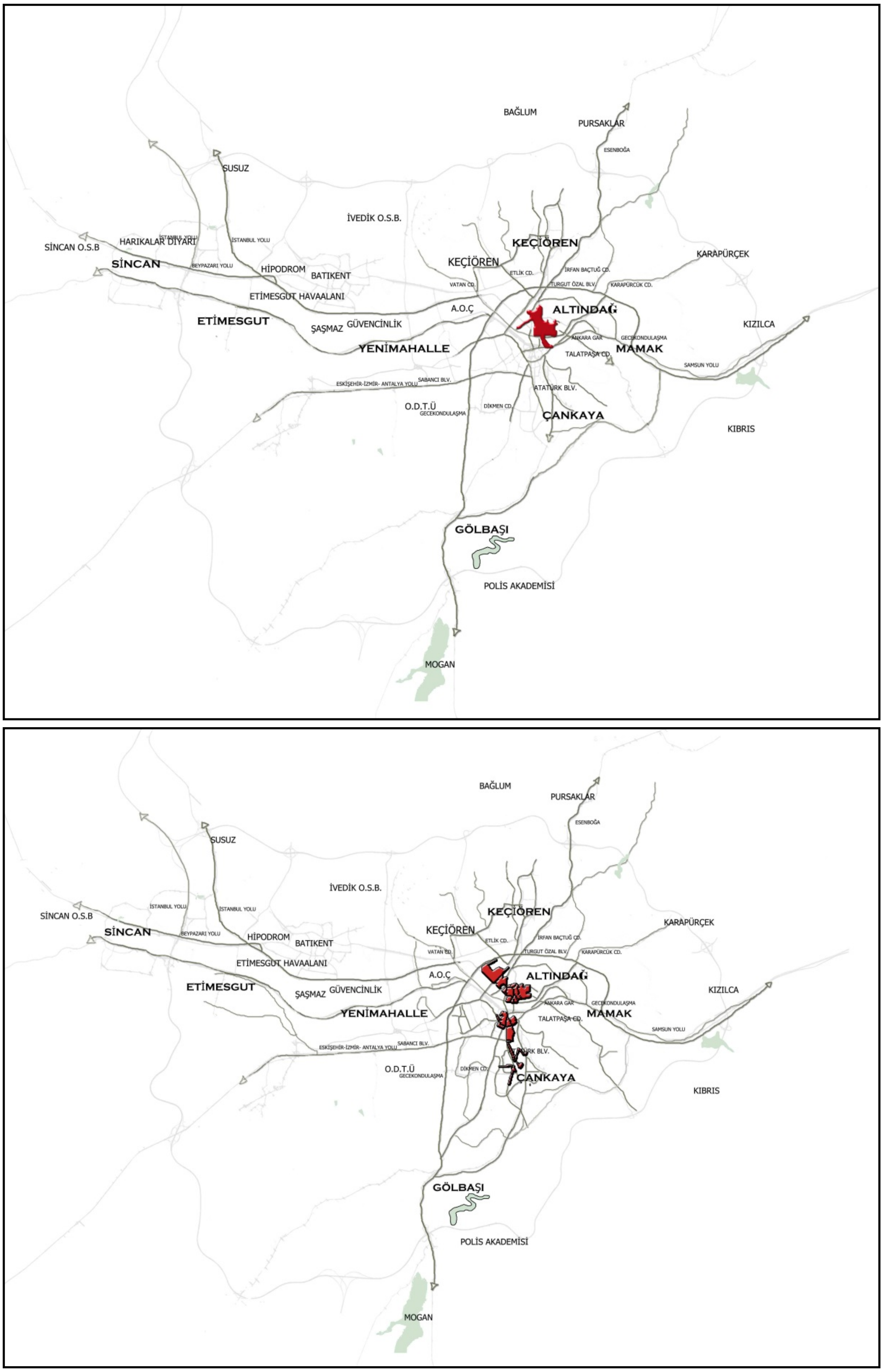


Figure 4.46, Ankara commercial and business development map, Above: 1920, Below:1950
(Personal study and rendering)

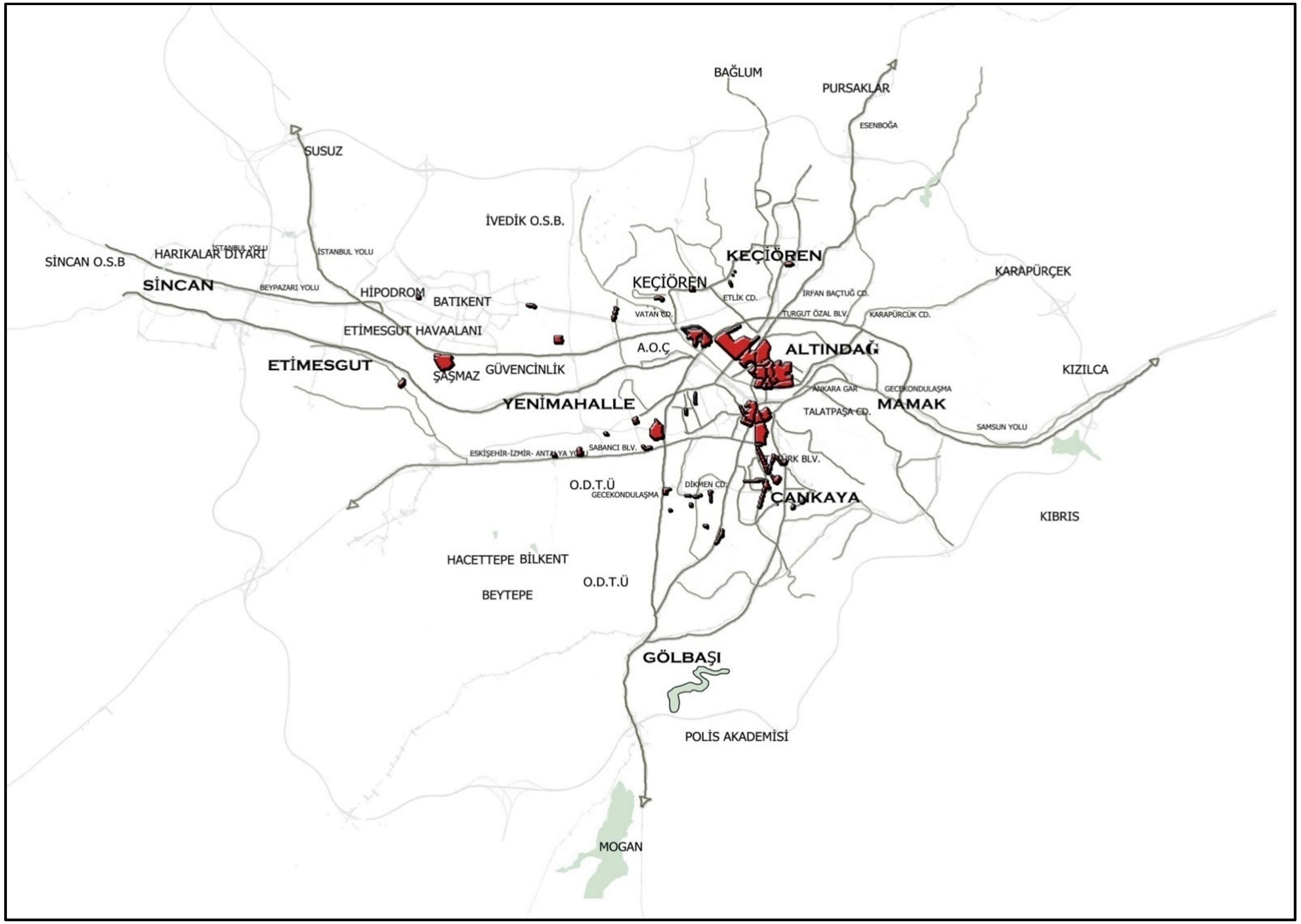
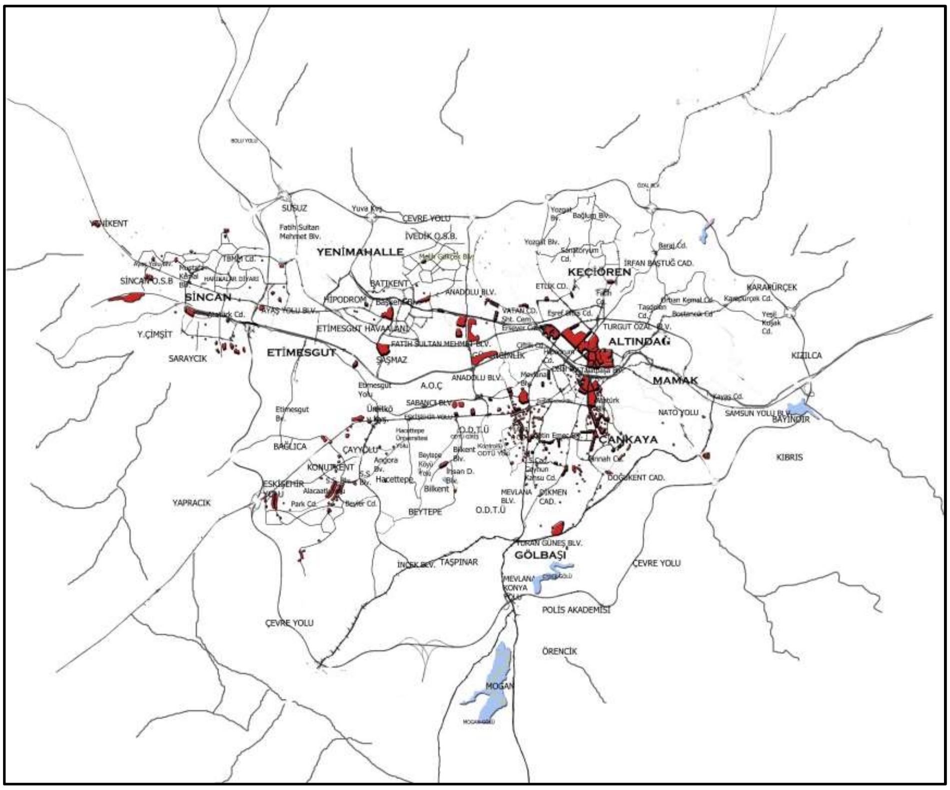


Figure 4.47,Ankara commercial and business development map, 1970 (Personal study and rendering)



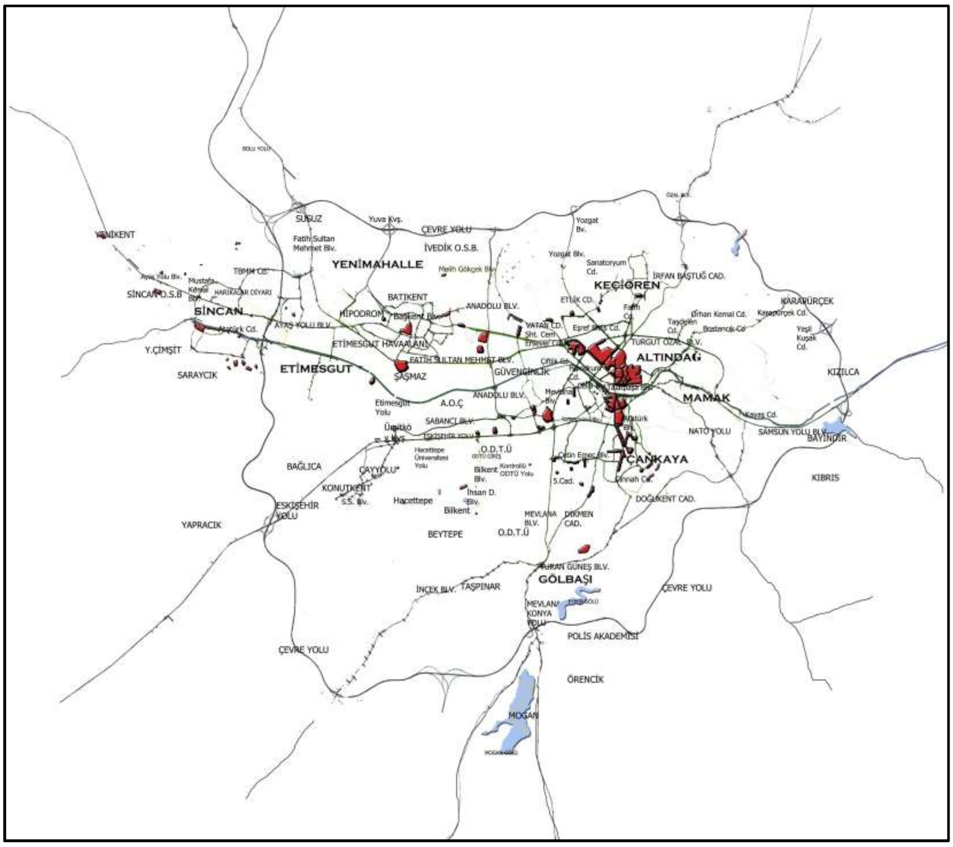


Figure 4.48, Ankara commercial and business development map, Above: 2005, Below: 2015: (Personal study and rendering)

CHAPTER 5

ASSESSMENT OF MESO-LEVEL WALKABILITY IN TUNALI AND ÇUKURMABAR NEIGHBORHOODS

This chapter aims to evaluate the walkability capacity of Tunalı and Çukurambar neighborhoods with particular attention to major attributes of walkability, which are explained in detail in Chapter 2. It first explains the essential features of case studies and then examines the meso-scale walkability qualities regarding the main walkability parameters: *transportation system* and *land use development*.

5.1 First case study: Tunalı Neighborhood (TN)

Tunalı Neighborhood is located south of Kızılay in Çankaya district (Figure 5.1). Within the scope of this my research, Tunalı Neighborhood (TN) starts from Kuğulu (Swan) park, continues to the intersection point of Atatürk Boulvard and Esat and Hacıyolu Streets and then continues to Bülbülderesi Street up to Tahran Street. It occupies an area of 1.113 $km^2$and 4268 m boundary length. TN is a traditionally developed sub-center of the metropolitan city of Ankara that is within close accessibility to Kızılay, one of the main city centers. It is also known as a prestigious neighborhood of Ankara city that appeals mostly to high-income groups. Tunalı Hilmi Street (THS), one of the major high streets and pedestrian-dominant precincts of Ankara, is its most popular street. Thanks to its location and attributes such as being a high street in TN, containing parks such as Kuğulu and Seğmenler, cafés and restaurants, famous hospitals such as Akay, Bayındırlık, Kudret, and Kavaklıdere, prestigious hotels, such as Sheraton, Hilton and Ramada, various institutions, and consulate buildings; it has transformed into one of the preferred high-level neighborhoods of the city.

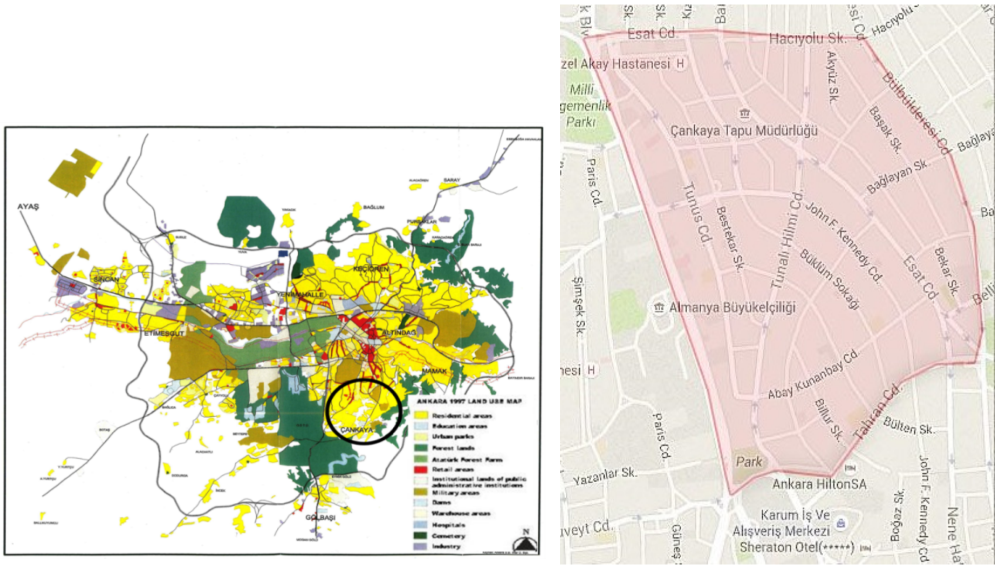


Figure 5.1, Left: Ankara and the location of Kavaklıdere neighborhood; Right: Boundary of research study area

The Major Meso-Level Attributes of Walkability in Tunalı Neighborhood

5.2 Transportation System

5.2.1 Social Value of Transportation System Supporting Walkability

5.2.1.1 Accessibility

As discussed in Chapter 2, the main and first parameter in the assessment of the social value of a transportation system is accessibility, which affects walkability at macro and meso scales. In a walkable city, an urban pattern should provide accessibility to public transport, daily activities, local facilities and green areas through various modes of transportation, such as walking, cycling, and public transport modes. When the distance between transport lines and stops is examined in the case of TN and whether the distance and travel time exceeds 600m (10 min walking distance) is evaluated; it becomes clear that the distance between transit stations and the relevant surrounding area does not exceed 600 m; making public transportation facilities accessible by walking (Figure 5.2).

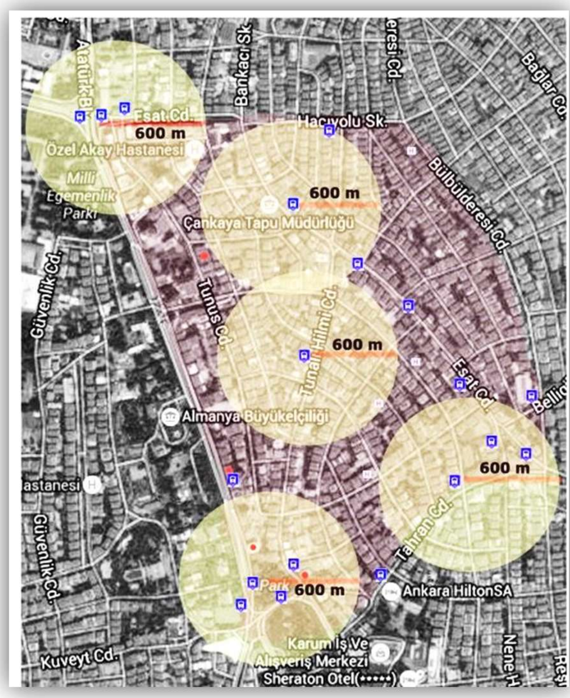


Figure 5.2, The analysis of Tunalı Hilmi Neighborhood to understand whether the transit stations are located within walking distance (Re: Personal study and rendering)

Furthermore, in the assessment of accessibility to daily activities and local facilities to find out whether the distance between home and destinations exceeds 400-800 m (10 minutes walking distance); it becomes clear that many common facilities, located in TN, are within walking distance (Figure 5.3).

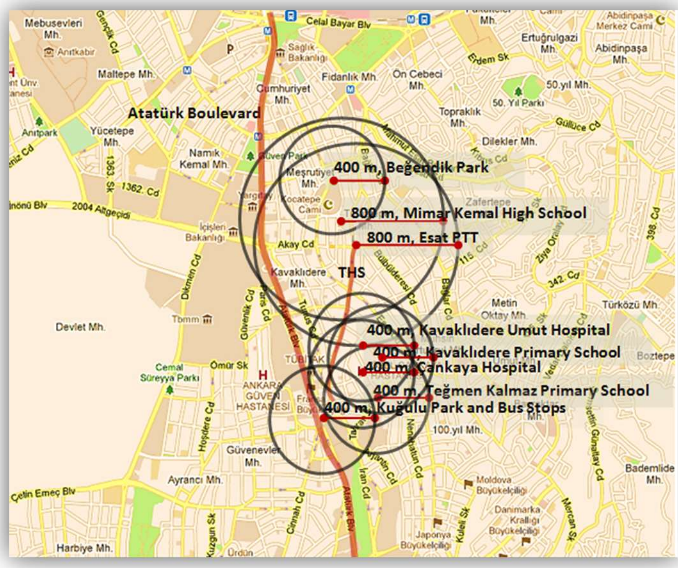


Figure 5.3, The analysis of THS to understand whether the common facilities are located within walking distance (Re: Personal study and rendering)

Furthermore, it is accessible to green areas such as Kuğulu, Seğmenler, and Milli Egemenlik Parks, green areas around Karum shopping center; additionally, has views to green areas inside the consulate buildings. Therefore, in the case of increasing the quality of other walkability measures, the walkability level of the site will be improved further (Figure 5.4).

Figure 5.4, Green areas accessible by TN, Accessed from Google Earth and personal rendering

Results of the research, carried out by Gazi University (2013), in the field of the use of vehicle type before the pedestrian trip in John Kennedy and Tunalı Hilmi Streets demonstrate that almost 33.2% of people start and finish their trip by walking. In addition, 29.7% of people use the EGO bus system before their walking trip. Finally, the least number of people (0.90%) use taxi before their walking trip (Figure 5.5).

Additionally, assessment of the vehicle type after the pedestrian trip in John Kennedy and Tunalı Hilmi Streets indicates that 41% of people do not use any transportation vehicle and start and finish their trip by walking. These groups of people live in residential areas around case streets and have 10-15 minutes walking distance to their destinations. Furthermore, 32.8% of people prefer the use of the bus system after their walking trip and finally, only 7.1% of people use public and private transportation vehicles after their walking trip (Figure 5.7).

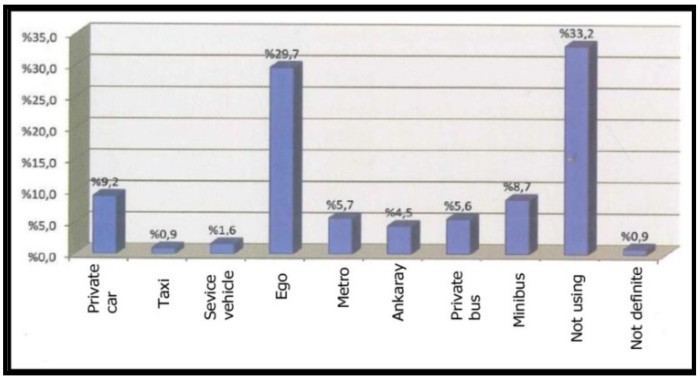


Figure 5.5, vehicle type distribution before pedestrian tripin John F. Kennedy and Tunalı Hilmi streets, (Gazi University, 2013)

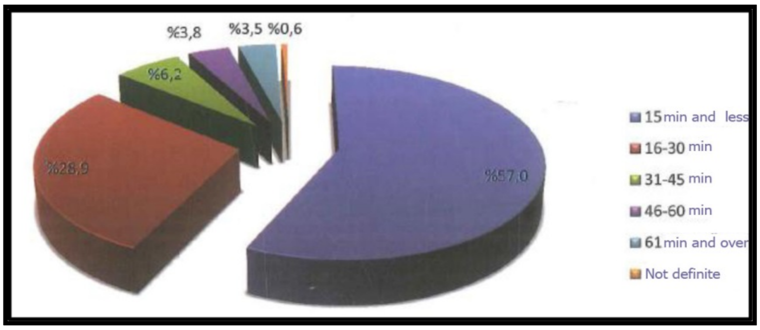


Figure 5.6, Pedestrian time distribution throughout the journey in view of John F. Kennedy and Tunalı Hilmi streets users, (Gazi University, 2013)

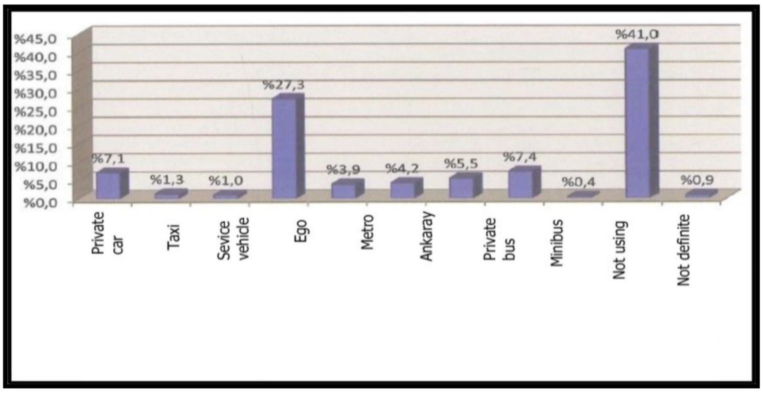


Figure 5.7, vehicle type distribution after pedestrian trip in John F. Kennedy and Tunalı Hilmi streets, (Gazi University, 2013)

The evaluation of people's walking time and distance during their trip indicates that 57% of people have a walking duration of 0-15 minutes, while 28.9% have 16-30 minutes and 3.5% have 61 minutes walking duration. The average walking distance of people is about 18 minutes and necessitates the use of transportation vehicles over this walking distance (Figure 5.6).

a. Network pattern

As discussed in chapter 2, the closeness of destinations in a network pattern influences mode choice and trip frequency in a positive manner. Networks can be high or low-interconnected. The interconnected street patterns have a simple system, in which traffic flows in parallel streets equally, to ensure alternative travel trip routes for pedestrians and bike users, and decrease trip distance, due to high value of intersections (Lawrence and Engelke, 2014: 14,47; Eriksson et al, 2012).

The network pattern of TN is similar to a modified grid and provides direct and short travels for pedestrians. It ensures alternative travel trips in parallel streets; so, it provides a high-level of walkability and livability (Figure 5.8).

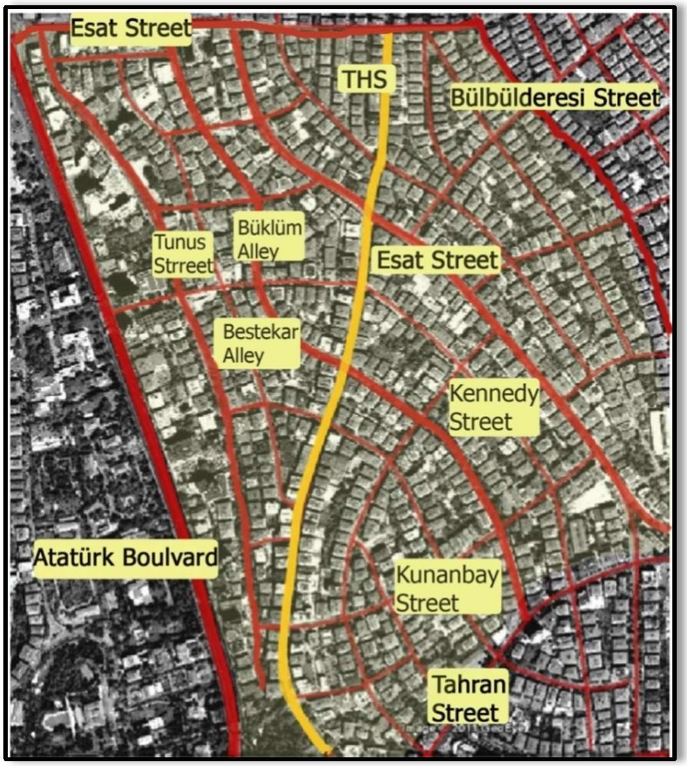


Figure 5.8, Street pattern of THN (Re: Personal study and rendering)

b. Network connectivity

Network connectivity of TN (Tunali Hilmi neighborhood) obtained by dividing the number of actual connections by the number of potential connections is 1.73. It is above the minimum value of network density (1.4= more than 100%), mentioned in the literature section; so, it is highly connected.

c. Land use pattern

As mentioned before, land use pattern is an essential value of accessibility. Walkable land use patterns should be compact with an interconnected street pattern, and roads that are as narrow as possible, with minimum parking facility.

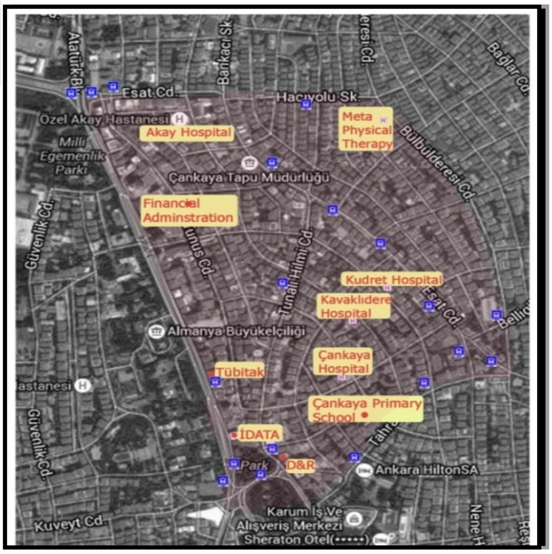


Figure 5.9, Above: Compactness level and Below: Placement of bus stops around the case study area. (Re: Personal study and rendering)

In the analysis of level of compactness, the land use pattern is known as compact if the distance between settlement areas is less than 200m; otherwise, it is regarded as a dispersed urban area and that is against walkability. Additionally, land use pattern should have various usages as single-use land development forms increase the distance between trip origins and destinations strengthen car dependence and discourage access with walking and biking.

Analysis of the distance between settlements and other land uses indicates that TN has a compact land use pattern with the variety of land uses including restaurants, cafés, schools, health centers, and private and public work places (Figure 5.9).

5.2.1.2 Separated walking and biking system

With the exception of park areas, no separated walking and biking system is offered to the users of TN. In this sense, Gazi University (2013) investigated to find out which groups of people used biking and which groups did not use biking, as well as the reasons for the latter. It demonstrated that 68.4% did not use biking while 31.6% used it. 21.9% of the people who did not prefer bicycle use stated non-existence of a separated biking system as their reason. Furthermore, 21.6% of them clarified their reason as insufficient area for biking, while 18.4% expressed inadequate parking area for non-motorized transportation vehicles as their reason. Finally, 31.4% of people indicated as their reason for not biking, unsuitable attitudes of motorized vehicles and lack of a suitable public transit system for transporting their bicycles (Figures 5.10-11).

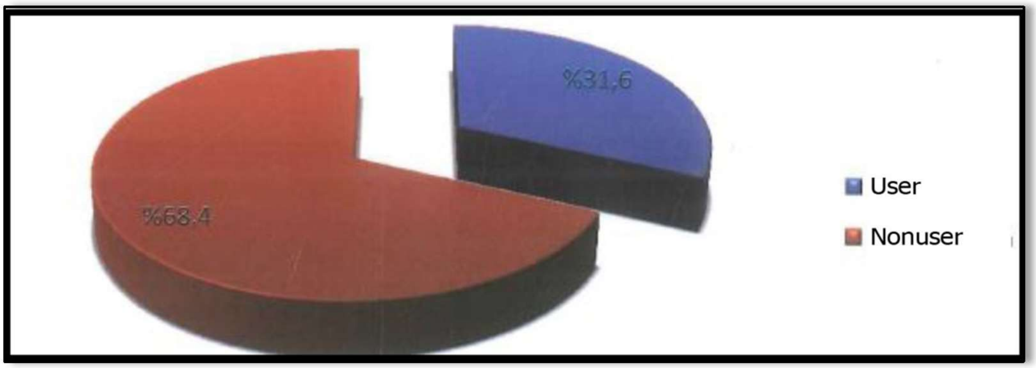


Figure 5.10, Bicycle use ratio in John F. Kennedy and Tunalı Hilmi streets, (Gazi University, 2013: 45)

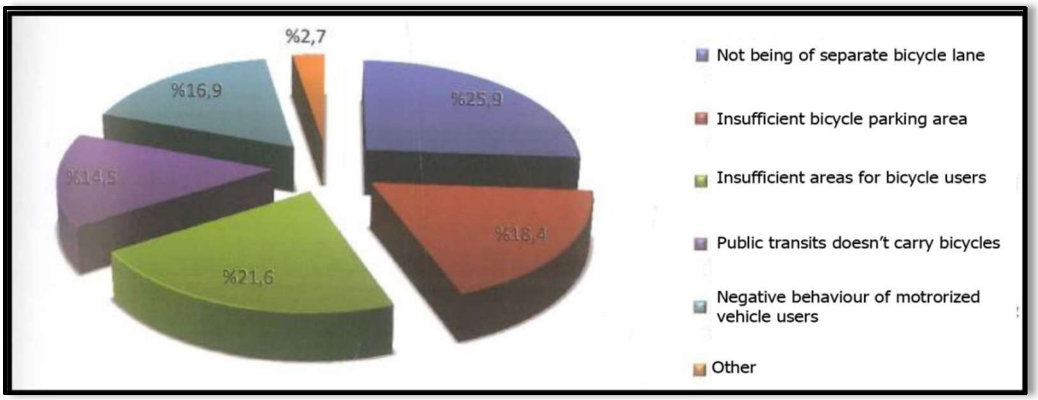
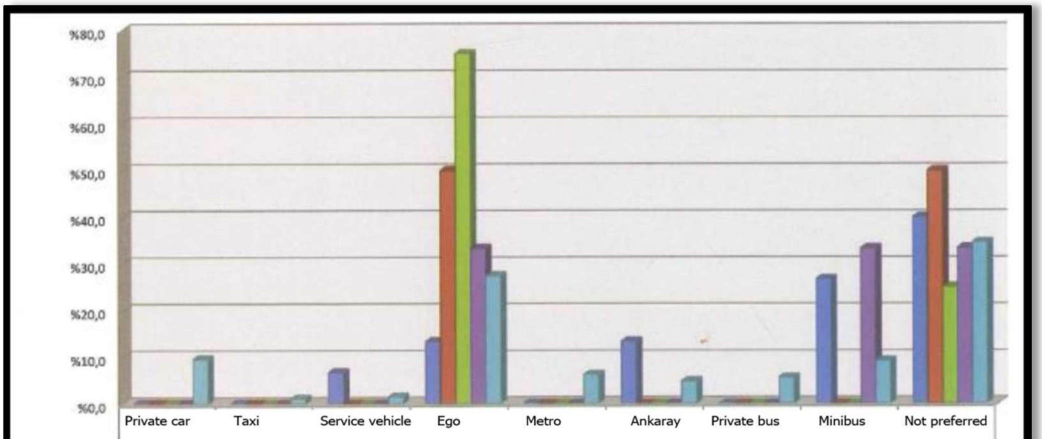


Figure 5.11, Encountered difficulties during the use of bicycle in view of John F. Kennedy and THS users, (Gazi University, 2013: 48)

5.2.1.3 Equity

In analysis of equity within the city of Ankara in response to the question of whether Ankara's transportation system planning and policies improve the accessibility of lower-income people groups or not, it becomes clear that *transportation prices do not appeal to all economic groups of people as almost 77% of passengers are not satisfied with public transit prices. Nevertheless, people with an income level of 1000-3500 TL inevitably use the EGO bus facility.*



	Private car	Taxi	Service vehicle	Ego	Metro	Ankaray	Private bus	Minibus	Not preferred
walking disabled	%0,0	%0,C	%6,7	%13,3	%0,0	%13,3	%0,0	%26,7	%40,0
Partially -sighted	%0,0	%0,C	%0,0	%50,0	%0,0	%0,0	%0,0	%0,0	%50,0
Hearing impaired	%0,0	%0,C	%0,0	%75,0	%0,0	%0,0	%0,0	%0,0	%25,0
Other	%0,0	%0,C	%0,0	%33,3	%0,0	%0,0	%0,0	%33,3	%33,4
No handicap	%9,6	%1,3	%1,5	%27,4	%6,2	%4,8	%5,6	%9,2	%34,6

Figure 5.12, Vehicle type use before walking trip according to kind of disability.
(Gazi University, 2013: 48)

In the continuity, handicapped users of John F. Kennedy and Tunalı Hilmi Streets were asked about which types of transportation vehicles they used before walking trip. The results of this investigation carried out by Gazi University (2013) indicated that 75% of handicapped people, mostly ones with hearing disability, used the EGO bus system, while, 26.7% of people with moving disability preferred dolmuş and 40% of them did not prefer to use any public transportation vehicle due to unsuitability of public transits to their disability type. Indeed, the majority of people with moving disability did not prefer to use public transportation, especially the EGO bus system (Figure 5.12).

5.3 Land use development

As mentioned in the literature section, land development pattern is a macro-meso property of urban form which indicates the proximity degree between origins and destinations and affects travel behavior directly. Its main parameters are diversity and density which can be measured in five manners: *population and employment density, built form, and sub-centers density*.

5.3.1 Population Density

Population density refers to the number of residents per unit area. According to Ankara Municipality census results; the number of people living in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods are 6554, 3963, 7133, and 3068 persons respectively. Although the population density in Esatoğlu and Küçükesat neighborhoods is higher than others, there is a balanced density across Tunalı neighborhood (Figure 5.13).

The total population density of Tunalı neighborhood obtained by dividing 20718 people living in this district by 108.89 Ha land area is 190.26 P/Ha. Taking into account the fact that a walkable city should have the medium density of over 40 people per ha; it can be concluded that the housing density of Tunalı neighborhood is over the minimum criteria.Additionally, elderly groups of people account for the major part of housing density in TN (Figures 5.13-15).

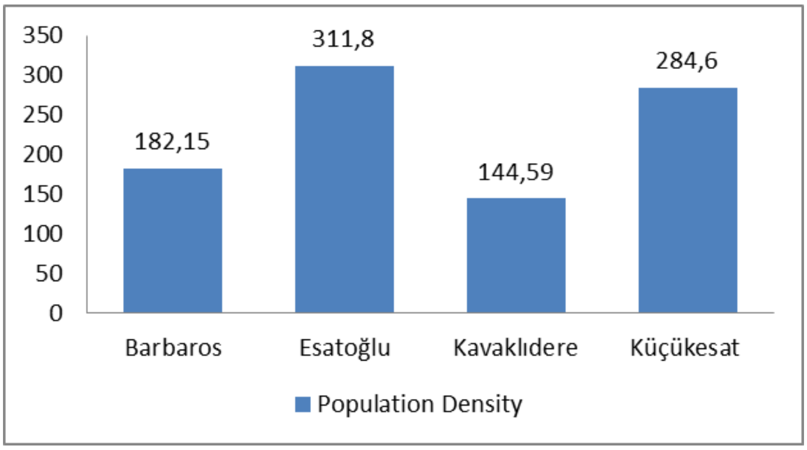
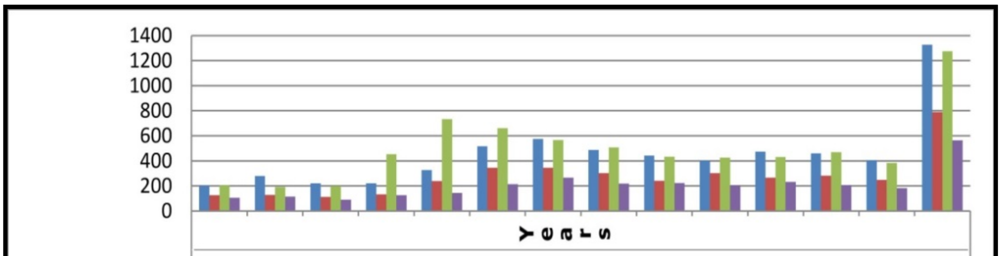


Figure 5.13, Above: Population density per neighbourhood. (Ankara Municipality) Below: TN boundary in this research. (Personal rendering)



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	+65
BARBAROS	203	279	221	220	327	517	575	487	443	402	474	461	405	1326
ESATOĞLU	126	128	113	133	239	344	345	302	241	301	266	282	247	789
KAVAKLIDERE	205	191	199	453	734	660	566	507	434	426	430	470	384	1274
KÜÇÜKESAT	106	115	90	126	143	215	265	219	222	205	232	208	182	563

Figure 5.14, Number of people living in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods according to age distribution, Re: Ankara Municipality and Personal evaluation and rendering

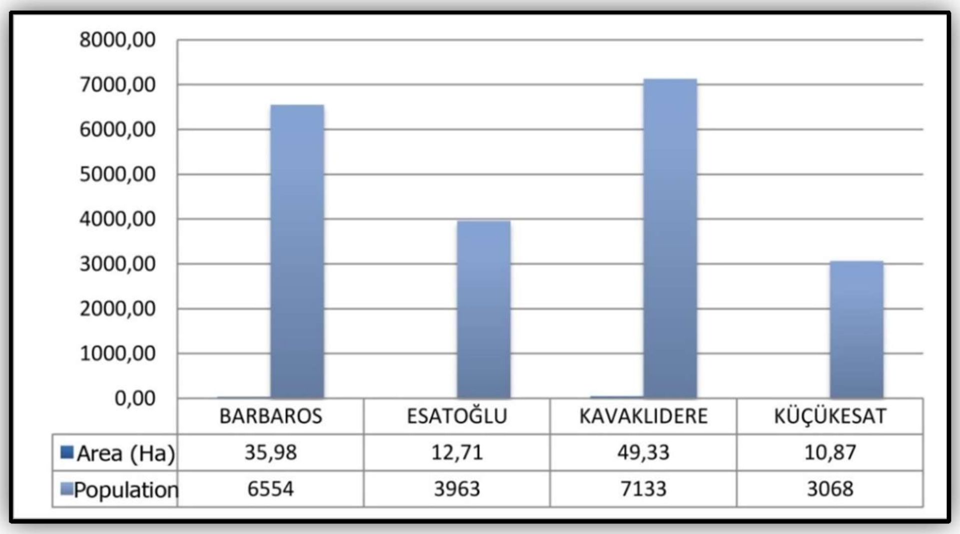


Figure 5.15, Total land area and people living in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods.(Re: Ankara Municipality and Personal evaluation and rendering)

5.3.2 Built-form Density

Built-form density addresses the density of built and residential area per hectare. TN including Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods, embraces 3417, 2013, 3593, and 1435 residential places, making a total of 10458 residential flats in addition to 4917 workplaces. Hence, the total built-form density in TN found by dividing 15375 total built-form numbers to the total land area, which is 108.89 Ha, becomes 141.19 numbers per hectare. These usages are located in 620 blocks, covering 73 percent of the area of TN (Figure 5.16).

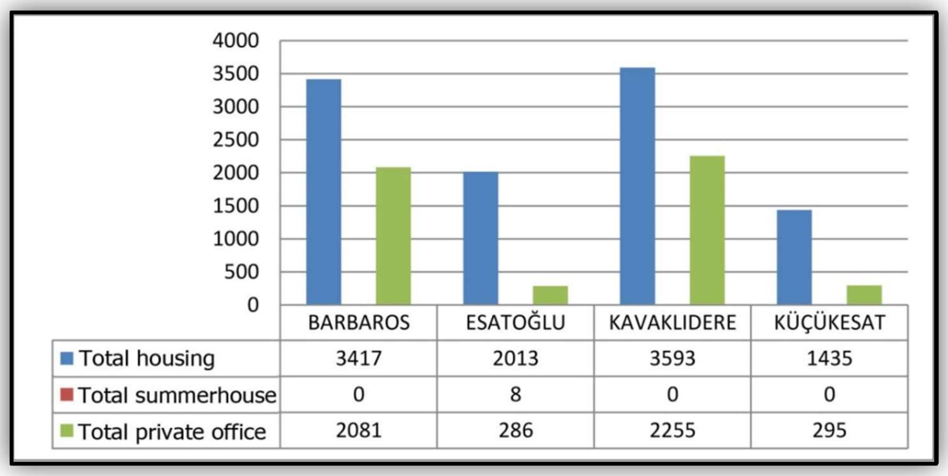


Figure 5.16, Total residential, summerhouse, and private workplace numbers in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods.(Re: Anakara Municipilaty and Personal evaluation and rendering)

5.3.3 Employment Density

Employment density measures the existent number of employees per area. As mentioned in the evaluation of employment density in Ankara at macro scale, Çankaya district has a high level of employment density. Additionally, the number of private workplaces in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods are 2081, 286, 2255, and 295 respectively; so the employment density in each of these nei ghborhoods is 57.83, 22.50, 45.71, and 27.13 respectively, and the average density in TN is 45.15 workplaces per hectare. Based on the assumption that an average of 2 people are employed in each workplace, dividing the total number of employees, which is 4917*2, by 108.89 hectare yields 90.31 employees per hectare (Figure 5.17-18).

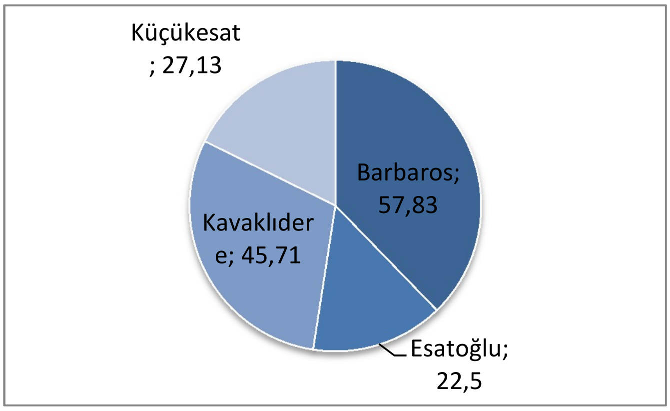


Figure 5.17, Employment density in Barbaros, Esatoğlu, Kavaklıdere, and Küçükesat neighborhoods, Re: Ankara Municipilaty and Personal evaluation and rendering

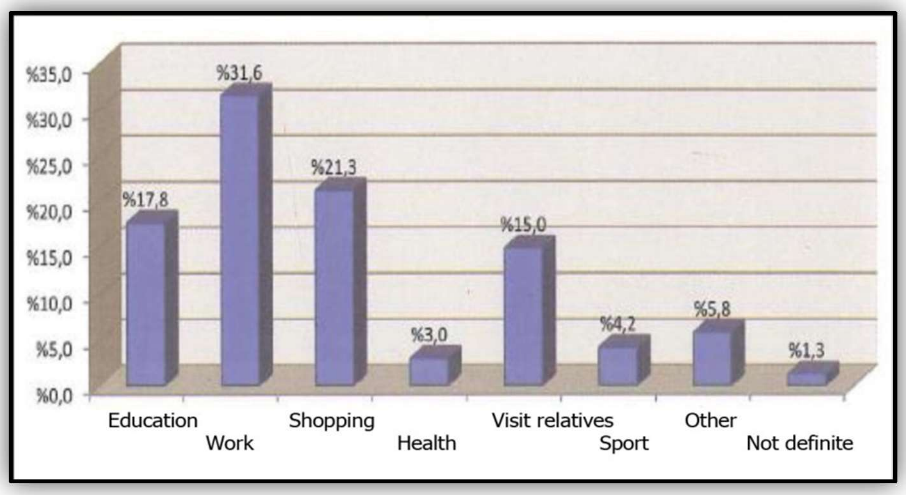


Figure 5.18, Distribution of the purpose of the journey on foot. (Gazi University, 2013)

The evaluation of access modes of pedestrians in John Kennedy and Tunalı Streets indicates that most groups of people (31.6%) use walking for accessibility to work. Furthermore, 21.3% of people use walking for shopping purposes and finally, smaller percentages of people use walking for accessibility to health centers, visiting and daily activities. Hence, it becomes clear that generally, people use walking for work and shopping reasons (Figure 5.19).

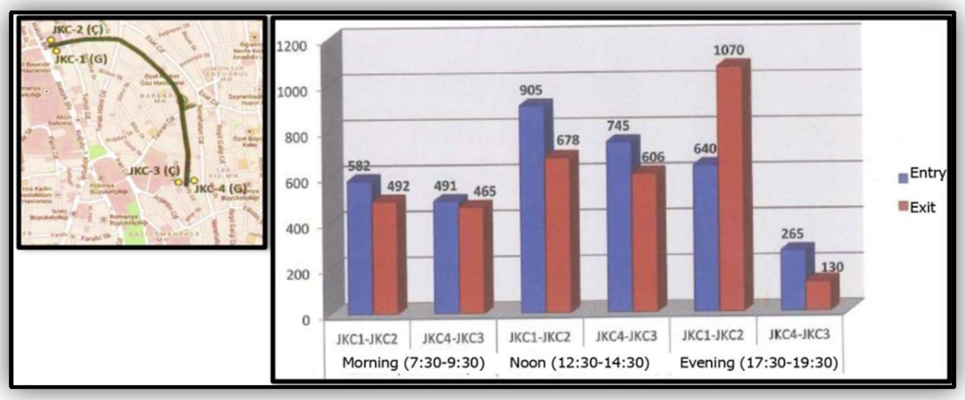


Figure 5.19, Results of pedestrian counting in 8 different parts of THS. .(Gazi University, 2013)

Additionally, pedestrian counting in eight different points of THS indicates that the highest level of pedestrian entrance occurs at noon hours, which is about 1424 persons. Furthermore, the highest level of pedestrian exit occurs during evening hours and is about 2235 persons. The same assessment in 4 different points of John F. Kennedy Street indicates that the highest level of pedestrian entrance occurs at noon hours and is about 905 people. On the other hand, the highest level of pedestrian exit is seen during evening hours and is about 1070 persons (Figure 5.20).

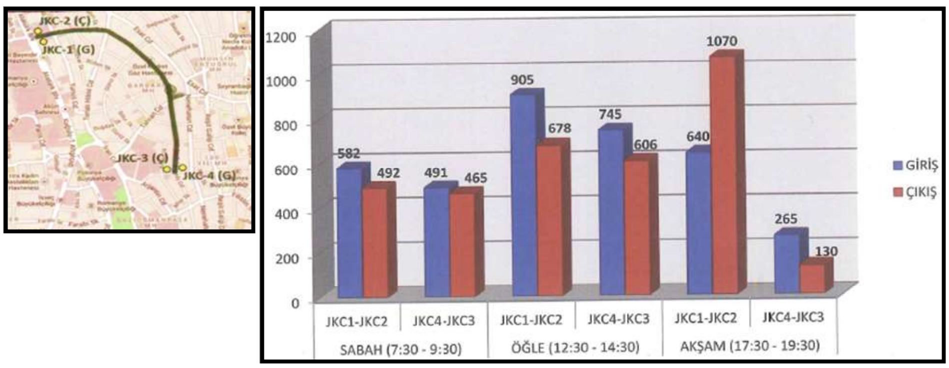


Figure 5.20, Results of pedestrian counting in 4 different parts of THS.(Gazi University, 2013)

5.3.4 Diversity

TN is home to several cafés and restaurants, famous hospitals such as Akay, Bayındırlık, Kudret, and Kavaklıdere; prestigious hotels, such as Ramada, Sheraton and Hilton; as well as institutions, and consulate buildings. There are mixed-use corridors in many parts of TN, such as THS, Bestekar Street and Büklüm Street. It includes 620 building blocks and has high-level of block density in a given area. The average length of building blocks in the TN is low (450 m^2), so it is possible to claim that streets connect together in a system of small blocks. As a result, in TN, street length and distance between origin and destination is short. This allows for more direct and shorter travel opportunities, contributing to walkability and decreasing car travels in TH neighbourhood. Additionally, it has approachability to Kuğulu, Seğmenler, and Milli Egemenlik Parks and the green areas around Karum Shopping Center. These assessments indicate that it has a high level of variety and accessibility.

5.4 Second case study: Çukurambar Neighborhood (ÇN)

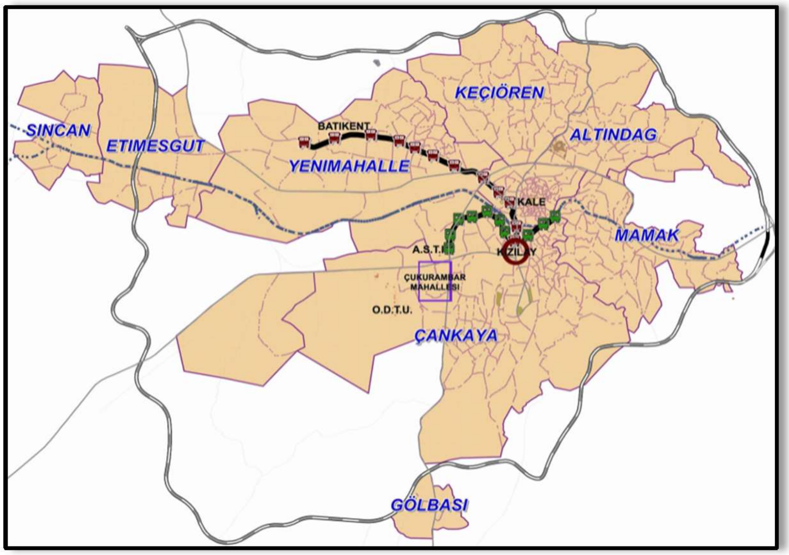


Figure 5.21, The location of Çukurmabar within Ankara City

Çukurambar Neighborhood (ÇN) is situated to the south-west of Ankara City in Çankaya district. It is encircled by the Eskişehir Highway and Kızılırmak neighborhood to the North, The General Directorate of Mineral Research and

Exploration (Maden Teknik Arama Genel Müdürlüğü) and Middle East Technical University (Orta Doğu Teknik Üniversitesi) to the west, Balgat district and Konya highway to the east, and Yüzüncüyıl neighborhood to the south. It has 5185 m boundary length and occupies an area of 1.440 km^2. It is situated on the intersection of three very important highways and main axes of the city: Eskişehir Highway, Konya Highway and Çetin Emeç Boulvard (Figure 5.21).

The word Çukurambar is the combination of ‘’çukur’’, meaning ‘’pit area’’ and ‘’ambar’’, meaning warehouse. Çukurambar is positioned in a low topography area including slight slopes from Eskişehir highway, Balgat districts, and Yüzüncüyıl neighborhoods. Additionally, Çukurambar used to be a productive agricultural area including grain storehouses. Accordingly, its name implies both topography and historical land-use.

Fundamentally, Çukurambar indicates three types of settlement character including residential district, a continuously growing commercial, business and culture center, also including some health services, and an area of transformation. Its original inhabitants occupied the public lands and built their squatter (gecekondu) houses on this site without obtaining a legal permission of the municipality to build and live. As a result, by 1974, Çukurambar became covered by the informal housing of squatter settlements. After 1993, with the start of the implementation and revision plans, the spatial and socio-economic geography of the area changed drastically. In addition, with the suburban development of Ankara along the west corridor and its direct connections with the main arteries such as the Eskişehir Road, Istanbul Road, Konya Road and Samsun Road, Çukurambar has more and more conceived as a highly accessible area to the CBD, as well as other parts of the city. The central location of this neighborhood increased its importance as a sub-center, containing residential, working, commercial, cultural, tourism and health uses. Over the last ten years, with the changes in the development plans, the building densities have been increased especially for residential, commercial and business uses. A totally new neighborhood and an extension of the CBD has been constructed in this area. The site includes luxury high-rise buildings for multiple functions, such as residential, office, commercial, tourism, and culture uses. Within this area, there are a number of shopping malls, such as Armada and Next Level, serving for high and middle-income groups. The site also contains a number of hotels, such as J.W. Marriott, important hospitals, such as Bayındır Hospital, Ufuk University Hospital, the public agencies such as the Undersecretariat of Turkish Treasury and Foreign Trade, the Bank of Province, the Ministry of Social Security and Labor, Ankara Chamber of Commerce, and the Congresium Convention Centre. Another critical development site in ÇN is the fast transformation of Muhsin Yazıcıoğlu Street (MYS). The street was transformed into a commercial high street of this neighborhood, including luxurious cafés, restaurants, bakery shops and other commercial and service uses, such as banks, delicatessens. Hence, population of Çukurambar increased from 2400 in the early 1980s to 4919 in 2000 and 56000 in 2015.

Briefly put, Çukurambar has transformed into an appealing area for high-income groups of people due to its central location in Ankara, its access to the main arteries of the city, as well as some of the key commercial and business centers, hospitals, cultural and tourism centers, educational sites, such as universities. As an appealing place for high and high-middle income groups, visitors and employees working in this area, Çukurambar has been turned into a highly demanded mix-used neighborhood and sub-centre of Ankara.

