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ANALYSIS OF PAVEMENTS FOR DISABLED PEDESTRIANS IN METROPOLITAN CITIES: CASE OF SISLI DISTRICT IN ISTANBUL

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ABSTRACT

Ozan Arif KESİK **January 2012**

Analysis of Pavements for Disabled Pedestrians in Metropolitan Cities: Case of Sişli District in Istanbul

This study aims at identifying to what extend the pavements in study area is convenient for disabled pedestrians who use wheelchairs. The study was completed in 20 neighborhoods located at the south of the Sişli district. In the process of data collection, 31 photogrammetric base maps of 1/100.000 scale were employed. First, all the roads and streets in study area were examined and the streets with no pavements were listed. Next, all the objects on the pavements of Sişli district were inventoried. The space between the intervening objects and the two ends of the pavements were measured to find out whether or not these objects obstructed the walking of people on the pavements especially of those who use wheelchairs. The pavements were measured every 40 steps; wherever the pavements were shorter than 40 steps, they were measured using a meter at the beginning, the middle and the end of the pavements. Furthermore, ramps and broken surface on the pavement segments were examined in the study. Final map of the study was produced to indicate which pavements were suitable for disabled people using wheelchair by considering mainly two criteria; including whether there is a ramp at each end of pavement segments and the object do not prevent passage of people with wheelchair. In the study, ArcGIS 9.3 GIS software was used in the process of data production and analysis.

In the study area 3018 pavement segments were recorded. Their total length was calculated as 251,122 meters. In course of the study, the pavements have explicitly seen to be occupied with various objects. Ninety percent of the objects are of immovable type such as trees and poles while 10% could be labeled as movable objects like cars and stands. In the study, 14,594 objects in total were

inventoried. The study found out that about 20% (2904) of the total objects on the pavements obstruct the passage of physically impaired people using wheelchair. There are broken surfaces in 299 places that prevent walking detected during the process of the study. While the number of pavements with ramps on it is 163, only 5 pavements have ramps at both sides. The ratio of the pavements below the standard width consists of 83% of the total pavement segments. Another problem for the disabled people using wheelchair in the study area is the high inclination and suddenly changing slopes on the pavements. The slopes in the study area are between 0% and 80.4%, and 60.9 % of the study area is above slope value 8%. As a consequence of the study, only 3 pavement segments out of 3018 pavements in 251 km fulfill the conditions that let disabled people using wheelchair to pass through. In other words only 0.1% of the pavement segments in the area of the study are suitable for the use of disabled people.

In the study, it has been found out that almost none of the pavements in the study area (i.e. Sişli district) is suitable for the use of disabled people using wheelchair. All the structures in the study area must be reconsidered within the frame of urban transformation; streets and pavements must be reconstructed in line with appropriate height and width. It is impossible to renovate the pavements in the study area to meet the needs of the disabled people unless there is a dramatic change through some big projects such as urban transformation. Only after some arrangements the significant streets in the study area could be appropriate for the use of the disabled people. By doing some minor arrangements at Büyükdere Street, Halaskargazi Street and Cumhuriyet Street located between Mecidiyeköy – Taksim, where there are many public institutions, social sites and business centers, the pavements on these streets could be made suitable for the use of the disabled people.

Key words: Disabled people, Urbanization, Geographic Information Systems (GIS), Istanbul, Sişli.

KISA ÖZET

Ozan Arif KESİK **Ocak 2012**

Büyükşehirlerde Yaşayan Engelli Yayalar İçin Kaldırımların Analiz Edilmesi: İstanbul Şişli Örneği

Bu çalışmanın amacı çalışma alanında bulunan kaldırımların tekerlekli sandalye kullanan engellilerin kullanımı için ne kadar uygun olduğunun tespit edilmesidir. Çalışma Sişli ilçesinin güney kesiminde kalan 20 mahallesinde tamamlanmıştır. Araziden veri toplama aşamasında 31 adet 1/100.000 ölçekli fotogrametrik hâlihazır harita kullanılmıştır. Çalışmada öncelikle Sişli İlçesindeki tüm cadde ve sokaklar gezilmiş ve çalışma alanında kaldırımların olmadığı sokaklar tespit edilmiştir. Çalışmada ayrıca Sişli İlçesindeki kaldırımlar üzerinde bulunan tüm nesneler tespit edilmiştir. Yapılan çalışmada kaldırım üzerinde bulunan objelerin, kaldırım üzerinde yürüyen insanların ve özellikle tekerlekli sandalye kullanan engellilerin kaldırımda yürümesine engel olup olmadığı ölçümlerle tespit edilmiştir. Çalışma alanında bulunan bütün kaldırımların yükseklik ve genişlikleri her 40 adımda bir kez, eğer kaldırım segmenti 40 adımdan daha küçük uzunluğa sahipse kaldırımın başından, ortasından ve sonundan birer kez olmak üzere metre ile ölçülmüştür. Çalışmada ayrıca kaldırımların üzerinde bulunan bozuk satıhlar ve rampalar da tespit edilmiştir. Çalışmanın sonuç haritası oluşturulurken kaldırımların tekerlekli sandalye kullanan engellilere uygun olup olmadığı iki kritere göre belirlenmiştir. Bunlar, kaldırım segmentlerinin başında ve sonunda rampaların bulunması ve kaldırım üzerinde bulunan objelerin tekerlekli sandalye geçişini engellememesi durumudur. Verilerin girilmesinde ve veri analizinde ArcGIS 9.3 programı kullanılmıştır.

Çalışma alanında toplam 3018 kaldırım segmenti tespit edilmiş ve tespit edilen kaldırım segmentlerin uzunluğu 251,122 metre olarak hesaplanmıştır. Çalışmada kaldırımların çok çeşitli objeler tarafından işgal edildiği tüm açıklığı ile görülmüştür. Bu objelerin %90 gibi önemli bir bölümünü ağaç ve direk gibi

taşınmaz objeler, %10 gibi az bir kısmını ise araba ve tezgâh gibi taşınabilir objeler oluşturmaktadır. Çalışma alanında kaldırımlar üzerinde toplam 14,594 obje tespit edilmiştir. Çalışmada kaldırımlar üzerinde bulunan objelerin yaklaşık %20'sinin (2904 adet) kaldırım üzerinde tekerlekli sandalye kullanan özürlülerin geçişini engelledikleri tespit edilmiştir. Çalışmada kaldırımlar üzerinde 299 yerde üzerinde yürümeyi engelleyecek bozuk yüzeyler tespit edilmiştir. Üzerinde rampa bulunan kaldırım sayısı 163 iken, her iki ucunda rampa bulunan kaldırım segmenti sayısı ise sadece 5'dir. Standart kaldırım genişliğine sahip olmayan kaldırım segmentleri toplam kaldırım segmentlerinin %83'ünü oluşturur. Çalışmada, çalışma sahasındaki kaldırımların tekerlekli sandalye kullanan özürlüler açısından taşıdığı problemlerden birisinin de yüksek ve ani değişen eğim derecesi olduğu tespit edilmiştir. Çalışma sahasındaki eğim %0 ile % 80.4 arasında değişmekte ve çalışma sahasının %60.9'unun eğim değerleri %8'in üzerindedir. Çalışmanın sonucunda 251 km uzunluğundaki 3018 kaldırım segmentlerinin sadece üçünün üzerlerinde tekerlekli sandalye kullanan özürlülerin geçişine imkân veren özellikleri taşıdığı tespit edilmiştir. Diğer bir ifade ile çalışmada, çalışma alanında bulunan kaldırım segmentlerinin sadece %0.1'inin engellilerin kullanımına elverişli olduğu ortaya çıkmıştır.

Çalışmada Şişli ilçesinin önemli bir bölümünü kapsayan çalışma sahasında yer alan kaldırımların tekerlekli sandalye kullanan özürlüler açısından hemen bütünüyle uygun olmadığı tespit edilmiştir. Kentsel dönüşüm projeleri kapsamında çalışma sahasındaki tüm yapılar yeniden ele alınmalı, cadde ve sokaklar, kaldırımlarla birlikte uygun genişlik ve özelliklerde yeniden inşa edilmelidir. Çalışma sahasındaki tüm kaldırımların özürlülerin sorunsuzca kullanımını sağlayacak şekilde yenilenmeleri kentsel dönüşüm gibi büyük projeler düşünülmediği takdirde imkânsızdır. Ancak bazı düzenlemeler yapıldığı takdirde çalışma sahasında yer alan bazı önemli caddelerin özürlülerin kullanımına uygun hale getirilmesi mümkündür. Çalışma alanında özellikle iş merkezlerinin, sosyal alanların, devlet kurumlarının fazla olduğu Mecidiyeköy – Taksim arasında bulunan Büyükdere Caddesi, Halaskargazi Caddesi ve Cumhuriyet Caddesi

üzerinde çok küçük çapta düzeltmeler yapılarak, bu caddeler üzerinde bulunan kaldırımlar özürlüler için uygun hale getirilebilir.

Anahtar Kelimeler: Engelliler, Şehirleşme, Coğrafya Bilgi Sistemi (CBS), İstanbul, Şişli.

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LIST OF ABBREVIATIONS

GIS: Geographic Information Systems

WHO: World Health Organization

ICFDH: International Classification of Functioning, Disability and Health

ADA: Americans with Disabilities Act Accessibility

TS: Turkish Standard

HIV: Human Immunodeficiency Virus

FADS: Facility Accessibility Design Standard

SOLIDERE: The Lebanese Company for the Development and Reconstruction of Beirut Central District

UNESCWA: United Nations Economic and Social Commission for Western Asia

TURKSTAT: Turkish Statistical Institute

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CHAPTER 1: INTRODUCTION

1.1. Goals and Objectives

Rapid increase in population and urbanization paves the way for cities to grow in an unplanned way and causes many different problems such as traffic jam, pollution, lack of infrastructure and insufficient transportation network. Unplanned construction of houses at different locations prevents cities from having a good transportation network with a satisfactory number of roads and streets built at certain standards. As observed in settlement areas particularly in cities with squatter houses forming the majority, one of the most significant elements reflecting the negative effects of unplanned settlement is pavements. In such cities, pavements are not constructed in accordance with certain standards and pavements show differences in terms of width, heights, and construction material in almost each street. When such cities grow in time, squatter houses are replaced with modern ones, but the roads and streets along with their pavements usually preserve their original characteristics due to lack of space. The pavements built at low standards and the many different objects occupying them make it a big challenge for the pedestrians to walk on them and most of the time the pedestrians are forced to walk on the roads and streets.

Disabled people using wheelchair are among the most affected from the problems arising in cities exposed to rapid population increase and unplanned settlement. Disabled people are rarely seen in streets in which there are pavements that are not suitable for them. Therefore, many disabled people are imprisoned in their houses due to these problems. One of the settlement areas in which this negative situation is experienced is undoubtedly Istanbul, the most populated city in Turkey.

Istanbul has welcomed a variety of different civilizations in its five thousands year old history. However, it has not been able to protect itself from the negative effects of rapid population increase and unplanned urbanization. The city got bigger and bigger especially with the in-migrations starting in the 1950s; however this growth has resulted in unplanned districts full of squatter houses due to the lack of provision in infrastructure at the same speed. First settlements of squatter houses in Istanbul started in Zeytinburnu district (Aşık, 2007) and as time went by, these settlements grew first in the direction of east and west and later in the direction of north in the both sides of Istanbul (Karaburun et al. 2010).

The first buildings in Istanbul were built in Sişli district. This architectural change paved the way for Sişli district to become one of the most popular places in Istanbul and directed the population of Istanbul to move towards this district. Furthermore, the erection of buildings made the former roads of transportation more obvious; it led to the construction of boulevards and streets. The second significant period for architectural changes and the growth of population in the district is the period between the years 1950-1960. Due to rapid urbanization policies in this period, the population that emigrated from Anatolia formed squatter district settlements in Sişli district. The squatter district settlements were built in the vicinity of industrial centers (Bomonti and Kâğıthane districts) first and thus the population of these neighborhoods increased constantly. The last period with great changes in architectural terms took place in the period between the years 1980 – 1990 (Üzmez, 2009). The squatter houses were turned into buildings in this period, which brought many problems along with it. One of these problems is that the streets and roads became narrower; pavements could not be constructed or they were constructed at lower adequate standards.

Being one of the most crowded districts of Istanbul, Sişli district is one of the areas in which walking on the pavements is a major problem even for the pedestrians without any disability. However, disabled pedestrians especially

those who use wheelchairs and the ones who are blind suffer the most from this inconvenient situation. Moreover, the narrow pavements are occupied by trees, street lamps, billboards, stalls, and even cars. Due to this situation, institutions representing disabled people have complained numerous times for the lack of provision of decent life standards for disabled people. This study aims at identifying to what extend the pavements in Sişli district is convenient for disabled pedestrians who use wheelchairs.

1.2. Methodology

The study is a part of a TUBİTAK project titled "Using GIS to develop social sensitivity among students: Implementation of GIS-Based projects at secondary school geography lessons" which was conducted between September 2009 – March 2011 in three pilot high schools in Istanbul. The project aimed at understanding the obstacles in front of conducting GIS based projects in geography lessons and developing a model for teachers to conduct similar projects in their schools. Nine GIS based projects were conducted in pilot schools and in one of these projects, students studied the pavements to understand to what extent the pavements were suitable for disabled pedestrians in Sişli district. The data collection phase of this thesis was completed together with students from Sişli High School as a part of this project.

Various methods such as survey, interview, data collection in the open field, and analyzing data in Geography Information Systems were employed in the study. The methods employed in the study are presented in three headings: literature review, data collection and data analysis.

1.2.1. Literature Review and Interviews

Literature review was conducted in order to obtain information on important concepts and topics about working in Internet and library environment. Metropolitan cities and their problems, definition of the handicapped, statistical

information on the handicapped in Turkey as well as the world, the problems that the handicapped have within the city, and required standards for pavements adapted for the use of disabled persons were researched in the literature review.

Furthermore, for a better understanding of the problems that the handicapped people have in urban life, interviews were conducted with officials from a number of institutions. Istanbul GÖZDER (Association for Visually Impaired People) was paid a visit and the visually impaired people were interviewed on the difficulties they have when they walk on pavements. Aiming at observing the problems of the handicapped in person, a walk was carried out with a number of people from the same association and the complaints that the visually impaired have on the street were closely observed (Figure 1).

Figure 1. A visit to the association of the visually impaired people

1.2.2. Data Collection

In the process of data collection, 31 photogrammetric base maps of 1/100,000 scale were used. The maps were obtained as digitally and the hard copies from the Istanbul Metropolitan Municipality. Data collected on the field was processed on a paper map, and then the data was transformed into digital maps in GIS. The process of data collection in the field was completed in a period of approximately 3 months from April to June 2010. The term 'pavement segment' was used in order to analyze the structural condition of the objects, height of the pavements and their width. The places remaining among the corner points of the city blocks were defined as pavement segments.

The data collection process was completed within the period between April - June 2010. During the field study, measurements and detection were carried out for four different features on pavements. First, all the roads and streets in study area were examined and the streets with no pavements were listed (Figure 2). Next, all the objects on the pavements of Şişli district were inventoried. These objects were classified as trees, billboards, motor vehicles (automobile, motorcycle), and mushrooms to prevent car parks on the street, buffets, stands, electric poles, trash bins and others. All these objects were mapped and their exact position is shown with numbers (with each object being assigned a different number).

Figure 2. A pavement sample where the pedestrians have to walk

The space between the intervening objects and the two ends of the pavements were measured to find out whether or not these objects obstructed the walking of people on the pavements especially of those who use wheelchairs. Any space with a width under 60 cm was considered not adequate for the passing of wheelchairs and was recorded as such on the maps (Figure 3).

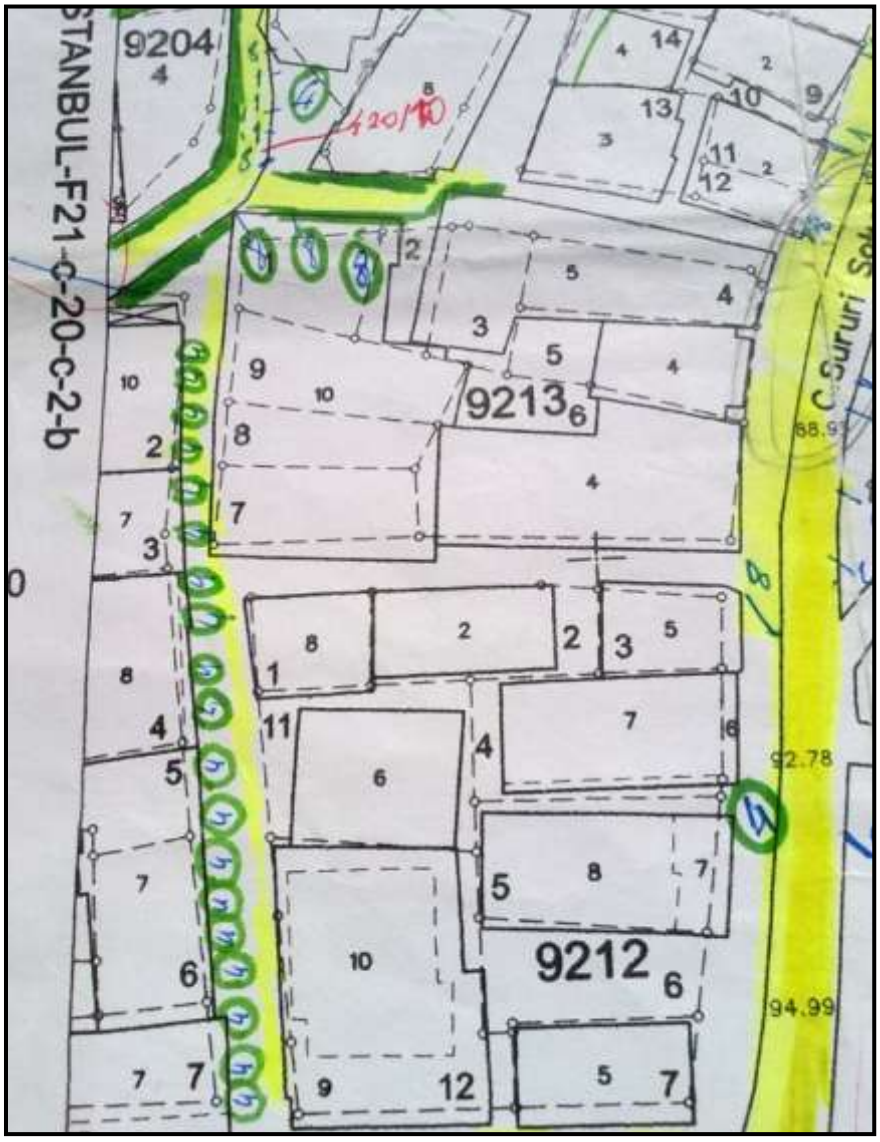

Figure 3. The objects on the pavement segments that obstruct walking

The pavements were measured every 40 steps; wherever the pavements were shorter than 40 steps, they were measured using a meter at the beginning, the middle and the end of the pavements. In addition, in order to have the work consistent with the field, re-measurements were carried out in places where there were sudden changes (for instance bus stops, traffic lights etc.) in the width and height of the pavements (Figure 4).

Figure 4. Measurement carried out on a pavement segment

Furthermore, ramps and broken surface on the pavement segments were examined in the study. Also, there are places with no pavement segments. These places are indicated with different colors on the map.

1.2.3. Analysis of Data

Data collected in the field was then transferred to the GIS environment. The widths and heights of the pavements obtained from the measurements taken from the different places of pavements were entered on their real positions in digital platform. The objects detected on the pavements were entered on their actual position as spotted data. The names of the objects, and whether they prevent those pass by wheelchair are recorded in the attribute table of the object layer.

In the study, ArcGIS 9.3 GIS software was used in the process of data production and analysis. Statistical calculations were made in GIS environment and the length of all the pavements in the study area were recorded in meter. The streets and avenues with or without pavements were detected. Through statistical calculations, all the objects on the pavement segment were grouped according to their types.

The following issues were determined in the analysis:

- The areas with or without pavements and their length were detected.
- The height and the width of the pavements were recorded. For each pavement segment, average pavement height and width were calculated. The number of pavement segments below international and Turkish standards, was recorded.
- All the objects on the pavements were recorded in computer according to their types. All the objects were illustrated with different symbols.
- The names of the symbols were entered into attribute table. The objects on the pavements were classified according to their degree of obstruction. The objects that prevent pavement to be used and those that will not prevent were stated at the data recording. Furthermore,

the number of all the objects detected in the study area and how many of them obstruct walking are stated as statistical data.

- All the ramps on the pavements were detected and whether or not these ramps prevent the wheelchair users from passing through the ramp was assessed. Moreover, broken surfaces (that need maintenance) on the pavement segments that may also prevent the physically impaired people from walking through the pavements were stated.
- One of the most important factors that affect the physically impaired people to use wheelchair is the slope of the field. Excessive slopes in a field affect the mobility of physically impaired people especially of those using wheelchair. In this study the places where there are slopes that affect the physically impaired people in the study area and the places that could be used safely were assessed by preparing slope map. Data for this map was obtained from the Metropolitan Municipality of Istanbul.
- Illustration of the areas which were suitable and unsuitable for the wheelchair users to pass through represented the conclusion map of the study. The following criteria were used in defining the pavements that are suitable for the wheelchair users:

1. Be wide enough to allow the use of wheelchairs
2. Not to have large objects that are as big as to prevent the wheelchair users to pass through
3. Not to have ramps at the beginning and the end of the pavements, which would prevent wheelchair users to enter and exit from the pavements
4. Not to have broken surfaces
5. To have an inclination of maximum 8%.

