STREET AS PLAYGROUND

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ABSTRACT

STREET AS PLAYGROUND

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In today's car-dominated cities, children (as well as other members of the public) have limited freedom to use streets, unless they are driving their cars through them. Urbanization has resulted in higher density housing, increased transportation, industry, associated pollution and changes in technology. These were accompanied by a reduction in children's independent mobility, associated contact with nature especially in cities (Wang et al., 2017) and freedom of using streets.

Today, unavailability of the streets –as outdoor places and spaces- for most of the pedestrian oriented functions, limits children's everyday activities and experiences, necessary for their healthy development. This is mainly because streets are increasingly being taken over by motorized traffic; they have become dangerous, which also had an effect on playability. Along with these reasons, technology's affect in everyday life resulted in a change in children's mobility patterns and play preferences.

Streets are public spaces, but now vehicles dominate the use of these public places and eliminate most other functions that streets used to have historically. The quality and use of streets are continuously decreasing particularly in cities due to increasing car traffic problem, and due to the design characteristics, that aim at accommodating this traffic, either flowing or parked. This has led to a drastic decrease in children's

presence in public urban space, and children's play dynamics have shifted from outdoors to indoors. However, children's independent mobility and outdoor play is important for children's development and well-being; and especially home street has a significant value for children with its diverse possibilities via its location. Children learn, develop and interact by playing, and they need peer interactions to develop socially.

1. How can streets become playgrounds for children to run freely and play games even in today's car-dominated urban areas?
2. Can the two functions of streets, i.e. accommodating motorized traffic and providing outdoor play areas for children, co-exist?
3. What is design's role in helping these two functions co-exist?

Child-friendly environments fall into the realm of urban design and children's needs also change along with the changing environment that surrounds them. This study focuses on "loss of play spaces for children as a spatial and social problem" and aims at answering the following questions:

In order to answer these questions, the study presents a comprehensive literature review on the subject, together with some good practice examples from around the world. These examples and the literature reveal various criteria and indicators that can help design streets to include children's needs, as well as analyse playability of streets. These criteria and indicators are incorporated into a planning and design framework, which can be used as a design guideline. This framework and its indicators are then applied to analyse the project of playground streets in Ankara, implemented by the Çankaya Municipality.

Keywords: Environmental Child Friendliness, Child-Friendly, Street Design, Woonerf, Playground Streets

ÖZ

OYUN ALANI OLARAK SOKAK

Mavikurt, Aslı Ceren
Yüksek Lisans, Kentsel Tasarım
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Motorlu taşıtların egemen olduğu günümüz şehirlerinde çocukların (ve aslında tüm yayaların) sokakları kullanım özgürlükleri oldukça kısıtlıdır. Kentleşme sonucunda ortaya çıkan yüksek yoğunluklu konut alanları, artan trafik, kirlilik ve teknolojik değişimler, özellikle şehirlerde çocukların bağımsız hareket etme yetilerinin, doğal alanlar ile temaslarının (Wang et al., 2017) ve sokakları kullanma özgürlüklerinin azalmasına neden olmuştur.

Bugünün şehirlerinde sokaklar, bir çok yaya odaklı işlev için olduğu gibi çocukların sağlıklı gelişimleri için gerekli aktiviteleri yerine getirebileceği uygun bir ortam sağlamamakta olup, bu durum temelde sokaklardaki yoğun taşıt trafiğine dayanmaktadır. Yalnızca trafik nedeniyle olmamakla birlikte; sokaklar bugün tehlikeli, ve oyun oynamak için pek de uygun olmayan alanlar haline gelmiştir. Tüm bu nedenlerle beraber gelişen teknolojinin de etkisiyle çocukların hareket örüntüsü ve oyun tercihlerinde değişimler meydana gelmiştir.

Kamusal alanlar olmasına rağmen, araç egemen kullanım sokakların tarih boyunca sahip olduğu diğer çoğu işlevi kaybetmesine neden olmuştur. Kent mekanlarında, park ya da seyir halinde, gittikçe artan motorlu taşıt yoğunluğunu barındırabilmeye yönelik alınan tasarım kararları da sokakların kalitesinin ve yayalar tarafından kullanımının azalmasına etken olmuştur. Bu çocukların kamusal alanlardaki varlığının azalmasına, oyun alışkanlıklarının açık mekanlardan kapalı mekanlara kaymasına neden olmuştur.

Ancak yaşadıkları çevrede özgürce hareket edebilmeleri ve açık mekanda oynanan oyunlar çocukların gelişimi ve sağlığı için oldukça önemlidir. Özellikle evlerinin olduğu sokak, barındırdığı özgürlükler ve olanaklarla çocuklar için ayrı bir önem taşır. Burada oynarlar, oynayarak etkileşim kurar ve öğrenirler, akranları ile bir araya gelirler ve bu sayede gelişirler.

Çocuk-dostu çevreler yaratmak kentsel tasarım alanına girmekte ve çocukların ihtiyaçları kendilerini çevreleyen ortam ile birlikte değişmektedir.

Bu çalışma "çocuk oyun alanlarının gittikçe yok olmasını bir mekansal ve sosyal problem" olarak ele alarak şu sorulara yanıt bulmayı amaçlar:

1. Baskın taşıt kullanımına rağmen, sokaklar nasıl çocukların özgürce hareket edip oyun oynayabilecekleri alanlar haline gelebilir?
2. Sokak, çocuklara açık oyun alanı olma ve taşıtları barındırma işlevlerini bir arada sunacak şekilde yeniden tasarlanabilir mi?
3. Bu iki farklı işlevin bir arada var olabilmesi için tasarımın rolü nedir?

Bu çalışmada, bahsi geçen sorulara yanıt aramak üzere konu ile ilgili kapsamlı bir literatür taraması dünyadan iyi uygulama örnekleri ile bir arada sunulmaktadır. Bu örnekler ve literatür bağlamında çeşitli kriter ve göstergelerin, sokakların çocuk dostu -çocuk kullanıcıların ihtiyaçlarını içerecek şekilde- tasarlanmasında veya sokakların oynanabilirliğinin analiz edilmesinde yardımcı olabileceği ortaya konmuştur. Bu kriter ve göstergeler tasarım sürecine rehberlik edebilecek bir planlama ve tasarım çerçevesinde bir araya getirilmiş ve çalışma kapsamında Ankara'da Çankaya Belediyesi tarafından uygulanmış olan oyun sokaklarının analiz edilmesinde kullanılmıştır

.

Anahtar Kelimeler: Çocuk Dostu Çevre, Sokak Tasarımı, Woonerf, Oyun Sokakları

To children.

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

CHAPTER 1

INTRODUCTION

In today's car-dominated cities, children (as well as other members of the public) have limited freedom to use streets, unless they are driving their cars through them. Urbanization has resulted in higher density housing, increased transportation, industry associated pollution and changes in technology. These were accompanied by a reduction in children's independent mobility, associated contact with nature especially in cities (Wang *et al.*, 2017) and freedom of using streets.

Today, unavailability of streets –as outdoor places and spaces- for most of the pedestrian oriented functions, limits children's everyday activities and experiences, necessary for their healthy development. This is mainly because streets are increasingly being taken over by motorized traffic; and they have become dangerous (Alexander, 1977; Karsten and Van Vliet, 2006; Galani and Gospodini, 2011), which also had an effect on playability (Moore, 1987). Along with these reasons, technology's affect in everyday life (Galani and Gospodini, 2011) resulted in a change in children's mobility patterns (Karsten and Van Vliet, 2006; Sener *et al.*, 2008) and play preferences.

Streets are public spaces (Alexander, 1977; Moore and Young, 1978; Igarta 2012; NACTO, 2012; Mehta, 2013), but now vehicles dominate the use of these public places and eliminate most other functions that streets used to have historically. The quality and use of streets are continuously decreasing particularly in cities due to increasing car traffic problem (Alexander, 1977; Karsten and Van Vliet, 2006; Galani and Gospodini, 2011), and due to the design characteristics, that aim at accommodating this traffic, either flowing or parked. This has led to a drastic decrease in children's presence in public urban space (Gill, 2007; Galani and Gospodini, 2011),

and children's play dynamics have shifted from outdoors to indoors (Karsten and Van Vliet, 2006). But both children's independent mobility (Kyttä, 2003b; Haikkola et al., 2007; Moore and Cosco, 2008; Wang et al., 2017) and outdoor play is important for children's development and well-being (Moore and Young, 1978; Wheway and Millward, 1997; Björklid and Nordström, 2007; Kemple et al., 2016), especially home street has a significant value for children with its diverse possibilities via its location (Gill, 2007; Moore, 1987). Children learn, develop and interact by playing (Krohe, 1996; Dattner, 1996; Wheway and Millward, 1997; Hurlock, 1978; cited in Dewi, 2010), and they need peer interactions to develop socially (Moore and Cosco, 2008).

Child-friendly environments falls into the realm of urban design (Moore and Cosco, 2000) and children's needs also change along with the changing environment that surrounds them. In order to determine the needs of today's children, children's participation in decision-making processes is necessary (Riggio 2002; Jørgensen, 2004; Björklid & Nordström 2007; Nordström, 2010).

This study focuses on "loss of play spaces (Björklid and Nordström, 2007; Galani and Gospodini, 2011; Igarta, 2012) for children as a spatial and social problem" and aims at answering the following questions:

- How can streets become playgrounds for children to run freely and play games even in today's car-dominated urban areas?
- Can the two functions of streets, i.e. accommodating motorized traffic and providing outdoor play areas for children, co-exist?
- What is design's role in helping these two functions co-exist?

To answer the questions above; a series of street design projects implemented in Ankara called "Playground Streets" have been selected as the case study; which is one of the first experiments of child friendly street design projects in Ankara, and also in Turkey. In this research, following Woonerf concept, various child friendly and shared street design concepts/ approaches have been examined in the literature and related indicators have been gathered from several frameworks towards evaluating

childfriendliness and play value of the streets. At the end, it is aimed to identify/select indicators which could be used as guidelines in designing child friendly / playful street design projects.

The theoretical framework of this study comprises a detailed literature survey about environmental child friendliness, street's role as a component of child friendly environment, street's and play's importance in children's life and development, principles of shared street design, child-friendly street design concept primarily in Europe then around the world, and the use of basic traffic calming techniques as a design element.

In Chapter 2, children in changing urban environment are examined from macro to micro scales. In the first part of this chapter, urbanization's effects in cities, physical environment's impact on the human behavior, children's relationship with environment and the link between children's well-being and quality of built environment are explained. In the second part, child friendly city concept is described in detail as a framework to make cities more "child friendly" based on Convention on the Rights of the Child as a legal basis of child friendly environments. The play right of children highlighted in this chapter is the main motivation of this study. The importance of creating good environment for children has led researchers to develop different perspectives to find a way to evaluate child-friendliness of environments in various scales. In the third part of the chapter, diverse frameworks developed to evaluate environmental child-friendliness are examined. Some indicators adaptable to evaluate child-friendliness in a street design scaled from these frameworks are later used for the analysis in the case study. In the fourth part, the definition and the role of streets, children's changing street usage habits and mobility patterns are presented in detail. The importance of residential street environment and neighborhood for children, the freedom and the opportunities they have outdoors near their home, and what streets provide for play, especially home streets as playgrounds are discussed. In the fifth part, shared street concepts as pedestrian oriented street design approach is elaborated. The Netherlands based Woonerf concept is examined as a pioneer of child

friendly street design approach; and in addition, UK based Home Zones and other similar shared street design concepts around the world are investigated. In the sixth part, the importance of outdoor play is explained, and indicators of play settings are examined. To summarize, in this literature review chapter, research from various geographies have been studied in order to determine what child friendly design should offer to children, not just as safe and secure streets, but also in terms of how streets could become interesting and full of new opportunities to discover for children.

This study aims at determining the quality of playable space and evolving process of child-friendly street design approaches, which translates to slow car traffic, pedestrian and cyclist priority, safe and enjoyable space for children to play, as well as creating social space for residents. In this study, two major analysis have been carried out to understand the link between design and usage of the streets by children as well as adults. First part of the analysis is evaluating physical design features of the streets in a scope of shared street concept, environmental child friendliness and play space quality to measure the streets' suitability for children's freedom and play; second is the analysis of street usage by behavior mapping with the aim of revealing the relation between design and street usage. In order to carry out the first part of the analysis, a matrix of design of features and studied streets has been prepared, i.e. through scoring presence/absence of a design feature for each street. At the end, streets are compared by summing scores for each street, and strengths and weaknesses of the project series are discussed based on generalizing results for each street. For the second part of the analysis, direct observations were conducted in each street in the research area. Activities and demographics of the users were recorded, together with mapping locations of occurred activities. The cars that occupied street space were recorded, together with the count of vehicles and pedestrian passers-by. And all these data were brought together. Detailed information about this methodology is presented in Chapter 3.

By choosing "Playground Streets" ("*Oyun Sokakları*") project series as a case study, it is aimed to highlight the strengths and weaknesses of this approach in Ankara and

to reveal lessons learnt to shape similar actions in the future in Ankara and elsewhere in Turkey. Chapter 4 first introduces the selected playground streets with different characteristics in four locations in Ankara, and then presents the evaluation and results of the analysis carried out in each street. Finally, the relation between the design and behavior is analyzed.

Finally, Chapter 5 presents the main findings of the study. Based on the study carried out in playground streets, comparisons with similar research conducted in different geographies are carried out in a scope of similarities and dissimilarities. Based on the results of this analysis, the relation between design and behavior is discussed. The child friendly design experience in Ankara is assessed with this study in Turkey. The study concludes with recommendations of child friendly street design, as well as recommendations for some useful tools for children to participate in the design process.

CHAPTER 2

CHILDREN & ENVIRONMENT

2.1. Children & Environment: From Macro to Micro Scale

Almost one third of the world population with a percentage of 30.3 consist of children and the situation is similar in our country with a percentage of 28 (TSI, 2016). According to UNICEF 43% of children were living in urban areas across the world in 2005.

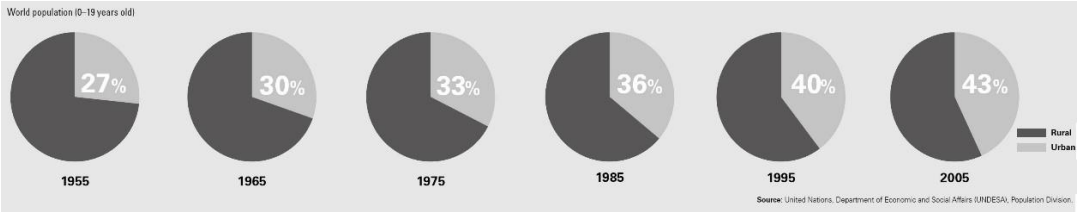

Figure 2.1. World population (0-19 years old) (Unicef, 2012)

Urbanization has resulted in higher density housing, increased transportation, industry, associated pollution and changes in technology. These were accompanied by a reduction in children's independent mobility and associated contact with nature especially in cities (Wang *et al.*, 2017).

Along with living environment, people's everyday life — routines and interactions in homes, families, neighborhoods, work sites, and so forth — has changed dramatically during the last 50 years. These changes were attributed to our style of mobility and migration; emphases on consumerism and mass communications; patterns of urban design and economic development; influences of bureaucracy and the state; sensory conditioning; use of language; and even personal orientation (Ellis, 2004; cited in Hay, 1992).

Features of the physical environment have an impact on the human behavior. Also, the perceived quality of the built environment has been found to be strongly associated with well-being (Kyttä et al., 2016; cited in Laatikainen, Broberg and Kyttä, 2017). That being said Karsten and Van Vliet (2006) similarly stated that children's peer and play interactions have been affected by the significant transformations in home and neighborhood environments in many cities especially in the last decades. These developments made streets and public spaces unfavorable to children. However, accessing to nature and playing outdoor were treated essential by parents for their children's health and development.

Karsten and Van Vliet (2006) referred to a highly meaningful relationship between local environment's trait of availability to access other children and children's subjective experiences of that environment like feeling lonesome. On the other hand children not only need to relate with other children but also with adults as Alexander (1977) explained:

> *"If children are not able to explore the whole of the adult world round about them, they cannot become adults. But modern cities are so dangerous that children cannot be allowed to explore them freely."* (Alexander, 1977; 57)

Furthermore, Alexander (1977) points out the children's need of accessing to the world of adults because adults pass on their ideology and their way of life to children through their actions, not through assertions.

> *"Children learn by doing and by copying. If the child's education is limited to school and home, and all the vast undertakings of a modern city are mysterious and inaccessible, it is impossible for the child to find out what it really means to be an adult and impossible, certainly, for him to copy it by doing."* (Alexander, 1977; 57).

Alexander (1977) stated that in modern societies child's and adult world apart from each other which is unlikely among traditional communities or animals. In rural areas children live their everyday life intimately with adult's daily actions. They see and

spend their time with/near farmers in the fields, and workers who are building houses. They witness, “the men and women around them: making pottery, counting money, curing the sick, praying to God, grinding corn, arguing about the future of the village” (Alexander, 1977; 57).

Moreover, Alexander (1977) stated that life in urban areas are massive and dangerous for children to move freely on their own. There is this unending danger coming from fast moving vehicles in busy traffic and social threats of kidnap, rape or assault. And small children cannot find their way around a city, which could cause them to get lost.

These threats give rise to a change in the behaviors and habits of children and adults living and moving together. As Karsten and Van Vliet (2006) stated, in urban areas children need to be escorted by adults when going out, and this influences the mobility patterns of children. They move like ordinary modern adults, they live their lives jumping around from one point to another through the city and beyond without (self-)experiencing it. Furthermore, Karsten and Van Vliet (2006) directed attention to children’s movement in the city between places, which is contingent upon their socio-economic and ethnic background. This spatial activity pattern of today’s children, mostly moving with vehicles from place to place makes it difficult for them to create an integrated image of the city. Ironically, children’s accompanied trips to detached places has “greatly expanded their activity space at the same time that the spatial range of their independent activities in their neighborhood has greatly diminished” (Karsten and Van Vliet, 2006; 152).

Similarly, Sener *et al* referred (2008) some studies to highlight the increasing interest in analyzing and modeling time use and activity-travel patterns of children. Studies support Karsten and Van Vliet’s findings of children’s and adults’ need of moving together, either adults’ need to drive their children or need to “engage in carpool arrangements with other households whose children attend the same activities” (Reisner 2003, cited in Sener *et al.*, 2008).

Children are citizens of our cities, and they are frequent users of urban space. This is hardly reflected in the overall city planning, however, for children are seldom seen as a relevant political group or given opportunities to participate in planning processes (Jørgensen, 2004).

Christensen and O'Brien (2003) highlighted some research on children's place in the city since the post war period; and list the key areas of research as:

- cognitive mapping (Lynch 1977; cited in Matthews 1992),
- the impact of urban traffic on children's mobility (HilJman et al. 1990),
- children's use of recreational and play space (Hart 1997; cited in Moore 1986)
- more recent critical children's geographies (Holloway and Valentine 2000; Philo 2000; cited in Christensen and O'Brien, 2003)

In this study three concepts have been synthesized in a residential street scale; the "street as a play space" for children, which is supported by an "environment" suitable for children as well as adults, and a concept of "streets to be a shared space/place" for vehicles and pedestrians to co-exist.

2.2. Child Friendly City

UNICEF defined a child friendly city as any local system of governance, urban or rural, large or small, committed to fulfilling children's rights under the Convention on the Rights of the Child. Over the past decade, a Child Friendly City Initiative (CFCI) has developed to provide an alternative to how cities were conceived and built by and for adults (Riggio, 2002). The international Child Friendly Cities Initiative was launched in 1996 to act on the resolution passed during the second United Nations Conference on Human Settlements (Habitat II) to make cities livable places for all. The conference declared that the well-being of children is the ultimate indicator of a healthy habitat, a democratic society and good governance (UNICEF, no date).

The concept of a child friendly city is not based on an ideal end state or a standard model. It is a framework to assist any city to become more child friendly in all aspects of its environment, governance and services (Riggio, 2002).

According to the Convention on the Rights of the Child, not only shall concerns for children's welfare be given priority but children themselves shall also be given the opportunity to speak up and have their voices heard. This double demand by the CRC is often reflected in children's environment studies (Nordstrom, 2010).

Convention on the Rights of the Child is the most ratified United Nations convention that defined the child as a person under eighteen years of age, and imposes legal obligations and responsibilities on families, institutions and governments to realize the rights of the child as codified in the convention. Throughout the last decade, countries across the world met at important international conferences and drafted the Agenda 21 (the program of Action from the United Nations Conference on Environment and Development 1992), the Habitat Agenda (Second United Nations conference on Human settlements 1996), and most recently A World Fit for Children (the document produced at the United Nations Special Session on Children in New York in 2002) promising to develop child friendly communities and cities through municipal action in collaboration with children (Riggio 2002). The United Nations Child Friendly City Secretariat was set up in Florence, in Italy to support city governments, organizations and communities in making cities friendly for children and youth across the world (Chatterjee, 2006). In 2016 as an output of "UN Conference on Humans Settlements" meeting, the New Urban Agenda (NUA) was published. Words of "child" or "children" was used 12 times totally in 10 different articles. There articles include promises about non-discrimination, equitable and affordable access to physical and social infrastructure for all; safe, healthy, inclusive and secure environment in cities; participation in governance; opportunities for dialogue, etc. But most importantly, related with this study, article 113 includes "measures to improve road safety and integrate it into sustainable mobility and transport infrastructure planning and design"

and highlights pedestrian safety and cycling mobility with an emphasis on “promoting a safe and healthy journey to school for every child as a priority”.

UNICEF defines the concept of Child Friendly City as the city that accepts children as an actor whose decision could influence policies, as a citizen of the city and guarantees every child's rights. They can also have a role in family, community and social life, as well as obtaining basic services in health and education, protected from trafficking, cruelty and mistreatment. They have the right to feel safe on the street as well as meet and play with their friends; the child should also have a green space for gardens and animals, live in pollution-free environment, involve in social and cultural activities, and be able to access each service, regardless of their ethnicity (Dewi, 2010).

Riggio (2002) stated child friendly city from the perspective of the Convention on the Rights of the Child as;

> *“... a child friendly city aims to guarantee the right of all young citizens to:*
>
> • *influence decisions about their city;*
>
> • *express their opinions on the city they want;*
>
> • *participate in family, community and social life;*
>
> • *gain access to basic services such as health care, education and shelter;*
>
> • *drink safe water and have access to proper sanitation;*
>
> • *be protected from exploitation, violence and abuse;*
>
> • *walk safely in the streets, on their own;*
>
> • *meet friends and play;*
>
> • *have green spaces for plants and animals;*
>
> • *live in an unpolluted and sustainable environment;*

• *participate in cultural and social events;*

• *be supported, loved and cared for; and*

• *be equal citizens with access to every service, regardless of ethnic origin, religion, income, gender or disability."*

This study focuses on how the children's right to play (article 31[1]) can be actualized in a concept of shared street.

2.3. Environmental Child Friendliness

The major motivations of recent child friendly environment studies are United Nations Convention on the Rights of Children, CRC, which was published in 1989 placing a significant emphasis on increasing conflicts in outdoor environment's use between different users. The importance of good environment for children's development lead researchers to explore different perspectives to find a way to evaluate child-friendliness of environments in various scales. Kyttä (2003b) has studied with the base of James J. Gibson's (1979) philosophy of ecological perceptual psychology and has focused on the term "affordances" to evaluate environment's child friendliness from two perspectives, one of which is possibilities of independent mobility while the other one is opportunities to actualize affordances. Chatterjee (2006) complained about the lack of theoretical understanding, which could guide planning and design of child friendly environments and has studied with the idea of "children's place friendship" based on their own experiences from an environment/behavior perspective. Horelli (2007) worked on a theoretical framework for defining significant criteria from two different perspectives, such as individual (person-environment fit) and the group (collective environment fit) perspectives. Björklid and Nordström (2007) have linked sustainable development with environmental child friendliness: they pointed out the

[1] Article 31 (Leisure, play and culture): Children have the right to relax and play, and to join in a wide range of cultural, artistic and other recreational activities (Unicef, 2011)

lack of places for children to use and children's independent mobility by defining the biggest obstacle as traffic.

Kyttä (2003b) referred to Bronfenbrenner (1989; cited in 1993) and discussed that the characteristics of an environment should be studied on various levels (Kyttä, 2003b). Chatterjee (2006) also referred to this levelling as shown in the figure 2.2 below;

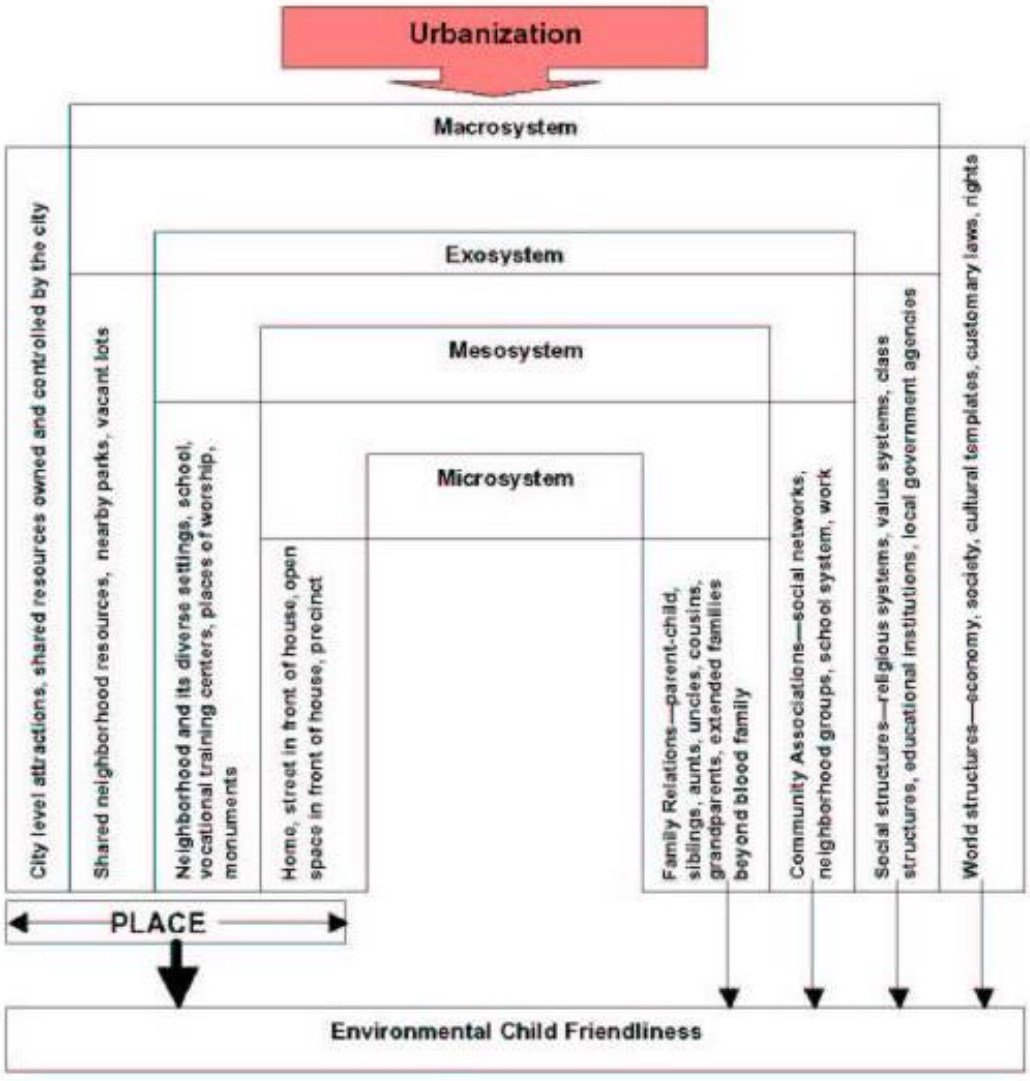

Figure 2.2. Environmental Systems of Childhood in Nizamuddin Basti (based on Bronfennbrenner 1979, and Wachs & Shpancer 1998) (Chatterjee, 2006; 249)

Kyttä (2003b) stated that studies have not examined the actual role of the physical environment on child-environment relationships. Environment is usually described as a social and cultural context that remains in the background in children studies, which is irrelevant to child's activities and experiences.

Child-environment studies are usually focused on children's ability of perceiving and constructing cognitive representations of spaces, functioning in and learning social rules related with places, instead of material environment (Kyttä, 2003b).

Mehta (2013) referred to Gibson, Lang and Heft to explain environmental affordances as:

> *"The term 'affordances' coined by Gibson (1979) refers to the physical properties of an object or environment (setting) that enable it to be used for some activity. Unlike the concept of behavior settings, affordances do not possess "coercive" or "invitational qualities" (Gibson, 1979; cited in Lang, 1987). Gibson further developed Barker's work on behavior settings and proposed that the physical properties are characteristics and configurations of the object or setting that not only afford behaviors but aesthetic experiences as well. By physically altering an object or setting, we can, and constantly do, change its affordances. Even if we do not alter the affordances of an object or setting, their usefulness and meaning may change with the needs, and the cultural and individual background of the individual who perceives them (Lang, 1987). In addition, similar to the idea of a behavior setting, the various affordances of an object or setting do not imply that it will be used. Affordances may either support or limit activities; they do not necessarily generate or "trigger" an outcome (Heft, 1997). "The affordances of the environment are what it offers; what it provides or furnishes, either for good or for ill" (Gibson, 1979, 129)".*

Kyttä (2003b, cited in 2004) presented the evaluation criteria of environmental child friendliness based on "independent mobility and actualized affordances". Kyttä (2003b) described affordances in multilayered dimensions.

Table 2.1. *The three layers of affordances of human environment (based on Loveland's nonexclusive categories) (Kyttä, 2003b; 79)*

The different layers of affordances	Description	Examples
1. Affordances for physical transactions with the environment (functional affordances)	– Allows us to manage getting around in the immediate environment – Failure to discover this category of affordances in the human environment would lead to a catastrophic inability to get around in the environment, to explore, to survive	– Affordances as the offering of support by appropriate surfaces – Obstacles and pathways – The visual/ tactual affordances of various substances – Affordances of things that can be picked up, manipulated, squashed, etc. – The container function of cups, etc. – The reflective properties of mirrored surfaces
2. Socioculturally preferred affordances	– Areferred but not necessary interactions – Selected among the very rich set of potential affordances – Reflect participation with other people in a shared cultural milieu that predisposes the individual use of objects, interpret events, etc. in particular ways – Failure to discover this category of affordances would lead to subtler yet potentially devastating and socially disabling problems[54]	– A person whose conception of preferred affordances is limited or inflexible will seem rigid or ignorant (e.g., a person who believes that certain food is edible only when cooked exactly a certain way) – A person, who lacks awareness of preferred affordances seems alien, incongruous, or unacculturated (e.g., a person who drinks from the fingerbowl)
3. Social and communicative affordances	– Reflect the meaning of human activity for other humans – Complete failure to grasp this category of affordances would lead to an absence of communication and to complete disruption of interpersonal behaviors – An imperfect grasp of what human language, gesture, postural behavior, etc. afford would result in a less severe but still serious handicap	– Affordances of symbolic behavior (conversation, writing) – Affordances of nonsymbolic activity (facial expressions, gesture, body postures and movements, tone of voice, direction of gaze)

Marketta Kyttä (2004; cited in 2006) has observed that environments vary in the quality of the affordances that they provide for children and developed a schema that clarifies how individual characteristics, social and cultural rules and factors have an impact upon the actualization of affordances (Chawla, 2007). Chawla (2007) referred Kyttä (2004) as she acquired Edward Reed's (1996a) concepts of fields of "free action," "promoted action," and "constrained action" and described "potential affordances" as the perceptible, meaningful ecological environment then divided this into three subset such as Field of promoted action (FPA), Field of constrained action (FCA) and Field of free action (FFA).

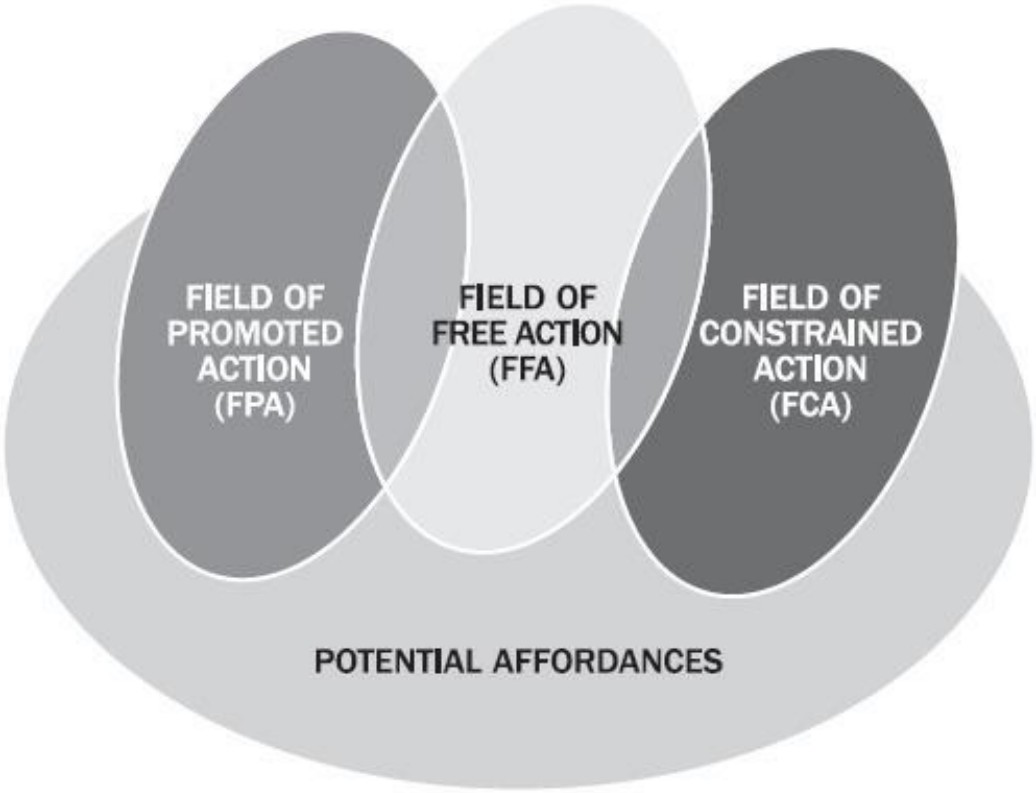

Figure 2.3. Schema of the environment as potential affordances, the actualization of which is regulated by the fields of promoted, free, and constrained action (Kyttä, 2004; 182)

Kyttä's (2004) subsets can be summarized as;

- Field of promoted action (FPA): actualization of the potential affordances. In fields of promoted action, children's actions are boosted by other people in particular ways: *"for example, by providing a stool so that a child can reach a basin of water, by placing a toy within reach, or by telling a child to go out to play"* (Chawla, 2007; 150).
- Field of constrained action (FCA): actualization can be;
    - actively promoted or restricted depending on variables
    - limited through the design of objects and spaces

  "In fields of constrained action, people limit what a child can do: placing bars on cribs, locks on cabinets, or making rules against crossing the street" (Chawla, 2007).
- Field of free action (FFA): actualization of explorations independently. "*In fields of free action, children can explore the world without guidance or interference from others"* (Chawla, 2007).

Combining these concepts with her research on affordances for children in different communities in Finland and Belarus (Chawla, 2007), Kyttä (2004) established a model based on the summarized subsets to analyze the connection between the actualization of affordances and the possibilities for independent mobility, and their importance for the quality of the child friendliness of the environment, she defined four hypothetical environmental types for children as Bullerby (the ideal environment), Wasteland, Cell and Glasshouse. Chawla (2007) described Kyttä's hypothetical environmental types as written below;

> *"Kyttä identified four types of places for children. Some can be described as "wastelands," where even if children have freedom to move about independently, there are few affordances to engage their interest. Other places may be described as "cells," where children's mobility is so restricted by physical and social constraints that they know very little about the world around them. In "glasshouses," children can see that the world is rich with possibilities for action, but they are excluded from accessing them. In the*

fourth and best place, which she terms a Bullerby (Swedish for "noisy village"), children can move freely through their world, and the world that they discover rewards their efforts. This setting, Kyttä notes, is characterized by positive cycles: the more widely that children move through their world, and the more satisfying encounters they have with engaging affordances, the more they feel motivated to explore yet further." (Chawla, 2007; 150).

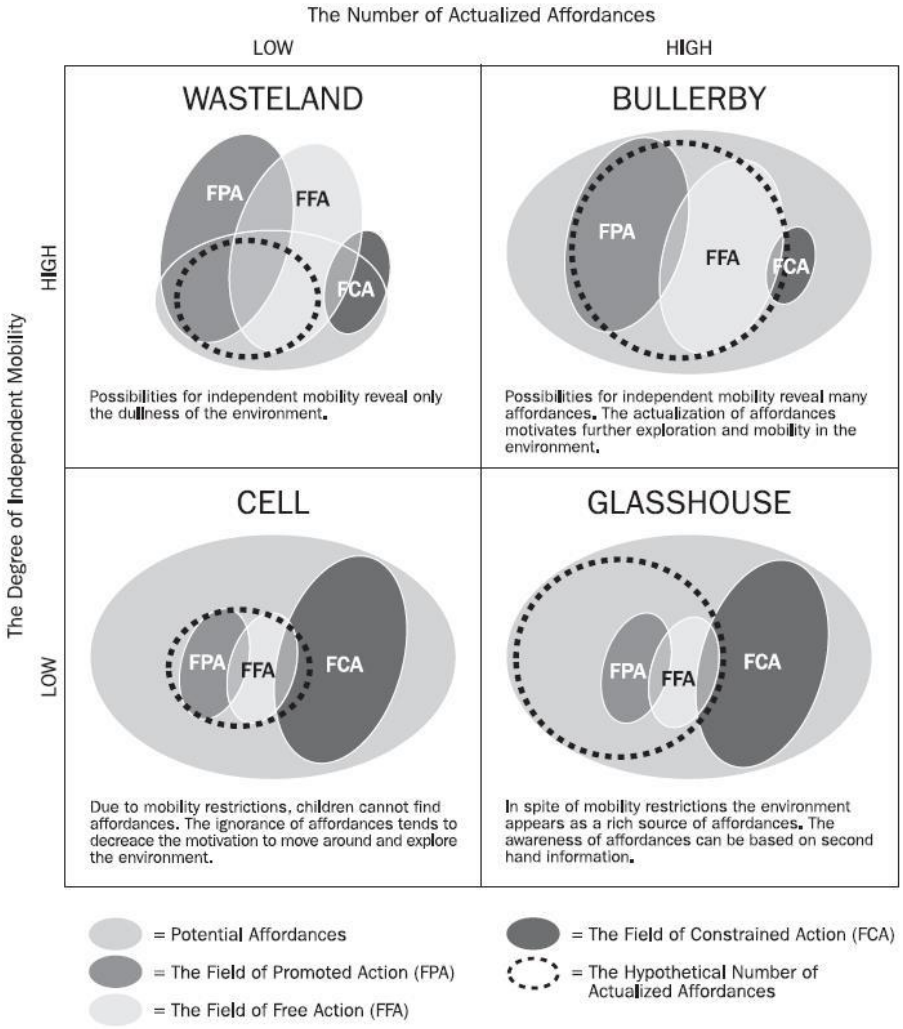

Figure 2.4. A model for describing four hypothetical types of environments that emerge from the co-variation of children's independent mobility and the number of actualized affordances (Kyttä, 2004; 183)

Kyttä (2003b) used the affordances listed below in her studies as the basis of the "affordance scale" which is used as indicators in this study to evaluate potential activities depending on physical setting of street.

Table 2.2. *A functional taxonomy of affordances used in the study and which was the basis of the Affordance Scale (Kyttä, 2004)*

Environmental qualities that support certain affordances	Affordances	Environmental opportunities for sociality	Affordances for sociality
Flat, relatively smooth surfaces	• Affords cycling • Affords running • Affords skipping • Affords skating • Affords playing hopscotch • Affords skiing • Affords playing football • Affords playing ice-hockey • Affords playing tennis or badminton		• Affords role playing • Affords playing rule games • Affords playing home • Affords playing war • Affords being noisy • Affords following/sharing adult's businesses
Relatively smooth slopes	• Affords coasting down • Affords skateboarding		
Graspable/detached objects	• Affords throwing • Affords digging • Affords building of structures • Affords using plants in play		
Nonrigid, attached object	• Affords swinging on • Affords hanging		
Climbable feature Shelter	• Affords climbing • Affords being in peace and quiet		
Mouldable material (dirt, sand, snow)	• Affords moulding something • Affords building of snow		
Water	• Affords swimming • Affords fishing		

Horelli (2007) stated two types of relevant literature about the scope of environmental child-friendliness; one of these is the research that focus on children's experiences of and transactions with their settings and other is theories and concepts on good environments. On the other hand, Chatterjee (2006) criticized the search of good environment when they were in fact in search of child friendly environments and lack of a theoretical and practical "elucidating" of environmental child friendliness.

Chatterjee (2006) adopted Doll's (Children without Friends: Implications for Practice and Policy, 1996) friendship framework to children's friendship with place and put six dimension for evaluating place friendship as a starting point.