5.4.1 The Current Land-use Functions in Çukurambar Neighborhood

ÇN encompasses a variety of commercial, official, and residential uses (Figure 5.22). For this reason, it attracts a significant number of users and consumers from its surrounding vicinity and from the other parts of the city. Today, there are about 190 residential buildings in Çukurambar and 50 residential buildings in Kızılırmak Neighborhoods. There are 24 business centers having 15-storey or above in these two neighbourhoods in total. 90 percent of the residential blocks are situated in ÇN and a small number of them, such as the Next Level complex centre, are combined with commercial-business usages. Hence, most of the buildings in ÇN are specific to one usage. The Next Level Center located on the Eskişehir Highway, Akman Towers, and Liva Patisserie in Yazıcıoğlu Street are among important landmarks of this neighborhood and play a prominent role in the street identity (Figure 5.22-23). A large structure, namely YDA tower, is another important mega structure that is under construction. It is expected to bring a large number of residential and work population, as well as daily users due to the multiple functions it will contain. The mega structure is also expected to increase traffic volume and cause significant traffic congestion for Eskişehir Road and the area of Çukurambar (Figures 5.22-25).

Figure 5.22, The view of ÇN. (Re: www.sozcu.com)

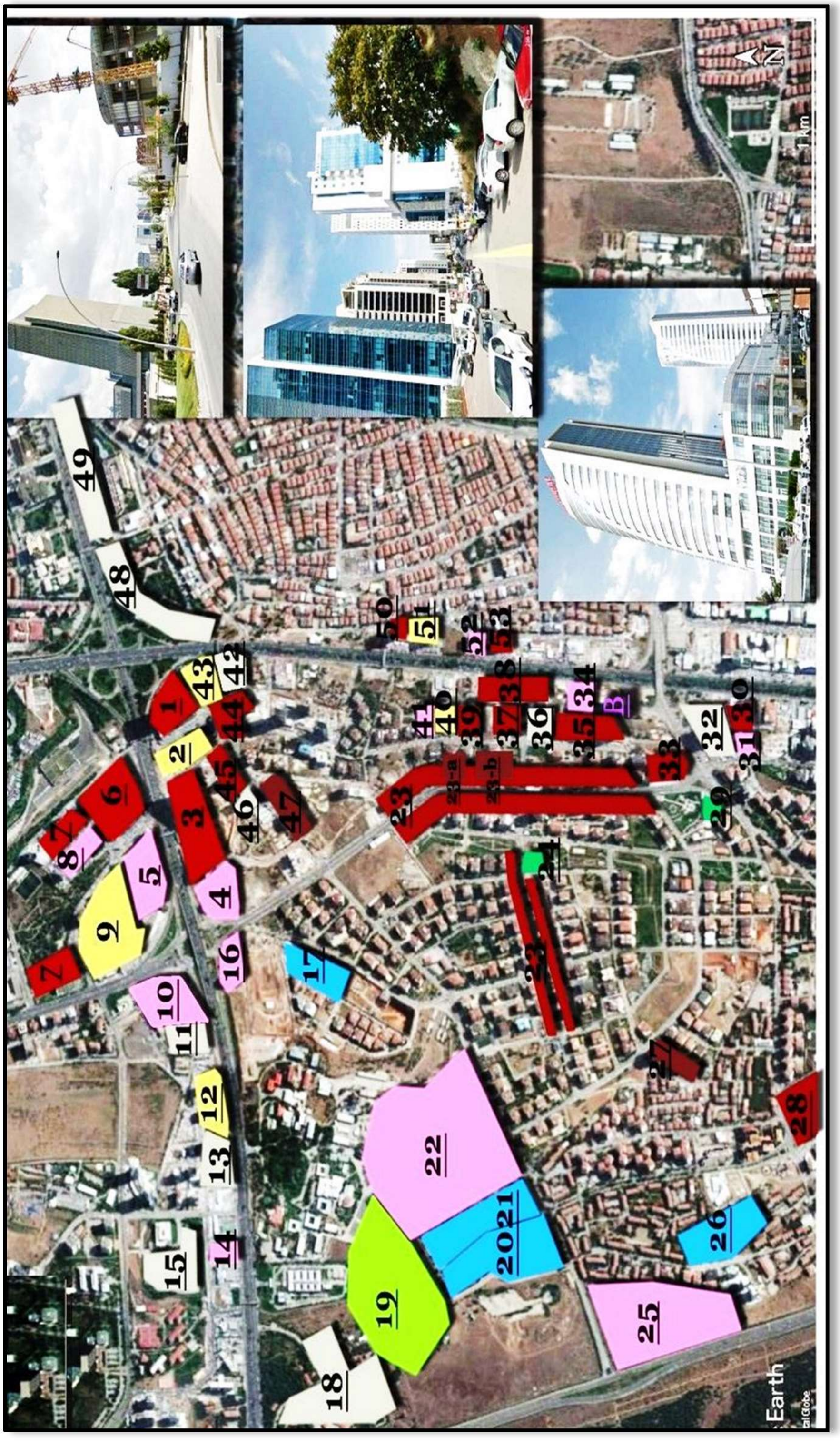


Figure 5.23, Effective land usages of ÇN. (Personal study and rendering)

Land uses of Figure 5.23

1.Next Level Trade Center
2. Bayındır hospital
3. YDA Center
4. JW Marriott Hotel
5.Movempick Hotel
6. Armada Trade Center
7. Right:Bayraktar and Left: AK Plaza
8. Ramada Hotel
9.TOBB ETÜ Hospital
10. Congresium Convention Center
11. Ankara Trade Branch
12. Medicana Hospital
13. Halk Bank
14. Doğan Media Center
15. Halk Bank Management Building
16. Hotel (Continuing Construction)
17. School
18. Şap Institute
19. Çansera Park
20. Arı Schools
21. Çankaya University
22. MTA (Nature Museum)
23. Commercial Lines of ÇN
24. Mosque
25. Vişnelik Building (Culture, Sport and Restaurant)
26. School
27. Gökteşehir Building
28. 100.Yıl Pazar
29. Mosque
30. Commercial Building
31. Sport Activities Center
32. Ankara Court House
33. Business and Commercial Center
34. Ataköşk Hotel
35. ATM plaza
36. Diroctorate of Tax Administration
37. Ulusoy Plaza
38-39. Business Building (Continuing Construction)
40. Koru Hospital
41. Green Park Hotel
42. Başkent Gaz Administration Building
43. Ufuk University Hospital
44. Paragon Tower
45. Farilya Business Building
46. Disaster and Emergency Management Center
47. Arma Tower Housing (Continuing Construction)
48. The department of State
49. Court of Accounts
50. Yelken Business and Commercial Building
51. Memorial Hospital
52. Metropolitan Hotels
53. Business and Commecial Building

Figure 5.24, Above: Paragon business and commercial center; Below: Next Level Complex center and Ufuk University Hospital. (Re: Personal archive)

Figure 5.25, Above: YDA Center; Middle: A view from Eskişehir Road to ÇN. (Re:Youtube.com); Below: B view to ÇN.(Re:Emlaknews.com)

The Major Mesco-Level Attributes of Walkability in Çukurambar Neighborhood

5.5 Transportation System

5.5.1 Social Value of Transportation System Supporting Walkability

5.5.1.1 Accessibility

As discussed in Chapter 2, the main and first factor in the assessment of the social value of a transportation system is accessibility, which affects walkability at macro and meso scales. An urban pattern should provide accessibility to public transport, daily activities, local facilities and green areas through various modes of transportation, such as walking, cycling, and public transport modes. Therefore, through an evaluation of the distance between transport lines and stops and whether the distance and travel time exceeds 600m (10 min walking distance); it becomes clear that, in ÇN, the distance between transit stations and its surrounding area does not exceed 600 m; so there is accessibility to public transportation facilities by walking (Figure 5.26,28).

Furthermore, in the assessment of accessibility to daily activities and local facilities according to the determination that distance between home and destination should not exceed 400-800 m (10 minutes walking distance). This shows that many common facilities located in ÇN are within walking distance. Therefore, if other walkabillity measures provide satisfaction, the walkability level of the site will be improved significantly (Figure 27).

Figure 5.26, The analysis of Çukurambar Neighborhood to understand whether the transit stations are located within walking distance (Resource: Personal study and rendering)

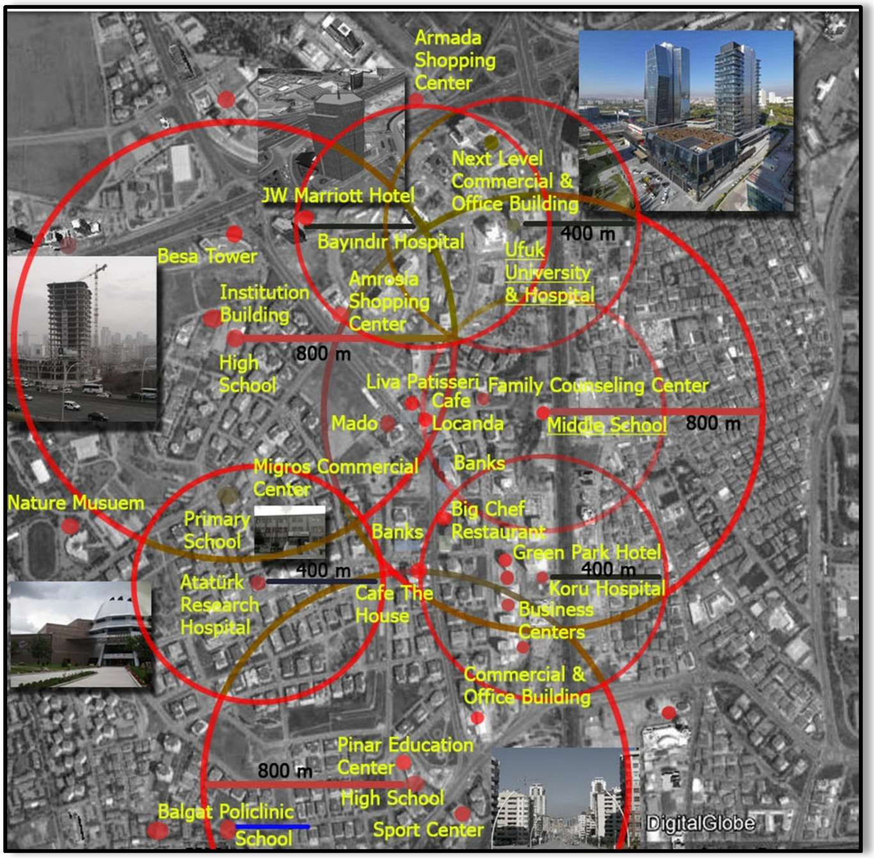


Figure 5.27, The analysis of Çukurambar neighborhood to understand whether the common facilities are located within walking distance (Re: Personal study and rendering)

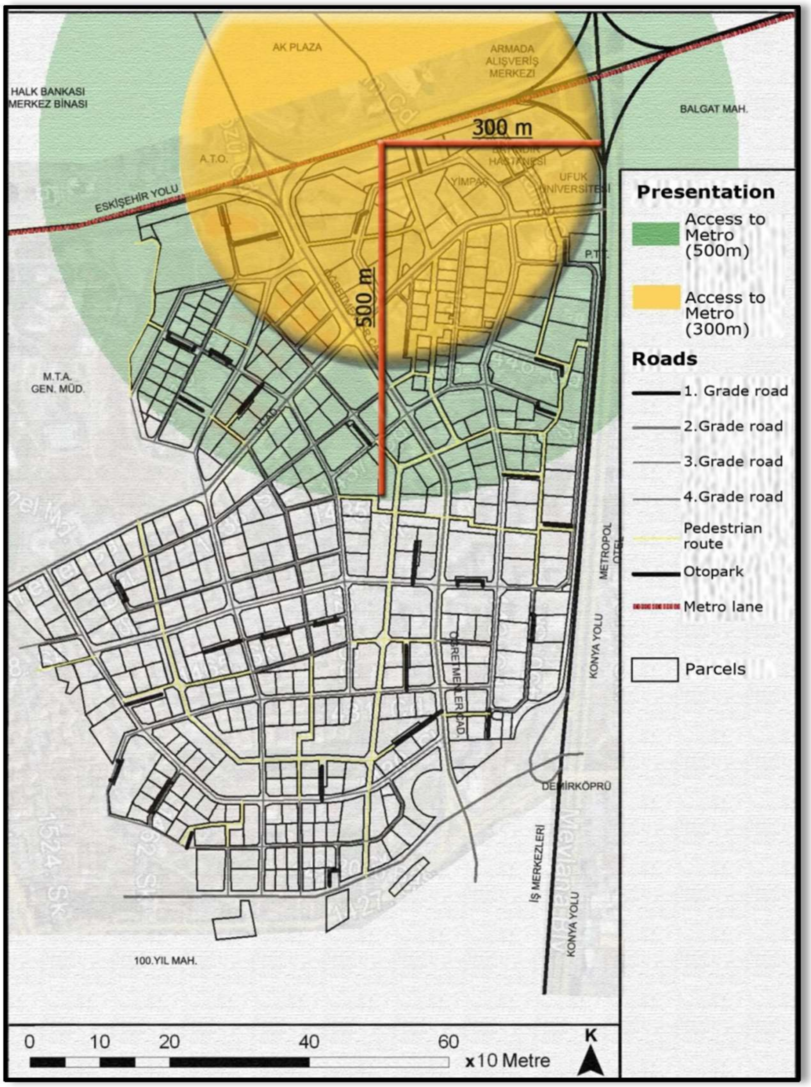


Figure 5.28, The analysis of accessibility of metro stations by walking
(Re: Personal study)

In terms of access to metro stations, almost 45% of people living in ÇN have 500 m walking distance to a metro station. In fact, groups with 300 m distance to the station are more advantageous. On the other hand, pedestrians outside the 500m walking distance have indirect access to metro stations and this increases cost and time consumption (Figure 5.28).

The evaluation of *satisfaction about the vehicle arrival time, number of stops and frequency* shows that 3.9 percent of participants are more satisfied, 33.3 percent are satisfied, 21.7 percent are not fully pleased and 34.6 percent are not satisfied. Additionally, 56.3 percent of participants find the frequency of public transportation vehicles to be insufficient. In the assessment of *distribution of passengers to the nearest stop by walking,* it is observed that 39.9 percent of passengers have a walking distance of 0-4 minutes, while 37.9 percent have a walking distance of 5-9 minutes to nearest the station. The average accessibility duration of passengers to the nearest station is 6 minutes. Furthermore, the valuation of *the reasons of preference of public transportation systemindicates* that 30.6 percent of people prefer public transportation vehicle due to its low price and 24.4 percent of people due to not having private cars. Together, passengers mostly use public vehicles for access to their necessary destinations, such as workplace and school. The reason is that passengers are not satisfied with the quality of public transportation vehicles and use them because of necessity or economic level reasons (Figure 5.29).

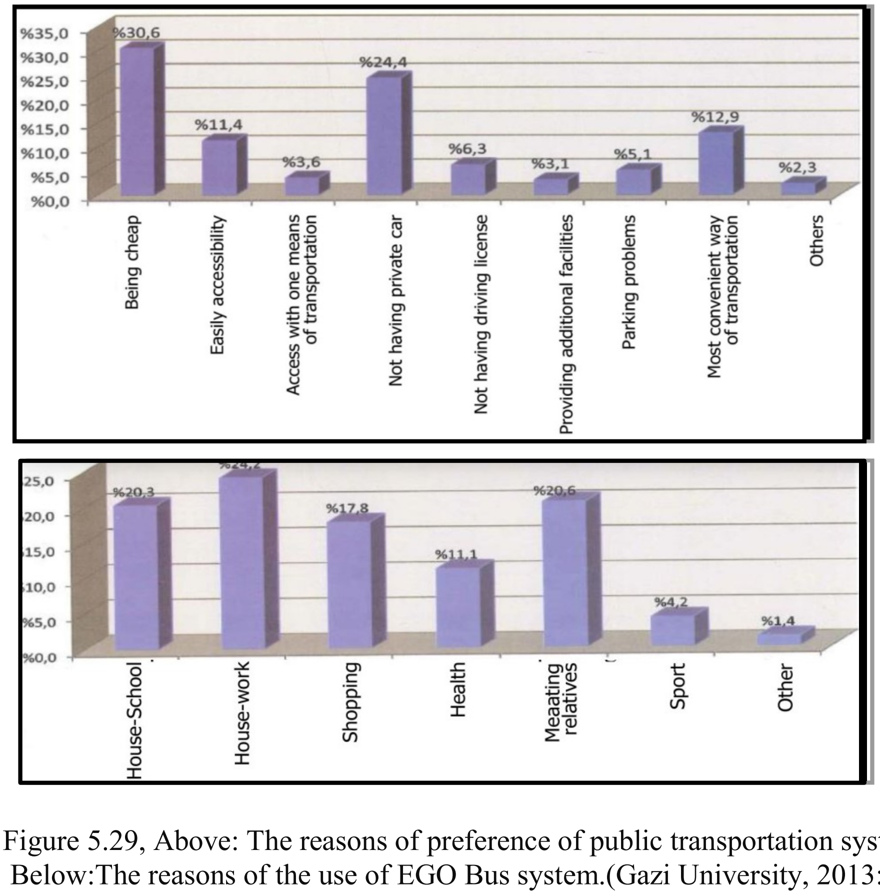


Figure 5.29, Above: The reasons of preference of public transportation system; Below:The reasons of the use of EGO Bus system.(Gazi University, 2013:68)

a. Network pattern and network connectivity

As discussed in Chapter 2, network patterns with low connectivity are hierarchical and curvilinear patterns. They include less intersection per unit area, long trip distances, less alternative trip modes, high car speed, and less pedestrian safety. Therefore, gridiron, interconnected network patterns have the potential to create more pedestrian-friendly neighborhoods.

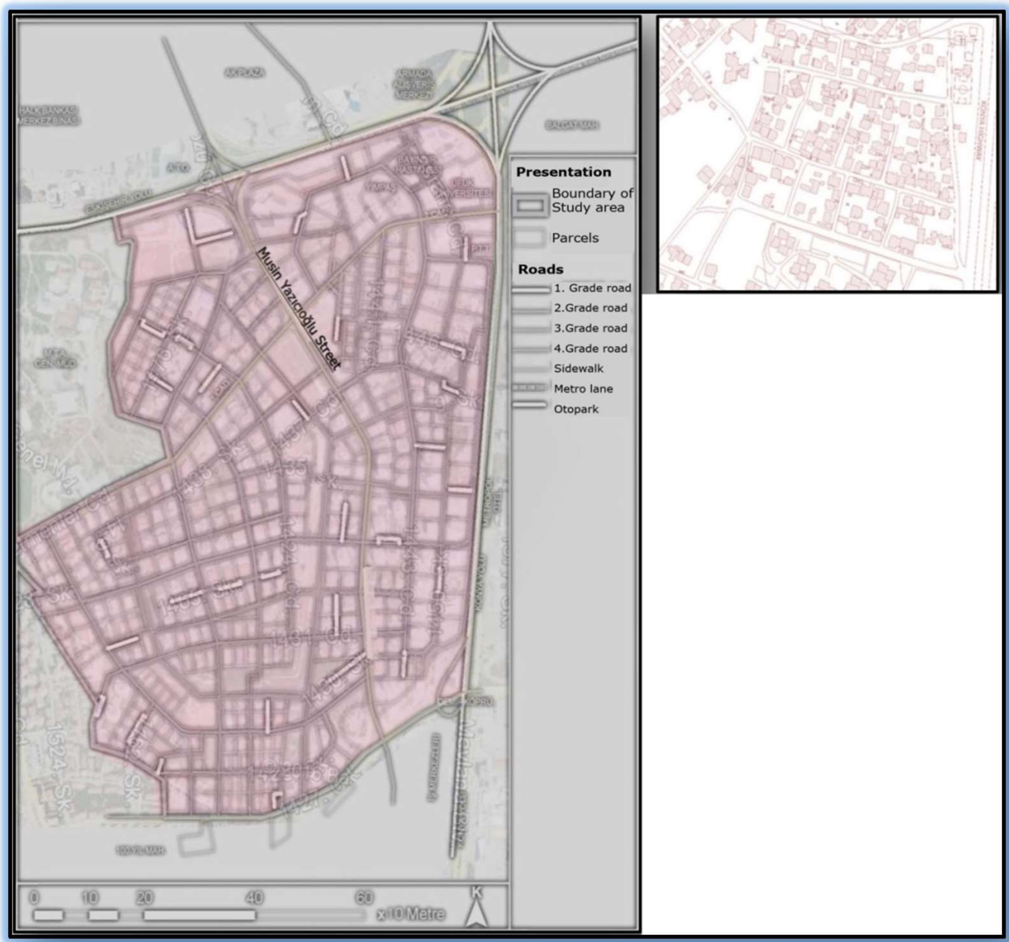


Figure 5.30, Left: Street pattern of Çukurambar neighborhood (Re: Personal study and rendering) Right: Old Settlement Pattern of Çukurambar. (Personal archive)

Before the current urban pattern was developed, ÇN had an organic cul-de-sacs street pattern resulting from the street pattern of squatter settlements (Figure 5.30). In line with the increase in the value of lands and the promotion of housing projects, its context transformed into a similar grid street pattern. Still, it includes cul-de-sacs street pattern in some residential areas. However, the current grid street pattern supports walkability and livability level (Figure 5.30).

The network connectivity of ÇN is 1.00. This figure was found by dividing the number of actual connections to the number of potential connections. It is less than the minimum value of network density (1.4= more than 100%), mentioned in the literature section; so, in comparison to TN, it is less interconnected. Behind this, there is a standard design approach of the Turkish planning system. According to the Development Law No.3194, the dead end street is not allowed, and each street has to be accessible by service vehicles in case of emergency. For this reason, rather than curvilinear street pattern, the development plans in almost all cities are prepared based on a grid or modified grid street pattern. This design approach has been also used in ÇN, as can be seen in Figures 5.30 and 5.31.

Figure 5.31, Street pattern of Çukurambar neighborhood. (Re: Personal rendering)

a. Land use pattern

As mentioned before, a compact and mix land use pattern is an essential value of walkability. In this sense, the land use pattern is known as compact if the distance between settlement areas is less than 200m; otherwise, it is regarded as a dispersed urban area. Additionally, the land use pattern should have various usages (i.e. mix-use) as single-use land development forms increase the distance between origins and destinations, strengthen car dependence, and discourage access by walking and biking.

ÇN has a variety of land uses including restaurants, cafés, schools, health centers, and private and public work places. Most of these usages have a high vertical density of 7-13 floors and are isolated trade buildings or offices, or gigantic business centers where offices, trade centers, and residences are clustered together like in the Next Level complex center. The average block size in the neighborhood is 1000 m^2, which decreases block density in a given area (regardless of the high vertical density in Çukurambar neighborhood) and increases the distance between destinations (Figure 5.32).

Figure 5.32, Compactness level of Çukurambar neighborhood. (Re:Personal study and rendering)

5.5.1.2 Separated walking and biking system

Except for urban park areas, no separated walking and biking system is offered to the users of ÇN. In this sense, Gazi University (2013) investigated to find out which groups of people used biking and which groups did not use biking, as well as the reasons for the latter. It demonstrated that 68.4% did not use biking while 31.6 percent used it. 21.9% of the groups of people who did not prefer bicycle use stated non-existence of a separated biking system as their reason. Furthermore, 21.6% of them clarified their reason as the insufficient area for biking; however, 18.4% pointed to inadequate parking areas for non-motorized transportation vehicles. Finally, 31.4% of people indicated as their reason for not biking, unsuitable attitudes of motorized vehicles and lack of a suitable public transit system for transporting their bicycles.

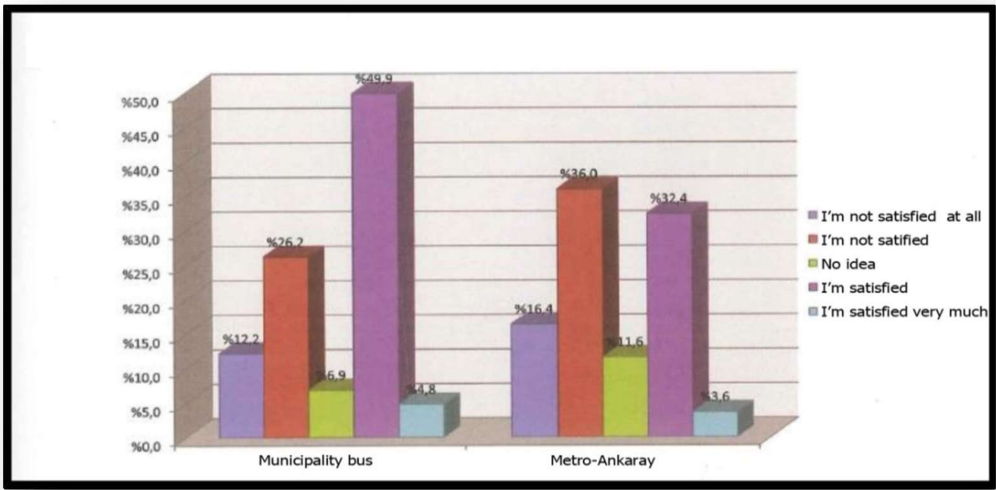


Figure 5.33, Satisfaction of the prices of EGO bus, Metro transportation systems. (Gazi University, 2013: 89)

5.5.1.3 Equity

In the analysis of equity within the city of Ankara and in response to the question of whether Ankara's transportation system planning and policies improve the accessibility of low-income groups of people or not; the research findings show that transportation prices do not appeal to all economic groups of people as almost 77% of passengers are not satisfied with public transit prices. Nevertheless, people with an income level of 1000-3500 TL, inevitably, use the EGO bus facility. The evaluation of equity in ÇN indicates that people are not satisfied with public transportation facilities. Most of its users, who are people with high-income level, do not prefer to use public vehicles due to concerns about time and energy consumption. As discussed in 5.5.1.1 section, 56.3 percent of people are not satisfied with the public transit system because of its arrival time, frequency and numbers of stops. As a result, 30.6% of participant's state low price and 24.4% define not having private cars as their reason for preference of public transit system. Therefore, passengers are not satisfied with the quality of public transportationvehicles and use them for necessity or economic level reasons (Figure 5.33).

5.6 Land use development

As mentioned in the literature review section, land development pattern is a macro-meso property of urban form which indicates the proximity degree between origins and destinations and affects travel behavior directly. Its main parameters are diversity and density which can be measured in five manners: *population and employment density, built form, and sub-centers density*.

Population Density

Population density refers to the number of residents per unit area. According to "Çukurambar-Karakusunlar Revision Plan", population density was determined as 250-300 people per hectare and 80% of the area was allocated for the development of high-dense residential areas. (Ankara Metropolitan Municipality, 1991) In this sense, based on the information of the Mukhtar, Çukurambar had a population of 20.000-25000 and Kızılırmak neighborhood had a population of 7.000-8.000 in 2013 (Figure 5.34).

Furthermore, according to Ankara Municipality census results, an estimated population of 30,000 and 8,000 are living in the residential buildings of Çukurambar and Kızılırmak neighborhoods respectively; the populations of the business centers are not even included in these numbers. Hence, the housing density is 394.73 people per hectare in Çukurambar, and 80 people per hectare in Kızılırmak neighborhood. Before the urban regeneration, these neighborhoods consisted mainly of squatter buildings, where the density was 160 people per hectare. This value boosted to 237.36 people per hectare in the focus areas of the study, Çukurambar and Kızılırmak neighborhoods, with 38,000 people living on 176 hectares of land. Despite the presence of under construction lands and buildings, the current density keeps growing. 30000 people live in in Çukurambar and 8000 people live in Kızılırmak neighborhoods.

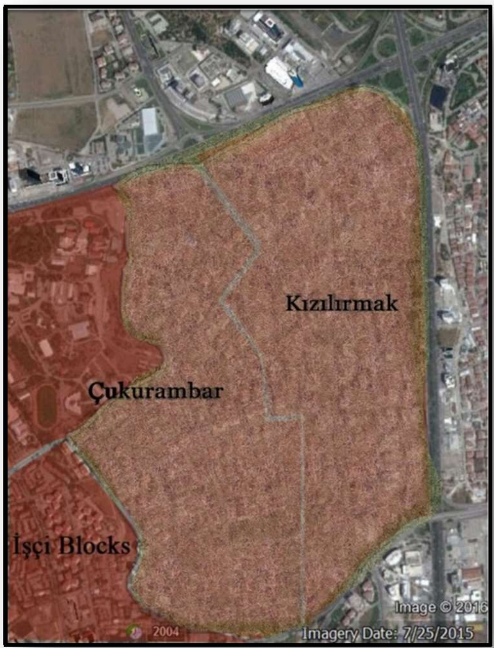


Figure 5.34, Boundary of the study area. (Re: Personal rendering)

Thus, the population density of ÇN is over the minimum criteria (40 people per ha) of walkable cities. Further developing of the city towards the west corridor, attraction of investors to build high-level residential buildings, and existence of universities, private educational facilities, public institutions and health facilities have attracted extra population to the neighborhood.

Consequently, residence construction projects, increasing storey height and plan decisions, have caused an excessive increase in the housing density and the population. As the population increased, the number of cars in traffic increased as well, causing the existing transport infrastructure to become insufficient in Çukurambar and Kızılırmak Neighborhoods due to increased density.

Built-form Density

The term *Built-form density* describes the density of built and residential areas per hectare. High-rise business buildings, with 9-10 stories, are concentrated in Kızılırmak neighborhood and residential buildings, with 4-11 stories, in Çukurambar neighborhood. The block size in ÇN is huge (1000 m^2), which decreases block density in a given area (regardless of the high vertical density in Çukurambar neighborhood). In this sense, 65 percent is the built area, 115 hectares, and 35 percent includes 11 hectares green area, 35 hectares network area and 13.3 hectares empty lands. To this end, ÇN is green by less than 6 percent (11 hectares). It includes Çansera Park, out of the focus boundary, Teoman Öztürk, and five more small parks. The furthest distance to Çansera Park is 1.4 km and it is accessible by walking and motorized modes of transportation (Figure 5.35).

Figure 5.35, Çansera Park, ÇN. (Re: google.com)

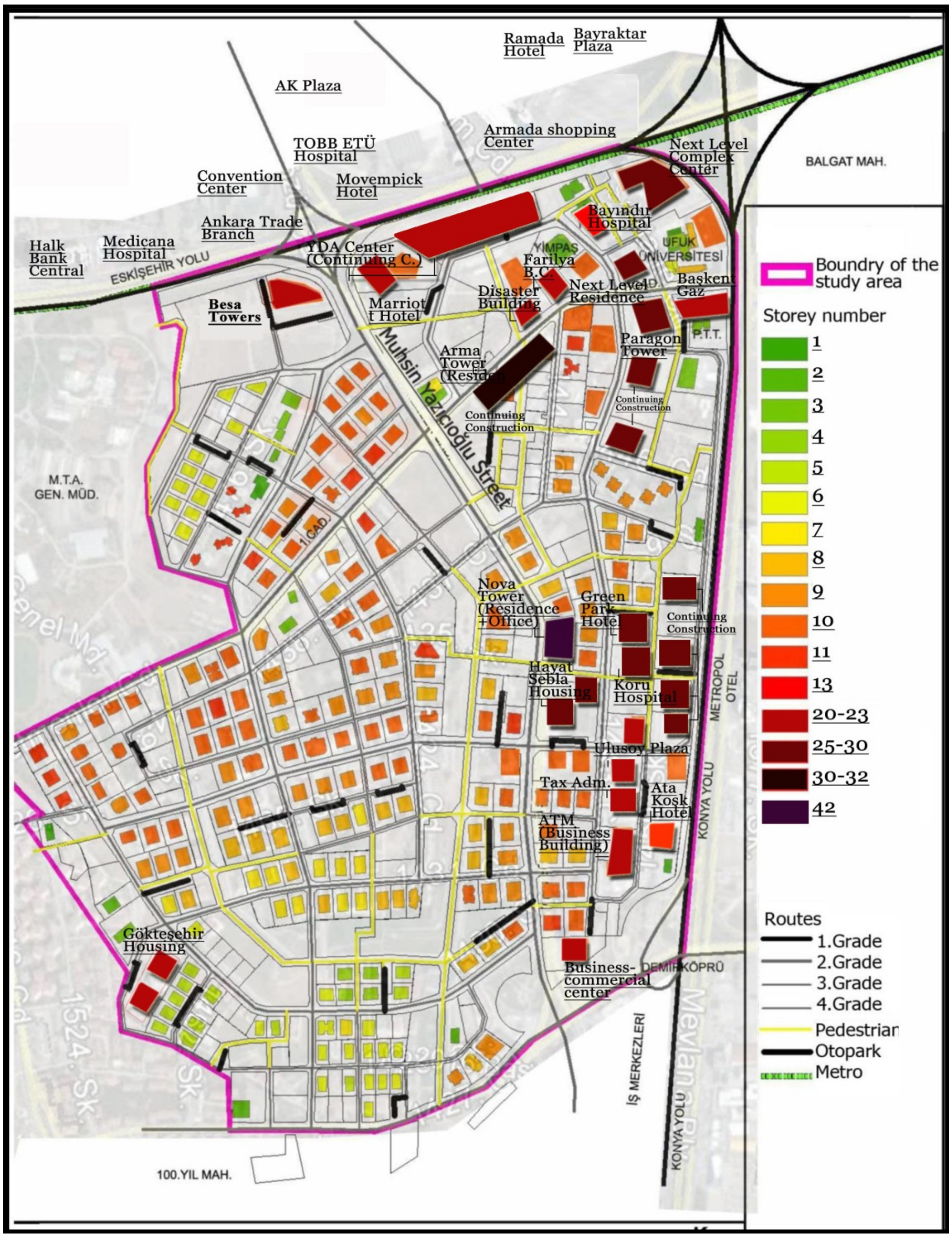


Figure 5.36, Vertical Compactness level of Çukurambar neighborhood, Ankara Municipilaty with personal editing and revising

Employment Density

Employment density measures the number of employees per area. As mentioned in related literature, Çankaya district has a high level of employment density. Additionally, the numbers of private workplaces located in Çukurambar and Kızılırmak neighborhoods are 334, and 3206 respectively. Totally, there are 24 business centers, with fifteen storeys or more in these two neighborhoods. For example, a 17-storey business center, such as “Ulusoy Plaza”, includes approximately 85 offices, with 90% occupancy rate and approximately 450 personnel and professionals, and 9 stores. Besides, the number of people entering and exiting to and from “Ulusoy Plaza” daily is approximately 60. Ankara Trade Center (ATM), which consists of two blocks, can be given as another example. Each block is 27-storeys with 172 active offices; so 688 people are working in these offices in total. The number of daily entrances and exits has reached to 150 people since offices of doctors and lawyers are also located in the business center. Hence, assuming that 50 persons work in each floor of ÇN business centers, 26400 people enter these 24 business centers. Additionally, there are 3624 people who work outside of business centers, and 1812 in monopoly workplaces. To this end, with division of 31836 persons, working in these two neighborhoods, to 176 Ha, the employment density becomes 180.88 P/Ha (Figures 5.36-39).

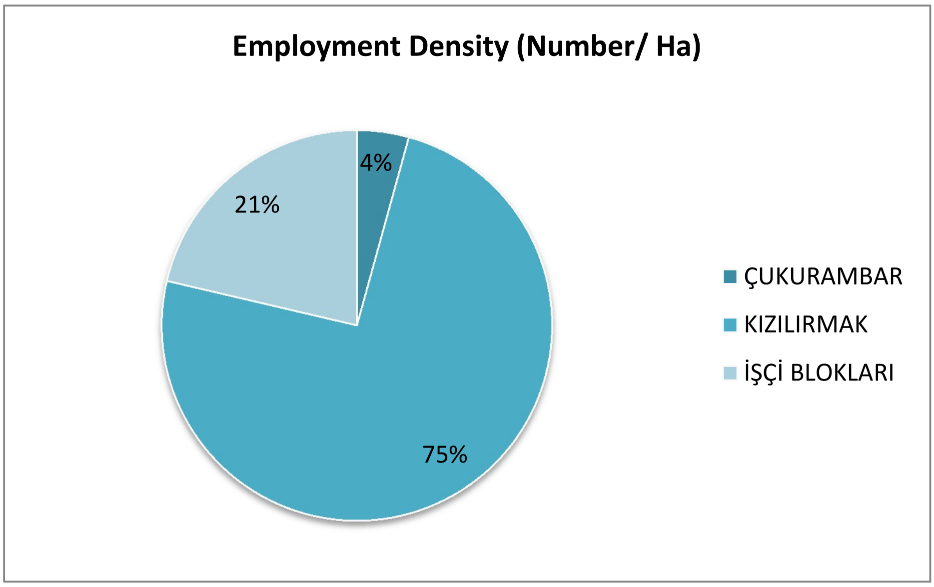


Figure 5.37, The ratio of employment density in Çukurambar, Kızılırmak and İşçi Blokları neighborhoods, Re: Ankara Municipilaty and Personal evaluation and rendering

Building	Floors	Housing	Business
Next Level Complex Center	30 (office); 20 (housing)	105	133 office + 150 shop
YDA Center (not accomplished)	17-20	5500	30 shop
Paragon Tower	27	-	147 office + 78 shop
Nova Tower	42	89	13 office
Green Park Hotel			
Ulusoy Plaza	17	-	68
ATM Business Center	27	-	172 office + 26 shop
Arma Tower	30	156	156
Besa Towers	20	-	104 office + 25 Shop

Figure 5.38, Properties of business centers located in ÇN. (Re: Personal study)

Figure 5.39, ATM business center, ÇN.

CHAPTER 6

HOW FAR TUNALI HILMI STREET IS A WALKABLE STREET?

This chapter aims to evaluate THS regarding its walkability capacity based on the attributes of walkability which are explained in detail in Chapter 2 (Table 2.4). It first explains the essential features of THS. Then it examines the walkability capacity of THS according to the criteria of safety, orientation, attractiveness, comfort, diversity, and local destination.

6.1. Essential Features of THS

THS is 1.2 kilometers in length and 16.10- 29.53 meters in width. The depth of building plots on THS is about 26 meters and the sidewalk width is about 3.67 meters (Figures 6.1-4). THS divides into two parts. The first part is the part from Kuğulu Park (KP) to the intersection of Esat Street and the second part is the part from Esat Street to the intersection of Hacıyolu Street. The first part of THS is much more used by pedestrians than the second part. This is mainly because of the commercial and business functions that serve the daily needs of pedestrians. The second part of THS is much more residential. In addition, the commerce on the ground floor is more specialized (Figure 6.5). As described in Chapter 6, THS contains 224 shops, 16 banks, and 11 arcades, together with administrative, residential, and business usages. There are a number of brand mark shops, such as Marks & Spencer, Collezione, Tüzün, Mado, McDonald's, Burger King. One of the major problems, which become an obstacle in terms of walkability of THS is the high vehicular traffic running during week and weekend days. Traffic volume is heavier in the first part than the second part. According to a one-day observation, the traffic volume on THS (between 7.00 am and 11.00 pm) is 22500 for the first part, and 13000 for the second part (Table 6-1).

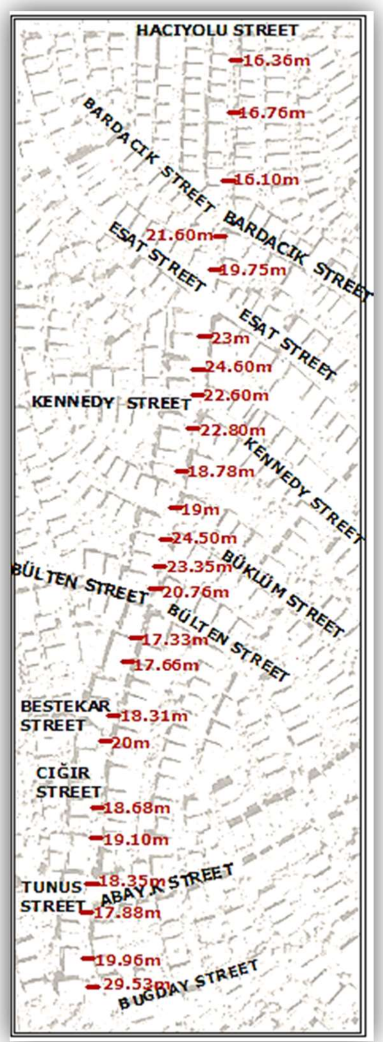


Figure 6.1, The width of THS horizontally from one building to another in different parts of the street. (Re: Personal study and rendering)

Table 6.1, Essential features of THS, (Re: personal study)

Length:	1200 meters
Width:	9-11 meters
Average sidewalk width:	3.67 meters
Number of Shops:	224
Number of Banks:	16
Number of Arcades:	11
Traffic Volume from Kuğulu Park to Esat Street(counted on 16 February 2011, Wednesday, 7:00-23:00):	22500
Traffic Volume from Esat Street to Hacıoğlu Street	13000
Number of Bus Stops:	2

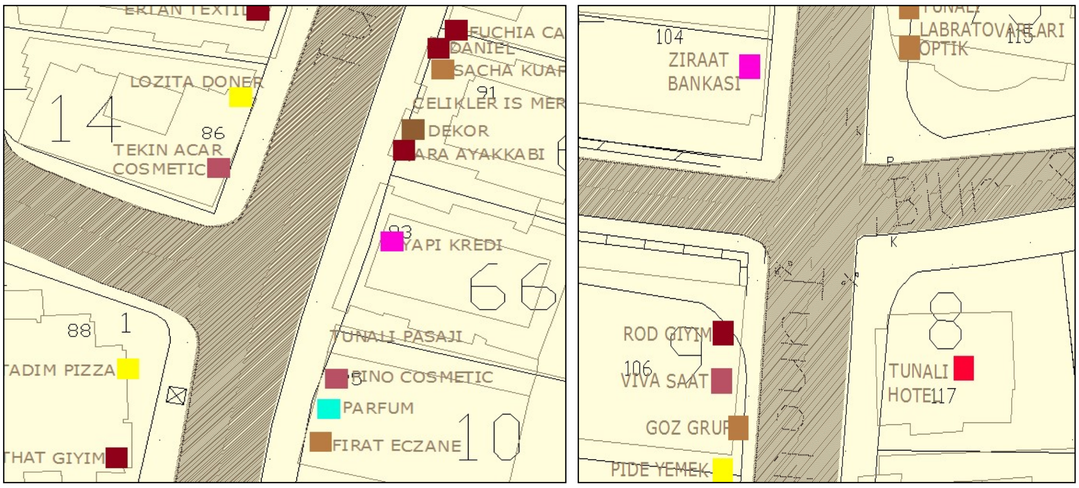


Figure 6.2, Space devoted to cars in THS (Re: Personal study and rendering)

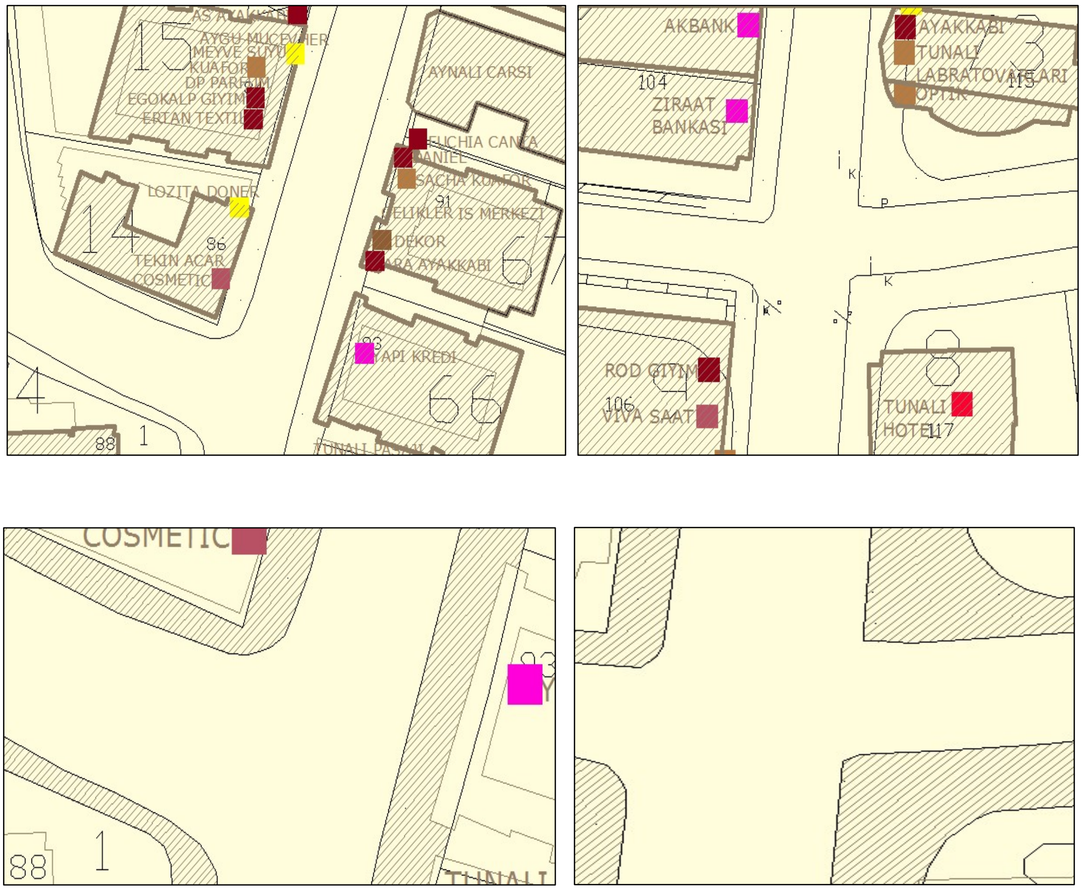


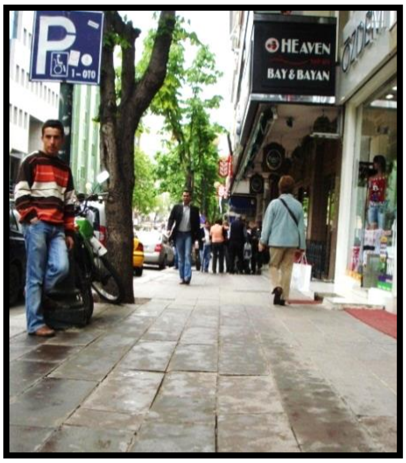
Figure 6.4, Above: Width of building plots in THS; Below: Sidewalks in THS, (Re: Personal study and rendering)

Observer

Socializers

Customers

Worker



Waiter

Beggar

Figure 6.5, Sidewalks in THS, (Re: Personal study and rendering)

6.2. Actual Safety

6.2.1. Street Pattern

As discussed in Chapter 2, connected street pattern, such as grid or modified grid, is more walkable due to four reasons: 1) it provides shortest trips and highest amount of paved surface; 2) it ensures pedestrian's accessibility to parallel streets in a short time; 3) it makes approachability to public services; and 4) it is safer as the intersections slow down car speed.

Figure 6.6, Street pattern of THS (Re: Personal study and rendering)

As once can note in Figures 6.6 and 6.7, the street pattern around THS is similar to a modified grid. The streets around THS provide direct and short travels for pedestrians. Similarly, THS is connected to parallel streets in near distances. Thus, the street pattern around THS provides a high level of walkability and livability in this sense. Nevertheless, as THS, the paved surface (or floor quality) and narrow sidewalks of these streets do not provide a high quality of walkability for pedestrians. Additionally, high vehicular traffic throughout the day time during week and weekend days discourage people to walk in THS and the streets around THS.

Figure 6.7, Distance between intersections (Re: Personal study and rendering)

Within the framework of the survey carried out on THS' users, three questions were posed:

- 'Is THS easy and comfortable to walk along the street?';
- 'Is THS an easily accessible street from other places by walking?';
- 'Is vehicular traffic on the street a problem for pedestrians to access to different parts of THS?'

When the first question is concerned, as shown in Figure 6.8, 51% of the respondents (twenty-eight persons) claimed that THS is not an easily walkable street. They claimed that even though THS is their favorable street and use this street frequently, high vehicular and pedestrian traffic volumes on the street, and low quality pavements make their walking uncomfortable. Most of old and disabled people and parents with pushchairs also do not see THS as a comfortable street, expressing that although stony pavement of Kuğulu Park is not very comfortable, they prefer to use the park rather than other parts of THS; as it is safer and more enjoyable. Furthermore, 24% of the respondents (thirteen persons) defined that only traffic congestion and some problems which exist in pavements make their walking partly uncomfortable. On the other hand, 25% of the questionnaire participants (fourteen persons) claimed that THS is an easily walkable street.

Regarding the second question, most users (thirty-three questionnaire respondents; 60%), who access THS by car or walking, claimed that THS is an easily accessible street (Figure 6.10). Especially car drivers see the lack of parking area and traffic congestion as tiring. 18% of questionnaire participants (ten people) claimed that THS is a partially accessible street by walking, while 17% (nine participants) expressed that THS is not an easily accessible street for pedestrians anymore due to the new urban policy on vehicular circulation, which has augmented traffic problem on THS and its surrounding area.

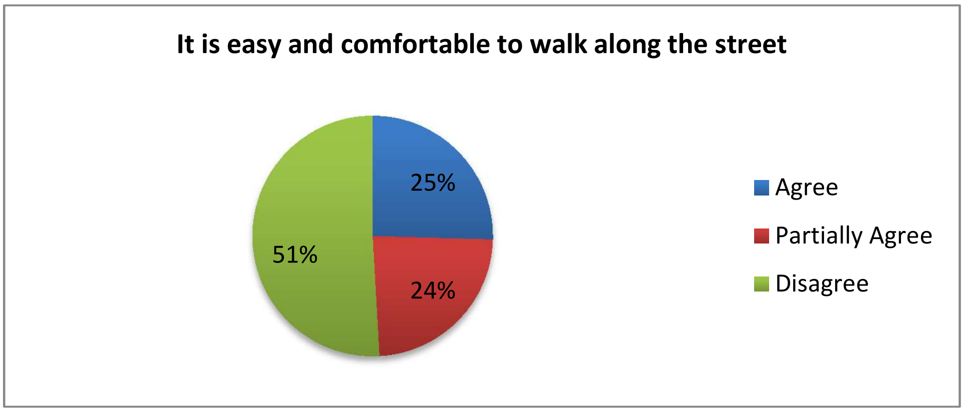


Figure 6.8, The walkability quality of THS regarding the users' point of view

As for the last question, 68% of the respondents (thirty seven people) agreed that high vehicular traffic volume on the street is a problem for pedestrians to access to different parts of THS (Figure 6.9). 17% of the questionnaire participants (nine people) stated that car traffic partially disturbs their accessibility to various facilities available on THS, whereas 15% (eight people) expressed their disagreement. The latest group mostly comprises pedestrians who work or live in THS and get used to the existent traffic problem on THS.

In summary, the analysis and survey results indicate that even though the street pattern around THS provides a high level of walkability and livability, the walkability for pedestrians is impoverished by the low-quality paved surface, narrow sidewalks of THS and the streets around THS, and vehicular traffic. As suggested by many survey participants, high vehicular traffic almost all day long during week and weekend days discourage people to walk in THS and the streets around THS. Although THS is an easily accessible street by walking for pedestrians, vehicular traffic on the street and its environs becomes the major obstacle for pedestrians to access THS from surrounding places and from different parts of THS.

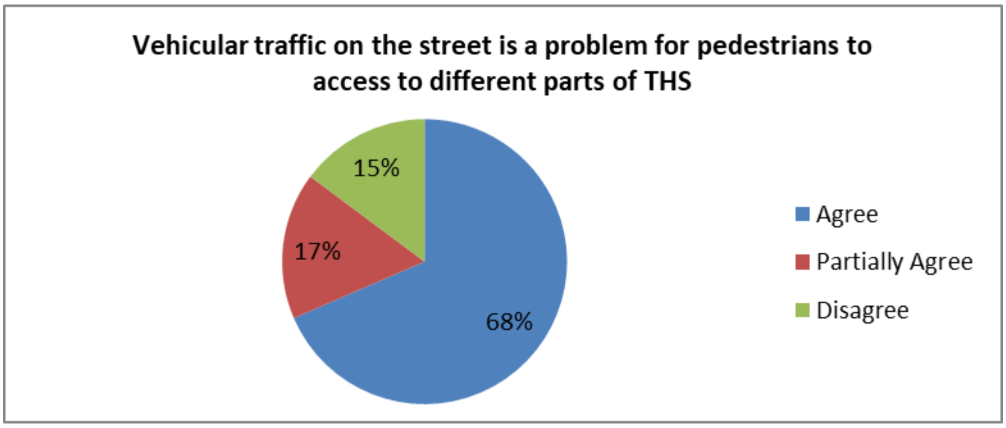


Figure 6.10, The relationship between the accessibility of THS and vehicular traffic on the street regarding the users' point of view

Figure 6.10, The accessibility quality of THS regarding the users' point of view

6.2.2. Traffic Calming Measures

Traffic calming measures comprise factors that decrease car speed in streets (i.e., *low width of street, systematic on-street parking* and *useful design details*). Street can be *narrow* or it can be perceived narrow. *Street trees, wide sidewalks* and *on-street parkin*g are the factors effecting the perception of a street as narrow. THS has a width of about 16.10- 29.53 meters. There are no wide sidewalks and adequate shady trees on the street. There is only unsystematic street parking that decreases perceptual width of THS, but creates serious problems for car and pedestrian movements (Figures 6.14 and 6.19).

Systematicon-street parking with adequate and appropriate street crossings lessens car speed and therefore increases safety of streets. In THS, unsystematic on-street parking without appropriate and sufficient street crossings decreases car speed, but causes a considerable traffic congestion and disturbance in pedestrian crossings (Figures 6.30 and 6.31).

Finally, *design details,* such as raised or textured pavement at crosswalks, barrier effect, are the important traffic calming measures, which decrease car speed especially in street crossings. THS is, however, poor in terms of such design details which will provide traffic calming.

6.2.3. Lightning

Appropriate and adequate lightening of streets and crosswalks increases the visibility of sidewalks and enhances the safety of pedestrians and drivers. On THS, there are 71 street lights with a height of 6 meters on the part between Kuğulu Park and Esat Street (Figures 6.11 and 6.12).

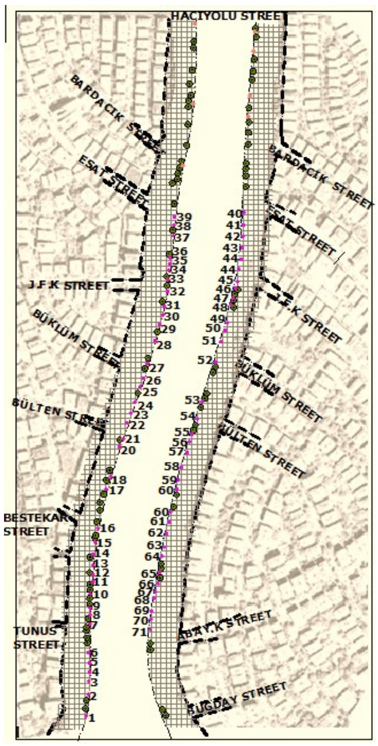


Figure 6.11, Lightning system of THS (Re: Personal study and rendering)

The distance between street lights depends on the types of street light. Although the ideal distance between two street lights is 6 meters, this distance in the case of THS varies from 5 meters to 50 meters. There are fewer street lights on the second part of THS than the first part. In brief, the first part of THS is partly lit and visible and the second part is not well-lit and visible.