On the result map, the pavements that could be used by the wheelchair users alone in the study area without any problem have been detected. The maps that show the location of these pavements and their lengths have been prepared

1.3. Study Area

Sişli district is located on the European part of Istanbul. Eyüp and Kağıthane are in the west of the district, Beşiktaş in the east, Sarıyer in the north, and Beyoğlu is in the south. Total land area of the district is 35 square kilometers. The population of the district is 317,337 (Turkish Statistical Institute 2010).

There are 28 neighborhoods in the district. While Huzur, Ayazağa and Maslak neighborhoods form the north of the district, the other neighborhoods form the south of the district. The south of the district occupies a larger area than the north.

The study was completed in 20 neighborhoods located in the south of the Sişli district. These are Fulya, 19 Mayıs, Merkez, Halide Edip Adıvar, Kaptanpaşa, Halil Rıfat Paşa, Cumhuriyet, Meşrutiyet, Teşvikiye, Halaskargazi, Bozkurt, Ergenekon, Feriköy, Eskişehir, İnönü, Harbiye, Yayla, Paşa, Duatepe, Mahmut Şevket Paşa neighborhoods respectively. The study area occupies 7.8 square kilometers (Figure 5).

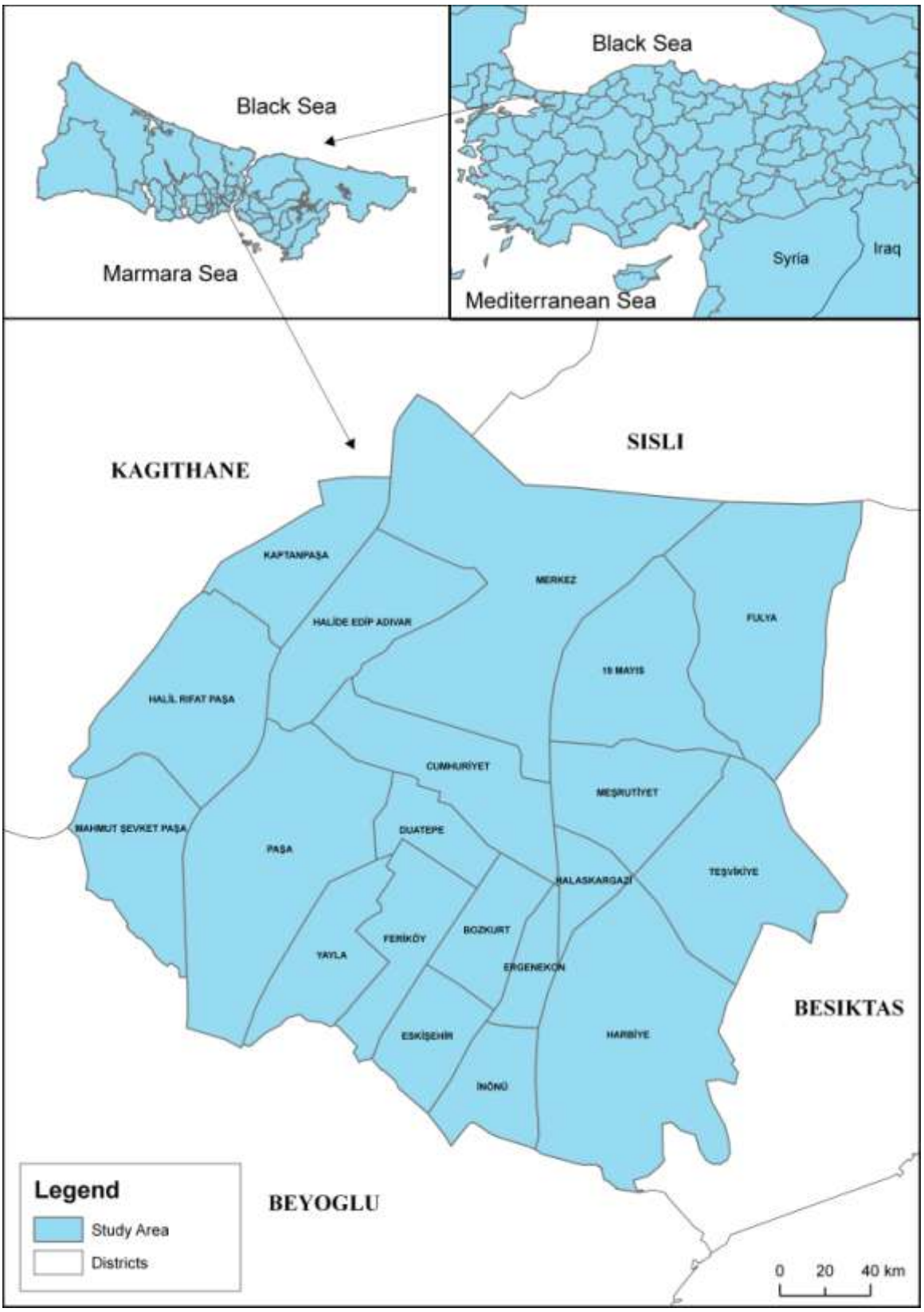

Figure 5. Location of study area

1.3.1. History of Sişli District

In order to comprehend the history of Sişli district, it is essential to know the place of Galata in history. Galata settlement has been the most significant place settlement in the north of the Golden Horn since the Byzantium period. Galata fell under the rule of Genoese tradesmen in the last period of the Byzantium and became a Genoese colony. Fatih Sultan Mehmet, who conquered Istanbul in 1453, knew the significance of the Genoese in the trade of the region, and issuing a pact, he maintained the Genoese stay in the Galata in line with this policy of making Istanbul the Centre of the World. Hence, Galata became the center of the Ottoman non-Muslims, European ambassadors, and the tradesmen (İnalcık, 1998). The increase in the population of the center paved the way for the formation of new neighborhoods for settlement. Sişli district is one of these settlement areas.

Rum (the Greeks) population in Galata came to Sişli district and formed Kurtuluş (Tatavla) neighborhood (Kara, 2009). The dwellers of the area did business in various professions and were famous for business of work place clothing. The population of the district reached 20 thousands towards the end of the 18th century. It is also known that there was an order to restrict people from different localities to come to this area of settlement (Üzmez, 2009).

The district was a place with few settlements until the middle of the 19th century and thus there used to be vast lands (Tekeli and Akbayar 1994); (Figure 6).

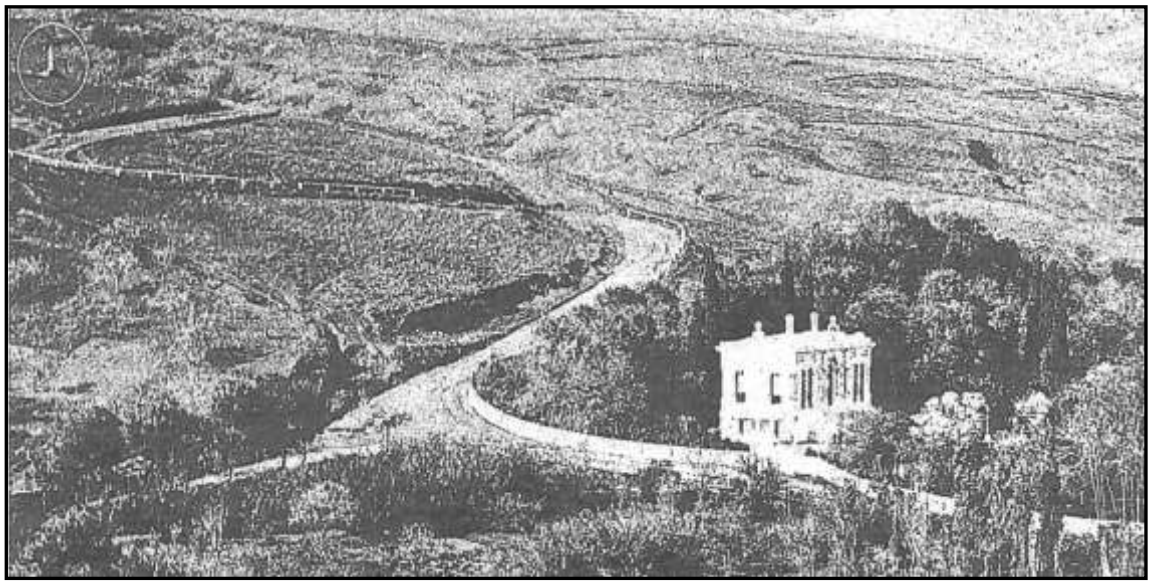

Figure 6. Lime pavilion and plantation in 1960; Nişantaşı is seen at the left
Source: (Üzmez, 2009)

The Imperial Edict, which was accepted upon the enthronement of Sultan Abdulmecit, provided foreigners with the chance of possessing properties in Turkey. The non-Muslims were encouraged to dwell in Sişli district. "Teşvikiye" (encouragement) neighborhood in Sişli was founded in this period. The fact that the Ottoman State lost vast territories in the 19th century caused mass migrations and the people from these lost lands were placed into the North of Sişli and Mecidiyeköy, which were, at the time, populated with mulberry trees. Harbiye school was established in 1862, Poorhouse in 1895, Etfal Hospital in 1898, Bomonti Beer Factory in Matbaa-i Osmaniye (Ottoman Printing House) in 1900s (Üzmez, 2009).

The population of the district increased more in 1870 after the Great Beyoğlu fire. As a result of the fire, the Non-Muslim in Beyoğlu, who were generally doing trade, moved to buildings constructed in the vicinity of Harbiye (Tekeli and Akbayar 1994).

The population of the district grew more on account of the Horse-pulled-tramway, and later the electrical tramway expended as far as Taksim, Pangalti, and Sişli (Üzmez, 2009).

Figure 7. Sişli district, Halaskargazi Street and electrical tramway (1895)
Source: (Üzmez, 2009)

Sişli enjoyed the most magnificent period in its history at the end of the 19th century and the first quarter of the 20th century. At the beginning of the 20th century, people and administrators from the palace build magnificent guest houses in Teşvikiye and Nişantaşı areas (Governership of Sişli, 2011). Furthermore, the first buildings were constructed in Sişli district at the beginning of the 20th century (1910 – 1920). The days of fires and worries of security, the main factors that led to the construction, were the terrible days in the history of the Ottomans (Üzmez, 2009).

As a result of the migration to Istanbul after the 1950s, Çağlayan and Gültepe neighborhoods were founded in the North part of Sişli district. With the constantly increasing population, Sişli became an independent district in 1954 splitting from Beyoğlu district. Esentepe and Gayrettepe neighborhoods were established with the housing sites built for the retired and journalists in 1960s. Population increase due to migration from Anatolia led to the establishment of

Hürriyet, Örnektepe, Kuştepe and Çeliktepe neighborhoods in the region. While Kağıthane was the place with the most industrialization, various factories were built in the vicinity of the Bomonti factory (Tekeli and Akbayar 1994).

The urban population of the district exceeded 250,000 and the rural population exceeded 100,000 in the 1970s. The rural population used to live in the squatter houses. Due to some unfavorable circumstances in Beyoğlu in the 1970s, Sişli district became one of the most attractive commercial places in Istanbul. New shopping centers were built in the district; moreover, some buildings on the street were destroyed and they were replaced by multi-story offices and business centers. Furthermore, the fact that the automobile workshops were moved from Dolapdere to Çeliktepe led to the establishment of an industrial area in the district. After such great changes, it became impossible to provide public services to the squatter neighborhoods in Kağıthane; hence, Kağıthane municipality was established. All the squatter settlement areas of the district were filled up with apartments in the 1980s. The urban population of the district was over 280,000 while the rural population was over 180,000. Kağıthane became a separate administrative district in 1987 and the population of the district was reduced to half. The split of Kağıthane from Sişli district divided the land area of the district into two (Tekeli and Akbayar 1994).

1.4. Literature Review

1.4.1. Metropolitan Cities and Their Problems

1.4.1.1. What is Metropolitan City?

There is no exact definition of 'Metropolitan City'. In general, the term 'metropolitan city' is applied to a region which dominates all urban and rural regions in economic and social aspects and is the largest city where the affairs of a country are controlled (Keleş, 1998); and that it is a city with all types of feature in regard to its size and function (İzbırak, 1992); it is the main city that affects economic, social and demographic aspects besides being the central metropolis area (İspir, 1982).

Although many criteria are taken into consideration in defining metropolitan city, the criterion of population is the most significant one. In general, the cities with the population of over 1 million are called metropolitan cities (Demir and Çabuk 2010). The word "Metropolitan" was first used in 1855 for the large cities of the USA (Triggs, 1911).

However, many researchers have given various population sizes while defining metropolitan cities in Turkey. There are researchers (Göçer, 1985; Çıracı, 1982) arguing that the population of the metropolitan cities should be over 500,000 as well as those support it to be 1,000,000 (Demir and Çabuk 2010; Yazar, 2006). Moreover, Turak (1985) classified metropolitan cities according to the criterion of population as follows: small metropolitan areas (100,000 – 500,000), medium size areas (500,000 – 1,000,000), young metropolitans (1,000,000 – 2,000,000), adult metropolitans (2,000,000 – 4,000,000), big metropolitans (4,000,000 – 6,000,000) and super metropolitans (6,000,000 - <…).

While mentioning metropolitan cities in Turkey, first 300,000, then 500,000 and finally 750,000 population criteria were taken into consideration. In accordance with the Article 4 of the Law Number 5216, "the city municipalities in

the places of settlement with the population of 750,000 according to the last population census within maximum 10,000 meter may be turned into metropolitan municipalities considering their physical settlement condition and level of economic development" (TBMM, 2004). As the law suggests, in order for a city to be a metropolitan city, the population must be minimum 750,000.

The large population is not solely sufficient for the definition of metropolitan cities. In addition to the large population, the economy, culture, history, its position to be a capital city, the work areas of the city dwellers, transportation, and development of service sector, its hinterland and social activities are also important features in defining the metropolitan city (Türkmen, 2002). Big cities are the heart of countries in economic terms. They are the places where most economic activities and trades take place. Istanbul is one such example in Turkey.

1.4.1.2. Problems of Metropolitan Cities

Following the Industrial Revolution, the population of the world increased rapidly and was centered around cities (Demir and Çabuk 2010). Use of combustion in engines, technological developments in heavy metal and steel industry led to improvements in industrial services. Moreover, after the Industrial Revolution, the use of machines in agriculture increased and as a result the need for man power in the rural areas decreased (Göney, 1995). In addition, application of inappropriate agricultural policies, division and inadequacy of farming areas, employment facilities and developed social and cultural life in cities, and advanced service sector paved the way for the increase of migration from villages to the cities (Mutlu, 2007).

The first city to exceed the population of 1 million in the world is London (Jones, 1990). Then the population of Paris, New York, Vienna and London cities exceeded 1 million. Also the population of Berlin, Moscow, Chicago, Tokyo and Calcutta exceeded 1 million at the beginning of the 20th century. The number of

cities with over 1 million population was 51 in 1940, 80 in 1961, 126 in the mid 1980s. The same number increased to 388 between 1980-2000 (Çabuk et al. 2007). Today, there are 795 cities with the population of over 500,000 people and 426 cities with over 1,000,000 (Demographia, 2011). This result illustrates that the population in metropolitan cities has increased rapidly and this trend will continue in the future.

On account of rapid population increase, metropolitan cities face various problems. Among these problems are the pollutions of air, water, land and noise, transportation problem, traffic, parking lot, security, problems of squatter settlements and unplanned settlements.

Environmental pollution is the most crucial problem caused by urbanization and the increase of city population. Environment is a name given to the existence of all animate and inanimate objects in the nature as well as those produced by human beings (Güney, 2004). On the other hand, environmental pollution is the mixture of substances that damage the life of animate and inanimate existences structurally and affect the lives of the living beings unfavorably by mixing into air, water, and land.

Environmental pollution was not considered as a problem until the end of the 19^{th} century in the world, and it has been seen as a problem after 1960s (Kiniş, 1988). With the constantly growing population, nowadays human beings benefit more from the nature for more welfare and luxury and thus they destroy the ecological balance (Sağlam, 2006). Even if the raw material input is sufficient, as a result of the use of raw material industrial and home wastes cannot contain natural waste (Kiniş, 1988). Especially in the industrialized metropolitan cities such environmental pollutions are at high levels.

Another problem of the metropolitan cities is the unplanned settlements and squatter settlements. This problem brings many other issues along with it. Squatter settlements is a phenomenon formed by the population that immigrates

to cities and cannot meet their needs of accommodation (Ertan, 1996). The squatter settlements is especially seen in industrialized metropolitan cities with large population.

Squatter settlements are first seen in the vicinity of industrial areas in cities and their number increases depending on the factors of kinship and being from the same home district. Owing to rising immigration, empty fields on the state lands are decreasing. The houses on these fields were single-family houses with gardens at first, but later they were converted into multi-family buildings because of immigrations. Moreover, when these buildings do not meet the accommodation needs of the immigrants, more buildings are constructed in the gardens and thus unplanned settlements take place. These places with little population at early stages turn into neighborhoods, which form the most parts of districts.

The squatter settlements are the most important reason of the unplanned urbanization. The first problems with such settlements are that facilities such as electricity, water and sewage system cannot be brought to these places. The dwellers of the squatter districts meet these needs themselves or use them illegally. In the past, the local administrations provided opportunities for these settlement areas to benefit from electricity, water and sewage system for political reasons. However, bringing these facilities has not been the only problem of the squatter settlement areas. Among other problems in the squatter settlements sites are environmental pollution, lack of facilities for education and health care, and shortage of parking space.

The order and the width of the streets and lanes in the metropolitan cities with rapid population growth and urbanization are other significant problems that are related to the pavements. As one of the most crucial result of unplanned urbanization, the streets in the squatter districts became narrower, some turned into cul-de-sac, and thus the construction of pavements became more difficult. If

radical urbanization projects are not put into effect in cities where the majority is formed of squatter districts, even if the squatter houses are turned into modern buildings, the problems related to the streets and lanes of the city cannot be solved.

The narrow streets makes the access of ambulance and rubbish trucks difficult, or even impossible. The fact that services such as ambulance and fire department trucks cannot enter these neighborhoods could lead to the loss of lives and possessions.

Another outcome of narrow streets, which have been formed because of unplanned urbanizations, the pavements at the sides of the streets and avenues do not have the required standards; or have no pavements at all.

Thes situations where that the pavements are not adequately wide and high, have ramps at the entrance and exit, and objects that prevent walking on the pavement are experienced more in rapidly urbanizing metropolitan cities. In these cities, in the streets of which even regular people face problems in walking, the disabled people are forced to have "life imprisonment" and they require assistance of someone whenever outside.

1.4.2. Problems of Disabled People in Metropolitan Cities

1.4.2.1. Definition of Disability

It is essential to provide some definitions about disability before we attempt to tell the problems of disabled people in the metropolitan cities, the standards that open and closed places must have especially for the use of pavements by the disabled people.

Disability is a general term of being under one's ideal capacity, being unable to play roles in social life, state of being unable to carry out certain activities (Burcu, 2007), not being able to use body functions or structural disorder or

impairment in the body, and a general term that prevents one to attend any social activity (WHO, 2011). According to the Law on Disabled Americans, the disability is a physical or mental disorder that limits a person to take part in one or more main activities of living to certain extent (Maraz, 2009).

A disabled individual in Turkey is defined as "a person who feels difficulty in adopting social life and meeting one's daily requirements as one has lost his or her physical, mental, spiritual, audio and social skills at various levels from the birth or afterwards and needs services of protection, care, rehabilitation, counseling, and support" (TBMM, 2005). According to Article 1 of the 'Declaration of the Rights of Disabled People', Addendum number 3447 of Universal Declaration of Human Rights, which was accepted in United Nations General Assembly on 9 December 1975, the disable person is defined as; "someone who cannot perform the tasks that he or she can carry out in a normal life on account of a deficiency in physical and spiritual skills because of genetic inheritance or that happened in later life" (Özdingiş, 2007).

The World Health Organization (WHO) classified the term of disability into three categories as Impairment, Disability and Handicap (Disability Resource Network of Bc, 1980).

1. Impairment: It is defined as deficiency in the psychological, physiological and physical structure and function.
2. Disability: It is defined as a state of being unable to perform an activity normally due to deficiency in the psychological, physiological and physical structure and function.
3. Handicap: Limitation or prevention of the roles brought by gender and age depending on social and cultural factors on account of a deficiency and a disability. Since city planning is not designed for the disabled people, they are imprisoned in their small rooms in big cities and cannot join social and cultural life; hence, they cannot play the role expected from them.

WHO classified disability by publishing a document titled "International Statistical Classification of Diseases and Related Health Problems". This classification by the WHO is summarized briefly in Table 1 and Table 2.

Table 1. Summary of ICFDH concepts with examples (Statistics Division, Department for Economic and Social Information and Policy Analysis of the United Nations, 1996)

Impairment (organ, body part)	**Disability (person)**	**Handicap (societal level)**
Amputated leg	Walking limitations	Unemployment
Partial sight	Difficulty in reading the printed page	Inability to attend school
Loss of feeling in fingers	Difficulty in grasping or picking up small objects	Underemployment
Paralysis of arms and legs	Limited movement	Homebound state
Impaired voice function	Limited ability to speak	Social isolation
Hearing loss	Difficulty in understanding speech	Reduced interaction
Mental retardation	Slow learning	Social isolation

Table 2. Summary of ICFDH concepts and categories (WHO, 1980).