Table 2.3. *Criteria for Place Friendship (Chatterjee, 2006) - rearranged by author*

Childhood Friendship (Doll 1996)	**Children's Place Friendship**
Mutual Affection and Personal Regard	Care and Respect for Places
Shared Interests and Activities	Meaningful Exchange with Places
Commitment	Learning and Competence through Place Experience
Loyalty	Creating and Controlling Territories
Self-disclosure and Mutual Understanding	Having Secret Places
Horizontality	Fredom of Expression in Place

However, the end result of the studies Chatterjee (2006) conducted was to reduce these six dimensions into four:

- Care and Respect for Places
- Meaningful Exchange with Places (including creating territories and free expression in places)
- Learning and Competence through Place Experience
- Having Secret Places

Chatterjee (2006) argued that the conceptualization of child friendly places can be possible once these typologies are filled with data from different social, cultural, political and economic contexts, which allow researchers to produce patterns of features, and that this could be a base input for preparing a unique design guideline for child friendly places in studied areas.

According to Haikkola *et al.*, (2007) Horelli defined environmental child- friendliness as;

> *"...a complex multi-dimensional and multi-level concept. It refers to settings and environmental structures that provide support to individual children and*

groups who take an interest in children's issues, so that children can construct and implement their goals or projects" (Haikkola *et al.*, 2007).

Horelli (2007) stated that forming a holistic picture of what environmental quality is or how it should be like is difficult, when there are various approaches to define the quality, with most of them submitting a large number of variables. Besides that theories and concepts of environmental quality ignoring children's perspectives is another difficulty (Horelli, 2007). In Horelli's theoretical framework, the idea of 'community' is central and her 'normative' engagement is for children to be seen as being part of and playing a role in the community, sharing common concerns about society with adults (Nordstrom, 2010).

Therefore research revealed that there are some variables or criteria of **environmental child friendliness** which are similarly regardless of time or region (Horelli, 2007).

Table 2.4. *Horelli's (2007) ten normative dimensions of Environmental Child Friendliness*

Normative Dimensions of Environmental Child Friendliness	**Abstract Definitions**
1. Housing and dwelling	• Flexible and secure housing alternatives.
	• Processes that transform the dwelling into a home.
2. Basic services (health, education, transport)	• Basic (public and private) services in the proximity that facilitate the everyday life of children.
3. Participation	• Opportunities to participate in planning and development.
4. Safety and security	• The guaranteeing of physical and psychological safety by the state and the municipalities: Child welfare and the prevention of violence.
	• An environment which is tolerant and pluralistic.

	• Safe transport systems and public places in general.
5. Family, kin, peers and community	• Opportunities for close social relationships with family, kin and friends.
6. Urban and environmental qualities	• High functional, aesthetic and cultural standards in the concrete elements of the local environment. Provision of a variety of interesting affordances and arenas for activities.
7. Resource provision and distribution; poverty reduction	• The provision of financial resources and work opportunities to young people who have a role to play in the local economies.
8. Ecology	• The protection of nature and the application of the principles of sustainable development in the construction of the built environment and the society.
9. Sense of belonging and continuity	• A sense of cultural continuity and a sense of belonging to a certain place at a certain time.
10. Good governance	• A flexible local governance that takes into account young people's opinions in the decision-making.
	• The provision of participatory structures, e.g. youth councils and varying participatory projects.

In another research, Hakkiola et al (2007) classified 20 macro-categories and sub-categories of analysis according to these ten dimensions in a comparative study of two neighborhoods in Helsinki and Rome. Nevertheless, the ten dimensions have cultural, local and individual variations; and they are all important in the assessment, research and creation of child-friendly environments (Haikkola *et al.*, 2007).

Table 2.5. *Macro and sub-categories of the analysis classified according to the normative dimensions of Environmental Child Friendliness (Haikkola et al., 2007)*

Normative Dimensions of Environmental Child Friendliness	**Categories of Analysis Dimensions**	
	Macro-Categories	**Sub-Categories**
1. Housing and dwelling	(1) Home; subject's own apartment or flat	
2. Basic services (health, education, transport)	(2) Services and facilities; commercial, public, recreational, hobbies,	Educational, cultural, medical, recreational, commercial
3. Participation	(3) Institutions	Parish, police, traffic wardens
	(4) Participation—refers to children's opportunities to take part in planning activities, services, and places, as well as in the decision-making processes that concern the community on various levels	Planning Decision-making and political or other societal participation
4. Safety and security	(5) Traffic	Traffic
	(6) Independence	Independent mobility/outdoor autonomy
	(7) Peacefulness—important term that participants used frequently with reference to overall peacefulness	Security in the sense of social safety and absence of fear of crime
5. Family, kin, peers and community	(8) Family, kin	Friends Neighborhood Intergenerational relationships Intercultural relationships Traditions Social control Civility/social disorder
	(9) Social climate	
6. Urban and environ- mental qualities	(10) Characteristics of the built environment	Urban planning, architectural style, type of housing, specific elements of the living place (squares, monuments, fountains), general positive or negative evaluation, beauty

	(11) Green areas, “greenery”	Nature, public and private green areas
	(12) Public spaces—refers to places where children could go to take part in sports and/or have contact with their peers	
	(13) Urban care and decay	Good or bad routine maintenance of public spaces (streets, parks, garden cleaning), urban degradation and regeneration
	(6) Independence	Independent mobility/outdoor autonomy
	(14) Proximity—the opportunity to easily reach specific places or persons due to their close location.	
	(7) Peacefulness	Acoustic pollution, noise
	(15) Spaciousness	Large spaces/restricted spaces
	(16) Morphological and natural characteristics—eg, mountains or climactic conditions	
7. Resource provision and distribution; poverty reduction	(17) Economy—both work opportunities and provision of resources	Occupational opportunities, tourism
8. Ecology	(18) Ecology	Pollution Relationships with nature and wild animals
9. Sense of belonging and continuity	(19) Identity, attachment—expressions of affective (both positive and negative) bonds with the subject’s own community or place	
10. Good governance	(20) Local institutions and processes that enable even young people to get involved in decision-making, such as children’s councils	Local councils

According to Björklid & Nordström (2007) sustainable development should allow participation and influence of children and youth by offering them opportunities for individual development. Sustainable development is based on children's understanding and evaluating physical environment with their own experiences through active involvement, within environmental psychology (cf. Klöfver 1995; cited in Björklid & Nordström, 2007; 390). Children's participation conditions are the possibilities they have to get experiences like freely moving out, exploring the natural and built environments, interacting with others and observing and acquiring new roles in public places (Björklid and Nordström, 2007). Especially in big cities; intensified building and increased traffic caused the reduction of outdoor spaces children use and safe access of children to outdoors. Having limited or non-accessible environment cost children their own experiences and opinions which are important for their development (Björklid and Nordström, 2007).

Bridgman (2005) interprets the outcome of child friendly environment studies in Horelli's book review as;

> *"Child-Friendly Environments lays out a useful framework for applying theories about a ''good environment'' for young people involving both the substantive (ecological, socio-cultural, ethical and political, economic, psychological, and aesthetic/physical) and the procedural (regime and governance, communicative and participatory planning, and place-based politics)."* (Bridgman, 2005; 467)

To summarize; children rights is the legal basis of child friendly environments and children's participation to design and planning process is important, and designers should create opportunities for children & young people. All these studies underline various analysis parameters for child friendly environment. Street is the very first outdoor freedom area for children. In this study streets are evaluated as being play spaces for children and some environmental child friendliness dimensions could be used in street scale. A good environment for children and young people should be

designed by taking into consideration of how to provide them a safe and secure environment, how they interact with natural or built environment, what this interaction means for them and how it affects their behavior. Moreover, how existence of various physical street elements promote activity for children and how to manage activity with design are other concerns of the study. In the next section, street, which has an important role in child friendly environment is examined as a playground, in the scope of residential streets. The aim is understanding the factors that make streets attractive especially for children and provide safe playing environments, and how shared street concepts could create child friendly environments.

2.4. Streets, Children and Play

"Streets are critical arteries for transporting goods and people, but they are also the places where we live, work, play and interact."(NACTO, 2012; 9). There are many anti-reactions to car traffic growth around the world. It is understood that the period in which the assumption that suggests "cities should be planned for vehicles" is over; vehicles should be planned and organized according to cities. Planners have developed projects that are supportive of public transport and non-motorized modes of transport, such as bicycle and pedestrian transport by applying traffic management and car restriction policies. In addition, citizen-based movements, such as reclaiming streets, have been observed recently. A new literature has started to form that concentrated on child-friendly design concepts such as woonerf, living streets, home zones, etc. Several street design manuals have been prepared, in which the place function of the street has been emphasized. And as a consequence of these changes, an awareness about "child-friendly streets" has emerged.

In the introduction part of Mehta's book "The Street" (2013), Andre Breton defined the street very simply as written below;

> *"Streets play a major role in structuring the form of settlements, particularly urban settlements. A considerable portion of land in cities—one-third to a half—is devoted to streets that serve as the prime infrastructure for movement,*

> *access and connectivity, and in carrying and delivering utilities and services. Streets bring light and air into buildings. But most importantly, streets of all types, in cities new and old, are the most immediate and ubiquitous public spaces that support myriad cultural, economic, political and social activities"* (Mehta, 2013).

Alexander (1977) supports this most important role of the street by emphasizing the streets as public spaces;

> *"Streets have been providing public space to city dwellers right outside their house for centuries but now in modern city, streets have become places which are for "going through," not for "staying in." This is reinforced by regulations which make it a crime to loiter, by the greater attractions inside the side itself, and by streets which are so unattractive to stay in, that they almost force people into their houses"* (Alexander, 1977;121).

Igarta (2012) stated that streets often served as the lifeblood of neighborhoods, knitting together the urban fabric of people and places that make up a community before the automobile era, and they used to form multifunctional and densely occupied spaces, serving also as playgrounds for children. In the last few decades there has been a decrease of the children's presence in public urban space and, at the same time, a reduction in their street-play activities (Galani and Gospodini, 2011). Today, streets are more commonly considered as "barriers between a neighborhood's residents and confine people to their private space or to a narrow sidewalk along the fringe" (Igarta, 2012). But as Alexander (1977;121) stated "streets should be for staying in, and not just for moving through, the way they are today". Streets are not only inter-joined connections that serve car mobility and access but public spaces that can promote social interaction, active living, and community identity which can make entire neighborhoods attractive or unattractive places to live (Igarta, 2012). Alexander (1977;100) stated that activities occur just where cars and pedestrians meet, but that cars are dangerous to pedestrians. Cars took over streets and made them unfavorable

for people, which is damaging because it robs the streets of people, and streets become abandoned and dangerous.

Streets' role in people's daily life has changed; however, fast urbanization caused more changes along with streets. There are multiple reasons for people losing their social place and children losing their play space especially in their neighborhood, just in front of their homes. Galani and Gospodini (2011) refer to a number of studies that associate children's decreased presence on streets with;

- changes in the mobility patterns of children and particularly the increase of the car-use for everyday journeys and the dangers that dense traffic causes.
- intensification of criminality, most notably the fear for attack, harassment and kidnapping
- technology's affect in everyday life. (The extensive use of World Wide Web and applications such as Facebook, Twitter etc., intensify children's isolation from the open urban spaces).

In each case the decrease of children's presence and play activities in the urban landscape and particularly in streets is a common outcome (Galani and Gospodini, 2011). Although outdoor environment has long been a favorite place to play for children, fewer children play in the street today, and they do so for a shorter time and in more limited ways, than in previous generations (Gill, 2007).

Karsten and Van Vliet's arguments (2006) of children's play has been shifted from outdoors to indoors in recent decades also support these facts. Whereas in the 1950s children's play meant playing outside, today many more play activities happen inside the home. Karsten (2005) also point out the children's increasing freedom of usage of space at their homes that they negotiate a much more democratized use of other spaces inside the dwelling, other than their bedrooms, transforming hallways and living rooms into play areas. The emergence of a category of indoor children—who hardly ever go outside to play—is new (Karsten, 2005; cited in Karsten and Van Vliet, 2006).

Even though children considerably withdrawn from outdoors and lose their independence, their freedom at home has grown. And their daily territory where children can move freely has decreased abruptly (Karsten, 2005; cited in Karsten and Van Vliet, 2006). Karsten and Vliete (2005) also refer to the work of Risotto and Giuliani (2006), suggesting that the loss of local experience for children has reduced opportunities for environmental learning and competence. For example, neighborhood parks that children used to visit on their own have become less accessible and changed character. Most of the parents think parks became places where children cannot go without escorted which lead parks to lose their characteristics as children's domain (Karsten, 2005; cited in Karsten and Van Vliet, 2006).

However, as Moore and Young (1978) emphasize, outdoors is a necessary counterbalance, an explorable public domain providing engagement with living systems and the prevailing culture – the locus of volitional learning for children, yet they don't have enough opportunity or are not attracted to such places anymore.

Along with the problems described above, recent movements in the field of urban planning and design (for example new urbanism, the ecocity, compact city and urban containment), point out the importance of walkable and livable streets, especially in residential areas, as part of sustainable urban development (Jabareen, 2006; cited in Galani and Gospodini, 2011).

In this study residential areas will be the focus to gather ideas, based on previous implementations and experiences, with a view to point out design approaches which can help reclaim streets as playgrounds for children.

2.4.1. Residential Street Environment & Neighborhood

Gill (2007) emphasized how being around/near home is a critical circumstance in children's need of going outside individually.

> *"Streets in front of their homes are therefore natural meeting places, and generally the places where most children feel - and are - safe from harm (assuming traffic poses no threat). The home street is also the starting point*

> *for all the journeys and trips that children make: a springboard for travelling around their 'home territory' - the area they are allowed to move around on their own."* (Gill, 2007; 7)

Gill stated (2007) that home street was, and is, a significant play space for several reasons. One of them is being just outside children's front doors, where children are able to play semi-independently near their homes. This also gives adults the opportunity to do other things at the same time as their children play out, which is *"something that is not possible if they have to accompany children to a park or play area. They also can get a drink, snack or visit the toilet, these are close at hand."* (Gill, 2007; 6)

Moore and Cosco (2008) indicated the children's need to move around the community on their own or more likely in a group of peers. However, this is becoming more and more difficult for children universally, because of the same reasons Galani and Gospodini (2000) stated, as described in the previous section: the dramatic growth in quantity, size, and speed of both private automobiles and commercial vehicles; as well as the added anxiety of parents in some countries about social threats (real or imagined) towards their children. Moore and Cosco (2000) argued that in England, a generation ago most children walked to school, whereas now most are driven, a situation that ironically adds substantially to the rush hour traffic density and level of risk to pedestrians. The same conditions apply in the United States where the effort to racially balance the public schools involves children being driven by bus long distances across town (Moore and Cosco, 2000). It is the same in our country too. In addition to all other reasons, divergence of quality of education in schools also push parents who has the opportunity to choose schools even if it is far away from their home. This makes schools to be out of range of walk for children.

Moore and Cosco (2000) also emphasized that the issue of child-appropriate environments falls into the realm of urban design policy at the scale of the urban neighborhood. Neighborhoods need to provide a vast of terrain of exploratory

possibilities for older children compared to a play garden for infants and toddlers. They also indicated some childhood environmental policy issues, which emerged from field research conducted in the 1970's and which are even more pertinent today.

Table 2.6. *Childhood environmental policy issues in approximate order of priority (Moore and Cosco, 2000)*

Landscape conservation	There is a critical need (not just for children), to protect and conserve landscape features with high educational and ecological significance (streams, woodlands, hedgerows, mature trees, rock outcroppings, etc.), when childcare centers, schools, and residential neighborhoods are constructed.
Preservation of special childhood places.	Natural places and some people-made places with unusual characteristics are especially attractive to children. Examples include remnant orchards, old trees, remains of old buildings and structures, dumps, former earthworks for mining and other scars on the land (as adults would label then). These latter stimulate children as they try to image what happened there. Nowadays, there is a serious issue of potential toxic dumping and possible earlier contamination of places children find attractive.
Making streets livable	In the past 25 years, many countries have developed a variety of measures and techniques to calm neighborhood traffic. The best known and systematic approach is the woonerf concept developed in the Netherlands.
Urban wildlife management	Interest in this task has grown in the past two decades and is a focus of urban policy in some countries. Schoolgrounds and childcare centers should be managed as urban wildlife reservations. In the U.S., the National Wildlife Federation has developed successful programs on both Schoolyard Habitat and Backyard Habitat creation and conservation.
Rough ground	Urban wildlife and children both appreciate diverse habitats of unkempt natural areas where they can feel free and interact with nature without annoying adults by making mess in more manicured areas. This is especially an issue in urban parks where there is a tendency to follow only aesthetic desires for orderliness. Alternative models exist in some countries: the ecological parks in England and the Netherlands, play parks in Stockholm, nature parks in Denmark and Germany.
Access to diversity	Implementation of the above five policies will ensure meeting the most critical childhood landscape criterion: access to diversity. Effective child development is dependent on richness of experience. Convenient, feasible access to diverse natural landscapes is the requirement.

2.4.2. Street As Playground

> *"Great differences exist between adults and children in their perception and use of the outdoor environment. While streets are functional resources to adults, for children they are places that offer play opportunities in each elements of the street. Children measure the environmental quality of the streets by the presence or absence of ordinary objects that lead to play. Nonetheless, traffic has a critical effect on street playability"* (Moore, 1987; 45).

Children learn about the world by playing with not just in it. Until they are dragged into schools, play is the principal medium for learning by children. They learn by doing, moving, pretending, building, taking chances, hiding, throwing, playing in dirt and in water, balancing themselves (Krohe, 1996).*"Children have an openness to the world and "play everywhere and with anything"* (Ellis, 2004; cited in Ward, 1977, p. 86).

> *"Children see streets differently, as play opportunities discovered in lampposts, curbstones, gutters, inspection chamber covers, over-head wires, parked cars, trees, piles of leaves, flights of steps, gates, bollards, hedges, retaining walls, drive-ways, building entrances, bus stops, mailboxes, street signs, and benches. Children measure the environ-mental quality of streets by the presence or absence of these mundane objects, not by the ease of traffic flow and parking. Nonetheless, traffic has a critical effect on street playability"* (Moore, 1987; 45)

Playground is a place where children develop their intelligence and personality in social life. This is where the children make contact and interaction with the social environment, which ultimately help to shape the children character (Hurlock, 1978; cited in Dewi, 2010).

Playground is a place of interaction, communication, and expression that can be accessed by children coming from various backgrounds. This is relevant to the

function of playground which also can be used as an open space for relaxation as well as environmental conservation, and the green area (Gallion and Eisner, 1994; cited in Dewi, 2010). The term playground used here refers to an open space equipped with playing facilities for children, under adult supervision, which we can be categorized as formal playground. Mostly, in dense residential areas, formal playground availability is lower in rank to other interests and finding playground, especially in residential area in large cities is difficult (Darmawan, 2003; cited in Dewi, 2010). That is where Krohe (1996) made his point as he mentioned the formal and informal playgrounds for children and expressed the idea of not to build better playgrounds but to eliminate the need for formal playgrounds as the sole venue for children's play. He argued that the street, the alley, the vacant lot, the riverfront, the underpass are the classic venues for child's play. As sufficiency of playgrounds is a lasting discussion, Alexander criticizes;

> *"any kind of playground which disturbs, or reduces, the role of imagination and makes the child more passive, more the recipient of someone else's imagination, may look nice, may be clean, may be safe, may be healthy - but it just cannot satisfy the fundamental need which play is all about. And, to put it bluntly, it is a waste of time and money. They are not just sterile; they are useless. The functions they perform have nothing to do with the child's most basic needs"* (Alexander, 1977; 73).

Why Streets Are So Attractive?

The major reason of streets to be so much attractive is the freedom children have in their known territory: moving, playing freely is just too charming and full of opportunities and surprises. Moore simply puts the situation as follows:

> *"...kids do play in streets-all kinds of streets-and nothing that planners. parents, or city officials can do will stop it. Indeed, there is every reason for celebration, for streets are the social hub of the neighborhood, where children*

meet, learn about each other and their adult neighbors, and investigate their surroundings" (Moore, 1987; 47).

Moore (1987) referred to some similar positive outcomes of studies in a number of countries, which can be explained by two phenomena:

- children's close proximity or case of access to such spaces
- hard, linear play surfaces that children prefer for many everyday games and play activity (Asphalt and concrete do not get muddy; they make a smooth surface for wheeled toys, bikes, and roller skates; and they have excellent ball-bouncing characteristics)

However, as stated by Moore (1987), streets' high degree of accessibility to children of both sexes and all ages is what makes streets especially attractive.

> *"Streets fall within the habitual range of child-hood territory; that is, they are close enough to home to be used every day within the severe time constraints under which most children live. Streets are available during the cherished intervals between school and the evening meal, between the completion of homework and darkness, between wet weather and domestic chores, between waking and a family outing."* (Moore, 1987; 48).

Moore (1987) indicated "when **traffic density is low** and **streetscape diversity high"** children are attracted into this environment which is highly suitable for their needs. Streets and street corners are valuable meeting places which serve to a critical meaning in *"children's loose-knit social structure by providing a locus for peer contact"* just around their houses.

Moore and Young (1978) also emphasized that the creation of childhood places cannot be left to chance or pressure groups' whims in the urban environment; they must be intentionally promoted by planning, design and management to answer basic human needs.

In addition, there is Krohe's (1996) interesting inference of the planning task becoming either to make playgrounds more exciting than streets as places to play, or to make the streets as safe as the playgrounds. Rising of child friendly design approaches to make streets more livable, walkable and safe indeed validates his idea.

2.5. Child Friendly Shared Street Concepts/ Design Approaches

Shared street concept is a design approach, which allows the same space to be used by both pedestrians and cars. Providing an awareness by design elements in street leads both users to behave different and respectful to each other's existence, and consequently pedestrians having a priority over cars is not a necessity depending on the legal background of application. Alexander (1977; 52) referred to pedestrian areas being more human and safer because of the common planning practice for separating pedestrians and cars. However, he also mentioned the need of pedestrians and cars belong together and that, *"in fact, a great deal of urban life occurs at just the point where these two systems meet"* (1977; 52). So, ideas of "different street users sharing the same space" have been developed and experimented in practice.

Karndacharuk, Wilson and Dunn (2014) argued that the notion of different street users sharing the same public road space is not new. However, the idea of encouraging the mixing of slower speed, smaller mass pedestrians or cyclists with a higher speed, larger mass vehicles is novel, particularly after the pinnacle of widespread automobile domination in the automobile era of the twentieth century and pervious objectives of separating vulnerable road users from vehicles (Karndacharuk, Wilson and Dunn, 2014).

Karndacharuk, Wilson and Dunn (2014) expressed the street design approaches to integrate pedestrian social activity into the underlying transport functions of the public road space can generally be divided into two categories based on whether they were designed for the segregation between vehicles and pedestrians.

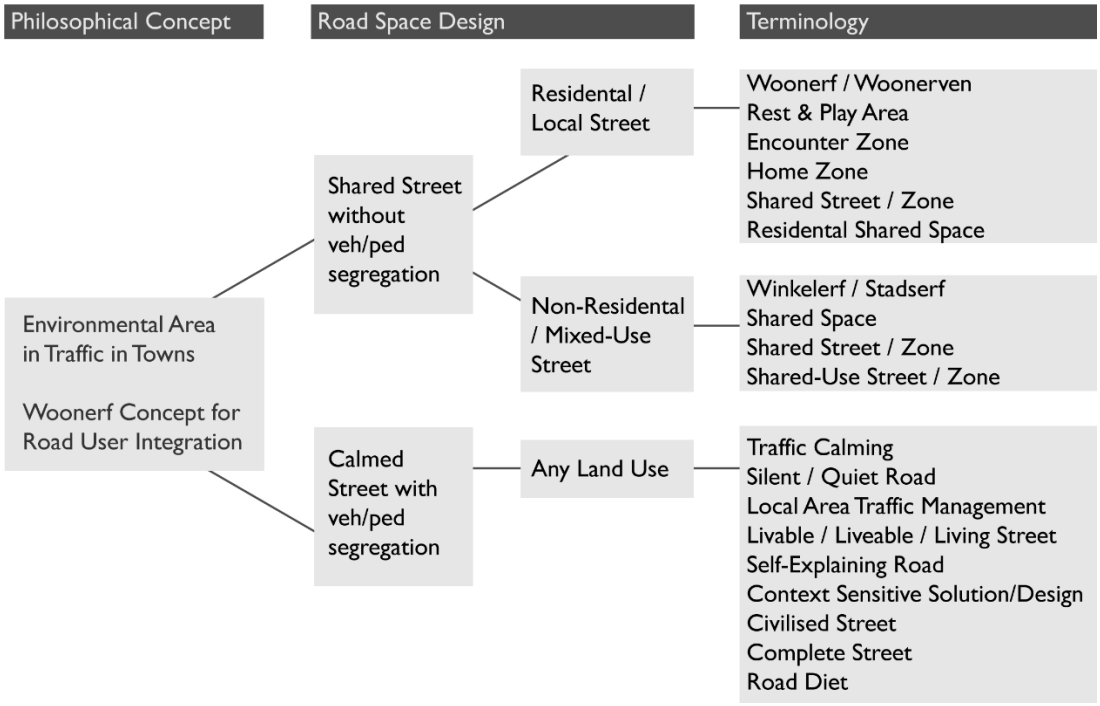

Figure 2.5. Evolution of the street design approaches to integrate pedestrian social activity into the underlying transport functions

The road user integration idea can be traced to Buchanan's environmental area philosophy and further developed in the Netherlands in the form of the residential shared space (Woonerf) concept (Karndacharuk, Wilson and Dunn, 2014).

Ben-Joseph (1995) also referred to De Boer for turning to Buchanan's concept of coexistence trying to overcome the contradiction between children playing and car use; that De Boer designed cul-de-sac streets in such a form that motorists would feel as though they were driving in a "garden" setting, and so would be forced to take into consideration the other street users. De Boer renamed this type of street "Woonerf," or "residential yard." (1995). De Boer's ideas were then implemented by the Municipality of Delft (1969) in some lower-income neighborhoods where more child play areas were urgently needed but available sites were almost non-existent, which was part of redesigning and upgrading the road surfaces in inner city locations. With resident participation, a physical design was formed that integrated sidewalks and roadways into one shared surface, creating the impression of a "yard." This was further

enhanced by trees, benches, and small front gardens (Jonquiere 1978; Hass-Klau 1990; cited in Ben-Joseph, 1995).

Ben-Joseph points out Delft's redesign as a success and afterwards, the shared street (Woonerf) concept became accepted and established through guidelines and regulations in the Netherlands (1976), and then in many other countries: Germany (1976), England (1977), Sweden and Denmark (1977), France (1979), Japan (1979), Israel (1981), and Switzerland (1982). The concept's popularity was such that in new residential areas it became the major type of residential street (Ben-Joseph, 1995).

Karndacharuk, Wilson and Dunn summarized (2014) shared street notion in one sentence from traffic engineering perspective as "supporting different street users mixing together within a public road reserve", and defined the concept as *"a public local street or intersection that is intended and designed to be used by pedestrians and vehicles in a consistently low-speed environment with no obvious physical segregation between various road users in order to create a sense of place, and facilitate multi-functions"*(Karndacharuk, Wilson and Dunn, 2014; 215).

Karndacharuk, Wilson and Dunn (2014) gathered ideas, experiments and implementations in literature about how the Woonerf concept evolved and was adapted in different geographies in time. They have formed a table that compares the ideas in a concept of terminology, jurisdiction, decade, land use, objectives, design features, authors' comments and references. This comparison, which is presented below in Table 2.7 will provide an understanding of how shared street/space concept spread across different cities, counties and geographies.

Table 2.7. *Shared street/space concepts across different cities, counties and geographies. (Karndacharuk, Wilson and Dunn, 2014; 198-202).*

Terminology	Jurisdiction	Decade	Land use	Objectives	Design features	Authors' comments	References
Shared Street Woonerf (Woonerven as a plural)	The Netherlands	1960s	Residential	(1) To integrate vehicle traffic into social residential space. (2) To enhance liveability	(1) Shared, level surface with special paving across the full road width. (2) Trees, bollards and parking spaces used to restrict vehicle speeds. (3) Gateway treatment with legal signage	(1) A woonerf often referred to as a calmed street due to its main objective of calming vehicular traffic. (2) Subsequent design from the 1980s includes safety areas, exclusively for pedestrians. (3) Design speed of walking speeds with frequent traffic restraining measures. (4) Vehicular traffic subordinated to pedestrians	Ben-Joseph (1995), HassKlau (1990), Nio (2010), Pharoah and Russell (1991), Quimby and Castle (2006), Russell (1988) and Southworth and Ben-Joseph (2003)
Winkelerf & Stadserf	The Netherlands	1970s	Activity centres	(1) To improve economic viability, community interaction and quality of life	(1) In principle, same as a Woonerf	(1) The original Woonerf regulation was replaced by Erf regulations to reflect wider land-use applications. (2) While the term 'Woonerf' applied to residential streets, 'Winkelerf' and 'Stadserf' for shared streets in shopping areas and city centres, respectively	Kraay (1986), Kraay and Dijkstra (1989), Pharoah and Russell (1991) and Quimby and Castle (2006)
Rest and Play/	Denmark and Germany	1970s	Various, predominantly residential	(1) To improve street environments for pedestrians and playing	(1) In principle, same as a Woonerf where the entire road area designed for rest and play	(1) The concept emphasises no distinction between carriageway and footpath. (2) Speed limit of 15 km/h	Kjemtrup and Herrstedt (1992) and Russell (1988)
Shared Area	Switzerland	1970s	Various, predominantly residential	(1) To improve street environments for pedestrians and playing	(1) In principle, same as a Woonerf	(1) Posted speed limit of 20 km/h	Sauter and Huettenmoser (2008)

Table 2.7. *Continued*

Home Zone	UK	1970s	Residential	(1) To integrate vehicle traffic into social residential space. (2) To enhance liveability and environmental quality	(1) In principle, same as a Woonerf; however many home zones do not incorporate level surface across road corridor	(1) Before the implementation of pilot home zones, trafficcalming measures were used to control vehicle speeds	Ben-Joseph (1995), Biddulph (2001, 2003), Clayden et al. (2006), DCC (1991), Hass-Klau et al. (1992) and IHIE (2002)
Shared Street	International	1980s	Residential	(1) To improve road safety. (2) To minimize environmental effects, e.g. noise and emission	(1) Similar to a Woonerf, with some specifying alternating vehicle path or chicane treatments	(1) Shared street design in Israel specifically incorporates a safe zone free of vehicles on either side of the shared street, which provides for the disability and other vulnerable users. (2) Design speed of 15–25 km/h	Ben-Joseph (1995), Bliek (2010), Craus et al. (1993), Ichikawa, Tanaka, and Kamiya (1984), NACTO (2013) and Polus and Craus (1988, 1996)
Shared Zone	Australia and New Zealand	1980s	Various	(1) To increase safety for pedestrians and cyclists. (2) To improve public amenity	(1) In principle, same as a Woonerf	(1) Shared zone in Australia has a compulsory speed limit of 10 km/h while the 10 km/h speed limit in a New Zealand shared zone is optional	Austroads (2008b, 2009b), Karndacharuk et al. (2013), NZTA (2009) and RMS (1987, 2012)
Shared Space	Internation al	1980s	Various, predominantl y activity centres	(1) To improve street environments and road safety. (2) To provide a better social interaction and sense of community and place	(1) In principle, same as a Woonerf, but design outcomes vary between jurisdictions. (2) Linear alignment of street and vehicle path often encouraged for improved legibility and urban form. (3) Emphasis on de-clutter and removal of traffic control devices (giving rise to the term 'Naked Street')	(1) Hans Monderman applied the Woonerf concept of integration in towns and villages. (2) Shared space concept became internationalised largely due to a European Shared Space project in the 2000s. (3) The term sometimes describes a calmed street with a focus on CSD and social interaction	DfT (2009, 2010a, 2010b, 2011), Hamilton-Baillie (2008a, 2008b), Kaparias et al. (2010), Kaparias, Bell, Miri, Chan, and Mount (2012), Karndacharuk et al. (in press) and Shared Space (2005, 2008a, 2008b)

Table 2.7. *Continued*

Calmed Street Woonerf (as Traffic Calming)	The Netherlands	1970s	Residential	(1) To improve road safety, especially by vehicle speed reduction. (2) To reclaim vehicle space for other road users. (3) To improve street environments	(1) Various physical calming measures, e.g. speed humps, raised platforms, carriageway narrowings, chicanes, gateway treatments, rumble strips and change in surface material	(1) The Woonerf design evolved from a shared to calmed street with design separation between vehicles and pedestrians. (2) High cost of shared, paved street contributed to the invention of certain physical calming measures and lower speed limit areas	Ben-Joseph (1995), Hass-Klau et al. (1992), Kjemtrup and Herrstedt (1992) and Pharoah and Russell (1991)
Stillerej /Silent or Quiet Road	Denmark	1970s	Residential	(1) To improve residential street environments	(1) Various physical calming measures	(1) Urban roads where 'living' has priority are designed with maximum speed of 30 km/h. (2) 'Quiet Road' forms part of wider traffic calming and speed management concepts	Kjemtrup and Herrstedt (1992) and Pharoah and Russell (1991)
Verkehrsberuhigung/ Traffic Calming	Germany	1970s	Various	(1) To improve street environments. (2) To reduce motor vehicle dominance	(1) Various physical calming measures, e.g. vertical and horizontal deflections	(1) According to Hass-Klau (1990), the traffic-calming concept initially included pedestrianisation and shared streets, and later expanded to an area-wide concept, including 20 mph (32 km/h) speed zones	Brindle (1991, 1992), Hass-Klau (1990) and Pharoah (1993)
Traffic Calming	UK	1970s	Various	(1) To reduce vehicle speeds. (2) To reallocate carriageway space for other activities. (3) To improve street environments and quality of life	(1) Various physical calming measures	(1) Policy framework for traffic calming involves classification of urban roads into living, mixed-priority and traffic areas. (2) Shared streets are included in a wider traffic-calming application	CIHT (2005), DCC (1991), Harvey (1992), Hass-Klau and Bocker (1992) and Pharoah and Russell (1991)

Table 2.7. *Continued*

LATM	Australia and New Zealand	1970s	Various	(1) To improve road safety and liveability. (2) To reduce vehicle speeds. (3) To remove non-local, through traffic	(1) Various physical calming devices (e.g. chicanes and humps) and streetscape elements	(1) LATM considers neighbourhood trafficrelated problems on an areawide basis. (2) It also involves strategically social, cultural and attitudinal changes in travel behaviour. (3) Shared streets also included in LATM	Austroads (2008b) and Brindle (1991, 1992, 1997)
Liveable/ Living Street	International	1970s	Residential	(1) To improve street liveability and amenity. (2) To reduce vehicular dominance	(1) Various physical calming measures. (2) Space reallocation for community activity and pedestrian amenity	(1) Appleyard's liveable street is considered in a neighbourhood context and designed as a pleasant place for social interaction. (2) Broader definition of the term 'Liveable Street' incorporates streets and roads with lower speed limits	Appleyard (1980), Appleyard et al. (1981), Bain et al. (2012), LAC (2011) and ODT (2002)
Traffic Calming	North America	1980s	Various	(1) To reduce vehicle speeds and volumes. (2) To improve road safety and liveability	(1) Various physical calming measures	(1) Definition of US traffic calming excludes nonengineering measures that are designed to slow or divert vehicular traffic, e.g. roadside planting and neighbourhood safety campaigns	Ewing (1999), Ewing and Brown (2009), Ewing et al. (2005), Lockwood (1997) and TAC (1998)
SERs	International	1990s	Various	(1) To ensure road design and user behavior match their intended functions. (2) To reduce driver's errors and enhance driving comfort	(1) Design varies based on road classification, including pedestrian crossings and refuges, special vehicle lanes and traffic-calming measures. (2) Minimum road marking and signage on local streets	(1) SER focus on consistent road design within each category, ranging from urban arterials to local rural roads. (2) Traffic-calming measures primarily used in local and collector roads, e.g. roundabouts and lateral shifts	Charlton et al. (2010), Mackie et al. (2013), Theeuwes (1998) and Theeuwes and Godthelp (1995)

Table 2.7. *Continued*

CSD/CSS	North America	2000s	Various	(1) To ensure transportation projects and systems fit into the context of enhancing community values while maintaining safety and mobility	(1) Traffic-calming measures often employed	(1) The term 'CSD' was the early terminology, which evolved into CSS to recognise the wider spectrum of issues from planning through construction and beyond	ITE (2010) and TRB (2009)
Civilised Street	Europe	2000s	Various	(1) To improve road safety and liveability and community interaction. (2) To ensure streets designed for all users	(1) Traffic-calming measures used on residential and activity centre streets	(1) Besides street design, the concept incorporates transport policy and strategy to enhance active modes and quality of life. (2) The term often manifested as calmed streets with traffic-calming measures to reduce vehicular dominance	CABE (2008), Hass-Klau et al. (1992) and LCC (2010)
Complete Street	North America	2000s	Various	(1) To provide safe movement and access for all users, especially pedestrians and cyclists	(1) Wide range of design measures, including traffic-calming measures for local streets	(1) Rebalancing priority for various road users prevents a vehicle-dominated street environment	Kingsbury et al. (2011), Laplante and McCann (2008) and NCDT (2012)
Road Diet	North America	2000s	Various	(1) To reallocate vehicle space for other transport modes, especially pedestrians. (2) To reduce vehicle speed and improve road safety	(1) Reduction of vehicular travelling space to provide for footpath, cycle lane and on-street parking	(1) Although calming vehicular traffic is not a primary objective, decreased space for vehicular movement contributes to reducing vehicle dominance	Huang et al. (2002) and Rosales (2006)

Moody and Melia (2013) referred to the UK Department for Transport's (DfT) definition of shared space as "a street or place" designed to lessen the domination of cars upon pedestrians and boost the ease and movement of pedestrians, which allow different users to share the same space rather than dictate users to follow the clearly defined rules implied by more conventional designs (DfT, 2011; cited in Moody and Melia, 2013).

> *"As such, and conversely to popular belief, the term ''shared space'' is not used to characterize entire streets and places as ''shared'' or ''not shared'', particularly given that streetscape design cannot be standardized and needs to be context-sensitive. Instead, shared space is used as an ''umbrella'' term to collectively refer to a range of streetscape treatments, aiming at creating a more pedestrian-friendlier environment. Examples of streets with varying extents of shared space elements can be found around the world and include the concept of ''woonerf'' and ''home zone'' in residential areas in the Netherlands and UK"* (Kaparias *et al.*, 2015; 116).

These examples are described in more detail in the following sections.

2.5.1. Woonerf (Netherlands)

As mentioned in previous sections, the term 'Woonerf' was first coined in 1965 by Niek de Boer, Professor of Urban Planning at the University of Emmen. Woonerf is generally translated as 'residential yard'. The first experiment of the Woonerf idea was undertaken in the late 1960s by the Planning Department of Delft (Karndacharuk, Wilson and Dunn, 2014) and after its success the Woonerf concept became widely accepted in the country. The concept was recognized by the Netherlands government in 1976 with legal status and formal traffic guidelines and regulations (Southworth & Ben-Joseph, 2003; cited in Karndacharuk, Wilson and Dunn, 2014).

Passmore (2005) stated that the Woonerf design principle is the notion of integrating uses. Unclear boundaries between pedestrians, cars and cyclists, convey doubt upon drivers. By this unique road design, designers hoped to boost social interaction and

enhance safety. Standardized road signage, marking, curbs and barriers were removed in order for the integration of traffic and residential activity and to promote pedestrian movement (Karndacharuk, Wilson and Dunn, 2014).

Karndacharuk, Wilson and Dunn (2014) stated that the shared space concept was first officially embodied in the form of a residential shared street in the Netherlands with the following typical design and operational characteristics:

- Pedestrians have priority to use the full width of the road while drivers are urged not to drive faster than walking speeds.
- There is little demarcation between carriageway and footpath. The entire width is often constructed in a continuous surface with special pavers.
- Through vehicular traffic is discouraged. Vehicle speeds and flows are restricted by street design (e.g. horizontal curves and the location of bollards and parking spaces).
- There are streetscape elements to encourage users to stay within the space.
- The access points to the residential shared street area are clearly marked.

Passmore has made a similar table of Woonerf design elements.

Table 2.8. *Common Woonerf Design Treatments Hierarchy (Passmore, 2005)*

Surface treatment	Interesting patterns and varied surface treatments are encouraged to send both visual and haptic cues to drivers, signaling that their driving context has changed. Usually the "carriageway" is a continuous color and texture.
Sidewalks level with road or non-existent	Reducing the emphasis of sidewalks encourages free pedestrian flow over the entire street rather than solely in isolated channels.
Gateways at entry/exit points	It is very important that the transition from one road behavior model to another is clearly marked to alert drivers that they are about to enter a different context.
Bollards	Typically placed in front of houses to prevent vehicle intrusion (both driving and parking).