Figure 6.12 indicates the survey results about the perception of pedestrians on THS' lightning quality. 36% of the questionnaire respondents (twenty persons) claimed that THS is a well-lit street, whereas 37% of the respondents (twenty-one people) thought that THS is a partially well-lit street; and 21% of the participants (twelve people) disagreed with this statement. As far as the lightning quality of Kuğulu Park is concerned, the results are rather similar. 29% of the questionnaire respondents (sixteen people) identified Kuğulu Park as a well-lit area and 43% (twenty-four pedestrians) thought as a partially lightened green space. However, 21% of the questionnaire participants (twelve persons) declared that KP is not an illuminated area (Figure 6.12-13). Briefly put, most of pedestrians were not satisfied with lightning quality of THS and KP.

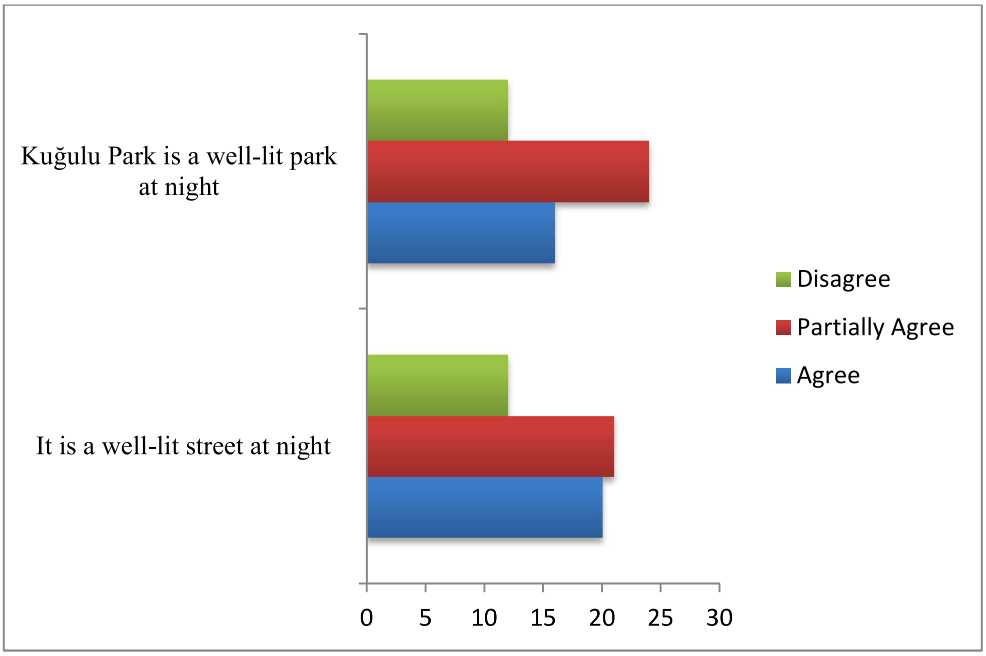


Figure 6.12, The lightning quality of THS and Kuğulu Park according to the THS' users

To conclude, the findings of the analysis indicate that the lightning quality of THS and Kuğulu Park differs. The first part of THS is partly lit and visible; and the second part is relatively poor in terms of street lightning and visibility. Pedestrians, mostly, are not happy about the lighting quality of the street and the park.

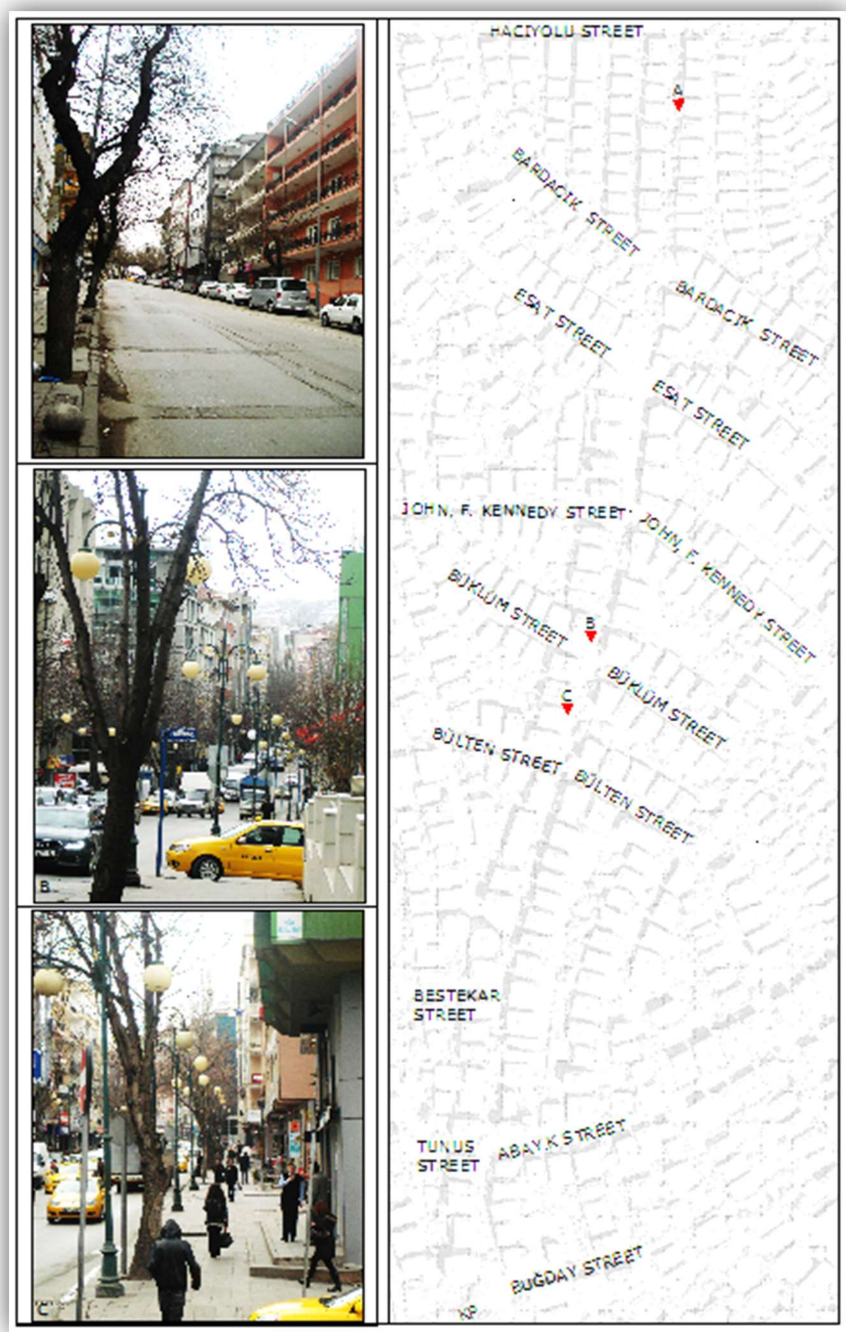


Figure 6.13, Lightning system of THS. (Re: Personal study and rendering)

6.2.4. Continuous sidewalk pattern

As discussed in Chapter 2, *continuity of sidewalks* can be strengthened physically and perceptually. More specifically, 'physical continuity' is provided by minimizing interruptions on the paths, whereas perceptual continuity is attained by harmonious street furnishings along sidewalks. The modified grid street pattern around THS offers more continuous, therefore, walkable sidewalks for pedestrians. However, the continuous sidewalk pattern on THS is interrupted by the street intersections of Bardacık, Esat, Kennedy, Büklüm, Bülten, Bestekar, Cığır, Tunus, Abay.K and Buğday Streets. The width of each street crossing differs from 2.80 meters to 13.50 meters. There are no street crossings adequately visible and safe for disabled and elderly people, and parents with young children. Traffic lights on THS are only provided on the intersections of Esat, JFK, Tunus and Abay.K Streets that provide safer crossings for pedestrians (Figures 6.7, 6.15, and 6.16).

Additionally, inharmonious rhythm of street furniture located on THS decreases its perceptual continuity; especially in the second part which is very poor in qualified street furniture (Figure 6.14).

To learn the THS pedestrians' views, this research investigates six questions:

- Is there any interruption on THS for pedestrians along sidewalks?;
- Are, crosswalks safe for pedestrians?;
- Are crosswalks are safe for old people, disable people, children and parents with young children?;
- Are sidewalks wide enough for pedestrians?; (It is discussed in '6.2.5. Pedestrian enclosure' part of this chapter)
- Is, street furniture provided along the street sufficient?
- Does the location of street furniture obscure the pedestrian movement? (It is discussed in '6.2.5. Pedestrian enclosure' part of this chapter)

Figure 6.14, Inharmonious distance between street furniture in THS (Re: Personal study and rendering)

When the first question is concerned, survey results show that 48% of survey respondents (twenty-seven persons) claimed that there are many interruptions for pedestrians along the sidewalks, and 23% of the respondents (thirteen persons) expressed that there are some interruptions (such as intersections of streets and elements) which decrease the continuity of THS (Figure 6.17). Fourteen people (25%) asserted that THS is a continuous street and there is no interruption along it.

Regarding the second question, 52% of the survey participants (twenty-nine respondents) thought that crosswalks are not safe for pedestrians, and 20% of the survey respondents (eleven respondents) partially accept the presence of safe crosswalks. But, 25% of the survey participants (fourteen people) declared that pedestrian crossings are adequately safe for pedestrians (Figure 6.17). On the other hand, 57% of the participants (thirty-two persons) claimed that existing crosswalks on THS are not safe for old and disabled people, and parents with pushchairs. This group of respondents stated that level variations on sidewalks and roads, low visibility, and lack of traffic lights in the intersections of streets make their crossing very difficult. 20% of the respondents (eleven persons) partially accepted that crosswalks are adequately safe for crossing of all groups of pedestrians, whereas 21% of the participants (twelve people) identified that crosswalks are sufficiently safe for all groups of pedestrians (Figure 6.17).

Regarding the adequacy of street furniture, 68% of the participants (thirty-eight pedestrians) emphasized that there is a serious lack of street furniture in THS, which causes cleanliness and resting problems (Figure 6.17). They claimed that they could find adequate street furniture only within Kuğulu Park. 29% of the participants (sixteen people) thought that there is adequate street furniture on THS, whereas only two people who live in THS (4%) expressed that there is sufficient street furniture along THS.

As for the question of whether the location of street furniture obscures the pedestrian movement, 18% of the participants (ten pedestrians) described that the location of street furniture do not disturb their movement. 30% of survey participants (seventeen people) declared that some wrong placed street furniture obscure their movement. Furthermore, 30% of survey respondents (seventeen people) claimed that less amount of street furniture do not interrupt pedestrian movement.

To conclude, even though the modified grid street pattern around THS offers more continuous and walkable sidewalks for pedestrians, the continuous sidewalk pattern on THS is interrupted by a number of streets crossings which are not adequately visible and safe for pedestrians, especially disabled and elderly people, and parents with young children. Unfortunately a few street crossings with traffic lights are not sufficient to provide a continuous and safe sidewalk pattern on THS. Furthermore, the perceptual continuity of the street is weakened by inharmonious rhythm of street furniture located on THS. The survey carried out among the pedestrians also show similar results. Pedestrians are considerably disturbed by the interruptions along the sidewalks, risky crosswalks (particularly for vulnerable pedestrian groups) and inadequate street furniture which do not serve sufficiently their daily needs on the street and which do not provide an adequate perceptual continuity.

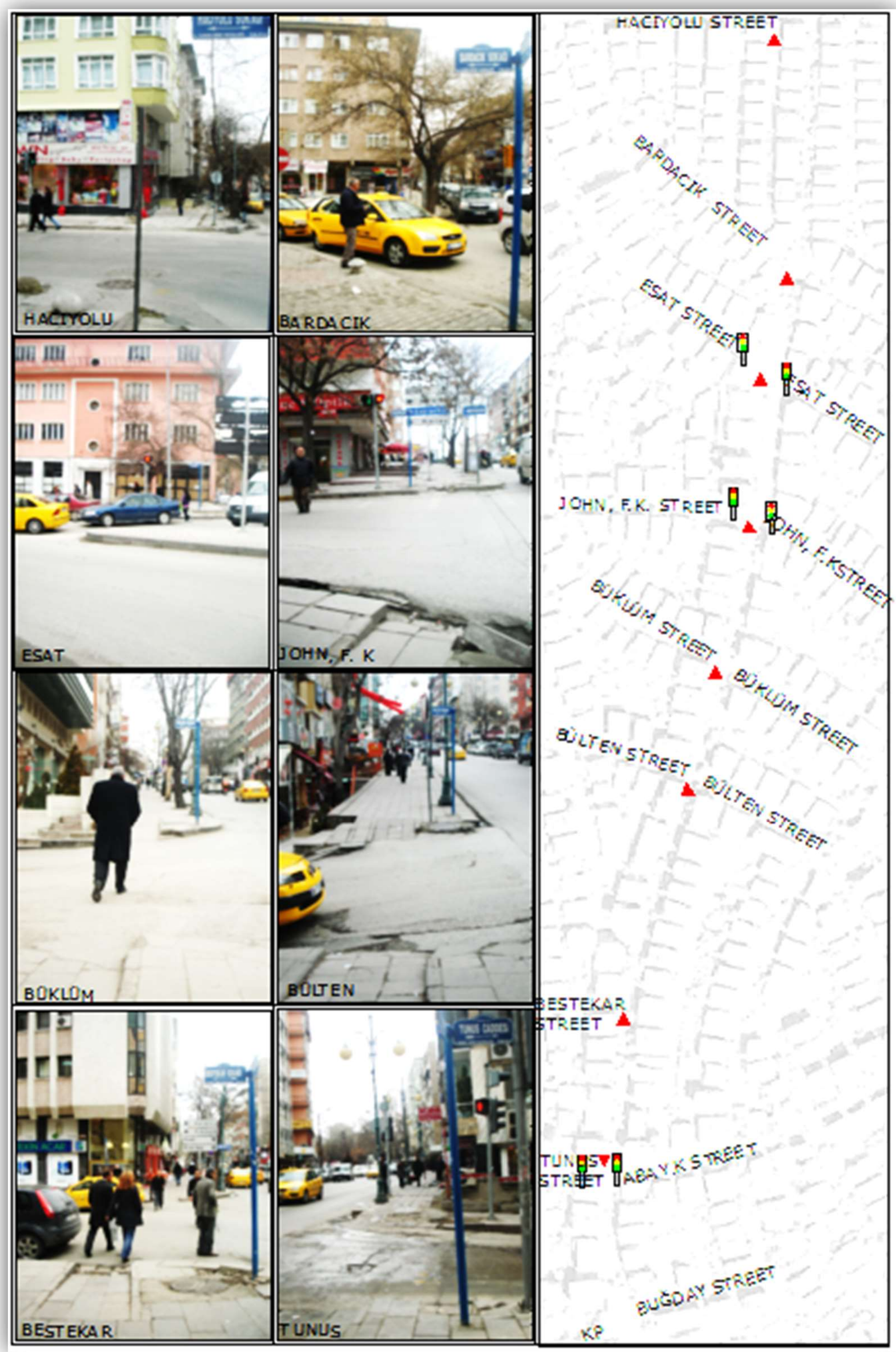


Figure 6.15, Some views of intersection points on THS. (Re: Personal study and rendering)

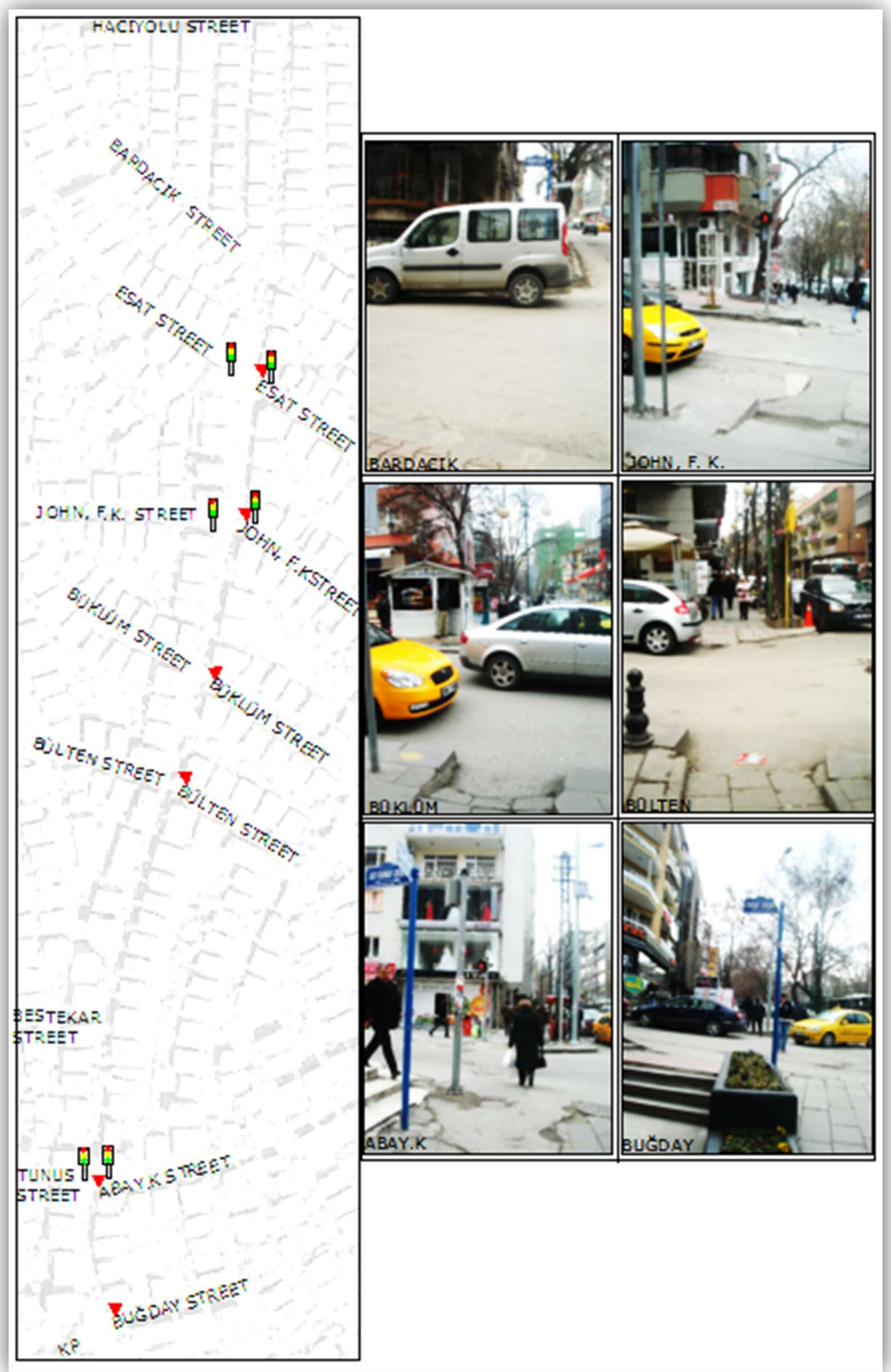


Figure 6.16, The intersections on THS. (Re: Personal study and rendering)

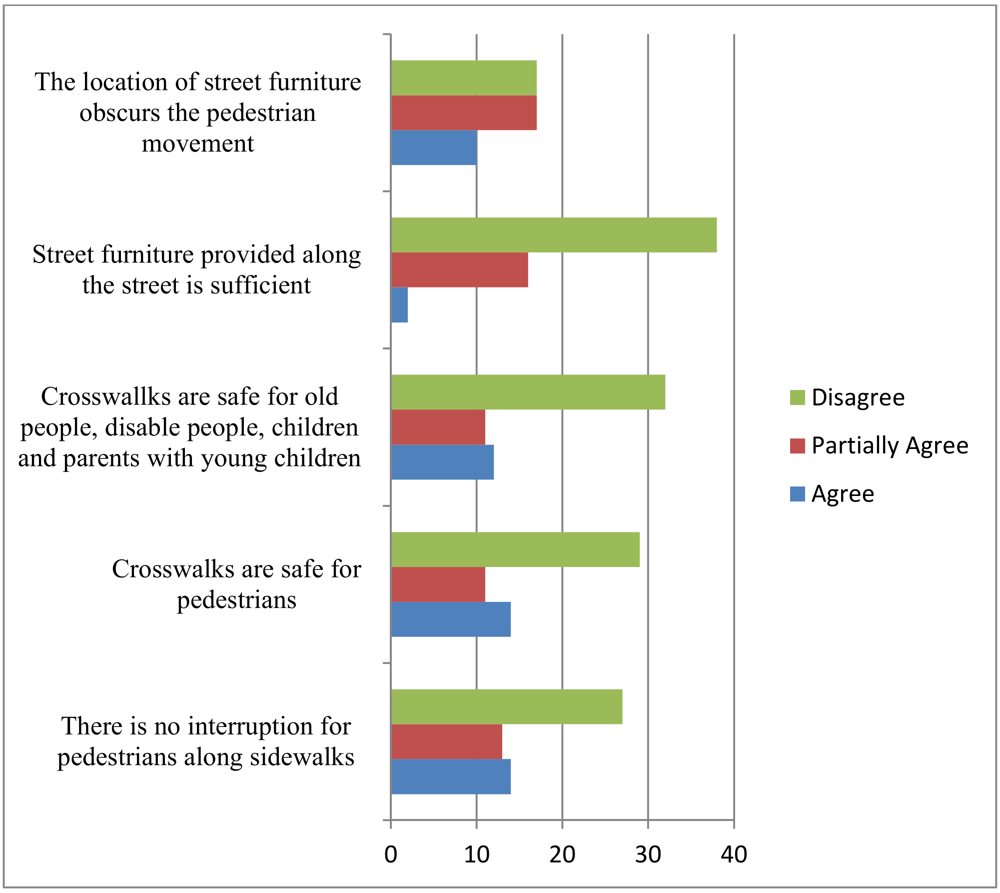


Figure 6.17, The views of THS' users on the continuity of pavements of THS

6.2.5. Pedestrian enclosure

Generally, pedestrian enclosure is related to definiteness of start and end of a street. When the case of THS is considered, Esat Street, as the widest intersection, divides THS into two parts. The first part is from Kuğulu Park to Esat intersection and the second part is from Esat intersection to Hacıyolu intersection (Figure 6.18). Because of usages, physical and perceptual qualities, the second part is not favorable by pedestrians.

Pedestrian enclosure is also evaluated by the criteria of *human scale, building orientation, and location of street furniture*. In terms of *human scale, sidewalk width and the ratio of* height of buildings to street width should be examined. Appropriate sidewalk width is determined according to pedestrian volume. The suitable ratio of height of buildings to street width is identified by Jacobs (1993) as 1:2, and by Greenbie (1981) as 1:4.

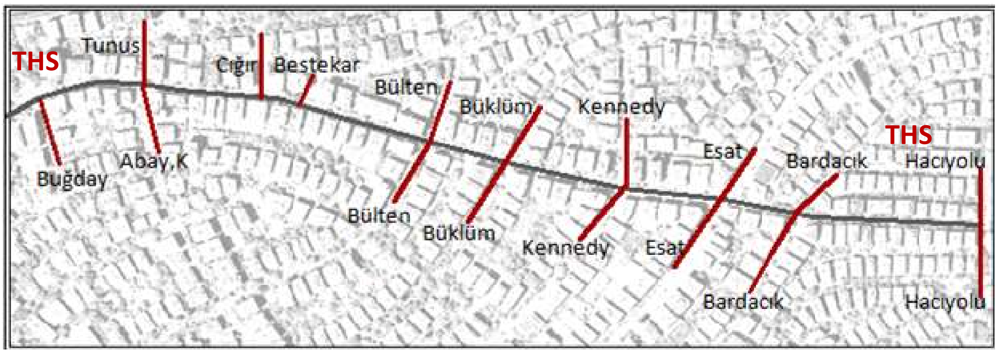


Figure 6.18, THS and intersecting streets (Re: Personal rendering)

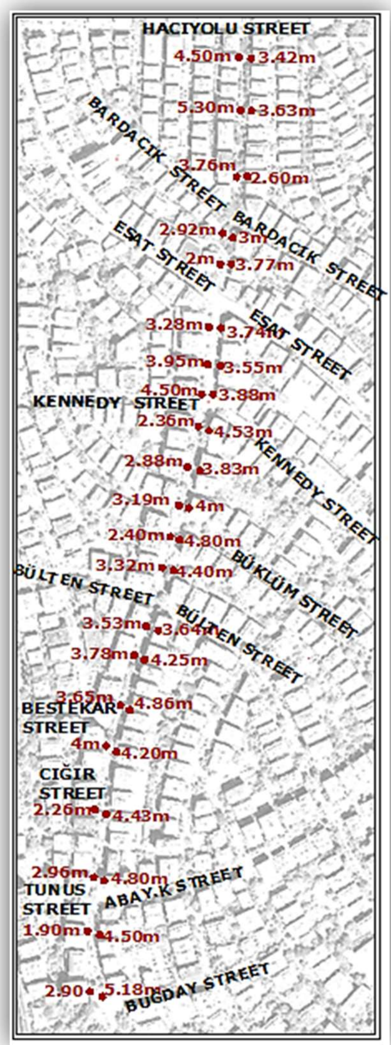


Figure 6.19, Sidewalk widths in THS (Re: Personal study and rendering)

The width of sidewalks on THS varies between 1.90 meters and 5.30 meters (Figure 6.19 and 6.20). Although predominantly the first part of THS is used by pedestrians, pedestrians are not able to move freely, except for quiet hours of week days. However, On the other hand, the sidewalk width is adequate in the second part of THS, as the pedestrian volume in the second part is very low. The ratio of street width to height of buildings is 1:1 and 1:2 in some places such as in front of Tekin Acar building and Ramada Hotel. It is in accordance with 1:2 ratio identified by Jacobs (1993). But the ratio of sidewalk width to height of building is 1:5 which is in insufficient due to high pedestrian volume in the first part of THS. Therefore, in terms of human scale standards, the first part of THS is insufficient (Figure 6.21 and 6.22).

As for *building orientation,* the analysis assesses whether most buildings and shops are oriented to the main sidewalks of THS and they therefore intensify pedestrian enclosure. As one can see from Figures 6.43 and 6.44, the entrances of most buildings on THS are oriented to the same sidewalk.

Finally, as discussed earlier, inharmonious distance between *street furniture* weakens pedestrian enclosure of THS, especially in the second part of THS (Figure 6.14).

Figure 6.20, Inconsistent widths of sidewalks in different parts of THS
(Re: Personal archive and rendering)

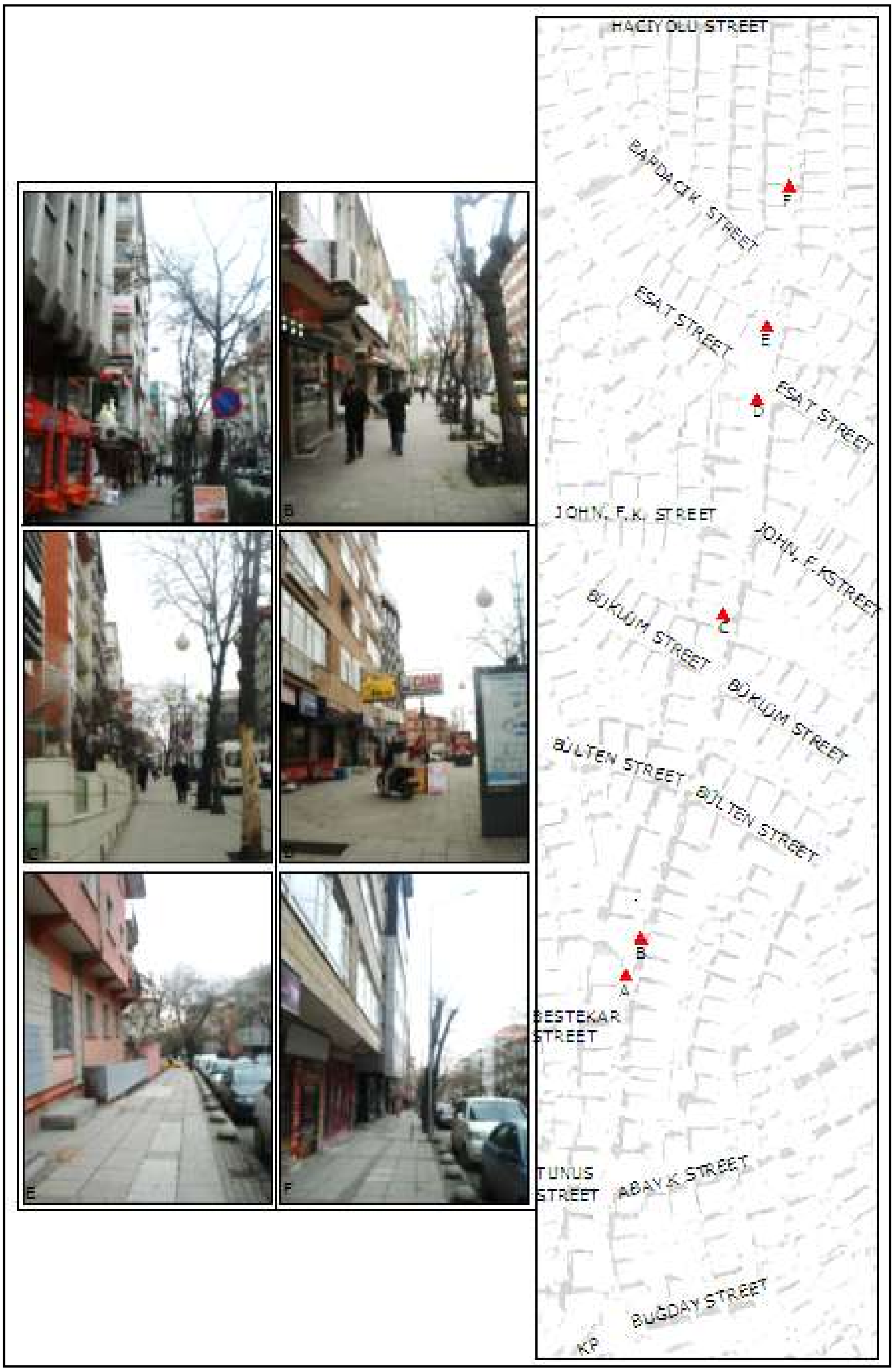


Figure 6.21, Ratio of building height to street width.
(Re: Personal archive and rendering)

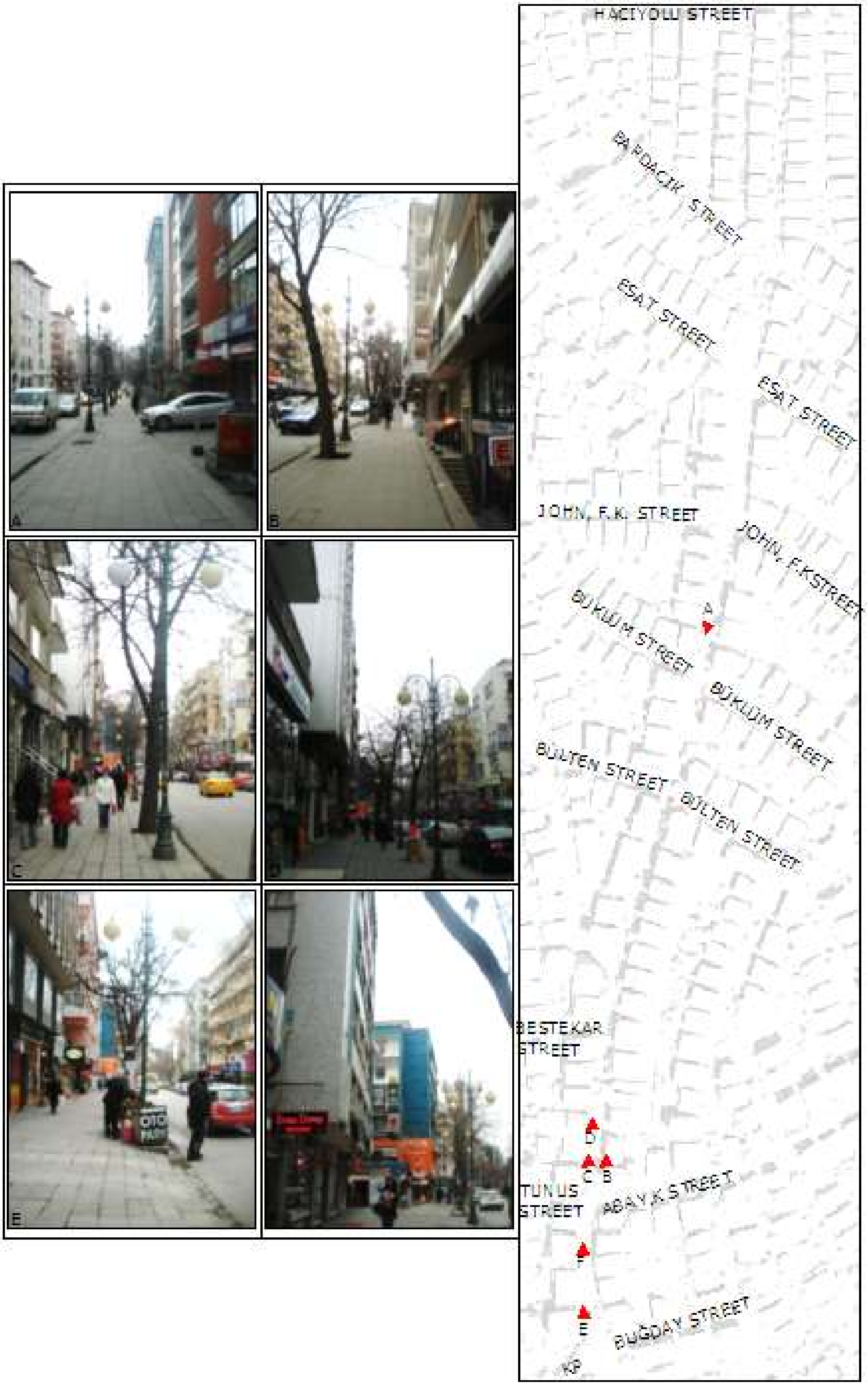


Figure 6.22, Ratio of building height to street width.
(Re: Personal archive and rendering)

To understand the perception of the pedestrians on the pedestrian enclosure, the survey participants were asked where THS starts and ends. 50% of the survey respondents (twenty-eight people), including those who live, work in THS or who are the visitors, expressed that THS starts at Kuğulu Park and ends at Esat Intersection. 32% of the survey respondents (eighteen respondents) stated that THS starts at Kuğulu Park and ends at Hacıyolu Intersection. 18% of the participants (ten users) had various responses which are different from these two options. Therefore, only eighteen people (32%) acquire the right information about the THS boundary (Figure 6.23).

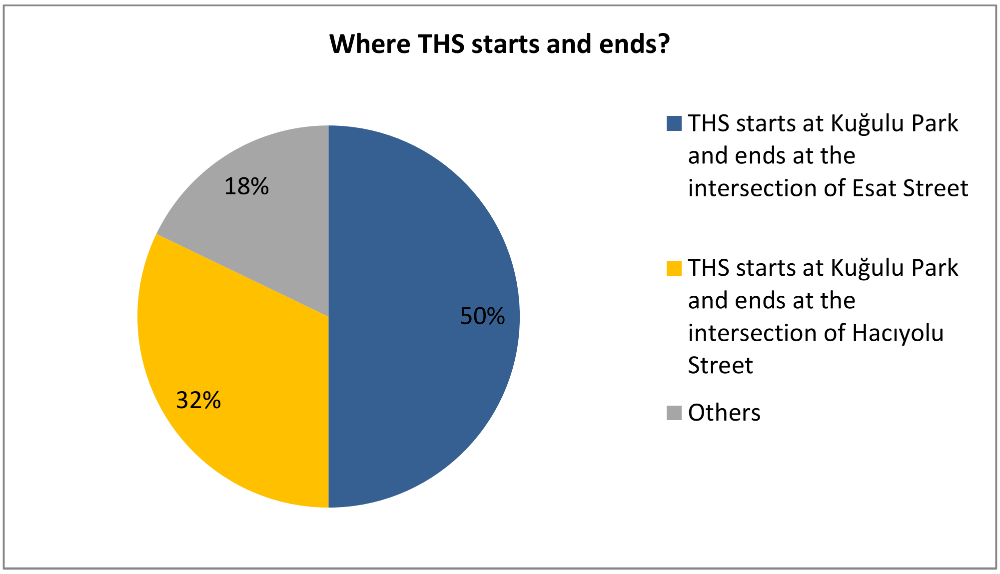


Figure 6.23, The views of THS' users about the boundary of THS

Another question that was asked to the THS users was whether some part of this street should be pedestrianized. 31% of the survey participants (nineteen respondents) desired the pedestrianization of THS, although they could not suggest any idea about the boundary of this pedestrianized site. However, 28% of the survey respondents (seventeen people) suggested that THS from Kuğulu Park to Esat Intersection should be pedestrianized, because this part is mostly preferred by pedestrians, and the heavy vehicular traffic disturbs their comfort. Similarly, 10% of the questionnaire participants (six people) (comprising either old people or parents who use to take their children to Kuğulu Park) recommended that about 400 meter walking distance from Kuğulu Park should be pedestrianized; and 13% (eight respondents) desired the pedestrianization of THS either from Kuğulu Park to Kennedy Street or from Buğday Street to Bülten Street. The latest group claimed that, although the east side of the street is crowded with pedestrians, they prefer walking in this part, which is much more enjoyable for them. Hence, they desired the pedestrianization of the east side of THS, especially between Kuğulu Park and Kennedy Street and Buğday and Bülten Streets. Finally, 10% of the survey respondents (six people) stated that the pedestrianization of the street might cause many problems. Therefore, they suggested the widening of the sidewalks that would decrease car numbers (Figure 6.24)

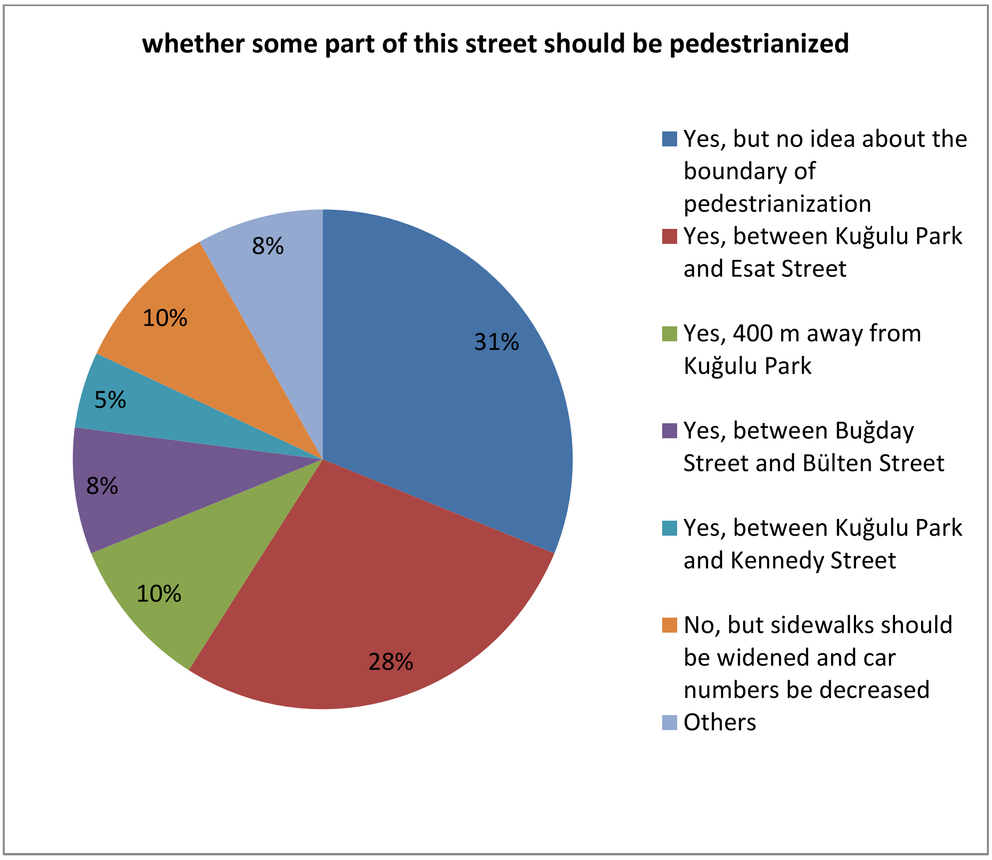


Figure 6.24, The preferences of pedestrians about the pedestrianization of THS

When pedestrians were asked whether some parts of THS' sidewalks should be widened, 59% of the survey respondents (thirty three people) gave positive responses, while 27% of survey participants (fifteen persons) claimed that it would not be feasible and 9% (five persons) asserted that sidewalk widths are adequate and it is not necessary to be widened (Figure 6.25)

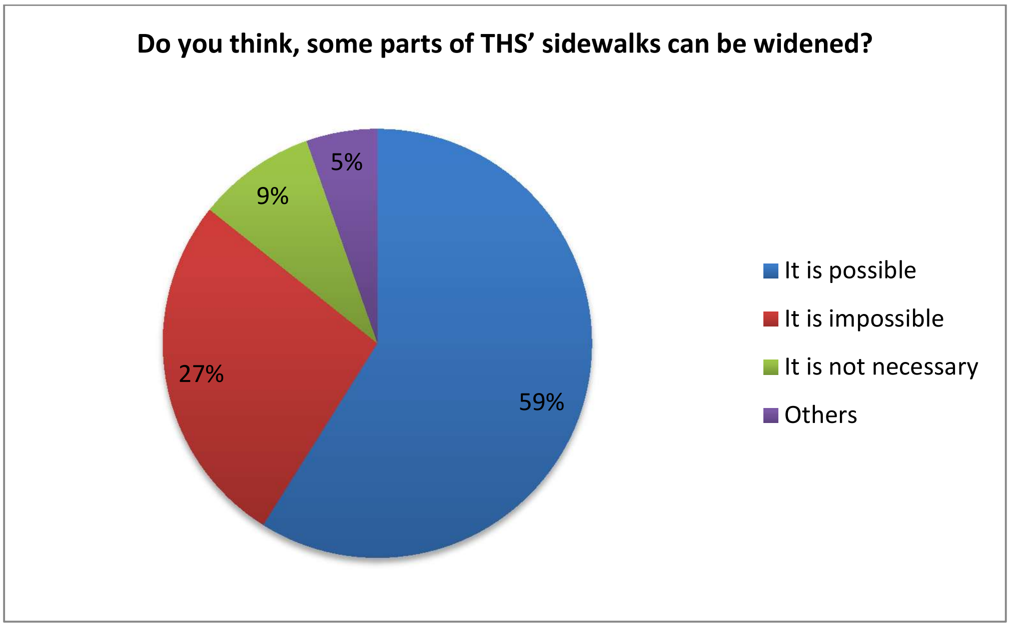


Figure 6.25, The views of THS' users about whether some parts of THS' sidewalks should be widened

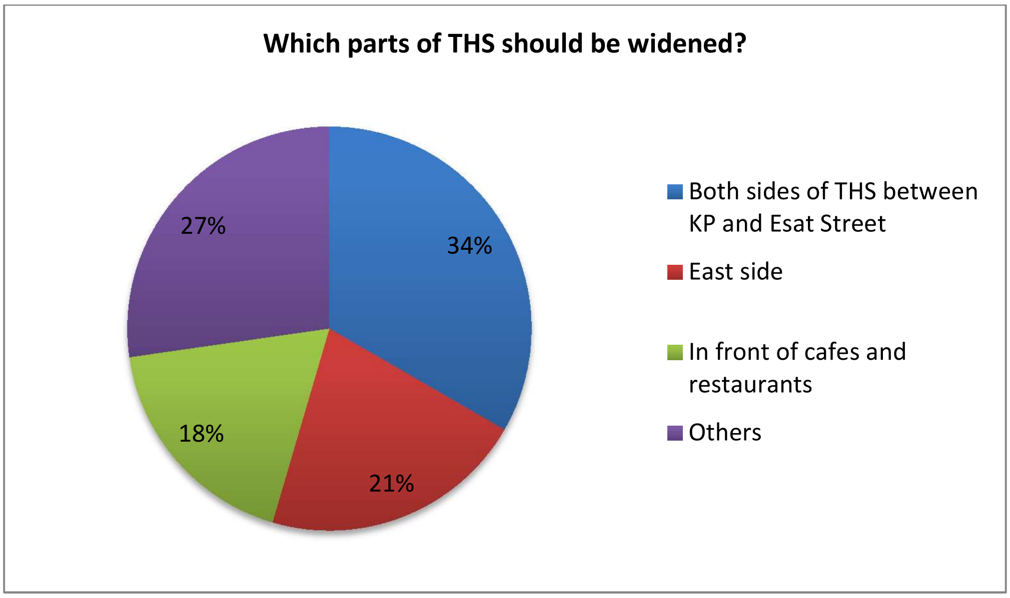


Figure 6.26, The views of THS' users about the question of which parts of THS should be widened

From thirty-three respondents who stated that sidewalks should be widened, 34% (eleven people) suggested that both sides of THS from Kuğulu Park to Esat intersection should be widened. Similarly, 21% (seven respondents) claimed that the east side of THS' sidewalks from Kuğulu Park to Esat Street is more enjoyable. As there is a pedestrian congestion, they suggested this part of sidewalk to be widened. Furthermore, 18% of the survey participants (six people) recommended the widening of sidewalks in crowded points, such as frontages of café and restaurants placed in east side of THS between Kuğulu Park and Esat Street. They suggested that this part of the sidewalk should be widened and designed with the provision of sitting places, flower pots, and other street furniture elements in order to become very comfort and attractive.

When survey participants were asked in which parts of THS they can walk easily and comfortably, the majority (32%, eighteen respondents) claimed that even though stony pavement of Kuğulu Park is not very comfortable, walking in the park is safer as it is cleaner and much more peaceful. Thus, they walk more comfortably and easier in Kuğulu Park than other parts of THS. Old people and parents with children suggested that they particularly preferred Kuğulu Park because it provides a safe environment for all. For this reason, they frequently visit the park. Because pedestrian congestion on the east side of the first part of THS is high, 11% of the survey respondents (six people) claimed that they walk comfortably on the west side of THS; and 12% (seven persons) stated that they have comfortable walking on the west part of THS between Tunus-Esat intersections. On the other hand, 16% of the survey respondents (nine people) expressed that they cannot walk comfortably in any part of THS. (Figure 7-27)

When pedestrians were asked in which parts of THS they walk with difficulty, 25% of survey participants (thirteen persons) claimed that, because of narrow and low-quality sidewalks and high traffic volumes, they are not able to walk comfortably in any part of THS. Sixteen respondents expressed that pedestrian congestion on the east side of the first part of THS makes walking very difficult, especially between Buğday and Bülten Streets. 10% of the respondents (five people) claimed that the lack of safe and visible street crossings and high traffic volume make their crossing very difficult. Additionally, 4% of the survey respondents (two people) delineated that low pavement quality on THS between Esat and Hacıyolu Streets make walking in this area uncomfortable. Finally, 9% of the survey respondents (five people) claimed that they walk in each part of THS comfortably. (Figure 6.28)

When pedestrians were questioned how the vehicular traffic disturbs their movement, 52% of the survey respondents (twenty-nine people) claimed that high traffic volume and unsuitable and unsafe street crossings make their crossing unsafe; and they cannot perceive street crossings. Moreover, 16% of the survey participants (nine respondents) declared that high traffic volume and narrow sidewalks make them feel suffocating. 9% of the survey respondents (five people), especially old people, stated that vehicular traffic creates noise and air pollution, and the only clean and peaceful place for them is Kuğulu Park. 5% of the survey respondents (three people) also expressed that high car traffic, and cars driving and parking on the sidewalks, become dangerous for pedestrians. (Figure 6.29)

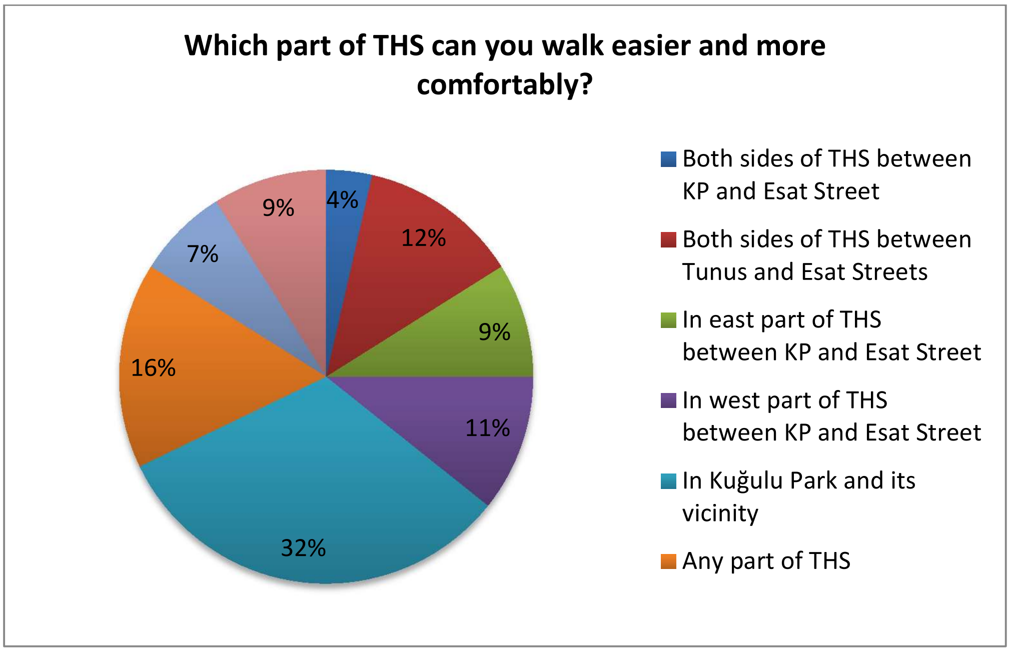


Figure 6.27, The views of THS' users on the question of which part of THS they can walk easier and more comfortably

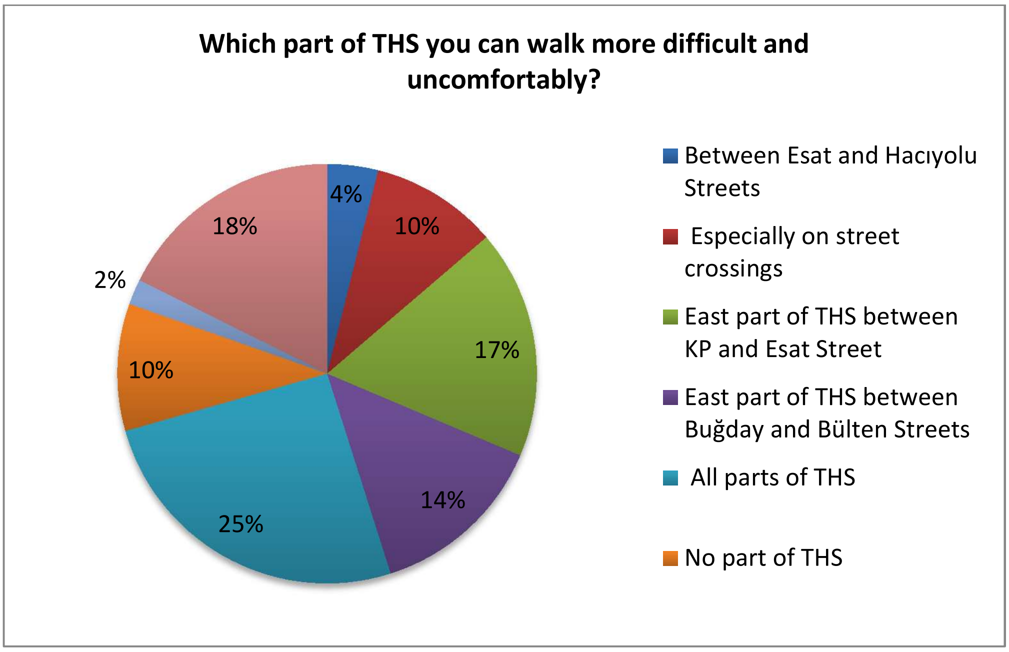


Figure 6.28, The views of THS' users on the question of which part of THS they can walk more difficult and uncomfortably

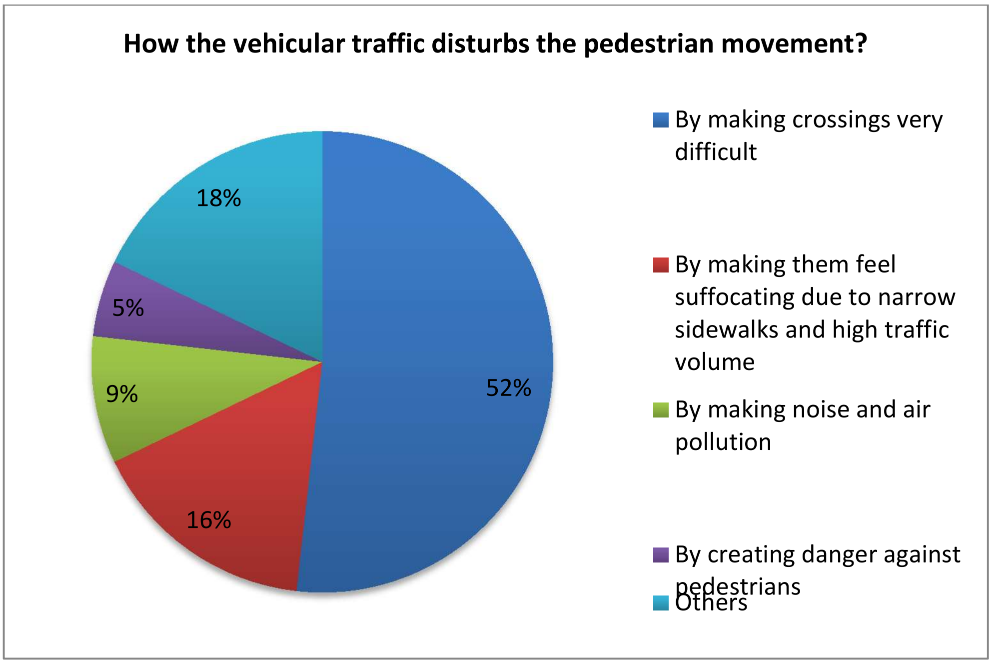


Figure 6.29, The views of THS' users on the question of how the vehicular traffic disturbs the pedestrian movement

Briefly put, the analysis of pedestrian enclosure shows that the majority of survey participants have varying ideas about the boundary of THS; and they do not know where it starts and end. The general recognition about the boundary of the street is from Kuğulu Park to the intersection of Esat Street due to the intensity of multi-purpose usages and high volume of vehicular and pedestrian traffic. High pedestrian volume in the first part of THS also negatively effects the comfortable movement of pedestrians on THS, except for quiet hours of week days. Together with the analysis on the ratio of height of buildings to the pedestrian volume and the pedestrian volume, the investigation show that pedestrian enclosure in the first part of THS is inadequate; and this creates a suffocating street. In the second part of the street, the pedestrian enclosure (therefore, the sidewalk width) is adequate particularly due to the low pedestrian volume. In terms of *building orientation,* the spatial analysis indicates that most buildings and shops are oriented to the main sidewalks of THS; hence they intensify pedestrian enclosure. Nevertheless, inharmonious distance between *street furniture* elements weakens pedestrian enclosure of THS. According to the survey findings, the majority of pedestrians agreed on the idea of pedestrianization of THS, especially from Kuğulu Park to the intersection of Esat Street. If the street cannot be pedestrianized, the majority of survey respondents agreed on the idea of widening the street sidewalks, especially on both sides of THS between Kuğulu Park and the intersection of THS in order to create comfortable walking conditions for the sidewalks. The survey findings also show that the only parts which they find comfortable for walking are Kuğulu Park and its vicinity; and particularly vehicular traffic on street crossing disturbs the pedestrian movement.