Concept	One-digit category
Impairment (I): organ or body-part level	1. Intellectual 2. Other psychological 3. Language 4. Aural 5. Ocular 6. Visceral 7. Skeletal 8. Disfiguring 9. Generalized, sensory, and other
Disability (D): personal level	1. Behavior 2. Communication 3. Personal care 4. Locomotors 5. Body disposition 6. Dexterity 7. Situational 8. Particular skill 9. Other activity restrictions
Handicap (H): societal level	1. Orientation 2. Physical independence 3. Mobility 4. Occupation 5. Social integration 6. Economic self-sufficiency 7. Other

In Research of Disabled in Turkey conducted in 2002, the disabled people were classified into 6 groups. These groups and their definitions are as follows (T.R. Directorate of the Prime Ministry Office of the Disabled, 2002):

• Orthopedic Impaired: A person with deficiency and loss of function in muscle and skeleton system. Shortness, deficiency, redundancy, absence, limited movement, and disorder in form in hand, arm, foot, leg, finger and spine and those who have muscle weakness, bone disease, paralysis, cerebral palsy, spastic disorders and spinal bifida are in this group.

• Visually Impaired: A person who has visual loss or disorder in one eye or both eyes either completely or partially. Those who use eye prosthesis, are color blind, and whose who suffer night-blindness are also in this group.

• Hearing Impaired: People with hearing loss completely or partially in one or two ears. Those who use hearing aid are also in this group.

• Motor Speech Disorders: A person who has disorders in speaking, fluency of speaking, speed of speaking or voice for any reason. Those who cannot speak despite the fact that they hear; those whose larynx is removed; those who use speaking aids, stutterers, aphasia, disorders in tongue-lips-palatal-chin are also in this group.

• Mentally Impaired: Those who have mental retardation, Down syndrome, Phenylketonuria (if it caused mental retardation) are in this group.

• Chronic Disorder: The disorders which require constant care and treatment and that prevent a person's capacity to work and function (Blood diseases, respiratory diseases, urinary tract disease and reproductive organ disorders, skin disorders, cancers, endocrines, and metabolic disorders, mental behavior disorders, nervous system disorders, HIV).

1.4.2.2. Statistics about Disabled People

The developments in human rights following the Second World War paved the way for the disabled people to be noticed in the society. In line with the developments, a number of works were carried out in order to have disabled people to benefit from economic, cultural and social rights and statistical data on the disabled people was required (Çalık, 2011). Due to the fact that the term disability has several definitions, it has been very hard to collect statistical data. Hence, international institutions had to develop a definition, and then data was collected about the disabled people according to this definition.

First approaches to presume the disabilities were made by the WHO in 1974 and published in 1976. According to this publication, 10% of the world population was assumed to be disabled (Çalık, 2011).

Today, it is estimated that there are about 650 million disabled people in the world and almost all the countries have 15-20% disabled population (Employers Forum on Disability, 2011).

Disability proportion increases in parallel to the aging of the population. Accordingly, it is estimated that the state of being disabled in the continent of Europe, which has the most number of old people, will increase to 37% in 2050 from 20% in 2000 for the population of the people above 60 years old is also increasing. Such a condition brings forward the fact that the percentage of disable people will rise increasingly in the future especially in Europe (T.R Presidency, State Supervisory Council, 2009).

According to a research conducted by the Turkish Statistical Institute, the number of registered disabled people consist 12.29% of total population (Turkish Statistical Institute, 2002). The research states that there are 8,4 million disabled people in Turkey. 9.7% of the disabled people suffer from disorders of blood, respiratory system, urinary tracts and reproductive organ, skin, endocrine and metabolic, nervous system, mental behavior, and chronic diseases such as HIV and cancer. Orthopedics disorders with 1.25 %, mental disorders with 0.48%, 0.38% speech disorders, 0.37% aural disorders, and 0.6% visually impaired people follow respectively.

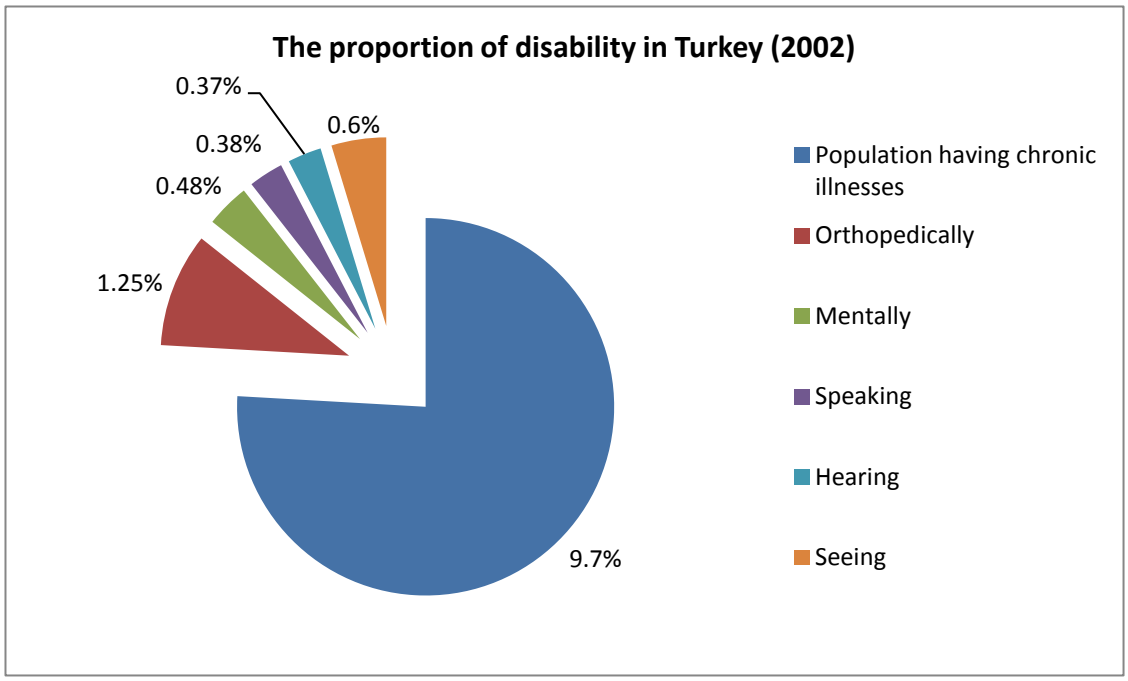

Figure 8. The proportion of disability in Turkey

The number of disabled people in Istanbul and Turkey increased between the years 1935 and 2000 in parallel with the population increase. As illustrated in Table 3, the total disabled population increased by 290% in Turkey general and by 1105% in Istanbul within 65 years (Murat, 2006).

Table 3. Change of the population of disabled people in Turkey and Istanbul according to years (Murat, 2006)

	Turkey			**Istanbul**		
Year	Total	Males	Females	Total	Males	Females
1935	315,677	186,817	128,860	13,140	8,233	4,907
1955	316,943	195,022	121,921	17,715	11,300	6,415
1975	588,267	355,557	232,710	61,312	32,706	28,906
1985	695,071	429,130	265,941	70,805	44,010	26,795
2000	1,234,139	730,405	503,734	158,436	91,695	66,741

1.4.2.3. How do Disabled People Live in Cities?

Human beings have fought with disability since their existence in the world and even in the societies with the most advanced technologies this problem could not be solved for the fact that state of being disabled or not is not originated out of the will of people. The burden that the disabled people have is generally suffered by the disabled people themselves or their family. However, disability is not a condition that concerns only the disabled person or his/her family. It concerns the entire society. The approach of the society towards the disabled people shows the society's level of advancement (T.R Presidency, State Supervisory Council, 2009).

The importance that the states give to the disabled is related to the level of civilization. Although it may seem controversial, the number of disabled on the street and avenues show how much importance the state gives to them (T.R Presidency, State Supervisory Council, 2009). Having the disabled in close and open areas in cities is not related to the number of the disabled people in that city, but with how the cities are livable places for them. It is assumed that in the countries where the disabled people are seen on the streets, in social areas, public institutions, and schools, there are no obstacles preventing the disabled people from being within the society (Figure 9).

Figure 9. Disabled people with wheelchair, who sustain their life without the need for the assistance of others - France Montpellier 2008 *(www.pedbikeimages.org / Ryan Synder)*

Only by seeing a disabled person, normal people can understand the problems of the disabled people in a city. The people with no disability generally ignore the problems of the disabled people or they try to understand the disabled people with just a single event.

The disabled people face many problems in cities with unplanned urbanization. Among these are: visually impaired people cannot cross the streets at traffic lights; they fall down from the high pavements; tackling to the obstacles beside the roads; wheelchair users cannot use the wheelchair because of the ramps and slopes on the street (Figure 10); not being able to get on transportations such as buses, taxis etc.; not being able to enter inside the public institutions due to lack of ramps; having the risk of death on account of too high slopes in some roads. In addition, the disabled people face problems such as being belittled, and

ostracized by the society. Because of all these problems, they live a life of "imprisonment" at home, or continue their life being dependent on the family.

Figure 10. A wheelchair user who has to use the bicycle lane because of wrongly designed ramp at a wide pavement – United States- in 2006 - (*www.pedbikeimages.org / Dan Burder)*

In a study titled "Research on the Problems and Expectations of the Disabled People, 2010" by TUIK institution in Turkey, the problems that the disabled people have in a city and their expectations were attempted to be found out. "National Database for the Disabled People" was formed in this study, and the study was completed according to this database. According to this study, the greatest problem that the disabled people have while walking on the street are related to pavements and pedestrian walkways. 66.9% of the participants in the study use pavements or pedestrian walkways and they stated that they face various problems. Besides, 66.3% of the participants stated that the building they live in are not suitable for the use of disable people; 59.5% characterized

the same way the stores, markets, and restaurants, 58.4% the public buildings, 55.5% the post office and banks, 43% parks and recreational areas, 38.4% the sport facilities, 33.4% cinema, theatre and so on, and 28.1% the holiday places and hotels (Turkey Statistical Institute, 2011). Accordingly, the most significant problems that the disabled people face in urban life is pavements and pedestrian walkways.

Association of Visually Impaired People (GÖZDER) has argued that the visually impaired people in Istanbul cannot walk even in the most developed and central districts of Istanbul, and that the width and height of the pavements are not sufficient. The association also stated that whenever the visually impaired people attempt to walk on the pavements alone, they have accidents and often get injured due to broken surfaces and objects on the pavements. They went on telling that in order to express the problems of the disabled people in the city, they organize demonstrations in different parts of Istanbul every month (Figure 11).

Figure 11. Demonstrations carried out by visually impaired people

1.4.3. Standards for Disabled People in Cities

In order to have physically impaired people to participate in social life, it is essential for cities to have some architectural standards. These standards are concerned with ergonomic design of all open and close areas of the city. To have the disabled people join social life without the assistance of anyone, it is

important to redesign public areas and places minimizing the problems that limit the movements of people (Mülayim, 2009).

It is indispensable for buildings to have ramps at the entrance of the buildings, and that the doors, elevator, transportations, bus stops, parking lots, and pedestrian passages must be suitable for the use of the disabled people. The pavement segments are crucially important to have disabled people join the social life for the fact that pavements are the most significant places used for socialization in cities.

It is essential that the height and width of the pavements, the electricity poles on the pavements, trees, and rubbish bins, sitting benches, fountains and signalization must have certain standards. In addition, especially for those using wheelchairs, the ramps at the beginning and the end of the pavements must be suitable and there should be no broken surfaces on the pavements.

This section will emphasize on removing the obstacles on the pavements completely and what type of pavement segment is required for the ergonomic condition of the disabled people in line with the standards in Turkey and in the world. Details about the width, height, ramp, surface covering the pavement, rearrangement of pavement edges and the slopes on the pavements will be dealt with under the title 'Pavements'.

1.4.3.1. Pavements

Pavement is a name given to a section paved with stones beside the streets and lanes and has certain height and width and is separated from the motorways in order to secure the safety of the pedestrians. Pedestrian pavement in TS (Turkish Standart) 12576 is defined as a place between motorway and the properties of legal entities or private persons, and which is separated from the motorways with border stones (Turkey Statistical Institution, 1999). The basic task of the pavements is to connect different places, structures and activities outside (T.R Prime Ministry, Directorate of the Administration of the Disabled

People, 2010). Hence, it is vitally important to keep the usage of all people into consideration while constructing pavements. There should be required arrangements especially for their use by the old and disabled people.

1.4.3.2. The Width of the Pavements

The width of pavement with no object on it should be 1.5 meter minimum and 2 meter ideally. The same width should be 3 meters at the bus stops and 3.5 meters in front of the stores (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2008).

TS 12576 standards for the width of pavements are as follows (Turkish Statistical Institute, 1999).

1.2.1 – *The width of pedestrian pavements must be sized depending on the density of usage, type and group of the road, and must be constructed in accordance with TS 7937.*

For all the pedestrians to move freely, the pavement width must be minimum 150 cm in addition to the length of the width, there must be 25 cm extension of emergency lane beside a property and 50 cm at the side of the border stone. Depending on the width and road group, the emergency lane could be extended to 50 cm beside a property and 120 cm at the side of the border stone (Figure 12).

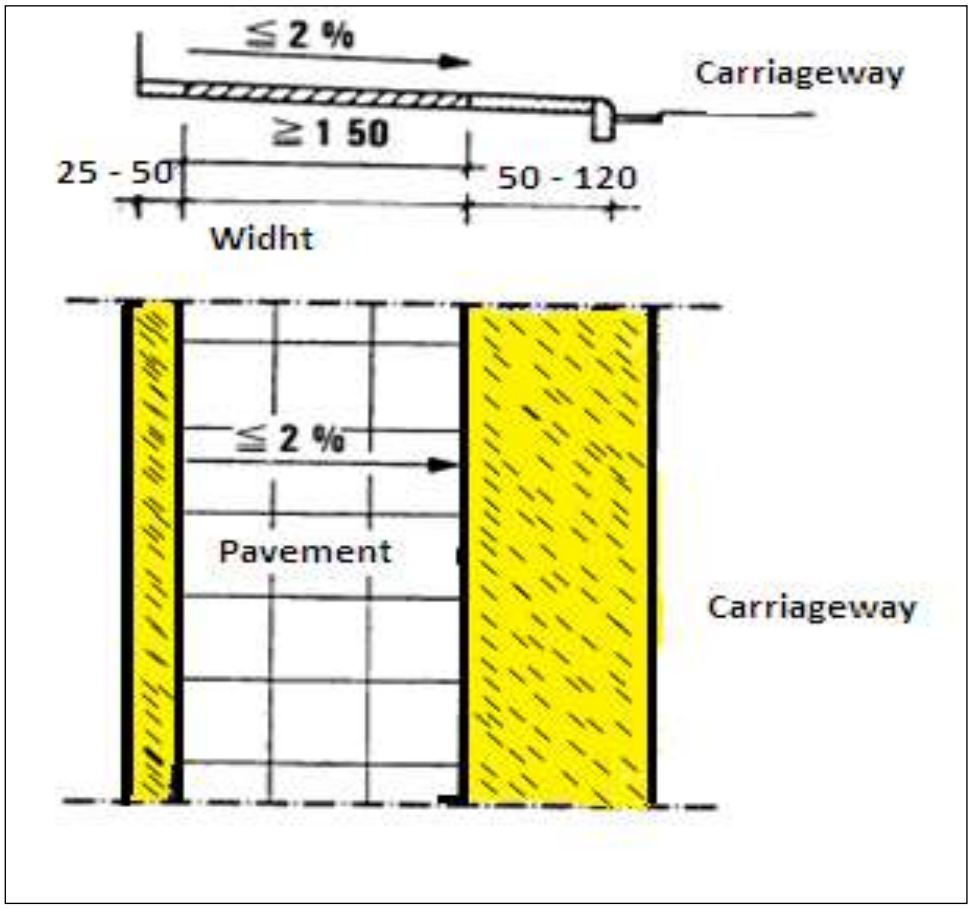

Figure 12. The width of pedestrian pavement and emergency lanes (TS 12576 amended) (Turkish Statistical Institute, 1999)

1.2.1.1 *– The intensity of the pedestrian: In the roads up to d = 0.3 pedestrian/m², on conditions that the pedestrians do not have to overpass each other, the width of pedestrian pavement is given in Figure 15, no object must be placed on the pavement that could prevent the passage of the pedestrians.*

1.2.1.2 *- The intensity of the pedestrian: In the roads up to d = 0.6 pedestrian/m², on conditions that the pedestrian walk freely in normal pace and in condition to pass one another easily, the width of pedestrian pavement is given in Figure 15; pole such as lighting could be placed.*

1.2.1.3 *- The intensity of the pedestrian: In the roads up to d = 1.0 pedestrian/m², when the easiness in passing one another decreases in the movements, and steps among the pedestrians, and the intersections increases; lighting beside the pedestrian pavement, poles, trees etc. could be arranged appropriately (Figure 13).*

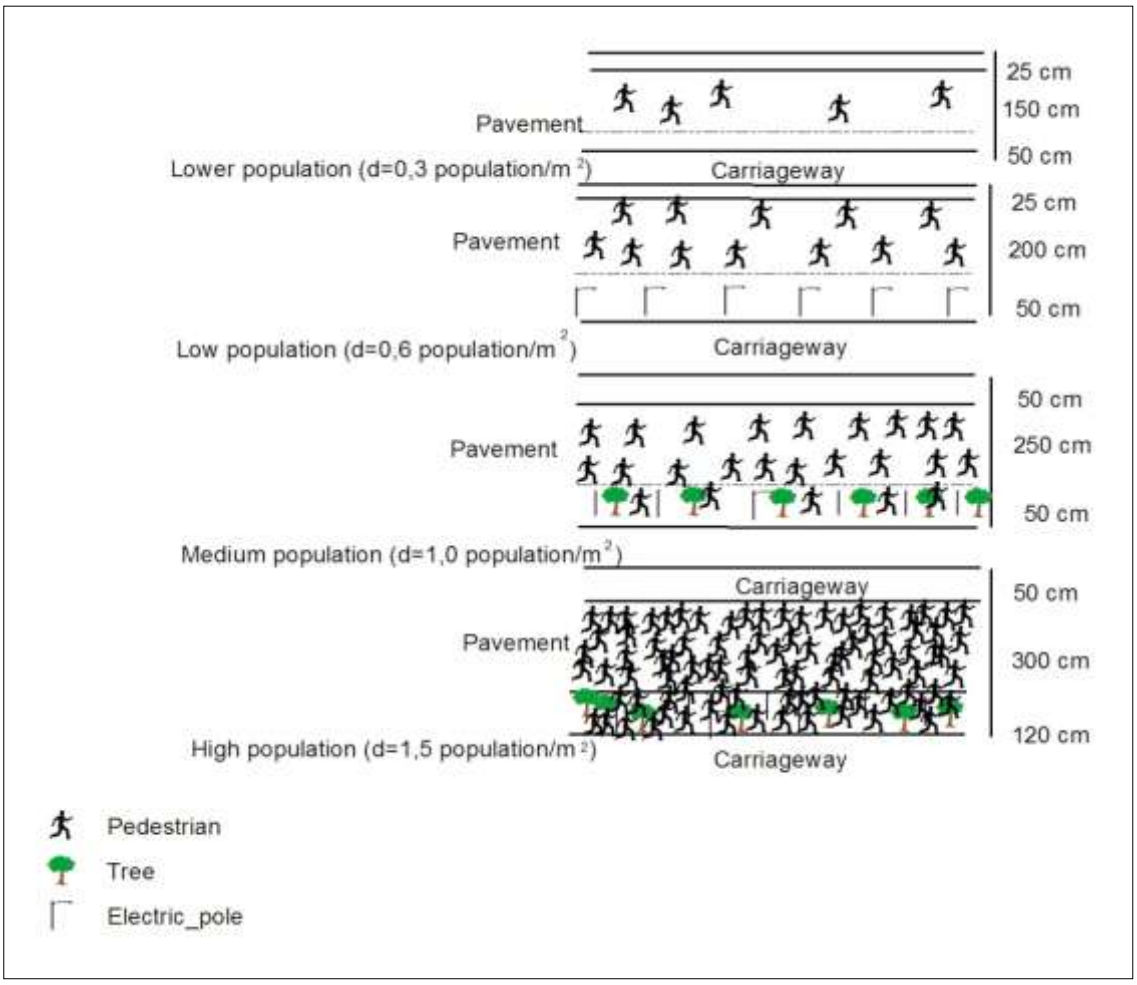

Figure 13. Pavement standards according to pedestrian intensity (Data obtained from TS12576 was redrawn)

1.2.1.4 *– In the roads where pedestrian intensity is as much as d = 1.5 pedestrian/m² such as sports, cinema, art, theatre, school and show places, the steps are limited, the pace reduces, intersections and jamming increase free and comfortable walks, the pedestrians walk in random steps in a way of zigzag or without crashing each other. In order for lighting poles and trees not to obstruct, a lane must be formed at the side of motorways on pedestrian pavements (Figure 13).*

1.4.3.3. The Height of Pavements

The border stone height at the pedestrian pavements must be maximum 15 cm higher and minimum 3 cm higher than the traffic way (Turkish Statistical Institute, 1999); (Figure 14).