Pedestrian level lighting	Lower lighting encourages a pedestrian scale of intimacy and mood. Sometimes white light is encouraged for improved definition of paving features.
Street furniture, squares, children's play areas, and cafes	Encouraging community use of the street and a sense of ownership, these facilities also act to obstruct linear travel and thus reinforce driver engagement.
Street trees, bushes, community gardens	"Greening" has same benefits as adding street furniture that also helps to integrate landscape across the street.
Parking	Parking is often in short supply (a common complaint) and is typically arranged in echelon patterns.
Public Art	Often local artists contribute to signs, gateways and surface mosaics.

New Woonerf

Passmore (2005) points out that a new approach to street design has been surfacing lately. Although this approach doesn't have a name it will be mentioned as new Woonerf in the next sections. Actually, it is not entirely a new concept, but includes additions or changes that have been made to original Woonerf by Hans Monderman and Ben Hamilton-Baillie. Monderman, credited as the movement's pioneer, appears to have come across these new principles rapidly as he sought to promote safer driving behavior through innovative urban design (Passmore, 2005).

Passmore (2005) stated that Monderman wanted to remove all signage and markings from city streets. Monderman claimed that if a road is properly designed, then driver behavior will respond to the social and physical context; road signs become redundant, and design will control driver behavior. Passmore (2005) referred to Tys van den Boomen's quote of Hans Monderman (July 2011) that the essence of Monderman's strategy is "to employ architectural and urban design techniques to guide, suggest and modify behavior. Ultimately the traffic code should be replaced by a social code".

Passmore (2005) correlated Woonerf and Monderman's recommendations about elimination of traffic signs and markings, which is similar with Woonerf but focused in their psychological effects. The idea behind this theory based on principles of

design psychology was making streets feel no longer like a space for driving by eliminating barriers.

Table 2.9. *Common Monderman Design Treatments (Passmore, 2005)*

No Traffic Signs & Road Markings	These are redundant clutter and an indication of an urban design's failure. Their removal promotes driver engagement. For example, removing a street's center-line has been shown to have significant effects on driving speeds and collision rates.
Public Art	Artwork can play an important psychological role. Monderman has included statues in roundabouts with a fixed gaze at incoming traffic.
Wide "speedhumps" which act as crosswalks	When a footpath meets a road, rather than erect a safety fence or large yellow sign, neither of which holds any intrinsic relationship to the path, the road is raised slightly and its surface texture changed. This legible feature quickly conveys its meaning and the need for caution. This approach would be more typical of busier streets.

Figure 2.6. First Woonerf implemented according to web sources; seating element for pedestrians, speed humps, significant paving materials, pedestrian level lighting, uneven street line (http://portlandtransitauthority.blogspot.com.tr/2012/07/a-visit-to-first-woonerf.html)

Figure 2.7. Entrance of Koningplain Street in Delft, Netherlands, Woonerf road signs, on-street parking areas, pedestrian level lighting (Google Maps, 2017)

Figure 2.8. Koningplain Street, on-street parking areas, play elements, uneven street line, street furniture (Google Maps, 2017)

Figure 2.9. People cycling in Koningplain Street, a primary school's entrance is on the right (Google Maps, 2017)

Figure 2.10. Name unknown Woonerf street; entrance sign, uneven street line, street trees, bollards, on-street parking (resource: https://i.pinimg.com/originals/55/1e/13/551e13ed58f28832fd3bb424c0878396.jpg)

Figure 2.11. Another example of Woonerf; Kleine Appelstraat Groningen, Netherlands; entrance sign pedestrian level lighting, street trees (Google Maps, 2017)

Figure 2.12. Kleine Appelstraat; seating elements, bollards, street furniture, bollards, surface treatment, street trees, bushes, community gardens (Google Maps, 2017)

Figure 2.13. Grote Appelstraat continuation of Kleine Appelstraat; street trees, bushes, community gardens, pedestrian level lighting, surface treatment (Google Maps, 2017)

According to Donald Appleyard and Cox (2006), the design philosophy of the woonerf is to create a kind of "gestalt" message that the streets belong to the residents, and that the car is only one of the users. Drivers are made to feel that it is natural to drive slowly by such physical and visual measures as follows: "

- *Creating clear and distinct gateways that celebrate and enhance the neighborhood's identity, announcing to drivers that they are guests in a neighborhood space.*
- *Adding curves to the travel lane to break up the driver's sight line.*
- *Using features that slow traffic while serving the needs of residents: benches, play equipment, landscaping.*
- *Eliminating continuous curbs, thus removing the channel that encourages drivers to speed. Instead, drivers and pedestrians are placed on the same level, and drivers are directed by bollards, street furniture, trees, and varied pavement treatment.*
- *Providing parking, but with intermittent spacing so the woonerf does not feel like a parking lot*" (Appleyard and Cox, 2006;33)

Figure 2.14. Elements of a woonerf in Denmark, one of the European countries that has adopted the concept. (Appleyard and Cox, 2006; 31)

2.5.2. Home Zones (UK)

The term home zone has been used in the United Kingdom to refer to residential streets designed to be shared by pedestrians and vehicles (hence, also called shared space) according to principles similar to the Dutch Woonerven (Royal Dutch Touring Club, 1977; cited in Biddulph, 2010). Gill (2006) defined home zone as a group of residential streets designed so that the street space is available for social uses such as children's play, while car access is also allowed. Institute of Highway Incorporated Engineers (2002; 11) defined home zones as;

> *"Home Zones are residential streets in which the road space is shared between drivers of motor vehicles and other road users, with the wider needs of residents (including people who walk and cycle, and children) in mind. The aim is to change the way that streets are used and to improve the quality of life in residential streets by making them places for people, not just for traffic. Changes to the layout of the street should emphasize this change of use, so that motorists perceive that they should give informal priority to other road users."*

Biddulph (2010) referred to the transport acts of England and Wales in 2000 and of Scotland in 2001 for passing of legislation to be endorsed by U.K. governments, while Woonerf was introduced in the Netherlands in the 1970s.

Gill (2006) referred to Children's Play Council and Transport 2000 (Children's Play Council 1997) to explain that the term "home zone" gained ground in the late 1990s with its adoption and promotion as an English-language equivalent of the Dutch "woonerf", and that "its application signifies a street with a unique function, legal designation and a distinctive design, advocated in a campaign led by the non-governmental organizations". He summarized the milestones in a table, given below;

Table 2.10. *Key milestones for home zones in the UK (Gill, 2006)*

1970s - early 1990s	Small number of schemes appear, influenced by the Dutch Woonerf model
Early 1990s	Term "home zone" coined by road safety campaigners proposing legislation for streets where child pedestrians have special status
Late 1990s	Campaigners adopt the term "home zone" in their call for woonerf-style child-friendly residential streets
1999	Government pilot program of 9 schemes announced
2001	Home Zones Challenge: £30 million funding to support around 60 schemes; new legislation announced to give home zones a legal status

Gill (2006) stated that the streetscapes that have emerged so far are arguably less radical on average than those in The Netherlands, Germany or other European countries, and few schemes have succeeded in creating spaces between houses that look as if they are genuinely designed for social rather than car use.

Gill (2006) compared Home Zone and Woonerf concepts in a simple table;

Table 2.11. *The home zone vs. the woonerf*

	Home zone	Woonerf or equivalent
Legal status	Not explicitly defined in law: legislation enables local authorities to create home zones	Explicitly defined in law
Design requirements	No statutory guidance	Statutory guidance
Shared surface use	Not universal	Required by law
Legal change giving priority for pedestrians	No	Varies from country to country

Figure 2.15. A Home Zone Example; entrance sign, on-street parking areas, surface treatment and vegetation (https://streetswithoutcars.files.wordpress.com/2014/08/20140827-naked-streets-1.jpg)

Figure 2.16. Morice Town Home Zone (JMU Access Partnership, 2007; cited in TrinityHaus, 2012, 65)

Figure 2.17. Robust communal street furniture & Activity for all (Institute of Highway Incorporated Engineers, 2002, 26)

Figure 2.18. An area designed for children's play & Children playing informally (Institute of Highway Incorporated Engineers, 2002, 26)

Figure 2.19. Planters and street furniture help prevent indiscriminate parking. & The Dutch “P” for a parking space. (Institute of Highway Incorporated Engineers, 2002, 36)

Figure 2.20. Northmoor Home Zone The regeneration project in an inner city urban area, has achieved traffic speeds of around 15 kmph (Institute of Highway Incorporated Engineers, 2002, 40, 71, 72)

Biddulph (Biddulph, 2001; cited in 2010) illustrated the features of a good home zone design as follows;

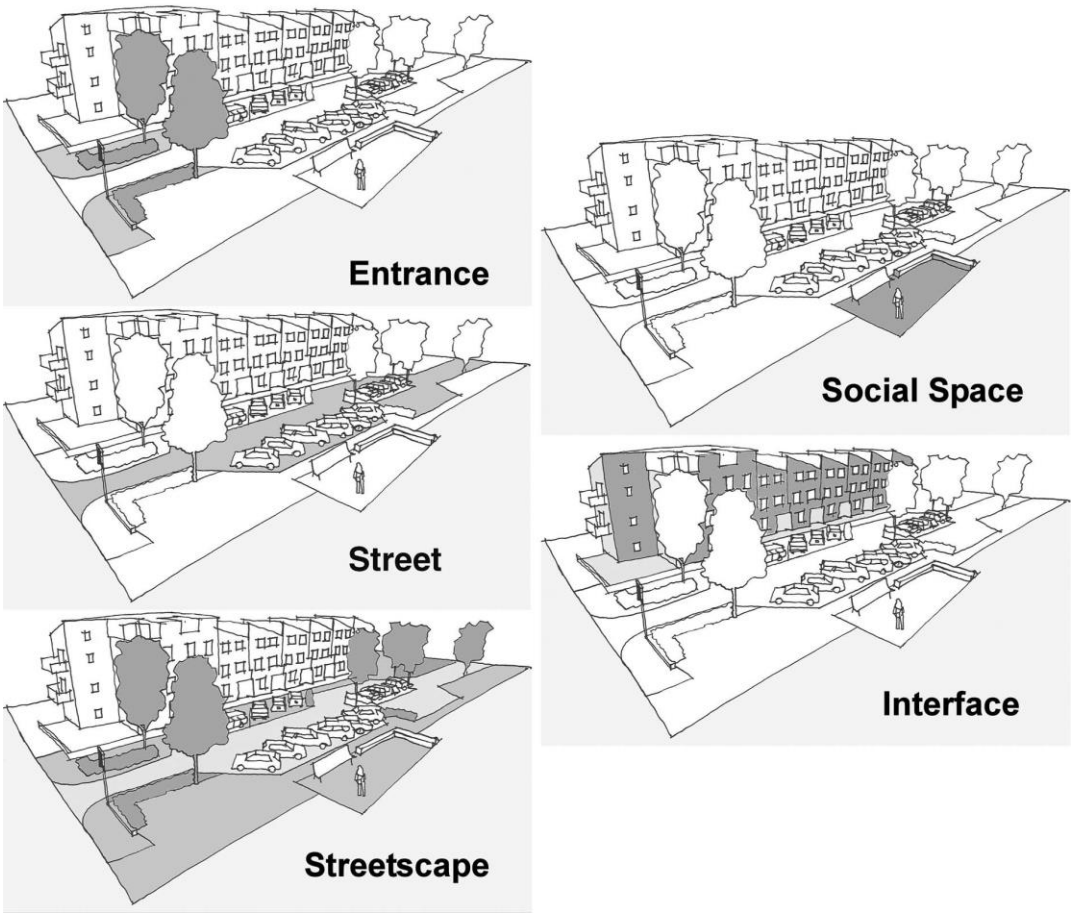

Figure 2.21. Features of a Good Home Zone Design (Biddulph,2001;cited in Biddulph 2010)

Table 2.12. *Aspects that a good home zone design should address according to Biddulph (2001, cited in 2010)*

Entrance	A good home zone entrance will involve a ramp up to the new shared space, use the nationally adopted home zone sign, and use planters or trees to clearly indicate a change in street status and encourage a slow driving speed.
Street	In contrast to normal traffic calming, which does not re-designate the street space, the vehicular route in a home zone should be an environment in which people feel able to walk, stand, or play. This more radical effect is achieved by combining areas of shared space and traditional calming techniques. On-street parking may be rearranged and either trees or planters introduced to narrow and shorten viewing distances. Drivers may be required to give way to oncoming vehicles or chicanes may be used to change their travel direction.
Streetscape	The patterns and types of material in the street surface should avoid the appearance of curbs, which can emphasize the through route, and should instead highlight relationships between areas across the street from one another or pick out particular subspaces.
Social Space	The social space refers to that part of the environment within the streetscape and adjacent to the vehicular route which can be directly or indirectly dedicated, for example, to seating or play. Although portions of the vehicular route or unused parking areas may be used for social activities, vehicles should rarely if ever use the dedicated social space.
Interface	A good home zone will have an interface between homes and the street that provides direct access, allows visual surveillance, and encourages personalization. British streets vary in width, but most are relatively narrow, with many homes having either no front gardens or yards or very small ones.

In addition to Woonerf and Home Zone concepts, Ben-Joseph (1995) discussed the shared street concept with a more generic point of view, stating that shared streets have first and foremost the functions of a residence, a playground, and a meeting area, which integrate pedestrian activity and vehicular movement on one shared surface. It has the additional functions of carrying access traffic and providing parking spaces

but is not designed for intentional through traffic. He characterized shared streets as follows;

- It is a residential, public space.
- Through traffic is discouraged.
- Paved space is shared by pedestrians and cars, with pedestrians having priority over the entire street.
- Walking and playing are allowed everywhere. It can be a single street, a square (or other form), or a combination of connected spaces.
- Its entrances are clearly marked.
- There are no conventional, straight stretches of pavement with raised curbs, and pavement (carriage way) and sidewalk (footway) are not rigidly demarcated.
- Car speed and movement are restricted by physical barriers, and by deviations, bends, and undulations.
- Residents have auto access to dwelling fronts.
- The area has extensive landscaping.
- The area has street furnishings (Ben-Joseph, 1995)

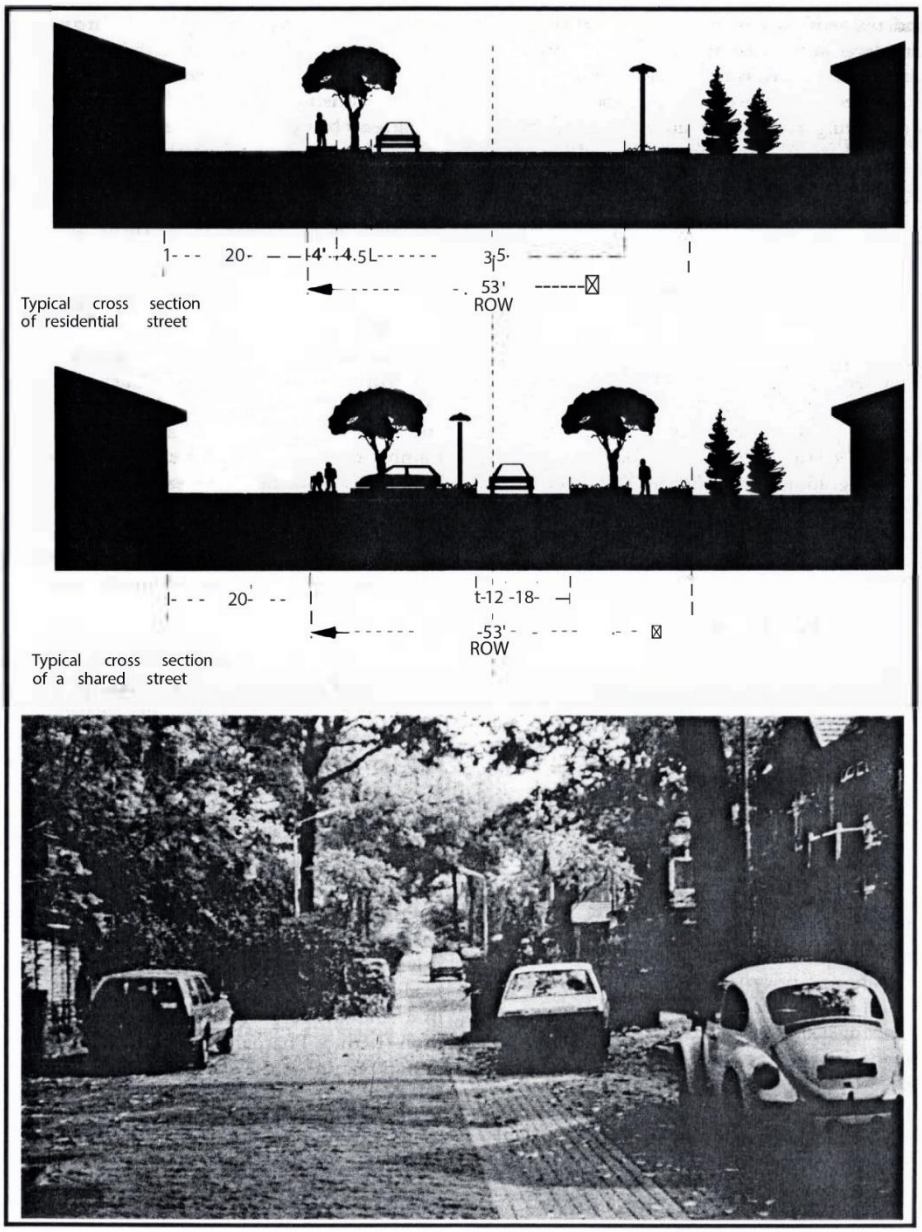

Figure 2.22. A Cross-section of a Shared Street, and a Typical Scene (Photo by Tim Pharoah) (Ben-Joseph, 1995; 508)

2.6. Criteria of Streets for Children To Play

Wheway and Millward (1997) suggest that there is a need to change our way of thinking and that our aim should be to provide a safe and interesting environment for play, not just a safe place to play (Wheway and Millward, 1997). Karsten and Van Vliet (2006) described a "child street" with the physical aspects that include green

neighborhood spaces, traffic-calmed streets and play space. Shackell *et al.* (2008a) emphasized similarly that the most important locations for playable space are where children and young people would naturally want to play – on their local street, or the local green. They highlighted the importance of parks and green spaces, trees, bushes and streams that give children and young people the chance to invent their own play; and added more urban places that also provide play opportunities such as streets, town centers, public squares and fountains (Shackell *et al.*, 2008a).

2.6.1. Why Play in Outdoors is Important?

> *"Play, both spontaneous and organized, is an important component of healthy development. When children play, they reap the benefits of physical exercise, develop advanced motor skills and find relief from stress and anxiety. Play also promotes children's cognition, creativity and socialization. In urban settings, public play spaces can help mitigate the effects of overcrowding and lack of privacy in the home and may enable children to mix with peers of different ages and backgrounds, laying the foundation for a more equitable society"* (Unicef, 2012; 62).

Wheway and Millward refered to Dattner (1996) to explain that play is the way that children learn about themselves and the world they live in. Their intelligence and personality grow, as well as their bodies, in the process of mastering familiar situations and learning to overcome new ones. The environment for play should therefore offer a richness of opportunity, allow each child to exercise choice, and to grow, safely, at their own rate (Wheway and Millward, 1997).

> *"Play has many functions: it gives children a chance to be together, a chance to use their bodies, to build muscles, and to test new skills. But above all, play is a function of the imagination. A child's play is his way of dealing with the issues of his growth, of relieving tensions and exploring the future. It reflects directly the problems and joys of his social reality. Children come to terms with the world, wrestle with their pictures of it, and reform these pictures*

constantly, through those adventures of imagination we call play."(Alexander, 1977, 73)

Kemple et al. (2016) draw attention particularly to outdoor play's importance, which provides children with important benefits and developmental experiences that cannot be easily or readily provided (if they can be provided at all) through other means. He states that there is something special about playing outside.

Olsen and Smith (2017) referred to some research that shows children who are engaged and given time to be in outdoors have a variety of opportunities to develop physically, socially, emotionally, and intellectually, and have a chance to make sense of the world. Small exposure to playing in nature have had positive effects on

- children's attention (Grahn, Martensson, Lindblad, Nilsson, & Ekman, 1997),
- reduction of stress levels (Well & Evans, 2003), and
- reduction of childhood obesity (Liu, Qi, & Ying, 2007).

Similarly, Kemple et al. (2016) referred to multiple studies on the benefits of active outdoor play, which is summarized in the table below.

Table 2.13. *Benefits of outdoor play (summarized from Kemlpe at al.'s (2016) paper by author)*

Health and Physical Development	combat the epidemic of obesity among opportunities for the development and refinement of locomotor skills as well as fine motor skills
	vigorous physical activity increases lung function; contributes to muscle, bone, and joint health; and strengthens the heart
	increased flow of oxygen-rich blood to the brain, benefiting brain function
	lack of outdoor play linked with myopia and asthma
	lack of vitamin D deficiency puts children at risk for bone problems, cardiovascular disease, and diabetes
Self-Regulation and Attention	improved self-control and more focused attention
	lowers the level of children's inappropriate in-class behaviors
	reduce child's ADHD symptoms

	increased their level of self-regulation led to better math and reading achievement
Communication and Social Development	more complex language usage than they do indoors
	more assertive
	better communication and perspective-taking skills
	fewer behavior problems
Cognitive Development	encourage children to be more observant of and curious about their surroundings, leading to a desire to explore, investigate, and make sense of their observations
	symbolic play considered an important element in the development of abstract thinking has been found to be more dominant in outdoor
	symbolic play considered an important element in the development of abstract thinking has been found to be more dominant in outdoor

2.6.2. Design Features of a Shared Street as a Play Space

In this study streets will be evaluated as play space and social and livable place in a concept of shared street movement. But since streets also have playground equipment, toys and ground game drawings to provide fixed play opportunities, indicators from various studies from the literature will be gathered to evaluate both formal and informal playgrounds.

Moore (1972) stresses that the term 'play place' is used in recognition of the fact that play happens, or can be designed to happen, in many places other than officially instituted 'playgrounds', and that in reality play is a continuous process through time and space. Moore referred to Elizabeth Cobb's essay (1969) that "play happens in manipulative 'plastic' places where children can act out in a world of their own creation; where a 'primary perceptual intuition of time and space' can evolve through 'motion and sequence of action', leading to the development of a 'biologic memory' of themselves as being both part of nature yet individually separate from it" (Moore, 1972).

Streets are easily accessible play areas for children. Children get to know their home street. Neighborhood is their territory which they feel a belonging. But what makes a street good for play? Gill stated the absence or comparative lack of cars as a key factor. Playable streets are first and foremost streets that are not dominated by moving cars. Gill (2007) referred to DfT (2006) government regulations on home zones suggesting that the model is only suitable where traffic flows are less than 100 vehicles per hour during peak times. Even the presence of high numbers of parked cars does not stop a street from being playable - though it may well limit the activities (Wheway and Millward 1997; cited in Gill, 2007). But "less cars" is not the only reason of streets to be good for play. Shackell *et al.* (2008b) define a playable space as one where children's active play is a legitimate use of the space. Playability is a feature of fixed equipment play areas. But it is also a feature of some parks, recreation grounds, natural areas and other types of public open space. Playability is not just a matter of the physical characteristics of a space. It can also be influenced by social and cultural characteristics. For instance, a space that is dominated by people who are hostile to children's presence is obviously not playable, regardless of its physical characteristics (Shackell *et al.*, 2008b).

"Play value" is also an important factor along with playability. Play England has a detailed study to evaluate play space. Before presenting indicators, a categorization has been defined as Type A, B, and C in the following table, which is adopted from Play England (2009).

Table 2.14. *Play space categorization (Play England, 2009) Appendix 2a: Quality Assessment Tool - Guidelines and definitions Classification of playable spaces*

Type A: 'doorstep' spaces and facilities for play and informal recreation.
This is a small open space within sight of home, where children, especially younger children, can play within the view of known adults. This could be a grassed area, a paved open space, a residential street in a home zone or a small designed play area, which is large enough to enable young children to play within sight of known adults. The space could incorporate some interesting and attractive landscape features and/or a small number of items of fixed play equipment to create an environment which will stimulates young children's play providing opportunities for a variety of play experiences, bearing in mind that older children and young people may also use the space from time to time. A doorstep space would be sufficiently close to home for the children who use it to feel safe and be able to interact with individuals and groups of other children. It should also be capable of catering for the needs of children with a range of impairments. Seating may be available for carers to be able to sit, watch and meet other people.

Type B: ‘local’ spaces and facilities for play and informal recreation.
A larger space which can be reached safely by children beginning to travel independently and with friends, without accompanying adults and for adults with young children to walk to with ease. This could be a grassed area, a small park, a local open space, a designed space for play or informal recreation or a school playground open out of school hours, which is attractive to children as they begin to move around their neighborhoods without being accompanied by adults. These spaces and facilities provide a varied and interesting physical environment including, for example, natural features, sand and water, and incorporate some interesting and attractive landscape features with varying levels and contours, which test children’s capabilities. There might also be features designed for specific activities such as ball games, wheeled sports or meeting places and/or several items of play equipment offering a variety of play experiences. Play facilities might also include local staffed play provision such as play centers, play schemes, play ranger projects and adventure play grounds. These spaces and facilities should also be capable of catering for the needs of children with a range of impairments. The children who use these spaces and facilities should feel safe and be able to interact with individuals and groups of other children of different ages.

Type C: `neighborhood’ spaces and facilities for play and informal recreation.
A larger space or facility for informal recreation which children and young people, used to travelling longer distances independently, can reach safely and spend time in play and informal recreation with their peers and have a wider range of play experiences. This might be a park, playing field, recreation ground or natural open space such as woodland, moor land or a beach, which is accessible and attractive to older children and young people.

According to these definitions, home street can be classified as Type A play space which determines the indicators to evaluate play space quality. Indicators differ

depending on classification. The detailed indicators for Type A playgrounds are given in the table below:

Table 2.15. *Simplified from; Local play indicators (Play England, 2009) Appendix 2a: Quality Assessment Tool - Guidelines and definitions Classification of playable spaces*

Involvement of children	Were children involved in the development of the site?
Location	Informal oversight by passers-by or nearby properties such as houses or community centers. Well used by children (evidenced by site visits, replacement of worn parts using desk research and local knowledge). Getting there. Personal safety, security and lighting. Getting there for those with impairments or with buggies and pushchairs. Meeting other children. Designed for the site.
Play value	Enticing to children to play. Play opportunities for disabled children. Movement. Ball games. Opportunities to change the environment/space (loose parts). Access to natural environment. Places for children to sit. Added play value: the site offers more than just a basic experience of sensation. It offers possibilities for children to take risks without hazards, to intensify the experience or broaden it.
Care and Maintenance	Well maintained. Health and safety (May require desk research). Seating for adults. Litter bins. Dog free zones.

Shackell *et al.* (2008b) defined the 10 principles for designing successful play spaces as those that: “

- *are ‘bespoke’*
- *are well located*

- *make use of natural elements*
- *provide a wide range of play experiences*
- *are accessible to both disabled and non-disabled children*
- *meet community needs*
- *allow children of different ages to play together*
- *build in opportunities to experience risk and challenge*
- *are sustainable and appropriately maintained*
- *allow for change and evolution*"

Moore (1989) has noted some recommendations to improve the physical quality of specific settings for play in the table below, some of which could be adapted to the creation of play spaces in the streets.

Table 2.16. *Moore's 17 setting types derived from the action -research results of the Environmental Yard, later refined and added to in Moore et al. (1987) (Moore, 1989).*

Entrance/Exit Settings	Entrance/exit settings create and reinforce a sense of arrival and departure. They are places for hellos and goodbyes, with opportunities to meet, gossip, and hang out. They provide for pick-up/drop-off and delivery activities.
Pathway Settings	Primary pathways provide direct pedestrian routes connecting entrance/exit settings to centers of activity, important landmarks, indoor facilities, toilets, drinking fountains, telephones, etc.
	Secondary pathways follow less direct routes, allowing children to wander and explore different settings at their own pace. They are a principal setting for hiding-and-chasing games
Signage and Display Settings	Informational signs present general information in words and graphics (for those who cannot read) about site layout, pathways, and the location of facilities (entry signs are an important sub-category).
	Directional signs, located at all entry and decision points, present information that indicates direction to a space or facility, change in route, or confirmation of correct direction.
	Identification signs present information in both words and pictographs indicating special features or facilities.
	Regulatory signs present notification of rules, requirements, warnings, and restrictions and are used for traffic delineation and control.

Fences, Enclosures and Barriers	Fences, enclosures, and barriers protect vegetation and other fragile environments by directing pedestrian traffic flow. They define pathways, enclose activity areas, and define social settings. Enclosure is a primary means of differentiating and articulating the child's environment; for example, fences can double back on themselves to provide small social settings.
Manufactured Equipment / Play Settings	Manufactured equipment/play structure settings primarily support motor development (Heusser, 1986). They are highly significant because even in the most diversified playground with many competing choices, they are well-liked (Moore & Wochiler, 1975) and attract both the highest density and greatest absolute level of use (Moore, 1986b). The most common items are (using industry terms) balance beams, climbers, enclosure structures, rocking equipment, slides, spinning equipment, swings, upper-body equipment, storage facilities, safety surfaces.
Multipurpose Games Settings	Multipurpose games settings support formal ball games and informal kickabouts. Because they are large and flat, difficult design tradeoffs with other types of space-demanding settings are involved.
	Informal ball play and games settings are less demanding on space and more flexible. Close observation of these settings (Moore & Wong, in press) indicates children's capacity for inventing adaptations of ball games to the characteristics of whatever setting is at hand (e.g., three-dimensional ball tag on play structures). Such constraints in fact force children to exercise ingenuity and are perhaps preferred.
Groundcovers and Safety Surfaces	Both soft and hard play surfaces are needed to support different types of play activity (Cooper Marcus, 1974). For children to have contact with nature, and in order to provide habitats for small animals, a choice of natural ground covers is needed, Options include turf; unmown, rough areas of wild grasses and plants, carefully managed grassy areas suitable for crawling infants; and non-accessible erosion control areas.
	Because the majority of playground injuries are due to falls from equipment (USCPSC, 1981), much attention is being focused on the development of practical, reasonably priced alternative surfaces.
Landforms and Topography	Landforms support varied interaction of the body in three-dimensional space, and varied circulation within and between spaces. Topographic variety stimulates fantasy play, orientation skills, hide-and-go-seek games, viewing, rolling, climbing, sliding, and jumping.

Trees and Vegetation	Trees and vegetation constitute one of the most ignored topics in the design of public play environments. Vegetation is an intrinsically interesting play setting and a major source of play props, including leaves, flowers, fruit, nuts, seeds, and sticks (Moore, 1986c). It marks the passing of the seasons, introducing a sense of time into the child's environment. It stimulates exploration and discovery, fantasy, and imagination and provides an ideal setting for dramatic play (Kirkby, 1987) and hide-and-seek games (Talbot, 1985). "Specimen" plants are important orienting elements.
	Trees and vegetation give greater spatial and textural variation to play settings (Moore, 1976). Indoor-outdoor transitions can be softened with vegetation-especially for people whose eyes adjust slowly to changing light levels and glare. Plantings used along paths create a complex sequence of texture, smell, light, shade, and color. Trees add a positive ambience to play settings through light modification, color, texture, fragrance, and softness of enclosure-esthetic impacts that both adults and children appreciate (Moore, 1989a). Broad-leaved deciduous trees can reduce the direct impact of heavy rain and extend the runoff period. Surface root systems bind the soil and help it resist erosion.
	Children are especially attracted by a mix of natural and people-made elements (Mason, 1982; Moore & Wong, in press). Design should emphasize the integration of planting into play settings, rather than creating segregated "nature areas."
Gardening Settings	Gardens enable children to interact with nature, learn about the ecological cycle, and to cooperate with peers. They stimulate social interaction fine-motor skills, and sensory stimulation. Gardening is a powerful play-and-learning activity with specific but flexible design requirements. Because they are dependent on skilled leadership
Animal Habitat	The two main categories of animals are domestic/farmyard, and wildlife. Animals stimulate a caring and responsibility attitude toward other living things. They provide therapeutic effects and offer opportunities for learning about biology (Blue, 1986; Children's Environments Quarterly, 1984). Animals are a source at wonder and fascination; they are living things that children can interact with, talk to, and invest in emotionally. They provide companionship in non-threatening ways and almost always come back for more contact. This can be critical for a child with limited self-esteem. Caring for animals can produce a strong sense of personal competence and pride in children, making animals a powerful socialization medium. Documented examples of childhood animal care are very strong (Moore, 1986a).

Aquatic Settings	Water in all its forms is a popular, universal play material because it can be manipulated vegetation. Water features and aquatic environments are highly valued by children because of their multisensory impact in sounds, textures, changes of state, and feelings of wetness (Moore, 1986a,b). Water both excites and relaxes; it adds a substantial esthetic dimension to any recreational setting. Children are strongly attracted to natural settings that range from a dew-covered leaf, to ponds, streams, and marshes. They support a variety of terrestrial and aquatic life that fascinate children, have a strong perceptual impact, and are vividly remembered for years (Moore, 1989a)
Sand, Dirt, Soil Settings	The younger the children, the more likely they are to play in dirt wherever they find it. Wood's (1976) highly detailed study provides overwhelming support for the developmental significance of classic dirt play. Using "props" such as a few twigs, a small plastic toy, or a couple of stones, children can create an imaginary world of their own in the dirt, around the roots of a tree for instance, or in part of a raised planter.
	The sandbox is a refined and sanitized version of dirt play and works best if it retains the qualities of dirt play (intimate, small-group spaces, play surfaces, access to water and other small play props). Sand is an excellent medium for creative play and social interaction. It is easy to move and mold. It can be dug, sifted, sculpted, poured, thrown, and drawn upon. It is the ultimate loose part. Large sand areas enable children to engage in more expansive sand play and create imaginary landscapes using.all manner of "found objects" (Hart, 1974; Moore, 1986a).
Manipulative Settings, Play Props and Adventure Play	Manipulative settings range from found objects in fixed settings to adventure playgrounds. Props include a wide variety of small natural and synthetic found objects, such as insects and small mammals, sticks and stones, bottle tops and popsicle sticks, logs, rocks, plant parts, sand, dirt, and scrap lumber, and larger manufactured items such as modular systems, wheeled toys, and dress-up clothes. They provide a low-cost method of enhancing existing play settings (Moore et al., 1987; Moore & Wong, in press). Their developmental significance has been demonstrated in several studies {G. T. Moore, 1985; Moore, 1966, 1974, 1986c; Moore & Wong, in press; Nichalson, 1971). Using larger-scale props, children and trained leaders can transform a playground into a completely different, temporary setting (Playing and Learning in adaptable Environments in press).

Gathering, Meeting and Working Settings	To support social development and cooperative working relationships, children need small, comfortable gathering places where they can meet and work together in small (2-7), medium (7-h), and large (15 +) groups. Such spaces are very often missing from public play areas (Cooper Markus & Sarkissian, 1986).
	Parents, too, need comfortable places in which to sit where they can interact, but from which they can keep an eye on their children. Architectural forms include benches, decks, patios, verandas, gazebos and sitting circles. When used as "activity stations" in recreation or education programs, such settings need to have a strong identity and be located next to display settings so that products can be exhibited (Moore et al., 1987).
Stage Settings	Stages support performances, dramatic and fantasy play, and performance activities. They stimulate presentation of self, encourage teamwork, and foster a sense of community. They are places where local culture can be created. Architectural forms include campfire circles, mini-arenas, stages and arenas, groups of picnic tables, and amphitheaters.
Fieldhouse and Storage Settings	Fieldhouses function as program bases, storage facilities, communication centers, emergency/first aid posts, and toilet locations. Because of their cost they are sometimes hard to justify. They are a traditional setting in European playparks and adventure playgrounds.

To summarize, design is a key element for a street to be child friendly and people of the place / community is another key element for using street actively and socially. Even if the street offers all the play/social opportunities, it might not be used by children or parents. That's why participation of users to design process is important. Good design is always encouraging people to go outside; however, designing streets to be pedestrian friendly is not enough to make children go out and play in the streets.

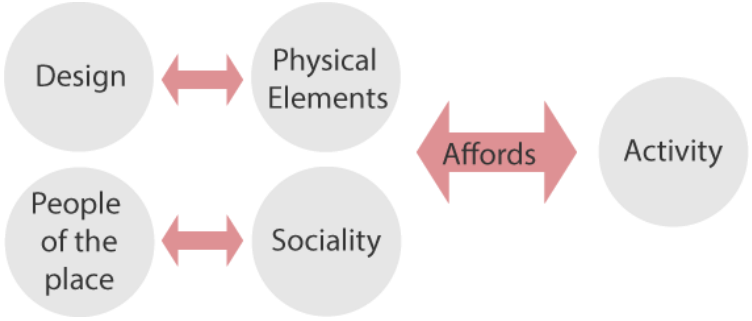

Figure 2.23. Design / Usage dynamics

Child friendly design should offer children more than just being safe and secure. Street should be interesting and full of new opportunities to discover. Children need to feel free to move, walk, run, climb, jump, and play lots of games. They need shelters and places to gather. They need elements to be creative, and objects to interact with. Street must be accessible to children from all ages, to the disabled and even to old people. There should be both hard and soft surfaces. But the most important is they need to feel free in the streets.

To make all these possible, design needs to give both drivers and pedestrians some messages. Drivers need to be aware that the street is pedestrian / child oriented. Drivers need to know when they arrive in these streets, so defining a change in street status in the entrances with sign boards, ramps, vegetation or elements is important. Traffic calming elements should be used for both decreasing the speed and creating lower traffic volume. Pedestrians need to feel safe walking on the shared surface and sidewalk continuity is important.

Sidewalk levels should be same with road or non-existent. Interesting patterns and varied surface treatments should be done. Social and play spaces should be defined. Trees and vegetation, pedestrian level lighting and seating should exist.

These measures are part of a large set of criteria that emerge from the review of the relevant literature. Throughout this section of the study, the literature survey provided a comprehensive list, which can be used in assessing schemes and implementations for children-friendly play streets. In the following chapter, the aim and method of the study is described, together with a more detailed presentation of the design criteria to be used in the analysis.

CHAPTER 3

METHODOLOGY

3.1. Aim of the Study

This study aims to determine the quality of playable space and evolving process of child-friendly street design approaches, which lead to slow car traffic, priority to pedestrian and cyclists, safe and enjoyable spaces for children to play, as well as creating social space for residents.

Problem Definition:

In car-dominated cities, children (as well as other members of the public) have limited freedom to use streets unless they are driving their cars through them. Today, streets –as outdoor places and spaces- limit children's everyday activities and experiences necessary for healthy development instead of supporting it. This is because streets are increasingly being taken over by motorized traffic, which dominates the use of these public places, eliminating most other functions that streets used to have historically. The quality and use of streets is continuously decreasing particularly in cities due to increasing car traffic and design characteristics that aim at accommodating this traffic, flowing or parked.

Objectives of the Study:

1. To provide a better understanding of how to (re)design streets to be playgrounds for children
2. To provide guidelines on how to (re)design streets in a way that can allow the co-existence of both children playing and motorized traffic flowing or parking.

3.2. Method of Research

The theoretical framework of this study comprises the detailed literature survey about environmental child friendliness, street's role as a component of child friendly environment, street's and play's importance in children's life and development, principles of shared street design, child friendly street design concept primarily in Europe then around the world and the use of basic traffic calming techniques as a design element.

From theoretical perspective:

"Streets are critical arteries for transporting goods and people, but they are also the places where we live, work, play and interact" (NACTO, 2012; 9). There are many reactions to car traffic growth around the world. It is understood that the period in which the assumption that suggests "cities should be planned for vehicles" is over; vehicles should be planned and organized according to cities. Planners have developed projects that are supportive of public transport and non-motorized modes of transport, such as bicycle and pedestrian transport by applying traffic management and car restriction policies. In addition, citizen-based movements, such as reclaiming streets, have been observed recently. A new literature has started to form that concentrated on child-friendly design concepts such as woonerf, living streets, home zones, etc. A number of street design manuals were prepared, in which the place function of the street has been emphasized. And as a consequence of these changes, an awareness about "child-friendly streets" has emerged.

The reason for choosing to study this specific topic is not only because this is a current and ongoing discussion in the literature and in practice; but also because the question of "how streets can be (re)designed to include children' needs while keeping its transportation function" is continuing to grow in importance.

From practical perspective:

As stated before, both the debate in the literature and implementations in practice are growing in number. There are several applications in European cities as well as around the world in pedestrian-oriented street design concepts similar to each other. Since this topic also includes some subtopics, such as traffic safety or children safety, the lessons learnt from world practices are important and should be examined. In addition to the above reasons, in the last 15 years a "Playground Streets" project was launched and implemented in some streets in Ankara, by the Çankaya Municipality. Considering the above context, it is important to examine this experience with a view to understand its strengths and weaknesses, and to provide recommendations to improve this scheme as well as to create successful applications in the future.

3.3. Case Study

As stated above, in Ankara/Çankaya there had recently been a series of projects similar to the "woonerf" and shared street concepts, which were named "Playground Streets" ("*Oyun Sokakları*"). This specific example is one of the very first approaches to reclaim streets -as playgrounds- in Turkey and has been put into practice in approximately 10-11 streets in the past 7-8 years by the Çankaya Municipality.