6.2.6. Separation

Sidewalks, medians, boulevards, on-street parking, and parallel routes that allow pedestrians to avoid arterials function as ‘separation’ and they provide obvious limitation between pedestrians and vehicle area and contributes to pedestrians’ safety. Especially on-street parking spaces that are situated on only one side of the street provide a significant separation between pedestrians and vehicle area. There are about 160-170 on-street car-parking lots along the first part of THS, and 65 car-parking lots on the second part of the street. Although on-street parking provides a separation between pedestrian and vehicular area, there are always cars parking and occupying the second lane of the street (i.e., the lane which is next to the on-street parking lots), impeding pedestrians seeking to cross on THS, disturbing their movement and endangering their safety. Besides, both the lack of street crossings and high number of cars parking on THS as the second lane cause traffic congestion (Figures 6.30 and 6.31).

The survey findings are similar to the findings of the spatial analysis and direct observation. When pedestrians were asked whether on-street car-parks disturb their movement, 74% (forty people) claimed that they are particularly annoyed by the cars which are parked next to the on-street parking lots as the second lane which make street crossing for pedestrian even more uncomfortable. 7% (four respondents) partially agreed, as they particularly tend to cross on the street crossings which make them feel almost safe. On the other hand, 19% of the survey respondents (ten people) claimed that on-street car-parking do not disturb their movement (Figure 6.32).

To sum up, even though the on-street parking of THS provides a significant separation between pedestrians and vehicle area, the cars parking next to these parking lots hinder pedestrians crossing and movement, and endanger their safety. They also create traffic congestion on THS. Thus, new controlling regulation that prohibits such parking is necessary for THS to ensure pedestrians' safety and to increase the walkability of THS.

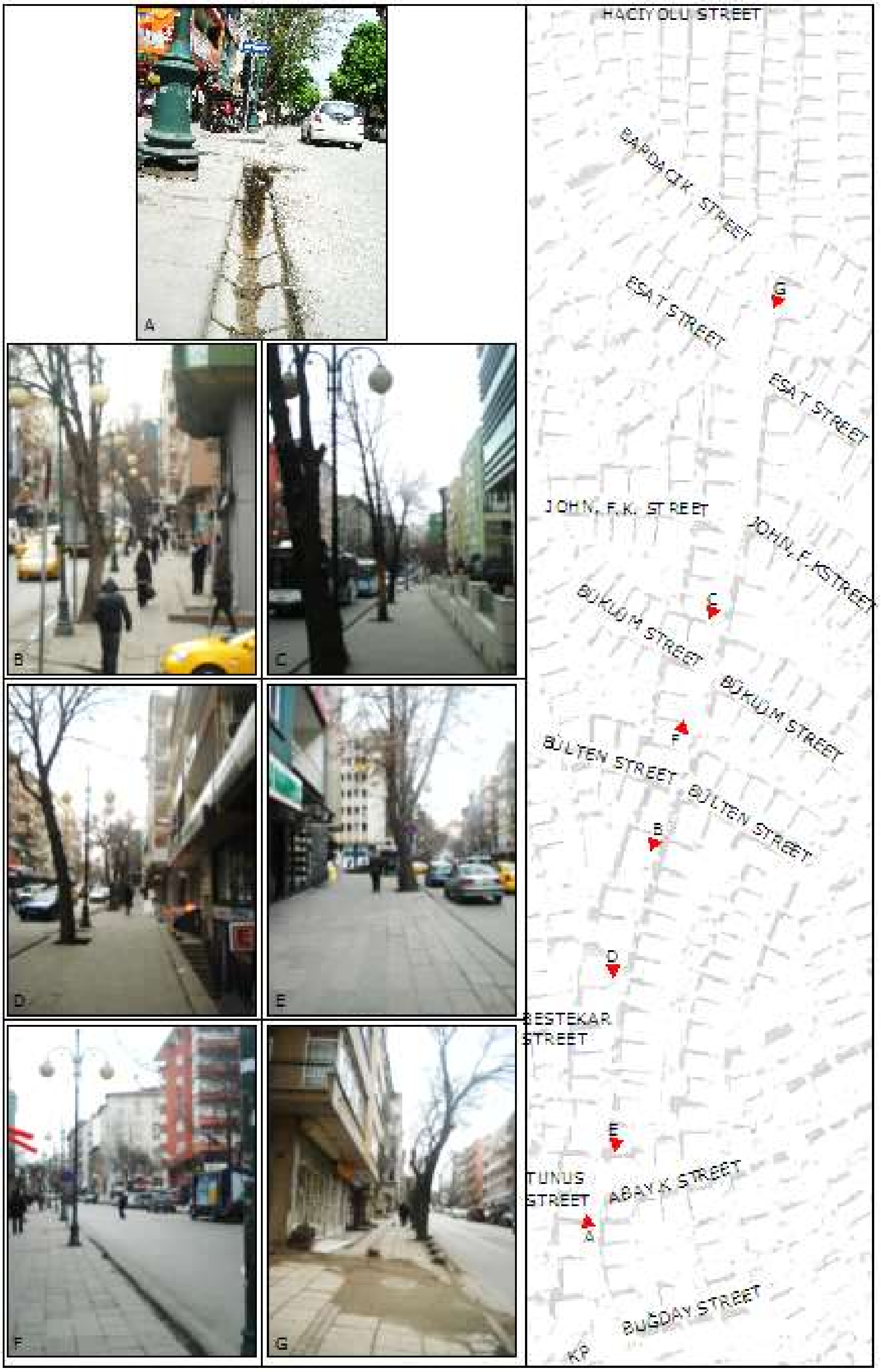
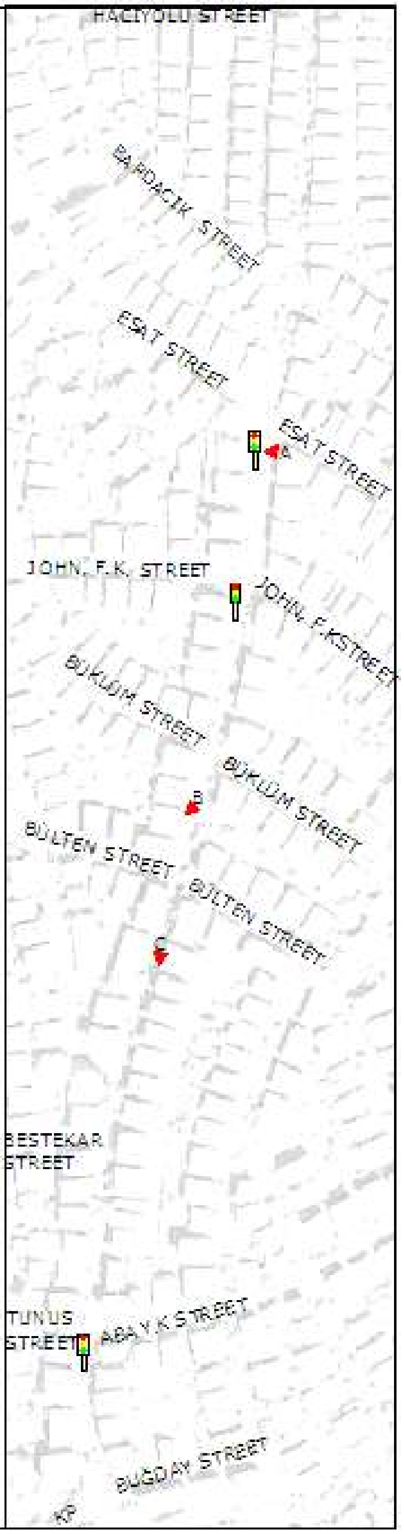


Figure 6.30, Separation on THS. (Re: Personal study and rendering)



On Street Parking			
Boundary	Day	Hour	Parking Cars Numbers
KP to Esat Intersection	Tuesday	14:30	211
	Saturday	17:30	197
Esat to Haciyolu Intersection	Tuesday	14:30	66
	Saturday	17:30	75

Figure 6.31, On street parking. (Personal study and rendering)

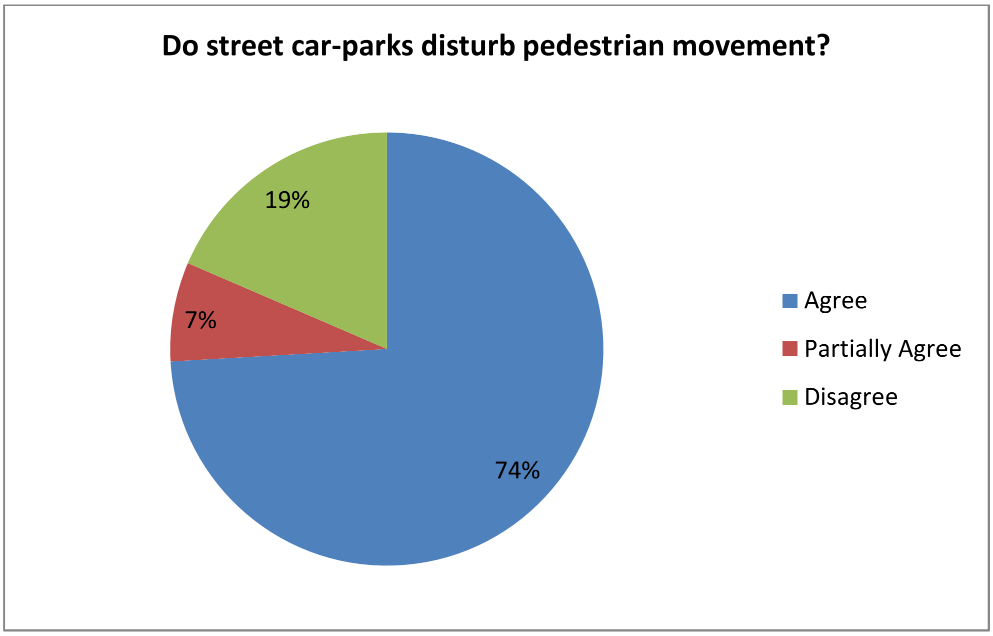


Figure 6.32, The views of THS' users on the question of whether existing on-street parkings disturb their pedestrian movement.

6.2.7. Floor quality

Qualified street floor makes walking more comfortable and pleasant for all groups of healthy and handicapped pedestrians. The material of floorscape, quality of pavements, removal of unusual obstacles on sidewalks, sidewalk ramps with safe level variation, suitable parapets selected according to climate features are important in terms of creating safe sidewalks for pedestrians. When the case of THS is examined, it is possible to note that floor quality is very poor. As can be seen in Figures 6.33, 6.34, and 6.35, broken pavement slabs, unsafe level variations of sidewalks, which range from 0.3 m to 2.70 m, and unusual obstacles along sidewalks have made THS unsuitable for pedestrians.

Figure 6.33, Floor quality of THS (Re: Personal archive)

Figure 6.34, Obstacles along sidewalks on THS (Re: Personal archive)

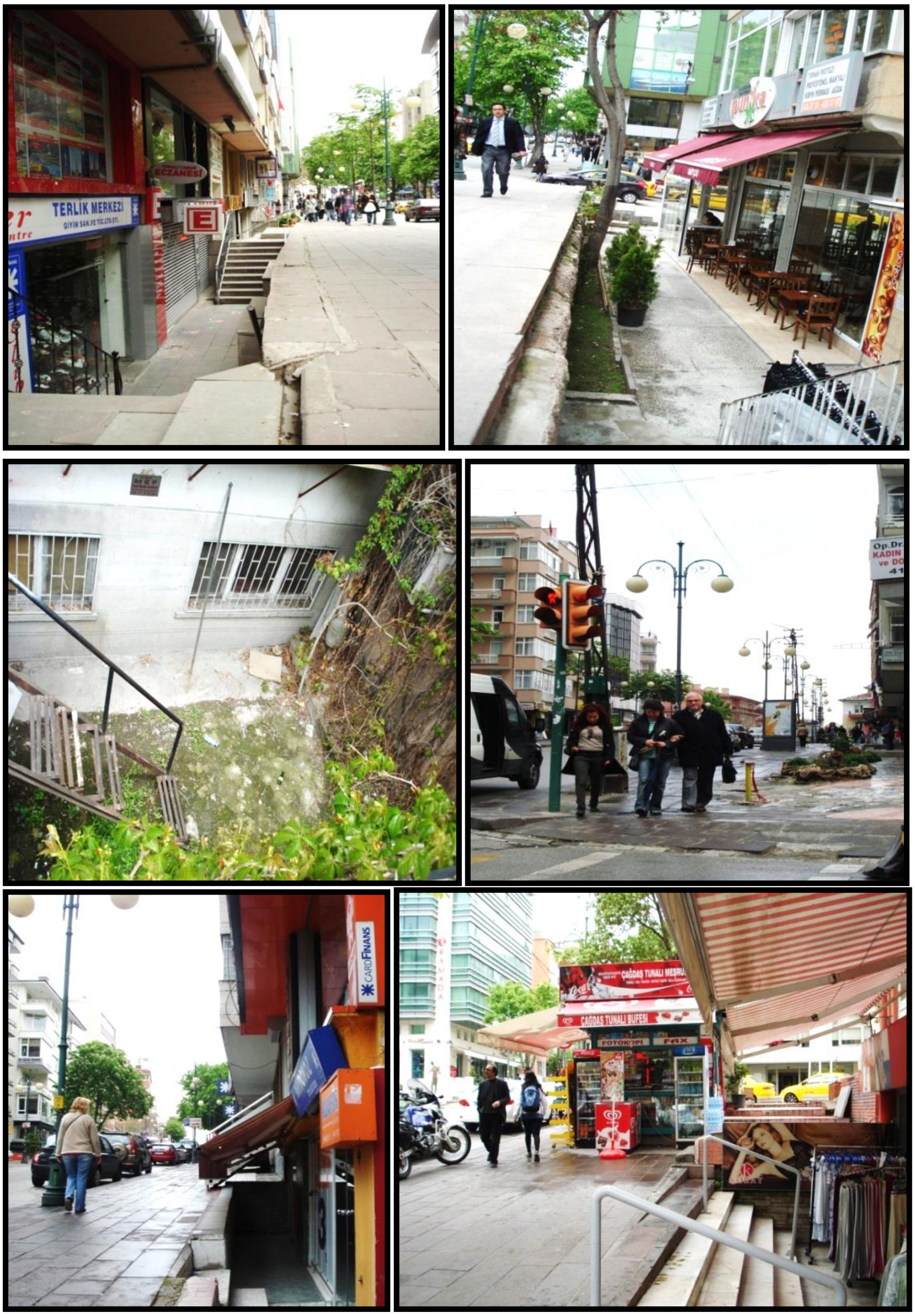


Figure 6.35, Unsafe level variations on the sidewalk of THS (Re: Personal archive)

Four questions were asked the THS' pedestrians about the floor quality of the street. The first question was whether pavement slabs are well-laid out and they do not disturb pedestrian movement. 54% of the respondents (thirty people) expressed that pavement slabs are not well-laid out and they disturb pedestrian movement, and 21%

of the survey participants (twelve) think that they partially agree with this statement, whereas 23% (thirteen people) claimed that sidewalk slabs are well laid out and do not disturb pedestrian movement (Figure 6.36). The second question was whether level variations along the sidewalks pavement (ramps, etc.) are adequately safe for pedestrians. 52% of the survey respondents (twenty-nine people) disagreed with this statement; 29% (sixteen people) partially agreed and 18% (ten people) agreed with this statement (Figure 6.36). The third question was whether pavement slabs along the sidewalks are not deformed or broken. 57% of the survey respondents (thirty-two people) disagreed; 25% (fourteen persons) partially agreed and 14% (eightpeople) agreed. Finally, the fourth question was whether there is no unusual obstacle for pedestrians along the sidewalks. 57% of the survey respondents (thirty-two people) disagreed; 23% (thirteen persons) partially agreed; and 16% (nine people) agreed (Figure 6.36).

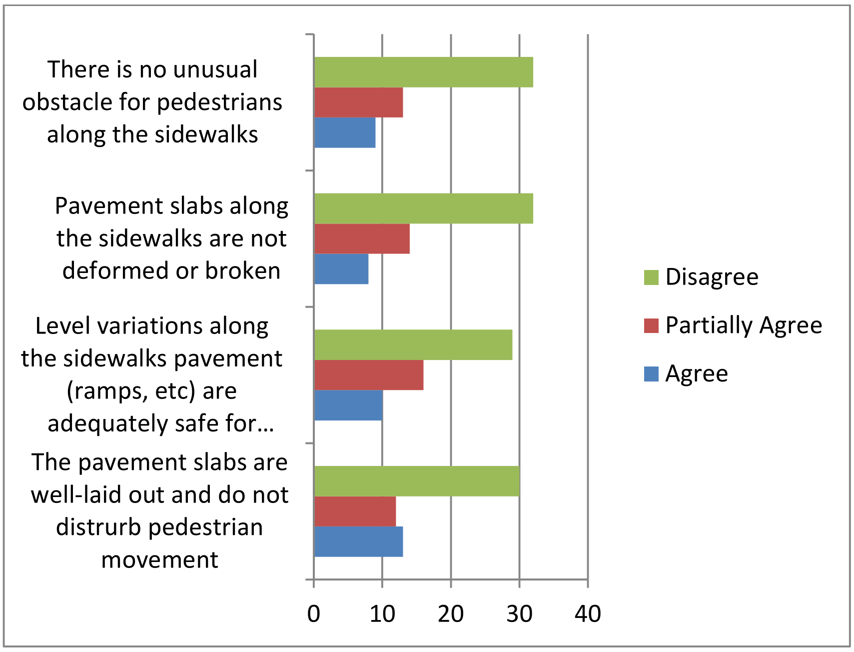


Figure 6.36, The views of THS' users on the floor quality of THS

Briefly put, the floor quality of THS is significantly poor. The results of the direct observation shows that broken pavement slabs, unsafe level variations of sidewalks, obstacles along the sidewalks makes walking more uncomfortable and unpleasant for all groups of pedestrians. The majority of survey participants agreed that the pavement slabs, which are not well-laid out, which are deformed or broken, unusual obstacles along sidewalks endanger the pedestrians' safety.

6.2.8. Street crossing

As explained in Chapter 2, street crossings should be short and visible to be safe for pedestrians. As THS is a long street intersected by many streets, there are at least ten street crossings along it. The only street crossings with traffic lights however are located on the intersections of THS with Abay K. Street, JFK Street and Esat Street (Figures 6.15 and 6.16). These three street crossings help pedestrians of THS to cross from east to west, or vice versa (but not from north to south, or vice versa). The street crossings are direct and short, but they are not adequately safe for pedestrians due to high level of ramps and lack of their visibility. Some ramps on street crossings are deformed; and there is no sign on the road surface showing pedestrians the location of the street crossing. Even though traffic lights help pedestrians cross the street, there are no special types of pavement on sidewalk to indicate street crossings for disabled people (such as, tactile pavement) or on the road for reducing car speed. Together with high number of cars parking on THS and unfit street crossings, pedestrians' safety is in danger (Figure 6.37).

Within the scope of the research, the THS' pedestrians were asked four questions, first of which was whether there are sufficient street crossings along THS. 52% of the survey respondents (twenty-nine pedestrians) claimed that there are no adequate street crossings, whereas 14% (eight respondents) disagreed and 27% (fifteen respondents) partially agreed. The second question was whether the street crossings along THS were well-situated. 48% of the respondents (twenty-seven respondents) disagreed; 27% (fifteen people) partially agreed; and 18% (ten people) agreed (Figure 6.38). The third question was whether street crossings along THS are located on easily accessible places. 50% of the survey participants (twenty-eight respondents) completely disagreed; 29% (sixteen people) were partially agreed; and16% (nine respondents) agreed (Figure 7.38). Finally, pedestrians were asked whether street crossings along THS were easily visible. 45% of the survey participants (twenty-five pedestrians) disagreed; 34% (nineteen respondents) partially agreed; and 14% (eight people) agreed (Figure 6.38).

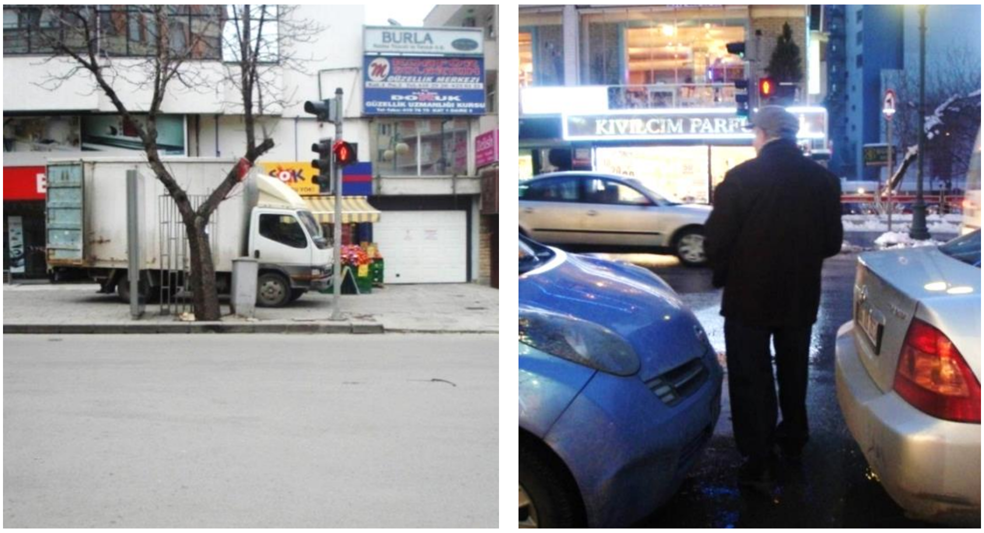


Figure 6.37, Street crossings in THS (Re: Personal archive)

In summary, the investigation on the street crossings of THS and survey results show that the street crossings with traffic lights are not sufficient to create a safe and walkable street. According to the majority of the survey participants, the street crossings are not well-situated, easily accessible and visible; and the street crossings with traffic lights along THS are insufficient. The findings of the investigation show that there is an urgent need for re-designing all the street crossings on THS as a continuity of the sidewalks to ensure the safety of all groups of pedestrians. Necessary standards should be implemented to the design of ramps, floor materials, signs that will ease the movement and comfort of pedestrians, and increase their safety. In this way, they will be easily visible (or perceivable) by everybody.

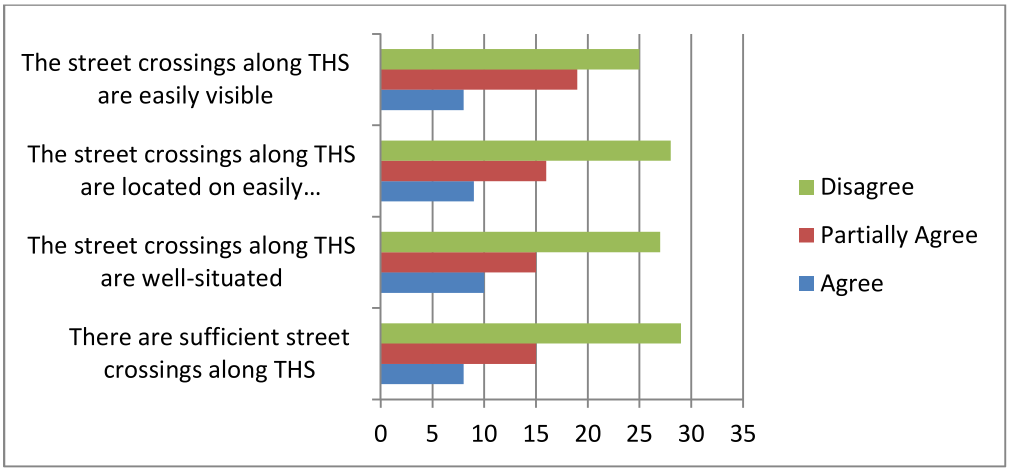


Figure 6.38, The views of THS' users on the street crossings of THS

7.3. Perceptual Safety

As explained in Chapter 2, Jane Jacobs (1961) defines three main qualities necessary for perceptual safety:

> 1) A clear delimitation between public space (streetscapes, sidewalks, public facilities) and private space (yards, shopping malls, gated communities, and private clubs),
>
> 2) Building orientation towards the street to provide 'eyes on street',
>
> 3) Common use facilities to add more 'eyes on street'.

The direct observation on THS shows that there are unclear or ambiguous boundaries between public and private spaces along the street. For example, in the first part of THS, the entrances of some buildings and some parts of sidewalks are often occupied by cars and trucks parked, and the sidewalk occasionally is occupied by tables and chairs of cafés and restaurants. Thus, along THS, it is hard to know which part of sidewalk belongs to the public space and which part is the private premise.

Regarding the second and third measures, the direct observations and spatial analysis show that all buildings entrances along THS are oriented towards the street, and THS is a mix-use street. Therefore, THS is arguably perceived as a safe street during day time, as there are a number of people who work and live on THS might act as 'eyes on the street'. The majority of commercial premises open until 8.00 pm., while some corner shops, tobacco shops, cafés, restaurants and bars, mostly located in the first part of THS, are open late night. In this part of the street, the residential usage is less than the second part. Therefore, in the first part of THS, the perceptual safety of night time can be seen lower than that of day time (Figure 6.39).

The second part of THS includes mostly residential uses, repair and tourism facilities, and a few groceries. Due to its usages and physical properties, this part is not preferable by pedestrians. It is possible to state that, compared to the first part, the perceptual safety in the second part of THS might be seen higher at day time. Because this part of the street is not as busy as the first part; there are a few pedestrians or strangers; and the residential and working population act as ’eyes on the street’ during day time. At night time, only residential population acts as ‘eyes on the street’. Therefore, the perceptual safety at night time might be lower than day time. Nevertheless, the perceptual safety of this part of THS at night is higher than that of the first part due to the presence of high residential population.

Regarding the ‘perceptual safety’, the users of THS were asked six questions, first of which was whether THS is a noisy street. 71% of survey respondents (forty people) perceived it as noisy street; 18% (ten people) replied that it is a partially noisy street; and 7% (four people) declared that THS is adequately peaceful (Figure 6.39). The second question examines the idea of the pedestrians about the origin of the noise on THS. Thus, pedestrians were asked whether the noise of the street was resulted from car traffic. 77% of the respondents (forty-three people) agreed on this reason; 5% (three people) thought that the noise arises from both car and pedestrian traffic; whereas 9% (five people) believed that there is no noise originated from car traffic on THS.

The third question mainly studies the perception of ‘safety at night’. Survey participants were asked whether facilities open until late night make the street safer at night. 20% of respondents (eleven) stated that they did not perceive THS as a safe street at night. Especially those who live in THS stated that, after late night when all businesses were closed, THS became an unsafe street. They noted the lack of pedestrian presence at night, which is essential factor in perceptual safety. They also complained about the lack of police patrolling on the street and the surrounding streets at night. 48% of survey participants (twenty-seven respondents) claimed that THS is partially safe during night-time, whereas 25% (fourteen people) considered it as a safe street at night. Regarding Kuğulu Park, 46% of the respondents (twenty-six respondents) stated that it is not safe at night; 36% (twenty people) believed that it is partially safe at night, while 12% (seven people) claimed that Kuğulu Park is a safe area at night (Figure 6.39).

Fourth, the survey participants also were asked whether facilities open until late nights make the street safer at night. 62% of survey participants (thirty-five people) agreed on this idea; while 21% of respondents (twelve people) claimed that besides open facilities, the pedestrian presence on THS is needed at night time to be perceived safe. Thus, for them, open usages partially contribute to their safety. 9% (five respondents), however, disagreed on this idea; expressing that the presence of pedestrians and police is much more important for them to feel safe on the street, rather than facilities open until late night (Figure 6.39-40).

At last, the THS' users were asked whether THS would be much safer if there are more residential uses (or residential population). 32% of the respondents (eighteen people) claimed that more residential uses (or population) will increase safety at night. 34% of the participants (nineteen people) claimed that the presence of residential usages are partially effective to consider the THS safe, adding that other factors such as open facilities late night and pedestrian presence, are essential, too. On the other hand, 27% of the respondents (fifteen people) claimed that residential usages did not have any effect in their safety because the inhabitants of THS were not particularly interested in what happened on the street (Figure 6.40).

To conclude, the findings of the spatial analysis and direct observation reveal that the perceptual safety of THS is weak regarding the delimitation of public and private space, as it is not clear which part of sidewalk belongs to the public space and which part is the private premise. Regarding the building orientations, the perceptual safety is strong, because all buildings are oriented towards THS, and THS is a mix-use street. Thus, THS might be perceived as a safe street during day time, since there are a number of people who work and live on THS might act as 'eyes on the street'. In the first part of THS, the perceptual safety of night time can be seen lower than that of day time, because the residential usage is less than the second part. In the second part of THS, the perceptual safety at night time might be lower than day time. Nevertheless, the perceptual safety of the second part of THS at night is higher than that of the first part due to the presence of high residential population. As for the survey results, the respondents generally agreed that THS is a partially safe street at night, except Kuğulu Park which is considered unsecure at night. The majority of the survey participants claimed that facilities open until late night might make the street perceived safe. Yet, there is no clear idea about whether THS will be a much safer place if there is a higher ratio of residential population.

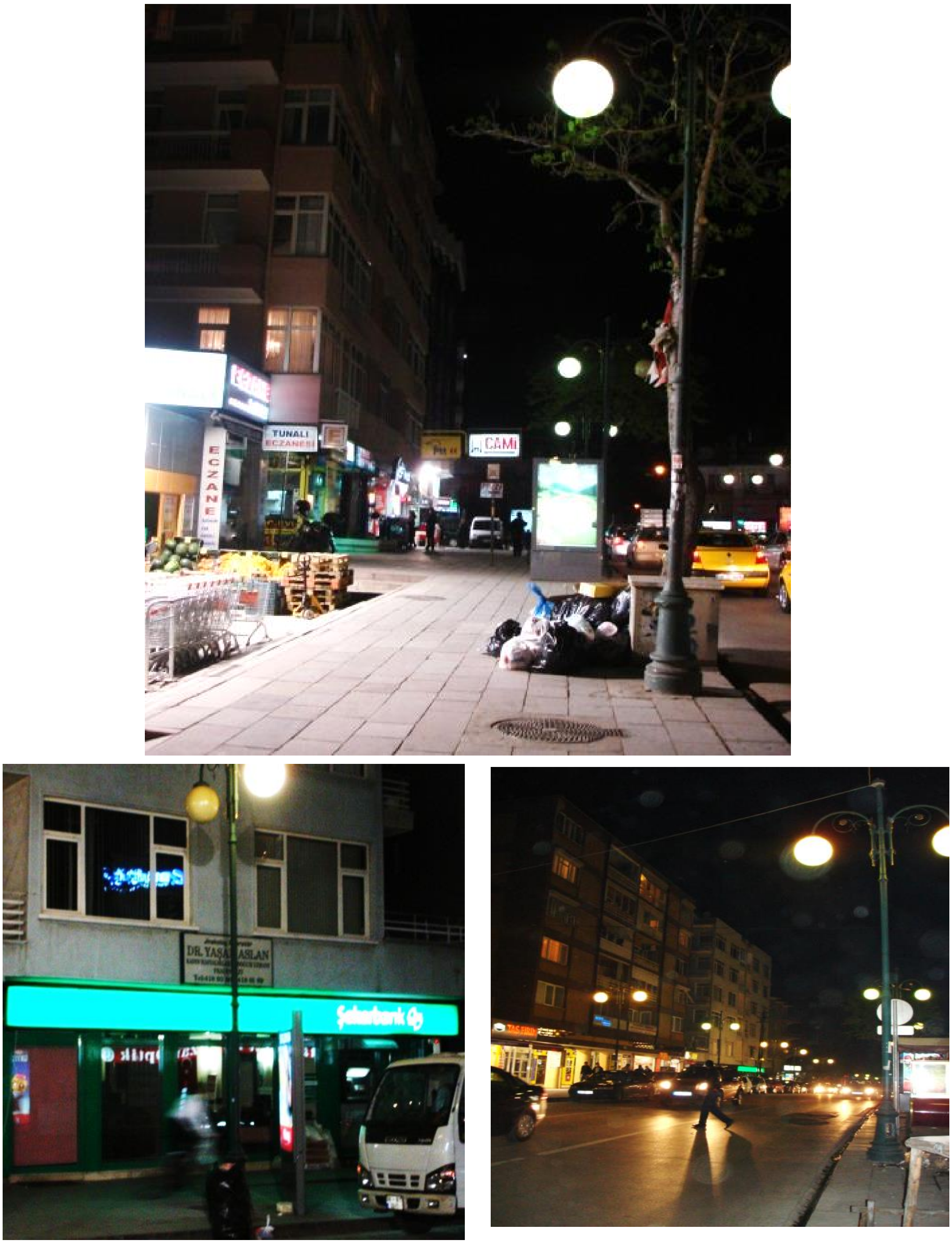


Figure 6.39, The first part of THS at night (Re: Personal archive)

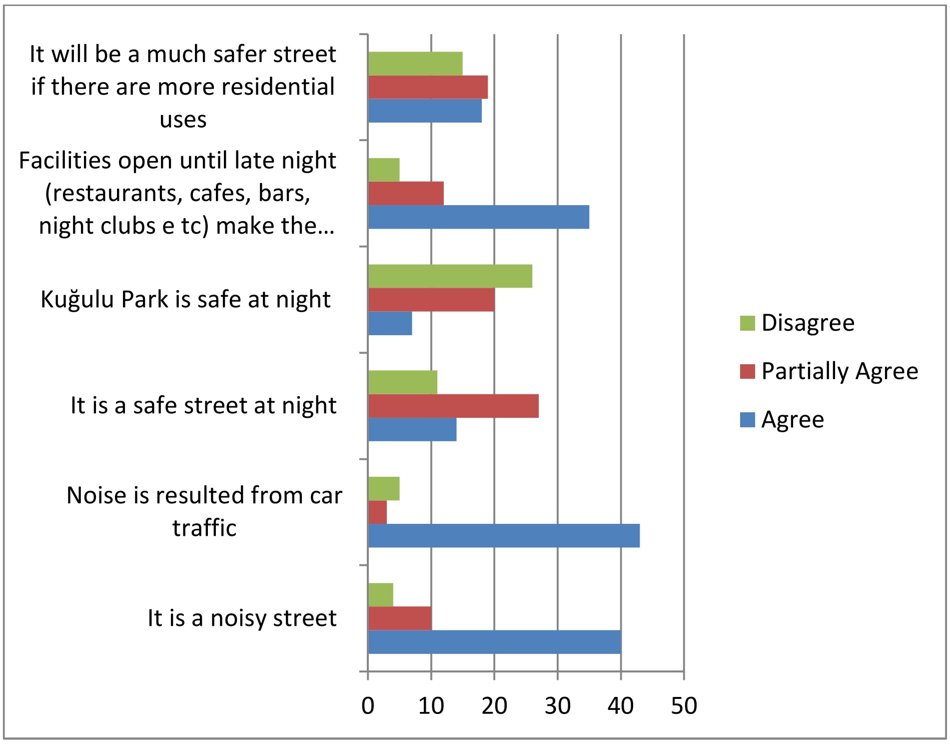


Figure 6.40, The views of the THS' users on the perceptual safety of the street

Table 6.2, The assessment of safety in THS

• THE EVALUATION OF SAFETY IN THS			
ACTUAL SAFETY	**Assessment results**	**PERCEIVED SAFETY**	**Assessment results**
1) Street pattern	Modified grid, high amount of paved surface, accessible,unqualified pavement slabs, high vehicular traffic	*1) Clear delimitation between public and private space*	Unclear delimitation
2) Traffic calming measures	Poor design and management policies	*2) Building orientation towards street*	Buildings are oriented to common pedestrian realm
3) Lightening	Partly-qualified lightning system	*3) The presence of common use facilities*	Many various usages are closed at night
4) Continuous pavement	Continuous street pattern, unsafe street crossings, inharmonious street furniture		

Table 6.2, (Continued)

5) Pedestrian enclosure	Well-oriented buildings, less ratio of sidewalk width to height of buildings, inharmonious street furniture	
6) Separation	Highly developed unsystematic parking	
7) Floor quality	poor	
8) Street crossings	Direct, short, invisible, and unsafe street crossings	

6.4. Orientation

Orientation is related to a quick recognition of public space network. If pedestrians are able to imagine a simple network map and its unforgettable points, it is a well-oriented and legible street. Within the scope of this research, five factors -*legibility of its street pattern, landmarks, continuity, built form and its location and architectural and environmental features*- are examined under the criterion of *orientation.*

6.4.1. Legibility

As I explained in Chapter 2, *legibility* refers to a quick understanding of a neighborhood plan. Simple, regular and highly connected street patterns are more legible. Street pattern around THS is a modified grid pattern and THS is regularly linked to its side streets through Bardacık, Esat, JFK, Büklüm, Bülten, Bestekar, Çığır, Tunus, Abay.K and Buğday Streets (Figure 6.6, , 6.15, 6.16, and 6.18). When the cognitive maps drawn by the survey participants are examined, it is possible to see that the respondents easily perceive the modified grid street pattern (Appendix B). Looking at these maps, it is possible to see that most pedestrians perceive THS and the surrounding street pattern as legible.

6.4.2. Landmarks

Landmarks increase the legibility of the environments, create a memorable and familiar image in pedestrians' minds, and thus help pedestrians to realize where they are or whether they are in the right way or not. As explained before, landmarks in the mind of pedestrians can be evaluated through mental maps. *Differentiation, detailed building form and junctions and singularity as suggested by* Gestalt rules and Lynch, help the formation of simple mental maps in people's mind and fix unforgettable landmarks in their memory.

The cognitive maps were used to understand the users' perception on the landmarks of THS. The survey participants were asked to draw and note the memorable buildings or usages on THS. Figure 6.41 shows the landmarks of THS according the responses of the survey participants. From Figure 6.41, it is possible to note that THS is very rich in terms of landmarks. As claimed by 54% of the survey respondents (thirty people), Kuğulu Park is still considered as the most important landmark of THS. This is followed by McDonald's (thirteen participants, 23%), Karum Shopping Center (eleven participants, 20%), and Kuğulu Arcade (ten participants, 18%). D&R, Mado, and Öğütler Market are the third-grade landmarks for the survey participants.

6.4.3.

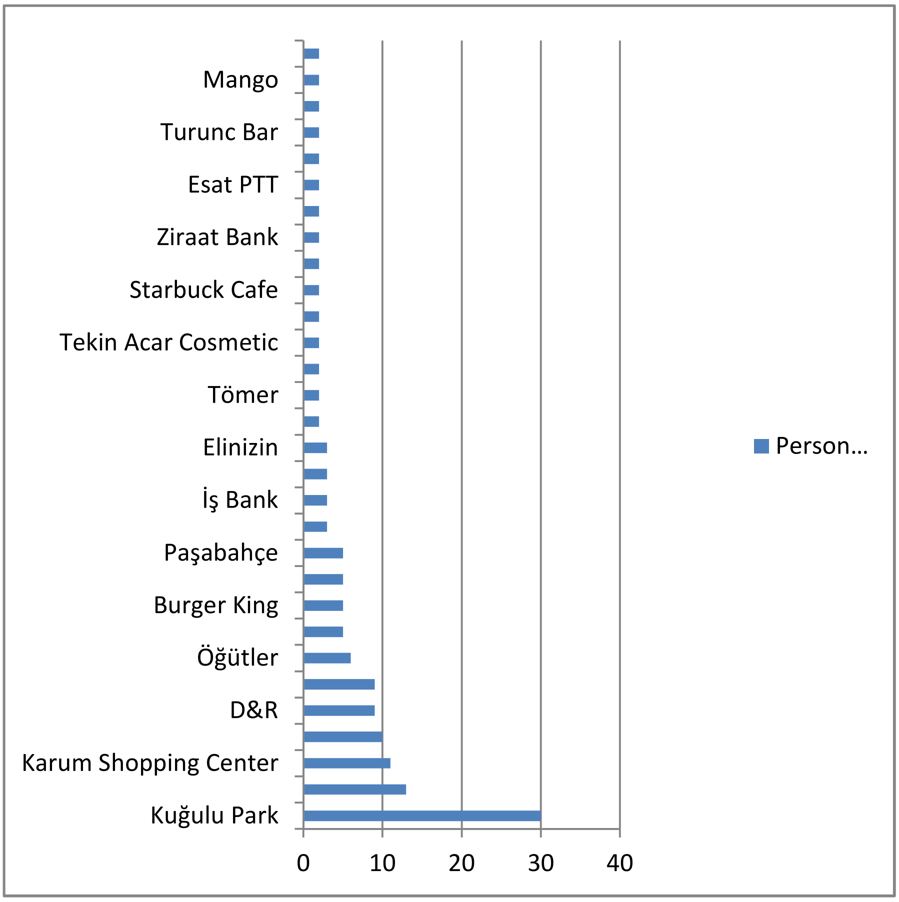


Figure 6.41, The assessment of safety in THS.

Continuity

Continuity (visual) expresses that how well the boundary of different parts of urban spaces are defined and how well different parts of public spaces are connected through architectural urban elements. A well-connected grid street pattern might create a continuity of sidewalks. Similarly, harmonious street furniture elements (particularly street furniture elements which are grouped together and repeated along sidewalks) can contribute to the continuity of sidewalks. Furthermore, various types of soft landscaping and street furniture elements should have definite height. For example, the height and width of street trees which are trimmed in the same width and height will be harmonious, and thus will contribute to the continuity of sidewalks.

As explained in the section 6.2.4, the modified grid street pattern around THS offers more continuous, therefore, walkable sidewalks for pedestrians. Subsequently located shops create a frontage continuity on both sides of THS. But, the continuous sidewalk pattern on THS is interrupted by a number of intersecting streets. Low quality of sidewalk floor (broken slabs), and inharmonious rhythm of street furniture located on THS decrease its perceptual continuity (Figure 6.7).

6.4.4. Built form and the location

Pedestrians can perceive some buildings and/or open spaces much easier than others due to their built form and the location that contribute greatly to their legibility. The survey results shown in Figure 7.41 indicate that the location of Kuğulu Park is one of the major reasons which turns it into a landmark in the mind of pedestrians. It is very close to the bus stops, and this makes it very accessible for bus passengers. Thanks to its location, Kuğulu Park is accessible by everyone by walking. The Park is known and recognized as the main landmark of THS due to its design that allows a variety of different activities (meeting, relaxing, exercising, socializing space, etc) to take place, as well as its greenery and well-known swans. Also, Kuğulu Park is the most memorable landmark owing to its design and management that has created a safe and relaxing place for the majority of its users especially during the day time.

Kuğulu Arcade, McDonald's and Karum are other important landmarks, because they provide safe, secluded and comfortable places for pedestrians to meet, shop, eat and drink, and spend time. due to their covered areas which protect them from bad climatic conditions. With its distinguished architectural style and the multiple activities it contains, Karum shopping mall is an important landmarks. McDonald's is seen as memorable due to its location on THS, and its popularity among young people for meeting and having something to eat inexpensively. However, Tunalı Arcade is memorable and attractive for all due to a variety of shops selling a wide range of commercial commodities.

Mado and D&R are third-grade landmarks. They provide protected places for people to sit, eat and drink, or meet others. Being situated next to Kuğulu Park, the location of Mado also makes it a memorable place for the users of THS. As for Öğütler (now Çağdaş supermarket), it is memorable for all due to its function as a supermarket and its central location, rather than the architectural style of the building.

6.4.5. Architectural and environmental features

As explained in Chapter 2, building entrances and building orientation become important in terms of understanding how far architectural and environmental features contribute to walkability of a street. Building entrances should be visible, and accessible by all pedestrian groups, including wheelchair users, old people and pedestrians with strollers. Moreover, buildings should be oriented to most preferable sidewalks. In the case of THS, in general, the entrances of shops and apartment buildings are visible by pedestrians, but few of them need some more architectural or urban elements to make them more visible (Figure 6.42). Some of the building entrances are not very accessible for disadvantaged groups, such as Üniversite Apartment and Ertuğ Building that need particularly ramps, or some pavement treatments on the floor to fix floor level variations (Figure 6.43 and 6.44).

All in all, THS is partly successful and partly unsuccessful in terms of the criterion of orientation. THS and its surroundings is highly legible environment owing to its modified grid pattern and a rich variety of landmarks that it accommodates. Interestingly, a public open space, i.e. Kuğulu Park, is the most important landmark of the area. It is followed by McDonald's, Karum Shopping Center and Kuğulu Arcade. D&R, Mado, and Öğütler Market (now Çağdaş supermarket) are the third-grade landmarks of THS. There are a number of reasons for the choice of these buildings or sites as the landmarks. Kuğulu Park is the most essential landmark because it provide accessible, safe, comfort, and attractive environment for pedestrians with a variety of functions it offers. Among these landmarks, only Karum has special architectural features, but the rest are memorable places due to their functions they accommodate. Rather than architectural features, most of the popular landmarks provide pedestrians with social environments for people to shop, sit, eat, drink and socialize; and protected environments from bad climatic conditions (hot or cold weather).

Figure 6.42, Accessibility and visibility of some building entrances on THS.
(Re: Personal study and rendering)

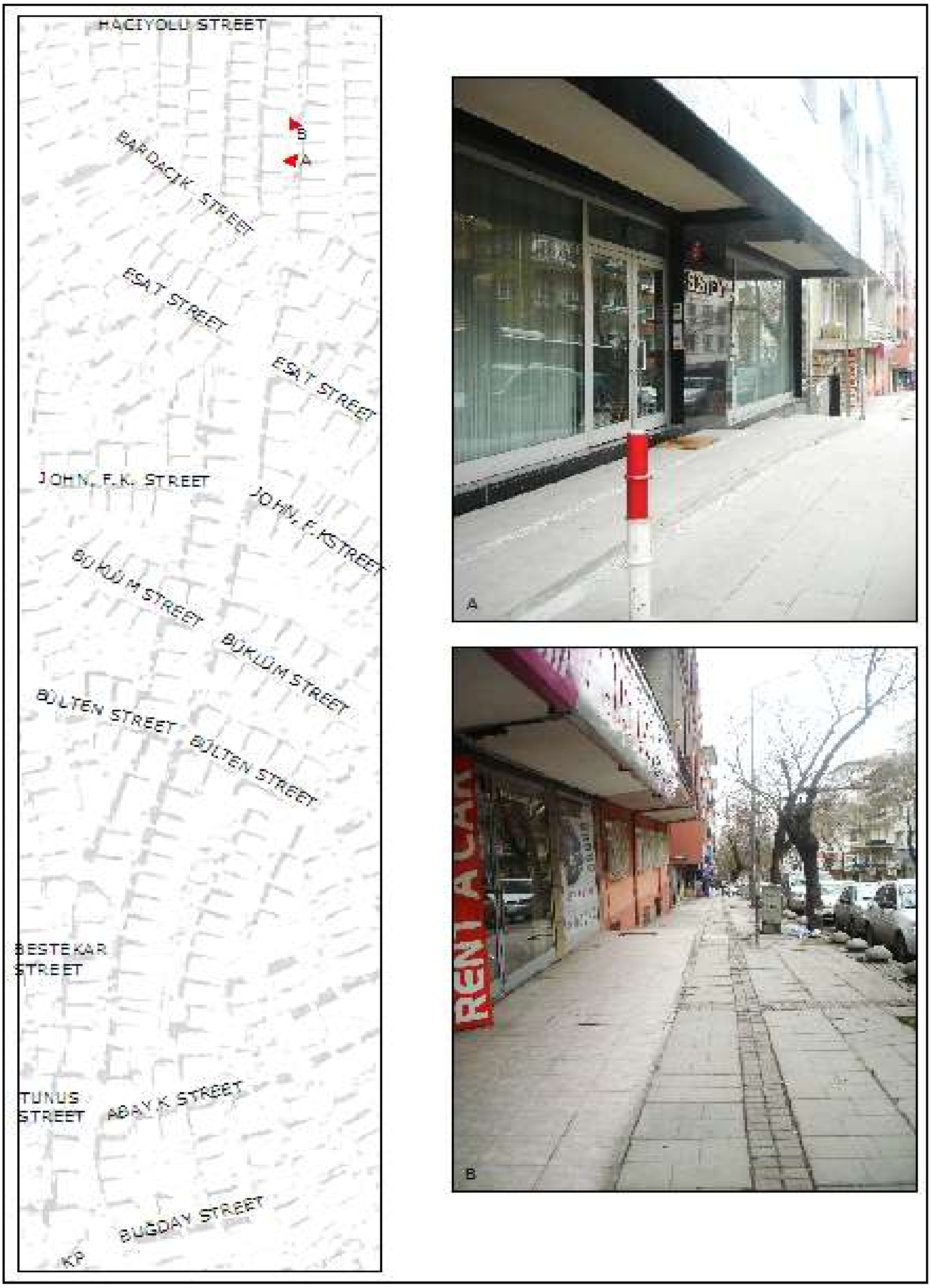


Figure 6.43, Accessibility and visibility of some building entrances on THS. (Re: Personal study and rendering)

Figure 6.44, Undefined building entrances along THS,
(Re: Personal study and rendering)

As for the continuity, the modified grid street pattern around THS offers more continuous, therefore, walkable sidewalks for pedestrians. Subsequently located shops create a frontage continuity on both sides of THS. But, the continuous sidewalk pattern on THS is interrupted by a number of intersecting streets. Likewise, the perceptual continuity of THS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture. In the case of THS, the entrances of shops and apartment buildings are visible by pedestrians, but they are not defined perfectly by architectural or urban elements. Some of them are not very accessible for vulnerable pedestrian groups, as well. These buildings entrances need particularly ramps, or some pavement treatments on the floor to fix floor level variations.

6.5. Attractiveness

As explained in Chapter 4, this thesis examines the criterion of 'attractiveness' based on the assumption that a street is attractive, if it is colorful, enjoyable, legible, safe, peaceful, comfortable and spacious. There are some qualities, such as predictable and monotonous versus intriguing, surprising, mysterious and exciting, which might be desirable to some extent, but not completely. Thus, the assumption of this thesis is that a street is attractive, if it is partly predictable, monotonous and boring, and partly intriguing, surprising, mysterious and exciting. If these qualities exist in an urban area with a high degree, the attractiveness of the space will be lessened. Finally, there are negative qualities, such as suffocating. If a street is suffocating, it will not be an attractive space.

Regarding the facades of the buildings on THS, although many buildings were built more than forty-fifty years ago and have lost their fresh color, they provide THS with a colorful scene (Figure 6.45). There is no specific municipal design guideline or regulation on the colors of buildings and shop fronts. Nevertheless, there is a color harmony among the buildings which were built between the 1960s and 1990s. Yet, the new ones are generally very different from the earlier buildings regarding their building materials and colors of their façades (Figure 6.46). The glass façade buildings mostly destroy the visual harmony (and continuity) of the street in terms of colors and building materials. Besides, as the signboards of the shops and offices on THS are not regulated, in some parts of the street, especially between Kuğulu Park and Esat Street, the design, size, material of signboards and shop fronts do not provide a visually harmonious streetscape (Figure 6.46). These factors therefore impoverish the visual quality of THS.

Figure 6.45, The facades of some buildings on THS between Kuğulu Park and Esat Street (Re: Personal archive)


Figure 6.46, Facades of some buildings in Esat-Hacıyolu boundary in THS, (Re: Personal archive)

As explained in 6.2 and 6.3, THS is not a safe street for pedestrians in many senses regarding actual and perceptual safety. Nevertheless, due to the street pattern and landmarks, it is highly legible for pedestrians, as explained in 6.4.1. and 6.4.2.

As can be seen in Figure 6.47, THS is a street containing the buildings with different architectural style. The buildings with similar architectural style may create a monotonous scene. As there are buildings with different architectural style, especially between Kuğulu Park and Esat Street, it is possible to argue that THS does not provide pedestrians with a monotonous scene. Also, the shops and shopwindows make it a very interesting place, particularly for shoppers (Figure 6.47, 6.48, and 6.49)

As explained in 6.2.5 in detail, pedestrian enclosure in the first part of THS is inadequate. This creates a suffocating street. In the second part of the street, however, the pedestrian enclosure (therefore, the sidewalk width) is adequate particularly due to the low pedestrian volume.

There are a number of visual elements which impoverish the attractiveness of the street, such as dirty advertisement boards, unsafe urban elements, inappropriate placement of air conditioners along sidewalks, broken pavement slabs, different level variations on sidewalks, improperly built street ramps (Figure 6.35,42).

Figure 7-47, Dissimilar and interesting buildings on THS according to their architectural style (Re: Personal study and rendering)

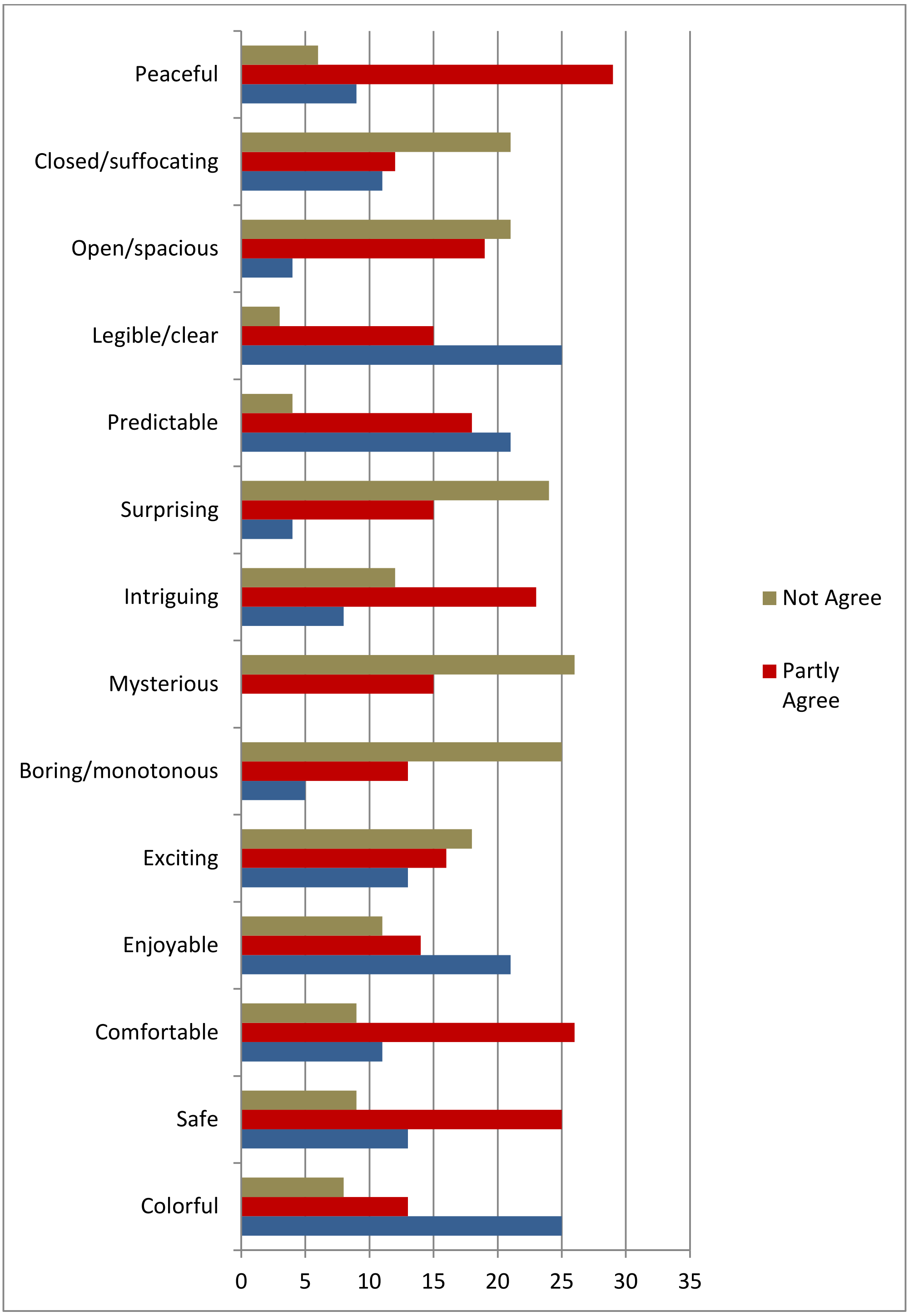


Figure 6.47, The evaluation of attractiveness according to the THS' pedestrians

As for the views of the THS' users, the survey participants were asked whether THS is *colorful, safe, comfortable, enjoyable, exciting, monotonous, mysterious, intriguing, surprising, predictable, legible, spacious, suffocating, and peaceful.* 45%

of the survey respondents (twenty-five people) found THS colorful, and 23% (thirteen people) claimed that it is partially colorful.