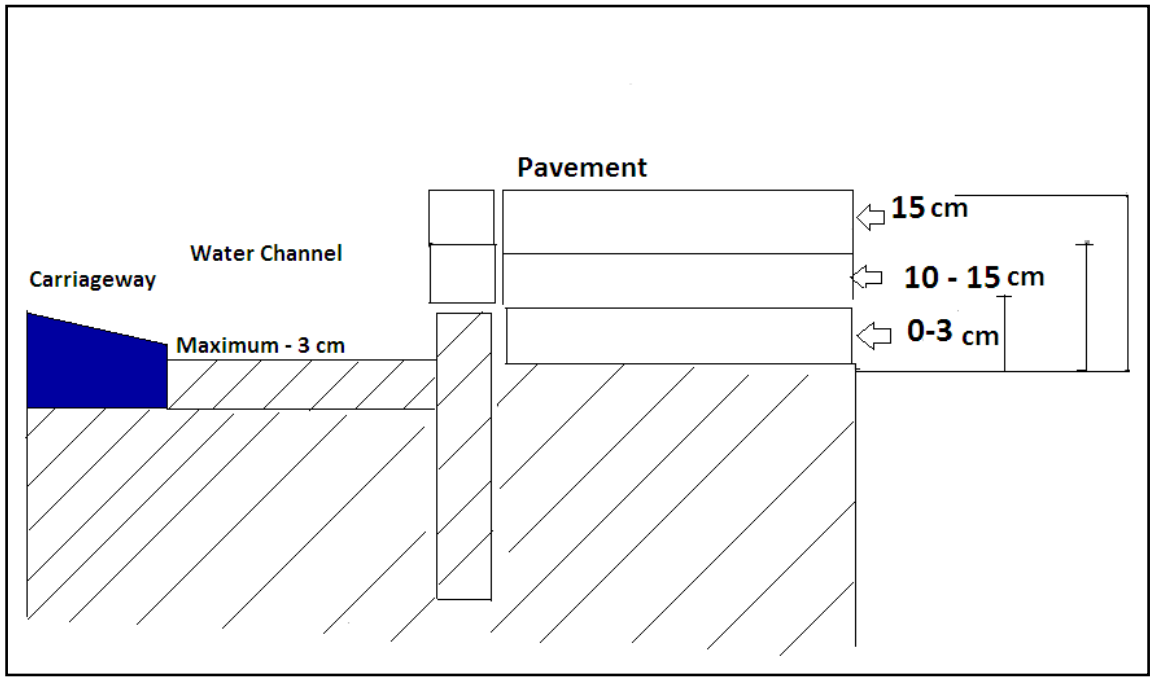

Figure 14. The height of pavement

Physical obstacles affect regular people as much as the physically impaired people. Hence, city planning, city designs and all types of arrangements in a city must be done in a way to meet the needs of all people in the city. There are some principles under the title "universal design" to have all people use places in a city easily (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010). Seven Principles of this design are listed below (Scott at al. 2001).

- *Equitable Use: The design is useful and marketable to people with diverse abilities.*
- *Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.*

- *Simple and Intuitive Use: Use of design is easy to understand, regardless of user's experience, language skills, or current concentration level.*
- *Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.*
- *Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions*
- *Low Physical Effort: The design can be used efficiently and comfortably, and with a minimum of fatigue.*
- *Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.*

By applying the principles of universal design, all the obstacles in the city will be removed for the physically impaired people, and all the citizens will benefit from the social facilities equally as required by a social state.

1.4.3.4. Designing Turning Points for Wheelchair Users at Pavements

While designing the width of the pedestrian pavement, minimum measurements that would let wheelchair users turn around an obstacle easily must be considered; and thus must be designed in accordance with these measurements (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010). Minimum required width for a non-moving wheelchair is 815 mm and for moving one it is 915 mm (United States Department of Justice, 1994). On the other hand, the same width at Facility Accessibility Design Standard is 1100 mm for a single wheelchair; and it is 1370 mm for a pedestrian and a wheelchair; however, it is stated as 1830 mm for two-wheelchairs (Figure 15).

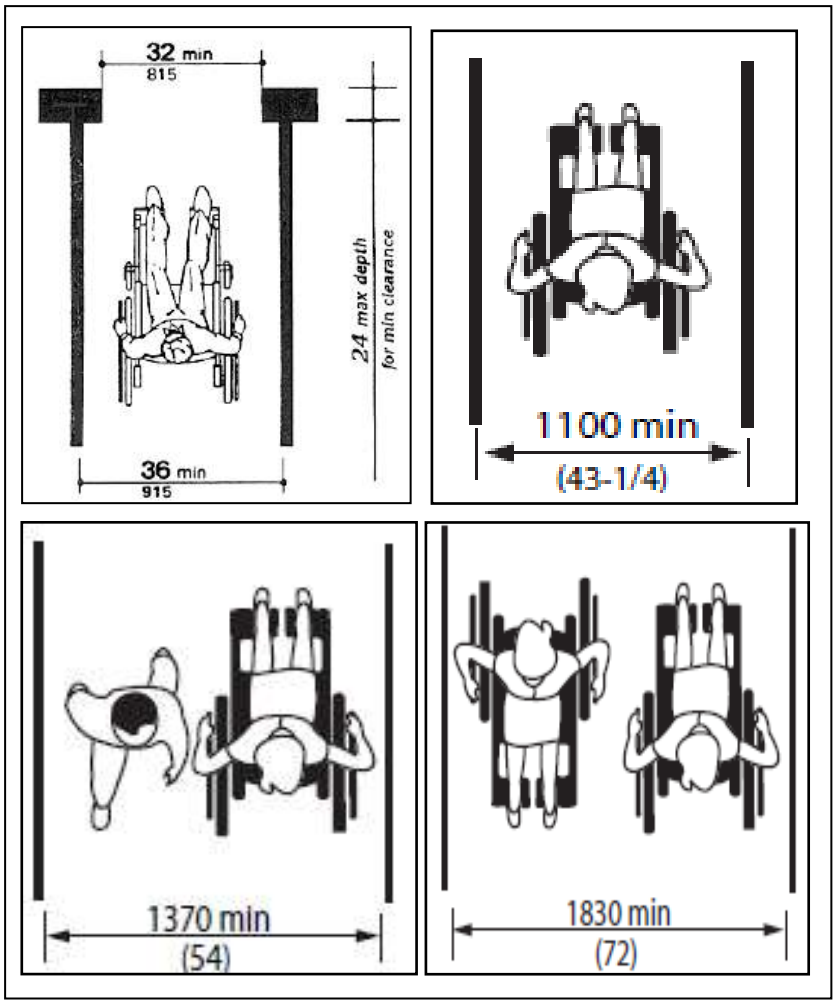

Figure 15. Pavement sizes for wheelchair users

In order for wheelchair user to turn 90º, 180º, 360º and or to make a 'U' turn comfortably on a pavement, the pavements of the following sizes are required. These figures and sizes have been cited from TS 12576 (Figure 16 – 17 – 18 – 19).

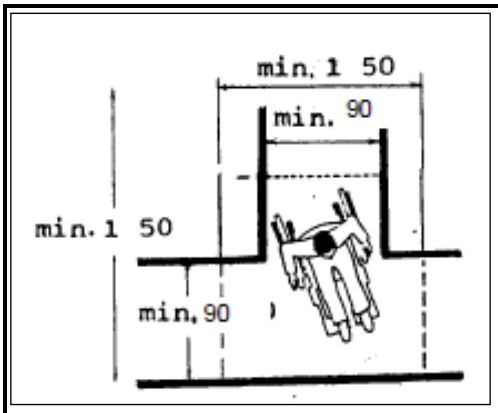

Figure 16. Turn at 90 degree angle

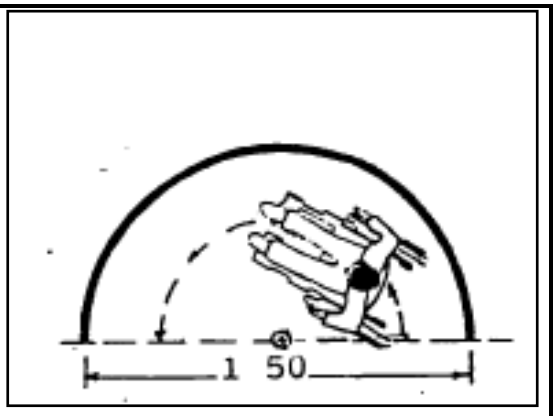

Figure 17. Turn at 180 degree angle

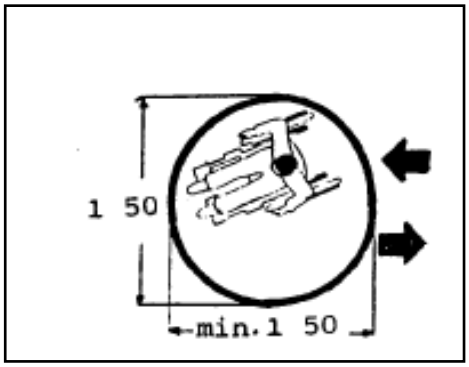

Figure 19. Turn at 360 degree angle

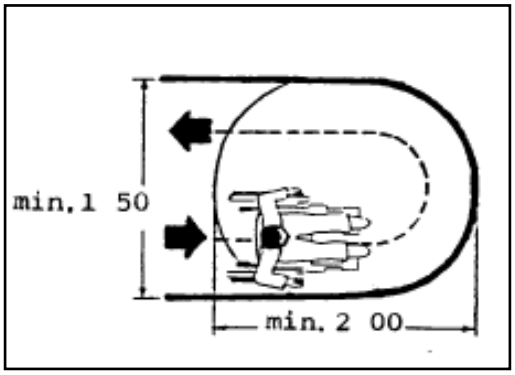

Figure 18 U turn

As against these standards, it is stated that for a 180º turn, the width of 1525 mm in ADA standards (Figure 20) and 2000 mm length and 2440 mm width in 2007 Facility Accessibility Design Standards are required (Figure 21).

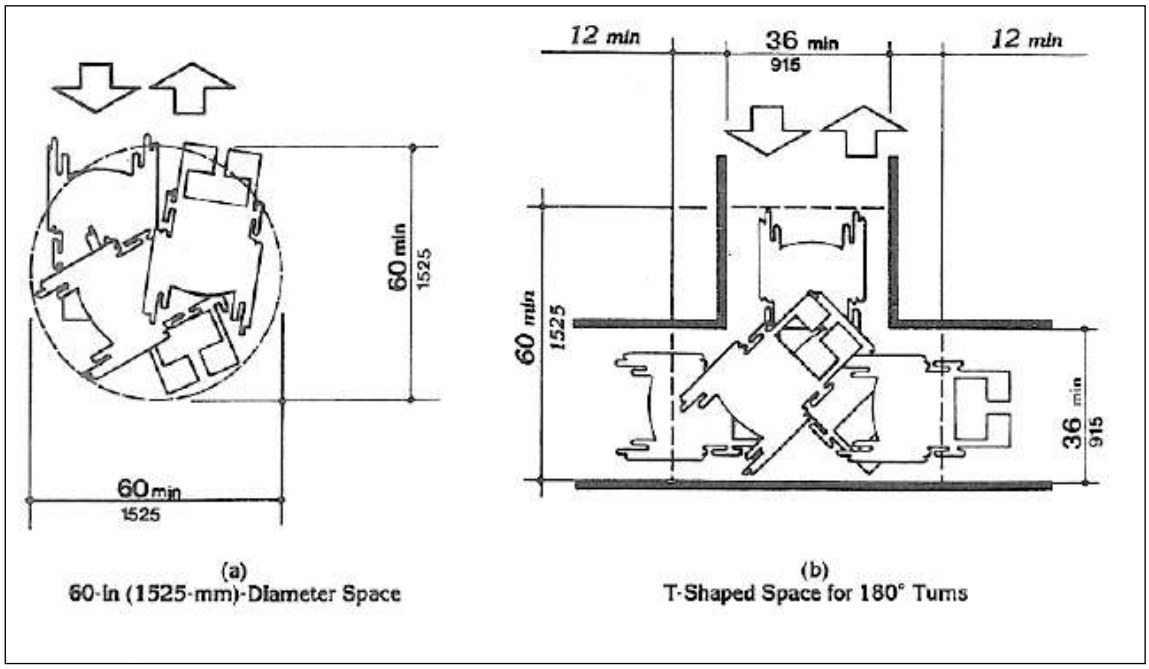

Figure 20. In ADA standards, necessary sizes for a 180º turn

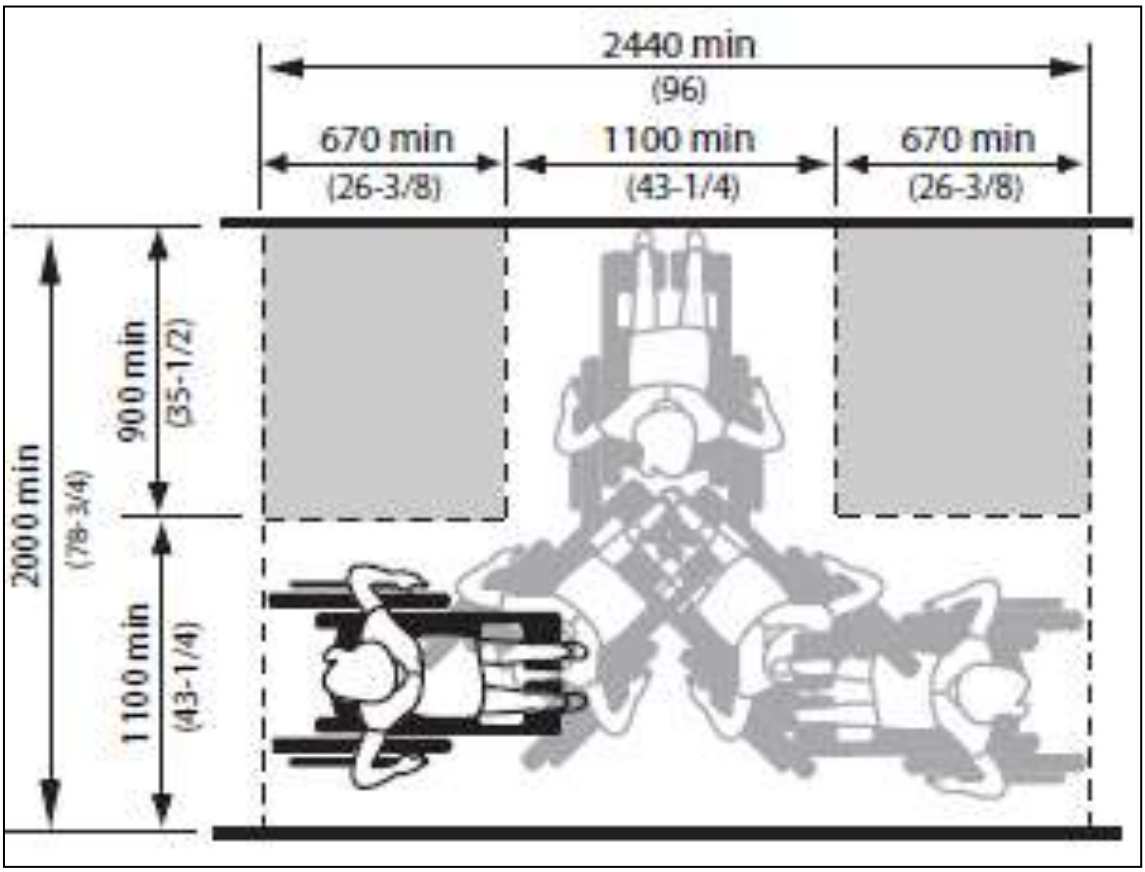

Figure 21. Required measurements for 180º turn in 2007 facility accessibility design standards

In order for a wheelchair user to turn around whenever he or she comes across an obstacle, 110 cm width and 122 cm pavement length are needed according to both TS 12576 and Facility Accessibility Design Standards (Figure 22).

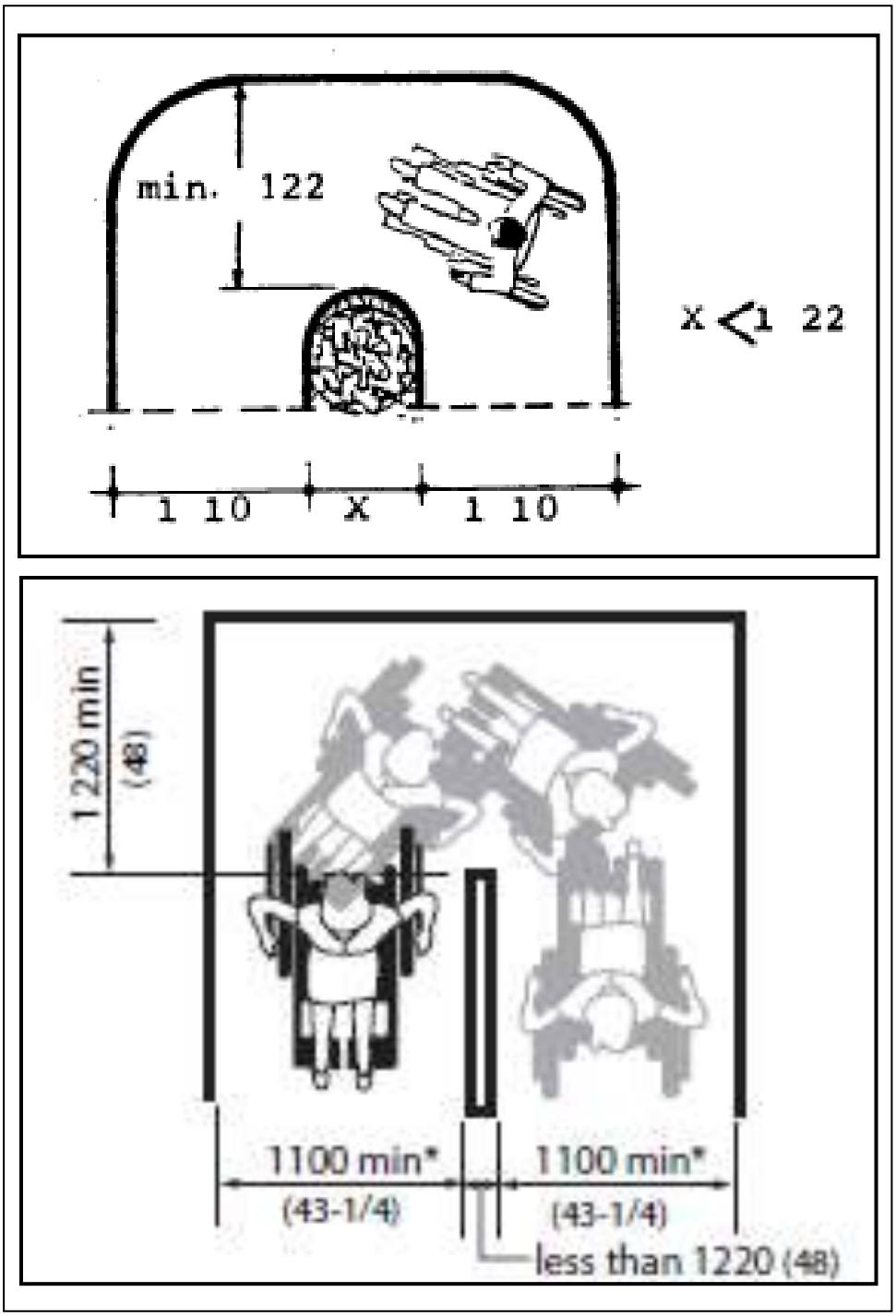

Figure 22. Required pavement measurements when wheelchair users come across and obstacle on a pavement

1.4.3.5. Slope of the Pavements

It is generally agreed that the slope of the pavement edge must not exceed 5%. On the other hand, the Swedish Association of Local Administrations has argued that the slopes at the edge of the pavements must be 2.5% and any inclination exceeding this may cause problems for wheelchair users (European Conference of Ministers of Transport (ECMT), 2006). Administration of the Disabled People in Turkey stated that the slopes at the edge of the pavements must be below 2% (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010).