It is crucial to analyze this experience with a view to find out how successful and effective the approach has been. The project should be evaluated with reference to universal approaches that aim at redesigning streets for a shared use of motorized traffic and children. If the strengths and weaknesses of the approach in Ankara are highlighted, lessons can be learnt for similar future actions. Furthermore, by combining these lessons with the literature and other world examples, a check list can be produced to be used as a guideline to (re)design streets.

3.4. Data Collection

Information about the project was collected with a combination of approaches:

- Analysis of project layouts, design elements, and visualization
- Interview with policy makers and planners (August 2015) to understand the planning background, objectives and expected outcomes of the "Oyun Sokakları" Project
- Field survey in the project streets
    - Observation of traffic and people/children (October & November 2015)
    - Observation and analysis of physical layout of the street before and after the project
    - Relation of design features and physical layout with observed activity by children

Traffic and people/children were observed during 20 minutes of intervals in each hour starting from 07.45 – 08.00 am to 05.45 – 06.00 pm. In total, two days of data were collected consisting of one weekday and one weekend. Cars and pedestrians passing the streets were counted in each interval; activities and interactions with environment and people were observed and noted according to age groups and gender. Only activities that require spending time in the streets were observed and generalized in three groups as; "standing", "sitting" and "playing". These observations were mapped including demographic data of people who actualized those actions.

Finally, data analysis and documentation have been carried out by making models, drawings, and plans.

Indicators

Since these case study areas include a mixed concept of play space and pedestrian/child-friendly design approach in street scale, “playground streets” project areas have been examined from different perspectives;

- shared street design elements (pedestrians and cars)
- environmental child friendliness (affordances / actualizations)
- playable space quality
- street usage after (re)design

Indicators help identify whether the criteria, that emerged from the literature survey, have been met in these projects. Consequently, the analysis and evaluation rest on these indicators, as described in more detail in the following section.

3.5. Evaluation

In this context; a checklist, which can also be defined as a table of parameters (or indicators) have been created. According to these parameters, which are presented in the subsections below, if the answer is positive the value is given “1”, and if the answer is negative the value is given “0”.

3.5.1. Physical Environment Assessment

The Physical Environment is to be assessed by using the following checklist:

- Entrance of the street
    - Is there a ramp to define an entrance to street
    - Are there are identification or restriction signs
    - Are there other elements to define a change in street status (planters or trees, pavement)
- Street’s car/pedestrian balance
    - Are there any traffic calming elements like;
        - Vertical measures (speed bumps, barriers)
        - Horizontal measures (chicanes)

        - Textured surfaced to slow down traffic
        - Trees or planters introduced to narrow and shorten viewing distances
    - Are there any on-street parking areas defined in the street for cars
    - Is there an identified shared space for cars and pedestrians
    - Are the pedestrians;
        - enjoying priority over cars
        - able to walk in vehicular route
    - Are sidewalks continuous
- Streetscape and Environment;
    - Are sidewalk levels the same with road or non-existent
    - Are there any interesting patterns and varied surface treatments done
    - Is there any social space defined
    - Is there any play space defined
    - Are there trees and vegetation in the street
    - Is there a pedestrian level lighting in the street
    - Are there seating areas for adults
    - Is there a night time lighting
    - Are there any elements for shade in summer time
    - Are there any shelters for rain, snow, etc.
    - Is there street/public art
- Interface
    - Do front yards allow integration with street space
    - Are front yards open/permeable to allow direct access to the street
    - Do façade and obstacles allow visual surveillance of street

3.5.1.1. Play and Learning Settings

The Play and Learning setting is to be assessed with the following checklist:

- Involvement of children
    - Did children involve in the development of the site

- Less traffic volume for street to be “playable”
    - Are there less than 100 vehicles / hour
- Location
    - Are there informal oversight by passers-by or nearby properties, such as houses or community centers
    - Is getting there easy (busy street, topography, etc.)
    - Is getting there possible for those with impairments or with buggies and pushchairs
    - Is there a school yard near the street
    - Are there any links with parks and playgrounds
- Play Value
    - Are street settings enticing to children to play (existing manufactured play equipment might be a reason)
    - Are there play opportunities for disabled children
    - Can children move freely (walk, run, jump, etc.)
    - Are there opportunities for ball games
    - Are there opportunities to change the environment/space (like loose parts)
    - Is accessing to any natural environment possible
    - Are there places for children to sit
    - Are there any gathering places defined for children
- Activity Settings
    - Are there flat, relatively smooth surfaces
    - Are there relatively smooth slopes
    - Are there any graspable/detached objects
    - Are there any nonrigid, attached objects
    - Are there any climbable features
    - Are there shelter for children to play in
    - Are there mouldable material (dirt, sand, snow)

- Care and Maintenance
    - Is the area well maintained
    - Is the area clean
    - Are there litter bins

3.5.2. Behavior Mapping

People's activity and interaction with each other or environment were mapped depending on observations including demographic features. Age groups were categorized as;

- Baby
- Toddler
- Infancy
- Age of basic education schools
- Pre-adolescent age (secondary school students)
- Highschool
- Adult
- Elderly

Woolfson's (2001; cited in Dewi, 2010) categorization of age stages were used for children aged between 0-14 years. He emphasized that "children in their development ages until the school ages need to get an equal proportion of time between playing and learning". Moreover, according to age stage, those who still need to play are the children aged 0-14 years. Here is the description of age stage of children;

> *"*
>
> *Age 0-1 years, called the baby*
>
> *Age 1-3 years, called the toddler*
>
> *Age 3-5 years of infancy*
>
> *Age 5-12 years, the age of basic education schools*
>
> *Age 12-14 years, referred to as pre-adolescent age"* (Woolfson, 2001, cited in Dewi, 2010; 227)

Children between 14-18 were categorized as age of highschool. Users other than children categorized as adults and elderly.

Activities were categorized as sitting, standing, playing; and interactions were noted as a secondary feature, if any observed beside activities. All the data collected have been analysed separately, and then also correlated with physical environment settings as described in the next chapter.

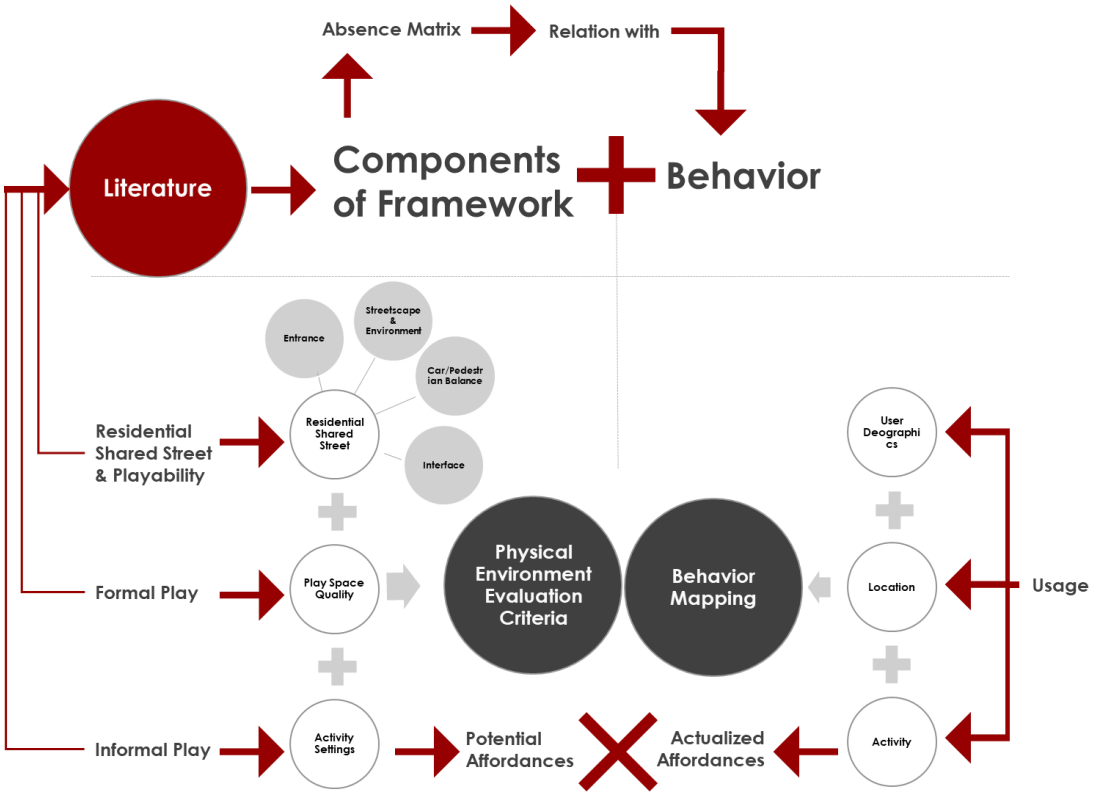

Figure 3.1. Methodology

CHAPTER 4

A SERIES OF CHILD FRIENDLY STREET DESIGN PROJECTS: PLAYGROUND STREETS IN ANKARA

4.1. Overview of the Case Study

In this study, a project series called “playground streets” implemented by the Municipality of Çankaya is evaluated. Playground streets was a project series to re-design existing streets for children to play. From 2005 to 2012, 21 projects were developed by the design department of the municipality but only 9 of them have been implemented on site. However, due to negative feedbacks and complaints from neighborhood residents -mostly adults – and bad or deficient implementation of designs and the change of mayor, the projects stopped. Recently (in 2018) it has been observed that the existing playground streets’ play equipment and street furniture have been removed. A reverse change in streets’ status has been done and they returned to “normal” streets. This project was one of the pioneer experiments of (re-)designing streets to be more child friendly along with a number of examples from other cities.

Recently more efforts by different municipalities to make child-friendly streets can be observed from the news but the lack of “know-how” to both design and implementation is a major obstacle. When these projects are implemented without a good background of knowledge that is fed by analysis, surveys, literature review, etc. they result in empty, unused spaces, leading to a waste of budget. In other countries, similar processes have been supported by laws/regulations, as well as government and non-profit organizations with expertise in related fields, cooperating with each other to make research, experiments and to create guides availing from best practices around world, which is a need in our country too.

4.2. Site Evaluation

4.2.1. Location

Playground Streets had been implemented in 9 locations that cover a total of 13 streets. These streets are; 215 & Kalamış streets in Aşıkpaşa, 455 street in Birlik, 839 street in Akpınar, 1002 & 1003 streets in Osman Temiz, 1201 & 1202 streets in Gökkuşağı, Akat & Değirmi streets in Cebeci, Av. Özdemir Özok street in Oğuzlar, Sokullu primary school's street in Sokullu and Turna street in Öveçler. All of the streets were visited on site and 6 streets in 4 different locations were selected for case study.

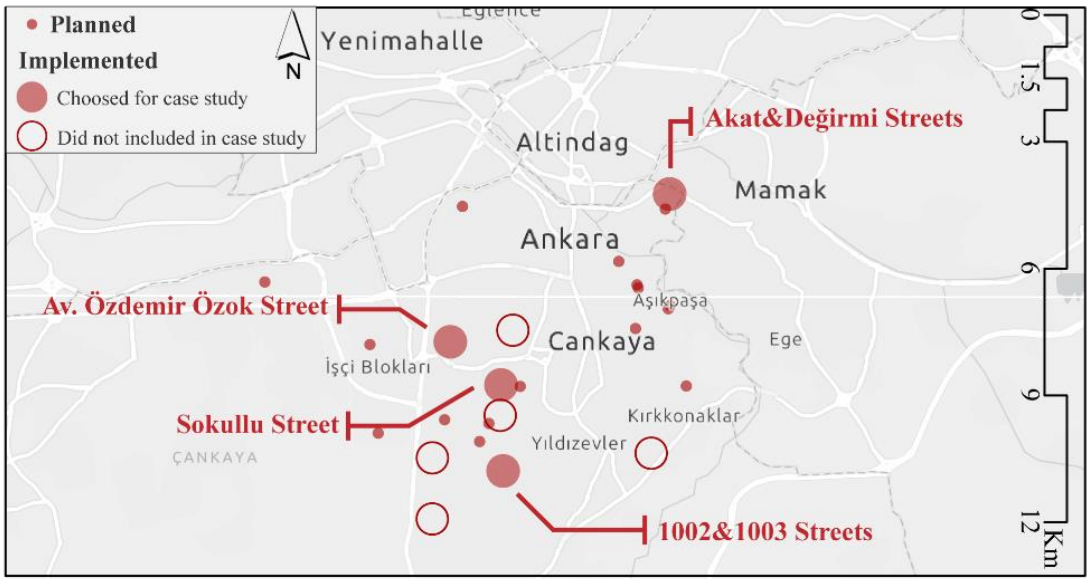

Figure 4.1. Locations of planned and implemented playground streets in Municipality of Çankaya boundaries & selected streets for evaluation

All the streets were in residential areas, but 4 case study areas were selected because of some features they have. 1002 & 1003 streets were selected because the street was very long, there was green space and park on the street and in an empty space a couple of gecekondu houses existed. Sokullu primary school street was the shortest street and there was a school yard on the street. Akat & Değirmi streets were in a completely residential area without any additional landuses. Finally, Av. Özdemir Özok street was a cul-de-sac.

4.2.2. Surroundings

Each street's surroundings were examined in a walking distance of 500 and 1000 meters. One point in the middle of the street has been accepted as a reference to calculate distances.

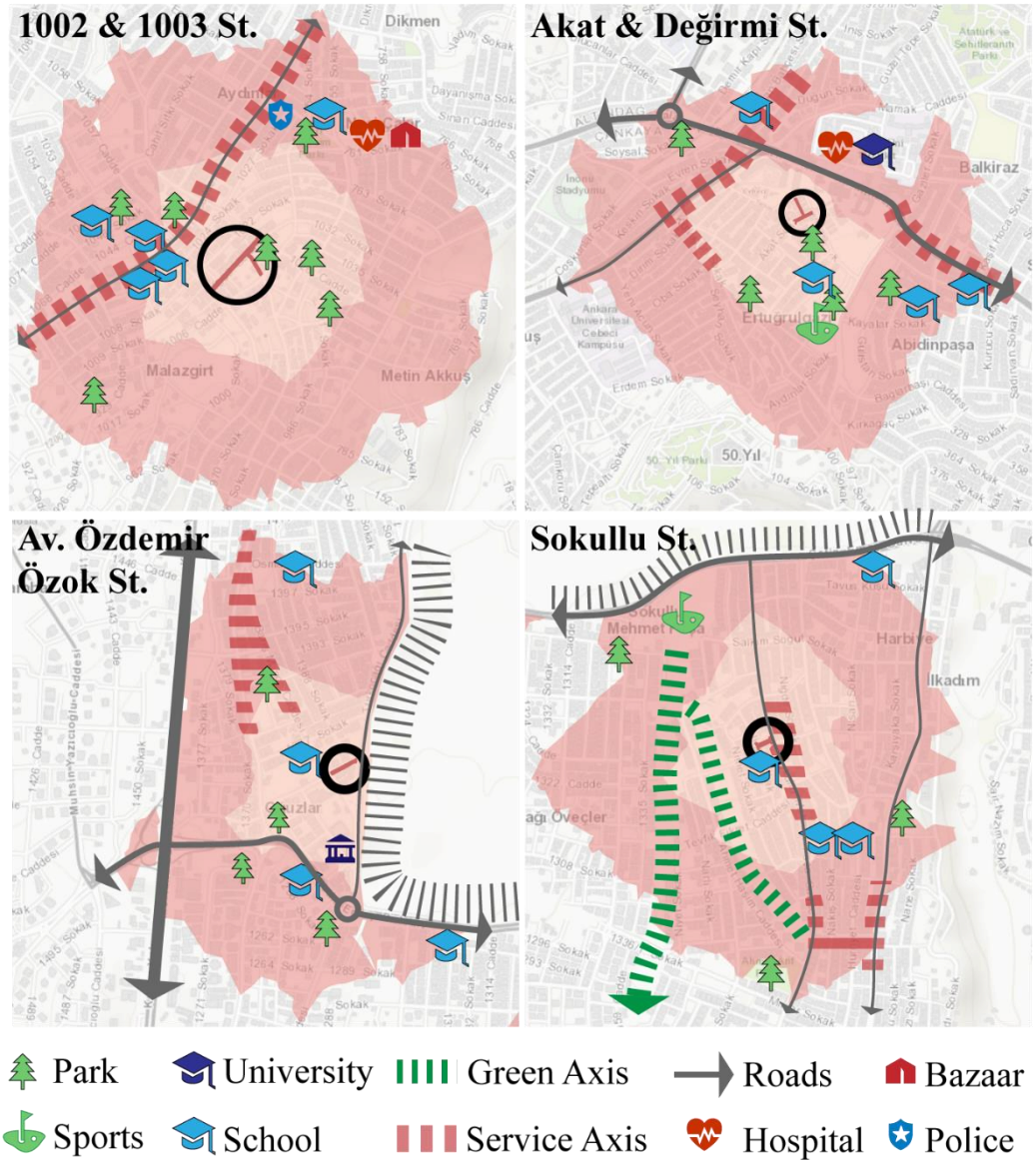

Figure 4.2. Surroundings of streets

In the figure 4.2 above; buffer areas based on walking distances from streets' reference points have been calculated. Buffer areas from 0 to 500m buffers are shown with light

color, 500m to 1000m buffers are shown with darker color. All streets have a local service axis in 500m walking range which serve residents' and visitors' daily needs like shopping, grossary, restaurants, cafes, markets, banks or ATMs, technical shops like plumbery, electronics, etc. Each street has parks or green areas both in 500m and 1000m walking range. But unlike others Sokullu and Akat streets have additionally open sports areas between 500m-1000m walking range. Sokullu and Av. Özdemir Özok streets are located just next to busy roads but Av. Özdemir Özok street is a cul-de-sac and is not connected with main road, which is still accessible for pedestrians. There is also a military zone located across that main road which is a restricted zone / a barrier close to the street. 1002 & 1003 and Akat & Değirmi streets are neighbor with other residential streets. Several schools are located both in range within 500m and 1000m walking distance in each street but Akat & Değirmi streets also have a college located between 500m and 1000m walking range. A hospital is located in 500 to 1000m buffer of 1002&1003 and Akat & Değirmi streets. A police station and bazaar area are located in 500-1000m buffer area of 1002&1003 streets. Furthermore, all the streets have public transport stops in 500m walking range.

In the following graphics, streets' connections with other transportation axis, traffic flows[2] of case and surrounding streets will be shown for each street to give a better grasp of location, and surroundings. In addition, building floor counts based on plans will be shown to give an idea about surrounding urban fabric.

[2] The traffic flow data is based on Esri's world traffic map service that include historical traffic data; source: https://www.arcgis.com/home/item.html?id=ff11eb5b930b4fabba15c47feb130de4

"Traffic speeds are displayed as a percentage of free-flow speeds, which is frequently the speed limit or how fast cars tend to travel when unencumbered by other vehicles. The streets are color coded as follows:

- *Green (fast): 85 - 100% of free flow speeds*
- *Yellow (moderate): 65 - 85%*
- *Orange (slow); 45 - 65%*
- *Red (stop and go): 0 - 45%"*

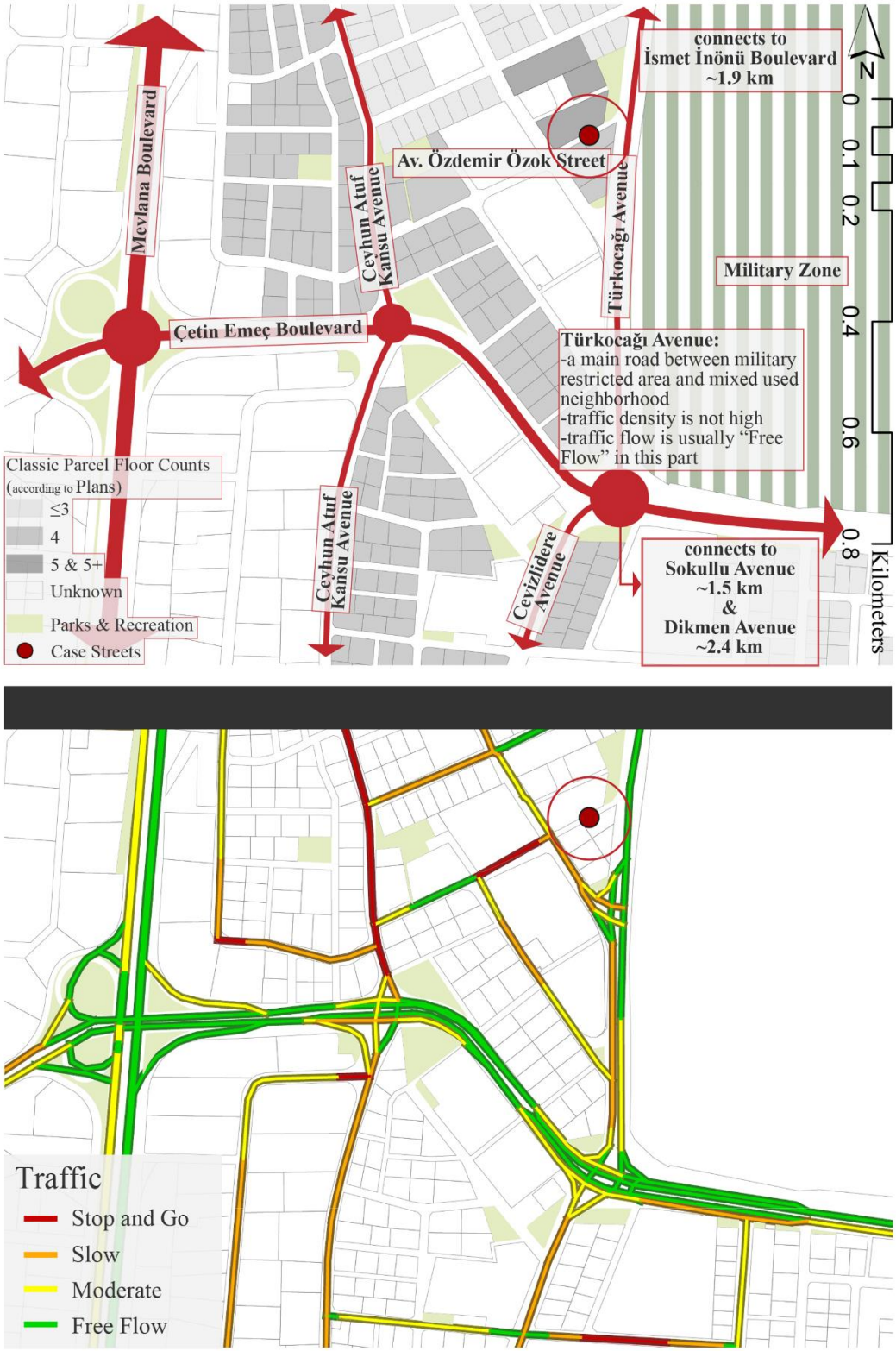

Figure 4.3. Detailed surroundings of Av. Özdemir Özok Street

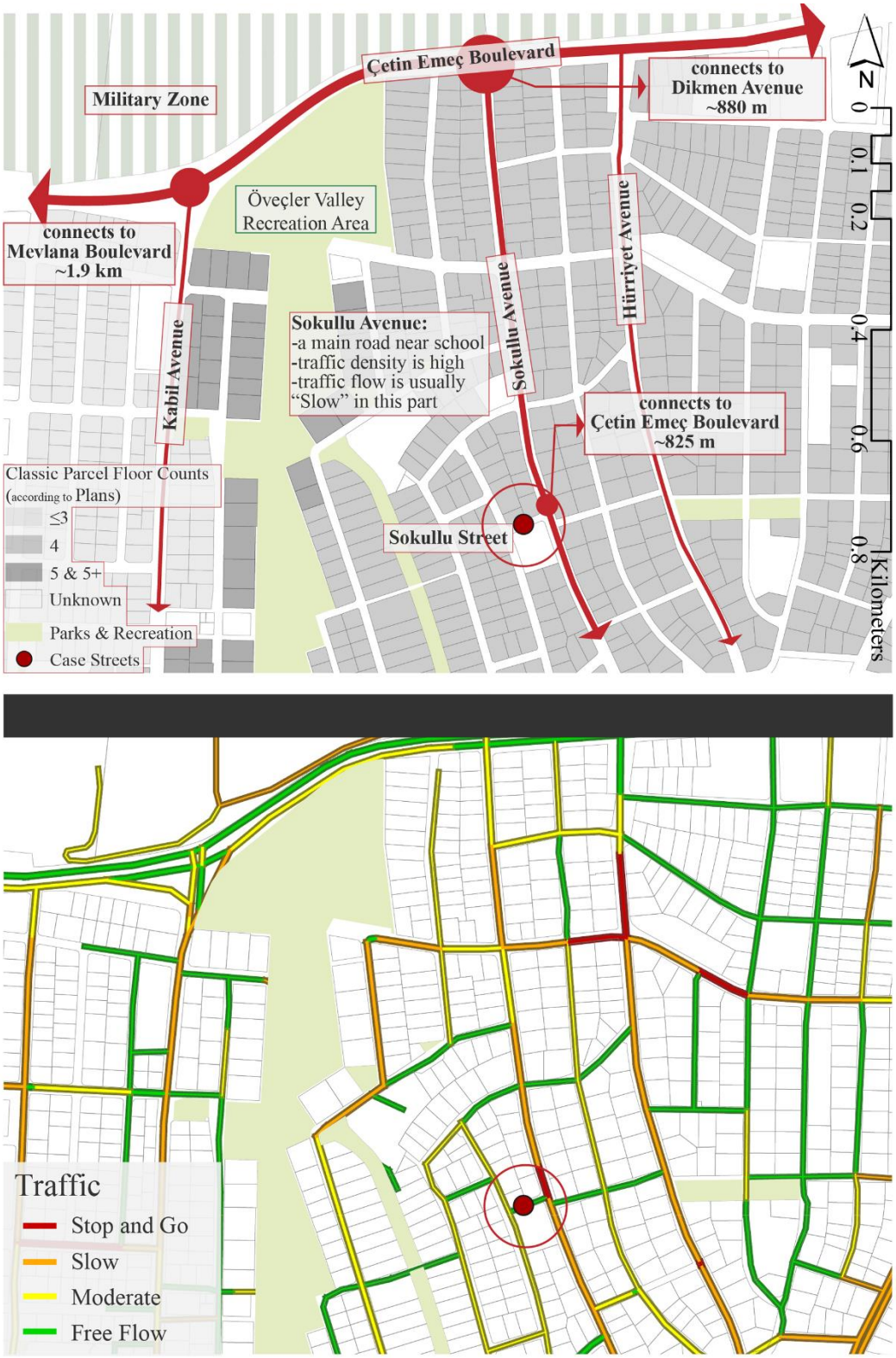

Figure 4.4. Detailed surroundings of Sokullu Street

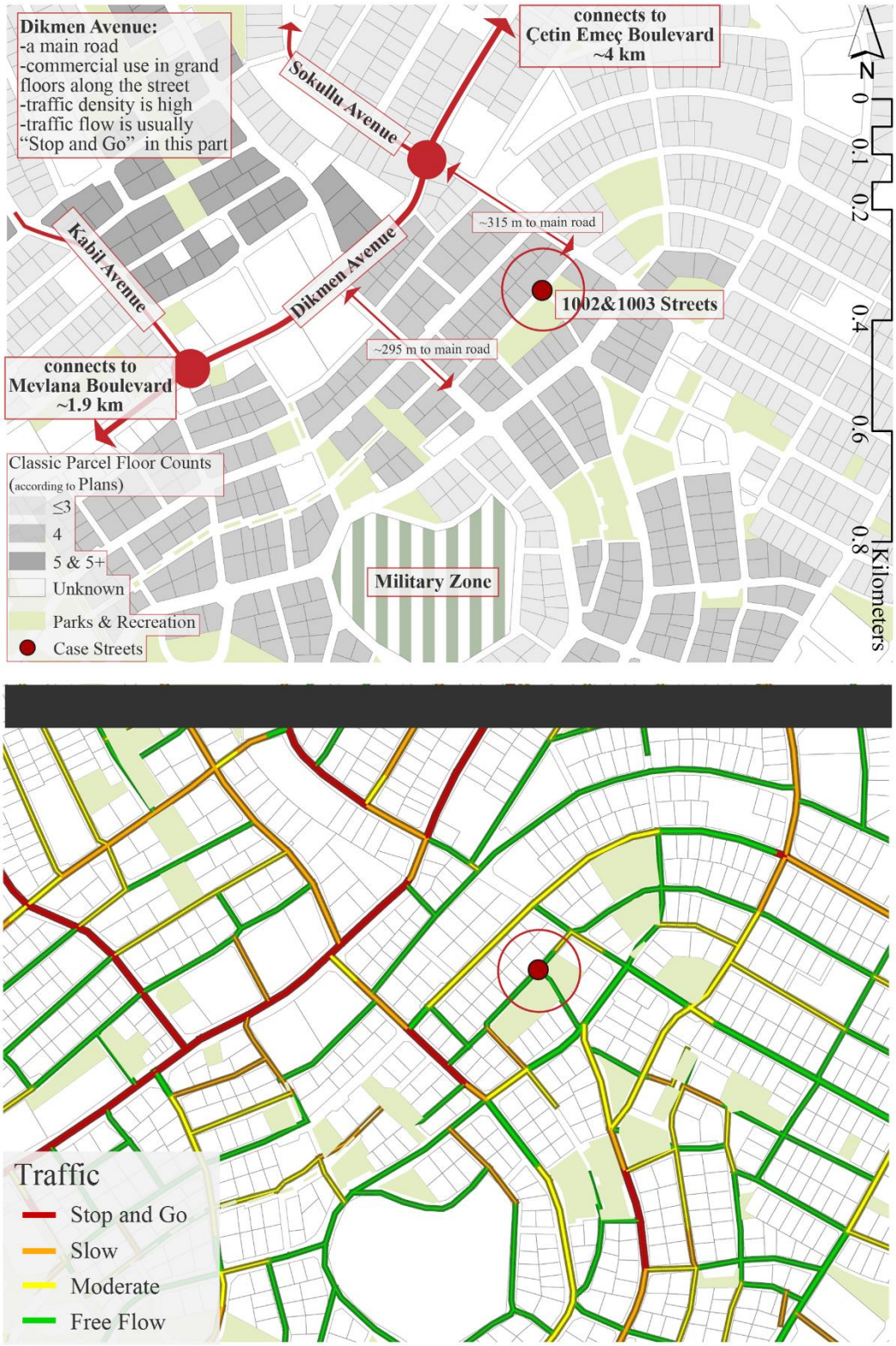

Figure 4.5. Detailed surroundings of 1002 & 1003 Streets

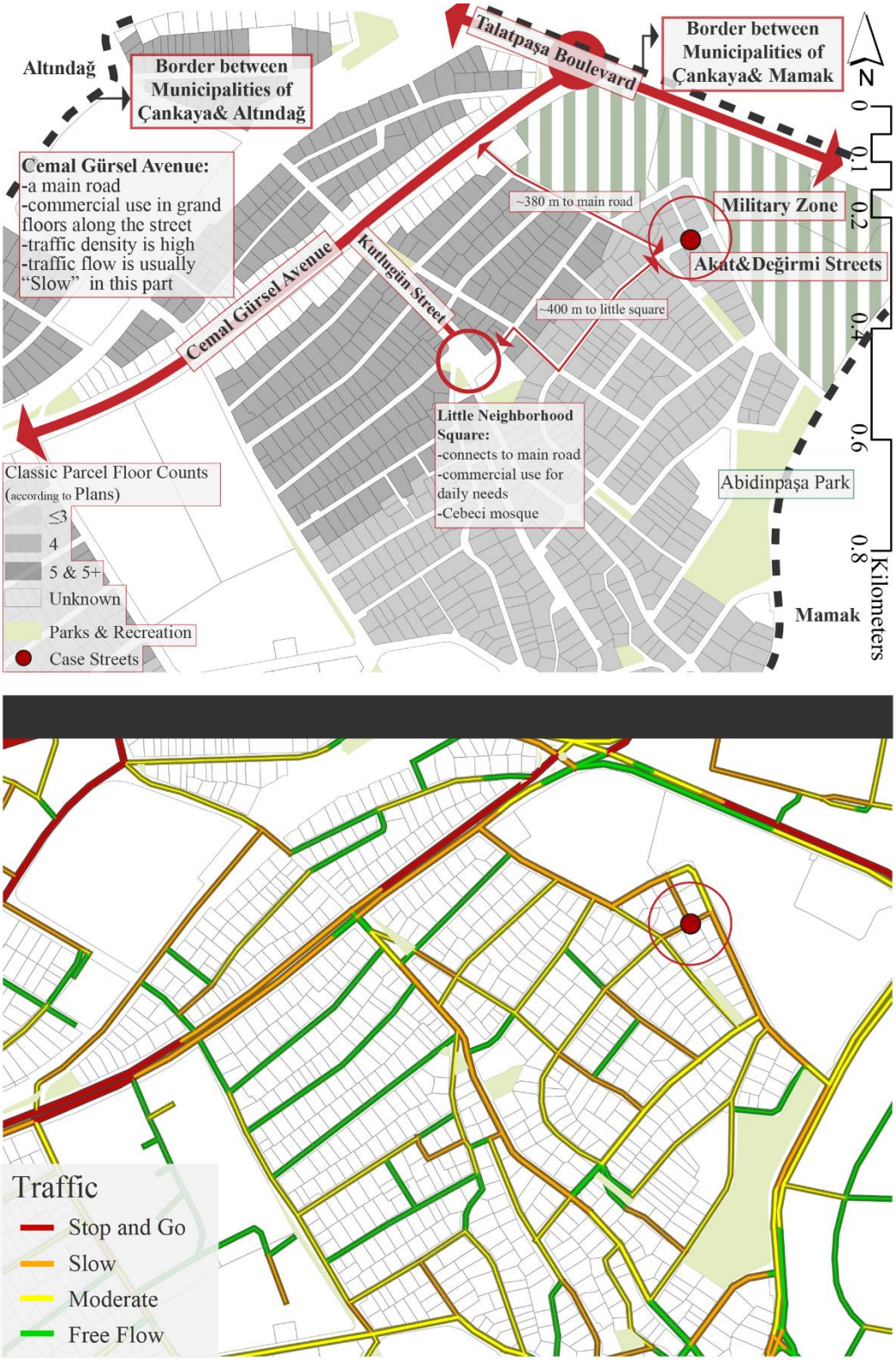

Figure 4.6. Detailed surroundings of Akat & Değirmi Streets

4.2.3. Before / After

In the context of these projects, sidewalks in the streets were renewed or rebuilt; sidewalk levels were decreased in some streets; new trees had been planted; street furniture, such as benches, shelters, flower boxes, barriers, and manufactured play equipment were placed along streets; and ground games were painted on the streets. All these features will be examined in detail in the next sections. The graphics below are prepared to give an idea of the spatial context of the projects. Red tones show the new implementations on each street.

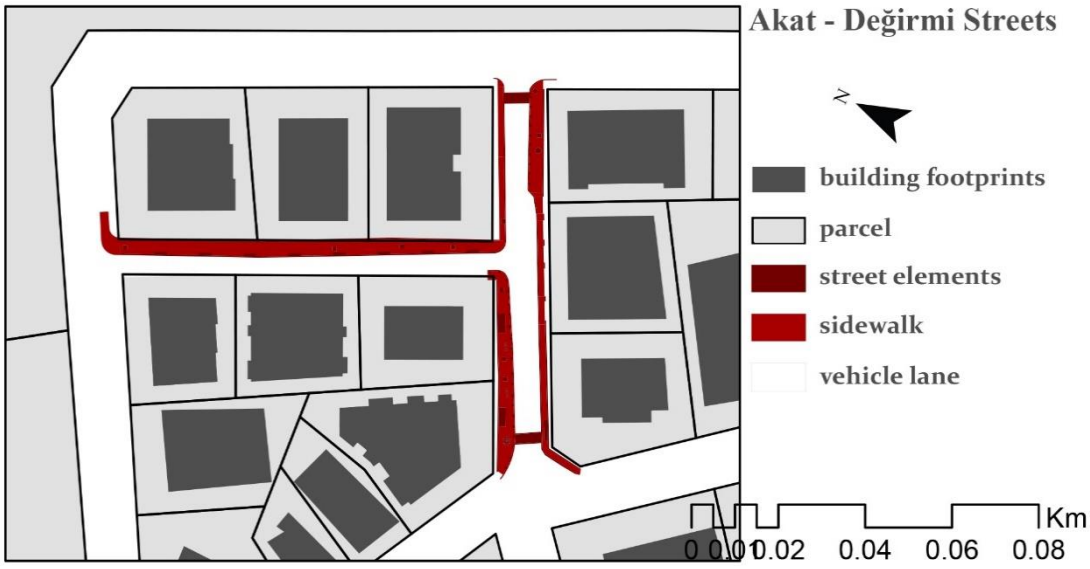

Figure 4.7. Existing parcel boundaries & implementations of Akat & Değirmi streets

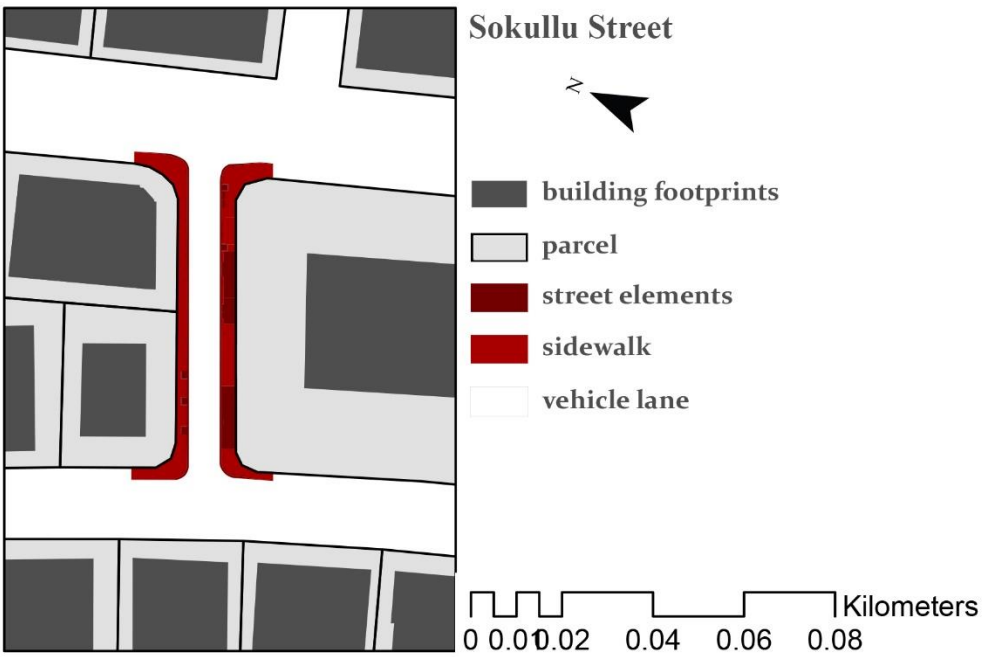

Figure 4.8. Existing parcel boundaries & implementations of Sokullu street

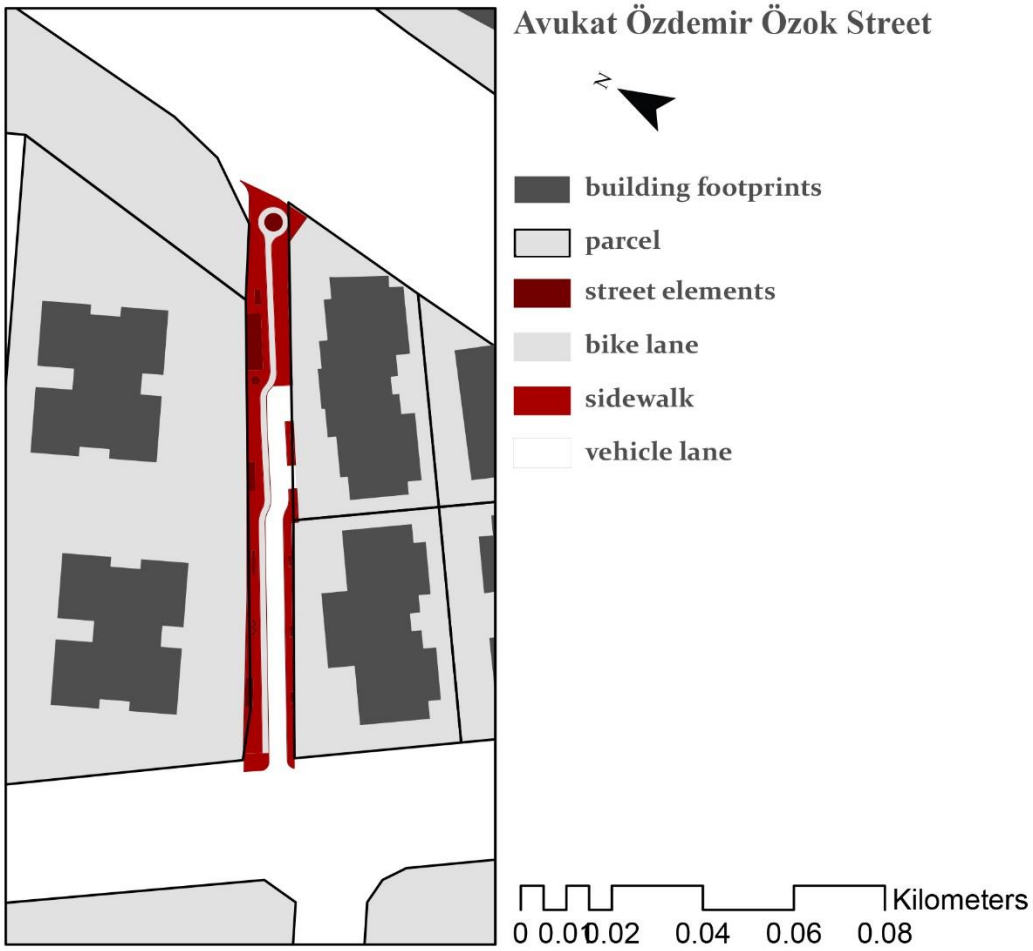

Figure 4.9. Existing parcel boundaries & implementations of Av. Özdemir Özok street

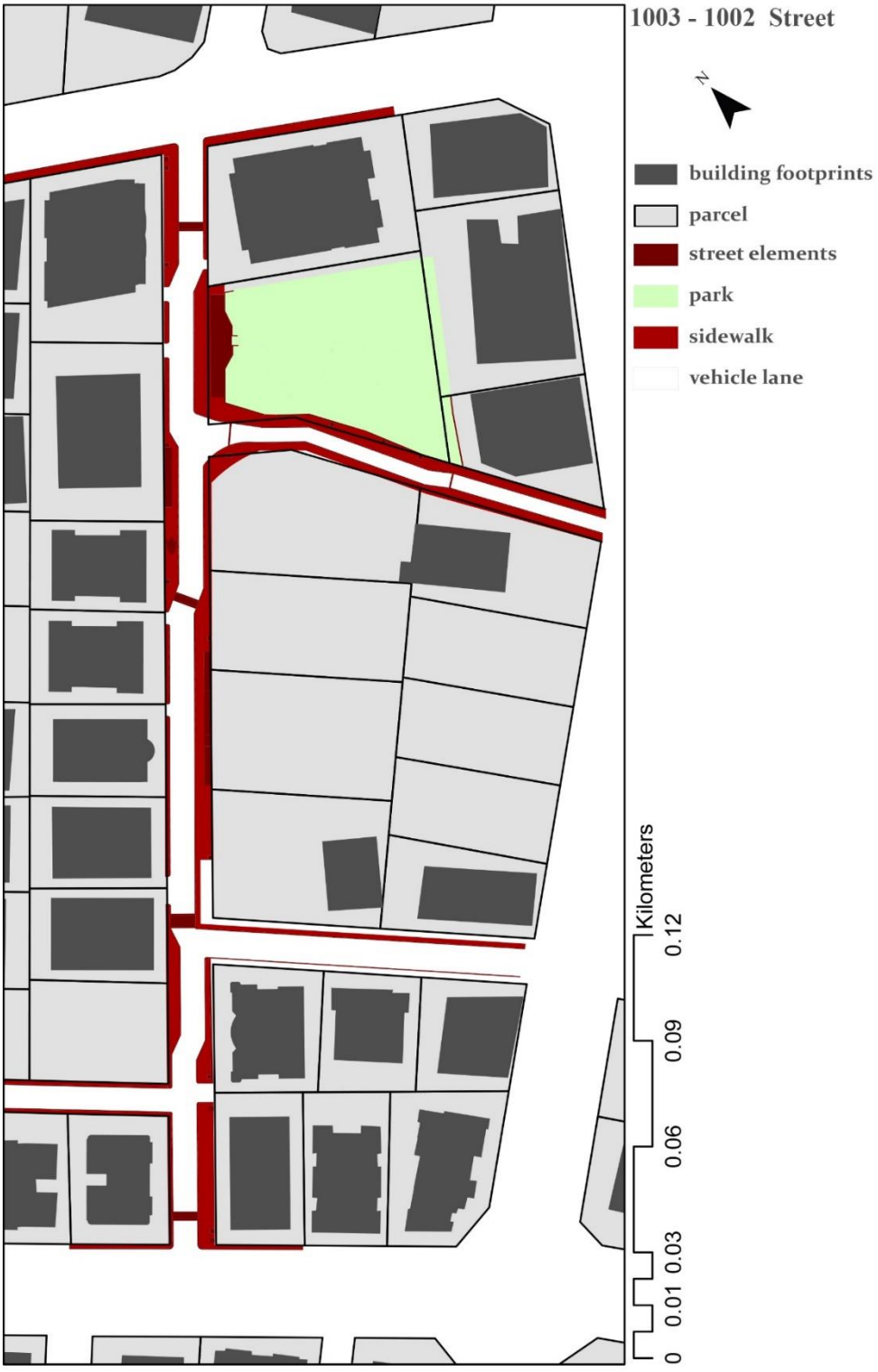

Figure 4.10. Existing parcel boundaries & implementations of 1002-1003 streets

4.3. Physical Environment Assessment

4.3.1. Entrance

Defining a gateway, a change in status in the street entrances is a key factor for shared street users' safety and free mobility. Drivers need to see (signs) or feel (ramps, trees, flower boxes, pavement changes, etc.) that they need to slow down and be aware of pedestrians; that they are entering a pedestrian oriented street and that they are guests in there.