23% of the survey participants (thirteen people) defined THS as safe, and 45% (twenty five people) found it partially safe. 16% of the respondents (nine people) claimed that THS is peaceful, and almost 50% (twenty-nine people) defined it as a partially peaceful street. 20% of the survey participants (eleven respondents) claimed that THS is a comfortable street and 46% (twenty-six persons) considered it a partially comfortable street. Furthermore, 37% of the respondent (twenty-one people) agreed that it is a comfortable street, and 25% (fourteen people) partially agreed. 23% of the survey responded (thirteen pedestrians) stated that THS is an 'exciting' street and 29% (sixteen people) defined it as a partially exciting street.

On the other hand, 45% of the survey participants (twenty-five respondents) claimed that THS is not monotonous and 23% (thirteen people) defined it as partially boring. 21% of the survey respondents (twelve people) did not find THS as intriguing while 41% (twenty-three participants) claimed that it is partially intriguing.

37% of the survey respondents (twenty-one respondents) considered THS as predictable, and 32% (eighteen people) considered it as partially predictable. For 45% of the survey respondents (twenty-five people), THS is legible, and for 27% (fifteen people), it is partially legible.

37% of the survey participants (twenty-one people) defined that THS is not spacious, and 34% (nineteen people) considered it as partially spacious. These survey results are complemented with the evaluation of the street regarding suffocating. 20% of the survey respondents (eleven people) defined THS as suffocating, and 21% (twelve people) claimed that it is partially suffocating, and the majority of the survey participants did not find it suffocating.

Briefly put, the majority of the survey participants claimed that THS is a colorful, enjoyable, predictable and legible street; it is a partially safe, peaceful, comfortable, and intriguing street; and it is not an exciting, mysterious, and surprising street, but it is not a boring or monotonous place, either. Besides, the survey participants claimed that THS is not spacious, but not a suffocating street either.

According to the survey findings, it is possible to claim that:

- THS is an attractive street in terms of the colors, joy, legibility and predictability it provides.
- It is an attractive street to a certain extent regarding the safety, peace, comfort and intriguing that it partially offers.
- THS is not attractive, because it provides neither an exciting, mysterious and surprising scene, nor a spacious street. However, it is not extremely unappealing and uninviting either, since it is not a boring or monotonous, and suffocating street. (Figures 7.47-50)

Figure 6.48, Urban elements which impoverish the visual attractiveness of THS (Re: Personal archive)

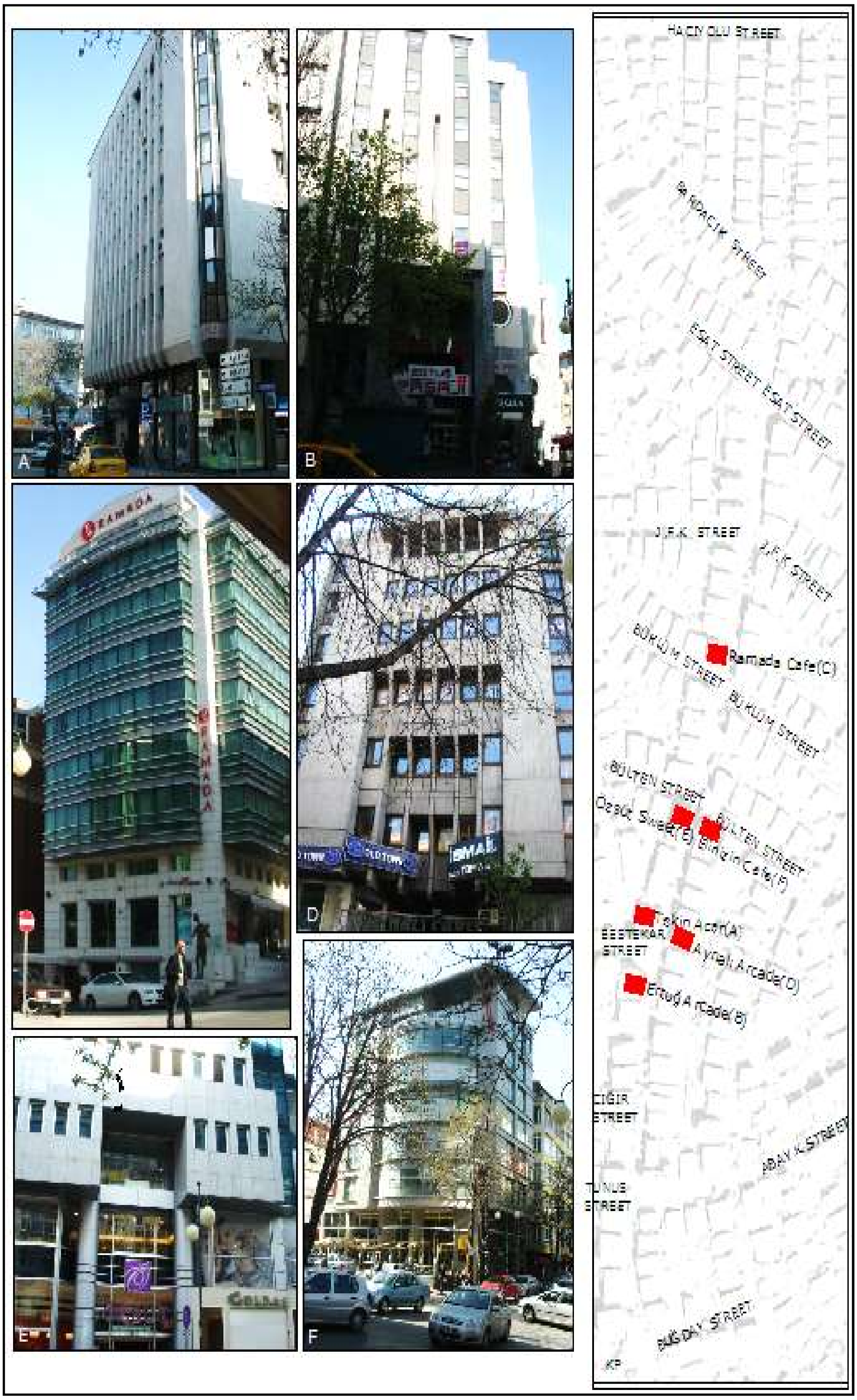


Figure 6.49, Buildings with different architectural style creating a dissimilarity and thus provide pedestrians with an interesting scene

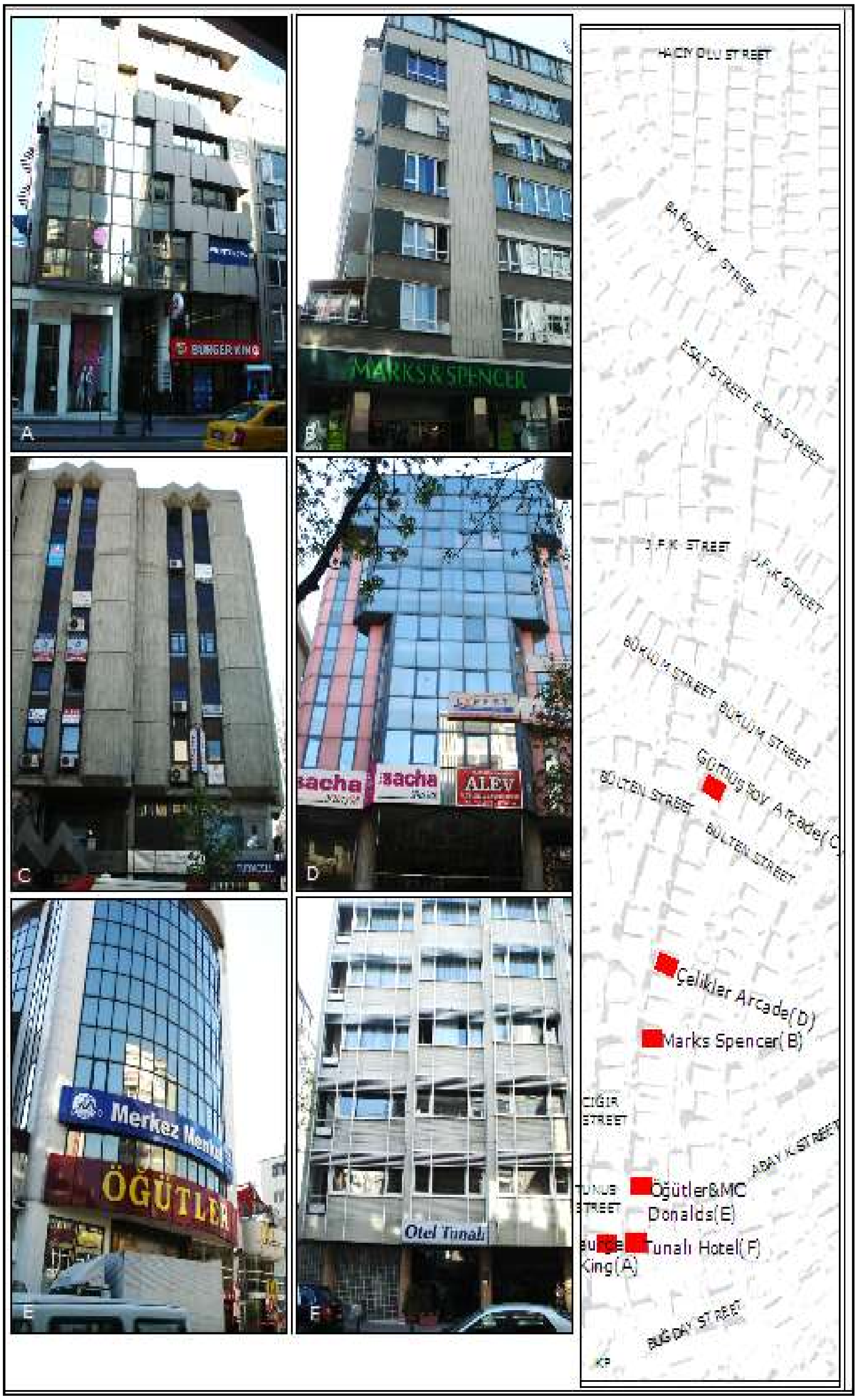


Figure 6.50, Buildings with different architectural style creating a dissimilarity and thus provide pedestrians with an interesting scene.

6.6. Comfort

As discussed in Chapter 2, comfort is evaluated physically and visually. Urban spaces should be 'physically usable' and 'visually understandable' to be comfortable for pedestrians. 'Physical usability' of an urban space depends on four factors that make the comfort of walking for healthy, handicapped, early-age and old-age people. These factors are i) architectural urban elements which protect pedestrians from rain, sun, snow, ice and wind; ii) clean air (which is provided by traffic calming); iii) the presence of the conditions for actual and perceptual safety, and iv) accessibility of the space for particularly all pedestrian groups. On the other hand, 'visual understanding' is assessed how far a public space provides a good quality of orientation and how far it is legible for pedestrians.

Regarding 'physical usability' of THS, the facades of some buildings provide architectural and urban elements which help the protection of pedestrians from climatic conditions (Figure 6.51). However, no specific regulation is provided by the local authority in terms of canopies for all the buildings along THS. Besides, a high traffic volume on the street causes air pollution; and insufficient number of street trees is not enough to clean polluted air in the street. Furthermore, the assessment on actual and perceptual safety shows that THS does not provide a safe place (Table 6.2). Finally, the sidewalks along THS do not contain any benches for pedestrians. Nevertheless, Kuğulu Park provides alternative rest places and seats for the public; and cafés and restaurants located along THS provide some private rest places for the people who can afford (Figures 6.52 and 6.53).

As for the accessibility of THS, it is subject to discussion. THS and the streets around it, comprises commercial and residential usages. Their ground floors are more devoted to commercial shops, while upper floors are occupied by residential, commercial and office uses. Therefore, all facilities placed in THS and around it, are easily accessible for their residents. In fact, the livability of THS is greatly supported by the presence of residential functions or the inhabitants living on the street and the neighboring streets.

Figure 6.51, Pedestrian presence in the rest places, cafes and restaurants on THS
Re: Personal archive

Regarding public transportation services, there are many bus stops along Atatürk Boulevard and some of them are located on THS. Yet, it is very difficult to pass through THS due to high traffic volumes resulted from both public and private vehicles in almost every hour of day. In terms of pedestrian traffic, THS is also a very busy street with pedestrians for all day long during the week and weekends. Because of both pedestrian and vehicular traffic, it is hard for pedestrians to walk on THS and to cross it in different parts of the street during both the weekdays and weekend days.

As the THS' inhabitants and daily users are from middle and high-income groups, they generally have cars. For this reason, the need for parking spaces for both private car-owners living in this area and those visiting the area is significantly increasing. This therefore creates more traffic congestion along the day. Especially in peak hours, neither visitors, nor the residents of THS and its surrounding streets can easily move by their cars or find parking places for their private cars. Even the sidewalks of the streets are sometimes occupied by cars. The vans, minibuses and delivery cars servicing the commercial premises along THS, as well as taxis, also intensify the traffic congestion. Therefore, although THS is situated in the central part of this area, and it is well-connected to many streets, traffic congestion, the cars parking on sidewalks and the crowded street discourage people to drive and walk on THS. These factors make THS an uncomfortable street.

As for 'visual understanding' of THS, the street is partly successful and partly unsuccessful. THS and its surroundings is highly legible environment due to its modified grid pattern and pedestrians easily perceive this pattern. In spite of the presence of a variety of landmarks on THS, Kuğulu Park is the most popular landmark of the area among the daily users. This is followed by McDonalds, Karum Shopping Center and Kuğulu Arcade; and then, D&R, Mado, and Öğütler Market (Çağdaş supermarket now) are the third-grade landmarks of THS. Three factors are important for the choice of these buildings or sites as the landmarks: their built form, location and usage (or function).

Regarding the continuity, the modified grid street pattern around THS offers more continuous, therefore, walkable sidewalks for pedestrians. Subsequently located shops create frontage continuity on both sides of THS. But, the continuous sidewalk pattern on THS is interrupted by a number of intersecting streets. Likewise, the perceptual continuity of THS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture.

As for the participants survey, pedestrians were questioned whether there are enough sheltering provided by building canopies on THS for pedestrians to be protected from sun light, rain, snow and wind. 41% of the survey participants (twenty-three people) claimed that there are not any measure taken to protect pedestrians from climatic conditions, while 32% of the survey participants (eighteen people) stated that there were some measures taken, and 23% (thirteen people) claimed that there are sufficient measures taken (Figure 7-54).

Pedestrians were also asked whether there are adequate rest places on the street. 61% of the participants (thirty-four persons) claimed that there are not enough rest places along THS, except for KP boundary. 12% of the survey participants (seven people) expressed that rest places are partially enough and 20% (eleven people) declared that rest places are completely enough (Figure 6.54).

Briefly put, the examination of THS regarding its comfort shows that the physical usability of the street is low. Because, it partly offers architectural elements that protect pedestrians from climatic conditions, as also supported by the pedestrians surveyed. There is no municipal design guidelines for the canopy or other architectural elements of the street in order to protect pedestrians from climatic conditions. THS does not possess clean air due to the high traffic volume on the street and insufficient greenery; it does not fulfill the conditions of actual and perceptual safety either. It is an accessible street for pedestrians by walking, public transport means or private car; but it is not an easily accessible place for vulnerable groups. The major difficulty for all groups is the mobility within THS. Despite its central location in the city and its well-connected street pattern, THS mainly suffers from traffic congestion, the cars parking on sidewalks, and the crowded street that discourage people to drive and walk on THS. These factors make THS an uncomfortable street.

As for 'visual understanding' of THS, the spatial analysis, direct observation and the survey results reveal that it is partly successful and partly unsuccessful. THS and its surroundings is highly legible because of its modified grid pattern which enable pedestrians to easily perceive this pattern, and contribute to their mobility capacity by walking. Three factors are important for the choice of these buildings or sites as the landmarks: their built form, location and usage (or function). The research findings reveal that, despite the presence of a variety of landmarks, Kuğulu Park is the most important landmark of the area; then followed by McDonald's, Karum Shopping Center and Kuğulu Arcade and then D&R, Mado, and Öğütler Market.

Regarding the continuity, the modified grid street pattern around THS offers more continuous, therefore, walkable sidewalks for pedestrians. Subsequently located shops create a frontage continuity on both sides of THS. But, the continuous sidewalk pattern on THS is interrupted by a number of intersecting streets. Likewise, the perceptual continuity of THS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture.

Figure 6.52, Architectural elements protecting pedestrians from climatic conditions (Re: Personal archive)

Figure 6.53, Rest Places in THS (Re: Personal archive)

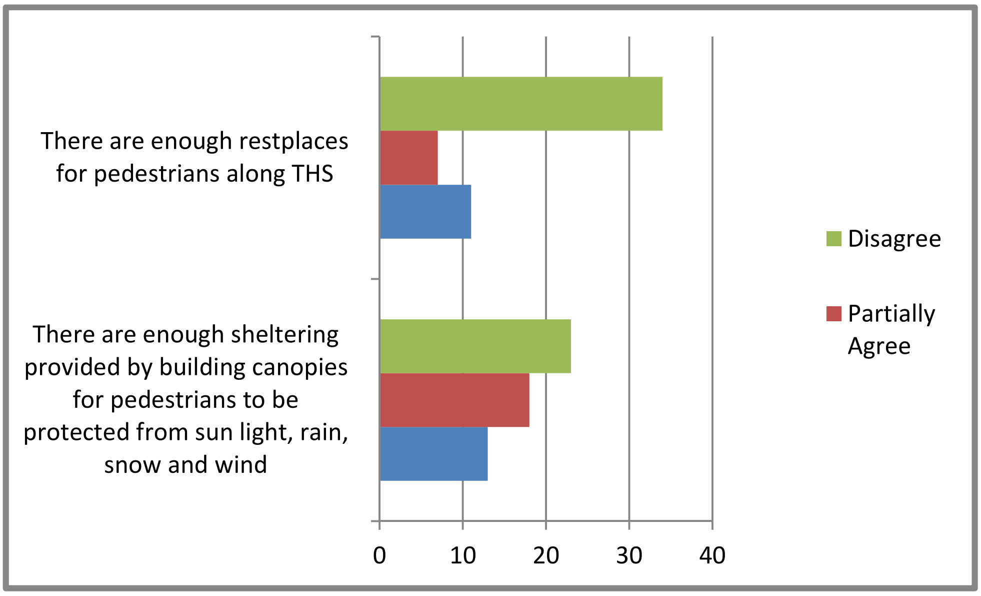


Figure 6.54, The assessment of comfort provided by THS according to the THS' users

6.7. Diversity

Diversity in urban space which includes physical, social and economic diversity has a close relation with walkability. 'Physical diversity', as mentioned earlier, means a variety of urban physical elements, such as a variety of dwelling types, architectural styles, and land-use activities. 'Social diversity' refers to a mixture of people coming from different ages, family types and socio-economic status, whereas 'economic diversity' means a variety of building types with different property values. The presence of such diversity in urban space is important in terms of bringing different groups of people together and to make them use public spaces.

With respect to physical diversity, the first part of THS includes dwelling types for middle and high income groups. In addition, this part comprises many different land-use activities which attract many pedestrian groups (Figure 6.5, 6.55). The presence of Kuğulu Park on this part of THS is another factor which increases the walking activities of THS. However, the second part of THS does not include as many land use facilities as the first part (Figure 6.6). In the second part, the property values are lower than those of the first part. Therefore, the dwellers in the second part are generally middle-income groups.

In terms of social diversity, THS is used by a variety of groups coming from different ages, socio-economic status and family types. As there are various shops serving daily needs, the inhabitants of the street and nearby residential quarters who are families and single people, as well as people who work on the commercial premises on the street or nearby places come to THS for shopping. Also, many young Turkish and international people come to restaurants, bars and cafes on the street or those located on the streets close to THS. Because of the hotels located on THS and nearby streets, it is possible to see many tourists at different ages, social and ethnic background. But, it should be noted that social diversity is mainly seen in the first part of the street which is much more lively than the second part.

Regarding economic diversity, the property values in the first part are generally higher than those in the second part. It is possible to observe more middle- and high-middle income groups in the first part, while the second part accommodates much more middle and low-middle income groups.

To conclude, even though the inhabitants living on THS and its surrounding streets are generally from middle and high-middle income groups, THS accommodates physical, social and economic diversity because of a variety of land-use functions that attract social groups from different quarters of the city, as well as the international tourists. If the walkability capacity of THS is improved, then social and economic diversity of the area will be much richer.

Figure 6.55, Pedestrians with different age groups on THS (Re: personal archive)

CHAPTER 7

HOW FAR IS MUHSIN YAZICIOĞLU STREET (MYS) A WALKABLE STREET?

This chapter aims to assess the walkability capacity of MYS in terms of the micro-scale parameters of walkability. After explaining the essential features of MYS, it studies the walkability capacity of MYS regarding the criteria of safety, orientation, attractiveness, comfort, diversity, and local destination.

7.1. Essential Features of MYS

MYS is 1.65 km in length and 25-30 m in width. The depth of building plots on MYS ranges between 20 meters and 50 meters and the average sidewalk width is about 1.60 meters (Table 7.1). In the boundary of the study, MYS contains has two different characteristic parts. The first part extends from Çetin Emeç Boulevard to the intersection of MYS and 1437. Street, while the second part stretches from 1437. Street to the intersection of MYS and Eskişehir Road. MYS' first part is much more used by pedestrians than its second part. This is mainly because of the commercial and business functions that serve the daily needs of pedestrians. In the second part of MYS, there is no land-use functions preferable by pedestrians, and some parts are undeveloped lands. MYS contains 17 cafes and restaurants, 10 banks, 4 parks, 18 trees, 6 business buildings, a hotel (JW Marriot Hotel), a buffet kiosk and 1 grocery shop, and 2 shopping malls, together with administrative, residential business usages. There are a number of brand mark cafes, restaurants of Besa Towers, and Mado, Liva patisseries (Figure 7.35). One of the major problems, which become an obstacle in terms of walkability of MYS is the high width of the street, narrow sidewalks and the high vehicular traffic running all the week days. Because various usages are concentrated on the first part of MYS, there is car parking problem, especially in this section. According to a one-day observation, the traffic volume on MYS (between 11.00 am and 14.00 pm, 20 May 2016) is 54000 (Table 7.1).

Table 7.1, Essential features of MYS. (Re: personal study)

Traffic Volume on MYS (counted on 20 May 2016, Friday, 11:00-14:00):	22500
Number of Bus Stops:	6
Number of Metro Stations	1
Length:	1656(m)
Width:	25-30 m
Average sidewalk width:	1.60 m

7.2. Actual Safety

7.2.1. Street Pattern

The street pattern around MYS is a modified grid pattern and the average street width is high (Figure 7.1). The distance between intersections, with an average of 321 meters, provides a reasonable distance between intersections of MYS (Figure 7.2). Although this distance is higher from this value in THS, 127 meters, it still provides a high level of walkability and liveability. However, the paved surface (or

Figure 7.1, The width of MYS in different parts of the street
(Re: Personal study and rendering)

floor quality) and narrow sidewalks of this wide street and many obstacles along it do not provide a high quality of walkability for pedestrians. In addition, high vehicular traffic almost all day through the week discourages people to walk in MYS and its vicinity. For this reason, only the existence of high-level commercial, resting and eating places encourage people to use this street.

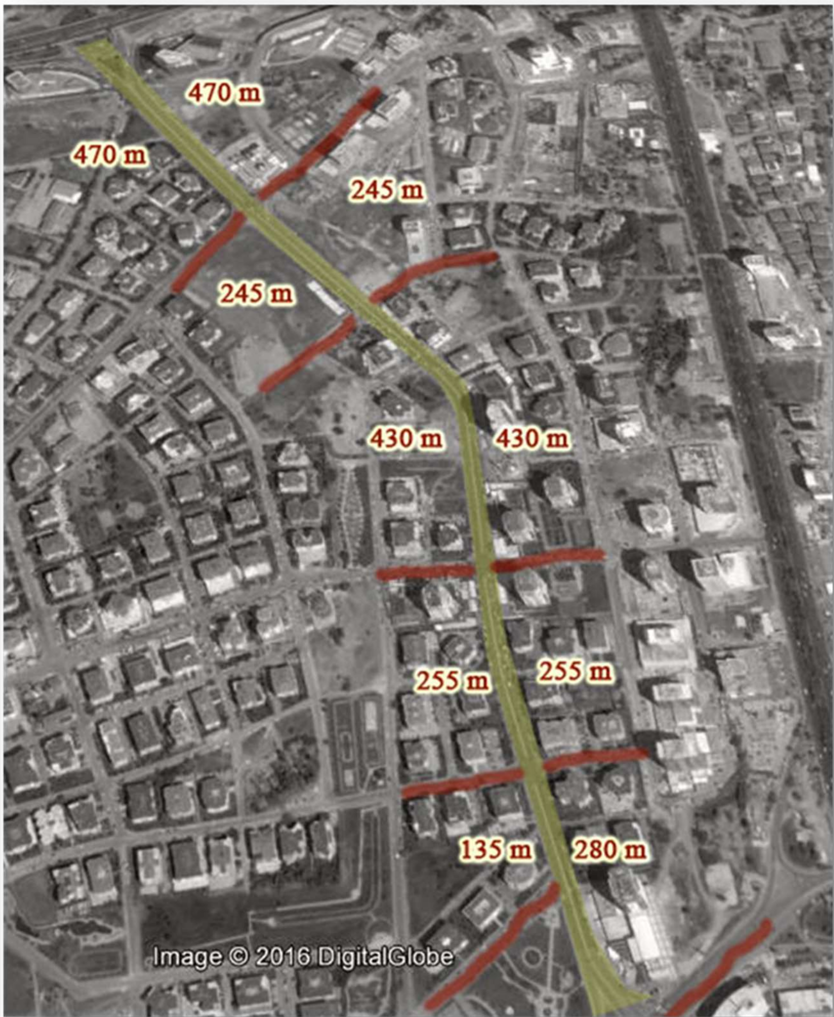


Figure 7.2, Distance between intersections,MYS, (Re: Personal study and rendering)

Three questions were asked in the survey carried out on MYS' users:

- 'Is MYS easy and comfortable to walk along the street?';
- 'Is MYS an easily accessible street from other places by walking?';
- 'Is vehicular traffic on the street a problem for pedestrians to access to different parts of MYS?'

Regarding the first question, as shown in Figure 7.3, 53% (fifty-eight) of respondents claimed that MYS is not an easily walkable street. They stated that although they use this street, high vehicular traffic, and noise and air pollution make their walking uncomfortable. They prefer to use the green park areas rather than other parts of MYS; because they are safer. In addition, 20% (twenty-two) of respondents defined that only traffic congestion and some problems which exist on pavements make their walking partially uncomfortable. On the other hand, 27% (thirty) of respondents claimed that MYS is an easily walkable street.

MYS has not a central location so it is accessible by both motorized and non-motorized modes of transportation from other parts of the city. Its start and end points are accessible by various public modes of transportation. Inner parts of the street are not easily accessible by public transit; so people prefer car usage, as discussed in Chapter 5. Therefore, respondents assess this question regarding accessibility by any modes of transportation. In this sense, fifty-three respondents (48%) claimed that MYS is an easily accessible street. (Figure 7.4) On the other hand, car drivers described the problem of car parking. Thirty of respondents (27%) claimed that MYS is a partially accessible street by car and public transit, while twenty-seven of respondents (25%) expressed that MYS is not an easily accessible street for pedestrians anymore due to the new urban policy on vehicular circulation, which has augmented traffic problem on MYS and its surrounding area.

As for the last question, sixty-eight respondents (62%) agree that high vehicular traffic volume on the street is a problem for pedestrians to access to different parts of MYS (Figure 7.5). Twenty-four respondents (22%) stated that car traffic partially disturbs their accessibility to various facilities available on MYS, whereas 16% (eighteen) expressed their disagreement. The latest group mostly comprises pedestrians who work or live in MYS and get used to the existent traffic problem on MYS.

In brief, the analysis and survey results show that although the street pattern around MYS provides a high level of walkability and liveability, the walkability for pedestrians is impoverished by the low-quality paved surface, narrow sidewalks of MYS occupied by car parking, and vehicular traffic. As suggested by many survey participants, high vehicular traffic almost all day long (especially at evening) during week and weekend days discourage people to walk in MYS and the streets around it. As discussed in meso scale assessment of ÇN, even though MYS has easy accessibility to metro station, vehicular traffic on the street and less frequency of public transit system become the major obstacle for pedestrians to access MYS from surrounding places and from different parts of MYS (Figures 7.3-5).

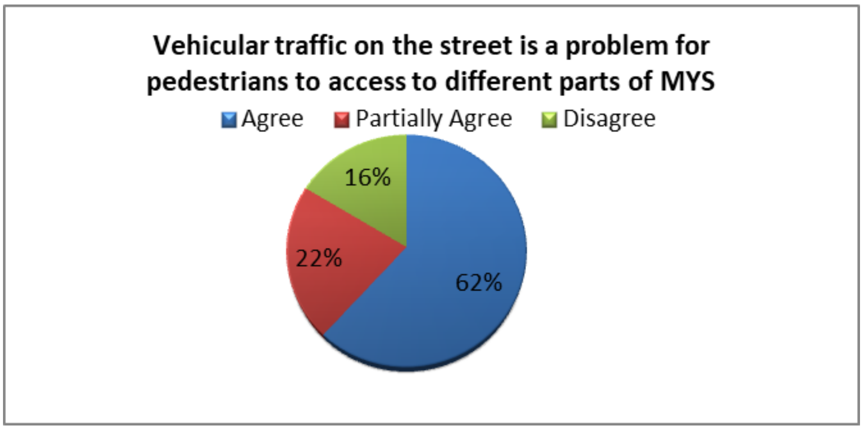


Figure 7.3, The walking quality of MYS regarding the users' point of view

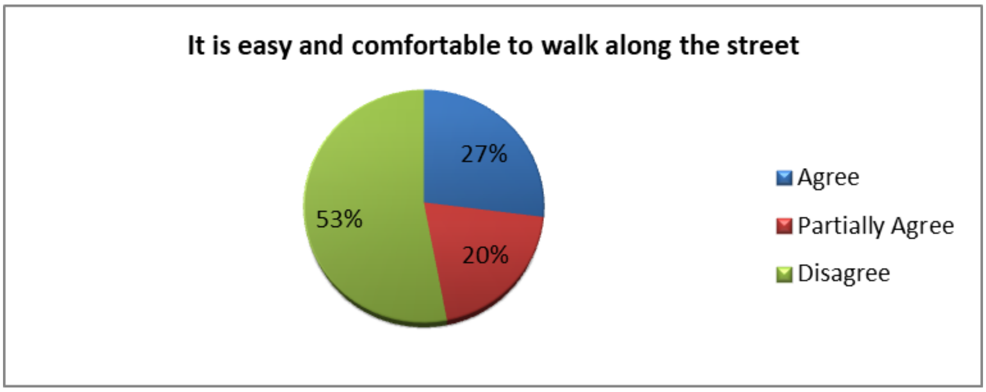


Figure 7.4, The accessibility quality of MYS regarding the users' point of view

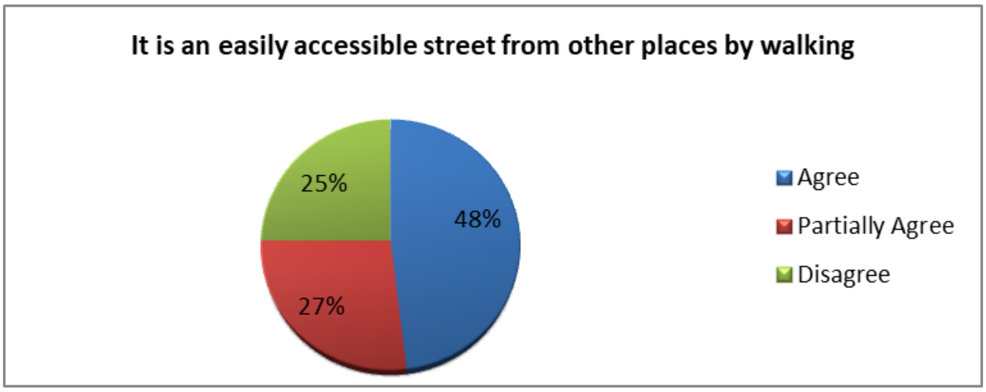


Figure 7.5, The relationship between the accessibility of MYS and vehicular traffic on the street regarding the users' point of view

7.2.2. Traffic Calming Measures

Traffic calming measures include factors, which decrease car speed in streets, such as *low width of street, systematic on-street parking* and *useful design details*. Street may be *narrow* or it may be perceived as narrow. *Street trees, wide sidewalks,* and *on-street parkin*g are the factors affecting the perception of a street as narrow. The width of MYS is between 20- 25 meters; so it is rather large. However, it does not include wide sidewalks and adequate shady trees. There is only unsystematic street parking that decreases the perceptual width of MYS, but creates serious problems for car and pedestrians movement (Figures 7-14 and 7-19).

Systematicon-street parking with adequate and appropriate street crossings lessens car speed and therefore increases the safety of the streets. In MYS, unsystematic on-street parking and inappropriate and insufficient street crossings cause a considerable traffic congestion and disturbance in pedestrian crossings (Figures 7-30 and 7-31).

Finally, *design details,* such as raised or textured pavement at crosswalks, barrier effect, are the important traffic calming measures, which decrease car speed, especially in street crossings. MYS is, however, does not include any design details, which will provide traffic calming. In addition, the high width of the street increases car speed along the street.

7.2.3. Lightning

Appropriate and adequate lightening of streets and crosswalks increases the visibility of sidewalks and improves the safety of pedestrians and drivers. On MYS, there are 110 street lights, especial to car users, with 20 meters height. Their big size occupies the sidewalks and disturbs pedestrian movement. (Figures 7-11 and 7-12). Except for lights in park areas devoted to pedestrians, there isn't any light especial to pedestrians along the sidewalks of the street. In brief, the visibility of the street is dependent to the lights especial to car users (Figures 7.6-7).

Figure 7.6, Existence of only street lightning system in MYS, Personal archive

Figure 7.7, Lightning system of MYS (Re: Personal study and rendering)

Figure 7.8 shows the survey results about the perception of pedestrians on MYS' lightning quality. Seventy-three respondents (66%) claimed that MYS is a well-lit street, whereas 19% of respondents (twenty-one people) thought that MYS is a partially well-lit street; and 15% (sixteen) of respondentsdisagreed with this statement.

To conclude, existence of restaurants and cafes on the first part of MYS has made it partially lit and visible; and the second part is relatively poor in terms of lightning and visibility. Pedestrians, mostly, are happy about the lighting quality of the street, especially its first part.

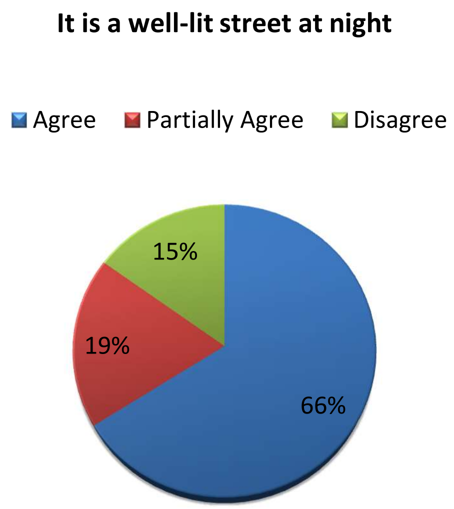


Figure 7.8, The lightning quality of MYS according to the MYS' users

7.2.4. Continuous sidewalk pattern

Continuity of sidewalks can be strengthened physically and perceptually (see Chapter 2). 'Physical continuity' is provided by minimizing interruptions on the street. The modified grid street pattern around MYS offers more continuous, therefore, walkable sidewalks for pedestrians. However, the continuous sidewalk pattern on MYS is interrupted by the five (5) street intersections. The width of each street crossing differs from 10 m to 15 m. No street crossings in the intersections are adequately visible and safe for disabled and elderly people, and parents with young children. Therefore, continuity of the sidewalks is not strengthened by well-designed intersections.

In addition, there is the obvious lack of street furniture along MYS; as street furniture along MYS are street lighting system, low amount of trees (mostly not shady), and large-scale garbage system. Additionally, lightings and trees are placed in the mid part of narrow sidewalks; it disturbs pedestrian movement seriously (Figure 7.9).

Figure 7.9, Green areas along MYS. (Re: Personal study and rendering)

To learn the MYS pedestrians' views, six questions were asked:

- Is there any interruption on MYS for pedestrians along sidewalks?;
- Are, crosswalks safe for pedestrians?;
- Are crosswalks are safe for old people, disable people, children and parents with young children?;
- Are sidewalks wide enough for pedestrians?; (It is discussed in '7.2.5. Pedestrian enclosure' part of this chapter)

- Is, street furniture provided along the street sufficient?
- Does the location of street furniture obscure the pedestrian movement? (It is discussed in '7.2.5. Pedestrian enclosure' part of this chapter)

Regarding the first question, survey results show that seventy-three persons (67%) claimed that there are many interruptions for pedestrians along the sidewalks, while nineteen persons (17%) expressed that there are some interruptions (such as intersections of streets and elements) which decrease the continuity of MYS (Figure 7.10). Eighteen people (16%) asserted that MYS is a continuous street and there is no interruption along it.

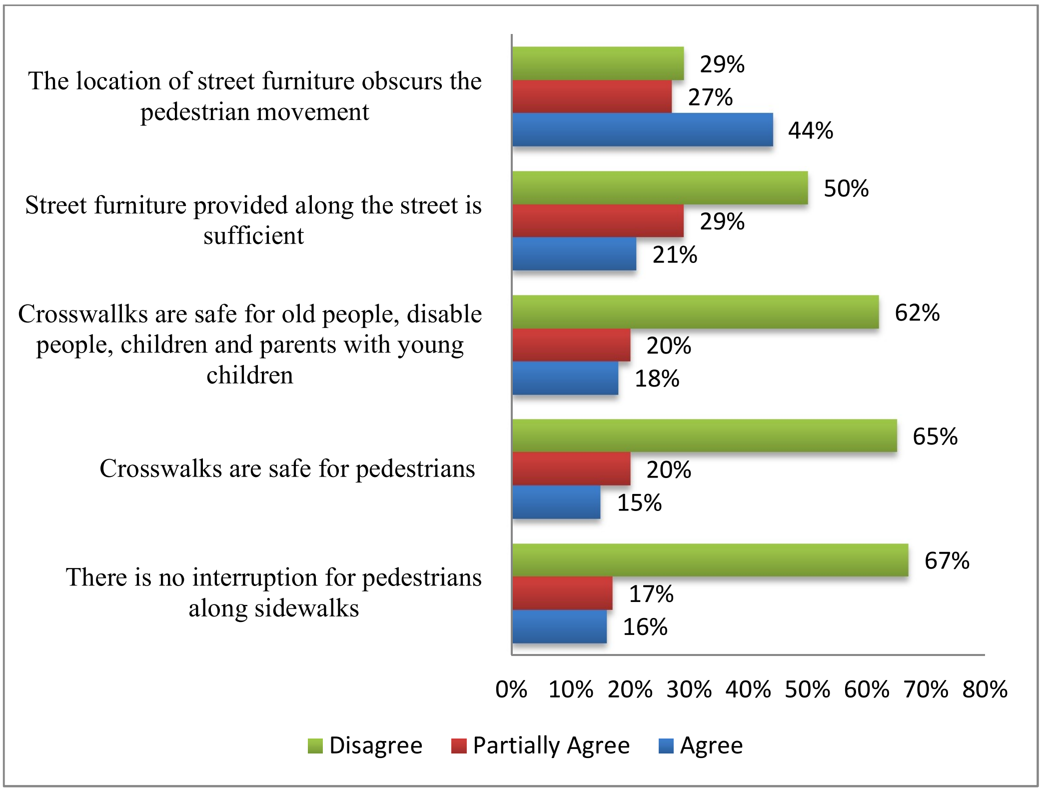


Figure 7.10, The views of MYS' users on the continuity of pavements of MYS

Regarding the second question, seventy-two respondents (65%) thought that crosswalks are not safe for pedestrians, and twenty-two respondents (20%) partially accept the presence of safe crosswalks. On the other hand, sixeen people (15%) declared that pedestrian crossings are adequately safe for pedestrians (Figure 7.10).

However, sixty-eight persons (62%) claimed that existing crosswalks on MYS are partially safe for old and disabled people, and parents with pushchairs. Twenty-two persons (20%) partially accepted that crosswalks are not safe for the crossing of all groups of pedestrians. This group of respondents stated that level variations on sidewalks and roads, low visibility, and lack of traffic lights at the intersections of streets make their crossing very difficult. Whereas twenty people (18%) identified that crosswalks are sufficiently safe for all groups of pedestrians (Figure 7.10).

Regarding the adequacy of street furniture, fifty-five pedestrians (50%) emphasized that there is a serious lack of street furniture in MYS, which causes cleanliness and resting problems (Figure 7.10). Thirty-two people (29%) thought that there is not adequate street furniture on MYS, whereas twenty-three people (21%) declared that there is sufficient street furniture along MYS.

Regarding the question of whether the location of street furniture obscures the pedestrian movement, thirty-two pedestrians (29%) described that the location of less amount of street furniture does not disturb their movement. Thirty people (27%) declared that some wrong placed street furniture obscure their movement. Furthermore, forty-eight people (44%) claimed that less and unqualified amount of street furniture, such as street lights and not shady small trees interrupt pedestrian movement.

To sum up, although the modified grid street pattern around MYS offers more continuous, therefore, walkable sidewalks for pedestrians, the continuous sidewalk pattern on MYS is interrupted by a number of streets crossings which are not adequately visible and safe for pedestrians, especially disabled and elderly people and parents with young children. Unfortunately, qualified street crossings are not enough to provide such a continuous and safe sidewalk pattern on MYS. The survey carried out among the pedestrians also show similar results. Pedestrians are considerably disturbed by the interruptions along the sidewalks, unsafe crosswalks (particularly for vulnerable pedestrian groups) and insufficient street furniture which do not serve adequately their daily needs on the street and which do not provide a sufficient perceptual continuity (Figure 7.11).

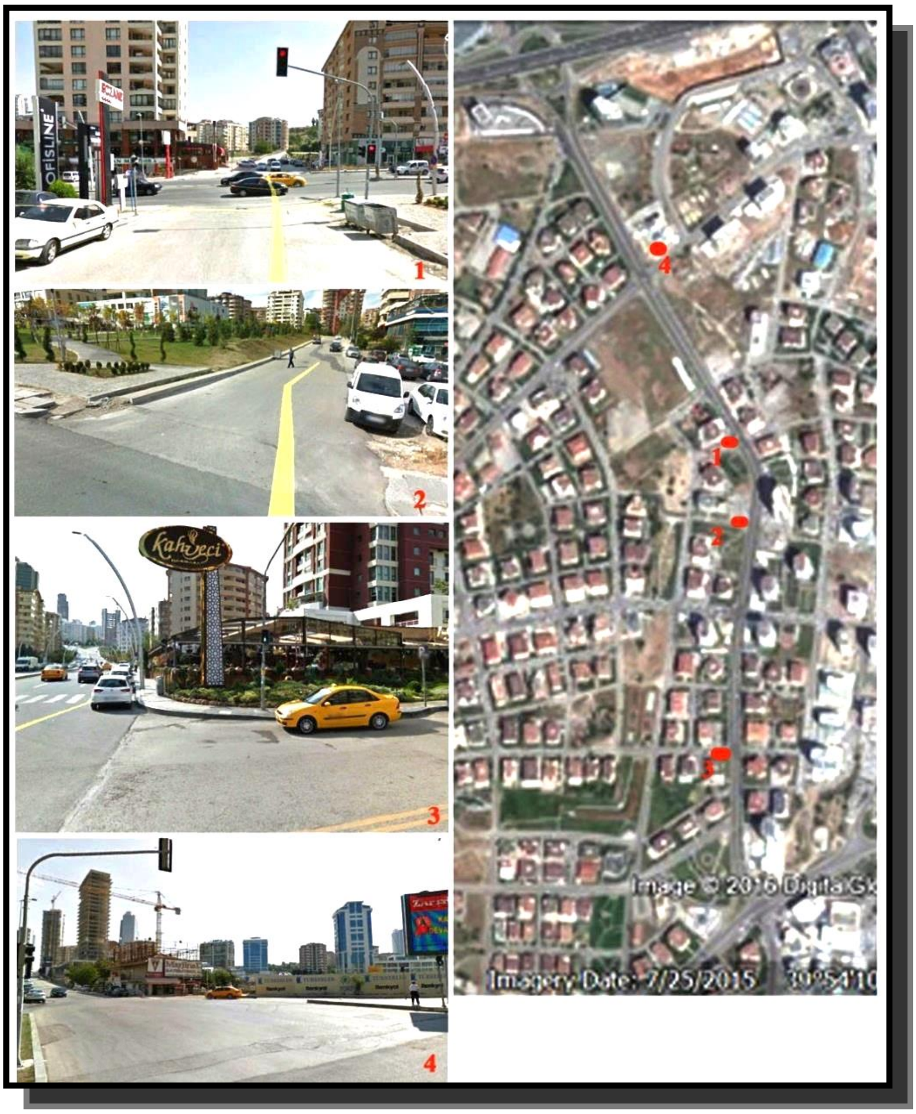


Figure 7.11,Photos from the intersections on MYS. (Re: Personal study and rendering)

7.2.5. Pedestrian enclosure

Generally, pedestrian enclosure relates to the definiteness of start and end of a street.In the case of MYS, 1437 street, as the widest intersection, divides MYS intotwo parts, as discussed in 7.1 section, and the start and end point of the street is obviously definite (Figure 7.12). The pedestrian enclosure is also evaluated by the criteria of *human scale, building orientation, and location of street furniture*. In terms of human scale, *sidewalk width and the ratio of* the height of buildings to street width should be examined. Appropriate sidewalk width is determined according to pedestrian volume. The suitable ratio of height of buildings to street width is identified by Jacobs (1993) as 1:2 and by Greenbie (1981) as 1:4.

Figure 7.12, MYS and intersecting streets (Re: Personal rendering)

Figure 7.12, Sidewalk width in MYS (Re: Personal study and rendering)

The width of sidewalks on MYS varies between 1.10 m and 3.00 m (Table 7.1). Mostly in all part of MYS, narrow sidewalks obscured with urban elements have decreased walkability and pedestrian volume.

The ratio of street width to height of buildings varies between 0.2 and 0.9 values; hence, it is in accordance with identified ratio (0.5) of Jacobs (1993). However, the ratio of sidewalk width to height of building change between 0.01 and 0.06 attributes which are seriously insufficient, especially for MYS with high population density. Therefore, in terms of human scale standards, MYS remains seriously insufficient. (Figure 7.13-16)

Figure 7.13, Sidewalk width in different parts of MYS regarding human scale
(Re: Personal archive and rendering)

Regarding *building orientation,* most buildings and shops are oriented to the main sidewalks of MYS and intensify pedestrian enclosure. As one can see from Figures 7.37 and 7.38, the entrances of most buildings on MYS are oriented to the same sidewalk. Finally, as discussed earlier, lack of *street furniture* weakens pedestrian enclosure of MYS.

Figure 7.14, Ratio of building height to street width.
(Re: Personal study and rendering)

Figure 7.15, Ratio of building height to street width.
(Re: Personal study and rendering)

Regarding the pedestrian enclosure assessment, the users were asked whether some part of MYS should be pedestrianized. Eight respondents (7%) desired the pedestrianization of MYS, but they could not offer any idea about the boundary of this pedestrianized site. On the other hand, twenty-three respondents (21%) suggested that alleys of MYS, such as 1425. Street, should be pedestrianized, as commercial usages such as Nişantaşı Bazaar (Nişantaşı Pazarı) are placed in this street. Seventy- nine respondents (72%) desired to widen the sidewalks and decrease car number. They believed that pedestrianization of MYS is not possible due to its location connecting two crowded streets together. (Figure 7.17)

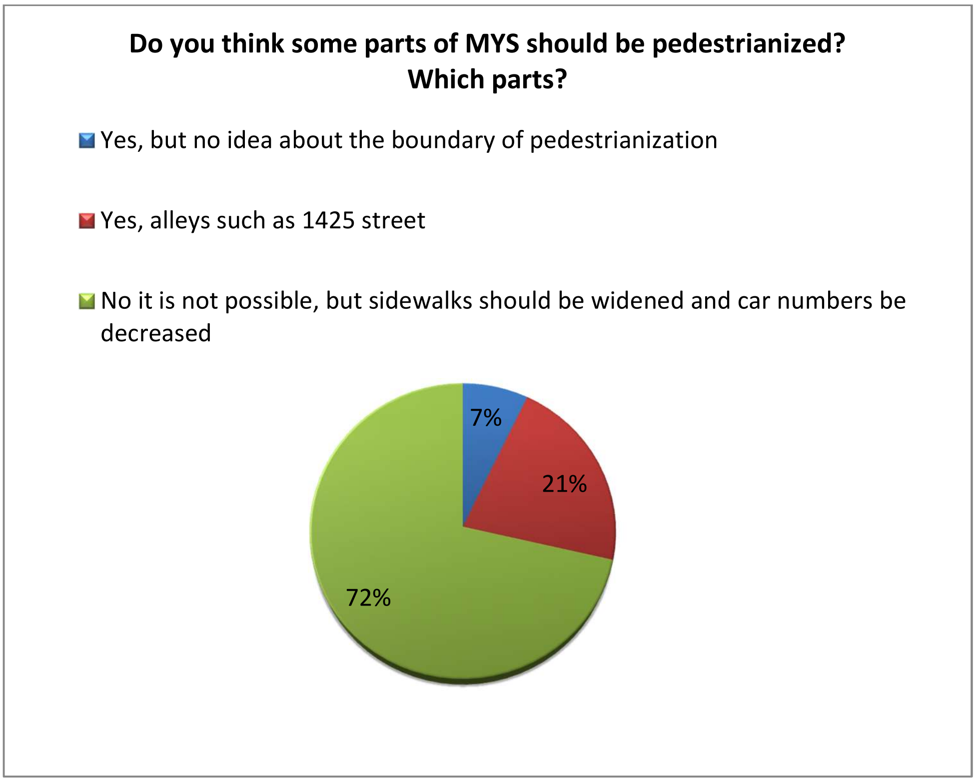


Figure 7.16, The preferences of pedestrians about the pedestrianization of MYS

When pedestrians were asked whether some parts of MYS' sidewalks should be widened, Eighteen respondents (16%) responded that it is not possible except for narrowing the road. On the other hand, ninety-two respondents (84%) gave positive responses. Thirty-four respondents of them (31%) asserted that all sidewalks of MYS should be widened. While fourty-one persons (37%) claimed that sidewalks in the front of restaurants, cafes and banks should be widened and be free of car parking. The last seventeen respondents (16%) claimed that some parts of sidewalks of MYS should be widened and in all parts, the obstacles should be removed. They suggested the re-design of this widened sidewalks as sitting places which are beautified with flower pots and other street furniture, and in this way, MYS will become very comfort and attractive (Figure 7.18).

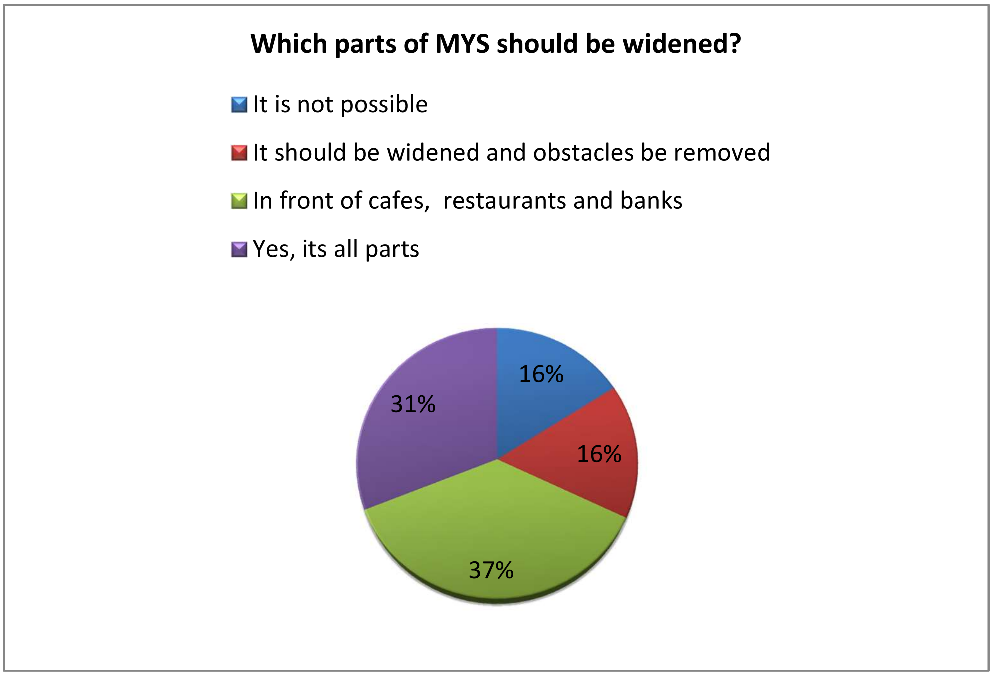


Figure 7.17, The views of MYS' users about the question of which parts of MYS should be widened

When pedestrians were asked in which parts of MYS they can walk easily and comfortably, the majority (sixty respondents, 55%) stated that no parts of the street are safe for walking. In addition, fourty respondents (36%) claimed that they walk comfortably on parks and their fronts. They particularly preferred parks because of the safety reason. Also, ten persons (9%) stated that they have comfortable walking from Hayat Sebla housing to near Eskişehir Road intersection. (Figure 7.19)

When pedestrians were asked in which parts of MYS they walk with difficulty, seventy-two persons (65%) claimed that, because of narrow, unqualified sidewalks and high traffic volumes, they are not able to walk comfortably in any part of MYS. Additionally, thirty-eight people (35%) delineated that pavements occupied by café, and restaurants sitting areas and parking cars in front of the banks have made walking in this area uncomfortable. (Figure 7.20)

When pedestrians were questioned how the vehicular traffic disturbs their movement, fifty-two people (47%) expressed that high car traffic, and cars driving and parking on the sidewalks, become dangerous for pedestrians. Twenty people (18%) claimed that high traffic volume and unsuitable and unsafe street crossings make their crossing unsafe. They described that they cannot perceive street crossings. Thirteen respondents (12%) stated that vehicular traffic creates noise and air pollution, and the only clean and peaceful place for them is two parks of the street. Moreover, twenty-five respondents (23%) declared that car traffic damage pedestrians because that car users do not obey the rules. (Figure 7.21)

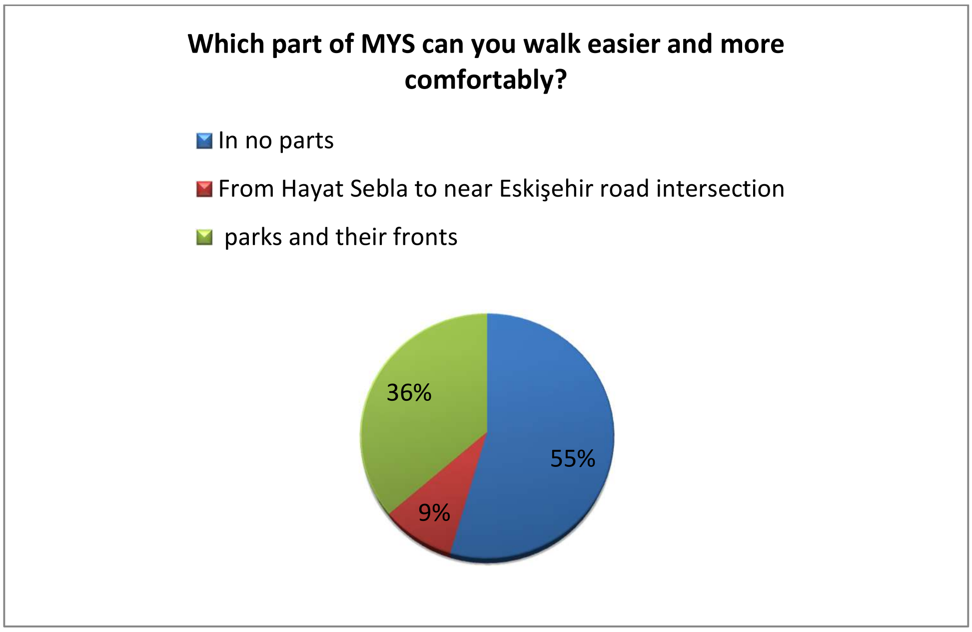


Figure 7.18, The views of MYS' users on the question of which part of MYS they can walk easier and more comfortably

Together with other deficiencies of walkability in ÇN, mentioned in meso scale assessment section, respondents desired to widen the sidewalks especially in front of some usages, such as café, restaurants, and banks occupied with sitting facilities or car parking. Because, uncomfortable walking conditions of the sidewalks discourages pedestrians from walking in the first part of MYS, from Çetin Emeç

Boulevard to the intersection of MYS and 1437 street. The survey also shows that particularly vehicular traffic on street crossing disturbs the pedestrian movement. Regarding pedestrians comfort in MYS, building orientation, the analysis shows that most buildings and shops are well oriented and intensify pedestrian enclosure. Nevertheless, the inharmonious distance between street furniture and their insufficient amount weaken pedestrian enclosure of MYS.