1.4.3.6. Arrangement of Pavement Edges

The arrangement of pavement edges in Turkey is governed by TS 12576 and in pavement constructions, the pavements edges are in line with these standards. Accordingly, the following rules are asserted at the title TS 12576 1.2.4. Arrangement of the Pavement Edges:

- *Depending on the width of the pedestrian pavement, the trees to be planted between the carriageway and the pavement edges must be in accordance with TS 8146 (the place to be protected for the trees at the pavement stated in TS 8146 City Road and Square Forestation Rules: The measurements of the soil surfaces on the root spreading area is 100 cm to all directions starting from the centre of the tree trunk diameter).*
- *Electricity poles, traffic light poles, decoration plants, vases, pedestrian banisters must be placed at a straight line on a lane with minimum 75 cm, and maximum 120 cm width including the border stones (Figure 23).*

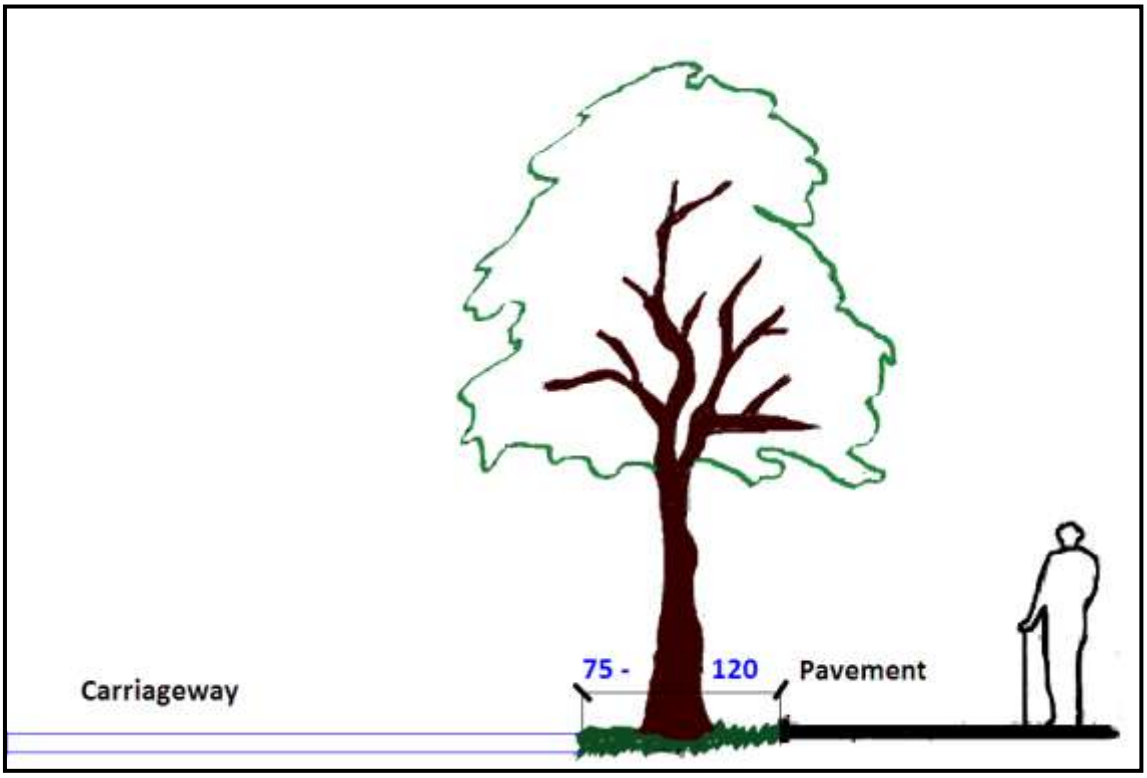

Figure 23. Forestation in pedestrian pavement - Obtained from TS 12576 and redrawn. Measurement unit is cm.

- On condition that there is a difference of level at the possession limit, banisters must be built between the pavement and the garden.

A comprehensive work was carried out, in order to have the disabled people not to face any problem related to pavement edge arrangements (SOLIDERA, UNESCWA, Ministry of Social Affairs, Lebanon, 2004). Accordingly,

- Signboards, city furniture, trees, electricity poles, and commercials on the pavements must be placed 10 cm above the pavement (Figure 24).

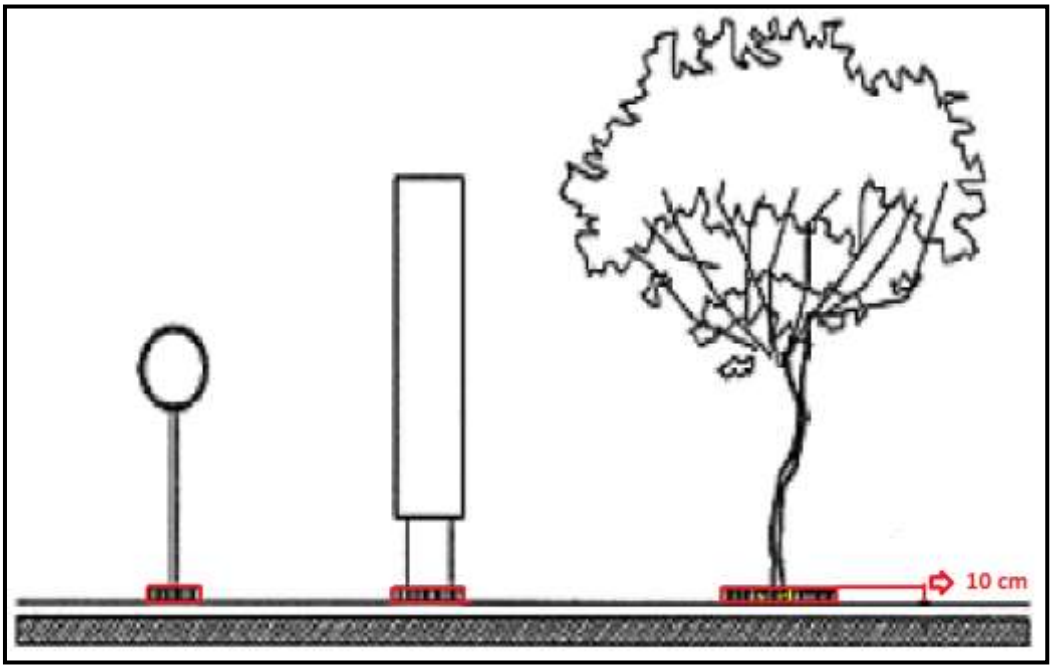

Figure 24. Lift the level of the elements of design at the edge of a pavement

- Around the elements of design such as signboards, tree spot, lighting poles, a design of difference of 0.60 cm must be formed (Figure 25).

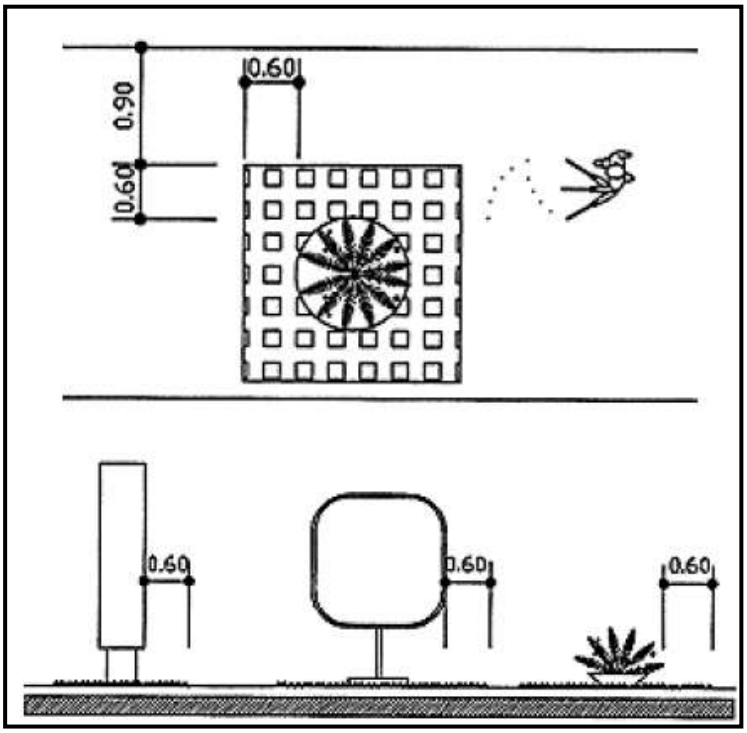

Figure 25. Construction of the design of difference around the elements of designs at the edge of a pavement

- In order to have regular individuals especially visually impaired people are not to have any problem on the pavement (crashing into signboards, tree branches entering into eyes), the branches of trees and the signboards must be 2 meters above the ground (Figure 26).

  Especially the tree branches must be cut at particular times to prevent likely accidents.

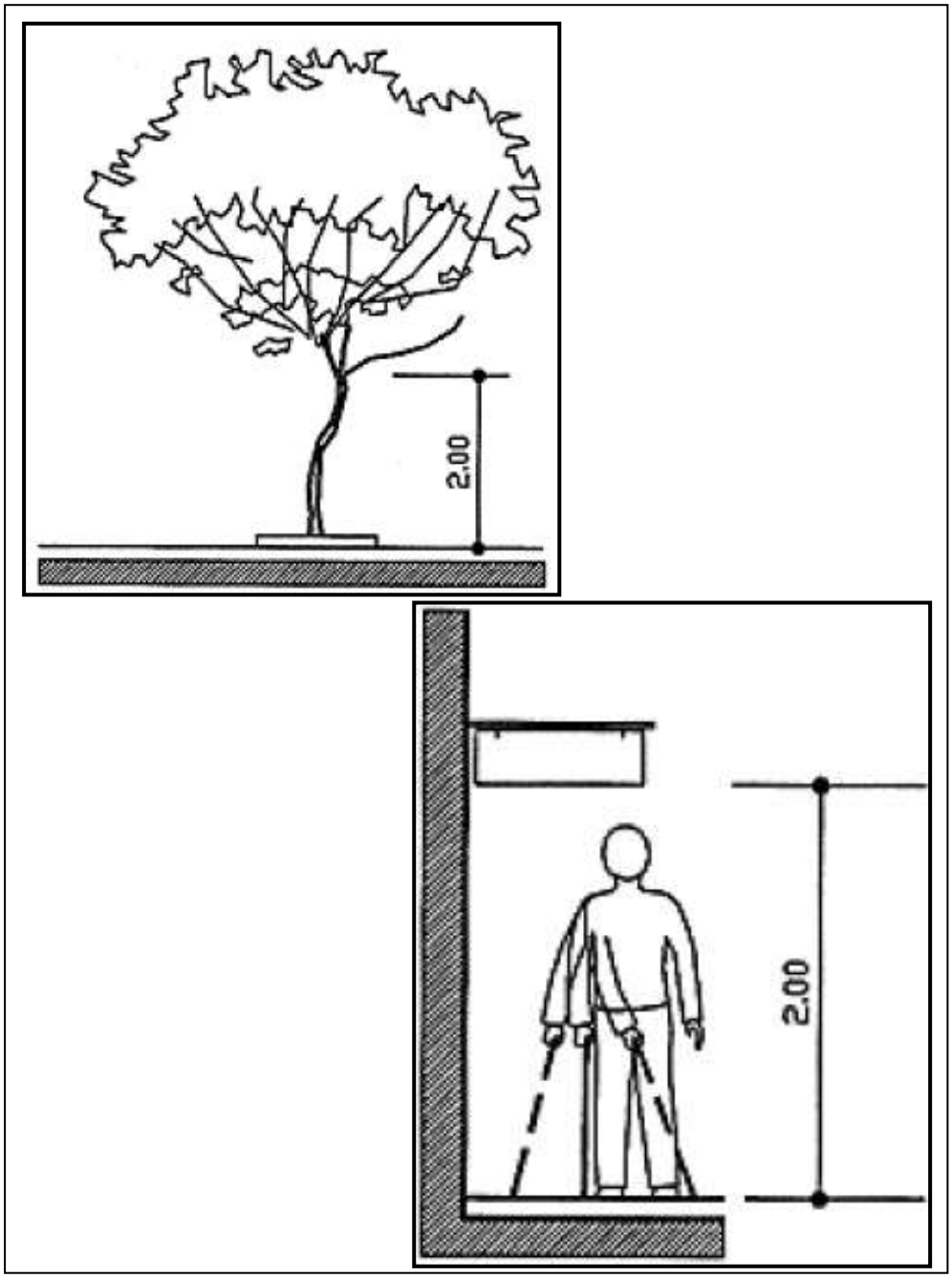

Figure 26. The height of trees and signboards at the edge of pavements

1.4.3.7. Ramps

Ramp means, "A walking surface which has a running slope greater than 1:20 (5%) (United States Department of Justice, 1994).The ramps, which were built especially for the old, the visually impaired and baby carriages, are constructed to overcome level differences on the walkways securely (Figure 27).

Figure 27. A sample of a secure slope – Washington – U.S. (www.pedbikeimages.org / Dan Burder)

Ramps are generally located at the intersections; however, there are also ramps in roadside parks, loading places, bus stops and in the middle of the streets (U.S.Department of Transportation Federal Highway Administration, 2001).

The ramps that provide passage between streets and pavements, and those for the wheelchair users are crucially important (U.S.Department of Transportation Federal Highway Administration, 2001). Turkish Standards number TS 12576 states the necessity for the disabled people to use the ramps easily. Accordingly;

"In order to have disabled people not to face any difficulty in overcoming level differences at pedestrian pavement, these roads must have slopes that allow for disabled people to move easily and comfortably" (Turkish Stastical Institute, 1999).

1.4.3.7.1. Classification of Ramps

Ramps are classified as follows: straight ramp, ramp with 90° and ramp with 180° (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010; Figure 28).

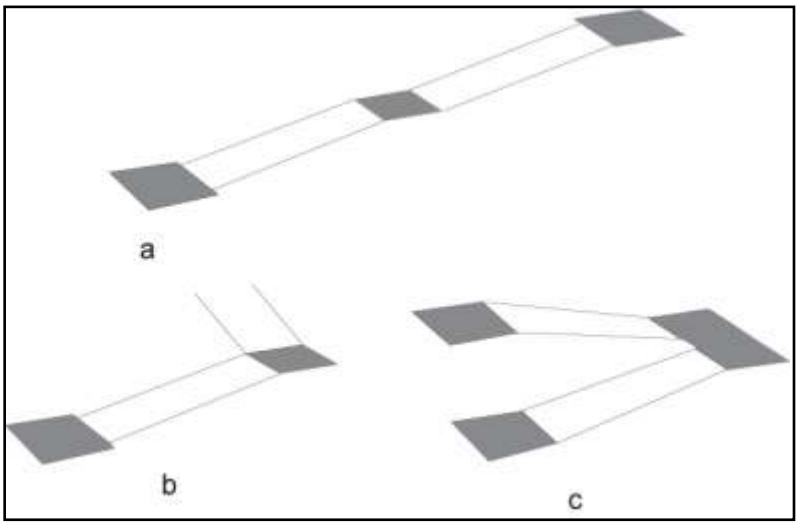

Figure 28. Types of ramps

The ramps to be built on the pavements in Turkey must be constructed according to Figure 29 (Turkish Statistical Institute, 1999).

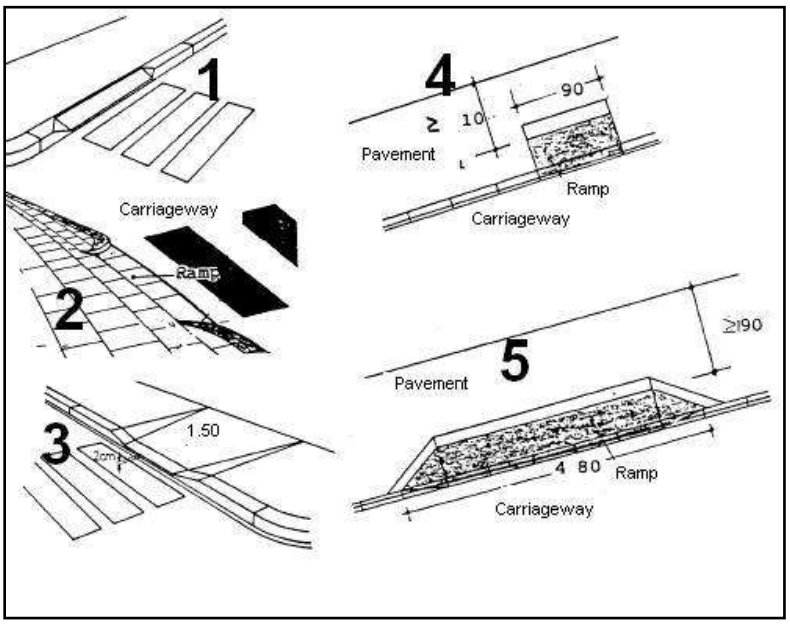

Figure 29. Ramps to be built on pavements in Turkey

1.4.3.7.2. The Width of Ramps

The width and sizes of the ramps in Turkey vary depending on the number of people to use them, the level of difference to be overcome and the type of ramp (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010). There is no standard value for the width of the ramps in the world. Various sources state ramp width to be minimum 90 cm (Ferneeuw, 2005), 915 cm (United States Department of Justice, 1994), 120 cm (Turner, 2006), 122 cm (Steblin, 2007), and maximum 120 cm (Ferneeuw, 2005), 150 cm (Steblin, 2007); (Figure 30).

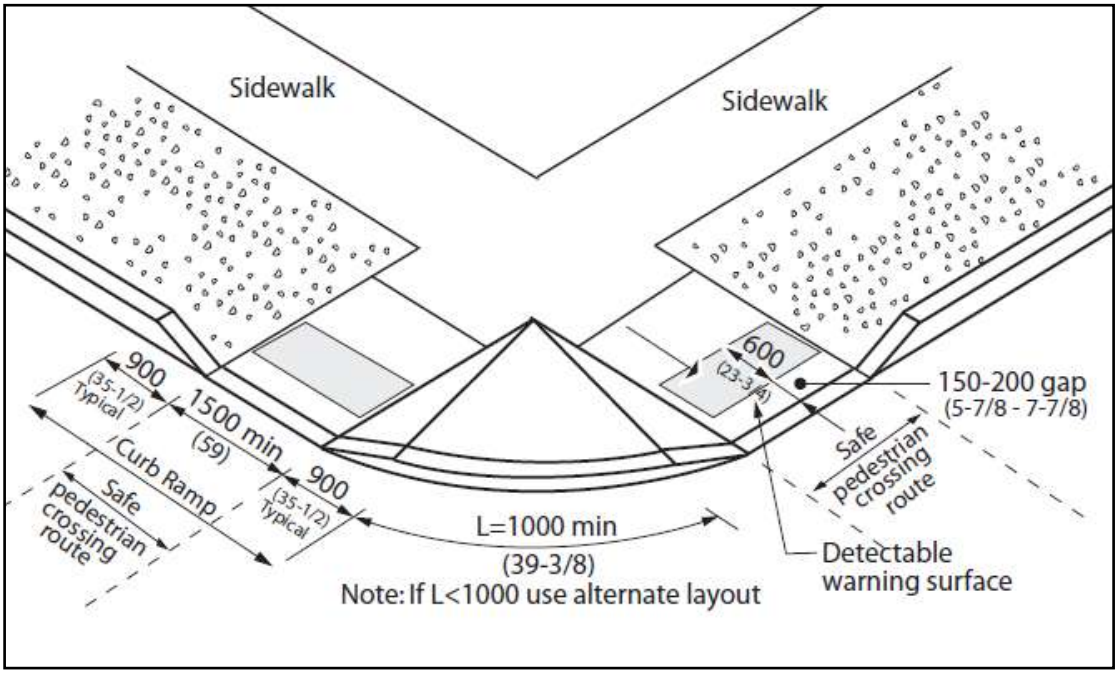

Figure 30. Standard curb ramp (Steblin, 2007)

In standard number TS 12576, it is stated that *"the ramps must be built in a way to allow two wheelchairs moving in opposite directions to pass which requires a minimum net passage width of 180 cm" and "in ramps exceeding more than 10 meters in length and 50 cm in height, or if there is a connection from one ramp to another, there must be recreational areas of minimum 250 cm."*

1.4.3.7.3. Slopes in Ramps

The slopes in ramps are vitally important for wheelchair users. Furthermore, excessive slopes in ramps cause unexpected accidents for the strollers, scooters, and skateboarders as well as for old people, and children (Figure 31).

Figure 31. A sample of a dangerous ramp in the study area

The slopes of the ramps must be between 2% and 5%. However, if the slope of the ramp cannot be reduced technically, the slope could be maximum 8% (Steblin, 2007). A study carried out by the United Nations in 2004 argued that the inclination of a ramp should not exceed 10% or else wheelchairs may fall from the ramps (T.R Prime Ministry, Directorate of the Administration of the Disabled People, 2010); (Figure 32).