Figure 4.11. Entrance of Av. Özdemir Özok Street playground street identification sign (author's archive 2015)

Figure 4.12. Entrance of Değirmi Street playground street identification and restriction signs (author's archive 2015)

Figure 4.13. Entrance of Akat Street playground street identification and restriction signs (author's archive 2015)

Figure 4.14. Entrance of 1002 Street playground street identification sign (author's archive 2015)

Figure 4.15. Entrance of 1003 Street playground street identification and restriction sign (author's archive 2015)

Figure 4.16. Entrance of Sokullu Street; playground street identification sign (Google Maps 2015)

All evaluation parameters (checklist questions) are gathered in the summary table given below: none of the streets had a ramp in the entrance, four of each street had signs in their entrances; some of them had just identification signs, some of them had both identification and restriction signs. But Sokullu street's identification sign was evaluated as a negative value even though it existed, because it was painted in a way that it was unnoticeable, and hence it had lost its function as a sign.

Table 4.1. *Evaluation Table of "Entrance" Features*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Ramp		0	0	0	0
Sign	Identification (special features)	0	1	1	1
	Restriction (speed)	0	1	1	0
Other Elements	To define a change in street status (planters or trees, pavement	0	0	0	0

4.3.2. Car/Pedestrian Balance

In this section traffic calming elements and car/pedestrian balance will be examined. As mentioned in the previous section, drivers need to slow down while entering these streets; but they also need to maintain slow speed while passing the street. It will be examined if any shared space features exist. Because of parking problem in big cities, streets are more likely to be divided by barriers, curbs or sidewalk levels. Otherwise, cars continue to dominate all pedestrian areas. Even though this seems to be opposite of shared street concept, it is not. There are implementations like this even in the countries with shared street culture for a long time. That means although the sidewalk and vehicular lane is separated, sidewalks belong to pedestrian (except for defined parking areas) and vehicle lane is shared between vehicle and pedestrian with pedestrian priority.

In Sokullu street (see figure 4.17 below), speed bumps were observed as a vertical measure for reducing vehicle speed near both entrances of the street. Street line was straight; and there were neither any textured surface areas to slow down traffic nor any trees or planters to narrow and shorten viewing distance. There were no defined on-street parking areas for cars, but cars were still parking on one side of the street. Sidewalks and vehicular lane were separated with drainage, barriers and flower boxes and there were no identification signs for the vehicle lane to be shared with pedestrian. There wasn’t any bike lane in the street. Sidewalks were continuous and people were able to walk in the vehicular lane. It has been observed that even in the peak hours drivers were cautious in the street because there was a school entrance in the street, but still pedestrians did not have any priority over cars.

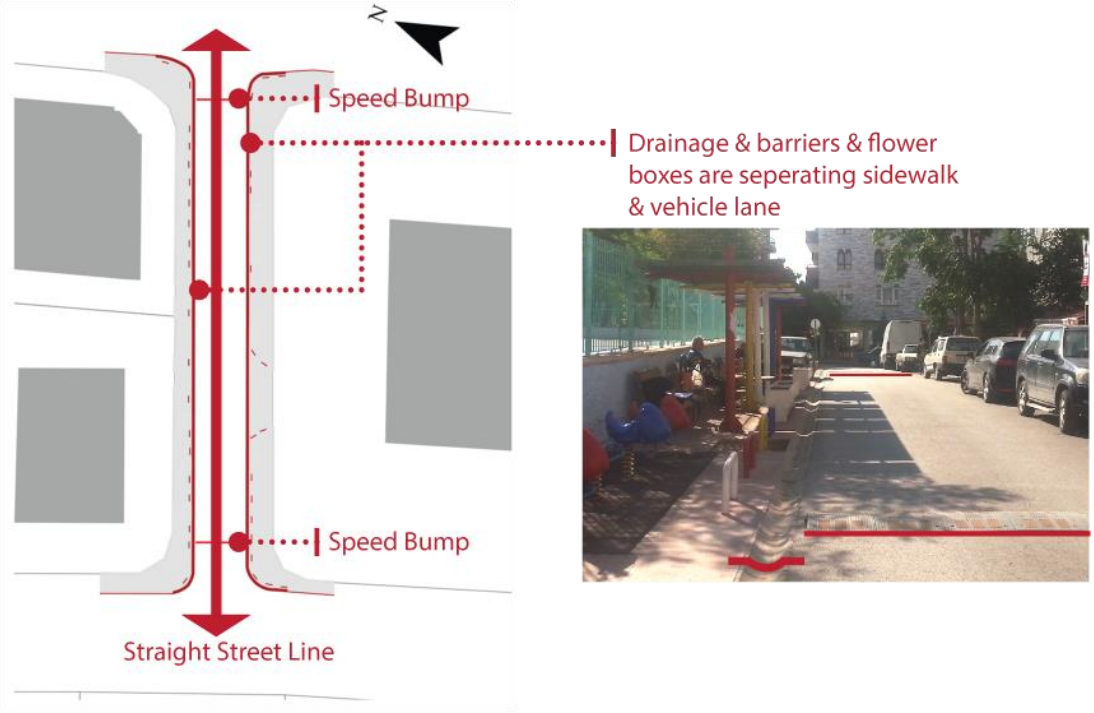

Figure 4.17. Sokullu Street car/pedestrian balance & traffic calming elements

In Av. Özdemir Özok street (see figure 4.18 below), no speed bumps were observed. Street line was uneven and there were neither textured surface areas to slow down traffic nor any trees or planters to narrow and shorten viewing distance. But since it is a cul-de-sac it was observed that drivers slowed down while entering the street and maintained the low speed. There were no defined on-street parking areas for cars, but cars were still parking on the street and narrowing down the lane. Sidewalks and vehicular lane were separated with continuous curbs and there was not an identification sign for vehicle lane to be shared with pedestrian.

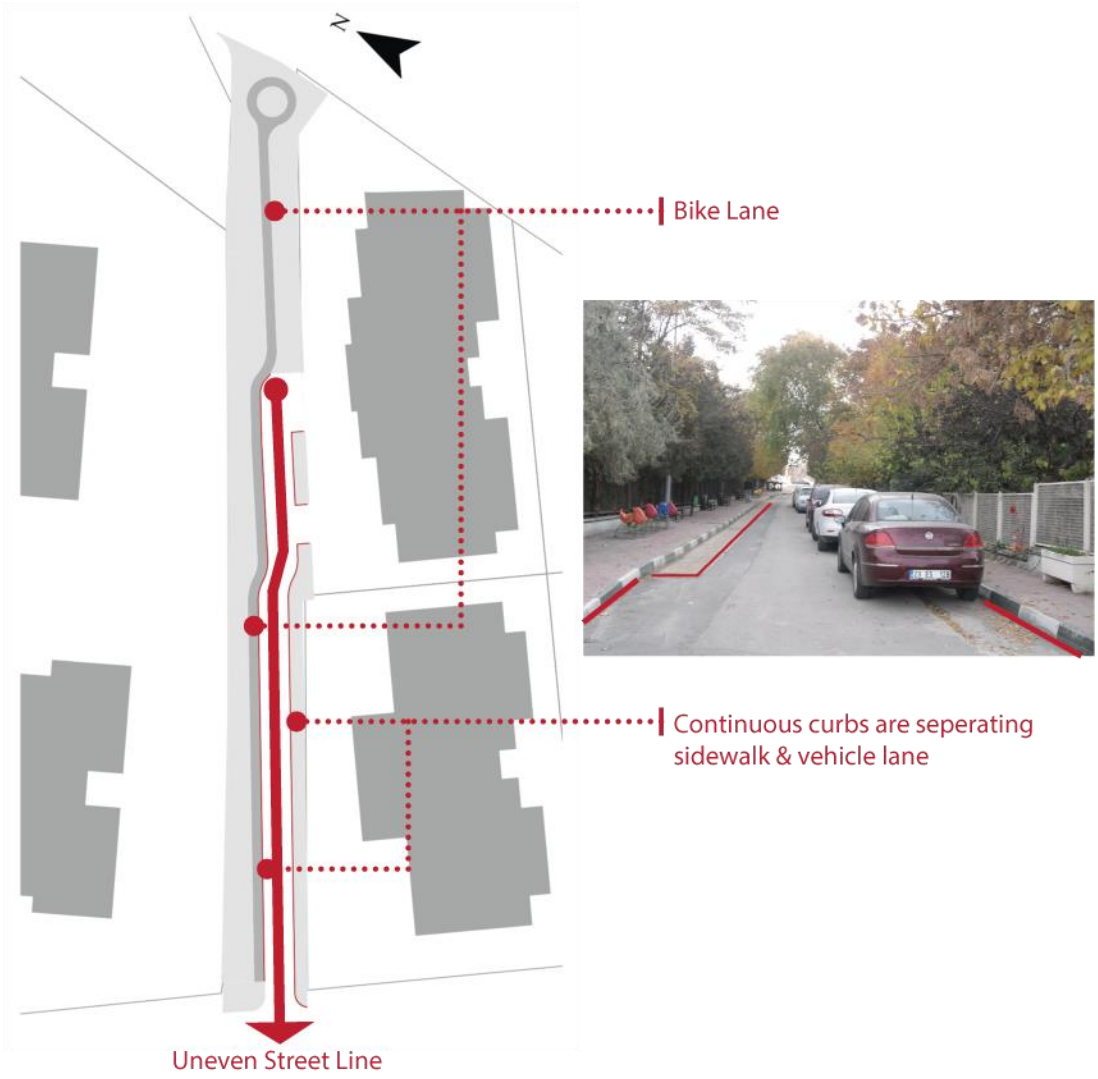

Figure 4.18. Av. Özdemir Özok Street car/pedestrian balance & traffic calming elements

There was a bike lane in the street, but it was drawn narrower than the standards (see figure 4.19 below). Sidewalks were continuous, and people were able to walk in the vehicular lane. It has been observed that pedestrians did not have any priority over cars.

Figure 4.19. Av. Özdemir Özok street bike lane without any standards

In Akat street (see figure 4.20 below), speed bumps were observed in the entrances. In Değirmi street no speed bumps were observed but since the street was sloppy drivers were slowing down naturally. Akat's street line was uneven and Değirmi's was straight. No textured surface existed to slow down traffic, no trees or planters were used to narrow and shorten drivers' viewing distance in either of the streets. There were no defined on-street parking areas for cars, but cars were still parking on the street and narrowing down the lane. Sidewalks and vehicular lane were separated with continuous curbs and there were no identification signs for the vehicle lane to be shared with pedestrian. Sidewalks were continuous and people were also able to walk in the vehicular lane. It has been observed that pedestrians did not have any priority over cars.

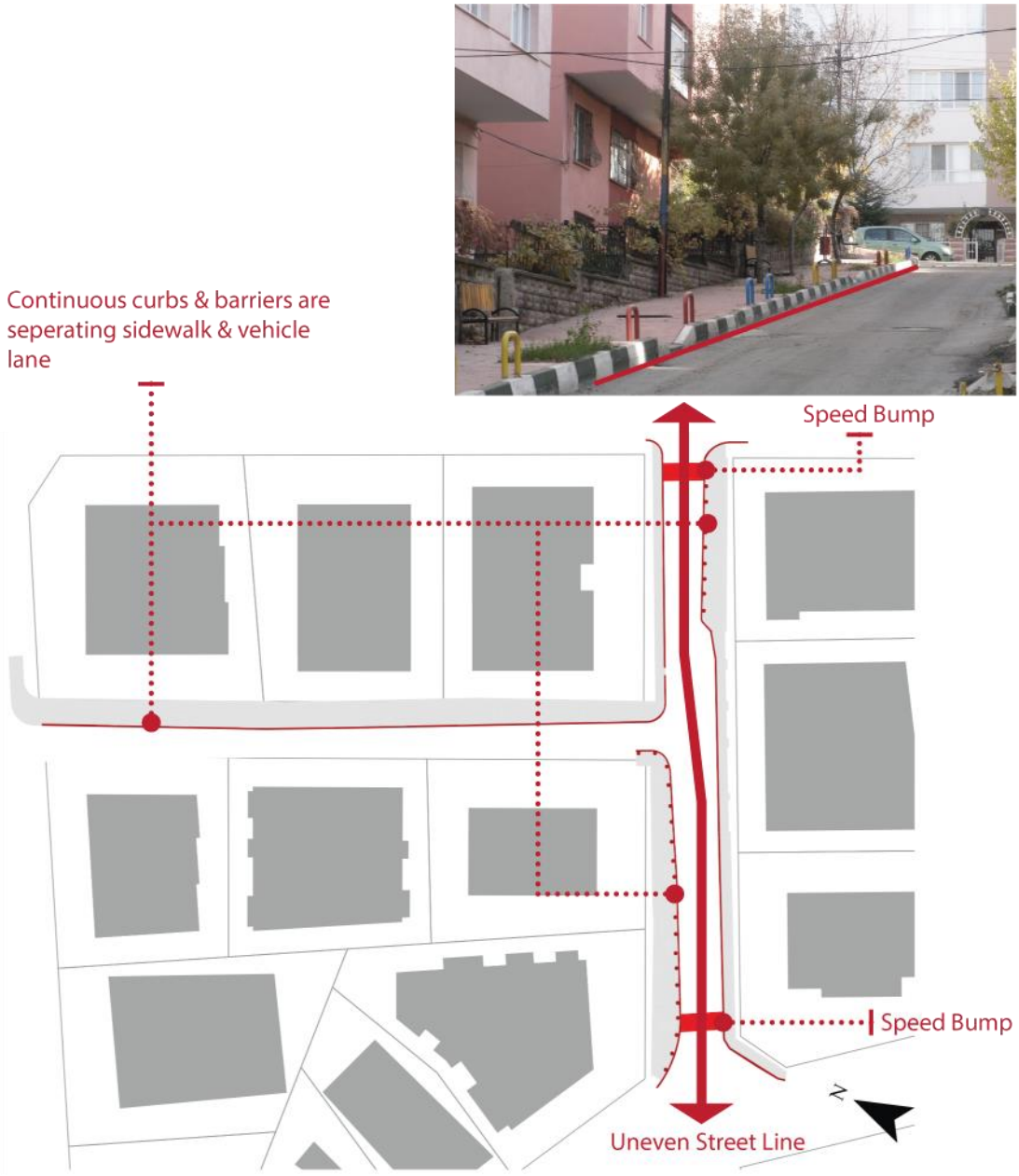

Figure 4.20. Akat & Değirmi Streets car/pedestrian balance & traffic calming elements

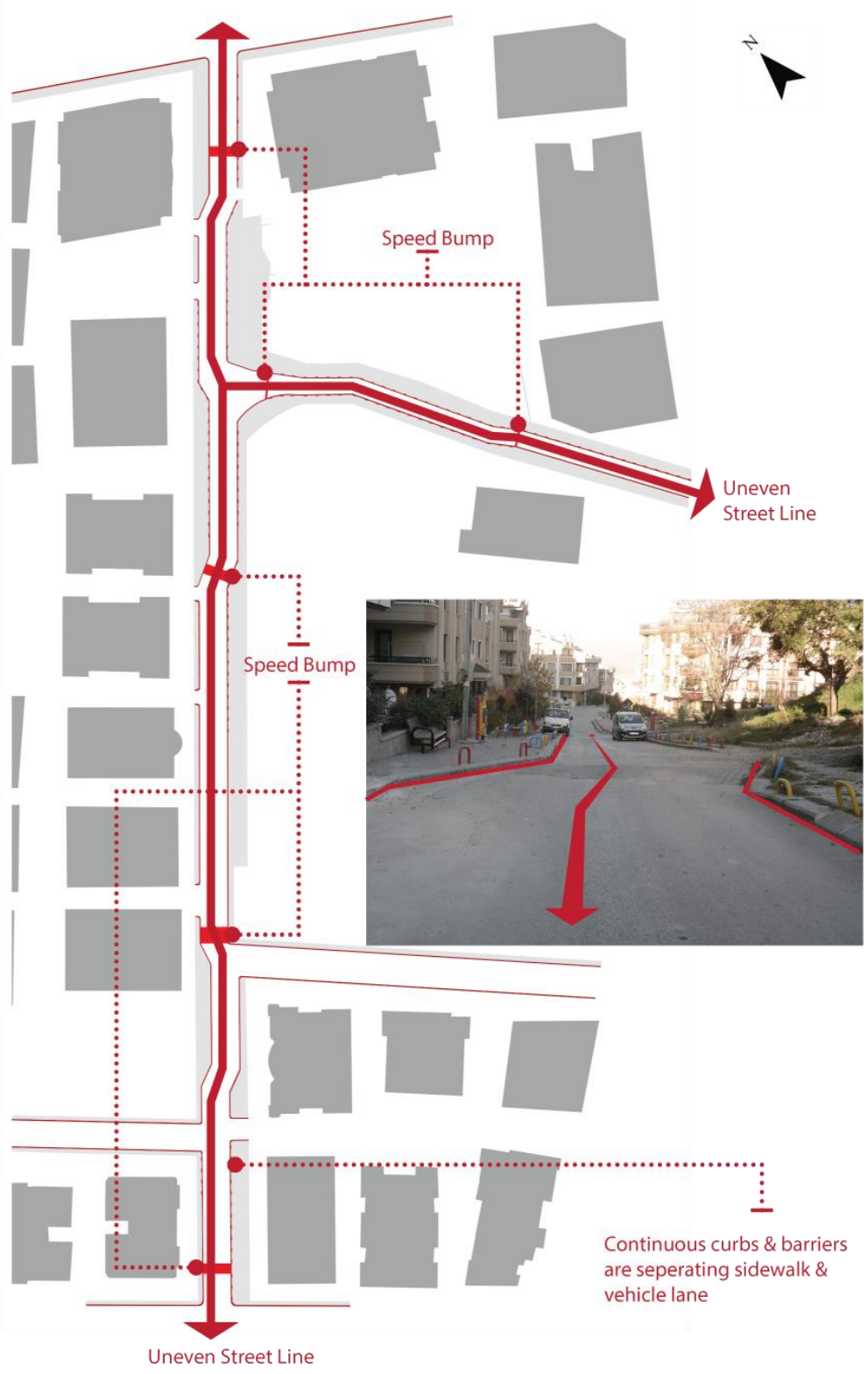

Figure 4.21. 1002 & 1003 Streets car/pedestrian balance & traffic calming elements

In 1002 & 1003 streets (see figure 4.21), speed bumps were observed. Street line was uneven in both streets. No textured surface existed to slow down traffic, no trees or planters were used to narrow and shorten viewing distance in either of the streets. There were no defined on-street parking areas for cars, cars were parking both sides on the street and narrowing down the lane. Sidewalks and vehicular lane were separated with continuous curbs and barriers, there was not any identification for vehicle lane to be shared with pedestrian. Sidewalks were continuous and people were able to walk in the vehicular lane. Pedestrian did not have any priority over cars.

Table 4.2. *Evaluation Table of "Car/Pedestrian Balance" Features*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Traffic Calming Elements	Vertical measures	1	1	1	0
	Horizontal measures	0	1	1	1
	Textured surfaced to slow down traffic	0	0	0	0
	Trees or planters introduced to narrow and shorten viewing distances?	0	0	0	0
Car	On-Street parking areas defined in the street	0	0	0	0
Car/ Pedestrian Balance	Identified shared space (cars & pedestrians)	0	0	0	0
	Bike lane	0	0	0	1
Pedestrian	Pedestrians has priority over cars	0	0	0	0
	Able to walk in vehicular route	1	1	1	1
	Sidewalk continuity	1	1	1	1

4.3.3. Streetscape & Environment

In this section some streetscape elements and environment features of streets will be examined. Sidewalks levels' being same with the road or non-existent is a key factor

in a street to be pedestrian/child friendly: this way pedestrians and automobiles will be put on the same level and this will create the impression of a yard. This integration of sidewalks and roadways into same level creates a situation where drivers are directed by other street elements. Surface treatment, bollards, street furniture, trees and vegetation are other elements used to support the idea of discouraging the drivers to dominate the street and create a good sense of comfort for residents to use the street space (see figure 4.22). What is required is creating a streetscape that valued the residents and provided a rich environment that fostered social interaction in addition to calming the traffic.

Figure 4.22. Use of textured pavement, trees and bollards to guide traffic (http://courses.umass.edu/latour/Netherlands/hand/index.html)

In studied streets only Sokullu street's sidewalk level was same with the roadway. Other streets' sidewalk levels were higher than the roadway. Sidewalk pavements were different than the road in all streets, but these are not accepted as surface treatments in evaluation, because varied surface treatments with interesting patterns should integrate the sidewalk and roadway (see figure 4.23).

Figure 4.23. Sidewalks & roadways in the streets

In all streets play equipment existed and were scattered in the sidewalk along the street. Some play spaces were defined with rubber floor pavement (see figure 4.24).

Figure 4.24. Two different play equipment in Akat Street with/without pavement treatment

Although there were benches for adults to sit in all the streets, there were no defined gathering spaces for residents on the street.

Figure 4.25. A social gathering space created by residents in their (own private) front yard, but it is separated from street by elevation, fence and vegetation: this way interaction with the street is very limited.

In 1003 and Sokullu streets there was a pergola and Av. Özdemir Özok street has tall, grown trees on both sides of the street for shade in the summer; but none of the streets had any element to be used as a shelter for rain or snow.

Figure 4.26. Pergola in 1003 Street providing shade for benches and play equipment

Figure 4.27. Av. Özdemir Özok Street, tall, grown trees on both sides of the street, all of them were planted before renewing the street by residents in their yards

After renewing the street, new trees were planted in 1002 and 1003 streets. They were young trees and mostly were not treated after planting. But in Değirmi street although new trees existed in the design, tree/vegetation slots were empty, or plants did not exist on site. Besides it was observed in all streets that implementation was not the same with the designed projects. Trees were not used for directing drivers or narrowing driver's sight line in any of the streets; and flower boxes were not used for direction either.

Figure 4.28. 1002 and 1003 streets; grown trees that existed on the left before renewing the street are making shade for people sitting on the benches, while planted young trees on the right after renewing the street are growing and appear to be in good condition.

Figure 4.29. Empty Tree/vegetation slots in Değirmi Street where should be flower boxes

All streets had night time lighting but Av. Özdemir Özok street was dark in the night because of the trees. If pedestrian level lighting existed, the street would have been lighted up, which also could strengthen the sense of a yard. But none of the streets had pedestrian level lighting. Street art did not exist in any of the streets.

Table 4.3. *Evaluation Table of "Streetscape & Environment" Features*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Sidewalks Level	Same with road or non-existent	1	0	0	0
Surface Treatment	Interesting patterns and varied surface treatments to integrate sidewalk & roadway	0	0	0	0
Gathering Space for Residents	For interaction	0	0	0	0
Play Space	Play equipment, ground games	1	1	1	1
Trees and Vegetation		1	1	1	1
Bollards		1	1	1	1

Seating for Adults	Benches	1	1	1	1
Pedestrian Level Lighting		0	0	0	0
Night Time Lighting		1	1	1	0
Shade (in summer time)		1	0	1	1
Shelter (rain, snow, etc.)		0	0	0	0
Street/Public Art		0	0	0	0

4.3.4. Interface

Woonerf approach was about creating front yards for those who may not even have a backyard. But in our country planning law and legislations are already forcing residents to have front yards. In this section, front yards' integration with street will be examined. Front yards can be used to serve to widen usable area in the streets. When social/play areas on the street are limited with sidewalks as it is in studied streets, open or semi-open front yards could have been utilized to create social areas or play areas by residents.

In 1003 street a small area from a parcel was open to street even though the boundaries of the area were determined by planted trees.

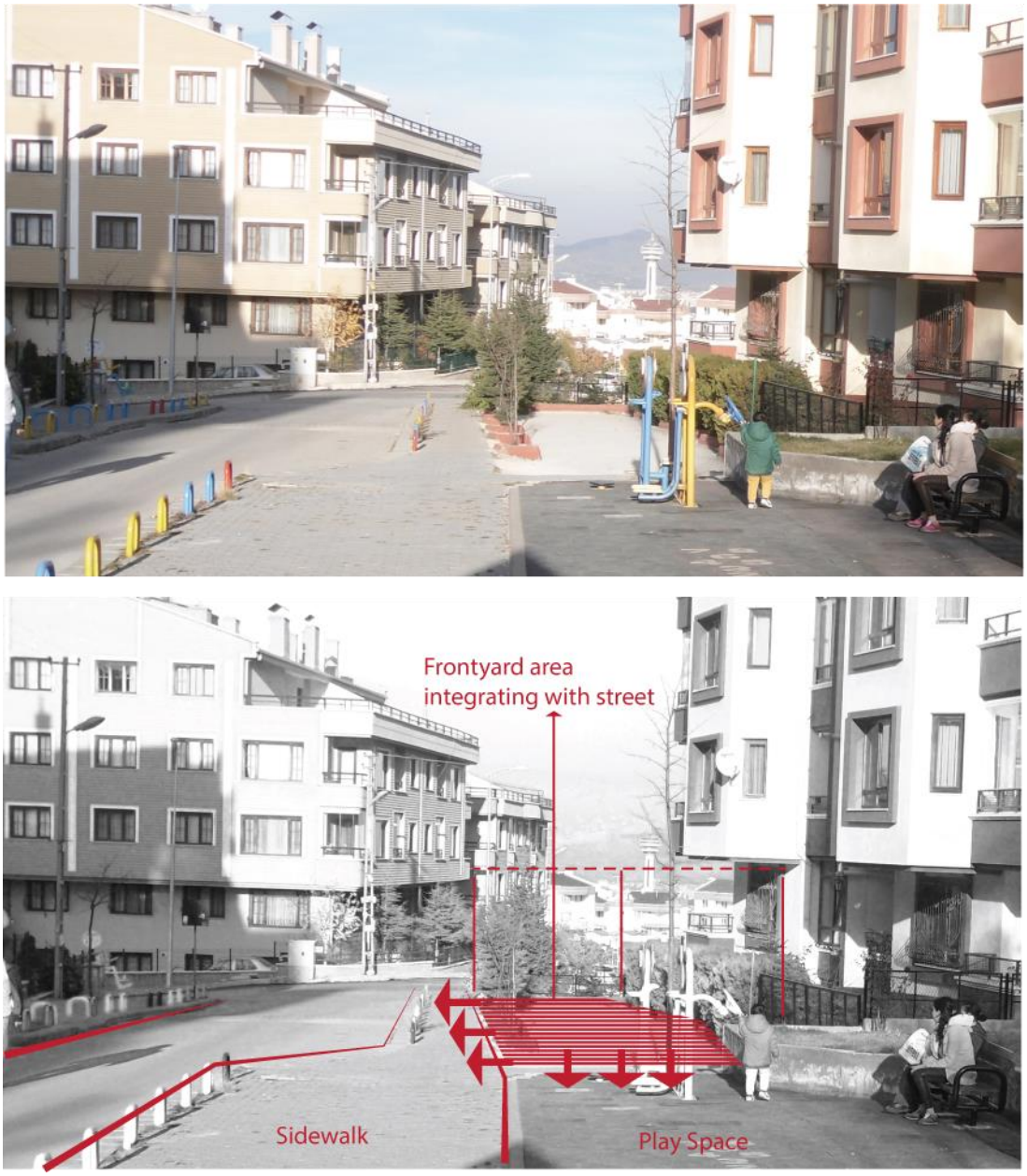

Figure 4.30. A part of front yard of a building integrating with sidewalk and play space

Children were observed playing in the area. They were not limiting themselves to play in the boundaries; they were using the area integrated with the sidewalk and street.

Figure 4.31. Children were playing in the semi-public area

In other streets no front yards were observed as an element that could allow integration with sidewalk or street space. None of the streets had any front yard area with direct access to the street. All the front yards were separated from street with fences, parcel walls with different heights and plantings.

Figure 4.32. An example from Av. Özdemir Özok street; very high and non-permeable parcel boundaries, which does not allow visibility

Figure 4.33. An Example from Sokullu street; medium height fences with low parcel walls, which allows visibility

Street's visibility from buildings have an effect on the safety, security and sense of belonging of a residential street. It is also important for children to go out by themselves. Because this way parents can have an eye on their children from windows or balconies while they are continuing their daily routine. All the studied streets have good visibility of play areas: there were not any obstacles other than trees which are permeable.

Table 4.4. *Evaluation Table of "Interface" Features*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Frontyard	Allows integration with street space	0	0	1	0
Open/Permable	Allows direct access (fence, parcel wall)	0	0	0	0
Allows visual surveillance	Façade / obstacles	1	1	1	1

4.4. Play & Learning Settings

The physical environment influences children's behavior. In this section physical elements that encourage/allow children to play will be examined in two sub sections as play space quality and activity settings.

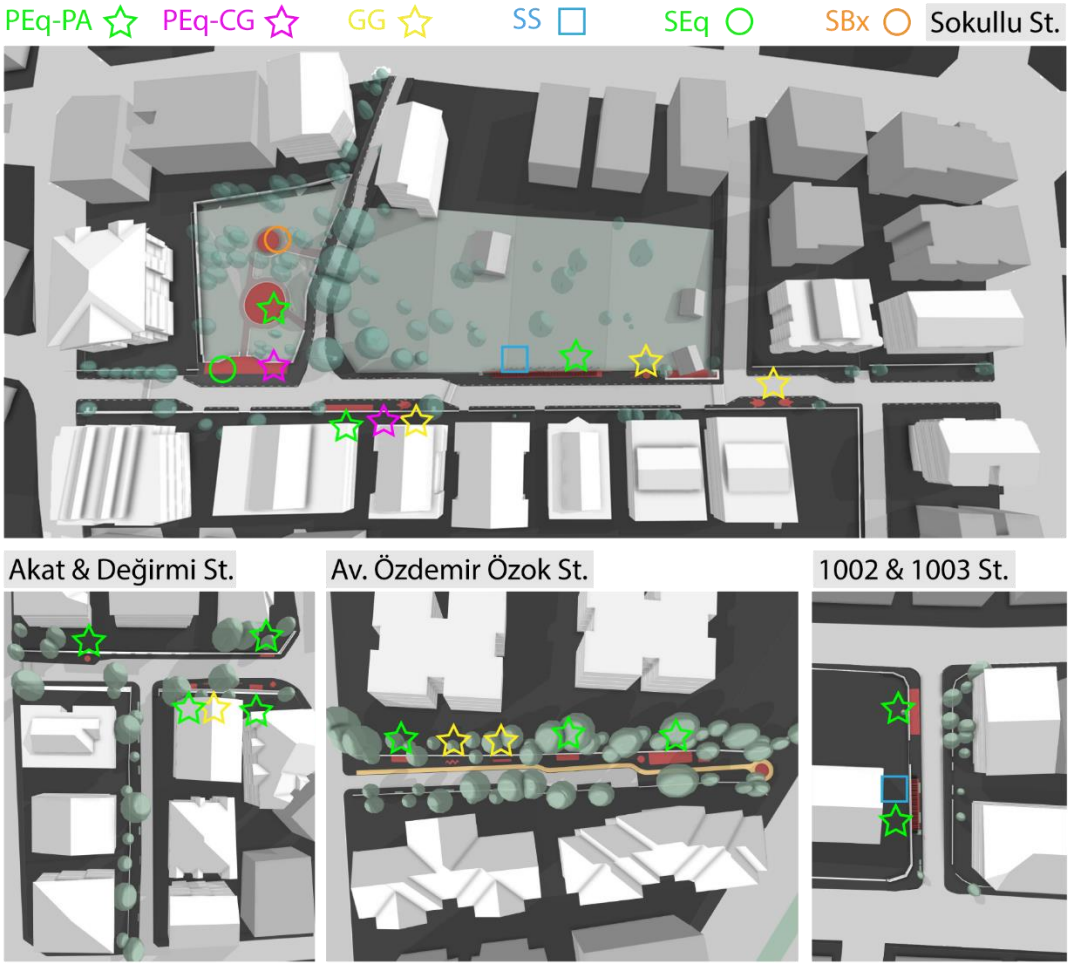

Figure 4.34. Play & learning settings

In the figure above an overview of play and learning settings in each street has been shown, which are categorized based on the function of the settings. The quality or qualification of the games are not taken into consideration in this study. Play equipment that affords physical activity is shown as PEq-PA, play equipment that affords cognitive games is shown as PEq-CG. Ground games are shown as GG which also offers physical activity for children. Sand box is defined as SBx, for which a free

play area was located in the park only in 1002 & 1003 streets. Lastly social spaces are shown as SS, which promote children to gather together, supported with street furniture that is suitable for little children' scales.

4.4.1. Play Space Quality

Play spaces were scattered along the street in all studied streets. Some areas were separated with soft pavement material, ground games were drawn, but all play areas were on the sidewalks.

According to interviews with municipality's design team, children were not involved in the development process in any streets. In each street, less than 100 vehicles were observed even at the peak times of the day. Maximum vehicle counts (depending on observations) are shown in the table below:

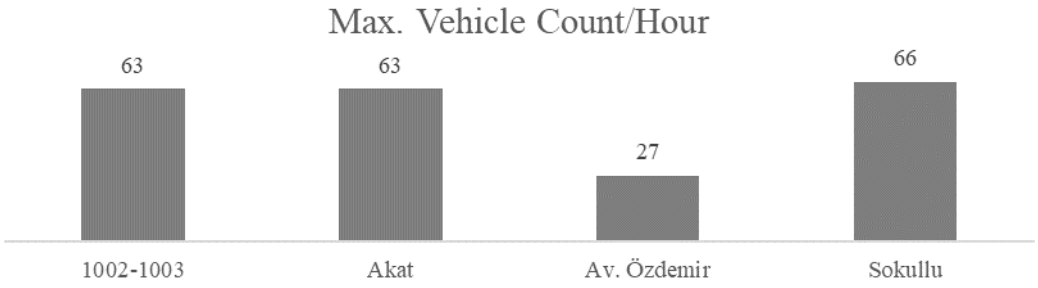

Figure 4.35. Maximum vehicle counts for each street (source: traffic counts by the author)

These evaluation parameters are gathered in the table below:

Table 4.5. *Evaluation Table of "Play Space Quality" Features – Children's Involvement & Traffic Volume*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Involvement of Children	Were children involved in the development of the site?	0	0	0	0
Less Traffic Volume	Less than 100 vehicles / hour observed	1	1	1	1

Sokullu street's playground was near a busy road with heavy traffic at peak times, which made it difficult for children to reach the area; but all other streets were surrounded by residential streets and accessibility was high. However, moving with impairments or buggies and pushchairs was not easy in any of the streets. In Sokullu street, sidewalks were levelled with the road so it was evaluated positively, but in other streets side walk levels were higher than the road. Furthermore, in each garage entrance, levels were changing, and these changes were not smooth. Sidewalks were in a bad condition because of poor maintenance and there were even obstacles such as dislocated pavement stones. Parked cars and some play equipment were becoming obstacles in using sidewalks continuously.

Figure 4.36. Poorly Maintained Sidewalks and Furniture, Parked Cars and Misplaced Play Equipment as Obstacles on Sidewalks

Sokullu street had a school yard entrance on the street, other streets were not close to any school yard. 1002-1003 streets had a link with a park, which also has a playground in it. Other streets did not have any links with parks.