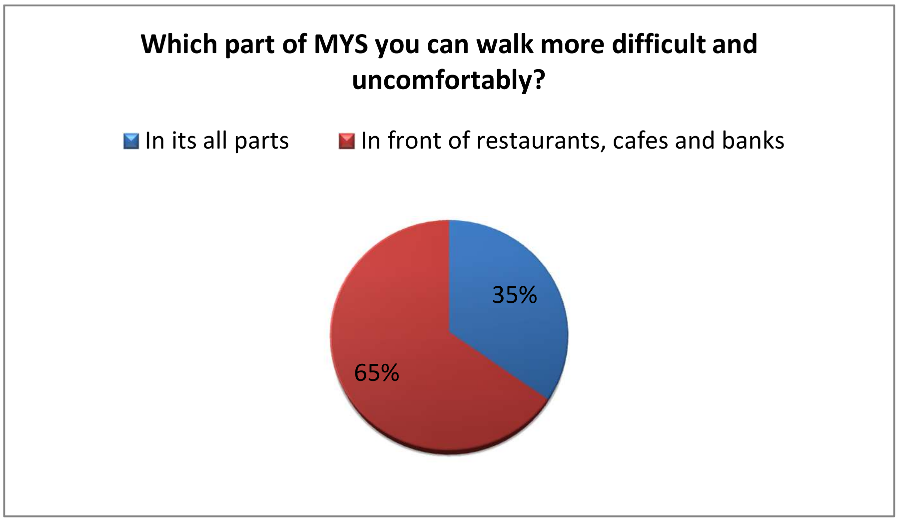


Figure 7.19, The views of MYS' users on the question of which part of MYS they can walk more difficult and uncomfortably

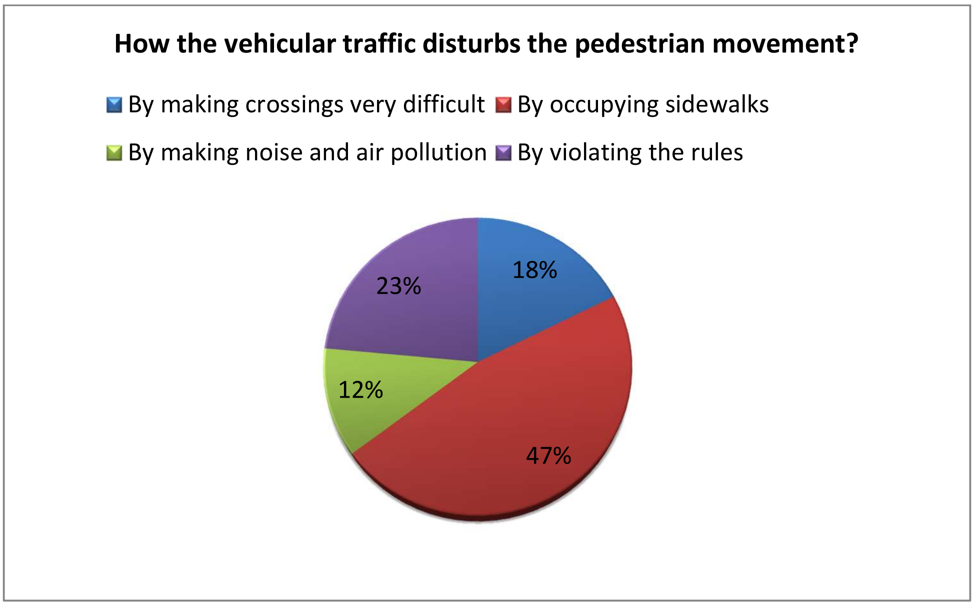


Figure 7.20, The views of MYS' users on the question of how the vehicular traffic disturbs the pedestrian movement

7.2.6. Separation

Sidewalks, medians, boulevards, on-street parking, and parallel routes that allow pedestrians to avoid arterials, function as ‘separation’, and they provide obvious limitation between pedestrians and vehicle area. In the case of MYS, especially on-street parking provides a significant separation between pedestrians and vehicle area. On-street parking along this street accommodates about 140-180 car-parking lots. Although on-street parking provides a separation between pedestrian and vehicular area, there are cars parking and occupying the second lane of the street and sidewalks. This creates important obstacles for pedestrians crossing on MYS, disturbs their movement and endanger their safety.

Because of high car speed and traffic volume; in contrast to other successful walkable streets around the world, such as Amsterdam, Barcelona, Edinburg, Vancouver and etc., in which sitting areas merge with the sidewalks; sitting areas of the cafés and restaurants of MYS are separated with glass panel from the street to decrease the noise and air pollution and increase user’s safety (Figure 7.22-23).
When pedestrians were asked whether on-street car-parks disturb their movement, seventy-four people (67%) agreed, stating that they are particularly annoyed by the cars which are parked next to the on-street parking lots, on the sidewalks and street crossings. They make pedestrian movement more uncomfortable. Twenty-three respondents (21%) partially agreed, as they particularly tend to cross on the street crossings which make them feel almost safe. On the other hand, thriteen people (12%) claimed that on-street car-parking do not disturb their movement (Figure 7.25)

In brief, although the on-street parking of MYS provides a significant separation between pedestrians and vehicle area, the cars parking hinder pedestrians’ crossings, obscure sidewalks, and endanger their safety. They also create traffic congestion on MYS. Thus, new controlling regulation that prohibits such parking is necessary for MYS to ensure pedestrians’ safety and increase the walkability level (Figure 7.24).

Figure 7.21, Mixture of sitting places with walking area in a walkable street in the City of Austin, Texas

Figure 7.22, Separation of sitting places from walking area to decrease noise pollution coming from the street, MYS,Personal archive

Figure 7.23, The views of MYS' users on the question of whether existing on-street parkings disturb their pedestrian movement

Figure 7.24, Separation on MYS. (Perosonal study and rendering)

7.2.7. Floor quality

Qualified street floor makes walking more comfortable and pleasant for all groups of healthy and handicapped pedestrians. Thus, the material of floorscape, quality of pavements, removal of unusual obstacles on sidewalks, sidewalk ramps with safe level variation, suitable parapets selected according to climate features are important in terms of creating safe sidewalks for pedestrians.

For the case of MYS, however, floor quality is partially poor. Broken pavement slabs, unsafe level variations of sidewalks, which range from 0.3 m to 1.00 m, and unusual obstacles along sidewalks have made MYS unsuitable for pedestrians (Figure 7.26 and 7.29). There are unsafe level variations along the sidewalks, such as broken ramps and thick pavements. Thick pavements with 25 cm height from the street make crucial difficulties for the crossing of pedestrians, especially elderly and handicapped ones. (Figures 7.26-29)

Figure 7.25, 25 cm side walk height (as unsafe level variation) along MYS, Personal archive

Four questions were asked the MYS' pedestrians about the floor quality of the street. The first question was whether pavement slabs are well-laid out and they do not disturb pedestrian movement. Seventy-three respondents (66%) expressed that pavement slabs are not well-laid out and they disturb pedestrian movement, and fifteen people (14%) think that they partially agree with this statement, whereas twenty-two people (20%) claimed that sidewalk slabs are well laid out and do not disturb pedestrian movement (Figure 7.30).

Figure 7.26, Obstacles along sidewalks on MYS (Re: Personal archive)

The second question was whether level variations along the sidewalks pavement (ramps, etc.) are adequately safe for pedestrians. Sixty-eight respondents (62%) disagreed with this statement; twenty people (18%) partially agreed and twenty-two people (20%) agreed with this statement (Figure 7.30). The third question was whether pavement slabs along the sidewalks are not deformed or broken. Forty-eight respondents (44%) disagreed; twenty-eight persons (25%) partially agreed and thirty-four respondents (31%) agreed. Finally, the fourth question was whether there is no unusual obstacle for pedestrians along the sidewalks. Forty-eight respondents (44%) disagreed; thirty-one persons (28%) partially agreed, and thirty-one people (28%) agreed (Figure 7-36).

Figure 7.27, Floor quality of MYS (Re: Personal archive)

To sum up, the floor quality of MYS is significantly poor. The results of the direct observation shows that broken pavement slabs, unsafe level variations of sidewalks, obstacles along the sidewalks makes walking more uncomfortable and unpleasant for all groups of pedestrians. The majority of survey participants agreed that the pavement slabs, which are not well-laid out, are deformed or broken, and unusual obstacles along sidewalks endanger the pedestrians' safety.

Figure 7.28, Unsafe level variations on MYS (Re: Personal archive)

Figure 7.29, The views of MYS' users on the floor quality of MYS

7.2.8. Street crossing

For the case of MYS, there is the lack of sign on the road surface showing pedestrians the location of the street crossing. Although traffic lights help pedestrians cross the street, there are no special types of pavement on the sidewalk of intersection points to indicate street crossings for disabled people (such as tactile pavement) or on the road for reducing car speed. Together with a high number of cars parking on MYS and unfit street crossings, pedestrians' safety is in danger (Figure 7.31).

Four questions were asked the MYS' pedestrians, first of which was whether there are sufficient street crossings along MYS. Sixty pedestrians (55%) claimed that there are not adequate street crossings, whereas thirty respondents (27%) disagreed and twenty respondents (18%) partially agreed. The second question was whether the street crossings along MYS were well-situated. Fourty-one respondents (37%) disagreed; fourty people (36%) partially agreed, and twenty-nine people (27%) agreed (Figure 7.32). The third question was whether street crossings along MYS are located on easily accessible places. Fourty-three respondents (39%) completely disagreed; thirty-three people (30%) were partially agreed, and thirty-four respondents (31%) agreed (Figure 7.32).

Figure 7.30, Street crossings in MYS (Re: Personal archive)

To conclude, the investigation on the street crossings of MYS and survey results show that the street crossings with traffic lights are not efficient to create a safe and walkable street. Most of the survey participants agreed that the street crossings are not well-situated, and easily accessible. Therefore, the results of this investigation point out an urgent need for re-designing all the street crossings on MYS as a continuity of the sidewalks to ensure the safety of all groups of pedestrians. Necessary standards should be implemented to the design of ramps, floor materials, signs that will ease the movement and comfort of pedestrians, and increase their safety. In this way, they will be easily visible (or perceivable) by everybody, as well.

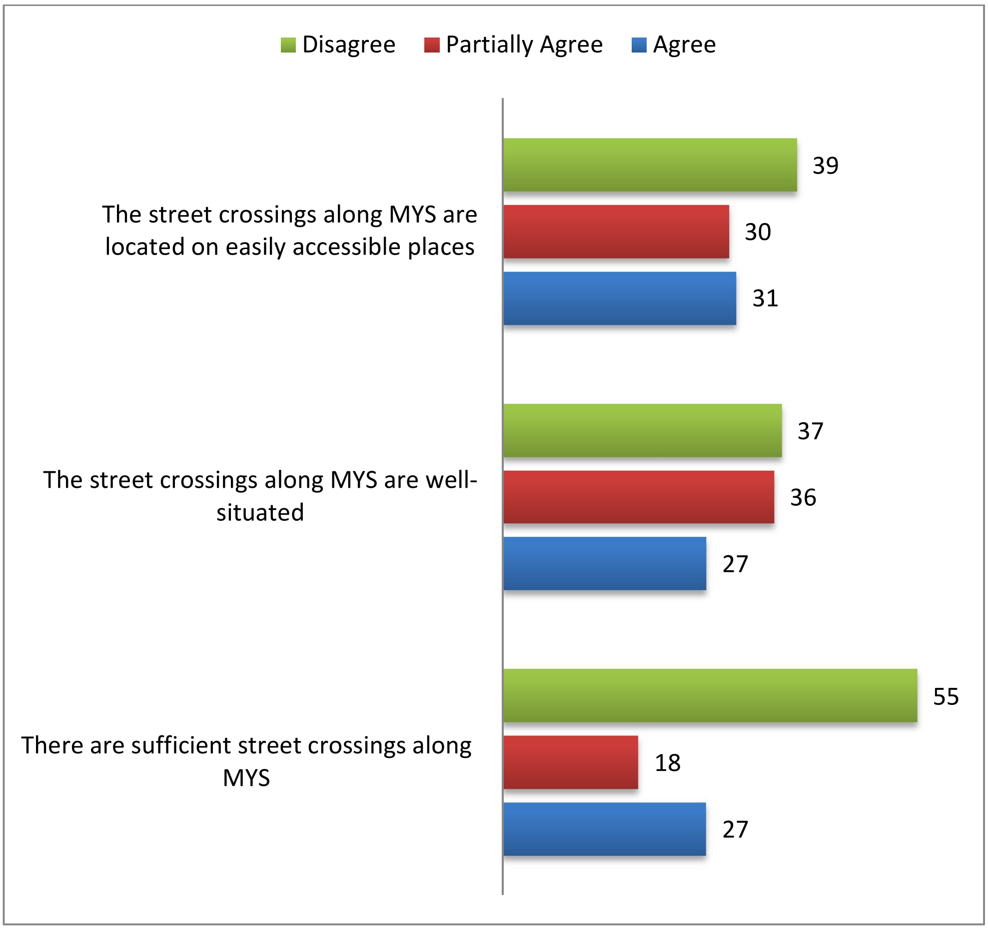


Figure 7.31, The views of MYS' users on the street crossings of MYS

7.3. Perceptual Safety

As discussed in Chapter 2, Jacobs (1961) identifies three main qualities necessary for perceptual safety: i) a clear delimitation between public and private space, ii) building orientation towards the street to provide 'eyes on street' and iii) common use facilities to add more 'eyes on street'.

First, the delimitation between public space (streetscapes, sidewalks, public facilities) and private space (yards, shopping malls, gated communities, and private clubs) of MYS is sometimes unclear. For example, in the first part of MYS, it is common to see the entrances of some buildings, such as in front of banks and some parts of sidewalks are occupied by cars and trucks parked.

Regarding the second and third measures, almost all buildings are oriented towards MYS, and the first part of MYS is partially a mix-use street. In this sense, it is possible to argue that MYS might be perceived as a safe street during day time, as there are a number of people who work and live in this section of the street and act as ‘eyes on the street’.

The majority of commercial premises open until **8.00** pm. Therefore, in the first part of MYS, the perceptual safety of night time is almost sufficient(Figure 7.34).

The second part of MYS includes mostly some residential, shopping center, hotel and business use and three unused parcels. Because of its usages and physical properties, this part is not preferable by pedestrians. It is possible to argue that, compared to the first part, the perceptual safety in the second part of MYS might be seen higher at daytime rather than nighttime. Because this part of the street is not as busy as the first part; there are a few pedestrians or strangers, and the existence of unused parcels decrease its perceptual safety at night times.

Regarding the ‘perceptual safety’, five questions were asked to the users of MYS. The first question was whether MYS is a noisy street. Seventy-six respondents (69%) perceived it as a noisy street; twenty-five people (23%) replied that it is a partially noisy street, and nine people (8%) declared that MYS is adequately peaceful (Figure 7-39). The second question assesses the idea of the pedestrians about the origin of the noise on MYS. They were asked whether the noise of the street was resulted from car traffic. Seventy-seven respondents (70%) agreed on this reason; twenty-one people (19%) thought that the noise arises from both car and pedestrian traffic; whereas twelve people (11%) believed that there is not any car traffic noise on MYS.

The third question mainly assesses the perception of ‘safety at night’. Pedestrians were asked whether facilities open until late night makes the street safer at night. Twenty-three respondents (21%) stated that they did not perceive MYS as a safe street at night. Especially those who live in MYS claimed that, after late night when all businesses were closed, MYS became an unsafe street. They pointed out the lack of pedestrian presence at night, which is an essential factor in perceptual safety. Fifty-seven respondents (52%) claimed that MYS is partially safe during night-time, whereas thirty people (27%) considered it as a safe street at night (Figure 7.33).

Another question was whether facilities open until late night makes the street safer at night. Eighty-eight survey participants (80%) agreed on this idea; while sixteen respondents (15%) claimed that besides open facilities, the pedestrian presence on MYS is an essential factor to increase safety at night times. Thus, for them, open usages partially contribute to their safety. Six respondents (5%), however, disagreed with this idea; expressing that the presence of pedestrians and police is much more important for them to feel safe on the street, rather than facilities open until late night (Figure 7.33).

Finally, the users of MYS were asked whether MYS would be much safer if there are more residential uses (or residential population). Seven participants (7%) claimed that more residential uses (or population) will increase safety at night. Eleven people (10%) claimed that the presence of residential usages are partially effective for them to consider the MYS safe, adding that other factors such as open facilities late night and the pedestrian presence, are essential, too. On the other hand, ninety-three respondents (85%) claimed that residential usages did not have any effect on their safety because the inhabitants of MYS were not particularly interested in what happened on the street (Figure 7.33).

To sum up, the perceptual safety is weak regarding the delimitation of public and private space, as it is not clear which part of sidewalk belongs to the public space and which part is the private premise. Regarding the building orientations, the perceptual safety is strong, as all buildings are oriented towards MYS, and it is a partially mix-use street. Therefore, MYS might be perceived as a safe street during day time, as there are a number of people who work and live on MYS might act as ‘eyes on the street’. The perceptual safety of the first part of MYS at night is higher than that of the second part due to the presence of high residential population and existence of café and restaurants usages. As for the survey results, the respondents generally agreed that MYS is a partially safe street at night. The majority of the survey participants claimed that facilities open until late night might make the street perceived safe. Nevertheless, there is no clear idea about whether MYS will be a much safer place if there is a higher ratio of residential population.

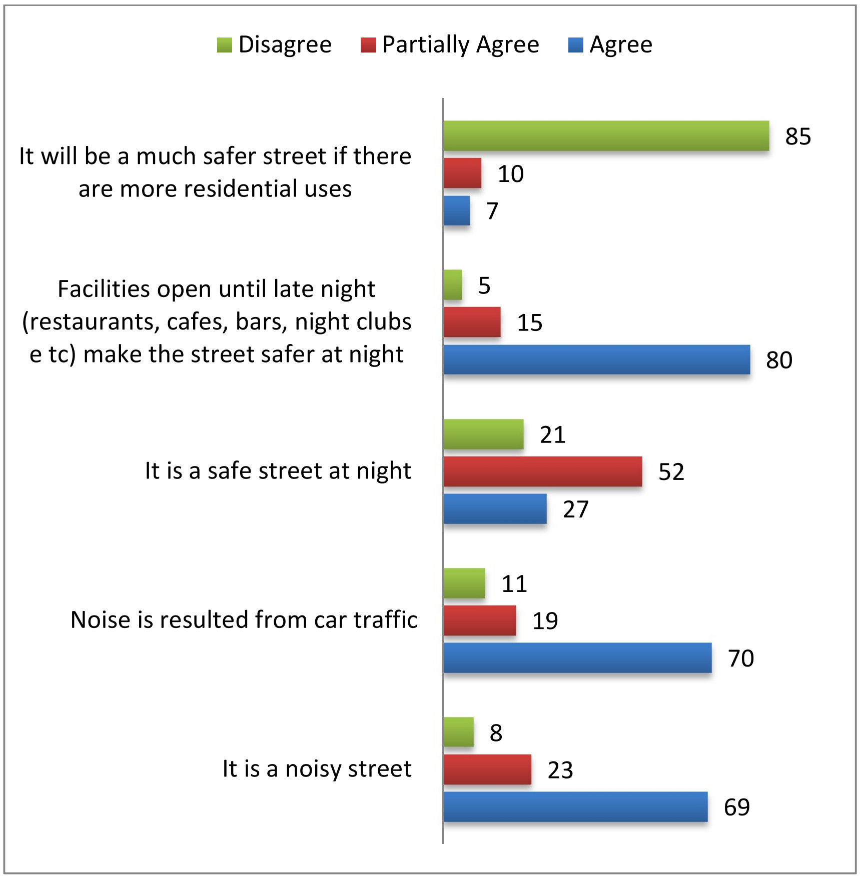


Figure 7.32, The views of the MYS' users on the perceptual safety of the street

Figure 7.33, The first part of MYS at night (Re: Personal archive)

Table 7.2, The assessment of safety in MYS

THE EVALUATION OF SAFETY IN MYS			
ACTUAL SAFETY	Assessment results	PERCEIVED SAFETY	Assessment results
1) Street pattern	Modified grid, high amount of paved surface, accessible,unqualified pavement slabs, high vehicular traffic	*1) Clear delimitation between public and private space*	Unclear delimitation
2) Traffic calming measures	Poor value of design detail measurements	*2) Building orientation towards street*	Buildings are oriented to common pedestrian realm
3) Lightening	partly qualified lightning system	*3) The presence of common use facilities*	Many various usages are closed at night
4) Continuous pavement	Continuous street pattern, unsafe street crossings, inharmonious street furniture		
5) Pedestrian enclosure	Well-oriented buildings, less ratio of sidewalk width to height of buildings, inharmonious street furniture		
6) Separation	Highly developed unsystematic parking		
7) Floor quality	poor		
8) Street crossings	Direct, short, invisible, and unsafe street crossings		

7.4. Orientation

Orientation is a quick recognition of public space network. Hence, if pedestrians are able to imagine a simple network map and its unforgettable points, it is a well-oriented street. The criterion of *orientation* for MYS is examined under five factors: *legibility of its street pattern, landmarks, continuity, built form and its location and architectural and environmental features.*

7.4.1. Legibility

Legibility refers to a quick understanding of a neighborhood plan. Simple, regular and highly connected street patterns are more legible. Street pattern around MYS is a modified grid pattern and it is regularly linked to its side streets through five (5) intersecting streets (Figure 7.2 and 7.12).

7.4.2. Landmarks

Landmarks increase the legibility of the environments, create a memorable and familiar image in pedestrians' minds, and thus help pedestrians to realize where they are or whether they are in the right way or not. There are many landmarks along MYS and its surrounding areas, such as ATM building, Mado, Liva café and restaurant, and two popular parks.

As can be noted from Figures 7.36-38, MYS is very rich in terms of landmarks. Nevertheless, as claimed by seventy-five respondents (75%), Kahveci Hacı Baba, Liva and Mado Patisseries are considered as the most important landmark of MYS. This is followed by Migros shopping market (fourteen participants, 14%), Banks (seven participants, 7%), and JW Marriot Hotel (four participants, 4%).

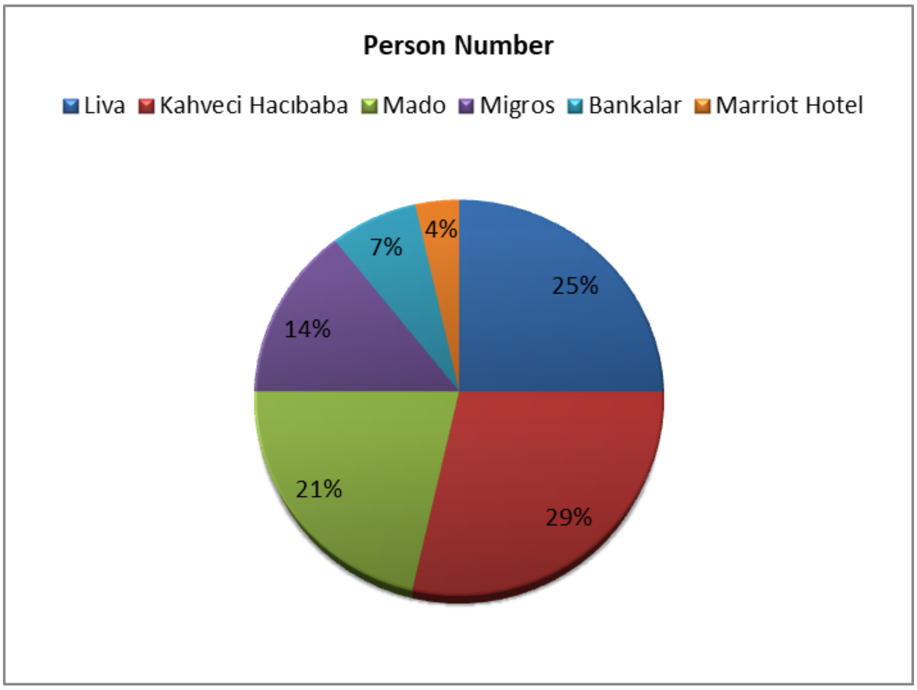


Figure 7.34, The landmarks on MYS according to the pedestrians

Figure 7.35, Liva Patisseries as first-grade landmark of MYS.

7.4.3. Continuity

This section is discussed in continuous sidewalk pattern actual safety analysis section.

7.4.4. Built form and its location

The placement and form of some buildings are important in terms of increasing their legibility, as pedestrians can perceive them easily. It is possible to argue that business buildings, commercial centers, parks, and cafes and restaurants along MYS act as a landmark in the mind of pedestrians. Generally, people are not more interested in accessing to these public areas from other parts of the city. The usages with the aim of meeting, relaxing, exercising, socializing space, etc. are mostly preferred by people who live or work in this street and its surrounding areas.

Kahveci Hacı Baba, Liva, and Mado are first-grade landmarks. They provide protected places for people to sit, eat and drink something while waiting for somebody. The location of these cafes in the first part of MYS has transformed this section to a memorable place in the mind of people. Migros, Banks and Marriot Hotel are the second- grade landmarks that are remained in pedestrians mind.

Together with the preference of famous café and restaurant along this street, people tend to access to the landmarks situated near to this area, such as Armada shopping center on the North and METU on the West. It is because shopping center provides safe and comfortable places for pedestrians to meet due to their covered areas, which protect them from bad climatic conditions. In addition, METU area is an open public space mixed with natural green areas and is preferred by pedestrians.

7.4.5. Architectural and environmental features

As explained in Chapter 2, building entrances and building orientation become important in terms of understanding how far architectural and environmental features contribute to the walkability of a street. Building entrances should be visible, and accessible by all pedestrian groups (such as wheelchair users, old people, and pedestrians with strollers). In addition, buildings should be oriented to most preferable sidewalks.

In the case of MYS, the entrances of shops and apartment buildings are visible by pedestrians and are defined perfectly by architectural or urban elements. Some of residential buildings and banks are not very accessible for vulnerable pedestrian groups. These building entrances need particularly ramps to fix floor level variations (Figure 7.37-38).

To sum up, when the criterion of orientation is considered, it is partially successful. MYS and its surroundings are highly legible environment due to its modified grid pattern and pedestrians easily perceive this pattern. MYS is very rich in terms of landmarks, such as Mado, Liva café and restaurants, Ambrosia and Migros shopping centers. As for the continuity, the modified grid street pattern around MYS offers more continuous, therefore, walkable sidewalks for pedestrians. Subsequently, as the most shops and shop windows are concentrated on half section of the first part of MYS, so there is not the continuity of shop windows along the street and this weaken MYS as a very interesting place, particularly for pedestrians. In addition, a number of intersecting streets interrupts the continuous sidewalk pattern on MYS. Likewise, the perceptual continuity of MYS is impoverished by the low quality of sidewalk floor and serious lack of street furniture.

Figure 7.36, Accessibility and visibility of some building entrances on MYS.

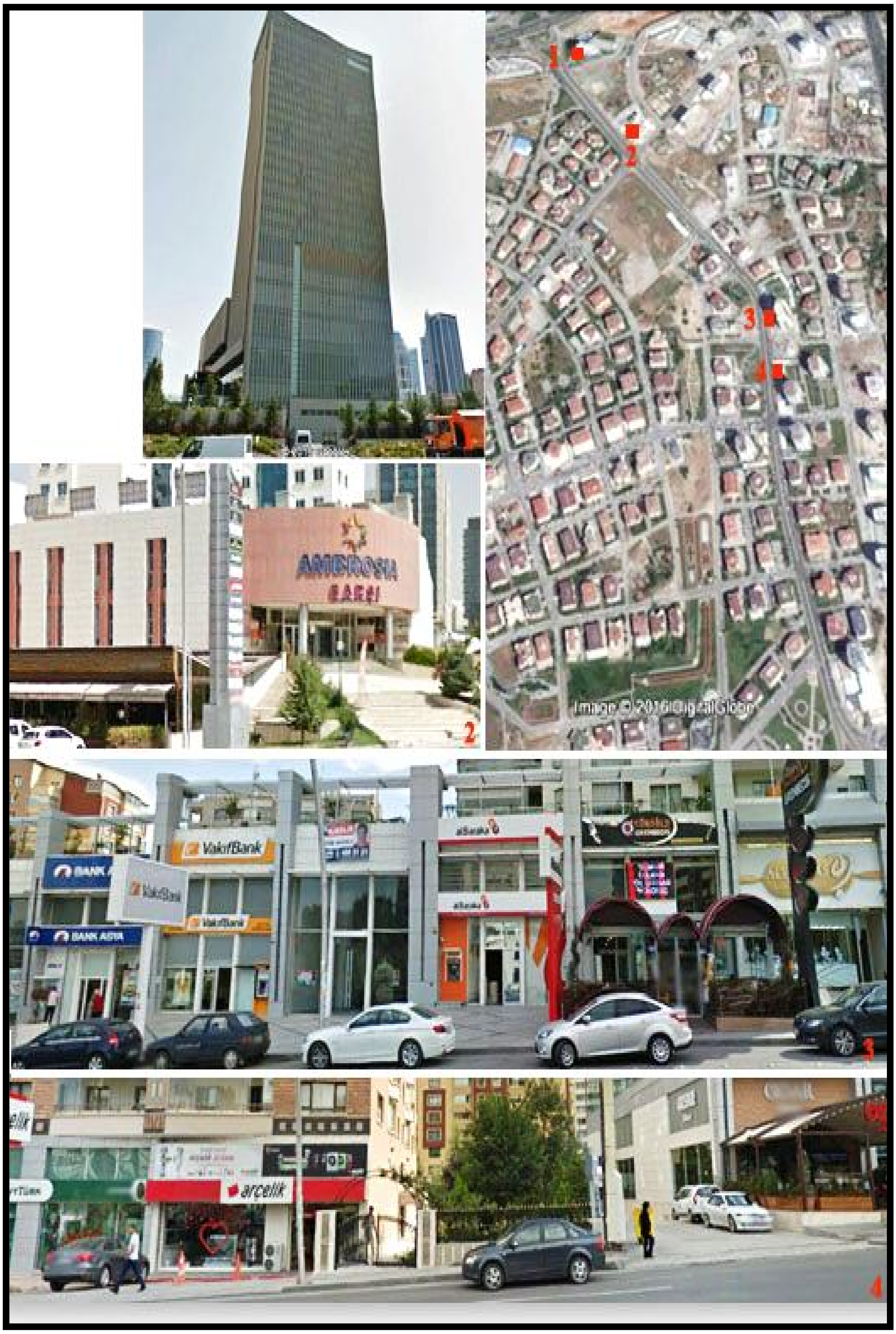


Figure 7.37, Accessibility and visibility of some building entrances on MYS

7.5. Attractiveness

As explained in Chapter 2, this thesis examines the criterion of ‘attractiveness’ based on the assumption that a street is attractive, if it is colorful, enjoyable, legible, safe, peaceful, comfortable and spacious. Regarding the facades of the buildings on MYS, most buildings are new, with modern material and fresh color; they provide MYS with a colorful scene (Figure 7.39). However, there are no specific codes that regulate the colors, which can be used for buildings and shopfronts.

There is a color, material, floor numbers harmony among residential buildings. In addition, glass and metal materials and floor numbers of business and hotel buildings are in harmonious together and different from residential buildings.

Figure 7.38, Facades of some Residential Buildings in inBuildings in MYS, (Re: Personal archive)

MYS contains the buildings with different architectural style, as shown in Figures 7.39-40. The buildings with similar architectural style and height may create a monotonous scene. As there are buildings with different architectural style, especially in the start and end point of MYS and back roads, it is possible to argue that MYS does not provide pedestrians with a monotonous scene. On the other hand, as the most shops and shop windows are concentrated on the first part of MYS, so there is not the continuity of shop windows along the street and this weaken MYS as a very interesting place, particularly for pedestrians.

As explained previously, pedestrian enclosure in all parts of MYS is inadequate. This creates a suffocating street. Additionally, there are a number of visual elements, such as dirty floors, unsuitable garbage system, unsafe urban element, broken pavement slabs, different level variations on sidewalks, improperly built street ramps, which impoverish the attractiveness of the street (Figures 7.28, 7.29 and 7.31).

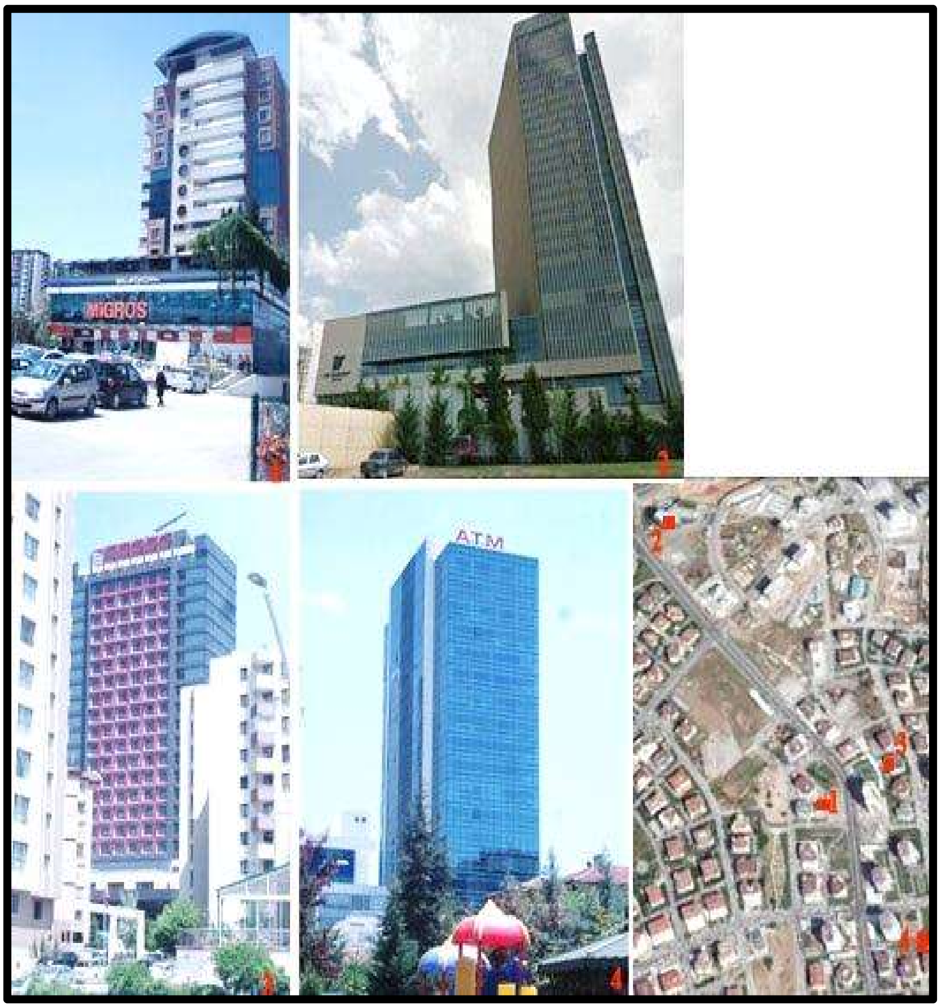


Figure 7.39, Buildings with different architectural style creating dissimilarity and act as landmark

7.6. Comfort

As discussed in Chapter 2, comfort is evaluated physically and visually. Urban spaces should be ‘physically usable’ and ‘visually understandable’ to be comfortable for pedestrians. ‘Physical usability’ of an urban space depends on four factors which make the comfort of walking for healthy, handicapped, early-age and old-age people. These factors are: 1) whether public spaces include architectural urban elements which protect pedestrians from rain, sun, snow, ice and wind; 2) whether it possesses clean air (which is provided by traffic calming); 3) whether it fulfills the conditions of actual and perceptual safety, and 4) whether it is an accessible space for particularly all pedestrian groups. ‘Visual understanding’ is assessed how far a public space provides a good quality of orientation and how far it is legible for pedestrians.

Figure 7.40,Urban elements which impoverish the visual attractiveness of MYS

Regarding ‘physical usability’ of MYS, the facades of buildings do not provide architectural and urban elements that help the protection of pedestrians from climatic conditions (Figures 7.34, 7.36, 7.38 and 7.27). Nevertheless, there is no specific regulation to provide canopies for all the buildings along MYS by the local authority. Second, a high traffic volume on the street causes air pollution. In addition, insufficient number of street trees is not enough to clean polluted air in the street. Third, the assessment on actual and perceptual safety shows that MYS does not provide a safe place (Table 7.2). Finally, there is not any seat along MYS. However, two parks in the first part of MYS provide alternative rest places and seats for the public. There are also cafes and restaurants located along MYS whereby provide some rest places for affordable people (Figures 7.22 and 7.43).

For the accessibility of MYS it is rather debatable. MYS and the streets around it comprises commercial and residential usages. Their ground floors are more devoted to commercial shops, and other floors are used as residential and commercial usages. Therefore, all facilities placed in MYS and around it are easily accessible for their residents. However, commercial usages in the ground floor of the buildings are more specific to one usage. In fact, there are not varied usages along the street; so, the liveability of MYS is greatly supported by the presence of residential functions or the inhabitants living or working on the neighborhood.

Regarding public transportation services, there are adequate bus stops and one metro stop along this street; however, there is not sitting and shelter facilities in bus stations to increase comfort, safety, and visibility of the bus stations. Yet, it is very difficult to pass through MYS due to high traffic volumes resulted mostly from private vehicles in almost every hours of the day. Because of vehicular traffic, lack of pedestrian enclosure, lack of usage variety, it is hard for pedestrians to walk on MYS and rather they prefer to rest in cafes and restaurants along the street.

As the inhabitants and users of MYS include middle and high-income groups of people, they generally have cars, and the need for parking spaces for the private car-owners living in this area and those visiting the area is much increasing. This, therefore, creates more traffic congestion along the day. Cars occupy even the sidewalks of the street. Therefore, although MYS is situated in the central part of this area, and it is well-connected to many streets, traffic congestion, the cars parking on sidewalks and the crowded street discourage people to drive and walk on MYS. These factors make MYS an uncomfortable street.

As for the participants' survey, pedestrians were questioned whether there are enough sheltering provided by building canopies on MYS for pedestrians to be protected from sunlight, rain, snow, and wind. Seventy-one respondents (65%) claimed that there are not any measure taken to protect pedestrians from climatic conditions, while twenty-one participants (19%) stated that there are some measures taken, and eighteen people (16%) claimed that there are sufficient measures taken (Figure 7.42).

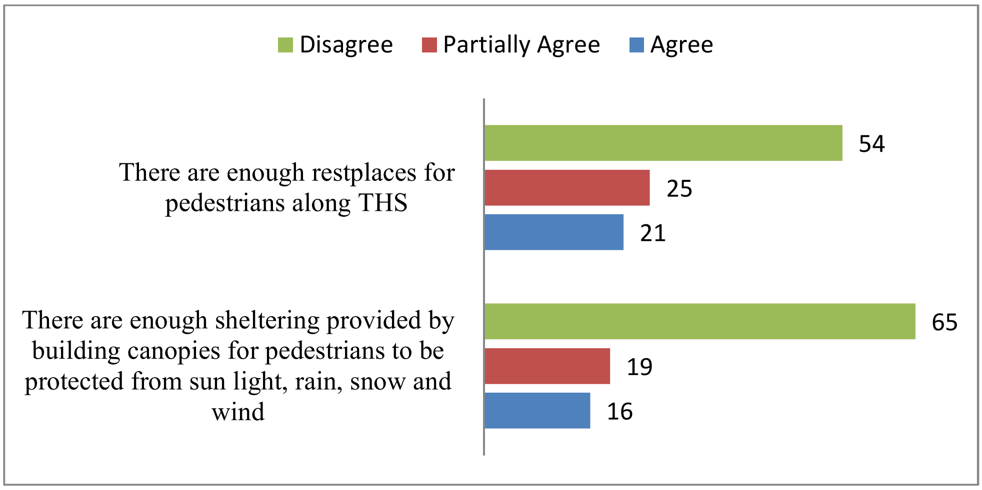


Figure 7.41, The assessment of comfort provided by MYS according to the MYS' users.

Pedestrians were also asked whether there are adequate rest places on the street. Sixty respondents (54%) claimed that there are not enough rest places along MYS, except for two parks and sitting areas of the restaurants. Twenty-seven participants (25%) expressed that rest places are partly enough and twenty-three (21%) respondents declared that rest places are completely enough (Figure 7.42).

To sum up, the examination of MYS regarding its comfort shows that the physical usability of the street is low. It partly offers architectural elements that protect pedestrians from climatic conditions, as also supported by the pedestrians surveyed. MYS does not possess clean air due to the high traffic volume on the street and insufficient greenery. MYS does not fulfill the conditions of actual and perceptual safety either. Although MYS is situated in the central part of ÇN, and it is well-connected to many streets, less frequency of public transit (discussed in chapter 5), traffic congestion, the cars parking on sidewalks and the crowded street discourage people to access with public transit and by walking. These factors make MYS an uncomfortable street, especially for vulnerable groups of people.

As for 'visual understanding' of MYS, the street is partly successful. MYS and its surroundings are highly legible environment due to its modified grid pattern and pedestrians easily perceive this pattern due to its rich landmarks, such as Mado, and Liva.

Regarding the continuity, the modified grid street pattern around MYS is more continuous; but located shops do not create a continuous frontage on both sides of the street. Subsequently, continuous sidewalk pattern on MYS is interrupted by unqualified intersections. Likewise, the perceptual continuity of MYS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture (Figure 7.41).

7.7. Diversity

Diversity in urban space describes the physical, social and economic diversity and has a close relation with walkability. 'Physical diversity', as mentioned earlier, means a variety of urban physical elements, such as a variety of dwelling types, architectural styles, and land-use activities. 'Social diversity' refers to a mixture of people coming from different ages, family types and socio-economic status, since 'economic diversity' means a variety of building types with different property values. The presence of such diversity in urban space is important in terms of bringing different groups of people together and to make them use public spaces.

With respect to physical diversity, MYS includes dwelling types for middle and high-income groups. In addition, it comprises business and commercial activities, which attract pedestrian groups. However, commercial areas, as open public spaces, do not continue on both sides of the street and this decrease walking activities of the street. For the second part of MYS, there are Ambrosia Shopping Center, hotel, and business building, which partially attract pedestrian activities (Figures 7.38 and 7.40).

In terms of social diversity, middle age and young groups of people living or working in it and surrounding areas use MYS. As there are various shops serving daily needs, the inhabitants of the street and nearby residential quarters who are families and single people, as well as people who work on the commercial premises on the street or nearby places come to MYS for resting and meeting activities.

Regarding economic diversity, the property values in the both part of MYS are generally high; so it mostly addresses to middle- and high-middle income groups. Therefore, the less varied land-use functions along the street accommodate physical, social and economic diversity, partially (Figure 7.43). If the diversity and walkability capacity of MYS is improved; then, social and economic diversity of the area will be much richer.

Figure 7.42, Pedestrian presence in the rest places, cafes and restaurants on MYS
Resource: Personal archive

7.8. Conclusion

MYS and its surroundings are highly legible environment due to its modified grid pattern and pedestrians easily perceive this pattern. It is also rich in terms of landmarks, such as Mado, Liva café and restaurants, Ambrosia and Migros Shopping Centers. Although the street pattern around MYS provides a high level of walkability and liveability, the walkability for pedestrians is impoverished by the low-quality paved surface, narrow sidewalks of MYS occupied by car parking, vehicular traffic, and less frequency of public transit system. Pedestrians are considerably disturbed by the interruptions along the sidewalks, unsafe crosswalks (particularly for vulnerable pedestrian groups) and insufficient street furniture which do not serve adequately their daily needs on the street and which do not provide a sufficient perceptual continuity. In addition, the inharmonious distance between street furniture and their insufficient amount weaken pedestrian enclosure of MYS. Furthermore, the perceptual continuity of MYS is impoverished by the low quality of sidewalk floor and a serious lack of street furniture. These factors make MYS an uncomfortable street, especially for vulnerable groups of people.

The inhabitants living on it and its surrounding streets are generally from middle and high-middle income groups because its luxurious land-use functions attract certain social and economic groups of people. Hence, together with mentioned deficiencies decreasing walkability; limited usages along the street and narrow sidewalks render the street unattractive to various groups from other parts of the city. As a result, together with potentials, such as grid and legible street pattern, sufficient landmarks and access to metro station, for being a walkable street; MYS includes deficiencies decreasing its walkability level, such as high car traffic, narrow sidewalk, less varied functions and etc. Thus, the improvement of mentioned limits and physical-social-economic diversity will increase the walkability capacity of the street (Figure 7.44).

What is the main problem behind walkability problem of MYS

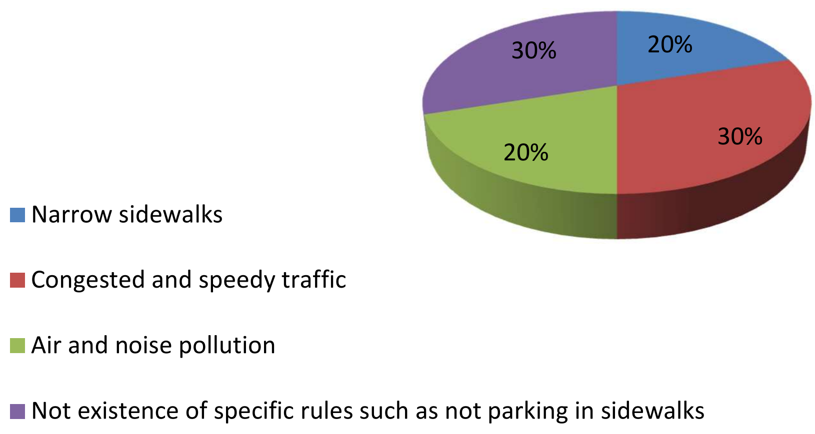


Figure 7.43, The views of the MYS' users on its main walkability problem.

CHAPTER 8

COMPARATIVE ANALYSIS OF THE CASE STUDIES

8.1. Overview of the research

Liveability and walkability have recently become major policy topics in the agenda of many cities all over the world. Many local authorities and municipalities have been taking measures to improve the walkability and liveability of city centers to ensure sustainable development of cities. Over the last twenty years, however, the urban development policies of Ankara have resulted in decreased liveability and walkability of the city center. Along with the decentralization policies, the CBD (Central Business District) has been losing its economic and social vitality. The recent public space policies have re-structured the city as a car-oriented city, neglecting and marginalizing the pedestrians. Poor public transportation services have increased the use of private cars, decreasing walkability capacity and liveability of the city.

This thesis investigates one of the few pedestrian precincts that still exist in the CBD of Ankara despite these policies: Tunalı Hilmi neighborhood. This mix-used street, which is a considerably lively place with many pedestrian activities, has been impoverished and losing its capacity of walkability by the recent policies of Ankara Metropolitan Municipality. Thus, this research investigates how far Tunalı Hilmi neighborhood is walkable at meso and micro scales and what factors have affected its walkability

The second case study investigated in this thesis is Çukurambar neighborhood. Being one of the important sub centers and neighborhoods of Ankara due to its location, Çukurambar is examined thoroughly in terms of walkability and liveability at meso and micro scales. It is crucial to consider Çukurambar's transformation process because since in contrast to THS, which has come into existence through time traditionally, this mixed use district was created as part of the renewal planning procedures in Turkey. Indeed, it is an example of squatter housing development rapidly transformed into a mix of luxury residential areas, governmental buildings, and business enterprises. It represents two different ways of urban development manner: traditional and regeneration. It is hoped that a study focusing on the two will allow for comparison of unexpected urban development and gradual development of urban context regarding walkability at meso and micro scales.

The research first explains the notion of 'walkability' at macro and meso scales, with main measures including *transportation system* and *land development* variables, and at micro scale with main measures containing *safety, orientation, attractiveness, comfort, diversity, and local destination*. It also explains the development history of Ankara and its public spaces, and how far the urban policies have tended to develop a walkable city. Afterwards, this study examines the walkability level within Ankara city at macro scale and on Tunalı and Çukurambar neighborhoods at meso scales. Then it focuses on the spatial characteristics of THS and MYS before an in-depth investigation of their walkability capacity and the factors affecting it.

8.2. Findings of the research

8.2.1 Assessment of Ankara at macro scale

A literature review on the issue of walkability revealed that, at macro scale, it can be examined in two main dimensions: *transportation system characteristics* and *land development variables*. Transportation system in social, economic and environment values and land development in density and diversity variables were deeply analyzed. In this scope, firstly, this research focuses on the accessibility and equity values of transportation system, which are the main problems of Ankara city that decreases its walkability (2.5.2.1 section of this study). Then, it evaluates density and diversity parameters of land development (2.5.2.2 section of this study) and discusses its relation with environment and economic values of social value of transportation.

So, firstly dependency of *transportation system* on highways due to insufficient rail systems, and crammed minibuses (*dolmuş*) have led to increasing use of private cars especially among those in higher economic position (i.e. high- and middle-income groups). There is a reverse relation between income level and the use of bus and dolmuş, and direct relation between income level and private car, and taxi use. High income group tends to use their private cars, and low income group use public transit system in an obligatory manner (discussed in 4.3.1.1 section).

The main traffic problems in Ankara are the dominance of private cars over other modes of transportation, inefficient public transportation system, low use of public transport from and to the city center, lack of connected rail system, and inadequate number of buses and bus stations, preventing people from taking short trips on foot or bike. As a result, the failure to provide an integrated transport system, which could provide an effective and efficient integration of various modes of transportation, reduces the accessibility capacity of Ankara for passengers, inflates car use, discourages short trips on foot or bike, thus decreases the quality of life (Discussed in 4.3.1.1 section of the study) (Figure 8.1)

Figure 8.1, Integrated transportation system, Amsterdam. (Re: Personal archive)

One of the main reasons behind the *low use of public transport from and to the city center*is the infrequent use of ring system around the main city and sub centers which cause traffic congestion in the city center. In this sense, a ring road system forms the backbone of all regional policies as it preserves the city and suburb centers from car traffic and increases pedestrianization in them. By the help of ring road systems, all parts of the city become accessible without city-dwellers entering the cores and *transmission (exchange) points integrate various modes of transportation* (Figure 8.2).

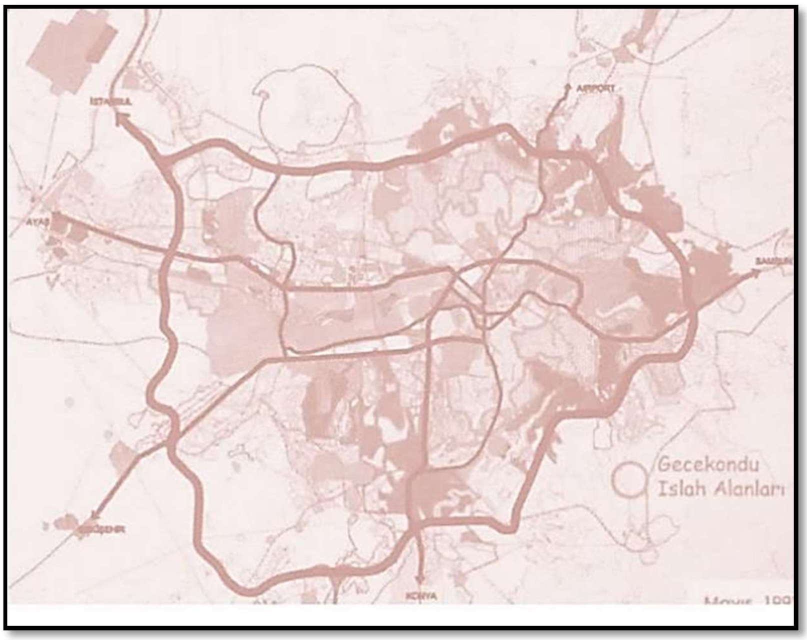


Figure 8.2. Ankara network system. (Accessed at bel.gov.tr)

As regards the integration level of various modes of transportation in Ankara, although average public transit people are higher than other European cities, there is traffic problem due to dependency of public transit system on highways. In fact, there is no integrated system between the modes of transportation as the ratio of rail system is considerably lower than developed countries.

The current railway system in Ankara is not adequate to serve the whole city region. There is no rail system to the South part of Ankara. Ankaray serves the east-west direction between ASTI and Dikimevi, while Metro system operates in Kızılay-Batıkent, Tandoğan-Keçiören, and Kolej–Cayyolu lines, connecting the city center with Western suburbs of Ankara. However, the rail system is not long enough to serve the whole city region, and there is no rail system to South part of Ankara. Compared to European cities' rail system such as the 400 km-long rail system in Zurich, the approximately 30 km-long rail system in Ankara with a population of 4.965.542 covering an area of 25.437 km^2 is not adequate (Ankara Regional Plan 2014-2023) (Figure 8.3-4). The accessibility of Ankara city is mostly based on the use of backbone highways, such as Atatürk Boulevard, Çetin Emeç Boulevard, Eskişehir Road, Anadolu Boulevard, Konya Road, and Samsun Road. However, an extended rail system and a sustainable and balanced public transport system are needed to decrease the extensive car use and increase walkability (Figure 8.4).