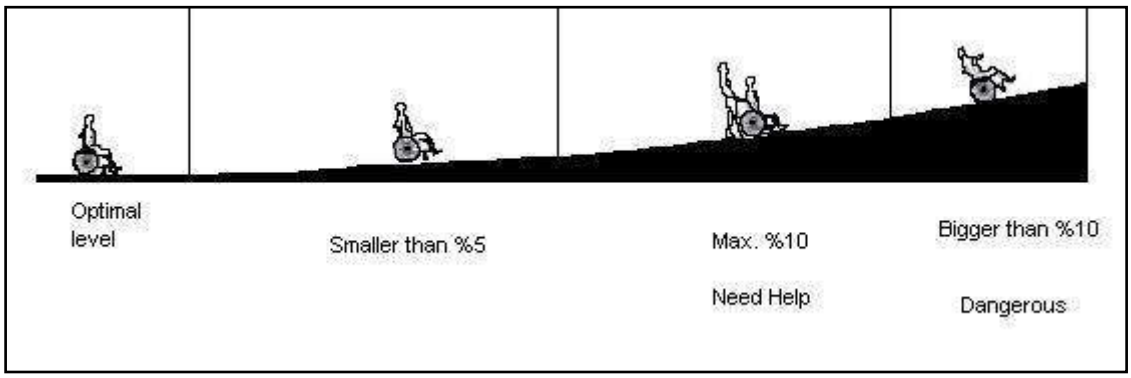

Figure 32. The slope of ramp (obtained and altered from TS12576)

The standards for the slopes of the ramps in Turkey are defined under TS12576 Accordingly:

- *The slopes of the ramps must be built as comfortable and safe as possible considering wheelchair users and old people with walking stick. They should never be steeper than 8% (1:12) (Figure 32).*
- *The slope of a ramp must be at minimum level. The maximum slope depends on the slope that a wheelchair user can overcome. If there is a level difference above 20mm, a ramp must be considered.*
- *In the ramps longer than 10 m and higher than 50 cm, or if there is passage from one ramp to another, minimum 2.50 m area for relaxation must be built. The slope of the ramps with maximum 10 m length must be maximum 8%. However, the same ratio must be 6% for the ramps longer than 10 meters. Sitting benches must be placed in relaxation places on the ramps (Figure 33).*

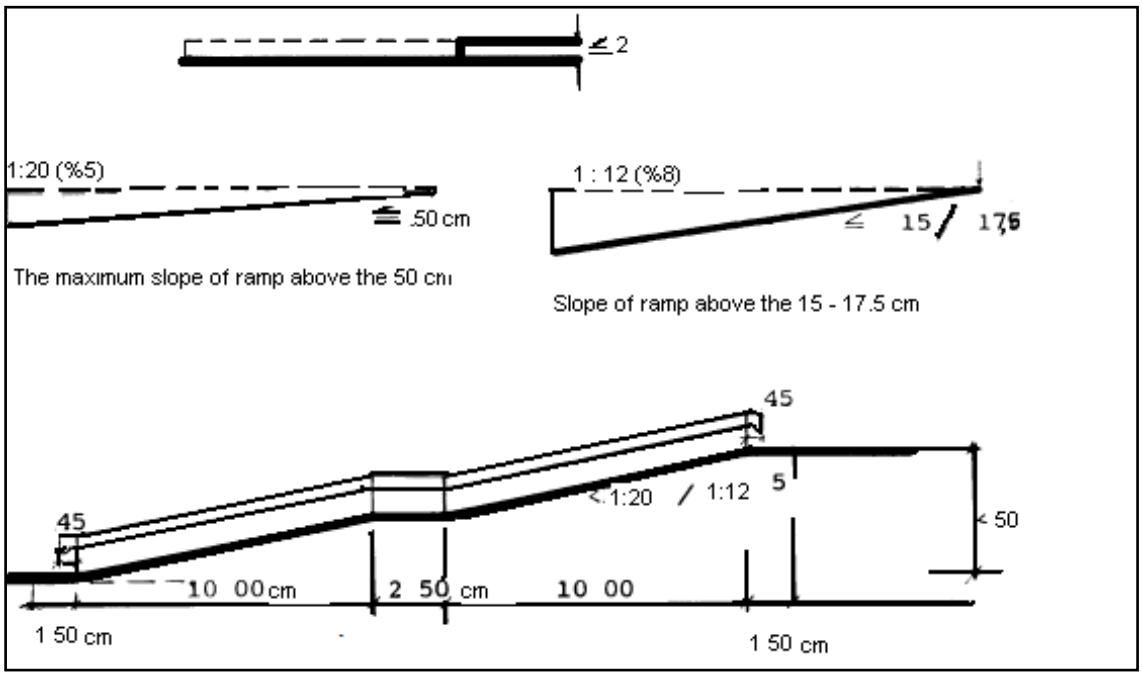

Figure 33. The slope of ramp and recreational areas (obtained and altered from TS12676)

- *If required, ramps with steps must be built. Effective slope in stepping ramp could be increased to 1/7 - 1/6 depending on the distance between steps (Figure 34). The height of steps must be 3 cm for the disabled people who use wheelchair. However, if it is not built in such a height due to the slope, there must be a slope of 90 cm at the beginning of the stop in a way illustrated in Figure 34.*

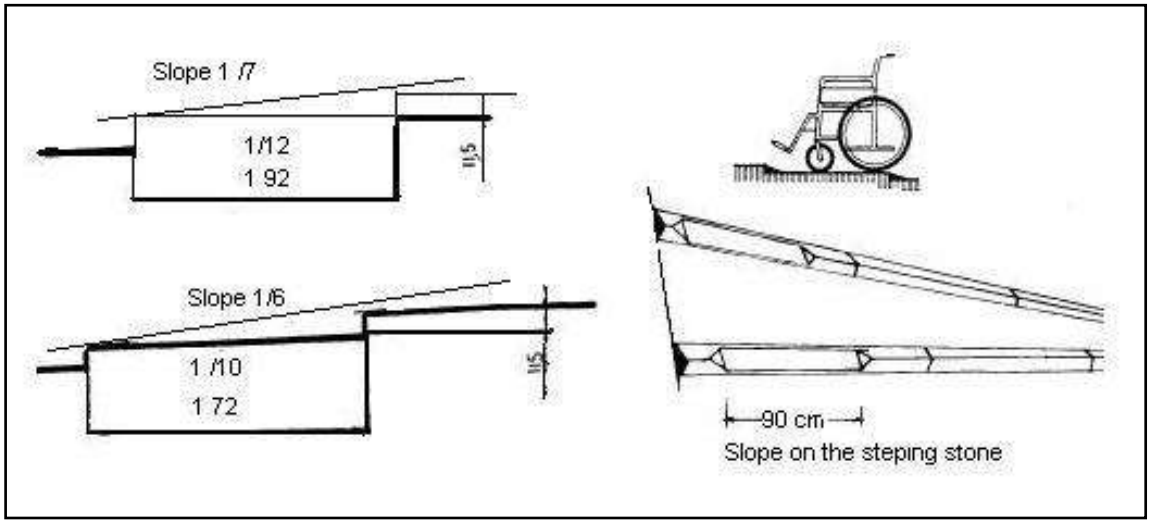

Figure 34. Slope on the stepping stone – It is redrawn taken from TS 12576. Unit of measurement is cm.

1.4.3.7.4. Slope Surfaces

For safety reasons, slopes should have smooth, perceptible and anti-skidding surfaces. In Turkey, the followings are taken in consideration especially for the surfaces of the ramps (Turkish Statistical Institute, 1999).

1. There is a smooth place of 150 cm length in different design at the beginning and the end of ramps.
2. The surfaces of the ramps must be covered with hard, stable, non-skidding materials with very little roughness (Figure 35).

Figure 35. Issaquah Highlands, Washington in 2006 (www.pedbikeimages.org / Dan Burder)

3. There must not be difference of more than 20 mm at the roughness heights on the surface.

CHAPTER 2: RESULTS

Data, obtained from study area, was analyzed with the use of a computer and numerous conclusions were drawn. Total of 3018 pavement segments were recorded in the study area. Their total length was calculated as 251,122 meters. However, the length of the pavement segment that could be used in study area was 67,075 meters (1118 pavement segment). Accordingly, 26.7% of all the streets and lanes have no pavement and the pedestrians face difficulty in walking on the roads (Figure 36, 37).

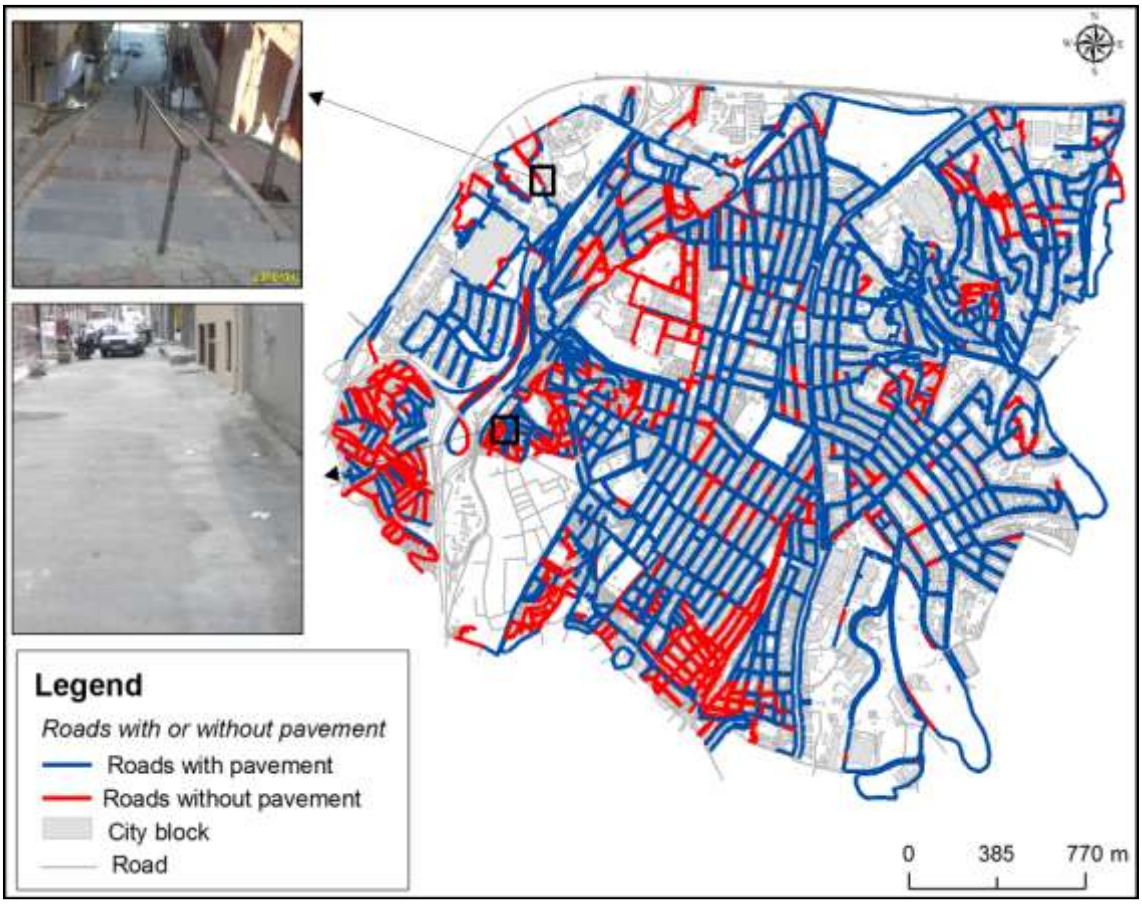

Figure 36. The streets did not include pavements

Figure 37. The streets did not include pavements

The study analyzed the distribution of pavements in the neighborhoods. According to this analysis, the neighborhood with the highest ratio of pavement segment is 19 Mayıs neighborhood with 89.2%. This is followed by Teşvikiye (85.3%), Halil Rıfat Paşa (84.9%) and Feriköy (76.5%) neighborhoods respectively. The neighborhood with the least percentage of pavement segments is Mahmut Şevket Paşa with 28.3 %. Then follow Kaptanpaşa with 30.3% and Eskişehir with 32.3% (Table 4).

Table 4. The number of pavement segments in respect to the neighborhoods

District	Roads with pavements	Roads without pavements	Total	As a percent of the distribution of pavement areas
19 Mayıs	133	16	149	89.2
Teşvikiye	152	26	178	85.3
Halil Rıfat Paşa	79	14	93	84.9
Feriköy	137	42	179	76.5
Duatepe	65	20	85	76.4
Halaskargazi	41	13	54	75.9
Ergenekon	41	14	55	74.5
Harbiye	66	25	91	72.5
Merkez	236	90	326	72.3
Cumhuriyet	89	36	125	71.2
Meşrutiyet	102	43	145	70.3
Fulya	191	86	277	68.9
Bozkurt	63	37	100	63
Halide Edip Adıvar	92	57	149	61.7
Yayla	93	79	172	54
Paşa	179	153	332	53.9
İnönü	75	67	142	52.8
Eskişehir	68	142	210	32.3

Kaptanpaşa	26	40	66	30.3
Mahmut Şevket Paşa	76	192	268	28.3

2.1. The Objects on the Pavements

All the pavements in the study area were carefully observed and all the objects in these pavements were assessed and classified according to their types. The number of total objects on the streets is 14,594. The objects on the streets and the ones causing obstruct are illustrated in Figure 38.

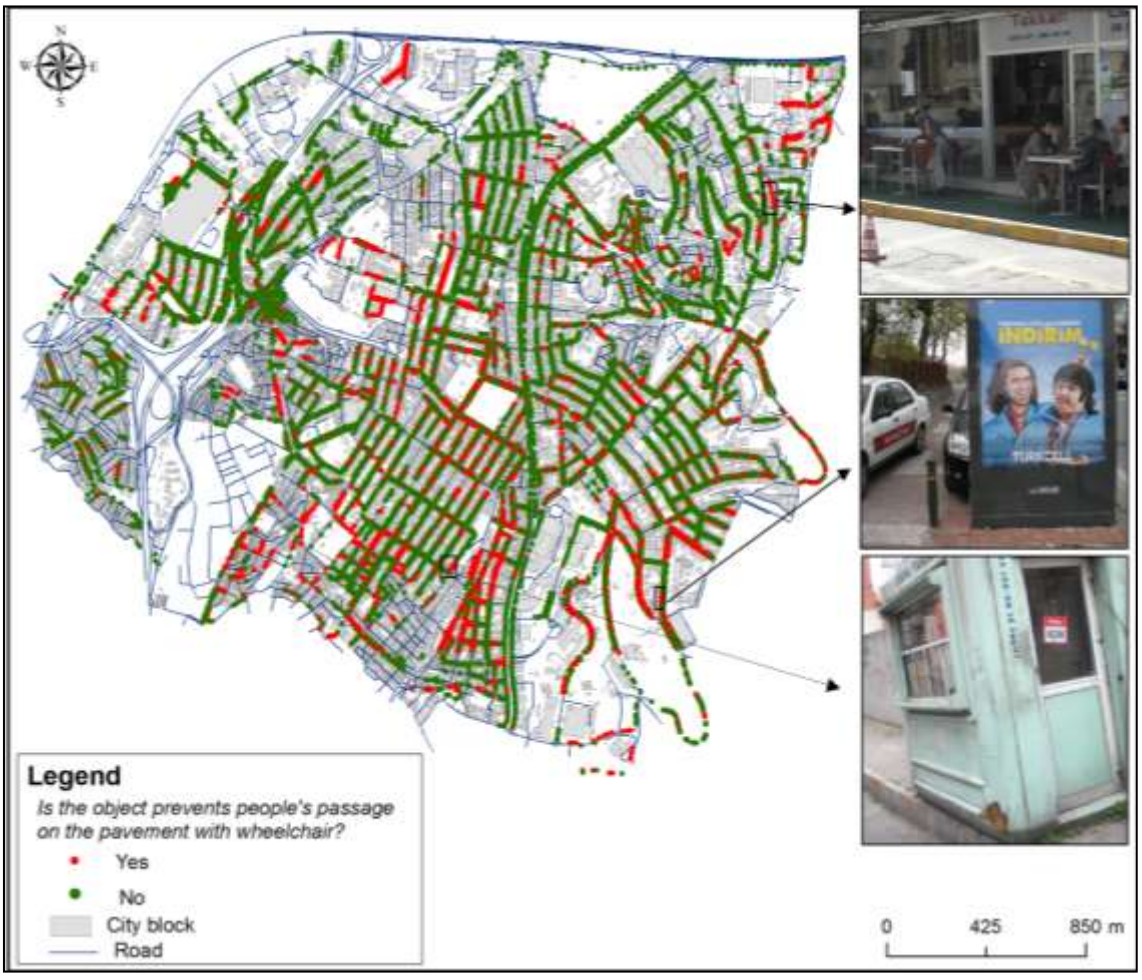

Figure 38. The pavement segments which include objects that prevent or not prevent disabled's passage on the pavements

Table 5. The objects occupied the pavements in the study area

Objects on the pavements	***Number***	***%***
Tree	6719	46
Electric pole	3453	23.7
Mushroom	2365	16.2
Motor vehicle	1152	7.9
Stand	391	2.7
Billboard	120	0.8
Buffet	101	0.6
Trash Bin	36	0.3
Others	257	1.8

Trees represent of 46% of the obstacles detected on pavements. Then come electric poles with 24.2% and mushrooms with 16.2% (Figure 39). Last are trash bins. The percentage of trash bins to the total ratio of the objects is 0.2% (Table 5).

The objects in the study area are illustrated on the map below with symbols in a part of the study (Figure 40).

Figure 39. The pavement segments which include objects

Figure 40. Objects occupied the pavements were shown on the map with different symbols

The obstruct of the objects was designed to have disabled people walk on the pavements safely. Accordingly, total number of objects that prevent walking on the street is 2904 (19.9% of all the objects) (Table 6).

Table 6. The number of objects that prevent walking and their percentage of prevention

Objects on the pavements	Number	Number of obstacles	%
Tree	6719	1075	16
Electric pole	3453	690	19.9
Mushroom	2365	360	15
Motor vehicle	1152	465	40
Stand	391	174	44
Billboard	120	28	23
Buffet	101	47	46.5
Trash Bin	36	9	25
Others	257	56	21.7

Every 46 buffets, 44 stands and 40 vehicles out of 100 cause obstacles for the disabled people to use the pavements (Figure 41). The mushrooms beside the pavements are the least obstructing in the use of pavements by disabled people (only 15% of them are in this situation). Then follow trees (16%) and electric poles (19.9%).

As illustrated in Table 6, trees, which account for the half of all the objects in the field of study, prevent the use of pavement very little in comparison to the other objects. For city planning, it is very important that the trees do not obstruct walking on the pavement. According to number of analysis, the percentage of trees to be obstacle increases in the places where there is huge number of social facilities and business centers. Especially in Merkez, Teşvikiye and Harbiye neighborhoods, the rate of trees to be obstacle in front of walking on the street increases. The most important reason for them to be obstacle is the huge trunk of trees and insufficient width of the pavements. The study confirms the same results for the electric poles. The number of pavements that prevent walking on the pavements is more especially in neighborhoods of Merkez, Fulya and Harbiye. The number of electric poles that prevent walking in these

neighborhoods is more on account of the fact that the width of the pavements is small. The reason for the great number of electric poles is that this is the area where business centers, social places, educational and health facilities and commercial life are located. The number of mushrooms that prevent car parking on the pavement is more at main streets such as Büyükdere, Halaskargazi and Cumhuriyet Streets, and the number decreases in the neighborhoods. The number of motor vehicles parking on the pavements is in inverse proportion with the number of mushrooms. The number of motor vehicle increases while we go from Büyükdere, Halaskargazi, and Cumhuriyet Streets to the neighborhoods. The reason is that these streets are always controlled by traffic police, no parking is allowed and vehicles that park on the streets are towed away. Cars are parked at almost all the pavements of squatter settlements neighborhoods such as Yayla, Paşa and Halil Rıfat Paşa, and it has become impossible to use pavements to walk. Stands, buffet, and billboards that prevent the use of pavements are more in Ergenekon, Eskişehir and Feriköy neighborhoods. In the study, objects such as traffic lights, information and warning boards, and direction poles are categorized as "Others". These objects are mainly centered at Cumhuriyet, Büyükdere and Halaskargazi Streets and roads like Piyale Paşa Boulevard.

Furthermore, the distribution of the objects according to the neighborhoods was also analyzed (Table 7). Accordingly, when the ratio of the objects that are obstacles to those that are not obstacles is scrutinized, 41% of the objects in Ergenekon neighborhood obstruct the use of wheelchairs. İnönü neighborhood follows it with (35.7%) and then Yayla neighborhood. On the other hand the number of obstructing objects in Kaptanpaşa neighborhood is 2.4% and in Mahmut Şevket Paşa neighborhood is 8.4%.

Figure 41. The pavement segments which include objects that prevent disabled's passage on the pavements

Table 7. The distribution of the objects according to neighborhood and the percentage of objects that are obstacles

District	The number of objects that prevent walking on the pavement	Walking on the pavement, without affecting the number of objects	Total	Percentage wise distribution of objects that are obstacles
Ergenekon	167	235	402	41.5
İnönü	192	345	537	35.7
Yayla	132	262	394	33.5
Cumhuriyet	264	529	793	33.2
Duatepe	129	281	410	31.4
Eskişehir	114	268	382	29.8
Bozkurt	193	537	730	26.4
Harbiye	284	816	1100	25.8
Halaskargazi	65	210	275	23.6
Teşvikiye	304	1101	1405	21.6
Feriköy	174	657	831	20.9
Merkez	310	1258	1568	20.1
Halil Rıfat Paşa	121	626	747	19.3
Paşa	155	659	814	19
Fulya	193	1132	1325	14.5
19 Mayıs	142	907	1049	13.5
Meşrutiyet	129	836	965	13.3
Halide Edip Adıvar	63	664	727	8.6
Mahmut Şevket Paşa	39	424	463	8.4
Kaptanpaşa	5	201	206	2.4

2.2. The Height and Width of the Pavements in the Study Area

Al the pavement segments in the study area were measured in meters. The width and height of the pavements were calculated based on data from 3183 points. Moreover, average pavement width and height was calculated for each pavement.

Standard value for pavement width is 2 meters. The height of the pavement must be 3 cm minimum and 15 cm maximum. The width and height of the pavements were considered taking these measurements into consideration.

Table 8. The width of the pavement segments in the study area

Width (m)	The number of pavement segments	%
0- 0.5	1488	49.3
0.5 - 1	88	2.9
1 - 2	909	30.2
2 and above	533	17.6

As seen in Table 8, the pavement segments which have less than 50 cm width, form the approxiamately half of the study area (Figure 42). There are 533 pavements segments that are up to the standards. Accordingly, 82.4 % of the pavements segments are below the standard width. The pavements segments with standards sizes form only 17.6 % of the total.

Table 9. The height of the pavement segments in the study area

Height(cm)	The number of pavement segments	%
0 - 3	1488	49.3
4 - 15	736	24.4
15 and above	794	26.3

There were 736 pavement segments with standard heights for pavements. Accordingly, 24.4 % of the pavement segments are in standard measurements

whereas approximately 75 % of the pavement segments are below the standard heights (Table 9).