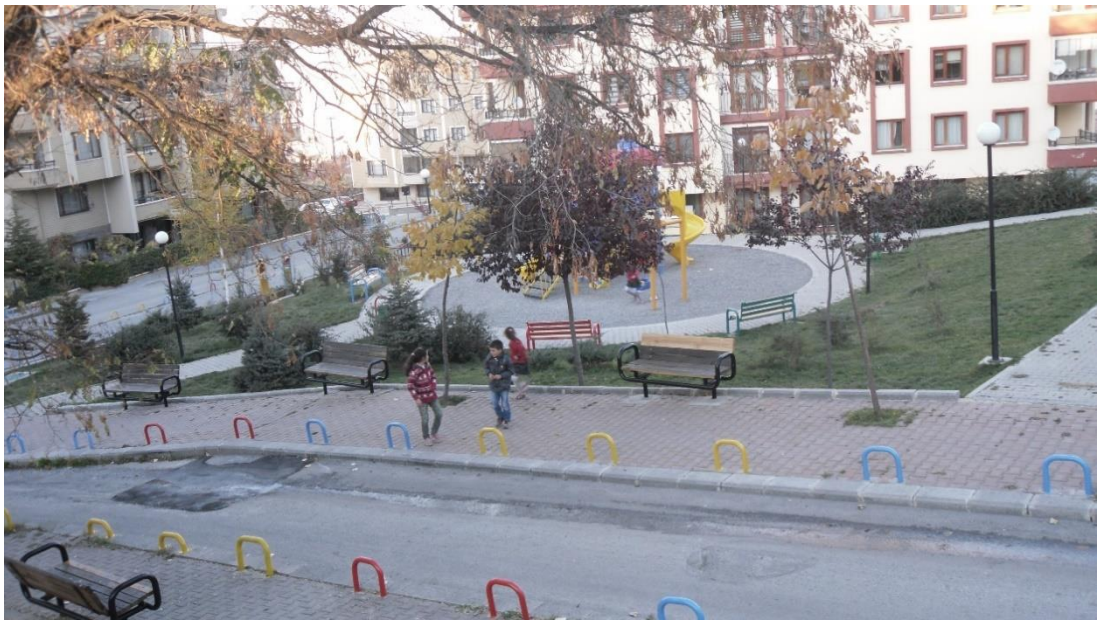

Figure 4.37. 1002-1003 streets' link with park & playground

Figure 4.38. School entrance on Sokullu street which is non-accessible to public

A summary of these evaluation parameters are gathered in the table below:

Table 4.6. *Evaluation Table of "Play Space Quality" Features – Location*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Location	Informal oversight by passers-by or nearby properties.	1	1	1	1
	Easily getting there (any busy roads to pass, topography?)	0	1	1	1
	Getting there for those with impairments or with buggies and pushchairs.	1	0	0	0
	Close to school yard	1	0	0	0
	Link with parks and playgrounds	0	0	1	0

Since selected streets all had play equipment and ground games drawn on sidewalks, they were enticing children to play. But none of the streets had specifically designed play opportunities for disabled children.

Each street had enough space and less traffic to allow children to move freely and had wide hard surfaces for ball games which were mostly on the roadway.

Figure 4.39. Children Playing Ball Games on 1003 Street Using Sidewalk, Roadway and Play Space Together

1002-1003 streets had opportunity to find loose parts for play on the site because there is a slightly natural non-built area on the street which hosted birds and some little animals. Other streets did not have any access to natural environment.

Figure 4.40. Natural Non-built Area

All streets had benches compatible with children scale, but only in Sokullu and 1002-1003 streets there were street furniture; a round table with seating to promote children to gather together.

Figure 4.41. Gathering space for children

These evaluation parameters are gathered in the table below:

Table 4.7. *Evaluation Table of "Play Space Quality" Features – Play Value*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Play Value	Enticing to children to play.	1	1	1	1
	Play opportunities for disabled children.	0	0	0	0
	Movement	1	1	1	1
	Ball games	1	1	1	1
	Opportunities to change the environment/space (loose parts)	0	0	1	0
	Access to natural environment.	0	0	1	0
	Places for children to sit.	1	1	1	1
	Places for children to gather	1	0	1	0

Usually all the streets were clean, and each had litter bins. Sometimes some trash bags were observed in some points in all streets; but since they were so rare, they are evaluated positively.

Figure 4.42. A Thrown Away Trash Bag on 1003 Street

Sokullu, Akat-Değirmi and 1002-1003 streets could be considered to be in a good shape, but Av. Özdemir was poorly maintained. In other streets it was observed that play equipment was broken; sidewalk stones were misplaced and thrown away; streets signs were bent; benches were broken or dirty.

Figure 4.43. Broken child bench, misplaced sidewalk stones and deformations in sidewalk were observed in Av. Özdemir Özok Street

Figure 4.44. A Scene from Akat street's entrance – Now / Then

The first photo (up) was taken by Çankaya Municipality staff just after the implementation of the project (2012), while the second photo was taken by the author (2015) on-site during observations. Broken play equipment, degenerated asphalt and

bike lane color, missing benches and bent litter bin could be seen in the second photo when compared to the first.

These evaluation parameters are gathered in the table below:

Table 4.8. *Evaluation Table of "Play Space Quality" Features – Care & Maintenance*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Care and Maintenance	Well maintained	1	0	0	0
	Clean	1	1	1	1
	Litter bins	1	1	1	1

4.4.2. Activity Settings

Activity settings were evaluated by the existence of some physical features which promote activity for children. Flat, relatively smooth surfaces promote activities like cycling, running, skipping, skating, playing hopscotch and ball games. In each street flat surfaces existed. Relatively smooth slopes promote activity like coasting down and skateboarding. Only 1002-1003 streets had relatively smooth slopes, which were not specifically designed but the street had naturally. Nevertheless, sloppy areas existed on the roadway, and they promoted the abovementioned activities; so 1002-1003 streets are evaluated positively in having relatively smooth slopes.

Existence of graspable/detached objects promote activities like throwing, digging, building of structures and using plants in play. 1002-1003 streets' link with a partially natural area on the street allowed children to find and play with graspable objects like stones or tree branches. There are earth and plants to play with.

Nonrigid, attached objects promote activities like hanging or swinging on. None of the streets had such features. Climbable features to climb or features to use as a shelter for peace and quiet were not present in any streets. Lastly mouldable material for moulding something was only available in 1002-1003 streets.

These evaluation parameters are summarized in the table below:

Table 4.9. *Evaluation Table of "Activity Settings" Features*

Design Features		Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Activity Settings	Flat, relatively smooth surfaces	1	1	1	1
	Relatively smooth slopes	0	0	1	0
	Graspable/ detached objects	0	0	1	0
	Nonrigid, attached object	0	0	0	0
	Climbable feature	1	0	0	0
	Shelter	0	0	0	0
	Mouldable material (dirt, sand, snow)	0	0	1	0

Overall Evaluation of Physical Features

All parameters in sections 4.3 and 4.4 are gathered in a single table below to compare physical features' existence in each street and a total score is computed.

Table 4.10. *Evaluation Table of Physical Design Features*

Design Features			Sokullu	Akat&Değirmi	1002&1003	Av. Özdemir Özok
Entrance	Ramp		0	0	0	0
	Sign	Identification (special features)	0	1	1	1
		Restriction (speed)	0	1	1	0
	Other Elements	To define a change in street status (planters or trees, pavement)	0	0	0	0
Vehicle / Pedestrian Balance	Traffic Calming Elements	Vertical measures	1	1	1	0
		Horizontal measures	0	1	1	1
		Textured surfaced to slow down traffic	0	0	0	0
		Trees or planters introduced to narrow and shorten viewing distances?	0	0	0	0

	Car	On-street parking areas defined in the street	0	0	0	0
	Car/Pedestrian Balance	Identified shared space (cars & pedestrians)	0	0	0	0
		Bike lane	0	0	0	1
	Pedestrian	Pedestrians has priority over cars	0	0	0	0
		Able to walk in vehicular route	1	1	1	1
		Sidewalk continuity	1	1	1	1
Streetscape & Environment	Sidewalks Level	With road or non-existent	1	0	0	0
	Surface Treatment	Interesting patterns and varied surface treatments to integrate sidewalk & roadway	0	0	0	0
	Gathering Space for Residents	For interaction	0	0	0	0
	Play Space	Play equipment, ground games	1	1	1	1
	Trees and Vegetation		1	1	1	1
	Bollards		1	1	1	1
	Seating for Adults	Benches, etc.	1	1	1	1
	Pedestrian Level Lighting		0	0	0	0
	Night Time Lighting		1	1	1	0
	Shade (in Summer Time)		1	0	1	1
	Shelter (Rain, Snow, etc.)		0	0	0	0
	Street/ Public Art		0	0	0	0
Play Space Quality	Involvement of Children	Were children involved in the development of the site?	0	0	0	0
	Less Traffic Volume	less than 100 vehicles / hour observed*	1	1	1	1

	Location	Informal oversight by passers-by or nearby properties such as houses or community centres	1	1	1	1
		Easily getting there (any busy roads to pass, topography?)	0	1	1	1
		Getting there for those with impairments or with buggies and pushchairs	1	0	0	0
		Close to school yard	1	0	0	0
		Link with parks and playgrounds	0	0	1	0
	Play Value	Enticing to children to play	1	1	1	1
		Play opportunities for disabled children	0	0	0	0
		Movement.	1	1	1	1
		Ball games.	1	1	1	1
		Opportunities to change the environment/space (loose parts)	0	0	1	0
		Access to natural environment.	0	0	1	0
		Places for children to sit.	1	1	1	1
		Places for children to gather	1	0	1	0
	Activity Settings	Flat, relatively smooth surfaces	1	1	1	1
		Relatively smooth slopes	0	0	1	0
		Graspable/ detached objects	0	0	1	0
		Nonrigid, attached object	0	0	0	0
		Climbable feature	1	0	0	0
		Shelter	0	0	0	0
		Mouldable material (dirt, sand, snow)	0	0	1	0
	Care and Maintenance	Well maintained.	1	0	0	0
		Clean	1	1	1	1
		Litter bins	1	1	1	1

Interface	Frontyard	Allows integration with street space	0	0	1	0
	Open/ Permable	Allows direct access	0	0	0	0
	Allows Visual Surveillance	Façade / obstacles	1	1	1	1
Grand Total Score (of 54)			25	22	31	21

According to table 4.10 above; most scored site is 1002 & 1003 streets with 31/54 points. Other streets' scores are even lower than 50% of the total score: Sokullu street is the 2nd best scored street with 25/54 points, Akat & Değirmi streets follow with 22/54 points and lastly Av. Özdemir Özok street with 21/54 points.

According to total scores for each section of the table (entrance, vehicle/pedestrian balance, streetscape & environment, play space quality and interface) a table of strengths and weakness is formed. This information is later used to cross check behavior mapping in the next section to reveal if there is any relation between the physical features and street usage.

Table 4.11. *Physical Environment Assessment of the Streets – Strengths & Weakness*

	Strengths	**Weakness**
Entrance	All streets - have identification signs.	All streets - Entrance of the street is not strongly defined to create a change of mood for drivers. All streets - design's role is weak; only signboards were used, no design elements were used to form drivers' behavior (like ramps, trees or pavement)

Pedestrian/ Vehicle Balance	All streets - some traffic calming elements exist to slow traffic flow	All streets - Weak pedestrian/vehicle balance - pedestrians are not comfortable using roadway as a shared space for any activity other than passing by from street; pedestrians have no priority over cars, roadway belongs to vehicles. All streets - parking problem; parked cars occupy a big part of the roadway which creates a continuous barrier between two sides of the street and limits the usable space for pedestrians in roadway, even sidewalks are parking areas for cars because there are no segregated/defined parking space on the street which might be used to limit parking on the street.

Streetscape & Environment	All streets - existence of trees and vegetation, bollards, seating for adults and play spaces to make streets more child-friendly.	All streets - even though trees exist on the streets, they are very young, unnoticeable as a street design element and poorly maintained. Most of the slots for vegetation is empty. Seating are not designed to allow people gather, rather there are benches located separately from each other which allow 2 people to sit together and look at the street, passing cars, etc.
	Sokullu Street - sidewalk levels are same with the roadway which allow users to feel the space can be shared,	All streets - Weak streetscape & environment design; no sense of shared street; sidewalk levels are higher than roadway (except for Sokullu street) which divides the street space into two as restricted and non-restricted spaces for pedestrians; no interesting patterns and varied surface treatments to integrate sidewalk & roadway; no gathering spaces for interaction except play spaces.
	1002 & 1003 and Akat & Değirmi Streets - People create gathering spaces in their front yard to spend some time outside and socialize.	1002 & 1003 and Akat & Değirmi Streets - Social spaces located in some apartments' front yard serve only the people living in those apartments, and non-integrated with the street and disconnected from neighbors or any passers-by.

Play Space Quality	All streets - Driving speed of cars are low, count of cars passing by from street are low enough to allow children play on the street	All streets - children were not involved in the development of the site.
		All streets - have bad accessibility and movement freedom for those with impairments or with buggies.
		All streets - have none play opportunity for disabled children. Even though Sokullu street has same sidewalk levels with roadway, the play and street elements are set in narrow sidewalks just as other streets, which makes the play space very condensed and this limits the freedom of usage and movement of disabled children.
	All streets - have play equipment and ground games and settings for children to entice them play out	
	1002&1003 streets - existence of play value and activity settings is relatively high because of the diversity of space (park, playground, semi-natural area, etc.) and play/sports equipment which offer more reason for children to play out	All streets - Even in the streets with a higher play value than the average; play equipment lack diversity. The quality of games and the activities that play equipment afford are low. This is actually same for most industrial play equipment in parks and playgrounds, which afford limited activity and offer rules about how to play with that toy, which does not trigger the creativity of children.
		All streets - weak activity settings; even though 1002 & 1003 streets have relatively more activity settings the quality of the settings are low. None of the activity settings are part of the design in these projects. If those settings exist in any street, it is
	All streets - are mostly clean	

		because of the natural / already existed features of the streets. All streets - none of the streets are well maintained. Municipality did nothing to maintain street elements after first implementation. Sokullu and 1002 & 1003 streets are in a better condition than other streets. But still at least a few equipments are missing in each street. Av. Özdemir Özok street on the other hand is in a bad shape, with almost all equipments broken or vandalized. This street's darkness at night and being hidden makes it easier to vandalized.
Interface	All streets - allow visual surveillance which is important for safety of streets and parents to allow their children go out on their own.	All streets - front yards' integration with street rarely exist and front yards do not allow direct access to streets because of fences and garden walls which could allow children to use a wider space for their games.

4.5. Behavior Mapping

On-site observations and data gathering on children's play/activity were conducted in fair weather both on weekdays and on weekends. Sessions, starting from 7.45 am to 6.05 pm in a day, were divided into 20-minute cycles with 40-minute intervals within each one-hour. Observations were made in October and November (2015), each street has been observed one day on weekday and one day on weekend. Observations and data recording were conducted by author.

In each 20-minute observation cycle, activities were noted with demographic information (gender, age group), the location, and the current activity being carried out. Furthermore, the locations of parked cars on the street were drawn, together with vehicle and pedestrian counts. If the same activity was continued until the end of the cycle, first location of activity was noted. As mentioned in chapter 4.4, only activities that require spending time in the streets were observed and generalized in three groups as: standing, sitting and playing.

In this section to relate where in the street, behavior occurred, some street spaces or spaces linked to streets referred as;

- social space
- play space
- sidewalk
- roadway
- bike lane
- park
- front yard

If a dedicated space defined with street elements to offer seating or gathering activities to users, it referred as **"social space".** In this case, seating areas include more than one bench that placed closed together to sit and covered with pergola that provide shadow in both 1002&1003 and Sokullu streets referred as social spaces, due to spaces' offer

to users to spend more time and interact. Single benches scattered sidewalks along streets did not defined as social space.

Figure 4.45. Referred social spaces shown with blue color.

Spaces that is segregated from sidewalk with surface treatment and include more than one play equipment or equipment that offer group play or street furniture dedicated to children's use, referred as **play spaces**. Single play equipment scattered sidewalks along streets did not defined as play space.

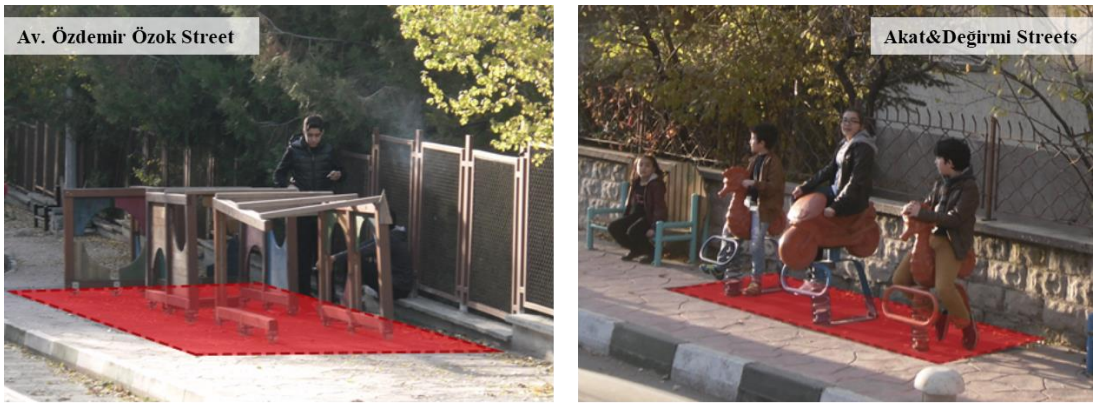

Figure 4.46. Referred play spaces shown with red color.

In case areas all play spaces and social spaces placed on the sidewalk, but in this section if **sidewalk** is used when explaining a behavior's whereabouts, it referred to the remaining sidewalk areas, play and social spaces excluded.

Roadway referred vehicular lane; spaces dedicated to car use. If bike lane exists in any street, that space excluded from roadway. In this case **bike lane** referred to bike lane segregated with color in Av. Özdemir Özok Street. **Park** referred to the park area linked with 1002&1003 streets. **Front yards** referred to private property front yards of each apartment.

All the streets were observed in same amount of time one weekday and one weekend. In total, 515 point data were created, each representing one activity carried out by one person in one time cycle, during 8 days of observations in 4 different sites. Here I present my findings from these observations. As can be seen from figure 4.47, among the 4 sites, most of the activities were observed in Sokullu Street (71%).

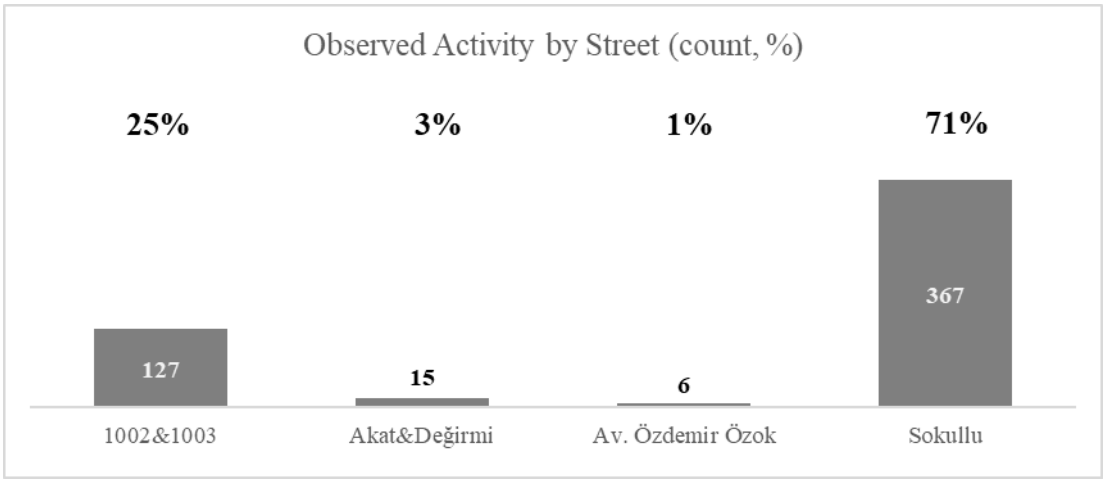

Figure 4.47. Observed activity by street (count, %)

By Day:

However, when comparing weekday / weekend activity, it was observed that 1002-1003 streets had the most activity on weekend (62%) and Sokullu street had most activity on weekday (89%; figure 4.48).

Figure 4.48. Activity by street on weekday vs weekend (count, %)

When looking at data in a detailed way, it became evident that most of the activities – 325 of 515 (63%) – took place in Sokullu Street on weekdays. This was mainly due to the presence of a school on that street. Both children and parents were using the street mostly because of necessity. It was observed that some children who came to school a little early, spent their time with the playing equipment on the street with other children (either friends or not) while waiting for their lessons to start. There were parents waiting, who accompanied their children either on their way from school to

home, or vice versa. In some cases, younger siblings had joined this journey with their mothers and siblings.

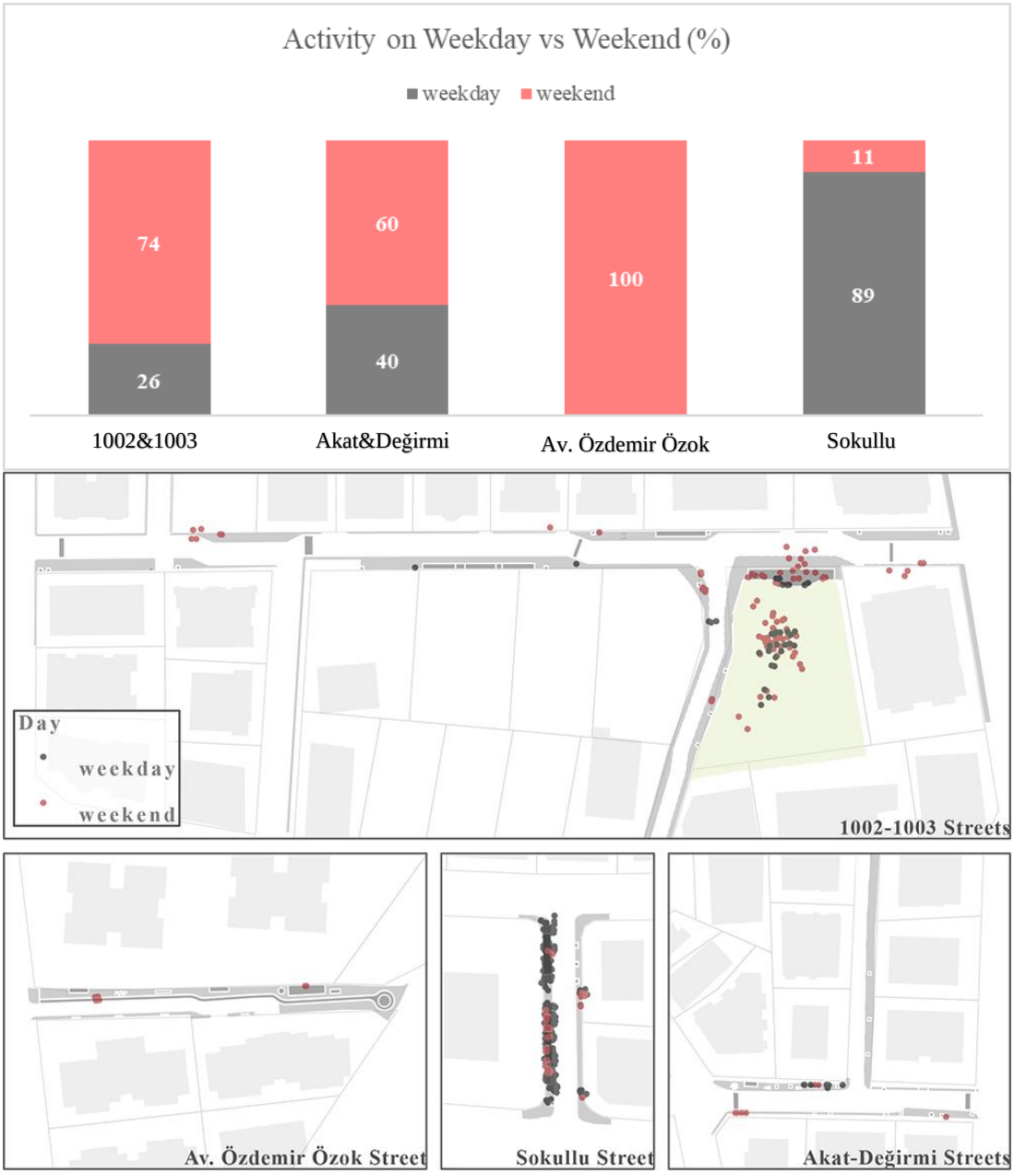

Figure 4.49. Activity in weekend vs weekday

Figure 4.50. Children's activity in weekend vs weekday

When looking at the data disintegrated by week day, it became evident that children's usage pattern of the streets had some little differences than the overall users. As it can be seen from the figures above, the activity in Av. Özdemir Özok Street was observed only during weekends; even though it should be noted that very few activities were ever observed on this street (i.e. a total of 6). In Akat street there was a noticeable

change in the usage ratio when a comparison is made between all users' activity and children's activity, which can be interpreted as "more children, less adults" on streets on weekends. This can also depend on children's age group: if children are able to play outside without escorted by parents, or if they can act as a group which also would not need to be accompanied by adults (parents or grandparents), their activity may be higher.

By Age Group:

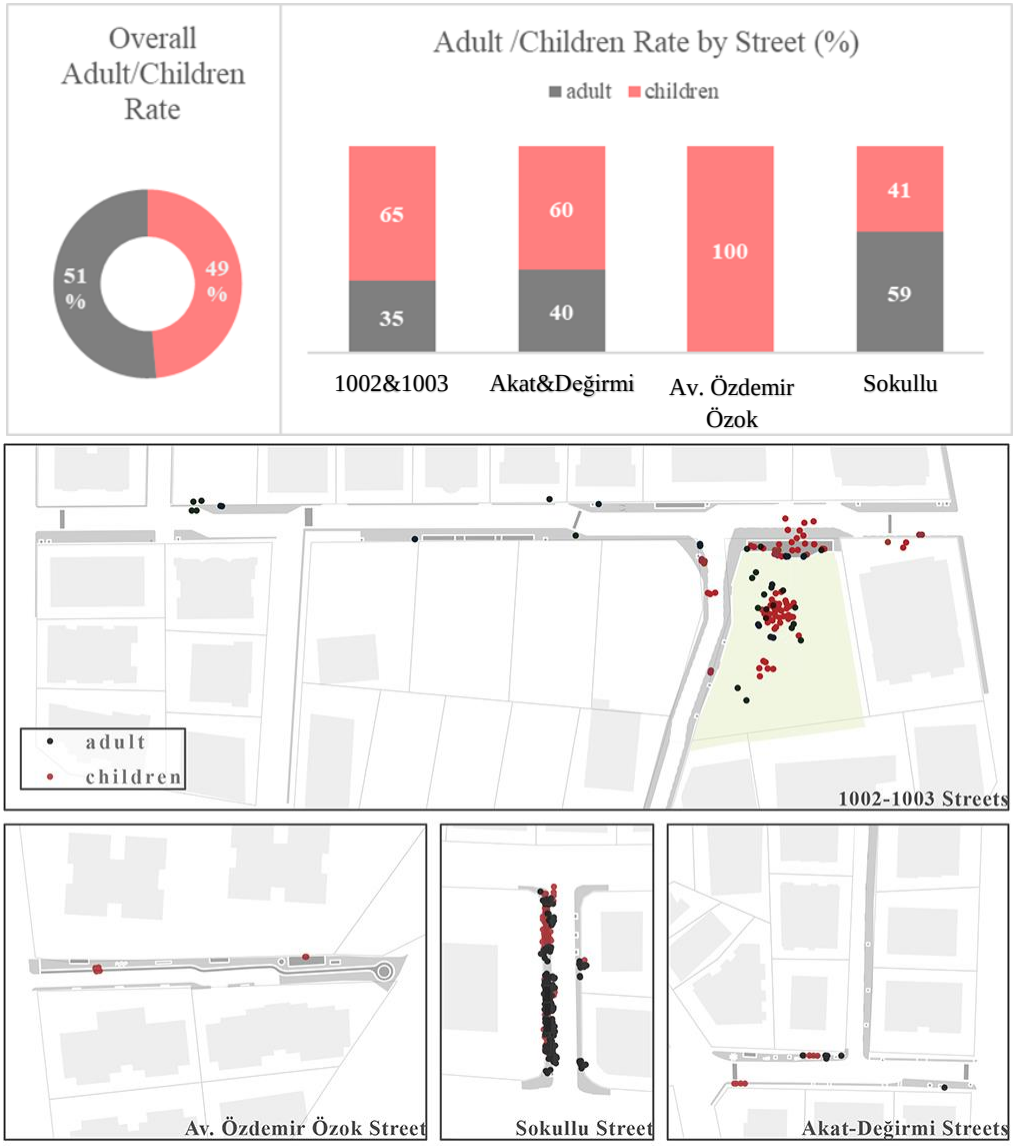

Figure 4.51. Adult vs children count

In figure 4.51, the street usage proportions between adult and children are shown. It can be seen that in general children were clustered near play spaces while adults were using either social spaces or street furniture to sit and accompany their children from a safe distance to the play spaces (i.e. 1002&1003, and Sokullu streets).

In total, adult users' ratio to the child users is more or less equal to one another, while it was expected to see more children on the streets than adults. There is a reason behind it. As it is shown in figure 4.47 above; the observed activity counts in four different streets slightly differ from each other while majority of the data was collected from Sokullu Street. Given the high influence of Sokullu Street data, the ratios in each street will not be interpreted according to overall ratios and will be examined separately.

Sokullu Street: As can be seen in figure 4.51, the majority of the activity in Sokullu Street was dominated by adults. This can be accepted as a special situation, a necessity other than any attraction of the street. As mentioned before, the main activity of the adults here was to wait their children, especially those in primary school, who needs to be escorted. And while waiting, it was seen that adults are using street equipment to sit, or waiting together with other parents, sometimes interacting with them. This was when the street became a social space where adults were talking about the weather, their children, the teachers in the schools, sometimes complaining about them, or laughing together.

Av. Özdemir Özok Street: As can be seen from figure 4.51, Av. Özdemir Özok Street was solely used by children. Yet, this conclusion is based on very few observation data (in total 6, reflecting the low number of children activity on the street). Av. Özdemir Özok was a little hidden street which is also a cul-de-sac and in one side of the street there were no entrances of any buildings but only high fences. And on the other side only two buildings took entrance from this street. Even though there is a school located close to the street (approximately 300 m) neither enough activity, nor a single passer-by other than residents of those two buildings was observed. Accordingly, children used the street as a hiding place; one of the boys were smoking

alone, and there was a group who came with two cars (without licenses because they were high schoolers), parked their cars in the middle of the street and spent some time as a group.

Akat & Değirmi and 1002 & 1003 Streets: In both streets, a similar pattern was observed: “more children, less adults”. Even though fewer activity was observed in Akat & Değirmi streets than 1002&1003 streets, more children were playing independently (without escorted, freely move) in both streets, and more group play was observed in both streets.

Figure 4.52. Mothers on Sokullu Street waiting for their children

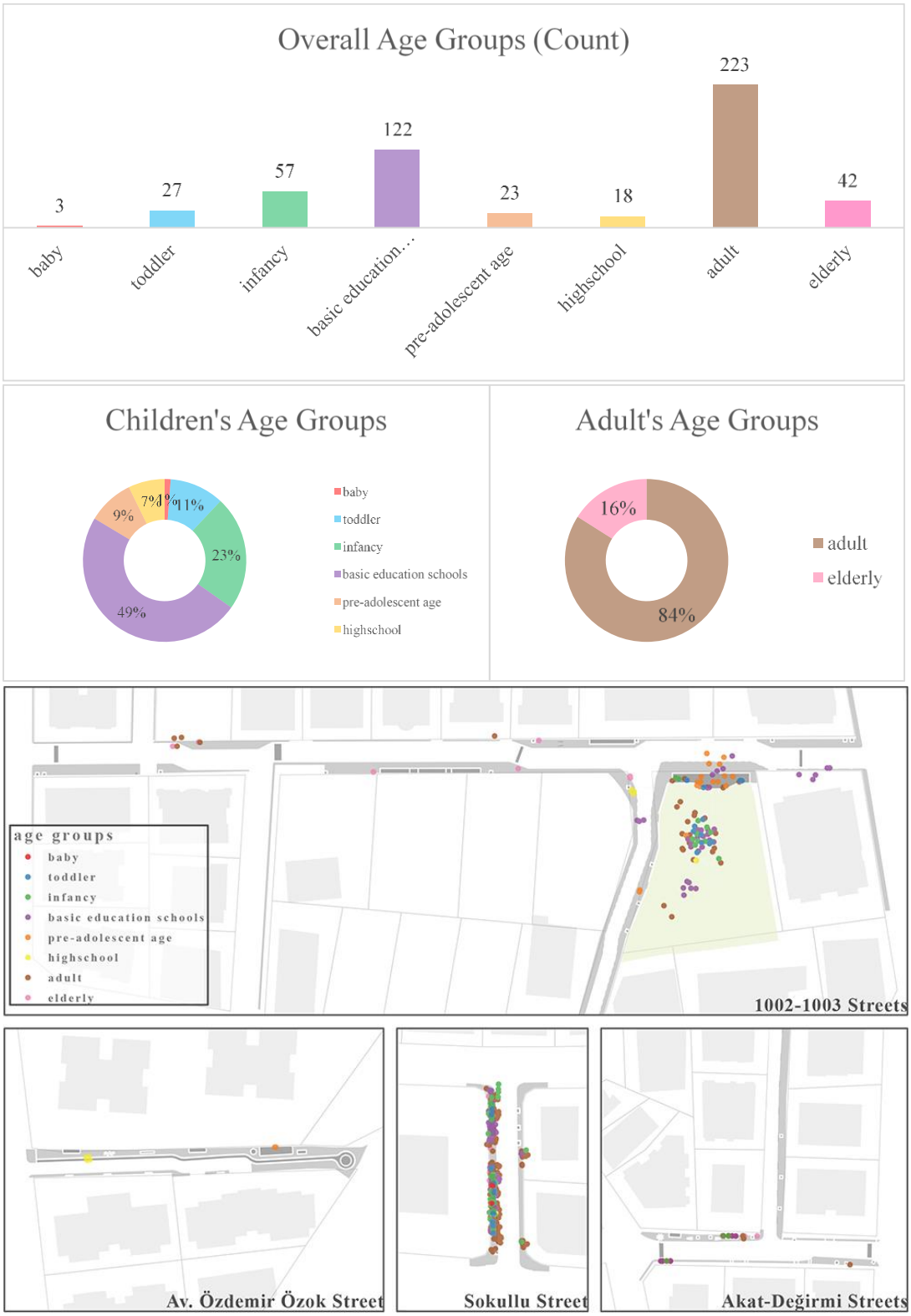

Figure 4.53. Age groups

When looking at the data disintegrated by age groups, it can be seen that almost half of the children users of the street were in the age of basic educational schools (see figure 4.53). Furthermore, 84% of the children users of streets were between 0-12 ages, which is expected given the play equipment placed on the streets. None of the play equipment in any of the streets offered any activity or game play to older children like pre-adolescent age group (12-14 years old) or high schoolers (14-18 years old). This can also be observed in the street usage patterns of children. Basic education schoolers, infants and toddlers' activity was clustered around play equipment. Older children were either using street furniture or play ball games separated from that cluster. Adults accompanied their children, while elderly people used street furniture in front of or next to their homes, most likely far away from children playing in groups.

Figure 4.54. Children playing on 1002&1003 streets realized me as I took photos and came for a group pose

By Gender:

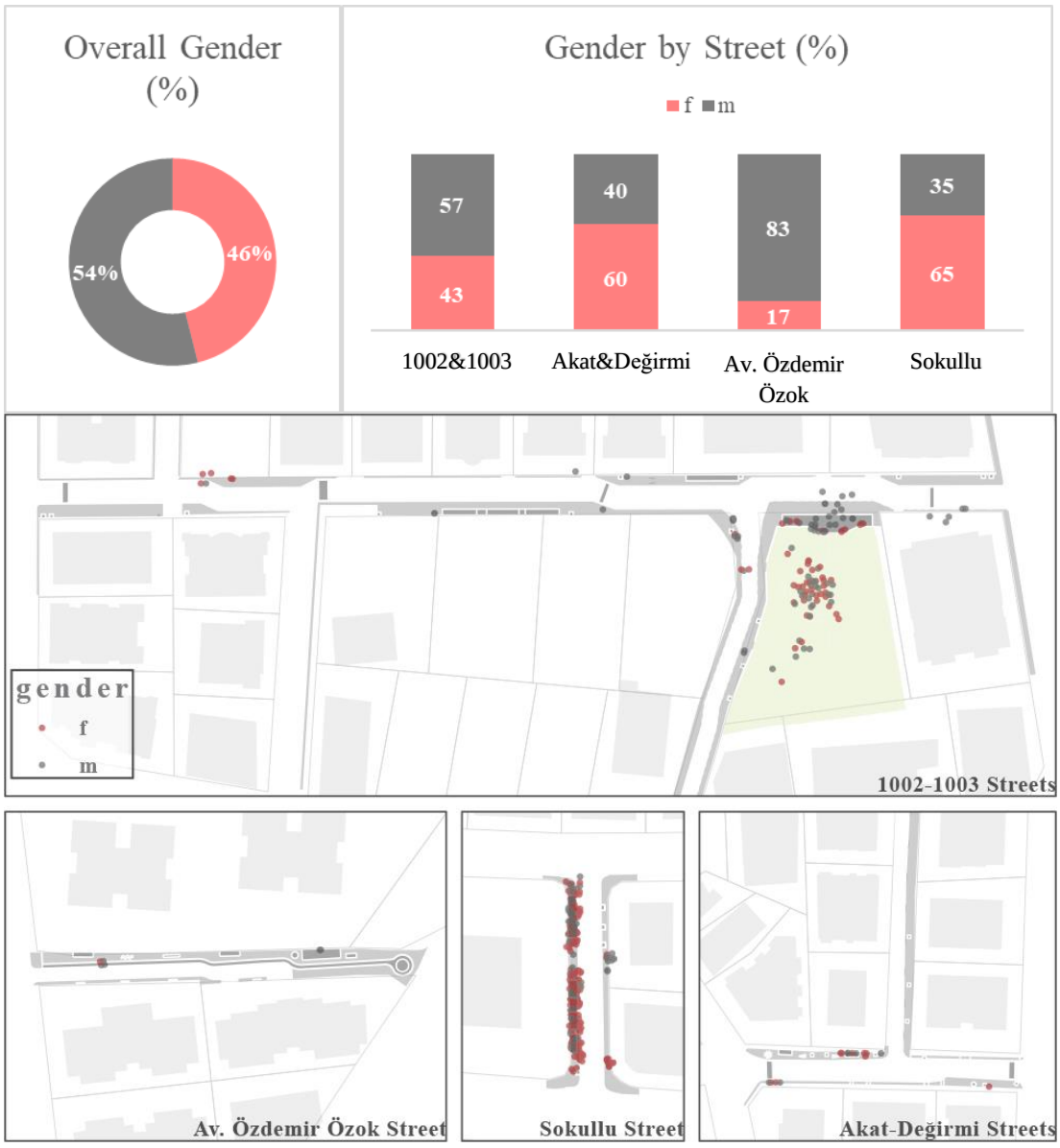

Figure 4.55. Gender of street users

When looking at the data disintegrated by gender, it can be seen that; female street users are almost two times of male users (see figure 4.55). Especially the dominance of females in Sokullu Street can be easily explained by mothers' existence on the street, which also affects the overall ratios. On the other hand, the dominance in Sokullu Street is not only about numbers but also presents a spatial context. Since

Sokullu is a very short street and has limited social areas and empty spaces, which permits parents to wait in front of the school, the usage density of street space just in front of the school is high. This might be related to the street's design, which does not have any furniture or treatment on the other side of the street. In other streets, the usage distribution is relatively balanced in a spatial context. Nevertheless, it should be noted that in 1002 & 1003 Streets it was observed that males tend to use sidewalks, front yard and road, while females tend to use places equipped with street features, street furniture along sidewalks, and park.