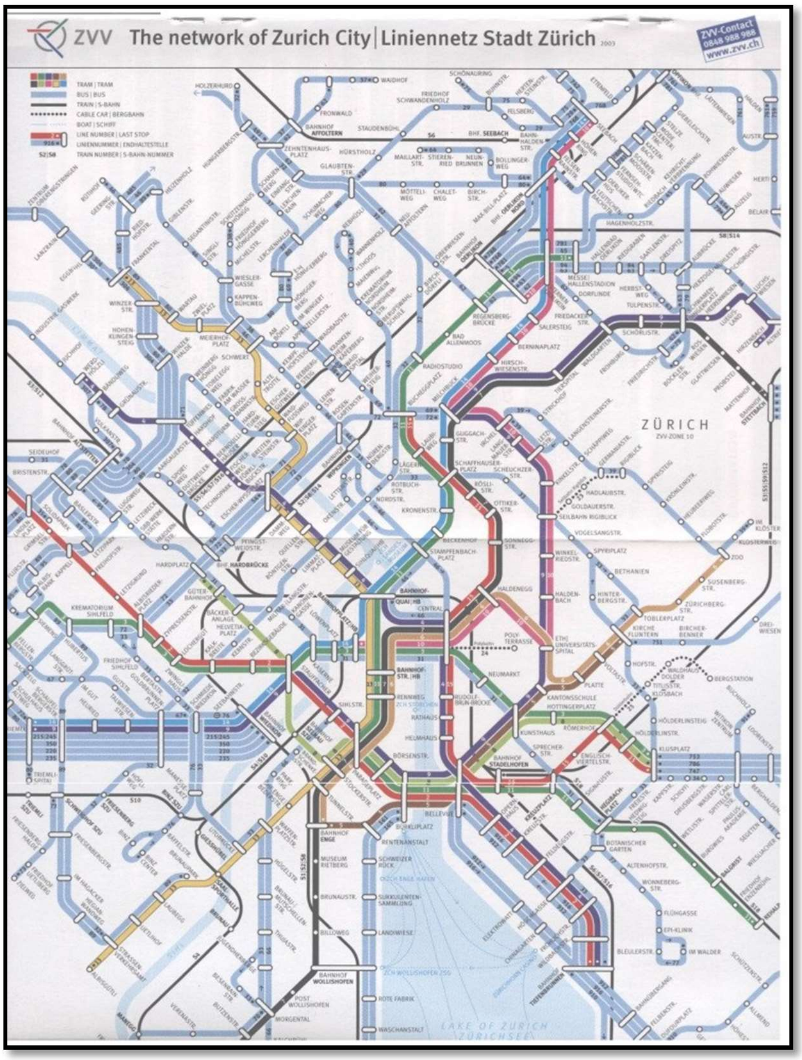


Figure 8.3, Zurich's 400 km rail system,
(Accessed at www.zvv.ch)

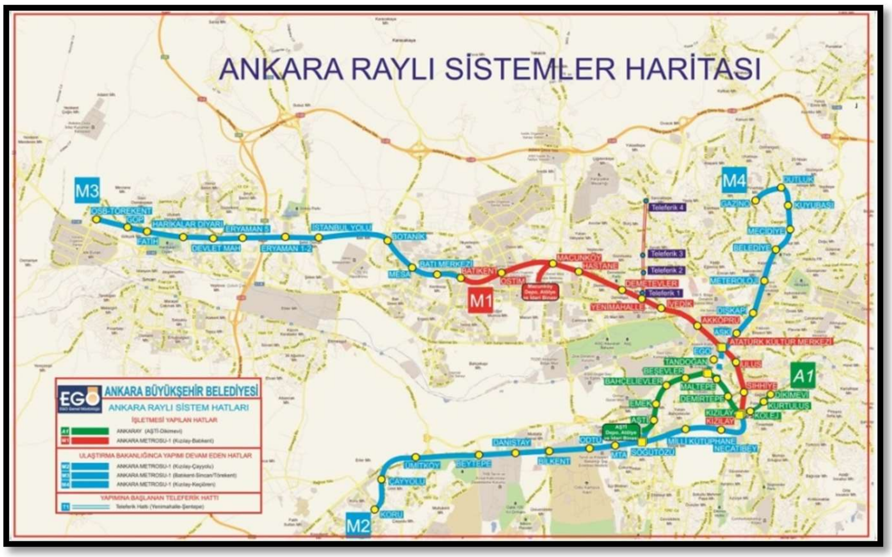


Figure 8.4, Ankara rail system. (Accessed at www.ego.gov.tr)

An analysis of the *land use pattern* of Ankara at macro scale shows that it has gone through fast expansion along *Western and South-Western corridors* after 1990 years. It has developed significantly as a sprawl towards all directions since the 2000s. The morphological analyses of the city shows that it has developed in the oil drop form due to the transformation projects and that the sprawl has produced into new sub-centers. That is to say, there has been a significant polycentric uncontrolled development in Ankara over the last 20 years, along with the rapid urbanization and urban sprawl. As mentioned before, the polycentric city configuration ensures a dispersed transportation rather than a concentrated (or compact) urban form, and provides equal access to urban destinations. Numerous arterials reach to the main commercial and business centers of Ankara, i.e. Ulus, Kızılay, Gazi Osman Paşa and Çankaya. Apart from these commercial and business centers and the traditional sub-centers such as Bahçelievler, Keçiören, Yenimahalle, Batıkent and Oran, a number of new sub-centers have developed over the last three decades, such as Çukurambar, Bilkent, Ümitköy, Çayyolu, Yaşamkent on the west corridor, Yıldızevler, Sancak, Birlik, İlkbahar to the south, Osmangazi, Ufuktepe, Ovacık, Bademlik, Pınarbaşı to the North and Tepecik, Küçük Kayaş, Yenibayındır, Altındağ Karapürçek to the East. Therefore, the development of such sub-centers with high urban density shows a potential to create a sustainable polycentric city, which will be detailed further in recommendation section.

Equity, another major social value of the transportation system, was also assessed, and answers to the following questions were sought for: *Do Ankara transportation system plannings and policies improve accessibility for lower-income people groups; How well is the public transit service for non-drivers?; Are transportation prices reasonable for all economic groups?* The answers revealed that population increase, limited and under-developed public transportation system, and high income groups' tendency to use private cars have decreased the quality of urban network. Actually, 34% of dolmuş passengers, 17% of bus users, and 39% of Ankaray passengers reported satisfaction with public transit. For these reasons, mostly low and moderate income groups use public transit system. Additionally, according to the results of a questionnaire applied in a research conducted by Gazi University (2013), 77% of passengers are not satisfied with public transit prices. Therefore, transportation prices are not reasonable for all economic groups of people (Discussed in equity section of Chapter 4)

Secondly, land development pattern is a macro property of urban form, which influences travel behavior in two main parameters:*density and land use mix.* Density is evaluated according to four criteria: *population, built form, sub-centers and employment density*.

Due to increase of squatter settlements after mid-1950s, the *population density* of Ankara showed a descending trend between 1927 and 1980. After the 1980s, population density remained stable with the decrease in housing production until the 1990s, after when house constructions began to increase due to the developments toward the Western corridor. After the 2000s, the urban transformation projects came on the agenda, and squatter areas situated in South-West corridor became the focus of many investments and transformation projects (TÜİK, 2013; Ankara District Planning of Development Agency, 2014: 51; Balamir, 1996) (Figure 8.5)

Expansion of city center toward periphery areas with saturation of city center and filling of the gaps between transition zones have caused an imbalance in the *built form density* along the city. Based on the investigation on Google Earth and Google maps, on the internet, this research observed that Ankara has areas with an increasing tendency of vertical building form density. These are: Çukurambar, Oran, Mamak and Çayyolu districtions. Additionally, because of the increase in squatter development and then rise in constructions in sprawl areas, the built form density of Ankara decreased, such as supplementation of Çayyolu and Yaşamkent sub-centers including medium-low density areas.

As regards the *sub-centers density*, Ankara seems to be a dense city, whose macroform *lacks the main properties of urban compactness including density, consistency, and mixed usage parameters.* Moreover, sub centers do not have well defined and legible borders. Ankara developed from a *core dependent* urban entity to an arrangement of *open growth*. That is, instead of developing based on major urban plans, it did so to have a shapeless city footprint. Consequently, Ankara pattern became dispersed, fragmented, and discontinuous due to sprawl in every direction on the periphery, especially in the South, South-West, West, North and North-West directions. As can be seen in the figure below and sub-centers section of chapter 4, high population density is concentrated in Çankaya, Yenimahalle, Etimesgut, and Keçiören districts. Despite the compactness requirement, discontinuity, nuclearity, concentration, clustering, and proximity has become the spatial characteristics of urban form of Ankara under the effect of this disorder sprawl. As a result, the density value of urban sprawl of Ankara can be said to vary between medium to low level.

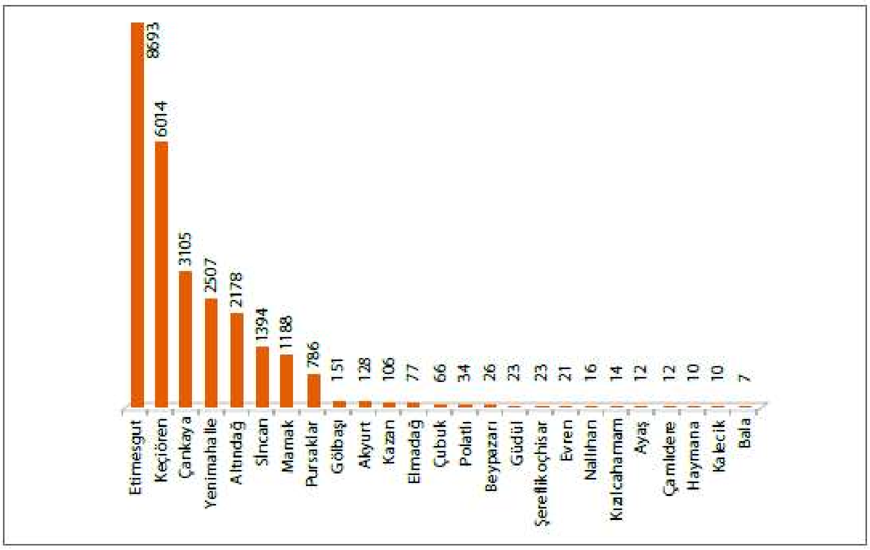


Figure 8.5, Population distribution on the neighborhoods of Ankara, (TÜİK,2013): 10

Before the decrease in the quality of the city center and start of the decentralization phase in the 1980s, Ankara had a more compact character. Nevertheless, following the outward urban growth to every direction especially South, South-West, West, and North-West corridors caused by *car-dependent urban planning,* total trip per capita increased rapidly. Additionally, decentralization of residential areas, development of low-density *–mono-functional-residential areas* in new development zones, *the increase of the average distance between residential and working areas* have disrupted the balanced *employment density* and have raised car traffic at the main arteries of urban fabric, such as Atatürk Boulevard, Çetin Emeç Boulevard, and Eskişehir Road. Connecting two main city centers and other sub-centers together, they are the backbones of Ankara city. Hence, there is not an interconnected urban network along the city which introduces other alternative connection subsidiary backbones to connect main and subcores to decrease the traffic congestion on the main arterial roads and contribute to the walkability (Figure 8.6). In fact, multi centers are accessible by public transit through crossing from main cores, whereas there is no direct connection between sub-centers. For example, to go to Oran or Mamak, everyone should go to the city center Kızılay and then they can reach to these destinations.

An analysis of the function parameter at macro scale in Ankara demonstrates that the growth process of the city started in connection with the city center with squatters situated in suburban areas (Figure 8.6). The transformation of squatter areas in Ankara to mass housing sites and commercial usages has led to the development of mono-functional urban forms. When sub-centers are examined in terms of the variety of usages per square meter and the distance between them, it is seen that there is a largedistance between mono-functional usages of sub centers, such as Yaşamkent sub-center. Therefore, there is a lack of intensity in sub centers caused by a lack of interconnectivity between the center and sub centers. As a result, density excessively increases in the main city centers rather than in poly-centers.

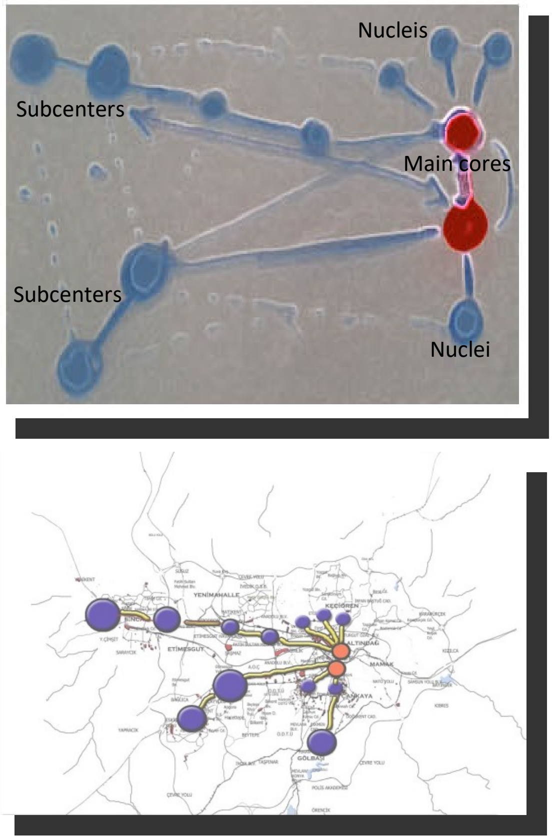


Figure 8.6, Schematic relation of Multi-centers of Ankara City.
(Personal study and rendering)

Some centers defined as uni-functional centers are not actually centers, but the concentration of one activity in a specific zone. It is the concentration or centralization of an activity or facility, and mostly known as *dormitory center* rather than sub-center. In this scope, the settlement area of Batıkent acts *not as a sub-center but as a dormitory town* because people have settled there mainly to live in a *bigger and affordable place away from traffic congestion with more work opportunities* (Figure 8.7-8; 4-42-43). With the development of residential areas, commercial areas were also added to the areas of high rise residents and apartments. Then, the working area, administrative units, and employment places became smaller and housing activities became greater, hindering the sub-central area development and walkability at macro and meso scales.

As can be seen here, the multifunctional parameter of the cores and the existence of an interconnected road network between them are essential for the livability of the city at macro and meso scales. In this sense, sub-centers should be taken as a smaller-scale city including all the facilities of a city.

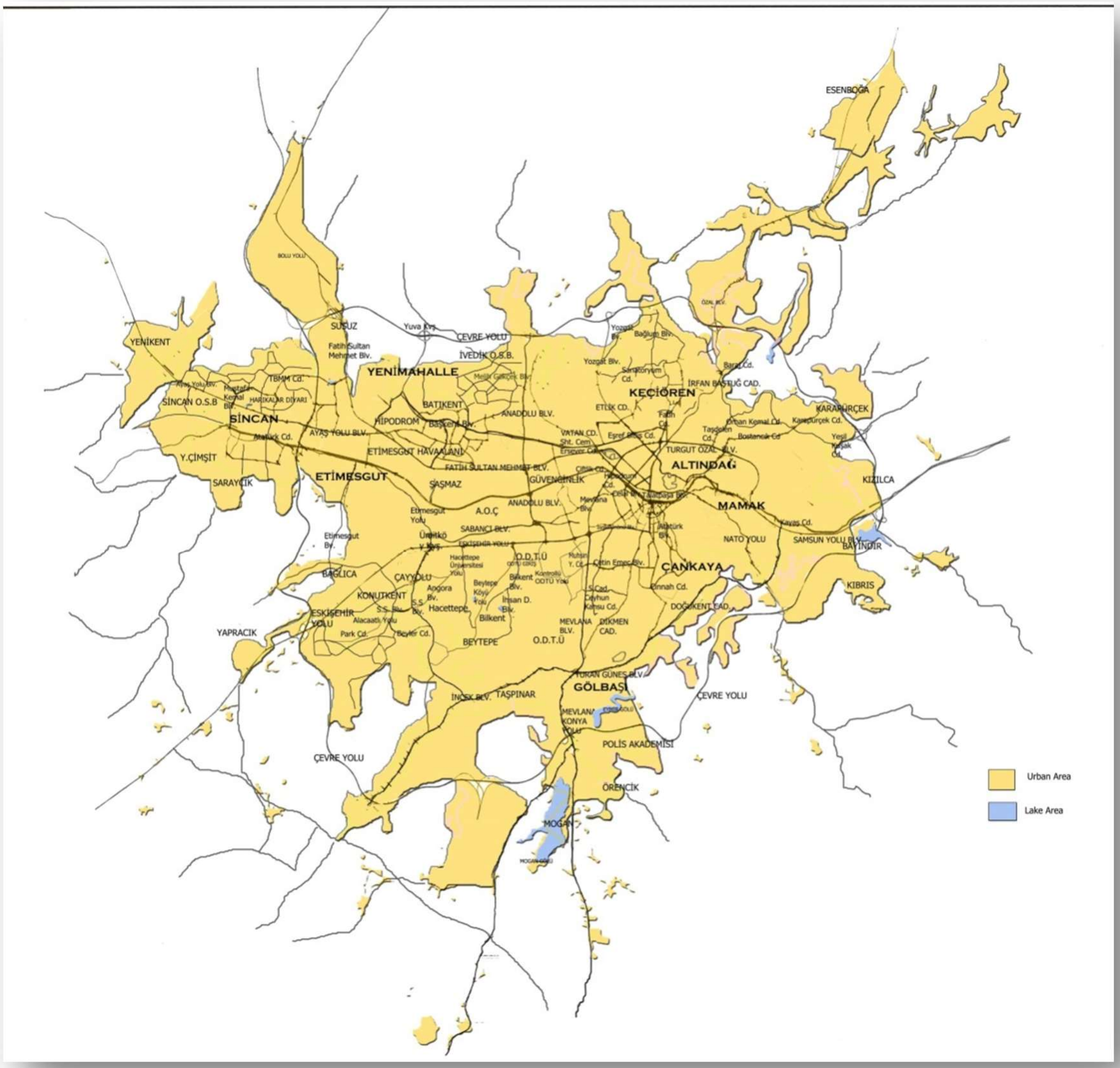


Figure 8.7, Urban areas of Ankara City in 2015 year. (Personl study and rendering)

In assessment of environmental value of transportation, dependency of transportation system on highways, dominance of private cars over other modes of transportation, shortage of pedestrianized areas, and lack of connected light rail system have decreased its quality. Economic value of transportation is affected by two parameters: land use and equity. Firstly, implementation of infrastructure due to unplanned land use development has proved highly costly. Secondly, according to the results of the study conducted by Gazi University andmentioned in equity section of chapter 4 and personal observation, transportation system facilities mostly address to specific groups, such as high income and healthy groups of people. As a result, it does not provide facilities equally accessible to low-income groups, and this decreases its affordability.

Figure 8.8, Views from subcenters of Ankara City. (Personal archive)

8.2.2 Assessment of Tunalı Hilmi and Çukurambar neighborhoods at meso scale

Social Value of Transportation System for Walkability

Accessibility

In both the cases of Kavaklıdere and Çukurambar Neighborhoods (ÇN), the distance between transit stations and its surrounding area *do not exceed 600 meters.* Therefore, the public transportation stops and mixed use facilities in both cases are accessible in a walking distance. In addition, almost *45% of people* living in Çukurambar neighborhood are able to reach the metro station within a *500-metre walking distance.*

In the case of ÇN, there is only one metro station on Eskişehir Road that provides access to Çukurambar neighborhood users. Several reasons were found that explain why potential passengers do not use the metro. First of all, effective and efficient integrated system with high frequency is needed to transfer passengers to the public transit stops. Although it is about a 6-minute walking distance to the station, 56.3% of the participants stated that they found the frequency of public transportation vehicles insufficient.Second, t*he quality of this exchange point (i.e., metro stop) is very low because there are no mixed-use facilities such as car-parking areas, park and ride system, services for the elderly and disabled, shuttle services to activity centers and daily usages) which can serve the daily needs of passengers. The exchange point does not provide an easy access to other residential parts of the district either*. The situation signaled the need for an integrated system in Ankara at macro scale, based on *neo-traditional*neighborhood design approaches. In other words, mixed usage service areas should be at the exchange points of the public transit stops (e.g. metro or bus stops), and they should be located in a walkable distance in order to respond to the daily needs of pedestrians/passengers. Also, for park-and-ride users, there is not a large-capacity car-park. These needs have been disregarded in the case of Çukurambar.

For the case of TN, due to its centralized location; it is accessible by walking and various modes of transportation. Its compact pattern, close destinations, qualified transit system including bus and dolmuş with high frequency which passing from various parts of the neighbourhood make walking more comfortable. Additionally, flatness of the neighbourhood support walkability further.

Street network and network connectivity

The analysis of network pattern revealed that the street pattern around Tunali Hilmi Avenue and its surrounding neighborhood is similar to a modified grid and provides direct and short travels for pedestrians.

Çukurambar neighborhood also includes a grid street network and cul-de-sacs street pattern in some residential areas. Thus, both neighborhoods have a similar grid street patterns contributing to their walkability (Figure 8.9-10). However, street connectivity (how densely the streets are connected together) of TN is higher than ÇN. Additionally, street density (total street in a given area) of TN is also high.

As for network connectivity, the network density, division of number of roadways to number of nodesin ÇN (Çukurambar neighborhood) and TN (Tunali neighborhood) are 1.48 and 1.37, respectively. That is, network density in TN is about 1.73 (more than 1.40), minimum value of network density mentioned in literature section, so the ÇN is less interconnected.

Figure 8.9, : Tunali Hilmi Neighborhood's street pattern. (Personal study and rendering)

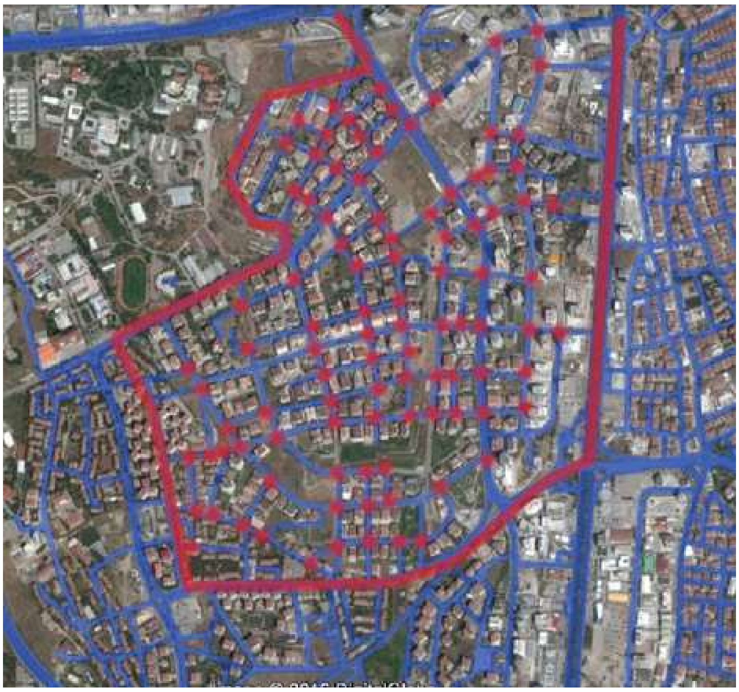


Figure 8.10, Çukurambar and , Tunali Hilmi Neighborhood's street pattern.
(Personal study and rendering)

Land use pattern

Although both cases have a variety of land uses including restaurants, cafes, schools, health centers, and private and institution work places, level of compactness and variety in Tunalı Hilmi Neighborhood is higher than Çukurambar neighborhood. On the other hand, most of these usages have a higher vertical density of 7-42 floors in Çukurambar neighborhood than the 3-4 floors in Tunalı Hilmi Neighbourhood. Most of the buildings in ÇN are isolated trade buildings or offices, or gigantic business centers where offices, trade centers, and residences are clustered together like in Next Level complex center. Hence, as the usages are perceivable in the 1st-2nd floor (Jane Jacob, 1962), and there is no mixed use corridor in ÇN, the variety of usages in TN is higher than ÇN.

Block size in the Tunali Hilmi neighborhood is low (450 m^2), so streets are interconnected in a system of small blocks. As a result, street length, distance between origin and destination, in Tunali Hilmi neighborhood is low. This allows for more direct and shorter travel opportunities, contributing to walkability and decreasing car travels in Tunali Hilmi neighborhood. However, sizes of blocks in Çukurambar neighborhood are huge (1000 m^2), which decreases block density in a given area (regardless of the high vertical density in Çukurambar neighborhood). As a result, street length and distance between destinations is greater than in Tunali Hilmi neighborhood (Figure 8.11).

Figure 8.11, Block frequency at intersections points in Tunali Hilmi (left) and Çukurambar (right)neighborhoods.

Separated walking, biking system

For both of the cases, except for park areas, there isn't any safe walking and biking system to ensure easily accessibility to public transit and multi usage centers. As mentioned in chapter 5, according to bicycle use analysis, implemented by Gazi University (2013); 68.4% don't use biking while 31.6 percent use it. The groups of people which don't prefer bicycle use stated their reasons as insufficient area for biking and parking of bicycles, unsuitable attitudes of motorized vehicles, and not existence of transferring system for bicycles by public transportation vehicles.

Equity, environment and economic values of transportation

Evaluation of equity in ÇN indicates that people are not satisfied with public transportation facilities. Most of its users who are people with high-income do not prefer to use public vehicles due to concerns about time and energy consumption. As discussed in 5.5.1.1 and 5.5.1.3, as for satisfaction from the vehicle arrival time, numbers of stops, and frequency, 56.3 percent are not satisfied. As for, reasons for preference of public transportation system, 30.6% of participants prefer public transportation due to its low price, and 24.4% due to not having private cars. While the same research in field of Kavaklıdere Neighborhood, mentioned in 5.2.1.1 and 5.2.1.3, indicates that 41% of participants do not use any transportation vehicle, starting and finishing their trip by walking, 27.3% prefer EGO bus use after walking, and finally only 7.1% use public and private transportation e after walking for a certain distance. Additionally, people walk at an average duration of 18 minutes, after which they switch to transportation vehicles. So, comparing to ÇN, TN ensures more equal facilities to various groups of people with its central location, low traffic volume , wider(preference of walking as the main transportation manner, narrow roads accommodating low volume of cars), and sufficient frequency of public transit system. . That is, TN ensures accessibility by various modes of transportation especially by walking and EGO system, which makes it more affordable. Additionally, TN accommodates lower volume of cars and damages the environment less. However, in both case studies public vehicles are not adapted to disabled people, so only the hearing impaired can use EGO transportation vehicles. As mentioned in chapter 5, according to analysis based on handicapped users of John F. Kennedy and Tunalı Hilmi Streets, implemented by Gazi University (2013); %75 of handicapped people, mostly ones with hearing disability, use EGO bus system. While, 26.7% of moving disability people prefer dolmuş and 40 percent of them don't prefer to use any public transportation vehicle because of not suitability of public transits to their disability type. Indeed, majority of moving disability people don't prefer to use public transportation, especially EGO bus system.

Land use development

Population density

An estimated population of 30,000 in Çukurambar and 8,000 in Kızılırmak live in the residential buildings, and the populations, in the business centers are not even included in these numbers. The housing density is 394.73 people per hectare in the Çukurambar area, and 80 people per hectare in the Kızılırmak area. Before the urban regeneration, these neighborhoods consisted mainly of squatter buildings, where the density was 160 people per hectare. This value has boosted to 237.36 people per hectare in the focus areas of the study, Çukurambar and Kızılırmak neighborhoods, with 38,000 people living on 176 hectares of land. Despite the presence of under construction lands and buildings, the current density keeps growing. The population density of ÇN is much higher than that of Tunalı Hilmi neighborhood where the population density is 190 people per hectare. Additionally, Tunalı Hilmi neighborhood has a more balanced population density (190 people per hectare) distributed along the residential district, while the population density in residential areas of Çukurambar is concentrated in vertical density. Given that a walkable city should have an average density of 40 people per ha, the population density of both neighborhoods, especially Çukurambar, is over the accepted limits.

These being said, it is controversial why high population density of Ç.N does not contribute to walkability. As it is indicated at macro scale assessment of Ankara and related problems, the main city cores are connected with its sub centers with two main backbones rather than being interconnected in an urban form, which causes traffic congestion at main arterials. Therefore, Çukurambar neighborhood seems to have traffic congestion problem due to its special strategic location**;** Muhsin Yazıcıoğlu Street connects two main crowded boulevards, Eskişehir Road and Çetin Emeç Boulevard, which turns its main road to a transition road and causes drastic traffic congestion especially at peak hours. Another reason behind urban transport problem is unexpected and excessive increase in building density, which has increased from 160 P/Ha to 237.36 people per hectare. Ankara suffers from uncontrolled development because of the connection of city center with squatters, which have newly been replaced with buildings with 7-42 storeys. Hence, building density has increased unexpectedly and enormously. The existing street network will undoubtedly fail to accommodate the excessive demand of increased population. Furthermore, commercial activities in Çukurambar and its vicinity have affected the traffic congestion negatively. To sum up, *excessive building density, special strategic location, and economic activities in Çukurambar neighborhood* have decreased the quality of life and walkability.

Built form density

High-rise business buildings with mostly 9-30 storeys are concentrated in Kızılırmak neighborhood and residential buildings with 4-42 storeys in Çukurambar neighborhood (Figure 8.13). In ÇN, 65 percent of the area is built area. As a result, THS and its vicinity, with 73 percent, shows a higher level of form horizontal density than ÇN. As regards green area, Çansera Park was considered although it was out of the boundaries under focus, yet accessible to ÇN users by walking and motorized modes of transportation (as the furthest distance to Çansera Park is 1.4 km). The analysis found that, regarding the population and built form density parameters, ÇN was green by less than 6 percent (11 hectares), which is a far low value (Figure 8.12). In TN green areas are scattered equally in gardens of the buildings. Additionally, it has access to many green areas such as Kuğulu Park, Seğmenler Park.

Employment density

*P*rivate work place numbers in Çukurambar, and Kızılırmak neighborhoods respectively are as 334, and 3206 (Figure 8.12). Together, there are 24 business centers with average 22 storey in these two neighborhoods in total.Hence, with assumption of the fact that 50 persons are working in each floor of ÇN business centers; so 26400 people are entering to these 24 business centers. Additionally, 5436 people are also working in remained 1812 work places situated along ÇN. Generally, with division of 31836 persons, working in these two neighborhoods, to 176 Ha; the employment density becomes 180.88 P/Ha. Additionally, about TN; If we assume, in average, 2 people are working in work places, so with division of 4917*2 number of employees to 108.89 Ha becomes 90.31 employees per hectare.

The average employment density in Çukurambar is 180.88 people per hectare, which is higher than that in Tunalı Hilmi neighborhood with 90.31 people per hectare.

Figure 8.12,Left: business density and Right: residential density in Çukurambar and Kızılırmak neighborhoods. (Personal study and rendering)

Diversity

There were 1510 residential buildings in the ÇN with 160 people per hectare population density before regeneration. Today, there are approximately 190 residential buildings in Çukurambar and 50 residential buildings in Kızılırmak Neighborhoods. There are 24 business centers having 15-storey or above in these two neighborhoods in total. While TN includes 620 building blocks; so, as mentioned in land use pattern section, block density in a given area (regardless of the high vertical density) of Çukurambar Neighborhood is lower than Tunali Neighborhood.

Figure 8.13, The summary of the 8.2.2 section. (Personal study)

Walkability assessment at meso scale

on Tunalı Hilmi Neighborhood		*on Çukurambar Neighborhood*
---Distance between transit stations and activities dont exceed 600 m- 10 min walking distance. ---Various mixed usages are accessible in 10 min walking distance.	***Transportation system Social value Accessibility***	---Distance between transit stations and activities dont exceed 600 m- 10 min walking distance. ---Various mixed usages are accessible in 10 min walking distance. ---50% of neighborhoods have walking distance to metro station
Grid street pattern Average distance of intersections are 127 (m)	***Street pattern***	Grid + Cul-de- sacs street pattern Average distance of intersections are 321 (m)
Tunalı Hilmi neighborhood have a very compact land use pattern Vertical density of Tunalı neighborhood is 3-4 floors	***Land use pattern***	Compactness level of Çukurambar neighborhood is less than Tunalı Hilm neighborhood Vertical density of Çukurambar neighborhood is 7-13 floors

Equity

-- People are not satisfied with public transportation prices
-- Hearing disabled people can use EGO facility
-- Most of moving disabled people dont prefer the use of public transportation vehicles

Land Use Development Density

Tunalı Hilmi	Çukurambar
- There is balanced density all over Tunalı Hilmi neighborhood	-- There is not balanced density all over Çukurambar neighborhood
- Population density in residential areas is 190 P/Ha	-- Population density in residential areas is 215.90P/Ha
- Residential builform density is 141.27 Housing /Ha	-- Residential builform density is 60.57 Housing/Ha
- Employment density is 45.15	-- Employment density is 14.52

Figure 8.14,Built form and green area density of Çukurambar and Kızılırmak neighborhoods.(Personal study and rendering)

Additionally, there are mixed use corridors in many various parts of THN, such as Tunali Hilmi, Bestekar, Büklüm Streets, while ÇN includes 90 percent of residential blocks which less amount of them, such as Next Level complex center, are combined with commercial-business usages. Together, as mentioned before, most of the buildings in ÇN are specific to one usage. In green areas assessment, ÇN have accessibility to Çansera Park, while THN has approachability to Kuğulu, Seğmenler, and Milli Egemenlik Parks and the green areas around Karum Shopping center. Due to these assessments, with low level of variety in ÇN; the distance between its destinations is higher than THN (Figure 8.13).

8.2.3 Assessment of Tunalı Hilmi and Çukurambar neighborhoods at micro scale

Safety, which is classified as *actual safety* and *perceptual safety,* is an important quality of walkable public spaces. Regarding the *actual safety*, the analysis and survey results show that the street pattern of both case studies, especially THS, provides a high level of walkability and liveability. However, the walkability for pedestrians is impoverished by high volume of vehicular traffic, low-quality pavement surface, and narrow sidewalks. As can be seen in Tables 6.1 and 7.1, sidewalk width of THS is greater than that of MYS. The street width of MYS is higher, yet this increases car speed and decreases pedestrian comfort. In this sense, THS is more conducive to walking. As suggested by many survey respondents, high vehicular traffic lasts almost all day long throughout the week, which discourages people from walking in THS, MYS and the streets around them. Even though THS is easily accessible by walking, vehicular traffic on and around the street is an obstacle to pedestrians.

Inadequate *traffic calming measures* have been taken in THS, such as raised or textured pavement at crosswalks and barriers.No such design detail is observed in MYS. Hence, average car speed is greater in MYS. Besides, the two-lane unsystematic street parking on THS and one-lane street parking in MYS decreases the perceptual width of the street, and therefore reduces car speed, yet it causes a considerable traffic congestion and disturbance in pedestrian crossings. It also creates serious problems for car and pedestrian movements.

The *lightning quality* is another important variable which affects the actual safety of a public space. It differs in the different parts of THS. The first part of THS is partly lit and visible, whereas the second part and Kuğulu Park are relatively poor in terms of street lightning and visibility. Pedestrians generally are not happy about the lighting quality of the street and the park. THS, therefore, needs a considerable improvement in terms of street lightning. In MYS, street lightning system is situated at the height of 20 m for the comfort of car users and there is not a lightning system addressing to pedestrians.

Continuous sidewalk pattern is an essential feature of a well-designed pedestrian system which increases walkability. Although the modified grid street pattern around THS and MYS offers more continuous, therefore, more walkable sidewalks for pedestrians, the sidewalk pattern is interrupted by a number of streets crossings which are not adequately visible and safe for pedestrians, especially for vulnerable groups. For example, the street crossings with traffic lights hinder continuous and safe sidewalk pattern on THS. In addition, high intersection widths in MYS, and lack of visibility and safety disturb sidewalk continuity. Besides, the perceptual continuity of the street is impoverished by inharmonious rhythm of street furniture located on THS. In contrast, there is no street furniture in MYS, which enhances continuity of the sidewalk.

The survey carried out among the pedestrians also show similar results. Pedestrians are considerably disturbed by the interruptions along the sidewalks, unsafe crosswalks (particularly for vulnerable pedestrian groups), and street furniture which does not serve daily needs on the street and which disrupts sufficient perceptual continuity.

Pedestrian enclosure also affects pedestrians' safety physically and perceptually. The study found that the majority of pedestrians do not have a right idea about the boundary of THS. Because of the intensity of multi-purpose usages and high volume of vehicular and pedestrian traffic, the general recognition about the boundary of the street is that it is from Kuğulu Park to the intersection of Esat Street.

High pedestrian volume in the first part of THS affects the comfortable movement of pedestrians, except for quiet hours of week days. The analysis of the ratio of building height to street width and the pedestrian volume revealed that pedestrian enclosure in the first part of THS is inadequate. This creates a suffocating street. In the second part of the street, however, the pedestrian enclosure, thus the sidewalk width, is adequate particularly due to the low pedestrian volume. Regarding *building orientation,* most buildings and shops are oriented to the main sidewalks of THS and MYS and they therefore intensify pedestrian enclosure. Nevertheless, inharmonious distance between *street furniture* weakens pedestrian enclosure of THS.

The ratio of street width to building in MYS is 0.20-0.90, and 0.50-1.00 in THS. The ratio of sidewalk width to the height of building in MYS is 0.01-0.06, and 0.20 in THS. Hence, due to raised buildings in MYS and narrow sidewalks, the ratio of sidewalk to building is very low, which weakens pedestrian enclosure in MYS (Figure 7.14).

The survey on the users of THS shows that the majority of pedestrians support pedestrianization of THS, especially from Kuğulu Park to the intersection of Esat Street. If the street cannot be pedestrianized, the majority of survey respondents agreed on the idea of widening the street sidewalks, especially on both sides of THS between Kuğulu Park and the intersection of THS because they find walking conditions of the sidewalks uncomfortable. The only part which they find comfortable for walking is Kuğulu Park and its vicinity. The users of MYS are also in the idea of widening of the street sidewalks. The survey also shows that particularly vehicular traffic on street crossing disturbs the pedestrian movement.

Separation is another component of actual safety of pedestrians. Although the on-street parking of THS and MYS provides a significant separation between pedestrians and vehicle area, the cars parking next to these parking lots hinder pedestrians crossing and movement, and endanger their safety. They also create traffic congestion on the street. Thus, new controlling regulation that prohibits such parking is necessary for case areas to ensure pedestrians' safety and to increase the walkability of THS.

Floor quality is also very important for the actual safety of pedestrians. The results of the direct observation shows that broken pavement slabs, unsafe level variations of sidewalks, and obstacles along the sidewalks make walking uncomfortable and unpleasant for all groups of pedestrians. Generally, the floor quality of THS is significantly poor than MYS.

The majority of participants agreed that the pavement slabs, which are not well-laid out, which are deformed or broken, and unusual obstacles along sidewalks endanger the pedestrians' safety.

Street crossing is a crucial factor in safety evaluation. The investigation of the street crossings of THS show that those with traffic lights are cannot create a safe and walkable street. As design details and visibility of intersection crossings in MYS is adequately insufficient, safety parameter regarding street crossings is lower than THS. The majority of the survey respondents of both streets agreed that the street crossings are not well-situated, easily accessible and visible. They also think that the street crossings with traffic lights along THS are insufficient. Therefore, the results of this investigation point out an urgent need for re-designing all the street crossings on THS as a continuity of the sidewalks to ensure the safety of all groups of pedestrians. Necessary standards should be implemented to the design of ramps, floor materials, signs that will ease the movement and comfort of pedestrians and increase their safety. In this way, they will be easily visible (or perceivable) by everybody.

Perceptual safety is another important factor which affects the walkability capacity of public spaces. The perceptual safety of THS and MYS is debatable in various terms. Regarding the *delimitation of public and private space* of THS, the perceptual safety is poor, as it is not clear which part of the sidewalk belongs to the public space and which part is the private premise. Regarding the *building orientations* of both streets, however, the perceptual safety is strong, as all buildings are oriented towards streets. THS is a mix-use and Muhsin Yazıcıoğlu Avenue is a semi mixed use street. Therefore, both of them might be perceived as a safe street during day time, as the people who work and live on them might act as 'eyes on the street'. In the first part of THS (i.e., Kuğulu Park-end), the perceptual safety of nighttime seems to be lower than that of daytime as the residential usage is less in this part than in the second part. Nevertheless, the perceptual safety of the Kuğulu-end part of THS at night is higher than Küçükesat-end due to combination mixed land usages with residential population. In the case of MYS, the perceptual safety of nighttime at its first part (from entrance to Ambrosia shopping center) is higher than the second part (from Ambrosia shopping center to Eskişehir road intersection point) due to concentration of mixed land use activities being open until late time and existence of residential usages acting as eyes on the street.

The Evaluation of Safety in THS			in MYS	
ACTUAL SAFETY	Assessment results	Assessment results	Assessment results	Assessment results
1) Street pattern	Modified grid, high amount of paved surface, accessible, unqualified pavement slabs, high vehicular traffic	- Distance between intersections = 127 m - Sitting places are are merged with sidewalk -Sidewalk width: 3.67 (m) - Street width: 9-11 (m)	- Modified grid, - Less amount of paved surface, - accessible, - Unqualified pavement slabs, - High vehicular traffic	- Distance between intersections = 321 m - Sitting places are separated with glass from sidewalk -Sidewalk width: 1.60 (m) or 50 cm in some places - Street width: 25-30 (m)
2) Traffic calming measures	Poor value of design detail measurements		- Not existent of any design detail measurments - Insufficient street crossing	
3) Lightening	partly qualified lightning system	- Existent of sidewalk lightning system -Light height: 6 (m)	- Unqualified lightning system	- Not existant of any sidewalk lightning system - Street light height: 20 (m)
4) Continuous pavement	Continuous street pattern, inharmonious street furniture	- Number of intersection: 10 - Width of intersections: 2.80-13.50 (m)	- Continuous street pattern, - Serious lack of street furniture	- Number of intersection: 6 - Width of intersections: 10-15(m)
5) Pedestrian enclosure	Well-oriented buildings, less ratio of sidewalk width to height of buildings, inharmonious street furniture	- Ratio of street width to height of buildings: 0.5-1.00 - Ratio of sidewalk width to height of buildings: 0.2	- Well-oriented buildings, - Serious low ratio of sidewalk width to height of buildings, - Serious lack of street furniture	- Ratio of street width to height of buildings: 0.2-0.9 - Ratio of sidewalk width to height of buildings: 0.01-0.06
6) Separation	Highly developed unsystematic parking	- Two lane 160-170 on street parking	- Highly developed unsystematic parking	- One lane 140-180 on street parking (mostly car parking on sidewalks)
7) Floor quality	poor	Sidewalk height: 10 (cm)	- Poor	Sidewalk height: 25 (cm)
8) Street crossings	Direct, short, partly invisible, and lack of safe street crossings	- No sign on road in some places - No special design for disabled people	Direct, partly long invisible, and unsafe street crossings	- No sign on road for street crossing of all intersections or any design for disabled

Figure 8.15,The summary of the analysis of THS and MYS in terms of safety parameter of walkability at micro scale). (Perosnal study)

The survey results generally demonstrated that THS is a partially safe street at night, except Kuğulu Park, which is considered insecure at night. The majority of the respondents perceive the street as safe because of the facilities open until late night.

Nevertheless, no clear idea was expressed about whether THS will be a much safer place if there is a higher ratio of residential population.

To sum up, there are some deficiencies as to perceptual safety parameter of walkability in MYS, which decreases walkability in it. Firstly, regarding the *Jane Jacob eyes on the street* concept, intersections in THS include a high amount of small, low-rise blocks placed in narrow roads, and there is a reasonable

road to sidewalk ratio. On the other hand, in MYS, the intersections include a high amount of huge and high-rise gated buildings on the wide roads, and there is an unacceptable road to sidewalk ratio. As a result, Çukurambar intersection roads are more car oriented, human perception angles and eyes on the street are not perceivable, so pedestrians do not feel secure there (Figure 8.16-17).

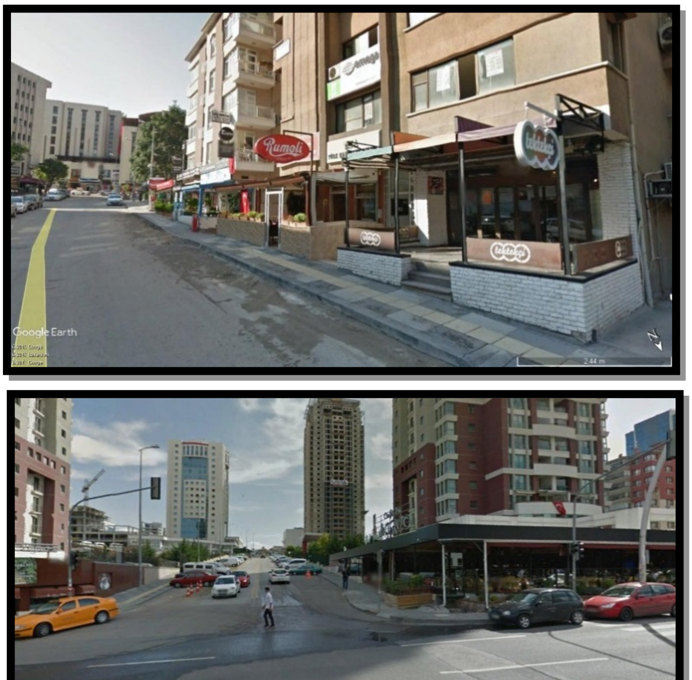


Figure 8.16, Comparison of eyes on the street in two case studies, (Above: THS, Below: MYS)

Secondly, there is the lack of walkable points along the back roads which would encourage pedestrians to access lively mixed use small centers. Thus, if we draw the mental map of pedestrians walking along intersection, we can see a wide street with narrow sidewalks. It is not clear how the pedestrians will reach the small shops that are probably situated near the main road. However, in THS a variety of usages along the intersections take pedestrians to back roads, encouraging pedestrians to walk along the intersections (Figure 8.17).

Figure 8.17, Quality of intersection in Left: MYS and Right: THS.

Orientation is a crucial part of safety and walkability, for it enables pedestrians to realize public space network, to recognize the most important public places, to avoid the fear of being lost, and therefore to have inclination to walk. The thesis assessed it in terms of legibility of street pattern and urban components, landmarks, continuity, built form and location, and architectural and environmental features. Regarding the criterion of orientation, both case studies are partly effective. The surroundings of both THS and MYS are highly legible due to the modified grid pattern and the ease with which pedestrians perceive it. They are also very rich in terms of landmarks, Kuğulu Park being the most remarkable landmark of THS, and Mado and Liva Cafes being the most remarkable of MYS.

As for *continuity*, the modified grid street pattern around the case studies offer more continuous, therefore, walkable sidewalks for pedestrians. Subsequently, located shops create frontage continuity on both sides of THS. However, continuity of shops on both sides of MYS is sometimes broken. In addition, a number of intersecting streets interrupts the continuous sidewalk pattern on THS and MYS. However, the narrow intersections in THS do not disturb continuity of THS as much as the wider ones in MYS. Likewise, the perceptual continuity of THS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture. Moreover, serious lack of street furniture in MYS weakens its perceptual continuity.

In THS, the entrances of shops and buildings are visible by pedestrians, but they are not well-defined by architectural or urban elements as in MYS. Some entrances in both case studies are not easily accessible to vulnerable pedestrian groups, either. These buildings entrances need particularly ramps, or some pavement treatments on the floor to fix the floor level variations.

Attractiveness is another important factor that should be considered in the assessment of walkability of public spaces. A number of factors affect the attractiveness of a place. This research is opted to examine it regarding the colorful, enjoyable, legible, safe, peaceful, comfortable, spacious, predictable, monotonous, intriguing, surprising, mysterious, exciting, and suffocating elements.

Regarding THS, there is a color harmony among the buildings which were built between the 1960s and 1990s. However, the new ones are generally very different from the earlier buildings regarding their building materials and thus façade colors. They decrease the visual harmony of the street in terms of colors. Besides, as the signboards of the shops and offices on THS are not regulated, in some parts of the street, especially between Kuğulu Park and Esat Street, they also impoverish the visual harmony of the street. Nevertheless, because of the street pattern and landmarks, THS is highly legible for pedestrians. THS is a street containing buildings with different architectural style. The buildings with similar architectural style may create a monotonous scene. As there are buildings with different architectural style especially between Kuğulu Park and Esat Street, THS provides pedestrians with a non-monotonous scene. In addition, the shops and shop windows make it a very interesting place, particularly for pedestrians.

Pedestrian enclosure in the first part of THS is inadequate. This creates a suffocating street. In the Küçükesat-end, however, the pedestrian enclosure (therefore, the sidewalk width) is adequate particularly due to the low pedestrian volume. Besides, a number of visual elements, such as dirty advertisement boards, unsafe urban elements, and inappropriate placement of air conditioners along sidewalks, broken pavement slabs, level variations on sidewalks, and improperly built street ramps, impoverish the attractiveness of the street.

Regarding the facades of the buildings on MYS, most buildings are new and have fresh color and modern material; they bring vitality to MYS. However, no specific codes regulate the colors of buildings and shopfronts. There is a color, material, height harmony among residential buildings. In addition, glass and metal materials and number of floors in business and hotel buildings are in harmony within themselves and different from residential buildings.

There are buildings with different architectural styles, especially at the beginning and end of MYS and on back roads, offering pedestrians a non-monotonous scene. On the other hand, as most shops and shop windows are concentrated on the first part of MYS, there is not the continuity of shop windows along the street, and this steals from the interesting aspect of MYS.

Pedestrian enclosure in all parts of MYS is inadequate. This suffocates the street. Additionally, the visual elements, such as dirty floors, unsuitable garbage system, unsafe urban elements, broken pavement slabs, level variations on sidewalks, and improperly built street ramps, impoverish the attractiveness of the street.

MYS survey does not include attractiveness survey; for THS the majority of the participants stated that THS is a colorful, enjoyable, predictable, and legible street. They also stated that it is a partially safe, peaceful, comfortable, and intriguing street. Finally, they reported that THS is not an exciting, mysterious, and surprising street, but they did not find THS boring or monotonous either. Last, they stated that THS is not spacious, but not suffocating either.

The results of the survey can be interpreted as follows:

- THS is an attractive street in terms of the colors, entertainment, legibility, and predictability it provides.
- THS is an attractive street to a certain extent regarding the safety, peace, comfort, and intrigue that it partially offers.
- THS scene is not attractive, as it is not exciting, mysterious, surprising, and spacious. However, it is not unattractive either. It is not a dull and suffocating street. nn

Comfort is another component, which influences the walkability capacity of public spaces. The examination of THS regarding its comfort shows that the *physical usability* of the street is low because, as the survey results show, it partly offers architectural elements that protect pedestrians from climatic conditions. There is no systematic regulation for the street about the canopy or other architectural elements that will protect pedestrians from climatic conditions. THS does not have clean air due to the high traffic volume on the street and insufficient greenery. It does not fulfill the conditions of actual and perceptual safety either. It is an accessible street for pedestrians by walking, public transport means or private car. THS, however, is not an easily accessible place for vulnerable groups. Besides, the major difficulty for all groups is to move through THS. Although it is situated quite centrally, and well-connected to other streets, traffic congestion, the cars parking on sidewalks, and the crowded street prevent people from driving and walking in THS. Briefly, these factors make THS an uncomfortable street.

As for *visual understanding* of THS, the street is partly successful. THS and its surroundings is highly legible environment due to its modified grid pattern and the ease at which pedestrians perceive it. Even though THS is very rich in terms of landmarks, Kuğulu Park is the most important landmark of the area. Following this are Mac Donalds, Karum Shopping Center, and Kuğulu Arcade. D&R, Mado, and Öğütler Market are the third-grade landmarks of THS. Three factors influenced the choice of these buildings or sites as the landmarks: their built form, location, and usage (or function). Regarding the continuity, the modified grid street pattern around THS offers continuous, therefore, walkable sidewalks for pedestrians. The shops create frontage continuity on both sides of THS, yet it is interrupted by a number of intersecting streets. Likewise, the perceptual continuity of THS is impoverished by the low quality of sidewalk floor and inharmonious rhythm of street furniture.

Regarding 'physical usability' of MYS, the facades of buildings do not have architectural and urban elements that help the protection of pedestrians from climatic conditions. Secondly, a high traffic volume on the street causes air pollution. The insufficient number of street trees fails to clean the polluted air in the street. Thirdly, MYS has not proved perceptually safe. Finally, there are not any seats along MYS.

As for the accessibility of MYS, the street and its surrounding area is comprised of commercial and residential usages. Hence, all facilities placed in MYS and around it are easily accessible by their users.

Regarding *public transportation services*, there are adequate bus stops and one metro stop along this street, but there are no seats, station canopies, and bus parking area to increase comfort, safety, and visibility of the bus stations. Because of vehicular traffic, lack of pedestrian enclosure, and lack of usage variety, it is hard for pedestrians to walk in MYS, so they prefer to rest in cafes and restaurants along the street. Additionally, the cars parking on sidewalks and the crowded street deter people from driving and walking in MYS. These factors make MYS an uncomfortable street.

Diversity(physical, social, and economic diversity of urban space) is another factor affecting walkability of public spaces. Although the inhabitants living on THS and its surrounding streets are generally from middle and high-middle income groups, it accommodates physical, social, and economic diversity because of a variety of land-use functions, which attract social groups from different quarters of the city, as well as the international tourists. However, decreased walkability in MYS due to limited usages along the street and narrow sidewalks renders the street unattractive to various groups from other parts of the city. Therefore, the inhabitants living on it and its surrounding streets are generally from middle and high-middle income groups because its luxurious land-use functions attract certain social and economic groups of people. If the walkability capacity of both streets is improved, then social and economic diversity of the area will be much richer.