When the distribution of the pavement widths according to the neighborhoods is studied, Harbiye neighborhood has the highest percentage of pavement segments with standard values (49.4%). Halil Rıfat Paşa (38.4%) and Cumhuriyet (31.2%) neighborhoods are next. Mahmut Şevket Paşa neighborhood (0.7%) has the least number of pavement segments up to the standards followed by Eskişehir (9%) and Bozkurt (10%) neighborhoods (Table 10).

Figure 42. Pavement segments which have less than 50 cm width

Table 10. The width of pavements according to the neighborhoods

District	Segments not within standards	Pavement segments with standard width	Total	Percentage of segments with standards
Harbiye	46	45	91	49.4
Halil Rıfat Paşa	57	36	93	38.7
Cumhuriyet	86	39	125	31.2
Meşrutiyet	102	43	145	29.6
Halide Edip Adıvar	108	41	149	27.5
Duatepe	63	22	85	25.8
Fulya	218	59	277	21.2
19 Mayıs	122	27	149	18.1
Ergenekon	45	10	55	18.1
Paşa	273	59	332	17.7
Yayla	142	30	172	17.4
Feriköy	153	26	179	14.5
Merkez	280	46	326	14.1
İnönü	122	20	142	14
Teşvikiye	154	24	178	13.4
Halaskargazi	48	6	54	11.1
Kaptanpaşa	59	7	66	10.6
Bozkurt	90	10	100	10
Eskişehir	191	19	210	9
M.Şevket Paşa	266	2	268	0.7

When the distribution of the pavement heights according to neighborhoods are scrutinized, 19 Mayıs neighborhood has the most number of pavement segments within the standards (57%). It is followed by Teşvikiye (43.2%) and Ergenekon (38.1%). Eskişehir (1.9%) neighborhood has the least number of

pavement segments within the standards followed by Feriköy (2.7%) and Halaskargazi (3.7%) neighborhoods (Table 11).

Table 11. Distribution of pavement heights according to the neighborhoods

District	Pavement segments not within standard heights	Number of pavement segments with standard heights	Total	Percentage of pavements with standard values %
19 Mayıs	64	85	149	57
Teşvikiye	101	77	178	43.2
Ergenekon	34	21	55	38.1
Meşrutiyet	94	51	145	35.1
Duatepe	57	28	85	32.9
Kaptanpaşa	47	19	66	28.7
Harbiye	65	26	91	28.5
H.Rıfat Paşa	67	26	93	27.9
Merkez	242	84	326	25.7
Yayla	128	44	172	25.5
Halide Edip Adıvar	114	35	149	23.4
Cumhuriyet	96	29	125	23.2
Paşa	255	77	332	23.1
Bozkurt	78	22	100	22
İnönü	112	30	142	21.1
Fulya	237	40	277	14.4
M.Şevket Paşa	248	20	268	7.4
Halaskargazi	52	2	54	3.7
Feriköy	174	5	179	2.7
Eskişehir	206	4	210	1.9

As it is illustrated in Table 11, the number of pavements with standard width and height is more in 19 Mayıs, and Teşvikiye central neighborhoods. These localities are the places where social places, business centers, health and

educational facilities are centered. Pavements in the area are often renewed for these places are immensely used by the town dwellers as well as those that come from outside the locality. On the contrary, Table 11 also illustrates that the width and height of the pavements in Eskişehir, Feriköy and Halaskargazi neighborhood is under the standards on account of unplanned urbanization and the changes of sudden slopes. There are many places with over 25 % of slope level especially in Eskişehir neighborhood. The fact that Feriköy is among the oldest places of settlement, there are less social places, and business centers, and unplanned urbanization which pave the way for the pavements to be below standard measures. Unplanned urbanization is the main factor for not having standard pavements in Halaskargazi neighborhood. The streets and roads became narrower and the pavements were not built in certain standards owing to unplanned urbanization.

Figure 43.A narrow street in Halaskargazi district

2.3. Broken Surfaces on the Pavements in the Study Area

All the broken surfaces on the pavements in the study area were also inventories. Accordingly, there are 299 broken surfaces on the pavements in our study area (Figure 44).

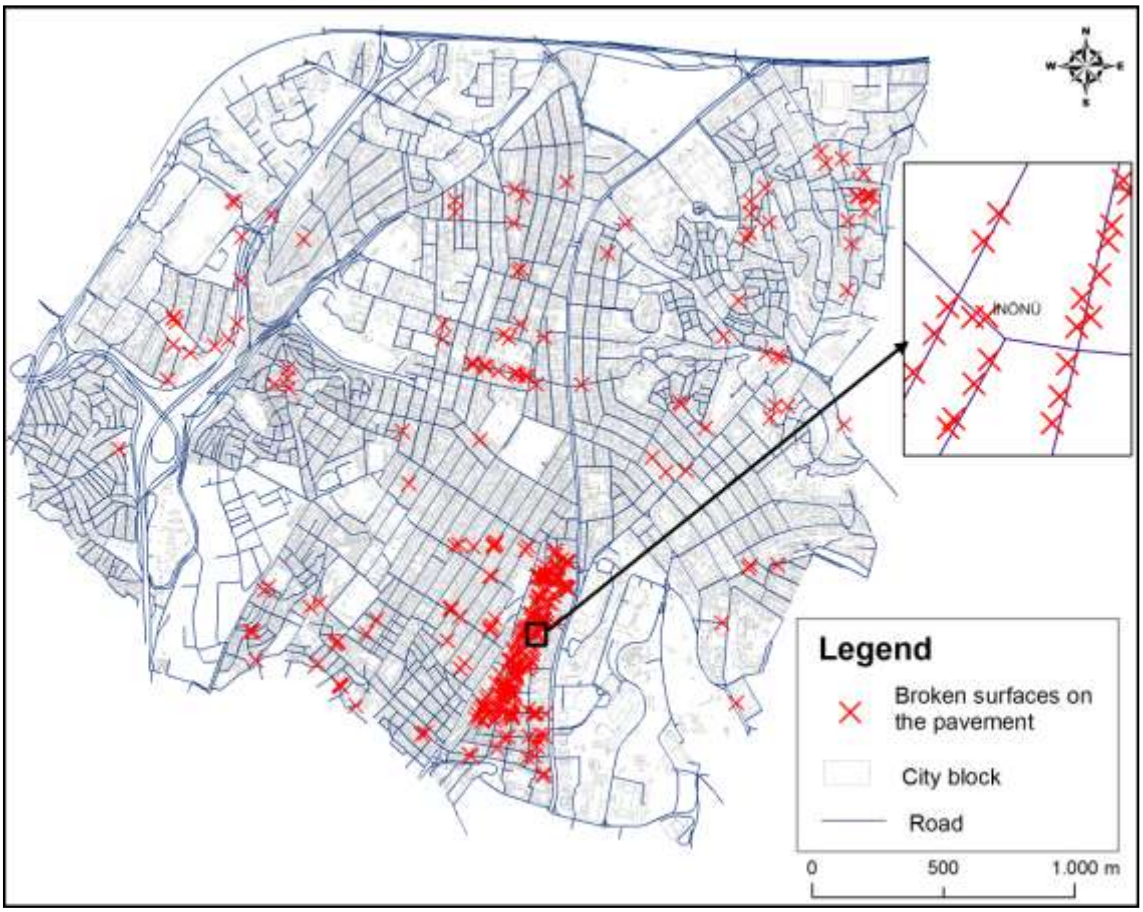

Figure 44. The broken surfaces on the pavements that need maintenance.

The distribution of broken surfaces according to the neighborhoods is illustrated in Table 12. Accordingly, Ergenekon neighborhood has the highest number of broken surfaces followed by İnönü and Fulya neighborhoods (Figure 45). Kaptanpaşa and Halaskargazi have no broken surfaces.

Table 12. Distribution of broken surfaces on the neighborhood

District	The broken surfaces	District	The broken surfaces
Meşrutiyet	7	Ergenekon	96
Paşa	5	İnönü	69
Eskişehir	5	Fulya	22
19 Mayıs	4	Bozkurt	18
Halide Edip Adıvar	2	Cumhuriyet	16
Harbiye	2	Halil Rıfat Paşa	12
Duatepe	1	Yayla	11
Mahmut Şevket Paşa	1	Merkez	11
Kaptanpaşa	-	Teşvikiye	9
Halaskargazi	-		

Table 12 illustrates that broken surfaces are especially more in Ergenekon and İnönü neighborhoods on account of the fact that the pavements were built long ago. The pavements were rubbed off by the time being, and those places have not been repaired or no new pavements have been built. Hence, the ratio of the broken surfaces increases day by day. Moreover, the effect of slope in the field contributes too little to have broken surfaces in these neighborhoods.

Figure 45. Broken surfaces in the study area

2.4. The Ramps on the Pavement

For disabled people using wheelchair, it is crucially important to have ramps at the beginning and end of the pavements segments. Total of 264 ramps were detected in the study area (Figure 46). The number of pavements with ramps on it is 163; however, only 5 pavements have ramps at both sides.

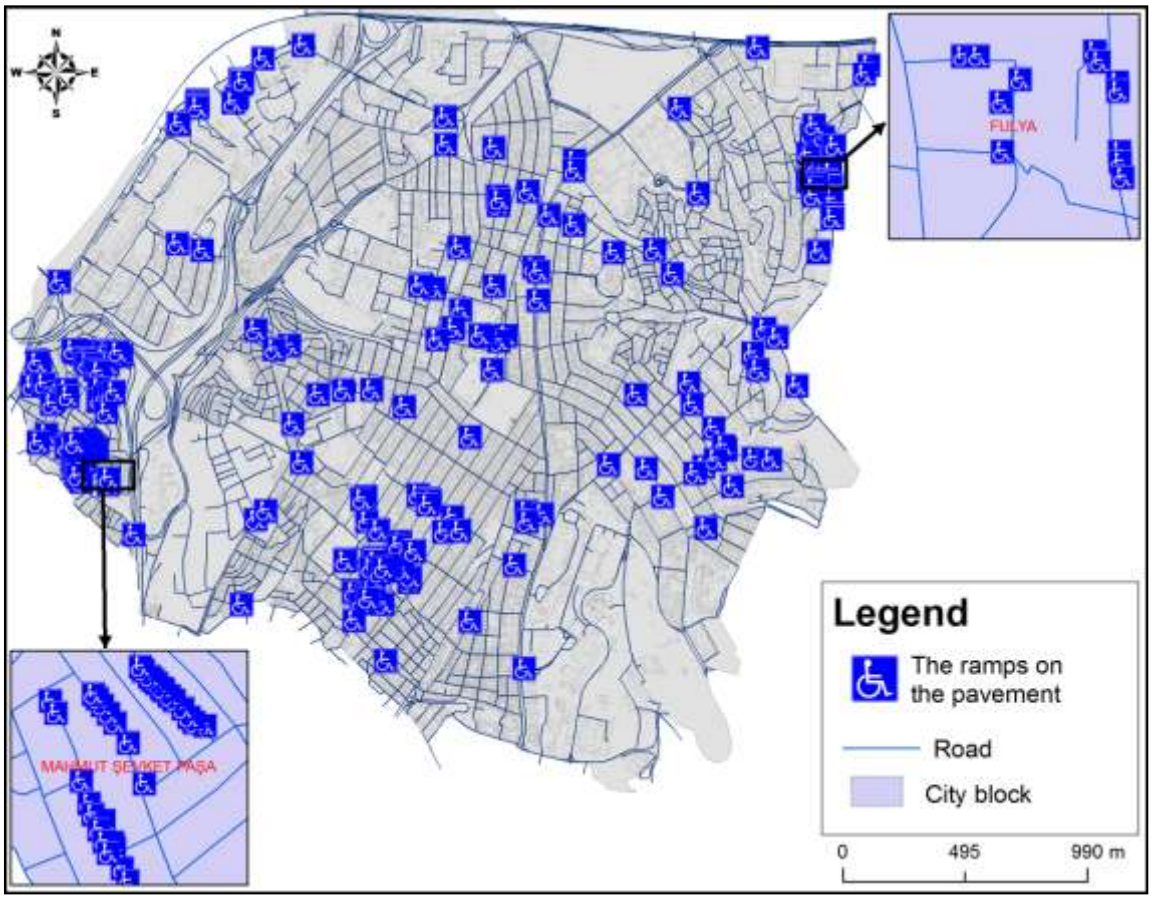

Figure 46. The ramps on the pavements

Table 13. Distribution of ramps on the neighborhood

District	Ramps	District	Ramps
Mahmut Şevket Paşa	86	Paşa	5
Fulya	37	Duatepe	4
Feriköy	27	Ergenekon	4
Kaptanpaşa	17	Yayla	4
Teşvikiye	17	Halil Rıfat Paşa	3
Eskişehir	16	Halide Edip Adıvar	2
Merkez	11	Harbiye	2
Cumhuriyet	11	İnönü	1
19 Mayıs	8	Halaskargazi	1
Bozkurt	7	Meşrutiyet	1

When the distribution of the ramps according to the neighborhood is studied, Mahmut Şevket Paşa has the most number of ramps (35.5) of the ramps in our study area are in this neighborhood). Feriköy (14%) and Fulya neighborhoods (10.2%) follow it (Table 13).

The neighborhoods with the least number of ramps are İnönü, Halaskargazi and Meşrutiyet respectively. Then Halide Edip Adıvar neighborhood and Harbiye neighborhood follow (Table 13).

2.5. Slope Map of the Study Area

Slope of the field is one of the most significant factors affecting the use of pavements. High slope may discourage disabled people from using the pavements. When the slope map of the study area is analyzed, it is seen that the average slope is 8.73 % (Figure 47).

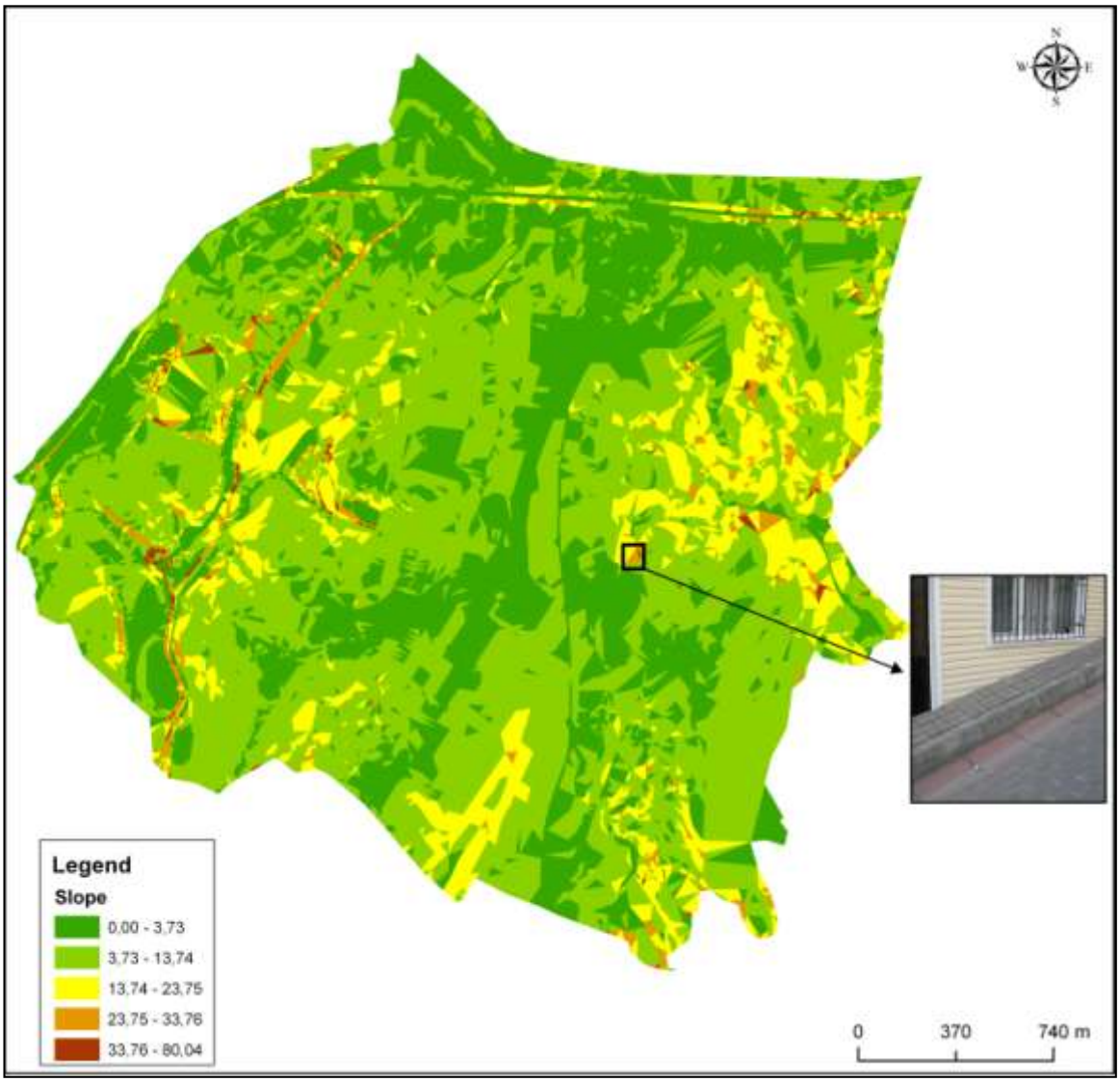

Figure 47. Slope map of the study area

There are 1717 pavement segments in the study area with ideal degree of slope, which the disabled people can use safely (Figure 48, 49).

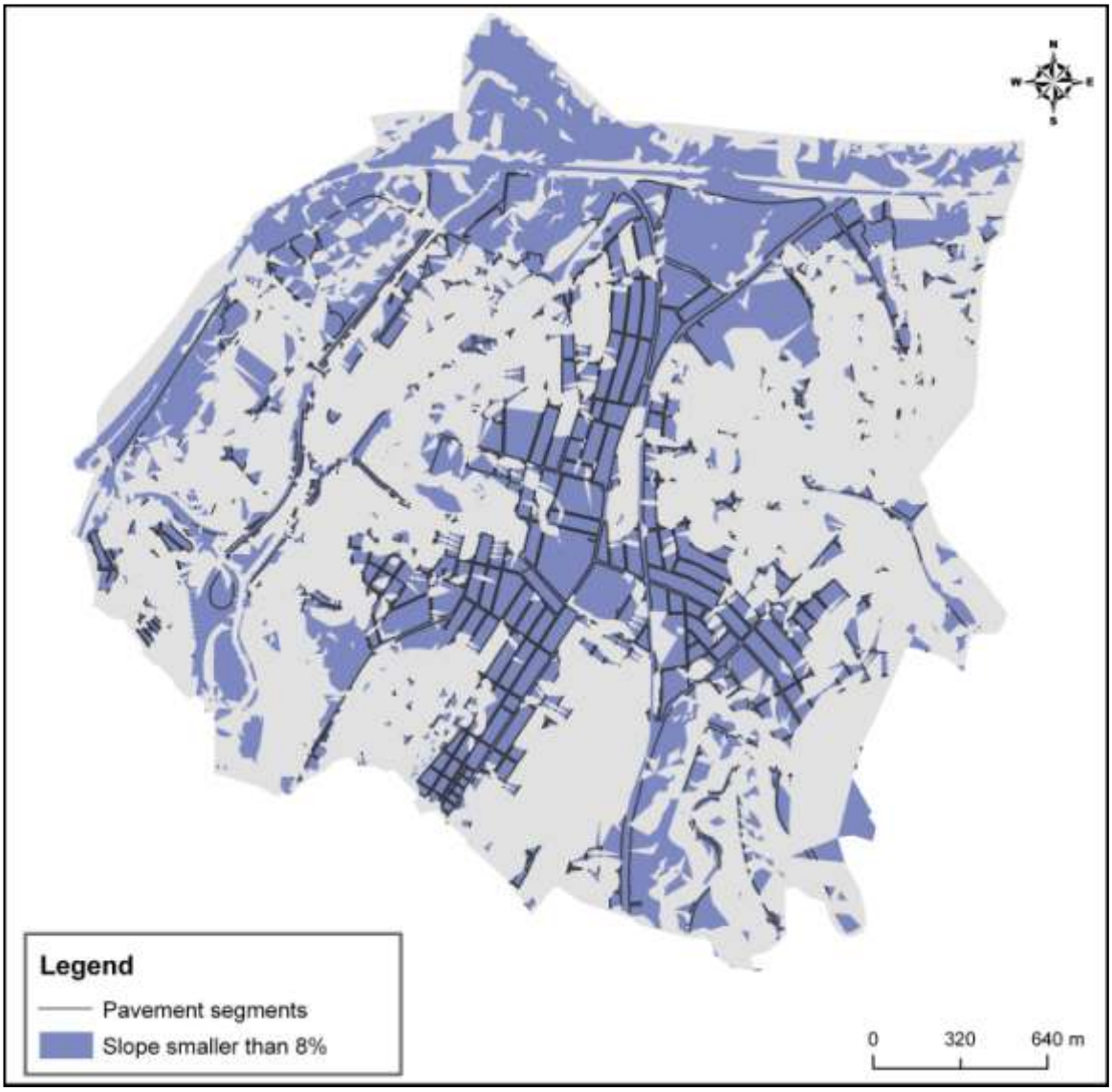

Figure 48. Distribution of slope smaller than 8%

When the distribution of pavement segments with ideal degree of slope (8%) according to the neighborhood is analyzed, Merkez neighborhood has the highest number of ideal pavement segment slope degree with 12.3%. Cumhuriyet and Paşa neighborhoods come next. Ergenekon is the neighborhood with the least number of pavement segments with ideal degree of slope followed by Kaptanpaşa and Duatepe neighborhoods (Table 14).