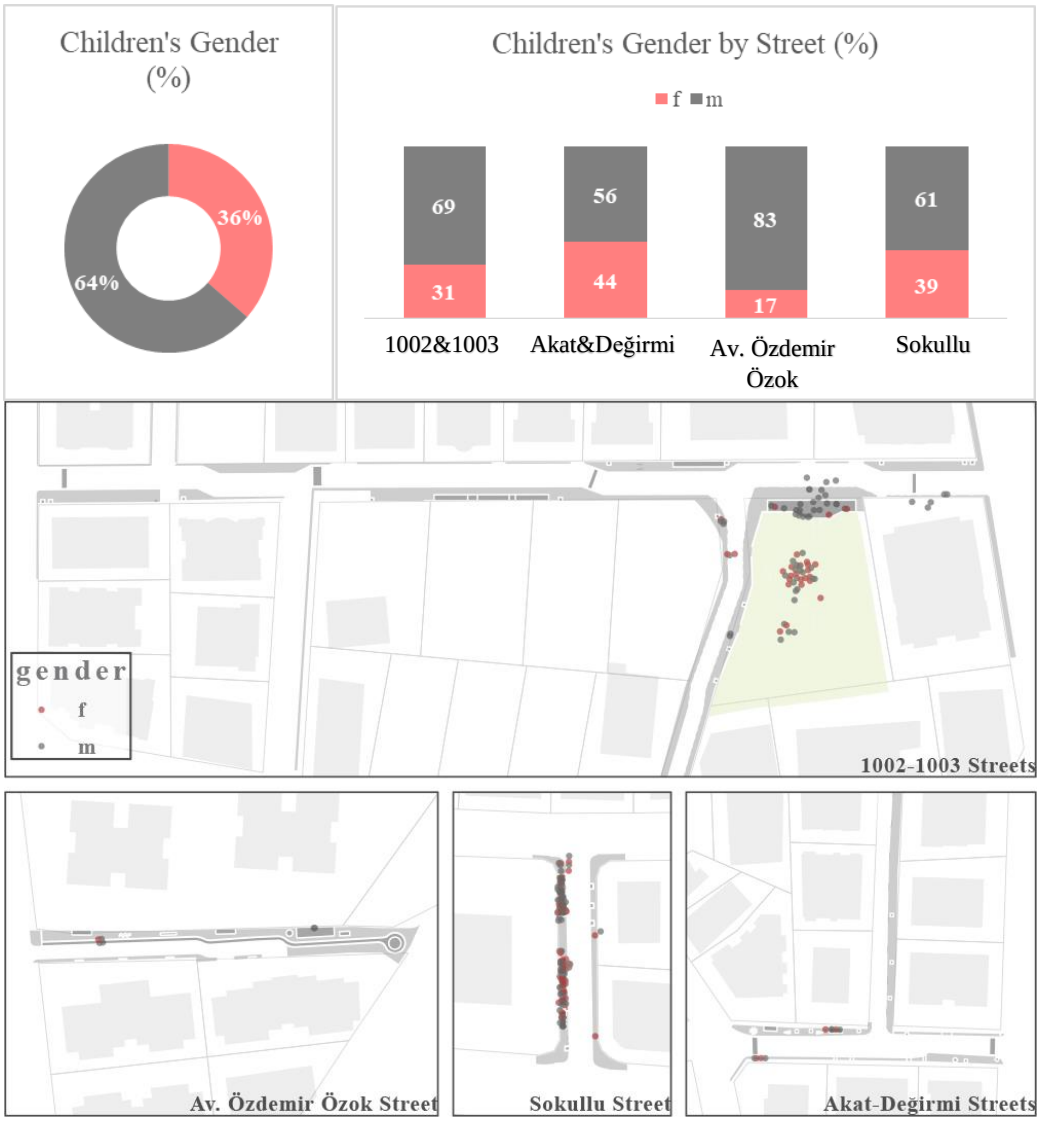

Figure 4.56. Gender of children street users

When the figures 4.55 and 4.56 are compared, gender ratios change dramatically after adults were removed from the equation, which supports the idea of mothers' existence on the streets and parks mentioned before. Females' ratio to male users was the reverse among children. This could be about both demographic diversity of neighbors or cultural reasons, which cause families limit children's freedom to be on the streets depending on their gender.

By Activity & Spatial Determinants:

Figure 4.57. Overall activity

Figure 4.58. Activity by children

Further into the data, I looked at data disintegrated by activity and spatial determinants. When overall and children's activity are compared (figures 4.57 and 4.58), play rates were higher as expected. Akat & Değirmi (9) and Av. Özdemir Özok (6) streets were the streets with less activity observed compared to Sokullu and 1002&1003 streets. And while all 9 children users of Akat & Değirmi streets were players, 6 children users of Av. Özdemir Özok street were non-players. This was relevant with age groups of children and street characteristics explained before.

On the other hand, street usage patterns differed very slightly between two figures. Except 1002 & 1003 streets, the places where activities occurred are almost the same with or without adults. In 1002 & 1003 streets social or play spaces are never used by children if they are not near the park. It can be said that the children's activity clustered in and near the park while some adult activity observed in relatively far away parts of the street. The reason for some children using front yard, road and the wider part of the sidewalk is those spaces' suitability for ball games. Such activities were observed during the site analysis. In other streets, most of the activities observed were within play spaces and social spaces which were also on the sidewalk.

Figure 4.59. Children playing in the park near 1002&1003 streets on a weekend, escorted by their parents or siblings

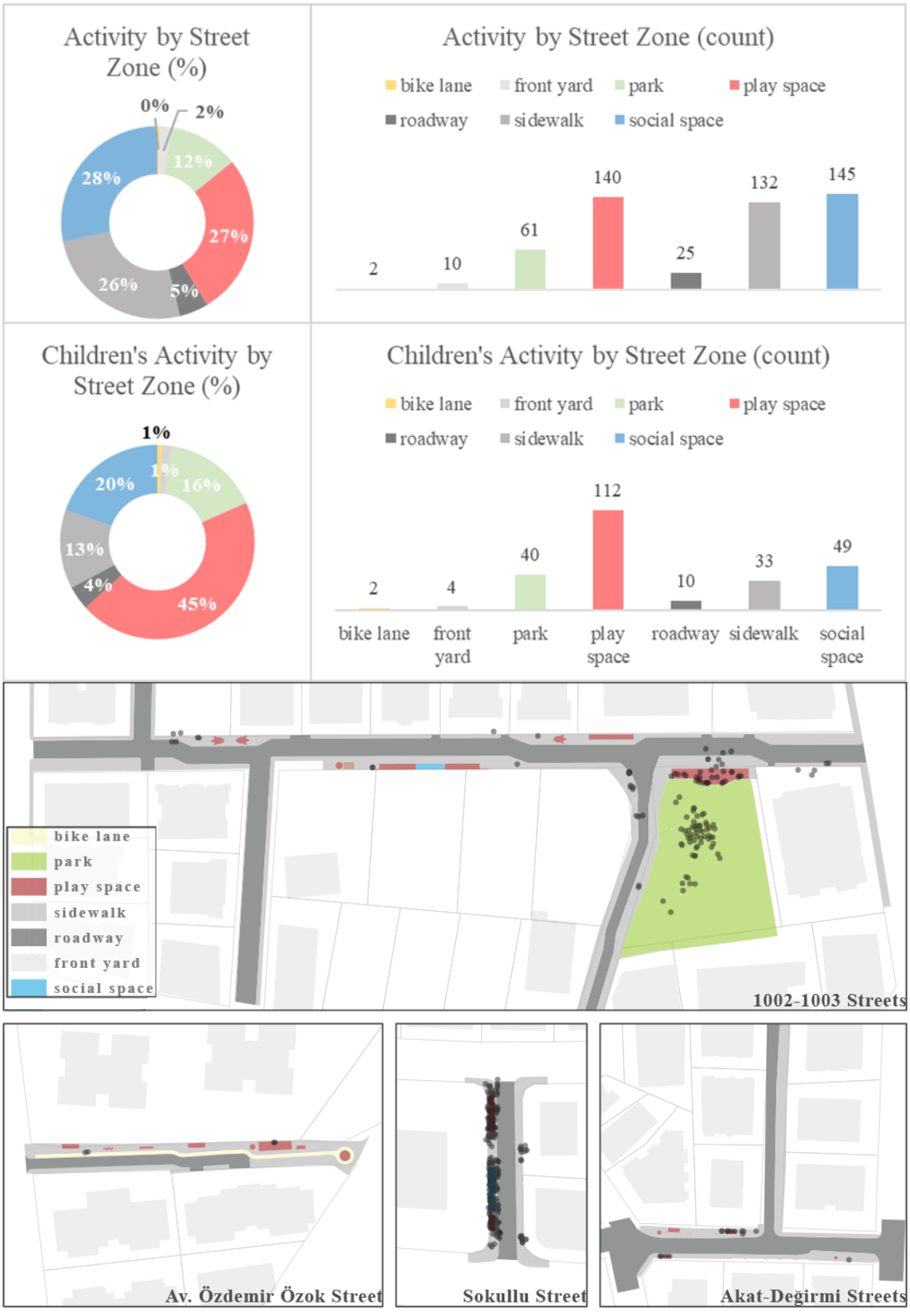

Figure 4.60. Activity by street zone

Observed activities occurred mainly in three street zone; play space, social space and sidewalk. High usage of social space was relative with necessary usage in Sokullu street where the highest count of activity occurred. After those three, the park was the most used area, which was the most used space in 1002 & 1003 streets, where half of the observed activity took place.

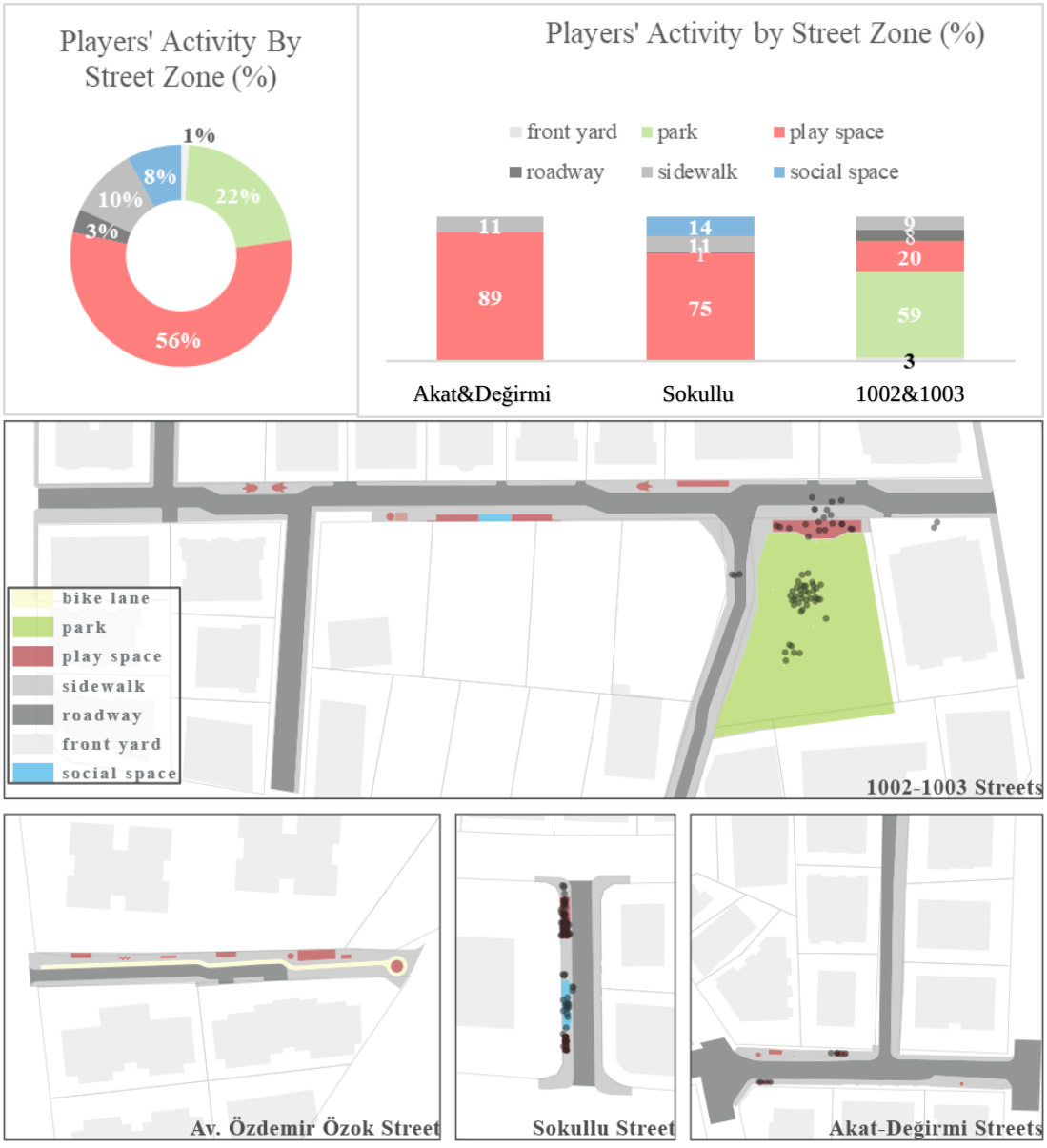

Figure 4.61. Play by street zone

Players, on the other hand, chose play spaces (with 56%) and then park (22%) for playing. But in 1002 & 1003 streets where the park is located, the situation differed from overall ratios; players mostly chose park with a 59%. In other streets without parks, activities were observed mostly in play spaces. It could be said that when the necessities were eliminated, or if they have the chance, children prefer reserved spaces such as parks to streets to play. This might be relevant with what parents permit, or what parents who escort their children prefer. Children prefer safer places with minimum traffic threats. They do not prefer roadways and front yards to play. Even if front yards with hard surfaces are good places for ball games, they are mostly separated from street with fences or garden walls, which limit their use as play spaces. The only activity observed in a front yard was in 1002 & 1003 streets which was integrated with the sidewalk and the street. On the other hand, it could be said that roadways are restricted spaces for children to play. Children do not tend to use roadway even though there is less traffic on the streets. That might also be due to the parked cars on the roadway, which limits the playable area and is a barrier to the other side of the street.

Figure 4.62. Children playing in the park near 1002&1003 Streets on a weekday without escorted by parents

Figure 4.63. Activity heatmap vs parked cars

The availability of usable space was also very important for actualizing activities. There are too many barriers that divide street space, limiting the usable space for activities, such as garden walls and fences, parked cars, different height levels of sidewalks and roadways, sometimes flower boxes. On the other hand, design elements are condensed in sidewalks, which promotes activity to be actualized in this defined, limited, linear part of street space. In figure 4.63 the density of overall activity is shown.

Figure 4.64. Players' activity heatmap vs parked cars

In figure 4.64, the density of players' activity is shown, which has a very similar pattern with overall activity. Most of the activities occurred in the other part of the street across the parked cars in both maps. This is mainly because design of the streets lacked defined on-street car parking spaces, which can limit the available space for car parking. Even in the wide parts of street space, potentially available for activities or play, parking spaces are not limited. Thus, activities are forced to be actualized in particular places in the street because of both design and usage of the street.

Figure 4.65. Kids playing with play equipment in Sokullu Street on a weekday, on the other side cars parked along street, creating a barrier, limiting the available space

Figure 4.66. Residents spend some time on the street on a weekday, one kid is playing escorted by grandparents, cars parked along street.

By Interactions:

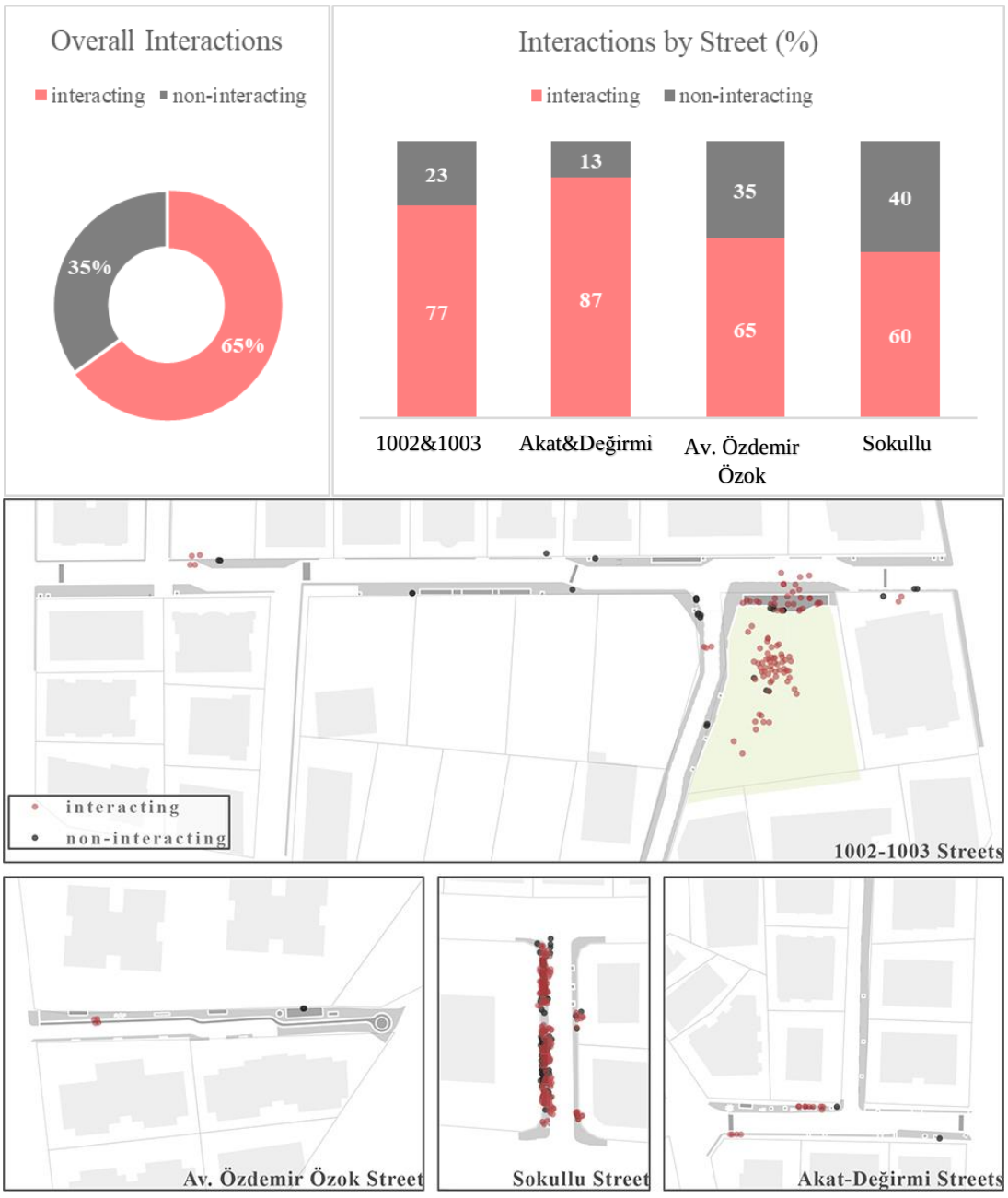

Figure 4.67. Interactions

People sharing the same environment for similar activities interact with each other. Children interact especially when they gather, play together. This study also supported these ideas. It can be said that nearly every 2 of 3 people were interacting on the streets

or parks as shown on the figure 4.67. This result also supports my previous statements of street being a social gathering space.

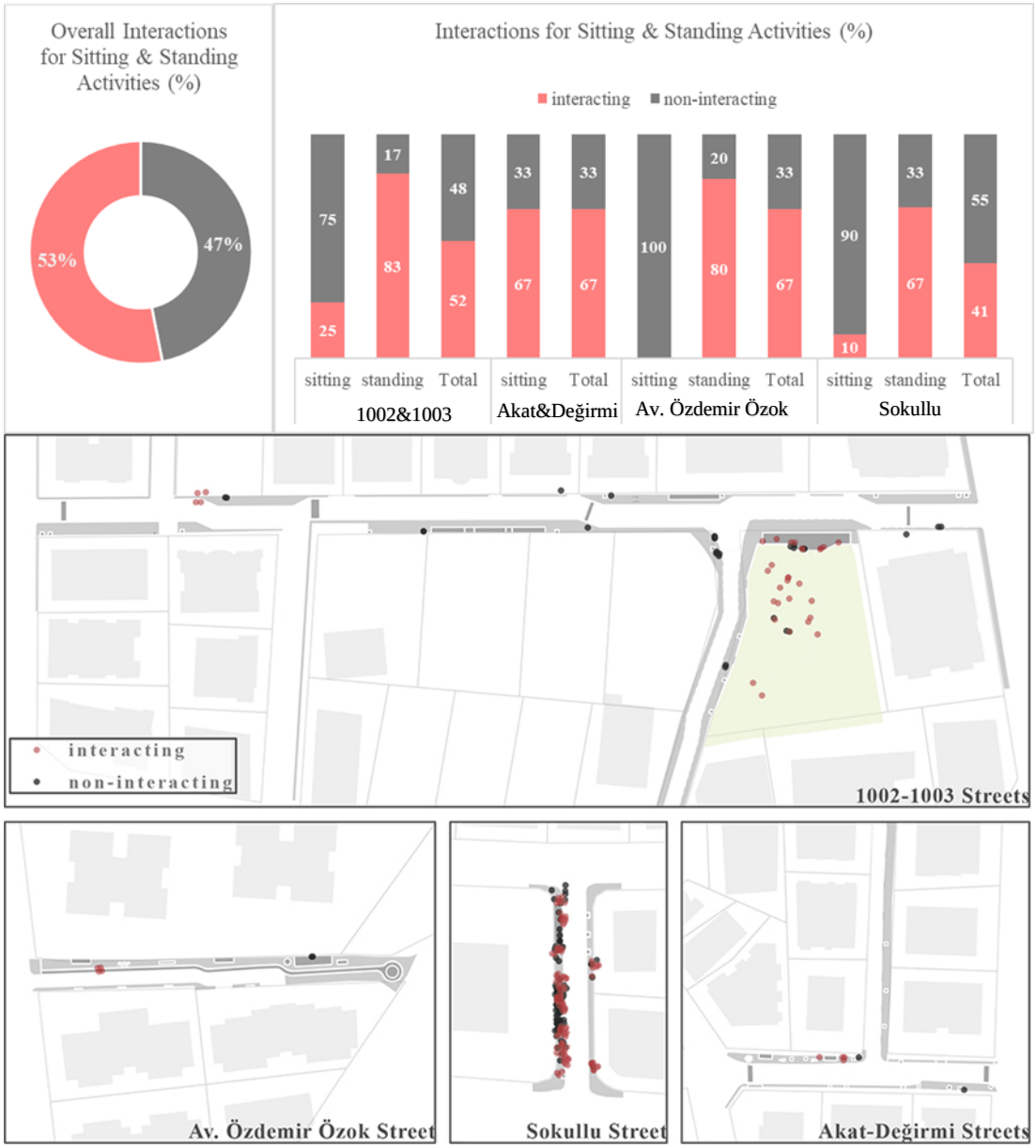

Figure 4.68. Interactions for sitting & standing activities (play excluded)

About half of the sitting and standing people on the streets were interacting with each other. In Sokullu Street, interactions were observed mostly in and around the sidewalk, which is the social space of this street. In Akat & Değirmi and Av. Özdemir Özok

streets a similar pattern was observed; in parts of these streets where people were together, close to each other, either sitting or standing, interactions were observed. In 1002 &1003 streets relatively less interaction was observed in the street than park. In the street, sitters and standers were separated far away from each other, which made the interaction harder. But in the park and play space, and in the entrance of the park people are closer to each other and hence they interact more.

Figure 4.69. Interactions for play activity

Players' interaction was categorized as "between children and environment" and "peer to peer". When they played with play equipment or street elements alone, it was noted as an "environment" interaction, when they play just with each other without any play equipment or street element, it was noted as "each other" and when they are playing with play equipment or street elements as a group it was noted as interacting with "both".

Children who were only interacting with the environment were the lonely children most likely escorted by a parent. It could be said that, every one of three children was playing alone (see figure 4.69). In Sokullu street, the place where children were playing alone, was the same space where adults' interaction was the most. This can be interpreted as, the presence of parents around children decreased children's interactions with each other. The play space on the other side of the school entrance was the place where children interacted both with each other and with the environment. In 1002 & 1003 streets a similar pattern can be read from maps as; alone players were close to the parents who most likely sit or stand around spaces where play occurred. This is seen both in the park and the play space in the entrance of the park.

4.5.1. Activity Settings & Street Usage Observations

In the table below, existence of Kyttä's (2004) elements of environment qualities and environmental opportunities for sociality that support certain affordances was compared in each street and site observations correlated with the potential activities afforded by those physical elements and sociality. The result of the evaluation of streets physically and socially and usage observations revealed that design and environment quality of the streets were mostly weak to create potential affordances. Furthermore, even in the streets with relatively high potential affordances (such as 1002 & 1003 street), existence of the street elements was not enough for affordances to be actualized. Most of the potential affordances were not actualized by children.

Table 4.12. *Comparison of Potential & Actualized Affordances*

Physical elements	Affordances	Sokullu		Akat&Değirmi		1002&1003		Av. Özdemir	
		(if exists - y=1/n=0)	(if actions observed - y=1/n=0)	(if exists - y=1/n=0)	(if actions observed - y=1/n=0)	(if exists - y=1/n=0)	(if actions observed - y=1/n=0)	(if exists - y=1/n=0)	(if actions observed - y=1/n=0)
Flat, relatively smooth surfaces	cycling	1	0	1	0	1	0	1	0
	running		1		0		1		0
	skipping		0		0		0		0
	skating		0		0		0		0
	playing hopscotch		0		0		0		0
	ball games		1		1		1		0
Relatively smooth slopes	coasting down	0	0	0	0	1	0	0	0
	skateboarding		0		0		0		0
Graspable /detached objects	throwing	0	0	0	0	1	1	0	0
	digging		0		0		1		0
	building of structures		0		0		0		0
	using plants in play		0		0		0		0
Nonrigid, attached object	swinging on	0	0	0	0	0	0	0	0
	hanging		1		0		0		0
Climbable feature	climbing	1	1	0	0	0	0	0	0
Shelter	being in peace and quiet	0	0	0	0	0	0	0	0
Mouldable material (dirt, sand, snow)	moulding something	0	0	0	0	1	0	0	0
Sociality	role playing		0		0		0		0
	playing rule games		0		0		1		0
	playing home		0		0		0		0
	playing war		0		0		0		0
	being noisy		1		0		1		0
	following/ sharing adult's businesses		0		0		0		0

Affordances are related with how children perceive and use their environment. At this point it should be reminded that Kyttä (2004) categorized affordances in two groups as potential and actualized affordances, which means even though a physical feature exists in a street, perceiving/identifying the activities or actualizing that activity could be related not only with the existence of physical feature but also social and psychological background of the individual. For example; even though there is space for running in the street, if it is restricted by child's parents for any reason, then there is a reason that the child will not actualize the potential affordance "running". Or for some children, the same street could be just no place for running.

The potential/actualized affordances table above summarize the situation well in playground streets; even though there are certain physical features in the streets; mostly they are not used. The identification and actualization of affordances might be relevant with quality of environment, restrictions/ boundaries of freedom children have, sociality, etc. Nevertheless, some interpretations can be made by analysing the table above. Firstly; "flat, relatively smooth surfaces" exist in each street, and this can afford activities, such as cycling, running, skipping, skating, playing hopscotch and ball games, all of which could be usually seen on the streets. However, in the case study areas, maximum two of these activities (running and ball games) out of six were observed in a single site. It may be possible to state that manufactured play equipment is more interesting for children and that they prefer playing with them rather than other street play activities.

Additionally, there is an interesting pattern that can be seen when looking at the table: the affordances that require skills, creativity or tools to be actualized tend to be less (or not at all) actualized by children. Cycling requires a bike and riding skills; skipping requires a rope and jumping skills; skating requires a skate/rollerblade and balance skills, playing hopscotch similarly requires balance and an extra effort to preparing a play site. A similar pattern is seen in actualized actions afforded by graspable

/detached objects: while throwing and digging activities were observed in the site, building of structures or using plants in play activities, which require skills, imagination and creativity, were not observed in streets. This could be simply interpreted as children preferring activities that are “easy to do”. However, this could be also related to the age (e.g.: if they did not gain the skills yet), opportunity (e.g.: if they have a bike or not) or their lack of creativity (which is boosted by education and the sense of freedom).

Another finding here was the relation between sociality, available space for play and peer interactions. The actualized sociality affordances were relatively high in 1002 & 1003 Streets, which may be related to the time children spent on the streets, the count of children (if there is a group to play with), their interaction with each other and the available space for free play. Even though activity counts were highest in Sokullu street, children had very little space for free play (other than roadway), and the sidewalk space were full of play equipment; so they mostly interacted with both the toys and each other. In 1002 & 1003 street it was the opposite: there was a wide available space for free play and peer to peer interaction counts and the actualized social affordances observed in the site validated the relation mentioned above.

CHAPTER 5

CONCLUSION

5.1. Overview

Car oriented city growth patterns, resulting in car dominated streets that exclude children from streets, which are supposed to be public spaces. Moreover, existing laws/regulations do not prioritize children (as well as other pedestrian) in urban spaces. This way the quality of urban spaces we live in, is left just to discretion of decision makers that heavily depend on their individual visions or ideals. Consequently, important topics are overlooked like livability, walkability, environmental quality, and child-friendliness of built environments.

Children are our future. They are, regardless of their age, stakeholders of this land and the community. They have every right to be free using their environment as they wish, modify it according to their needs, play with/in it comfortably. Even though today's technology allows people to socialize without going outside, which also changed the play habits of children, they still need to go out, interact with the environment they live in and play together with their peers in order to develop well. Thus, parents, local governments and professionals have a duty to come together and create appealing environments for children's well-being. They need to do it together with children, because even though adults have their own childhood experiences, those belong to another time and the current needs of children can only be revealed by the children themselves.

The main contribution of this study is to create a design and analysis framework, consisting of a check list of criteria in designing streets that include children users' needs, which can be used as a guideline for transforming or (re)designing streets to include children's needs, to become playgrounds. In this study, criteria from relevant

literature and past studies in different geographies were introduced and compared with local inputs in order to determine the quality of playable space. A project series of playground streets implemented in Ankara was examined as a case study according to the gathered design criteria and supported with children's site usage observations in order to reveal whether or not those projects have been successful in creating playable street environments.

5.2. Research Findings

In the previous chapters it was mentioned that this study focused on the "loss of play spaces for children as a spatial and social problem". There have been too many changes in the urban environment and urban dynamics in the last few decades. However, street space is mostly still there, possibly in the same width as 20 years before or maybe even wider. However, the users, users' habits, maybe the environment that surrounded the street and the meaning of street for its residents have changed drastically. Now, the dominant users of the streets are cars and they occupy a significant portion of the street space, either through parking on the streets or by passing-by. This domination limits people's usage of street both physically and mentally. At the same time, it is undeniable that people will continue using their cars. There is a crucial need for a new approach in designing our cities in a way which would permit streets to host spaces available for play and other social activities, in addition to spaces allocated for flowing or parked cars.

Available space in a street can be roughly defined from façade to façade in shared street concepts. Biddulph (2001; cited in Biddulph 2010) stated that British streets vary in width, but most are relatively narrow, with many homes having either no front gardens or yards or very small ones, and this is similar in other European countries. In fact, in Netherlands where Woonerf concept emerged, the aim was creating a sense of front yard by re-designing the existing home streets for the neighborhoods with houses that have no front yards and no backyards. This is also another reason why space/street is shared; to create more available space for residents in a narrow street environment

and allow both cars and pedestrians to use streets together. In Turkey there is generally more space in housing areas, especially in recently developed parts of cities and generally (unless there are exceptions in plans) legislations require at least 5 meters wide front yard usage for each building in residential zones. Even though this seems like an advantage, site analysis in this research revealed that, the front yards were either used for car parking (which is also a requirement) or landscaping areas, and they rarely included socializing space with furniture like benches, pergola, etc. for the apartment's residents. Front yards are usually separated from sidewalks and the street with garden walls and fences, which means they are not accessible or usable by the public, and hence not integrated with street space. Briefly, front yard usage is different in Turkey than in European cities and has a potential to be an extra/integrated play/social space with the street, but the keen segregation of private and public space with impermeable street elements limits the design and usage of the street together with front yards. This in turn makes the front yards unavailable for any activity integrated with street space. The importance of available space together with private and public integration was also emphasized by Galani and Gospodini's (2011; 1180) study in Thermi, Greece; "*it was observed that at some of the streets with high densities of children, the boundary of public space extended into private space, creating successful urban spaces, full of life*".

Site analysis in this research showed that parked cars along streets were another dividing factor of available space, creating a barrier between two sides of the street space and narrow part of divided spaces were not preferred for activity. Parked cars occupy at least 1/3rd of roadway width and make the sidewalk of the parked side of the street unfavorable for any activity. Curbs or elevated sidewalks are other factors that limit the available space for playing, which would require wide flat areas for activities like ball games (a very common child game in Turkey). Keen borders or huge obstacles – such as parked cars between roadway and sidewalk - creates limitations of using street space entirely. This explains the reason behind Biddulph's (2001; cited in Biddulph 2010; 205) suggestions of using "*patterns and types of*

material in the street surface should avoid the appearance of curbs, which can emphasize the through route, and should instead highlight relationships between areas across the street from one another or pick out particular subspaces".

These segregations also affect how comfortably pedestrian and children use the roadways. Since street space is not defined as "shared" with design elements (even though there are signs to warn drivers that they are entering a playground street), roadway belongs to vehicles rather than pedestrians, and pedestrians do not have any priority over cars. Site analysis in this research revealed that people do not feel comfortable using roadways, even when traffic flow is low, for any activity other than passing by on the street. Only 25 out of 515 activity (5%) occurred in roadway in the case study streets that were redesigned as playground streets. Even that 5% might be related with the play equipment's existence on the sidewalk, which narrows the sidewalk and limits the available space for walking comfortably. Pedestrians might be choosing to walk on the roadway without facing an obstacle.

The reason why people feel uncomfortable using the roadway in the case study streets (although the aim of the case study project was to create a road environment safe for children and a street area playable for them), is also related with the design quality. Design quality and site-specific design is an important factor to create appealing spaces for human activities. In this study, the site analysis was carried out to evaluate the existence of physical settings (i.e. design quality) and then correlate this with site usage observations. The results showed that just the existence of physical settings does not mean they would be used effectively, or they would enhance the give value of the streets.

As Moore (1989) emphasized, trees and vegetation constitute one of the most ignored topics in the design of public play environments. This was also validated through the site analysis carried out in this research. Trees and vegetation are interesting play settings, also major sources of play props, including leaves, flowers, fruit, nuts, seeds, and sticks (Moore, 1989). Furthermore, they are good physical settings in narrowing

and shortening viewing distances to calm traffic, they limit on-street parking, they define street entrances, create a sense of change in street status, and when used wisely and chosen suitably, they can create the impression of a "yard" or a social space. Site analysis in this research showed that the trees planted after the re-design of the streets were very young and thin, which made them almost invisible to the eye. This in turn does not help to create any ambiance or change in environment after design and observations showed that no one interacted with them. Furthermore, they were scattered around sidewalks randomly and were not well maintained. Flower boxes present on the street were empty, and they became just another obstacle that narrowed the sidewalk. Trees or vegetation were thus not used as an element of traffic calming, or to limit on-street parking, and neither did they help to create a social space. Even existing old trees were not used effectively, integrated to design. The right usage and right choice of trees and vegetation compatible to the site is an important factor while creating a good design.

A specific design for the site is another important factor as mentioned before, which requires detailed data, participation of locals and deep analysis including both physical and social inputs to understand local dynamics well. Even in this digital era, reaching open access data in a street scale is not possible, and especially in underdeveloped or developing countries like Turkey, it is even more difficult. Even though most government systems are now digitalized, the privacy and sharing of the data is a major concern; which does not allow designers to design data-driven. To give an example; in this study street demographics could not be taken into consideration because of the absence of data. Similarly, in design process of playground projects (according to interviews with planners/designers in the municipality) street demographics could not be used for the right site selection process or for determining design requirements. The demographic information at the neighborhood scale was used for both processes. Even though this information could give an idea about the general user profiles, the administrative borders in a city does not usually overlap with how urban spaces live, relate and are being used. So, for a street scale design, neighborhood demographics is

not the best data to use. But this is another research question to be argued further. Consequently, the right site selection of these projects could not be evaluated accurately in this study, which is important when implementing a series of pioneer projects. It is important to reach right users, in right places.

Nevertheless, the projects have been designed and implemented within the neighborhoods with a high proportion of child population. At this juncture; it is important to add that this study showed that in every street there are differences between the implementation and the projects (e.g. missing trees, vegetation, different play equipment, different sidewalk heights, etc). Even though the projects sometimes offered better solutions for different issues, in the implementations they were not taken into consideration. For example, the sidewalk heights are mostly the same level as the roadways in the proposed projects, but implementations on the ground were different. This might be done to avoid extra costs of both budget and workforce. However, in order to provide a better environment for pedestrians and children, these costs needed to be afforded by the municipality, and the quality of implementations should have been controlled by a qualified team.

Designing for the site is also important when deciding the street elements to be used. In this study, play equipment were almost all the same in different streets with only slight differences. They were not selected specifically for the site, probably bought from the same manufacturer, and just placed in available spaces on the widened sidewalks. Even though streets do not necessarily have to have the play equipment and to be formal playgrounds, in playground street project series, each street had formal play spaces. It is possible that these projects did not have any informal play setting that is added as a part of design while re-designing the streets. According to Moore (1989;109); *"manufactured equipment/play structure settings primarily support motor development. They are highly significant because even in the most diversified playground with many competing choices, they are well-liked and attract both the highest density and greatest absolute level of use."* Having said that the function and what those chosen equipment afford to children are also important. Site

analysis revealed that play equipment were used only by 12 years and younger children (more specifically, 60% by basic education school children, 24% by infants, 16% by toddlers). Older children were only playing with each other – which supports Chawla's (1992, cited in Kyttä, 2003b) statement that the functional relationship with the environment will shift into a more social one with children above the age of 12. None of the streets had a space for older children to gather and socialize, interact, create/play games of their interest, or talk to each other. Even though benches accommodating a maximum of three people are not the best space for socializing, some activity were observed around benches with older children in small groups. Quality of games and play were not measured in this study's context, but it could be stated humbly that most of the play equipment and street settings were far from stimulating any child's imagination or creativity. During the site analysis, it was observed that every child used the equipment in the same known way and no invented games or play were observed. At this point Alexander's statement must be reminded;

> "*any kind of playground which disturbs, or reduces, the role of imagination and makes the child more passive, more the recipient of someone else's imagination, may look nice, may be clean, may be safe, may be healthy - but it just cannot satisfy the fundamental need which play is all about. And, to put it bluntly, it is a waste of time and money. They are not just sterile; they are useless. The functions they perform have nothing to do with the child's most basic needs*" (Alexander, 1977; 73).

Diversity of streetscape is another important factor attracting people to go out. This study showed that streets with the highest scores in that respect were used more. Additionally, when streets had different spaces clustered around, like parks or schoolyard which afford play opportunities, it attracted more people. Site analysis revealed that more activity occurred in the streets with a schoolyard or park. Even though the schoolyard is not integrated with the street and is not available for play or any other activity after school times, just the presence of school in that area creates movement and activity. It could be said that in this case; street does not attract people

but used densely because of the existence of the school. On the other hand, parks were the biggest attraction on streets and most of the activities occurred in parks. This supports Galani and Gospodini's (2011) statement regarding the importance of clustering spaces suitable for children's play to achieve high densities of children in urban streets. "*The correlation of streets that have alluring properties with other spaces that can accommodate children's play (such as playgrounds, squares, parks, school yards) results in a coalition that serves as a successful playground*" (Galani and Gospodini, 2011; 1180).

Site analysis also revealed that there were certain differences among street space usage preferences, depending on gender of the children. Even though Moore (1987) emphasized the importance of the streets for girls because of the families' restrictions of wandering far from home alone, in this study male users were almost twice that of female users as mentioned in the previous chapter. However, when this was examined more in detailed, it was seen that the gender ratio was more or less balanced with the children 12 years old and younger: 42% were female and 58% male. The children older than 12 years old on the other hand had big differences in ratio. Only 10% of the children older than 12 years old were female, which means that older girls rarely went out to street. This might be relative with demographic characteristics of the observation sites, parental restrictions or lack of the attractive spaces for this age and gender group in the streets.

Finally, it is important to mention that streets are social spaces not just for children but also for adults. Site analysis revealed that adults did not use streets for socializing and streets were not part of their daily lives to spend time. As Alexander (1977) stated "*children learn by doing and by copying"*. So, when adults do not use streets as a daily life place, children cannot get involved with them in the streets, share their routines or learn from them. Site analysis revealed that most of the adult users of the streets were parents escorting their children. Furthermore, it is important to highlight that most of the adult users were females. Only 20% of adult or elderly users of the street were

male. And this could be interpreted as there being more mothers than fathers in the streets.

To sum up, streets are neither social spaces, nor playgrounds for children anymore. Unfortunately, the playground street project in Ankara does not seem to have been successful in attracting children to go out and play on the streets. In this thesis, the reasons behind this finding were examined within a framework of determined criteria from different literature about child friendly design concepts. Some recommendation will be given in the next sections.

5.3. Assessing the Child-friendly Design Experience in Ankara

Ankara is the capital and the second largest city in Turkey. It is expected from the capital city to be a pioneer of innovative movements to make better places to live for its residents. Child friendly city is a wide concept with different aspects and scales. In this study it has been evaluated in a street design scale, within the scope of "playground street" project series which has been realized by a local municipality; Municipality of Çankaya. However, there was also a "child friendly city Ankara" project, which has been started by the Governance of Ankara, and this involved some actions taken in order to make the city more child friendly. A children chamber was formed in 2011 in order to get feedback from children. Other municipalities and Ministry of Education continue to put a few different projects into practice, take action and grow awareness about child-friendliness. But those projects mostly covered the social aspects of child friendliness, rather than the physical environment and design.

In this study's context some negative traits were determined about the child-friendly design experience in Ankara;

- Political conflicts between local and greater city municipalities and authority separations put some limits to design scope and this effect the quality of design.
    - Only 12m and narrower streets are under local municipality's jurisdiction, so projects by local municipalities cannot be implemented

in wider streets – this could affect the continuity or wholeness of the projects.

    - Traffic flow directions in all streets (regardless of their width) is in greater city municipality's jurisdiction, local municipalities cannot decide/change if the street will serve one direction or not.