The Evaluation of Comfort and Diversity in THS			in MYS	
	Assessment results	Assessment results	Assessment results	Assessment results
Perceptual safety	The public spaces are more dominant, even building entrances are not privileged. Its first part is fully mixed-use street. So, it is safer than second part at late times.	High level of variety attract pedestrians to enter to back streets.	privileged, gated urban areas addressing to private users. It is more private than public. It is semi-mixed use, especially the second part is less mixed use and safety at night in this part is lower.	Huge high-rise gated buildings in the entrance of intersections less attract the pedestrians to enter back roads.
Orientation	Street pattern is legible. There are adequate landmarks. Shops make frontage continuity in the THS(I)	Building entrances are partly visible. Many entrances are not designed for vulnerable groups.	Street pattern is legible. There are adequate landmarks. Shops are not more connected and continous especially at its second part.	Building entrances are adequately visible. Many entrances are not designed for vulnerable groups.
Attractiveness	Partly monotonous styles belong to 1960-1990 years.	However, continous diverse usages and interesting places make it attractive.	Residential usage and mono-functional usage are seperately in harmony together.	No especific coding system. Semi-mixed usages less attract pedestrians.
Comfort	- Some elements to protecting from climatic condition - Air pollution due to traffic - Insufficient number of trees - Inadequate sitting place	- Continous commercial uses in both sides of the street -Adequate bus stop -sittinig and shadow facility in bus stops	- No architectural elements protecting from various climatic condition - High air pollution level due to traffic -Very low number of street trees - No sitting place	- No continous commercial uses in both sides of the street -Adequate bus and metro stop -No sittinig and shadow facility in bus stops
Diversity	- Various residential, commercial, business, hotel usages on the street **Horizontally and vertically placement of various usages inccrease its d level.**	- Residential and business usages on backroads -Middle and high economic levels of people	- Residential, commercial, business, hotel usages on the street **Generally, its huge block size and mono-functional usages have decreased its diversity level.**	- Middle and high economic levels of people

Figure 8.18, The summary of analysis of perceptual safety, orientation, attractiveness, comfort , and diversity in THS and MYS. (Personal study)

8.3 Recommendations

Many cities throughout the world, such as Amsterdam, Copenhagen, and Barcelona, have implemented different strategies to develop sustainable, liveable, and walkable urban environments. Their prominent aims are to reduce car traffic in the city center and to promote architectural quality that offers optimum conditions for pedestrians. This study evaluates the causes that increase the number of cars and decrease walkability in cities. Furthermore, in the light of research on walkability assessment at macro, meso, and micro scales, it explores how far Ankara, particularly two case study areas –Kavaklıdere and Çukurambar, are walkable urban environments. To this end, after identifying the walkability parameters at macro, meso, and micro scales based on the related literature, it examines the two cases in Ankara and assesses their walkability levels. After detailed examination of the case studies, this research proposes suggestions to improve their walkability levels. It is expected that Ankara will benefit from these experiences and develop strategies and tools to improve livability and walkability.

Although Ankara and the selected cities are considerably different from each other, some are analyzed according to certain criteria. For example, Barcelona, Amsterdam, London, San Jose and Copenhagen are analyzed with a focus on social, economic and physical values of walkability. These cities were selected as they have proved to be good examples as regards these features at macro and meso scales. They have, for example, successfully built a sustainable transportation system and achieved land use development rather than creating dependence on automobile.

The analysis of these examples has somewhat shown that *limitedaccessibility, car dependency, congestion, and pollution are problem in most cities at varying levels*. Automobile dependency has negatively influenced the liveability and walkability of city, especially in the inner city. To improve the declining social and environmental conditions of the city, these cities took into account the *three dimensional values of sustainability*. They have focused on sustainable transport planning and land use development, and determined some policies integrating several levels of concerns, from macro level to micro level. Additionally, they used the potentials of compact urban development concept providing mixed land uses with easy access to public transits to promote travel by walking and discourage car dependency. Furthermore, their network pattern grows around centers including social and commercial activities close to public transit nodes, and this increases livability level of the city.

Amsterdam is a small compact polycentric city which is economically strong and sustainable. It maintains density not only in the city center but also in the surrounding district of the city. It uses a city park system in its compact city center and sprawling areas. Without this system, people have no access to their work places even if they are within an-hour biking distance. This system *a) does not over-grow at a particular, thus prevents dependency on a single core, b) provides equal accessibility to centers, transport stations, and various destinations via dispersed* *transportation, c) protects density not only in centers but also in sub-centers, and d) distributes green areas between built areas equally* (Figure 8.19).

Secondly, London and Barcelona have a plural centrality urban village urban form, with the main strategy to make compact, dense, and walkable multi urban villages, to correlate multi-centers physically, socially, and economically, and to increase the variety of housing tenures, ages, and social groups. Such a form decreases automobile use and increases walkability remarkably.

Figure 8.19, Urban form of Amsterdam, Accessed from www.amsterdam.nl

Thirdly, San Jose in the city of California with a population of over 1 million faced traffic congestion problem. In 1994, it proposed the 2020-general plan focusing on the use of light rail system, and in 2011, it proposed a qualified rail and public transit system to encourage people to prefer public transportation to private cars. Additionally, it To sum up, the urban villages are recommended to prevent unplanned urban sprawling, decrease car dependency, increase accessibility of workplace, and ensure walkable, bicycle friendly, transit- oriented, and mixed use neighborhoods (Figure 8.20).

Fourth, some cities, such as Copenhagen used the ring system by Gehl (2002) to solve traffic congestion and revitalize the city center. Their aim was to re-orientate vehicle traffic by ring road system, connect multi centers, and shift traffic out of city centers. Therefore, the ring system associated with improved public transit and parking restrictions allowed for pedestrianization implementations at city centers. It also helps the integration of automobile use with other modes of transportation and increases walkability at macro and meso scales (Figure 8.21).

Figure 8.20, Increase in sustainability through implementation of urban villages in San Jose city of California. (Accessed at www.greenbelt.org)

As discussed in the literature review section about the relation between city form and transportation system, the polycentric city is a sustainable urban form; all the indicated examples have also tried to utilize the potential of *compact polycentric cities,* which are against radial and star city forms. They do not rely on a single core; they enhance walkability when supported with *qualified integrated transportation systems between the cells, correlation between multi centers, and balanced density along the centers. They restrict traffic entrance to city center, revitalize city core* *through application of ring system around the cells, reduce automobile traffic, and achieve a balance in the use of transportation modes.* In addition, these cities have focused on encouraging public transportation including light rail transport, bus, tram rather than private cars and integration of varied modes of public transport.

Ankara is also a polycentric city. However, its oil-drop development based on unplanned new centers has caused growth of of main cores. As a result, new centers have become accessible by means of crowded main city centers in access through public transit system. In this scope, this study proposes to transform Ankara from a dispersed city form to a better connected poly-centric one. This proposition mainly aims to a) increase interconnectivity between cells through interconnected urban transport network and urban transportation system, b) promote the use of a ring system around urban cells, c) develop an integrated and qualified transportation system.

Firstly, building an interconnected polycentric city form is likely to increase accessibility between cells and produce alternative routes by decreasing traffic congestion on main routes. Secondly, the use of ring system around the main city centers of Ankara may ensure accessibility to the city center without inserting car traffic to the city center. As mentioned in this section, ring system, as a macro level urban planning solution, was proposed by Jan Gehl (2002) to organize traffic flow, shift traffic out of city center, and expand pedestrianized areas in city center,thus increase walkability of the city. Thus, if the proposed ring system brings about improved public transit and parking restrictions, it will allow for pedestrianization implementations at city centers. Additionally, supporting ring roads with high capacity parking places can ease transfer of people from ring roads to rapid transit systems, such as trains or buses. Indeed, this establishes an integrated network system which conveniently connects mostly private car users at ring roads with alternative modes of transportation in inner areas . Thirdly, the promotion of an integrated and developed transportation system will decrease preference of private car to other modes of transportation in the case of Ankara.

In the light of the data collected, this research proposes to improve the public transportation system by constructing a connected rail system. In addition to a connected rail system extending to various parts of Ankara in all directions, a bus system needs to be designed to complement the rail network system on the routes where access by urban rail system is not provided. In the areas where rail systems cannot be extended due to topographic thresholds, high construction costs, etc., it is possible to support the public transport system by connected bus and dolmuş systems. In addition, well connected and varied modes of transportation at exchange points and increased frequency and stations of transits are essential. All modes of public transport system, (e.g. rail system, bus, dolmuş) should be well scheduled in an interconnected way so that passengers will not have to wait long at exchange points. In this way, the efficiency and effectiveness public transport can be achieved in terms of commuting from one place to another. Therefore, building an integrated transport system with appropriate and qualified exchange points and an integrated scheduling of public transport modes will decrease car usage and encourage people to walk and cycle short distances in Ankara. Furthermore, an integrated transportation system will support equity parameter of walkability, which is degraded in Ankara, and improving the public transportation system and making an integrated network system along the city will decrease car usage and expand opportunities for alternative modes of transportation. Consequently, people from different economic and social classes will be able to use appropriate means of transportation. This will increase equity level in Ankara, ensuring equal access for all groups of people.

As for the meso-scale assessment section, the cities that were examined within the scope of this research have the following common features promoting walkability level of the district: a) pedestrian oriented urban area b) more connected and accessible urban form b) high level of density, and diversity c) qualified public transit system and d) integrated network system. Walkability assessment, on the other hand, is very complex, and as previously discussed, the improvement of one aspect of walkability cannot make the city more sustainable. That is, all parameters complement and support together. For instance, as it is seen in the walkability assessment of case studies, high level of density in Çukurambar neighborhood is not the only factor influential on its walkability level. Together with deficiency of the mentioned walkability parameters at meso scale, its car-oriented urban form, insufficient green area, and macro-scale urban transit system of Ankara have also affected the walkability level of Çukurambar negatively. However, in Tunalı neighborhood, density and most of other major factors of walkability (e.g. diversity, accessibility) complement each other, increasing its walkability level. So, in the case of Çukurambar neighborhood, firstly, an integrated transportation system is proposed. Hence, it is important to design a high-quality integrated bus system functioning at increased frequency to transfer passengers to the public transit stops and various parts of the neighborhood. Thus, the existence of a metro station on Eskişehir road will be helpful in making an integrated network system. Additionally, a ring system around the Çukurambar neighborhood will be practical for users who do not want to enter the inner amenities of the neighborhood.

Figure 8.21, Various public share systems, (Accessed at www.cycling-embassy.dk)

Secondly, this research suggests qualified exchange points around public transit stops (e.g. metro or bus stops) to create mixed-use walkable activity zones. It is expected that creating sufficient park capacity for park-and-ride users, providing services for elderly and disabled people, and operating shuttle services to activity centers will increase the walkability level along the neighbourhood (Figure 8.21). Thirdly, this study proposes to design and construct footpaths and bicycle sides on external and internal roads of the neighborhoods where applicable. For example, for the case of Çukurambar, this will improve connectivity by increasing the internal and external linkages because improved riding and walking facilities will ensure accessibility to public transit stations, parks, trails, stores, and other amenities by foot and non-motorized transportation vehicles.

Fourth, this research suggests strengthening the existent mixed use roads, such as Muhsin Yazicioğlu Avenue and 1425 Street, to turn them into more effective mixed-use and walkable corridors. Indeed, to increase the social and economic diversity in a neighborhood, it is highly recommended to accommodate specific usages which address different social-economic groups. Finally, because the green area of Çukurambar district is less than 6% (11 ha), this research proposes to develop a comprehensive green open space strategy, which will realize continuous green areas along the interconnected street patterns and in exchange points, and develop a pedestrian and cyclist network within this continuous green corridor for pedestrians and cyclists. It is intended that such network will be well connected to the footpath and bicycle network of external and internal roads of the Çukurambar neighborhood (Figure 8.21).

CHAPTER 9

CONCLUSION

9.1 Theoretical contributions of the research

It proposes a qualitative method of examination regarding the walkability capacity of an urban space via these three scales; i.e. macro, meso and micro scales. It provides a systematic way of analysing the walkability capacity of urban space through the suggested parameter sets and the data sets. This walkability assessment method can be used in everywhere. It can also be used for the assessment of the walkability of one place in different time periods to see the changes in the walkability level of this particular space.

John Gehl as a follower of Jane Jacob has recognized that the planning should be developed at three scales: city-plan scale, site-plan scale and people scale. However, as planning and engineering were ideally suited only to the city, the site-planning or only people scales. Gehl cites the City of Brasilia, in Brazil, as a classic practical example of macro scale type of planning. It looks fantastic from above, at the city scale, but at the intimate scale, the people scale, it does not work. (Gehl, 2017)[3] On the other hand, there are theoretical studies such as Özbil and et al (2017)[4] and Jorge Monteiro de Cambra (2012)[5] which have done their research on micro scale of walkability. Hence, due to necessary to a complete research regarding three scales (micro, meso and macro); this study have investigated walkability at mentioned three scales.

---

[3]. Gehl,J., 2017, In The Last 50 Years, Architects have forgotten what a good human scale is, Accessed at 23. 11.2017 from archdaily.com

[4]Özbil, A.,Yeşiltepe, D., and Argin, G., November 2015, Modeling walkability: The effects of street design, street network
configuration and land-use on pedestrian movement, ITU A|Z, Vol 12 No 3,189-207

[5]Jorge Monteiro de Cambra, P., 2012, Pedestrian Accessibility and Attractiveness Indicators for Walkability Assessment, A dissertaiton submitted to lisbon technical university, Lisbon, Portugal

In order to determine the main parameters of walkability, this thesis take into account the notions of Jane Jacob and Lynch introducing that the problems of city planning such as increase of mono-functional urban areas, automobile-focused planning cannot be solved only through solutions related to physical environment but also *social, economic* and *environmental* values. Hence, this thesis has studied the measures of walkability at macro-meso-micro scales with attention to mentioned multi-dimensional parameters. It is not possible to suggest in everywhere the same planning and design policies. The walkability assessment and planning and design policy development should be place-based. As this research shows how two different neighbourhoods with different land use and transportation system characteristics, place-based approach is required to develop walkability capacity of each districts, neighbourhoods and streets according to their peculiarities.

This research shows that the walkability assessment of urban space needs a system approach. Containing numerous parameters at macro, meso and micro levels, the issue of walkability is very complex. Therefore, the city and its spaces need to be seen and approached as a system. A change in one parameter can change simultaneously the other parts. More generally, it shows how transportation system characteristics and land development variables are mutually integrated and how the planning and design of urban space should be extensively analysed to nurture for the development of walkability policies in a city with a consideration of different urban scales. In other words, from the macro scale for the whole city to a micro scale at the street level, it is very critical to understand how different transportation system characteristics and land development variables affect the walkability capacity of the macro form of the city, its neighbourhoods and streets. In this sense, this thesis underlines the importance of approaching walkability problems of cities from a comprehensive and integrated viewpoint.

Finally, it provides a user-centre approach for the assessment of the walkability capacity of urban space. The general attempt of the earlier research are generally is based on the experts' analysis of urban space, while this research combines both the users opinions of the urban space and the spatial analysis of the researcher. In this sense, the research contributes to the literature of walkability by providing a hybrid approach which integrates both the walkability capacity assessment of the users of the urban space and the morphological and archival analyses of the researcher. In this way, it seeks to provide a mixed assessment approach.

9.2 Practical contributions of the thesis

First and foremost, this research, investigating the city of Ankara and two mixed use districts in this city, shows how to analyse the walkability capacity of a city at the macro scale, and the walkability extents of two districts and their main streets at the meso- and micro-scales. Depending on the identified parameters of walkability, it shows that the suggested walkability assessment method can be applicable to a city.

Secondly, it shows the critical importance of continuing to build a public transport system relying on railways despite such infrastructure developments take longer time and cost big budgets. It also shows such a railway transport stops should be fed by ring road systems in order to support the development of walkable cities.

Thirdly, the findings of this research show that, different from the arguments in the literature of walkability, population and building density of urban space do not necessarily contribute positively to the walkability capacity of the environment. The walkability parameters need to complement each other to create liveable and walkable urban spaces. For this reason, a careful analysis approach which assesses the positive and negative walkability qualities of urban space is required. Likewise, a comprehensive and integrated design approach is necessary to improve the pros and cons of the walkability level of urban space at the macro, meso and micro scales. The findings of the research also shows that identifying the parameters regarding planning, design and management of urban space is also critical.

Fourthly, this study indicates the strong relation between urban form and walkability. In this sense, it put forward the importance of *compact* and *compact poly-centric* as sustainable urban forms. Additionally, dispersed, fragmented and discontinuous urban patterns, increase distance between destinations, are against human-scale standards and diminish walkability.

Fifthly, it indicates equity and diversity as essential factors of walkability. Hence, it detects *equal network system facilities, equal connectivity level of various centres* and *usability of urban amenities by various socio-economic groups of people* as crucial walkability parameters.

Finally, the thesis shows the differences between two different mixed-use districts; that is, Tunalı neighbourhood - a traditional neighbourhood with a regular urban pattern in the city centre that has been developed in a slow pace under the regular planning decisions whereas Çukurambar neighbourhood is in one of the urban areas which has recently transformed from a squatter and irregular urban pattern to a highly dense urbanized regular pattern along the decentralization policies and *ad hoc* planning decisions.

9.3. Discussion of the research findings

This thesis mainly indicates the strong relation between urban form and walkability which affect public health physically and mentally, and contribute widely to the development of liveable and sustainable cities. The walkability as a topic is first discussed within the context of making dense, mixed-use urban forms rather than sprawled urban form by the recent planning and design approach such as *Smart Growth, New Urbanism, Efficient Land Use Planning* and *Transit Oriented Developments* discussions. However, whether an urban form is liveable or unliveable, or whether it is compact or fragmented and polycentric, it becomes obvious that walkability is a complex notion owing to a rich variety of parameters it comprises. This research particularly emphasises that the walkability can and should be assessed at three different scales that are macro-, meso- and micro-scales. In parallel to the research approach to the issue of walkability within the context of this thesis, the discussion on the research findings can be made under three levels (Table 9.1).

Table 9.1,Major attributes of walkability at three scales, (Re: Personal study)

<table>
<tr><th colspan="3">THE MAJOR ATTRIBUTES OF WALKABILITY-Macro scale</th></tr>
<tr><td rowspan="2">TRANSPORTATION SYSTEM</td><td colspan="2">Social
B. Accessibility B. Equity</td></tr>
<tr><td>Economic</td><td>Environment</td></tr>
<tr><td>LAND USE DEVELOPMENT</td><td>Density

Population density
Employment density
Built form density
sub-centers</td><td>Diversity</td></tr>
</table>

<table>
<tr><th colspan="4">THE MAJOR ATTRIBUTES OF WALKABILITY-Meso scale</th></tr>
<tr><td rowspan="3">TRANSPORTATION SYSTEM</td><td colspan="3">Social
B. Accessibility B. Equity</td></tr>
<tr><td>Network connectivity</td><td>Network pattern</td><td>Separated walking biking system</td></tr>
<tr><td colspan="2">Economic</td><td>Environment</td></tr>
<tr><td>LAND USE DEVELOPMENT</td><td colspan="2">Density
Population density
Employment density
Built form density</td><td>Diversity
-</td></tr>
</table>

<table>
<tr><th colspan="3">THE MAJOR ATTRIBUTES OF WALKABILITY-Micro scale</th></tr>
<tr><td>SAFETY</td><td>• ACTUAL SAFETY</td><td>• PERCEVIVED SAFETY</td></tr>
<tr><td rowspan="2">ORIENTATION</td><td>• LEGIBLE STREET PATTERN AND COMPONENTS</td><td>• LANDMARKS</td></tr>
<tr><td>• CONTINUITY</td><td>• BUILT FORM AND ITS LOCATION</td></tr>
<tr><td></td><td>• ARCHITECTURAL AND ENVIRONMENTAL FEATURES</td><td></td></tr>
<tr><td>ATTRACTIVENESS</td><td colspan="2">• SIMILARITY
• PROXIMITY
• COMMON GROUND OR COMMON ENCLOSURE
• ORIENTATION
• CLOSURE
• CONTINUITY</td></tr>
</table>

9.3.1. Macro-scale

The results of the investigation on the city of Ankara indicate that urban form and walkability are related together in two main dimensions: **transportation system** and **land use development**. The strong relation between these two key topics of urban planning is important to decrease the usage of private cars and increase quality of life. Assessment and discussions of the mentioned planning dimensions on the case studies throughout this thesis indicate how and which values affect the walkability through mentioned parameters. For instance, the compact city approach which offers urban areas with increased density and the compact polycentric pattern, such as Amsterdam City, which ensures accessibility by public transit, foot or bicycle to city cores are more walkable. Therefore, compactness, density, mixed land use and walkability are essential issues in making sustainable communities.

To achieve a walkable urban form in the shadow of *network system*, it is critical to develop transit-based urban facilities in a sustainable integrated (connected) network system. Hence, as in the analysis of the case studies, it became clear that inadequate rail system and dependency of transit system to high-ways have made transit system facilities insufficient and unsustainable. An extended rail system and a balanced public transport system in a sustainable manner are needed to decrease extensive car use and increase walkability. Otherwise, lack of connected and integrated network system will discourage people from taking short trips on foot or bike and this will inflate car usage.

The assessment of land use pattern within the context of Ankara and two cases show that compactness, density and diversity are crucial factors in having walkable urban areas. Although compact, mixed-use nodes reduce journey requirements and create lively sustainable neighbourhoods, disturbance of the balance between supply and demand make the city unsustainable. Hence, the tolerance level of the city which does not damage the environment is important. As it is obvious in the evaluation of Ankara case, exceed of tolerance density in inner cities have caused to unexpected decentralization and process of rapid urbanisation. Hence, the process which the city followed includes three sections: a) concentration b) de-concentration and dispersion. This makes the urban pattern dispersed, fragmented and discontinuous due to sprawl in every direction. Additionally, sprawl towards all directions have made oil-drop and uncontrolled polycentric development during the city.

Furthermore, increase of densification and multi-purpose facilities in some centres and low density in the others have made unbalanced density and diversity in the main centre and sub-centres. This development process is against ideal parameters of sustainable compact and polycentric city. Further, it is against polycentric city configuration which provides dispersed transportation rather than a concentrated one, ensures equal access to various urban destinations and none of the city core grows too large. To these many reasons-disturbances of balanced density entrance of numerous arterials to specific commercial and business centres- the city lacks the main properties of urban compactness: density, consistency and mixed-usage parameters.

Mixed-use and crowded main centres and on the other hand, development of low-density mono-functional usages in the newly established zones cause to imbalanced built form and employment density and this increase the average distance between residential and working area. Firstly, this is against human-scale properties and discourages people from walking. Secondly, increase of distance between cells, unbalanced density over the centres and easy access of public facilities in some centres cause that mono-functional sub-centres be accessible through crossing from more useful centres. The mentioned problem and less connectivity between sub-centres -no direct relation between them through various sustainable modes of transportation- cause sub-centres be accessible through crossing from main centres and this increase traffic congestion further. Hence, it aggravates traffic congestion between main arterials. Thirdly, multi-functional parameter of the cores and the existence of an interconnected road network between them are essential for the liveability of the city at macro- and meso- scales. In this sense, sub-centres should be taken as a smaller-scale city including all the functions of a city. Otherwise, uni-functional centres which are the concentration of one or more activities in a specific zone hinder the sub-central area development and walkability at macro and meso scales.

Equity is the essential parameter of environmental value which introduces various transportation facilities to various social-economic groups of people equally. Additionally, it is in direct relation with the quality and usability of the public transit system. Literature review analysis examination of the case study clarified which four essential parameters should work properly together to ensure various transportation facilities in an equal manner. They are *economic, social, quality and usability of public transit system and connectivity of network system.*

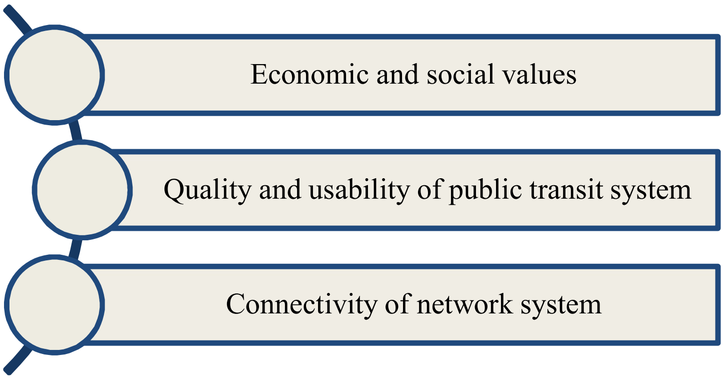


Figure 9.1, Three main parameters of equity

Hence, when qualified and usable public transit system in a connected network integrate with other modes of transportation and address to various economic-social groups of people, most users interest to use public transit system rather than private car.

9.3.2 Meso scale

Analysis of the findings of the accessibility assessment in the case studies indicate that *a. effective and efficient integrated system, b. qualified exchange points c. flatness, d. network pattern and its density* are essential parameters which complement each other function and deficiency of any of them decrease the walkability level drastically. Firstly, effective and efficient integrated system with high-frequency is needed to transfer passengers to the public transit stops and necessary destinations. It is compatible with the results of the analysis of the cases, which the case study that is near to the city centre and takes the advantages of closeness of destinations and importantly public transit system with high frequency, is more walkable.

Secondly, the quality of exchange points is the essential factor in increasing the walkability. In this sense, mixed-use facilities, car parking areas, park and ride system, services for the elderly and disables, shuttle services to activity centres and daily usages in the exchange points, response to the needs of pedestrians and increase walkability. For instance, the analysis of the TN case pose that even existence of two or more qualified exchange points, including park, bus stop with high frequency, shops, cafés, sitting and eating places, facilitate pedestrian needs. While, for the ÇN, essential access points such as the entrance and exit points of the neighbourhood, which are important exchange points, are not qualified. This discourages pedestrians to reach various parts of the neighbourhood by walking and promote car dependency.

Together with mentioned essential factors, flatness is the next remarkable value which increases walkability of various groups of people. Its important effect on the increase of walkability is inferred in the Amsterdam and TN cases, which are examined throughout the thesis. Hence, when other factors, such as efficient integrated system and qualified exchange points, complement together; the flatness improve walkability further.

Finally, according to walkability parameters, grid-iron network pattern increase accessibility, distribute traffic equally and contribute to walkability. When the network pattern is walkable, street connectivity (ratio of number of roads to the nodes) and street density (total street length in given area) can be discussed as crucial factors in the identification of walkability level.

Coming to the analysis of the findings of land use pattern parameter, it is determined that patterns including mono-functional buildings with huge block size establish limited usages which are arranged vertically rather than spatially. These limited usages are not sensible by the scale of pedestrian; additionally, huge blocks decrease diversity in a given area and this diminishes the walkability level.

The other essential factor which affects the walkability at meso scale is equity level. In this sense, when people are not satisfied with vehicle arrival time, numbers of stops and their frequency; they use public transit system in an obligatory manner due to their economic condition and other reasons. On the other hand, people with high income level prefer to use their private cars and this increase traffic congestion. On the other hand, increase of quality and efficiency of public transit system encourage people to use public transit system even increase walking duration to 18 minutes. This decrease traffic congestion in the streets and make more safe, fresh and so walkable environment to the pedestrians. As it is clear in the case of TN, it ensures more equal facilities to various groups of people with its central location and easy access potentials, low traffic volume (because of its narrow road which accommodate limited number of cars), widened sufficient frequency of public transit and so ensures equal facilities of various modes of transportation.

Analysis of the research findings in terms of density indicates that although walkable city should have a population density over 40 people per hectare; there is a tolerance level, which neighbourhood can accommodate specific amount of people and their needs. In this sense, excessive vertical building density and accumulation of business activities, on the one hand and lack of the ratio between population density and their daily needs cause to traffic congestion, disturb pedestrian movement and decrease the walkability level. In fact, when open spaces of the neighbourhood are not compatible with its population, built form and employment density, mono-functional commercial-business buildings fail to accommodate the excessive demand of people.

9.3.3 Micro-scale

At the micro scale, walkability capacity of urban space is assessed and discussed via standards and parameters, and the findings show that the parameters of walkability are all very effective in terms of identifying the quality of walkability on urban space. However, comparison of the cases of THS and MYS gave the opportunity to define which parameters of walkability are so crucial. They are *safety* including *street pattern, pedestrian enclosure* and *continuous pavement parameters* and *diversity* value. In street pattern analysis comparison of two cases indicate that street and sidewalk width are essential. As, wide street divides the street into two section and discourage the pedestrian to cross between two sides, disturb pedestrian movement and make the street unsafe to pedestrians. Additionally, safe place to the movement of pedestrian is sidewalk, so its suitable width is very essential. Appropriate sidewalk width is 1.53 m which response to minimum needs of urbanites. However, suitable sidewalk width is determined by the ratio of height of buildings to street width, which is identified by Jacobs (1993) as 1:2. Decrease of appropriate value to 0.2 and lower values essentially affect walkability level.

In continuous pavement factor, number and width of intersections becomes important. Although intersections disrupt sidewalk continuity, when they are narrow and safe, they decrease traffic speed and make views to back streets.

The next important factor after the analysis of safety is diversity. Continuous diverse land usages on both sides of the street have crucial role on the increase of walkability. They ensure continuity of sidewalk, response to various needs of pedestrians and increase their safety at late times. Additionally, land usages should address to various social economic groups of people to attract wide groups of people. The results of the two different cases which are illustrated during the thesis indicate that THS with high physical, social and economic diversity is more walkable than MYS.

9.4 Limitations of the research

There are certain limitations during the thesis writing procedure which have made the completion process of the thesis little difficult. In addition, they have affected obtained outcomes and analysis manner of the thesis. The determined limitations are arranged as below:

In the investigation of employment density at meso scale, employee numbers were determined via estimated number of business places and average employee’s number. Hence, the first limitation was not access to exact number of employees and stable stuff numbers (habitants who work in the same amenity) of the neighbourhood.

I spent much time on preparation of Ankara map indicating *built, high-dense* and *green* urban areas within the city. Hence, the second limitation was not existence of mentioned map in related associations, although they have sufficient facilities to do such study.

The third limitation was the fact that the users of specific neighbourhood, such as ÇN examined in this thesis, are accustomed to their current urban amenity condition, such as a car-oriented urban area, and unfortunately cannot imagine the reverse situation. In other words, interact with high-class users, access to luxurious café and restaurants make people more satisfied than having pedestrian oriented network system. This fact is reflected in the results of questionnaires, as there was moderate level of satisfaction and so serious walkability problem for the case of ÇN was hindered.

The fourth limitation of the thesis was the lack of resources in field of macro scale walkability assessment and its parameters. Hence, I put much effort to classify and discuss the macro scale dimensions of walkability.

Although green areas per person according to years is identified by TÜİK, which is mentioned within the thesis, however the fifth limitation is not existence of Ankara map including, constant (people who living in the neighbourhood) and variable (the users which use the neighbourhood during the day) population density, average building floor number, green area squares information. Applying mentioned information on the map make quick access to the information of compatibility with standard green area, which is defined 9 m2 per person by WHO.Additionally, it identifies the districts which have exceeded the tolerance population density level.

The last limitation was not access to air pollution level of neighbourhoods within the Ankara City. Although from two cases, which are examined during the thesis, TN is more walkable, however this would be complementary helpful information to approve the seriousness of the problem.

9.5 The new dimensions and discussion issues and questions for the future research

This research discusses the walkability capacity of urban space by identifying the walkability parameters at the macro, meso and micro-scales. It shows and proves that the parameters identified at these three different scales can affect the walkability level and quality of urban space, and these parameters are very much related to and highly contribute to the sustainable and liveable urban form. The level of influence of each parameter to the quality of urban space at different scales however varies according to the context of localities.

Starting this point, new research questions come to the ground for the future researches. I classified these research questions which can be investigated by using the information and results obtained from this thesis and so widen the analysis borders. They are:

- In the increase of approachability of sub-centers, for the case of poly-centric Ankara City, which connections have critical role and what would be the confronted problems?
- In the analysis of walkability at macro-meso scales in other different districts, which discussions may be inferred and come to the ground?
- What are the like and unlike obtained results of meso-scale walkability assessment of the neighbourhoods, like ÇN, which are created during transformation projects?
- Which district within Ankara City is appropriate to build a walkability association and what are the interests of the association?
- Based on the information of this thesis and narrowing the topic to children's walkability assessment at meso and micro scales, which factors come to the ground? For instance, evaluation of easy access of children to activity, education and entertainment centres at meso scale.
- Furthermore, which factors should be taken into consideration in walkability assessment of women at evening times?
- If a research conducted to detail transportation section of this thesis which new factors should be analysed?

- When the relation between built form density, green area and air pollution be analysed, which results could complement the findings of this thesis?
- If we assume there is no shopping centre in Ankara City, which are the proposed plans to increase walkability level at macro-meso-micro scales within the city at winter season?
- Which studies can be conducted to emphasize on the effect of sense organs, such as hearing, in micro-scale walkability evaluation?

REFERENCES

2023 Başkent Ankara Nazım İmar Planı, 2006, Ankara Büyükşehir Belediyesi, İmar ve şehircilik Dairesi Başkanlığı: Ankara.

Akit, M., 2004, Pedestrian Experiences in Bahçelievler 7th Street: Setting the Design Criteria for the Enhancement of Urban Public Realm, A master thesis to be submitted to Department of City and Regional Planning, METU: Ankara.

Alaylı,B., December 2006, Land Use Optimization For Improved Transportation System Performance Case Study: Ankara A Thesis Submitted To The Degree Of Master Of Science In Civil Engineering, Middle East Technical University, Ankara.

Anderson, S., 1978, On streets, MIT Press: Cambridge.

Distribution of Business Trips in Ankara by Transportation Types, Aralık 2014, Accessed at http://www.ego.gov.tr in 06.10.2015.

Ankara District Planning for 2014-2023 years, 2014, Development Agency Accessed at http://www.ankaraka.org.trin 06.10.2015

Ankara Development Agency, 2013, Ankara Istatistik Information, Accessed at http://www.ankaraka.org.tr in 15.10.2015.

Ankara Metropolitan Area and its surroundings Transport Master Plan,Passenger Satisfaction Survey, 2013, Gazi University, Ankara metropoliten Municipilaty

Ankara Traffic Problems, 1970, Ankara Architecture Branch, 1970-03 (77), P. 49-54, Accessed at http://www.mimarlikdergisi.com in 20.09.2016.

Appleyard, B., 2006, At Home in the Zone, Planning 72, No. 9: 30-35.

Appleyard, D., Sue Gerson, M., Lintell, M., 1981, Livable Streets, University of California Press: Berkeley.

Balamir, M., 1996, Making Cities Of Apartment Blocks, Transformation of the Built-Environment in Turkey by means of Reorganizations in property Rights, Published in the book of ‘’From History to now settlements in Anatolian’’.

Barlas, A., 2006, Urban Streets and Urban Rituals, METU Faculty of Architecture: Ankara.

Bentely, J., 2002, Urban Transformations, Power, People and Urban Design, Routledge: London and New York.

Ben-Joseph, E., 1995, Changing the residential street scene - Adapting the shared street (Woonerf) concept to the suburban environment, Journal of the American Planning Association 61(4): 504-515.

Ben-Joseph, E. and Southworth, M., 2003, Streets and the Shaping of Towns and Cities, Island Press.

Bian,Z., 2002,Towards A Sustainable Transportation System in Downtown Winnipeg, A Research submitted to the Department of City Planning Faculty o f Architecture, University of Manitoba, Winnipeg, Manitoba.

Breines, S., Dean, W.J., 1974, The Pedestrian Revolution: Streets Without Cars, Vintage Books: New York.

Burden, D., no date, Ten Keys to Walkable Communities, Accessed at www.planetizen.com/node/21 in 17.3.2010.

Calthorpe, P., 1993, The Next American Metropolis: Ecology, Community, and the American Dream, Princeton Architectural Press: New York.

Cerver, F.A., no date, City Planning: Urban Architecture, Accessed at www.pdfxp.com/cerver-pdf.html in 26.3.2010.

Ceylan, A., no date, Drought Management Plan for Ankara, Turkish State Meteorological Service, Accessed at www.tn.gov/environment in 24.3.2010.

Chairatananon, A., 2006, local street design and transit accessibility access to mainline public transportation in Bangkok Neighborhoods, A Research submitted to Doctor of Philosophy(Urban Technological and Environmental Planning) in The University of Michigan.

Chirapiwat, Th.,2005, street configurations and commercial and mixed-use landuse patterns: a morphological study of the north-eastern region of Bangkok to evaluate recent transportation and land-use plans, A Research submitted to Doctor of Philosophy (Urban, Technological, and Environmental Planning) in The University of Michigan.

Cihangir Çamur, K. and Yenigül, S.B., 2009, The Rural-Urban Transformation through Urban Sprawl: An Assessment of Ankara Metropolitan Area, The 4th international conference of the international forum on urbanism (IFoU), Amsterdam/Delft The new urban question – urbanism beyond neo-liberalism P.1045-1054.

Commita, T.J., 2000, A range of parks, from tot lots village greens to ballfields and community gardens, should be distributed within neighbourhoods. Conservation areas and open lands should be used to define and connect different neighbourhoods and districts. M.Leccese and McCormik (Eds.), Charter of New Urbanism. McGraw-Hill: New York.

Çakan, A., 2004, Central Business District Problems in Ankara: Transformations in Kazikçı Bostanları, A master thesis to be submitted to Department Of City and Regional Planning, METU: Ankara.

Çalışkan, Olgu (2014) Changing perspectives on the planning of Ankara (1924-2007) and lessons for a new master-planning approach to developing cities. Footprint. Vol 3, Iss 2, pp 23-54.

Çapanoğlu, İ., 2010, A member of Kavaklıderem Association.

Çiçek, B.E., 2009, Pedestrian Safety around Elementary Schools, A master thesis to be submitted to Department Of Psychology, METU: Ankara.

Daisy Bank Walking Group, 2006, Mental Health, Getting out of the Day Centre, WHI: Manchester, North West, Accessed at www.wfh.naturalengland.org.uk in 19.3.2010.

De Chiara, J., Panero, J. And Zelnik, J., 1995, Time Saver Standards for Housing and Residential Development, McGraw-Hill:New York.

Dinca, C., Livable cities campaign, 2017, Accessed at 15.11.2017 from www.sustainableamsterdam.com.

Dixon, J.M., FAIA, Patel, H.K., 2001, Urban Spaces, the Design of Public Places, New York: Visual Reference Publications; Urban Land Institute: Washington, DC.

Dr Allison Orr, 2006, Retailing and the City: an Investigation into the Relationships between Urban Form and Retailing in Edinburgh, University of Glasgow, Department of Urban Studies.

Durning, A.T., Callister, B., Christopher, C., and Valdez, L., 1996, The Car and the City: 24 Steps to Safe Streets and Healthy Communities, Wash, S., Northwest Environment Watch.

Dumbaugh, E., 2005, Safe Streets, Livable Streets, Journal of the American Planning Association 71(3): 283-298.

Eker, A. and Eker, F., 2008, Oral History, Kavaklıderem Associaiton, Accessed athttp://www.kavakliderem.org.tr in 15.9.2010.

Eraydın, Z., 2007, Building A Legible City: How Far Planning is Successful in Ankara, A master thesis to be submitted to Department of City And Regional Planning, METU: Ankara.

Ercoşkun, Y.Ö., 2013, Successes and Failures in Urban Development of Ankara International Journal of Architecture and Planning, Volume 1, Issue 2, pp: 132-151. Available online at: www.iconarp.com

Eriksson,U., Arvidsson,D., Klaus Gebel, K. Henrik OhlssonH., Kristina Sundquist,K., 2012, Walkability parameters, active transportation and objective physical activity: moderating and mediating effects of motor vehicle ownership in a cross-sectional study, Accessed at http://www.ijbnpa.org/content/9/1/123 in 17.12.2014.

Evans, G., 2009, Accessibility, Urban Design and the Whole Journey Environment, Built Environment, 35(3) 365-385, Accessed at www.citiesinstitute.org in17/9/2010.

Forkenbrock, D., Weisbrod, G., 2001, Guidebook for Assessing the Social and Economic Effects of Transportation Projects, Accessed at www.onlinepubs.trb.org in 19.3.2010.

Fyfe, N.R., 1998, Images of the Street: Planning, Identity, and Control in Public Space, London; Routledge: New York.

Filion, P. and etal: Canada-US Metropolitan Density Patterns: Zonal Convergence and Divergence.

Sarigiannis, Georgios, 2000, Athens 1830 – 2000: Evolution -Planning – Transportation (in Greek).

Frank.,L.D., Engelke, P., 2000 , How Land Use and Transportation Systems Impact Public Health: A Literature Review of the Relationship Between Physical Activity and Built Form, City and Regional Planning Program College of Architecture Georgia Institute of Technology, Accessed at www.cdc.gov in 2.04.2015.

Gehl, J., 1987, Life between Buildings: Using Public Space, Van Nostrand Reinhold: New York.

Ghadimkhani, P., 2011, Increasing Walkability in Public Spaces of City Centres: The Case of Tunali Hilmi Street, Ankara, A master thesis to be submitted to Department of City and Regional Planning, METU: Ankara.

Giles-Corti,B., 2006, The impact of urban form on public health, School of Population Health, The University of Western Australia, Australian State of the Environment Committee, Accessed at: www.environment.gov.au in 1.10.2014

Gülsah, A., 2004, Automobile Travel Reduction in Urban Areas and City Centers, A master thesis to be submitted to Department of Civil Engineering, METU: Ankara.

Gülbay, Y., July 2006, Usıng Geographical Information Systems (G.I.S.) For Determining Urban Rent In Ankara Çukurambar District, A thesis submitted to master degree of city and regional planning at Gazi University.

Günay, B., 2007, Baykan Günay ile Ankara Üzerine..., Accessed at www.arkitera.com in 19/3/2010.

Günay, B., 2012, Ankara spatial history, AESOP, METU.

Grammenos, F. (2011) *European Urbanism: Lessons From A City Without Suburbs.* Accessed atwww.planetizen.com in 2.04.2015.

Handy, S.L., *Urban Form and Pedestrian Choices: Study of Austin Neighborhoods.* Transportation Research Record, 1996.1552: p. 135-144.31.

Hansen, G.M., 2008, Design Codes For Healthy Communities: The Potential Of Form-Based Codes To Create Walkable Urban Streets, A thesis submitted to the Doctor Of Philosophy,University Of Florida.

Haughey, R., 2008, Getting Density Right, Tools for Creating Vibrant Compact Development, Urban Land Institute: National Multi Housing Council: Washington, D.C.

Hyldebrand, F. 1999, *Designing Toward the More Sustainable Urban Form*, Spon Press, Taylor and Francis Group, London and New York.

Johns, P., Roberts, M., and Morris, L., 2007, Rediscovering Mixed-Use Streets, Joseph Rowntree Foundation, The Policy Press, Bristol.

J. Arnott, R., P. McMillen, D., 2006 , A Companion to Urban Economics, University of İllinois at Chicago, Blackwell Publishing.

Jorge Monteiro de Cambra, P., 2012, Pedestrian Accessibility and Attractiveness

Indicators for Walkability Assessment, A dissertaiton submitted to lisbon technical university, Lisbon, Portugal.

Kaiser, E.J., Lawrence D.F., Peter O.E., and Thomas L.S., 2003, Health and Community Design, University of Illinois Press, Urbana, Illinois.

Kaiser, E.J., Godschalk, D.R., and Stuart Chapin, F., 2006, Urban Land Use Planning, University of Illinois Press, Urbana, Illinois.

Kazimee, B.A., 2002, Sustainable Urban Design Paradigm: Twenty-five Simple Things to do to Make an Urban Neighbourhood Sustainable, School of Architecture and Construction Management, Washington State University, USA, Accessed at www.arch.wsu.edu in 17.01.2011.

Khodabakhshi, Sh., 2011, Sustainability and urban density, Ecocity World Summit 2011 in Montréal, Oral presentation.

Kolody, A.D., 2002, Planning for Physical Activity: The Need for Comfortable and Convenient Pedestrian Movement in the Urban Form, A master thesis to be submitted to Faculty of Environment Design, University of Calgary.

Lambert, K., 2005, Critical Evaluation of Livability in Garisson Woods, A master thesis to be submitted to Faculty of Environment Design, University of Calgary.

Land Use Density and Clustering, 17 April 2015, TDM Encyclopedia, Victoria Transport Policy Institute, Accessed at 10/11/2015 from www.vtpi.org/tdm/tdm81.htm.

Land Use Density and Clustering, April 2015, TDM Encyclopedia, Victoria Transport Policy Institute, www.vtpi.org/tdm/tdm81.htm.

Landman, K., 2003, Sustainable ‘Urban Village’ Concept: Mandate, Matrix or Myth? CSIR Building and Construction Technology, Accessed at www.csir.co.zain 25.01.2016

Lawrence D. F. PhD and Engelke,P., 2000, How Land Use and Transportation Systems Impact Public Health: A Literature Review of the Relationship Between Physical Activity and Built Form, City and Regional Planning Program College of Architecture, Georgia Institute of Technology, Accessed atwww.cdc.gov in 3.10.2014.

Lennard, S.H.C., and Lennard, H.L., 1995, Livable Cities Observed: A Source Book of Images and Ideas for City Officials, Community Leaders, Architects, Planners and All Other Committed to Making Their Cities Livable, Gondolier Press: CA.

Leyden, K.M., 2003, Social Capital and the Built Environment: The Importance of Walkable Neighbourhoods, Accessed at http://geography.ssc.uwo.ca in 30.3.2011.

Leyden, K.M., 2003, Social Capital and the Built Environment: The Importance of Walkable.

Neighbourhoods, American Journal of Public Health, 93: 1546–1551, Accessed at http://ajph.aphapublications.org/ or http://geography.ssc.uwo.ca Retrieved on 30/3/2010.

Litman, T.A., 2011, Evaluating Non-motorized Transport, Benefits and Costs, Victoria Transport Policy Institute (VTPI), Accessed at www.vtpi.org/walkability.pdf in 25/2/2011.

Litman, T.A., 2009, Transportation Cost and Benefit Analysis Techniques, Economic Value of Walkability, Accessed at www.vtpi.org/walkability.pdf. in 19/3/2010.

Litman, T.A., 2009, Transportation Cost and Benefit Analysis Techniques, Health and Safety, Estimates and Implications, Accessed at www.vtpi.org . in 30.3.2010.

Litman, T., 23 March 2016, Evaluating Transportation Equity, Guidance For Incorporating Distributional Impacts in Transportation Planning, Accessed at www.vtpi.org in 20.04.2016.

Lucy, W.H., Phillips, D.L., 2006, Tomorrow's Cities, Tomorrow's Suburbs, American Planning Association, Chicago.

Malcolm C. Burns,M.C., Moix,M., AlHaddad,B.H., Garcia,J., Garcia,P. and Roca,J., September 2007, Urban form, transport and sustainability, Compact cities and densification, The outward expansion of the built-up areas of Madrid and Barcelona ınto theır surrounding metropolitan regions, the vital city European urban research Association Conference, Glasgow, Polytechnic University of Catalonia.

Maddox,D., 8May 2013, The Cities We Want: Resilient, Sustainable, and Livable,New York City, Accessed atwww.thenatureofcities.com in15.11.2017.

McDonald, J., Wise, M., & Harris, P., 2008, The Health Impacts of the Urban Form: A Review of Reviews, Centre for Health Equity Training, Research and Evaluation, part of the Research Centre for Primary Health Care and Equity, University of New South Wales: Sydney, Accessed at www.in 3.10.2014.

Margaret, M.C., Song, Y.Ch., Wu, J., 2008, Ecology, Planning, and Management of Urban Forests: International perspective, University of Louisville (USA), East China Normal University (Shanghai), School of Life Sciences (USA).

Marshall, S., 2005, Streets and Patterns, Spon: London, New York.

Moudon, A.V., and Appleyard, D., 1987, Public Streets for Public Use, Van Nostrand Reinhold: New York.

Moudon, A.V., and Appleyard, D., 1991, Public Streets for Public Use, Columbia University Press: New York.

Mutlu, Ö., 2006, Understanding City as an Architectural and Non-Architectural Program: Learning From Ankara, A master thesis to be submitted to Department of Architecture, METU: Ankara.

Nozzi, D., 2010, Ingredients of a Walkable Street,Accessed at www.metrojacksonville.com in 24/11/2010.

Livingstone, K. (mayor), 2004, Making London a walkable city, The Walking Plan for London February, Accessed at http://www.tfl.gov.uk in 26.3.2010.

Okullu, S.G., 2007, Non-Motorized Transport for Mobility Planning in City Centres: An Assessment of Opportunities for Transforming Ankara, Tunali Hilmi Street into A Pedestrian-Friendly Area, A master thesis submitted to Department of Urban Policy Planning and Local Governments, METU, Ankara.

Özbil, A.,Yeşiltepe, D., Argin, G., November 2015, Modeling walkability: The effectsof street design, street-network configuration and land-use on pedestrian movement, ITU A|Z, Vol 12 No 3,189-207.

Pacione, M., 1990, Urban Problems: An Applied Urban Analysis, Routledge: London.

Pehlivanoğlu, Y., 2011, Understanding Perceptions Regarding the Aesthetics of Urban Public Space: Tunalı Hilmi Street, Ankara. A master thesis to be submitted to the Department of City and Regional Planning, METU: Ankara.

Perdue, W.C., L.O. Gostin, and L.A. Stone, *Public health and the built environment: historical, empirical, and theoretical foundations for an expanded role.* J Law Med Ethics, 2003. 31(4): p. 557-66.

Rapoport, A., 1987, Pedestrian Street Use: Culture and Perception: Public Street for Public Use, Mc Millan: Agincourt Ontario, Canada.

Reeves, D., 2005, Planning for Diversity, Policy and Planning in a World of Difference, The RTPL Library Series: London.

Residential Streets, 1990, New York, N.Y., American Society of Civil Engineers; Washington, D.C., National Association of Home Builders: Urban Land Institute.

Stevens, Q., 2009, 'Broken' public spaces in theory and in practice, TPR Journal Article, no 3: 371-391.

Social Demographic Structure,2000, Ankara Municipality, Accessed at ankara.bel.com.tr in 20.03.2016.

Southworth, M. and Ben-Joseph, E., 1995, Street Standards and the Shaping of Suburbia, Journal of the American Planning Association 61(1): 65-81.

Southworth, M., 2005, Designing the Walkable City, Journal of Urban Planning and Development- Asce 131(4): 246-257.

Southworth, M., Owns, P.M., 1993, Evolving metropolis: studies of community, neighbourhood, and street form at the urban edge, Journal of the American Planning Association, 59(3): 217-87.

Southworth, M., 1997, Walkable suburbs: An Evaluation of neotraditional communities at the urban edge, Journal of the American Planning Association, no 63(1): P.28-44.

Söderholm, D., 2008, The Commercial Structure of Pedestrian Streets and Shopping Districts, A master thesis submitted to Department of Geography, University of Helsinki.

Steuteville, R., Langdon, P., and other special contributors, 2003, New Urbanism: Comprehensive Report and Best Practices Guide, Third edition, New UrbanPpublications: Ithaca, NY.

Sutcliffe, E.B., 2005, Kent merkezi ulaşim planlama ilkeleri çerçevesinde Ankara kent merkezi. Cumhuriyet'in Ankarasi. T. Şenyapılı (der). ODTÜ Yayıncılık: Ankara. pp. 287-308.

Tan, E., Gehl, J., Gemze, L., 2006, The Copenhagen Experience, What the Pedestrian Wants, Journal of NovaTerra, p.31-35, Delft University of Technology.

Todd Litman,T., 24 August 2015, Land Use Impacts on Transport,How Land Use Factors Affect Travel Behavior,Victoria Transport Policy Institute With Rowan Steele.

Thwaites, K., Porta, S., Romice, O. And Greaves, M., 2007, p.111.

Thwaites, K., Porta, S., Romice,O. And Greaves,M., 2007, Urban Sustainability throughEnvironmental Design Approaches to time–people–place responsive urban spaces, Routledge Taylor &Francis Group.

Tekeli, I., 1971, Planlama ve Ülkesel Fiziki Planlama Üzerine, Ankara: ODTÜ Mimarlık Fakültesi, Yayın No.17

United Nations, Sustainable Urban Transportation Systems, 2012, Economic and Social Commission for Asia and the Pacific and CITYNET (UNESCAP), Accessed atwww.unescap.orgin 10/11/2015.

Untermann, R., Moudon, A.V., and Appleyard, D., 1987, Changing Design Standards for Streets and Roads: Public Streets for Public Use, In: Moudon, Anne Vernez (ed). 1991. Public Streets for Public Use. Columbia University Press: New York. pp. 255-60.

Ünsal, B.B., 2010, An Analysis of Street as a Shopping Precinct: Tunali Hilmi Street Vs Shopping Centres, A master thesis to be submitted to Department of City and Regional Planning, METU: Ankara.

U.S. Department of Transportation, 2May 2016, Federal High Way Administration, Separated Bike Lane Planning and Design Guide, Chapter 3: Why Choose Separated Bike Lanes?, Implementing Separated Bike Lanes Using a Flexible Approach, Accessed at www.fhwa.dot.gov/environment/bicycle in 10.11.2015.

Victoria Transport Policy Institute (VTPI), 2010a, Community Livability, Accessed at www.vtpi.org/tdm in 25.11.2010.

Victoria Transport Policy Institute (VTPI), 2010b, Evaluating Non-motorized Transport, Accessed at www.vtpi.org/tdm in 25/11/2010.

Victoria Transport Policy Institute (VTPI), 2011c, Evaluating Non-motorized Transport, Benefits and Costs, Accessed at http://www.vtpi.org/walkability in 25.2.2011.

Victoria Transport Policy Institute (VTPI), 2010b, Evaluating Non-motorized Transport, Techniques for Measuring Walking and Cycling Activity and Conditions. Accessed at www.vtpi.org/tdm in 25/11/2010.

Victoria Transport Policy Institute, 29 May 2015, Sustainable Transportation and TDM Planning That Balances Economic, Social and Ecological Objectives, TDM Encyclopedia, Accessed at 10/11/2015 fromwww.vtpi.org

Victoria Transport Policy Institute, 14 May 2014, Land Use Evaluation: Evaluating How Transportation Decisions Affect Land Use Patterns, and the Economic, Social and Environmental Impacts That Result Accessed at 10/11/2015 fromwww.vtpi.org

Victoria Transport Policy Institute TDM Encyclopedia, Victoria Transport Policy Institute, http://www.vtpi.org/tdm/tdm81.htm

Voukas, Y.K. November 2001, WS Atkins Transport Planning: European Best Practice in the Delivery of Integrated Transport, Personal Transportation in Athens. Master’s Thesis, Lund University, Sweden.

Walkability Checklist Guidance for Entitlement Review, City of Los Angeles Department of City Planning, Accessed at www.urbandesignla.com in 26.3.2010.

Wall, H.J., 1999, Voting with Your Feet and Metro-Area Livability, Accessed at www.stls.frb.org/publications/in 30.3.2010

We need more pedestrian walkways like this, Accessed at www.anilnetto.com/development-issues in 11.10.2010.

Weissman, S., and Corbett, J., 1992, Land Use Strategies for More Livable Places, Accessed at http://www.lgc.org. in19.3.2010.

Wheeler, S.M., and Deakin, E., Livable Communities: Creating Safe and Livable Neighbourhoods, towns, and regions in California, Accessed at http://escholarship.org/uc/item/8xf2d6jgin 17.3.2010.

Wheeler, S., 2001, Livable Communities: Creating Safe and Livable Neighborhoods, Towns and Regions in California, Accessed at http://escholarship.org/uc/item/8xf2d6jg. in 30.3.2010.

Williams, D.E., 2007, Sustainable Design: Ecology, Architecture and Planning, Wiley: Hoboken.

Yasdag, S., 2006, Achieving A Pedestrian Oriented Transportation System In Ankara, A master thesis to be submitted to Department of City and Regional Planning, METU: Ankara.

Zegras,P.Ch., August 1, 2006, Household Income, Travel Behavior, Location and Accessibility: Sketches From Two Different Developing Contexts, Massachusetts Institute of Technology, Department of Urban Studies and Planning.

Zurawik, M.A., 2014, Socio-Ecological Perspective On Walking, Jan'14/3(1), P.81-98.

CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Ak, Aslı
Nationality: Turkish (TC)
Date and Place of Birth: 21 September 1980, Khoy
Marital Status: Married
Phone: +90 541 663 77 88
email: parisaak1980@gmail.com

EDUCATION

Degree	Institution	Year of Graduation
MS	METU Urban Design	2011
BS	AU Architecture	2006
High School	Nasr High School, Tabriz	2000

WORK EXPERIENCE

Year	Place	Enrollment
2011-2014	DA Architecture	Architect
2007-2010	AGM Engineering	Architect

FOREIGN LANGUAGES

Advanced English, Fluent Azerbaijani and Persian

PUBLICATIONS

-

HOBBIES

Painting and Music activities