Table 14. Distribution of pavement segments with ideal slope (8%) according to the neighborhoods

District	Pavement segments	Slope (%)	District	Pavement segments	Slope (%)
Merkez	212	12.3	19 Mayıs	77	4.5
Cumhuriyet	134	7.8	Mahmut Şevket Paşa	76	4.4
Paşa	133	7.7	Halil Rıfat Paşa	65	3.7
Feriköy	126	7.4	Halide Edip Adıvar	62	3.6
Harbiye	125	7.3	Halaskargazi	61	3.5
Teşvikiye	96	5.7	Yayla	59	3.4
Eskişehir	92	5.4	İnönü	53	3.0
Fulya	88	5.1	Duatepe	51	2.9
Bozkurt	78	4.6	Kaptanpaşa	29	1.8
Meşrutiyet	77	4.5	Ergenekon	23	1.4

Figure 49. Pavement segments in the study area with ideal slope degree on which disabled people can walk safely

There are 2681 pavement segments with no suitable degree of slope (>8%) that disabled people cannot use safely in the study area (Figure 50).

Figure 50. Distribution of slope bigger than 8%

When the distribution of pavement segments with no ideal degree of slope (>8%) is analyzed, Merkez neighborhood has the most number of ideal pavement segment slope with 12.3%. Then follow Cumhuriyet and Paşa neighborhoods. However, Ergenekon neighborhood has the highest number of pavement segments with no ideal degree of slope followed by Kaptanpaşa and Duatepe neighborhoods (Table 15).

Table 15. The distribution of pavements segments with no ideal percent of slope (>8%)

District	Pavement segments	Slope(%)	District	Pavement segments	Slope(%)
Paşa	340	12.7	Yayla	127	4.7
Merkez	248	9.3	Cumhuriyet	112	4.2
Mahmut Şevket Paşa	204	7.7	Halil Rıfat Paşa	103	3,9
Fulya	195	7.3	Halide Edip Adıvar	91	3,3
Meşrutiyet	174	6.5	Ergenekon	85	3,1
Teşvikiye	165	6.2	Bozkurt	79	2,9
19 Mayıs	165	6.2	Feriköy	70	2,6
İnönü	147	5.5	Duatepe	54	2,0
Eskişehir	142	5.3	Halaskargazi	25	0,9
Harbiye	130	4.8	Kaptanpaşa	25	0,9

Figure 51. Slope exceeds 8%

2.6. Pavement Suitable for Disabled People Using Wheelchair

Three of the segments out of 3018 segments in total are suitable for the use of disabled people without the assistance of anyone. In the study area which includes pavements in 251 km length, only 273 meters of pavement segment are suitable for the use of disabled people. These pavements segments are in 19 Mayıs neighborhood, Feriköy and Eskişehir neighborhoods (Figure 52).

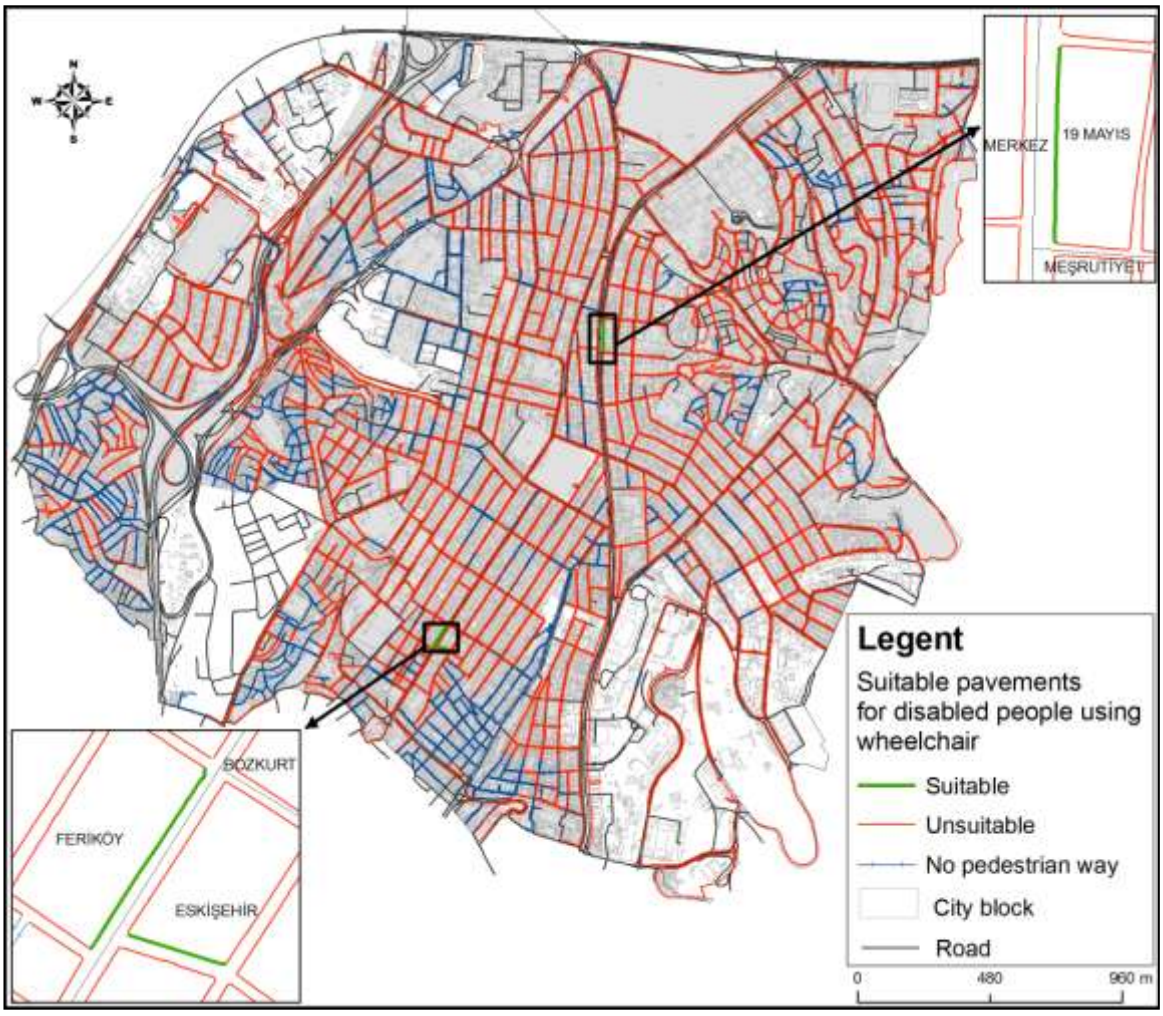

Figure 52. Suitable pavements for disabled people using wheelchair

CHAPTER 3. CONCLUSION

Total length of 251 km of 3018 pavement segments were analyzed in this study, which was carried out in order to find out to what extend the pavements in the study area are suitable for the disabled people using wheelchair. The width and height of the pavements along with the objects on them were analyzed. The study was completed by researching 251 km pavement segment entirely in the study area as a result of an immense work, marking data on a map of 1:1000 scale, and then analyzing it through ArcGIS 9.3 software. The work reached significant conclusions showing to what extent the pavements, which are vital, part of urban pattern, in Sişli district are suitable for the use of disabled people using wheelchair.

Total length of 251 km pavement segment was examined in the study. However, in the course of the study, it was also observed that the pavement segments were not constructed appropriately and moreover, no pavement is available in many places. The length of the streets with no pavement segments was measured to be approximately 67 km, which represents 26.7% of the total pavements.

In course of the study, the pavements have explicitly seen to be occupied with various objects. Ninety percent of the objects are of immovable type such as trees and poles while 10% could be labeled as movable objects like cars and stands. In the study, 14594 objects in total were inventoried. About half of these objects were trees and a third of them were electricity and street light poles. In addition, automobiles, mushrooms, stands of the stores, buffet and sign boards are other types of obstacles frequently found on the pavements.

The study found out that about 20% (2904) of the total objects on the pavements obstruct the passage of physically impaired people using wheelchair. Majority of these objects consist of motor vehicles and the stands of the stores.

Especially the stores, taxi stations and the buffets that sell bread occupy the pavements in the squatter districts completely and thus obstruct the walk of pedestrians. Automobiles have been observed to park on the pavements especially in by-streets and lanes on account of the fact that streets and lanes are generally narrow and parking lots are lacking. The cars parked on the pavements beside the roads makes even the walk of healthy people impossible let alone disabled people using wheelchair. It was also found out that the mushrooms, which were placed to prevent car parking on the pavements, often cause troubles for the passage of disabled people using wheelchair. Ergenekon neighborhood is the area with the most number of objects whereas Kaptanpaşa neighborhood has the least number of objects.

There are broken surfaces in 299 places that prevent walking detected during the process of the study. These broken surfaces pose obstacles for the passage of the disabled people using wheelchair. The disabled people, who face these broken surfaces on which it is almost impossible to walk, have to ask for the help of people around to get down from the pavement to the street and then go up to the pavement again after crossing the broken surface.

Inadequate number of ramps on the pavements in the study area is the most significant reason why the pavements are not used by disabled people in wheelchair. It was explicitly found out that the needs of the disabled people are not considered when constructing pavements. Most of the pavements in the study area have no ramps at all or few of them have ramps. While the number of pavements with ramps on it is 163, only 5 pavements have ramps at both sides. The study also discovered that the pavement width in the study area is narrower than 2 meters, which is the standard width of pavements in Turkey as well as the world. The ratio of the pavements below the standard width consists of 83% of the total pavement segments. Also, the pavements below standards heights (above 3 cm and below 15 cm) consist of 75% of the total pavements. Harbiye neighborhood has the most number of pavements with standard width whereas

Mahmut Şevket Paşa neighborhood has the least number. 19 Mayıs is the neighborhood with the most number of pavements with standard height whereas Eskişehir neighborhood has the least number.

Another problem for the disabled people using wheelchair in the area of the study is the high inclination and suddenly changing slopes on the pavements. The slopes in the study area are between 0% and 80.4%, and 60.9 % of the study area is above slope value 8%. It was discovered that even normal people face difficulties in the places where the slope is high. In addition, the pavements with high slopes are detected to have been constructed to prevent flooding.

When analyzing the obstacles that obstruct the use of pavements as well as the width and the height of the pavements. Significant differences were found in the neighborhoods. These differences are more obvious in neighborhoods like 19 Mayıs, Teşvikiye and Merkez, where there are mainly business centers, shopping centers, schools, public places, and the neighborhoods like Mahmut Şevket Paşa and Kaptanpaşa, where there is unplanned urbanization. As a result of the analysis, it was noticed that when moving from central neighborhoods towards the areas with unplanned urbanization, the pavement standards get further from the standard values and the percentage of disabled people using the pavements decreases.

As a consequence of the study, only 3 pavement segments out of 3018 pavements in 251 km fulfill the conditions that let disabled people using wheelchair to pass through. In other words, only 0.1% of the pavement segments in the study area are suitable for the use of disabled people. None of these 3 pavements have any objects that prevent disabled people from walking and also have ramps constructed at both sides. However, when the fact that the wheelchair users cannot reach at these pavements themselves, it is found out that the pavements in the study area do not have adequate features for the use of disabled people. The problems recorded in the study pose problems not only

for the physically impaired people but also for healthy pedestrians. Due to the poor condition of the pavements, let alone disabled ones, even healthy pedestrians prefer to walk in the middle of the streets rather than on the pavements. Such a situation could create a number of problems such as the blockage of traffic flow and accidents.

In the study, it has been found out that almost none of the pavements in the study area (i.e. Sişli district) is suitable for the use of disabled people using wheelchair. This is due to the existence of streets which extend narrowly in an unplanned way. The streets do not allocate adequate space for the pavements and often ramps at the beginning and the end of the pavements are missing. The pavements are occupied with objects that cause problems for walking. Moreover, there are no pavements at all along many of the roads and in some cases the excessive slope of the streets and the broken surfaces on the pavements are also effective obstructers. These unfavorable conditions, consequences of unplanned urbanization prevent the adaptation of disabled people (or 12% of the society) to the social life. Many disabled people cannot function independently and are forced to remain in their own houses in a state of imprisonment, secluded from social life. There are many things to do in order to all the barriers in front of the disabled people. Under the available city pattern, it seems possible for Sişli district to have standard streets and also the pavements just like in developed countries. It is impossible to maintain these narrow and unplanned streets and upgrade them to international standards. If the entire districts in general with its streets and pavements are desired to have international standards, dramatic urban transformation projects must be focused on.

All the structures in the study area must be reconsidered within the frame of urban transformation; streets and pavements must be reconstructed in line with appropriate height and width. The features that the pavements must have in order to be suitable for the use of the disabled people have to be kept in

consideration. Due to the fact that urban transformation projects are time consuming and require huge funds, they are long term transformations. Even if they are not considered within the frame of long term urban transformation, there are some short term solutions that may make some of the regions of study area suitable for the use of disabled people using wheelchair to move around alone. In order to ease or remove the problems related to the pavements that the disabled people face, the following issues must be kept into consideration.

1- Construct pavements on the streets where they are not available
2- To reconsider trees, poles and signboards on the pavements, which cause problems even for the walk of healthy people. To stop plantation of trees on pavements which obstruct pedestrian walk. To carry poles to more appropriate places, cutting tree branches in a way for them not to be an obstacle for the disabled people,
3- To extend pavement width in suitable streets and lanes,
4- To prevent random parkings of the car on the pavements. Rather than mushrooms different methods must be developed to prevent the parking of the cars on the pavement; to fine car owners parking on the pavements and to increase the number of auto parks.
5- The mushrooms placed to stop the random parks of the cars must be removed. More appropriate methods that would not cause any problems to the walk of the disabled people must be found,
6- Occupation of pavements by stands and tables of various stores must not be allowed. Such type of uses must be stopped,
7- Ramps must be constructed at the beginning and the end of the pavements,
8- To repair broken surfaces on the pavements, all misapplications that pose problems for the disabled people should be fixed,
9- To reconsider all sign boards, traffic signs, and all other movable and unmovable objects in order to have both able and disable to walk on the pavements easily.

It is impossible to renovate the pavements in the study area to meet the needs of the disabled people unless there is a dramatic changes through some big projects such as urban transformation. Only after some arrangements the significant streets in the study area could be appropriate for the use of the disabled people. By doing some minor arrangements at Büyükdere Street, Halaskargazi Street and Cumhuriyet Street located between Mecidiyeköy – Taksim, where there are many public institutions, social sites and business centers, the pavements on these streets could be made suitable for the use of the disabled people. For instance, there is 2460 meter pavement segment on the Büyükdere Street. There are 391 objects on these pavement segments. Only one of these objects prevents the passage of the disabled people. The rest of the objects are not obstacles for the disabled people. There is only one ramp that the disabled people can use. If 24 ramps are constructed on this street, the disabled people can use the pavements on the street without the help of anyone (Figure 53).

Figure 53. The pavement segments which include objects that prevent or not prevent disabled people passage on the pavements on Büyükdere Street

Halaskargazi Street shares the same condition. There is 2149 meters long pavement segment detected on this street. There are 389 objects in total on these pavement segments. Six of the objects cause obstacles for the disabled people to use the pavements. The rest of the objects do not pose any problem for the disabled people to use the pavements. There are four ramps on the same street that could be used by the disabled people. If 32 ramps are constructed on this street, the disabled people can use the pavements on the street without the help of anyone (Figure 54).

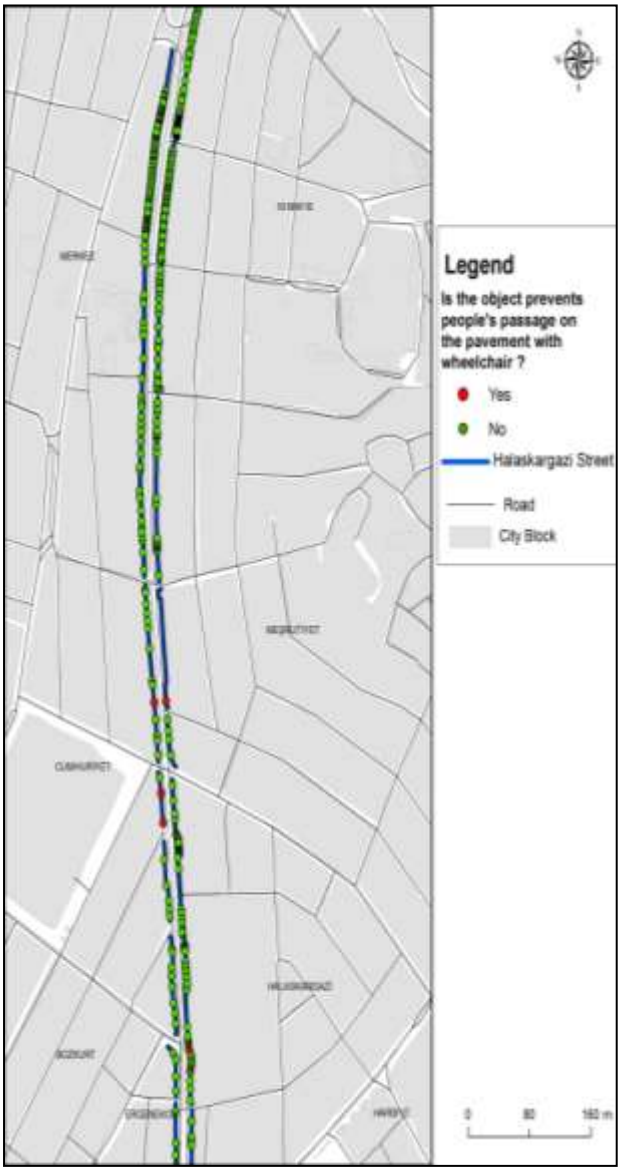

Figure 54. The pavement segments which include objects that prevent or not prevent disable people passage on the pavements on Halaskargazi Street

Pavement segments of 1943 meter length are detected on the Cumhuriyet Street that extends from the South to the North in general. There are total of 195 objects on this pavement segment. Only nine of these objects cause problems for the use of the disabled people. The rest of the objects do not pose any problems. There are 2 ramps that could be used by the disabled people on

the same ramp. If 34 ramps are constructed, the disabled people can use the pavement segments on the street without the assistance of anyone (Figure 55).

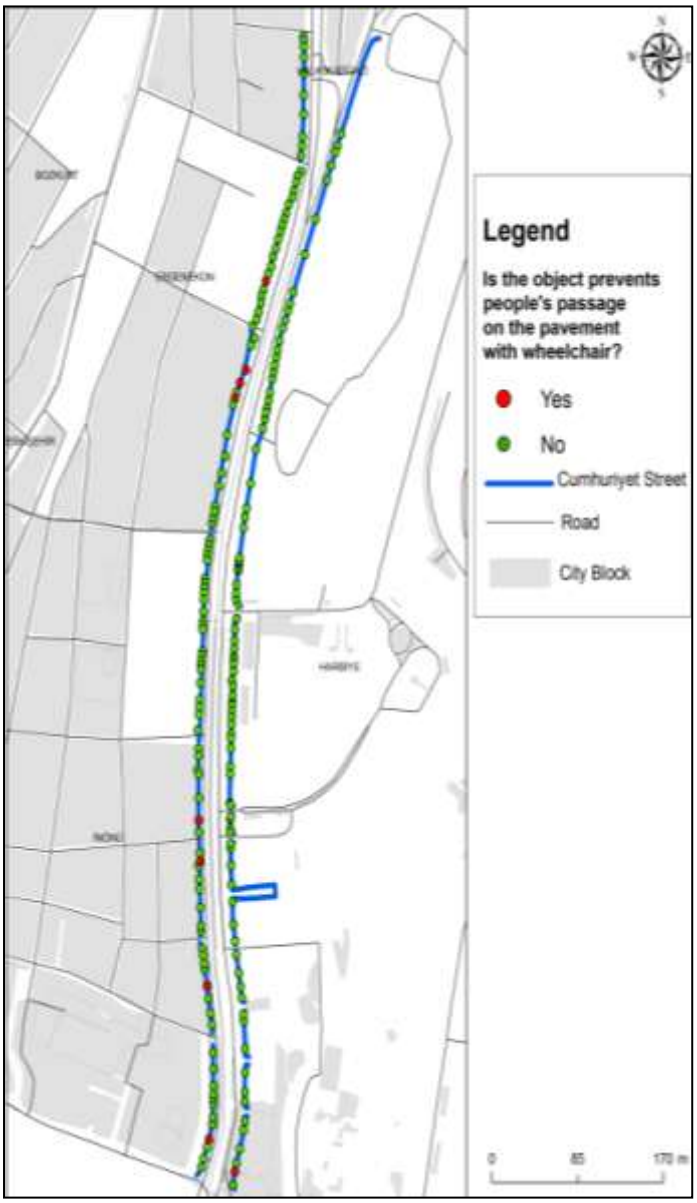

Figure 55. The pavement segments which include objects that prevent or not prevent disable people passage on the pavements on Cumhuriyet Street

In the study area, the length of 6822 meters between Mecidiyeköy – Taksim could be open to the use of the disabled people through the aforementioned changes. These streets can be selected as pilot regions for the use of the disabled people and other municipalities can conduct their works in line with these works. The communities could be in shape and good standards only if all

able and disable citizens stay side by side in the society. Hence, it is essential to carry out all the works that would allow the disabled people to take part in society and remove all the obstacles that prevent it.

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