- There are limited data available for decision making process and the requirement analysis of projects were weak.
- Despite having common design characteristics, projects were not designed in a comprehensive design approach as shared street or woonerf concepts;
    - Spaces for pedestrian and vehicle were segregated
    - Sites were defined more with signs and notifications rather than design elements to slow traffic or create a sense of shared space
    - Play equipment put on the sidewalks narrowed the pedestrian movement space and became a restriction rather than an attraction
- Participation of users were not included in design process.
- Designed projects could not be implemented in the site
- Regular maintenance and repairs did not carry out

5.4. Recommendations for Child Friendly Design

There are many research and guidelines published about physical aspects of child friendly design. In this study, a comprehensive list of design criteria from different studies and research were brought together to create a framework for analyzing the case study project in Ankara. This framework can be used as a checklist in design process of streets to become more child friendly and to measure the play value of the streets. But each project should be evaluated in its specific context, characteristics and requirements, and the rules should be determined before the design process. So, **making research and preparing guidelines before the design process** is a good idea to lead designers into good design. But it is also important to **keep the guideline up to date after feedback analysis** of implementations.

"**Designing for site**" is another important factor. Even though guidelines include general rules, minimum standards, important tips for design, and learnt lessons from previous implementations; it is important to determine the local and site-specific needs in every project depending on both physical and socio-cultural inventory of the street and people of the place.

Design with children to understand changing needs **with the right team using effective tools** is one of the most important requirements of a child friendly design and implementation process. The changing living habits and needs of children is needed to be determined properly which is possible only by listening and understanding children regardless of their age. They have the right to have a word about how their environment will be shaped, how they want to use it and feel free in it. In order to facilitate the participation of children into design process, an emerging method called **gamification**[3] could be an effective tool, which can be defined as follows: "*implementation of game design elements in real-world contexts for non-gaming purposes, is to foster human motivation and performance in regard to a given activity*" (Sailer et al., 2017; 371). Gamification is a powerful concept to reveal the hidden potential of users in the right settings of required solution. Using gamification to reveal what children want might be a good idea.

> "***User Centered Design*** *approach is a widely used approach in game design. It considers the end user's needs and wants, identifies the player's interests, emphasizing user involvement in the design process (Nicholson, 2012; Norman, 1988). Emphasizing user input, the carefully designed gamification system should identify the individual player's needs, wants, abilities and limitations*". (Xu, Buhalis and Weber, 2017; 246)

[3] *"The term gamification emerged in the early 2000s (Marczewski, 2013), and has been the focus of increased attention since the beginning of the 2010s (Deterding, Dixon, et al., 2011; Werbach & Hunter, 2012). The central idea behind gamification is to harness the motivational potential of video games by transferring game design elements to non-game environments (Deterding, Khaled, Nacke & Dixon, 2011). However, despite the increasing number of gamified applications, there is still no universally accepted scientific definition of the term (Deterding, Khaled, et al., 2011; Seaborn & Fels, 2015; Werbach & Hunter, 2012)." (Sailer et al., 2017; 372)*

Forming the right team in all processes is important; a team consisting of not only designers but child development experts, psychologists, game designers, etc. An effective team should be formed corresponding to the requirements of each project or concept. Partnerships should be established between municipalities, non-governmental organizations that work in related fields. Professional or academic experts that work in related fields should be included in the team.

In addition to those written above and the checklist of requirements given in the previous chapter, a summary of findings and recommendations is given in the table below;

Table 5.1. *A Summary of Findings & Recommendations*

Findings	**Recommendations**
• Children do not play on the roadway / vehicle lane • Both children and adults do not use roadways for any other activity except for passing-by	• Street space should be identified with design elements as a space "shared" by pedestrians and vehicles. Otherwise the perception that "roads belong to vehicles" will not be change.
• Sidewalks occupied by play equipment limits the mobility of pedestrians using sidewalks	• Play equipment should be located by considering pedestrian mobility on the sidewalks, walking routes could be identified by various surface treatments; color, pavement, drawings, etc.
• Poorly maintained streets with broken/old play equipment are preferred less by children	• Streets should be regularly maintained after design, people from the neighborhood could be involved in maintenance process. o Digital tools could be used for a fast feedback system.

• Play equipment are designed for / preferred by 12 years old and younger children • Secrecy (secret places) attracts older children • There are fewer pre-adolescent and high school children on the streets • There are fewer girls on the streets • Especially girls between 13-18 years rarely go out	• Play spaces should also allow children with different age groups to play together. Spaces for different age groups should not be separated with keen borders. • Children's needs are different depending on their age group. Child-friendly environments should be designed to provide needs of their users. • Not only but especially in conservative societies girls have less freedom in the streets, but gender interactions are important in social development of children and the society. Girls should be encouraged to be on the street by providing spaces of their needs for different age groups.

- Available space for play;
    - Front yards have a potential of widening available space for play but borders between public and private space limits the integrated usage of front yards and street
    - Parked cars on the street are creating barriers, dividing available space
    - Curbs or elevated sidewalks limit usage of available space
- Physical features affect children's street usage behavior, such as:
    - How much time they spend outside
    - How they interact
    - How they play
- Density of children and available space is related with time spent – children tend to spend more time in wider spaces available for play
- Children need space for free play and sociality
- Social games require peer-to-peer interaction, peer-to-peer interaction requires free play space
- When spaces available for play are separated and far away from each other or gathering spaces on a linear axis (i.e. long streets) that is less preferred by children.
- Free space creates more peer-to-peer interaction
    - Peer-to-peer interaction leads more time spent
    - Peer-to-peer interaction boosts creativity, imagination

- Available space for play should be widened and diversified by integrating different street spaces
    - Parking spaces on the streets should be limited by defining certain spaces for car park.
    - All integrable spaces on the street should be in the same level
    - Wider spaces should be created for play – front yards could be used integrated with street space as social and play spaces for residents by negotiations with stakeholders, or encouragements.
- Physical features should be accessible and provide different types of play and social space for children.
    - Design should be for everyone, allowing children with disabilities to use the street freely and play together with peers.
    - Play spaces should be designed to boost both physical, mental and social development of children – game's educational value should be considered.
    - Multifunctional free play spaces should be created.
    - Social and play spaces for different age groups should be created according to their needs.
- Streetscape diversity creates more attraction
- Clustered spaces with different functions create more attraction

• Children prefer easy-to-do activities • Children tend to be attracted by play equipment	• When play equipment occupy a wide portion of street space it diverts the children's interests from informal play opportunities, and it also limits available space for other activities. The play space diversity should be distributed in a balanced way in order to present play options that stimulate creativity, imagination and curiosity of children as well as afford physical activity and sociality. • Families and professionals could be organized for supervised play in neighborhoods to enrich play opportunities afforded by physical environment. Local governments could take an active role in bringing relevant parties together and organizing events.

• Adult dependency is high
  ○ Especially 12 years old and younger children cannot go out to street or walk to school without being escorted by adults
  ○ Mothers are more likely to accompany children rather than fathers (in the case area)
  ○ Almost 1/3 of children play alone, interacting just with the environment (more likely escorted by their parents)
• Adults rarely use street space for any activity other than escorting their children
	• Children's independent mobility and freedom on the streets should be increased.
	• Even toddlers and infants need to play without escorted by adults and play with peers.
	  ○ Spaces for adults could be located in a safe distance or separated with semi-permeable design elements to provide children a sense of freedom and to allow parents to observe their children while having a social space to interact with other parents or neighbors.
	  ○ Little children need more sheltered spaces to play safe without being escorted; fences, walls, vegetation or other design elements could be used to create safe spaces for little children.

5.5. Future Research

In this study, existence of the physical quality and sociality settings of the streets and their relation with street usage have been examined.

This study can be supported by some further analysis as recommended below;

- A score-based evaluation of design quality and settings (existence of features does not mean that they are used, usable or attractive)
- Incorporation of three-dimensional spatial features and relations into the design and analysis framework developed in this study (measurements of available space, sense of space &place, streetscape, etc.)
- An analysis of the quality of games and play (what they trigger in children, and how)
- An analysis of children's behavior patterns of play (how long they spend for which activity/toy, and where)
- An analysis of seasonal differences of play behavior, and an investigation of how these differences can be used as inputs in the design of play streets
- A detailed analysis of game/play types
- An analysis of user profiles of children and parents (their social, cultural, economic, ethnic backgrounds and differences)
- An analysis of user perspective (surveys and interviews with both children and parents)

Furthermore, the design and analysis framework developed in this study can be implemented in other case studies, within Turkey or in other parts of the world. This can also facilitate a richer comparison of different design approaches, which has not been possible due to the limited number of sites within this project.

5.6. Concluding Remarks

In this study, I choose the term "playground" to define the one primary role of the street for children. But I choose it not just because of the dictionary meaning[4] of the word, but also the word's informal usage with anything that include "experimental" and "learning" features (i.e.; math playground, code playground, etc.). Playground refers a virtual, theoretical or physical environment to make experiments and learn from.

A home street is a playground not only for children but all the residents who is willing to use it. Even though the image of playground matches with equipment, streets do not need manufactured play equipment to be playgrounds. Regardless of the fact that they are attractive for younger children, mostly they are useless with their fabricated design. Children neither need prescriptive equipment, nor isolated, tight, little dedicated spaces to play. They need to feel safe, free and express themselves openly in their surrounding environment. They need environments that stimulate their curiosity, imagination and creativity. They need an environment they interact with and interact within. Play is a process of development in multiple ways, learning and adapting to the environment and community they are living with. Play is a process to learn becoming adult. And the games they play should serve in these purposes. They need to learn thinking about their actions, taking risks, making experiments, response to encounters and to shape their behaviors instead of taking directions about how to play, how to act or how to use their environment. They need to build their characters through their own experiences. They need to create their own games with the existing resources in their surrounding environment. But mass manufactured play equipment

[4] Definition of "**playground**" according to dictionaries:

- a piece of land used for and usually equipped with facilities for recreation especially by children – *'I was playing football in the playground'* (https://www.merriam-webster.com/dictionary/playground)
- an area known or suited for activity of a specified sort – *'the mountains are a playground for hang-gliders'* (https://www.merriam-webster.com/dictionary/playground)
- a place where a particular group of people choose to enjoy themselves – *'It is not designed as a playground for the rich, but as a museum for the masses.'* (https://en.oxforddictionaries.com/definition/playground)

provides easily consumable experiences for children, afford limited activity for a short time and they are not cheap either.

As designers; we need to embed required physical settings into streets and other public spaces that affords both physical and cognitive activity and provide all those needs mentioned above, instead of limiting children's play spaces in isolated playgrounds with mass manufactured play equipment. The urban space is our playground to play within, we need to make experiments to find innovative ways to adapt design into changing dynamics of the city and its users, to create good quality playable/social spaces, learn from fails and then make better designs, while doing it we need to find ways to include nature more. This way, the city itself could become a playground for all its users.

As a final word, reminding Moore's words about children's play is important; *"...kids do play in streets-all kinds of streets-and nothing that planners, parents, or city officials can do will stop it*" (Moore, 1987; 47). But it is also important to say that 30 years after that statement, things have substantially changed. Regardless of the reasons behind it, most of the kids do not play on the streets anymore. And digital tools' role in this change is beyond argument. Not only parent's restrictions, loss of play spaces, dangers of the streets either coming from people or vehicles, force children to live and play indoors, but also the colorful digital world behind the screen attracts their interest. And as a fact, sometimes that digital world full of different play opportunities stimulate their senses in so many ways, more than the physical world. In addition, being digitally connected with people can be easier to make real friends in some cases. This again might be another research question, but it is important to learn from this. There might not be enough challenges in outdoor play anymore while the digital games have every opportunity to discover new imaginary worlds, offering quests to follow and solve interesting puzzles along the way. In real world, physical environment does not offer them same adventures. Mass manufactured play equipment are everywhere making children to act in a limited way, without need of any imagination. So, creating more available space for children to play is important

but might not be enough to call them play out. Maybe, to attract children to go out and play, design concepts also needed to be re-evaluated; innovative solutions to increase the functionality, usage, attraction and meaning of the space are necessary. Design and usage of the streets could be supported by innovative solutions mixed with digital content. “Digital games in physical environments” can be designed, to attract children to use the space, thus, usage of the same space could be changed dynamically time to time, game to game or people to people. City itself could become a playground for children as well as for adults by “gamification of public space experience”. These are yet imaginary concepts created by the author with the inspiration of developing digital tools; similar ideas could be developed. To sum up, new approaches to design games and to the play experience should be searched, with a view to create games that are playable in physical environment, including both environment and people interaction and enriched with digital content to create a more attractive world of play rather than the imaginary world behind the screens.

REFERENCES

Alexander, C. (1977) A pattern Language.

Appleyard, B. and Cox, L. (2006) 'At Home (In The) Zone Creating livable streets in the U.S.', Planing, (October), pp. 30–35. Available at: https://nacto.org/docs/usdg/at_home_in_the_zone_appleyard.pdf.

Ben-Joseph, E. (1995) 'Changing the residential street scene- adapting the shared street (Woonerf) concept to the suburban environment', Journal of the American Planning Association, 61(4), pp. 504–515. doi: 10.1080/01944369508975661.

Biddulph, M. (2010) 'Evaluating the English Home Zone Initiatives', Journal of the American Planning Association, 76(2), pp. 199–218. doi: 10.1080/01944361003622688.

Björklid, P. and Nordström, M. (2007) 'Environmental Child-Friendliness : Collaboration and Future Research', Children, Youth and Environments, 17(4), pp. 388–401.

Bridgman, R. (2005) 'Book Review', Journal of Environmental Psychology, 25(4), pp. 467–468. doi: 10.1016/j.jenvp.2005.12.001.

Chatterjee, S. (2006) 'Children's Friendship with Place: An Exploration of Environmental Child Friendliness of Children Environments in Cities', p. 296.

Chawla, L. (2007) 'Childhood Experiences Associated with Care for the Natural World : A Theoretical Framework for Empirical Results', Children, Youth and the Environments, 17(4), pp. 144–170. doi: 10.7721/chilyoutenvi.17.4.0144.

Christensen, P. and O'Brien, M. (2003) Children in the City; Home Neighbourhood and Community. London: RoutledgeFalmer.

Dewi, S. P. (2010) 'How Does The Playground Role in Realizing Children-Friendly-City?', Procedia - Social and Behavioral Sciences, 38(December), pp. 224–233. doi: 10.1016/j.sbspro.2012.03.344.

Ellis, J. (2004) 'The Significance of Place in the Curriculum of Children ' s Everyday Lives', Taboo: The Journal of Culture and Education, 8(1996), pp. 23–42. Available at: http://search.proquest.com/docview/61916749?accountid=13042.

Galani, V. and Gospodini, A. (2011) 'Sustainable and friendly cities for children : Investigating planning and design parameters to reclaim street space as children ' s playground – the case study of Thermi , Greece .', pp. 1177–1183.

Gill, T. (2006) ‘Home zones in the UK: History, policy and impact on children and youth’, Children, Youth and Environments, 16(1), pp. 90–103. Available at: http://www.jstor.org/stable/10.7721/chilyoutenvi.16.1.0090.

Gill, T. (2007) Can I Play Out? Lessons from London Play’s Home Zones project. London. Available at: www.londonplay.org.uk.

Haikkola, L. et al. (2007) ‘Interpretations of urban child-friendliness: A comparative study of two neighborhoods in Helsinki and Rome’, Children, Youth and Environments, 17(4), pp. 319–351. Available at: papers://b384f54c-36dc-4b6d-90b9-f041a965aefc/Paper/p29.

Horelli, L. (2007) ‘Constructing a theoretical framework for environmental child-friendliness’, Children, Youth and Environments, 17(4), pp. 267–292. Available at: papers://b384f54c-36dc-4b6d-90b9-f041a965aefc/Paper/p30.

Igarta, D. (2012) ‘Livable streets where people live’.

Institute of Highway Incorporated Engineers (2002) Home Zone: design guidelines.

Jørgensen, G. (2004) ‘Urban neighbourhoods – a childs eye view –’, Nordisk Arkitekturforskning, 1, pp. 1–5.

Kaparias, I. et al. (2015) ‘Behavioural analysis of interactions between pedestrians and vehicles in street designs with elements of shared space’, Transportation Research Part F: Traffic Psychology and Behaviour. Elsevier Ltd, 30, pp. 115–127. doi: 10.1016/j.trf.2015.02.009.

Karndacharuk, A., Wilson, D. J. . and Dunn, R. (2014) ‘A review of the evolution of shared (street) space concepts in urban environments’, Transport Reviews, 34(2), pp. 190–220. doi: 10.1080/01441647.2014.893038.

Karsten, L. and Van Vliet, W. (2006) ‘Children in the City: Reclaiming the Street’, Source: Children, Youth and Environments, 16(1), pp. 151–167. doi: 10.1017/CBO9781107415324.004.

Kemple, K. M. et al. (2016) ‘The Power of Outdoor Play and Play in Natural Environments’, Childhood Education, 92(6), pp. 446–454. doi: 10.1080/00094056.2016.1251793.

Krohe, J. (1996) ‘Beyond Playgrounds’, Illinois Issues, June, pp. 19–26. Available at: http://www.lib.niu.edu/1996/ii960619.html (Accessed: 5 January 2018).

Kyttä, M. (2003a) ‘An Internet-Based Design Game As A Mediator of Children’s Environmental Visions’, Environment and Behavior, 35(10), pp. 1–24.

Kyttä, M. (2003b) Children in outdoor contexts. Helsinki University of Technology.

Kyttä, M. (2004) ‘The extent of children’s independent mobility and the number of actualized affordances as criteria for child-friendly environments’, Journal of

Environmental Psychology, 24(2), pp. 179–198. doi: 10.1016/S0272-4944(03)00073-2.

Laatikainen, T. E., Broberg, A. and Kyttä, M. (2017) 'The physical environment of positive places: Exploring differences between age groups', Preventive Medicine. Elsevier Inc., 95, pp. S85–S91. doi: 10.1016/j.ypmed.2016.11.015.

Mehta, V. (2013) The Street (A Quintessential Social Public Space).

Moody, S. and Melia, S. (2013) 'Shared space – research, policy and problems', Proceedings of the ICE - Transport, 167, pp. 1–9. doi: 10.1680/tran.12.00047.

Moore, R. C. (1972) 'Patterns of Activity in Time and Space ':

Moore, R. C. (1987) 'Streets as Playgrounds.pdf', in Public streets for public use, pp. 45–62.

Moore, R. C. (1989) 'Playgrounds At The Crossroads (Policy and Action Research Needed to Ensure a Viable Future for Public Playgrounds in the United States)', Human Behavior and the Envitonment, 10, pp. 83–120.

Moore, R. C. and Cosco, N. G. (2000) 'Developing an Earth-bound culture through design of childhood habitats', People, Land and sustainability, pp. 1–7.

Moore, R. C. and Young, D. (1978) 'Childhood outdoors: Toward a social ecology of the landscape', in Children and the Environment, pp. 83–130. doi: 10.1007/978-1-4684-3405-7_4.

NACTO (2012) NACTO Urban street design guide, National Association of City Transportation Officials. Available at: http://www.nyc.gov/html/dot/downloads/pdf/2012-nacto-urban-street-design-guide.pdf.

Nordstrom, M. (2010) 'Children's Views on Child-friendly Environments in Different Geographical, Cultural and Social Neighbourhoods', Urban Studies, 47(3), pp. 514–528. doi: 10.1177/0042098009349771.

Olsen, H. and Smith, B. (2017) 'Sandboxes, loose parts, and playground equipment: a descriptive exploration of outdoor play environments', Early Child Development and Care. Taylor & Francis, 187(5–6), pp. 1055–1068. doi: 10.1080/03004430.2017.1282928.

Passmore, D. (2005) 'Evolving Streets : a Review of Contemporary Approaches To Road Design', North.

Play England (2009) 'Tools for evaluating local play provision: A technical guide to Play England local play indicators', (October), pp. 1–54. Available at: www.playengland.org.uk.

Riggio, E. (2002) 'Child friendly cities: good governance in the best interests of the child', Environment and Urbanization, 14(2), pp. 45–58. doi: 10.1177/095624780201400204.

Sailer, M. et al. (2017) 'How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction', Computers in Human Behavior. Elsevier Ltd, 69, pp. 371–380. doi: 10.1016/j.chb.2016.12.033.

Sener, I. N. et al. (2008) 'An analysis of children's leisure activity engagement: Examining the day of week, location, physical activity level, and fixity dimensions', Transportation, 35(5), pp. 673–696. doi: 10.1007/s11116-008-9173-9.

Shackell, A. et al. (2008a) 'Design for Play : A guide to creating successful play spaces', (June), pp. 1–156. Available at: http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/standard/publicationDetail/Page1/DCSF-00631-2008.

Shackell, A. et al. (2008b) 'Design for Play : A guide to creating successful play spaces', pp. 1–156. Available at: http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/standard/publicationDetail/Page1/DCSF-00631-2008.

TrinityHaus (2012) Shared Space , Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland - Key Findings & Recommendations.

TSI (2016) İstatistiklerle Çocuk 2016, Turkish Statistical Institute. Available at: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24645 (Accessed: 4 December 2017).

Unicef (2011) 'FACT SHEET: A summary of the rights under the Convention on the Rights of the Child', 1, pp. 1–4. Available at: http://www.unicef.org/crc/files/Rights_overview.pdf.

Unicef (2012) State of the World's Children 2012: Children in an Urban World, The state of world's children 2012. Available at: http://www.unicef.org/sowc2012/pdfs/SOWC 2012-Main Report_EN_13Mar2012.pdf.

UNICEF (no date) The Convention on the Rights of the Child. Available at: http://www.unicef.org/rightsite/sowc/pdfs/panels/Child Friendly Cities.pdf (Accessed: 3 November 2016).

Wang, X. et al. (2017) 'Young children's and adults' perceptions of natural play spaces: A case study of Chengdu, southwestern China', Cities. Elsevier, 72(August 2017), pp. 173–180. doi: 10.1016/j.cities.2017.08.011.

Wheway, R. and Millward, A. (1997) ‘Child’s play: Facilitating play on housing estates’.

Xu, F., Buhalis, D. and Weber, J. (2017) ‘Serious games and the gamification of tourism’, Tourism Management, 60, pp. 244–256. doi: 10.1016/j.tourman.2016.11.020.

APPENDICES

A. Behavior Data (Points)

OBJECTID	time_period	gender	age_group	activity	street	day	interaction	zone	interacting_with
1	07.45-08.05	m	highschool	standing	sokullu	weekday	y	social space	
2	07.45-08.05	m	highschool	standing	sokullu	weekday	y	social space	
3	07.45-08.05	m	highschool	standing	sokullu	weekday	y	social space	
4	07.45-08.05	m	highschool	standing	sokullu	weekday	y	social space	
5	07.45-08.05	m	adult	sitting	sokullu	weekday	no	social space	
6	07.45-08.05	f	adult	sitting	sokullu	weekday	no	social space	
7	07.45-08.05	f	adult	sitting	sokullu	weekday	no	social space	
8	07.45-08.05	f	adult	sitting	sokullu	weekday	no	social space	
9	07.45-08.05	f	adult	sitting	sokullu	weekday	no	social space	
10	07.45-08.05	f	infancy	standing	sokullu	weekday	y	social space	
11	07.45-08.05	f	adult	standing	sokullu	weekday	y	sidewalk	
12	07.45-08.05	f	adult	standing	sokullu	weekday	y	sidewalk	
13	07.45-08.05	f	adult	standing	sokullu	weekday	y	sidewalk	
19	07.45-08.05	f	adult	standing	sokullu	weekday	no	sidewalk	
20	08.45-09.05	f	adult	sitting	sokullu	weekday	no	social space	
21	08.45-9.05	f	basic education schools	standing	sokullu	weekday	no	sidewalk	
22	08.45-09.05	f	adult	standing	sokullu	weekday	y	sidewalk	
23	08.45-09.05	m	adult	standing	sokullu	weekday	y	front yard	
24	08.45-9.05	m	infancy	standing	sokullu	weekday	no	front yard	
25	09.45-10.05	m	toddler	playing	sokullu	weekday	y	play space	environment
26	09.45-10.05	f	adult	standing	sokullu	weekday	no	play space	
27	09.45-10.05	f	adult	sitting	sokullu	weekday	no	social space	
28	09.45-10.05	f	adult	sitting	sokullu	weekday	no	social space	
29	09.45-10.05	m	baby	sitting	sokullu	weekday	no	social space	

30	09.45-10.05	f	basic education schools	sitting	sokullu	weekday	no	social space	
31	09.45-10.05	f	toddler	playing	sokullu	weekday	y	play space	environment
32	09.45-10.05	f	adult	standing	sokullu	weekday	no	play space	
33	10.45-11.05	f	adult	sitting	sokullu	weekday	y	social space	
34	10.45-11.05	m	baby	sitting	sokullu	weekday	no	social space	
35	10.45-11.05	f	adult	sitting	sokullu	weekday	no	social space	
36	10.45-11.05	f	adult	sitting	sokullu	weekday	no	social space	
37	10.45-11.05	m	elder	sitting	sokullu	weekday	no	social space	
38	10.45-11.05	f	elder	standing	sokullu	weekday	no	sidewalk	
39	10.45-11.05	f	adult	standing	sokullu	weekday	no	sidewalk	
40	10.45-11.05	m	toddler	playing	sokullu	weekday	y	play space	environment
41	10.45-11.05	f	adult	standing	sokullu	weekday	y	sidewalk	
42	10.45-11.05	f	adult	standing	sokullu	weekday	y	sidewalk	
43	10.45-11.05	f	adult	standing	sokullu	weekday	y	front yard	
44	10.45-11.05	m	adult	standing	sokullu	weekday	y	sidewalk	
45	11.45-12.05	f	adult	sitting	sokullu	weekday	no	sidewalk	
46	11.45-12.05	f	adult	standing	sokullu	weekday	no	sidewalk	
49	11.45-12.05	f	adult	standing	sokullu	weekday	y	play space	
50	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
51	11.45-12.05	f	adult	sitting	sokullu	weekday	y	sidewalk	
52	11.45-12.05	f	adult	standing	sokullu	weekday	y	roadway	
53	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
54	11.45-12.05	f	adult	standing	sokullu	weekday	y	play space	
55	11.45-12.05	m	infancy	playing	sokullu	weekday	y	play space	environment
57	11.45-12.05	f	adult	standing	sokullu	weekday	y	play space	
58	11.45-12.05	f	basic education schools	playing	sokullu	weekday	y	play space	environment
59	11.45-12.05	m	toddler	playing	sokullu	weekday	y	play space	environment
60	11.45-12.05	m	toddler	playing	sokullu	weekday	y	play space	environment
61	11.45-12.05	m	adult	sitting	sokullu	weekday	no	social space	
62	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
63	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
64	11.45-12.05	f	infancy	standing	sokullu	weekday	no	social space	

65	11.45-12.05	m	adult	sitting	sokullu	weekday	no	social space	
66	11.45-12.05	m	elder	sitting	sokullu	weekday	no	social space	
67	11.45-12.05	f	infancy	sitting	sokullu	weekday	no	social space	
68	11.45-12.05	f	adult	standing	sokullu	weekday	no	social space	
69	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
70	11.45-12.05	f	infancy	standing	sokullu	weekday	no	social space	
71	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
72	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
73	11.45-12.05	f	elder	sitting	sokullu	weekday	no	social space	
74	11.45-12.05	f	elder	standing	sokullu	weekday	no	social space	
75	11.45-12.05	f	elder	sitting	sokullu	weekday	no	social space	
76	11.45-12.05	f	adult	sitting	sokullu	weekday	no	social space	
77	11.45-12.05	f	adult	standing	sokullu	weekday	no	social space	
78	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
79	11.45-12.05	m	toddler	playing	sokullu	weekday	y	sidewalk	environment
80	11.45-12.05	f	adult	standing	sokullu	weekday	no	sidewalk	
81	11.45-12.05	f	elder	standing	sokullu	weekday	no	sidewalk	
82	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
83	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
84	11.45-12.05	m	basic education schools	sitting	sokullu	weekday	no	sidewalk	
85	11.45-12.05	m	basic education schools	standing	sokullu	weekday	no	sidewalk	
86	11.45-12.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
90	11.45-12.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
91	11.45-12.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
92	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
93	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
94	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
95	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
96	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
97	11.45-12.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
98	11.45-12.05	m	infancy	playing	sokullu	weekday	y	play space	environment
99	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	

100	11.45-12.05	f	adult	standing	sokullu	weekday	y	sidewalk	
101	11.45-12.05	m	adult	standing	sokullu	weekday	y	sidewalk	
102	11.45-12.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
103	11.45-12.05	f	infancy	standing	sokullu	weekday	no	roadway	
104	11.45-12.05	m	infancy	standing	sokullu	weekday	no	roadway	
105	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
106	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
107	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
108	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
109	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
110	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
111	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
112	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
113	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
114	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
117	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
118	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
119	12.45-13.05	f	infancy	playing	sokullu	weekday	y	play space	environment
120	12.45-13.05	f	adult	standing	sokullu	weekday	no	play space	
121	12.45-13.05	f	infancy	standing	sokullu	weekday	no	social space	
122	12.45-13.05	m	adult	standing	sokullu	weekday	y	sidewalk	
123	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
124	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
125	12.45-13.05	m	infancy	sitting	sokullu	weekday	no	social space	
126	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
127	12.45-13.05	f	infancy	sitting	sokullu	weekday	no	social space	
130	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
131	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
132	12.45-13.05	f	basic education schools	sitting	sokullu	weekday	no	social space	
133	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	social space	environment
134	12.45-13.05	f	elder	sitting	sokullu	weekday	no	social space	
135	12.45-13.05	f	elder	sitting	sokullu	weekday	no	social space	

136	12.45-13.05	m	infancy	playing	sokullu	weekday	y	social space	environment
137	12.45-13.05	m	infancy	playing	sokullu	weekday	y	social space	environment
138	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	social space	both
139	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	social space	both
140	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	social space	both
141	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	social space	both
142	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	social space	environment
143	12.45-13.05	f	adult	standing	sokullu	weekday	no	social space	
144	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
145	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
146	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
147	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	social space	both
148	12.45-13.05	f	infancy	playing	sokullu	weekday	y	social space	both
149	12.45-13.05	f	elder	sitting	sokullu	weekday	no	social space	
150	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
151	12.45-13.05	m	basic education schools	sitting	sokullu	weekday	no	social space	
152	12.45-13.05	f	basic education schools	sitting	sokullu	weekday	no	social space	
153	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
154	12.45-13.05	f	infancy	sitting	sokullu	weekday	no	social space	
155	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
157	12.45-13.05	f	elder	sitting	sokullu	weekday	no	social space	
158	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
159	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
160	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
161	12.45-13.05	m	adult	standing	sokullu	weekday	y	sidewalk	
162	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	environment
163	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	environment
164	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
165	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
166	12.45-13.05	f	adult	standing	sokullu	weekday	no	social space	
167	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
168	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	both

169	12.45-13.05	m	basic education schools	sitting	sokullu	weekday	no	social space	
170	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	roadway	both
171	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	both
172	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	social space	environment
173	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
174	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
175	12.45-13.05	f	adult	sitting	sokullu	weekday	no	social space	
176	12.45-13.05	f	adult	sitting	sokullu	weekday	no	sidewalk	
177	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
178	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
179	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
180	12.45-13.05	f	adult	standing	sokullu	weekday	y	social space	
181	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
182	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
183	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
184	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
185	12.45-13.05	m	adult	standing	sokullu	weekday	no	sidewalk	
186	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
187	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
188	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
189	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
190	12.45-13.05	f	infancy	playing	sokullu	weekday	y	play space	both
191	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
192	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
193	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
194	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
195	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
196	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
197	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
198	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
199	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
200	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both

201	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
202	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
203	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
204	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
205	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
206	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
207	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
208	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
209	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
210	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
211	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
212	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both
213	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both
214	12.45-13.05	f	infancy	playing	sokullu	weekday	y	play space	both
215	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
217	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both
218	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
219	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
220	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
221	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
222	12.45-13.05	m	adult	standing	sokullu	weekday	y	play space	
223	12.45-13.05	f	adult	standing	sokullu	weekday	y	play space	
224	12.45-13.05	f	adult	standing	sokullu	weekday	y	play space	
225	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
226	12.45-13.05	f	adult	standing	sokullu	weekday	y	roadway	
227	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
228	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
229	12.45-13.05	m	toddler	playing	sokullu	weekday	y	play space	both
230	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both
231	12.45-13.05	f	infancy	playing	sokullu	weekday	y	play space	both
232	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both
233	12.45-13.05	m	infancy	playing	sokullu	weekday	y	play space	both

234	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	play space	both
235	12.45-13.05	f	adult	standing	sokullu	weekday	y	play space	
236	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	eachother
237	12.45-13.05	f	basic education schools	playing	sokullu	weekday	y	sidewalk	eachother
238	12.45-13.05	m	basic education schools	playing	sokullu	weekday	y	sidewalk	eachother
239	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
240	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
241	12.45-13.05	f	adult	standing	sokullu	weekday	y	sidewalk	
242	12.45-13.05	f	elder	standing	sokullu	weekday	no	sidewalk	
243	12.45-13.05	f	adult	standing	sokullu	weekday	no	sidewalk	
244	13.45-14.05	f	adult	standing	sokullu	weekday	y	sidewalk	
245	13.45-14.05	f	infancy	standing	sokullu	weekday	y	sidewalk	
246	13.45-14.05	f	adult	standing	sokullu	weekday	y	sidewalk	
247	13.45-14.05	f	adult	standing	sokullu	weekday	y	sidewalk	
248	13.45-14.05	f	elder	sitting	sokullu	weekday	y	sidewalk	
249	13.45-14.05	f	adult	standing	sokullu	weekday	no	sidewalk	
250	13.45-14.05	f	basic education schools	sitting	sokullu	weekday	no	social space	
251	13.45-14.05	f	elder	standing	sokullu	weekday	y	social space	
252	13.45-14.05	m	baby	sitting	sokullu	weekday	no	social space	
253	13.45-14.05	f	adult	sitting	sokullu	weekday	y	social space	
254	13.45-14.05	f	adult	sitting	sokullu	weekday	y	social space	
255	13.45-14.05	f	adult	standing	sokullu	weekday	y	social space	
256	13.45-14.05	m	toddler	standing	sokullu	weekday	no	social space	
257	13.45-14.05	f	adult	standing	sokullu	weekday	y	roadway	
258	13.45-14.05	f	adult	standing	sokullu	weekday	y	sidewalk	
259	13.45-14.05	f	basic education schools	sitting	sokullu	weekday	no	play space	
260	13.45-14.05	f	basic education schools	sitting	sokullu	weekday	no	play space	
261	13.45-14.05	m	basic education schools	sitting	sokullu	weekday	no	play space	
262	13.45-14.05	m	adult	standing	sokullu	weekday	no	sidewalk	
264	15.45-16.05	f	elder	sitting	sokullu	weekday	no	social space	
265	15.45-16.05	f	adult	sitting	sokullu	weekday	no	social space	
266	15.45-16.05	f	adult	sitting	sokullu	weekday	no	social space	

267	15.45-16.05	f	infancy	sitting	sokullu	weekday	y	social space	
268	14.45-15.05	f	adult	standing	sokullu	weekday	y	roadway	
269	14.45-15.05	f	adult	standing	sokullu	weekday	no	sidewalk	
270	14.45-15.05	m	toddler	playing	sokullu	weekday	y	play space	environment
271	14.45-15.05	f	adult	standing	sokullu	weekday	no	play space	
272	14.45-15.05	f	adult	sitting	sokullu	weekday	no	social space	
273	15.45-16.05	f	adult	sitting	sokullu	weekday	no	social space	
274	15.45-16.05	m	elder	sitting	sokullu	weekday	no	social space	
275	16.45-17.05	f	adult	standing	sokullu	weekday	no	play space	
276	16.45-17.05	f	infancy	playing	sokullu	weekday	y	play space	environment
277	16.45-17.05	m	highschool	sitting	sokullu	weekday	no	social space	
278	16.45-17.05	m	highschool	standing	sokullu	weekday	no	social space	
279	16.45-17.05	f	basic education schools	standing	sokullu	weekday	no	social space	
280	16.45-17.05	f	adult	standing	sokullu	weekday	y	sidewalk	
281	16.45-17.05	f	basic education schools	playing	sokullu	weekday	y	play space	environment
282	16.45-17.05	m	adult	standing	sokullu	weekday	no	roadway	
283	16.45-17.05	f	adult	standing	sokullu	weekday	no	sidewalk	
284	16.45-17.05	f	infancy	playing	sokullu	weekday	y	play space	environment
286	17.45-18.05	f	adult	standing	sokullu	weekday	no	play space	
287	17.45-18.05	f	adult	standing	sokullu	weekday	y	play space	
288	17.45-18.05	f	adult	standing	sokullu	weekday	y	social space	
289	17.45-18.05	f	adult	sitting	sokullu	weekday	y	social space	
290	17.45-18.05	f	adult	standing	sokullu	weekday	y	roadway	
291	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
292	17.45-18.05	f	adult	standing	sokullu	weekday	y	play space	
293	17.45-18.05	m	infancy	playing	sokullu	weekday	y	play space	environment
294	17.45-18.05	f	adult	standing	sokullu	weekday	y	play space	
295	17.45-18.05	f	basic education schools	playing	sokullu	weekday	y	play space	environment
296	17.45-18.05	m	toddler	playing	sokullu	weekday	y	play space	environment
297	17.45-18.05	m	toddler	playing	sokullu	weekday	y	social space	environment
298	17.45-18.05	m	adult	sitting	sokullu	weekday	no	social space	
299	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	

300	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
301	17.45-18.05	f	infancy	standing	sokullu	weekday	no	social space	
302	17.45-18.05	m	adult	sitting	sokullu	weekday	no	social space	
303	17.45-18.05	m	elder	sitting	sokullu	weekday	no	social space	
304	17.45-18.05	f	infancy	standing	sokullu	weekday	no	social space	
305	17.45-18.05	f	adult	standing	sokullu	weekday	no	social space	
306	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
307	17.45-18.05	f	infancy	standing	sokullu	weekday	no	social space	
308	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
309	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
310	17.45-18.05	f	elder	sitting	sokullu	weekday	no	social space	
311	17.45-18.05	f	elder	standing	sokullu	weekday	no	sidewalk	
312	17.45-18.05	f	elder	standing	sokullu	weekday	no	social space	
313	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
314	17.45-18.05	f	adult	standing	sokullu	weekday	no	sidewalk	
315	17.45-18.05	f	adult	standing	sokullu	weekday	y	social space	
316	17.45-18.05	m	toddler	playing	sokullu	weekday	y	social space	environment
317	17.45-18.05	f	adult	standing	sokullu	weekday	no	sidewalk	
318	17.45-18.05	f	elder	standing	sokullu	weekday	no	sidewalk	
319	17.45-18.05	f	adult	standing	sokullu	weekday	y	roadway	
320	17.45-18.05	f	adult	standing	sokullu	weekday	y	play space	
321	17.45-18.05	m	basic education schools	sitting	sokullu	weekday	no	play space	
322	17.45-18.05	m	basic education schools	standing	sokullu	weekday	no	sidewalk	
327	17.45-18.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
328	17.45-18.05	m	basic education schools	playing	sokullu	weekday	y	play space	environment
329	17.45-18.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
330	17.45-18.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
332	17.45-18.05	m	infancy	playing	sokullu	weekday	y	sidewalk	environment
336	17.45-18.05	m	basic education schools	playing	sokullu	weekday	y	play space	both
337	17.45-18.05	f	infancy	standing	sokullu	weekday	no	roadway	
338	17.45-18.05	m	infancy	standing	sokullu	weekday	no	roadway	
339	17.45-18.05	f	adult	standing	sokullu	weekday	y	roadway	

340	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
341	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
342	17.45-18.05	f	adult	standing	sokullu	weekday	no	sidewalk	
343	17.45-18.05	f	adult	standing	sokullu	weekday	no	sidewalk	
344	17.45-18.05	f	adult	standing	sokullu	weekday	no	sidewalk	
345	17.45-18.05	f	adult	standing	sokullu	weekday	y	social space	
346	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
347	17.45-18.05	m	infancy	sitting	sokullu	weekday	no	social space	
348	17.45-18.05	f	adult	sitting	sokullu	weekday	no	social space	
349	17.45-18.05	f	infancy	sitting	sokullu	weekday	no	social space	
350	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
351	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
352	17.45-18.05	f	adult	standing	sokullu	weekday	y	sidewalk	
353	13.45-14.05	f	toddler	playing	sokullu	weekend	y	social space	both
354	13.45-14.05	f	adult	standing	sokullu	weekend	y	sidewalk	
355	13.45-14.05	m	adult	standing	sokullu	weekend	y	sidewalk	
356	13.45-14.05	m	adult	standing	sokullu	weekend	y	front yard	
357	13.45-14.05	m	adult	standing	sokullu	weekend	y	front yard	
358	13.45-14.05	f	adult	sitting	sokullu	weekend	no	social space	
359	13.45-14.05	m	pre-adolescent age	sitting	sokullu	weekend	no	social space	
360	13.45-14.05	m	elder	sitting	sokullu	weekend	no	social space	
363	13.45-14.05	m	infancy	playing	sokullu	weekend	y	sidewalk	environment
368	09.45-10.05	m	elder	sitting	sokullu	weekend	no	social space	
371	13.45-14.05	m	adult	standing	sokullu	weekend	y	social space	
372	13.45-14.05	m	highschool	sitting	sokullu	weekend	no	social space	
373	13.45-14.05	m	adult	sitting	sokullu	weekend	no	social space	
374	13.45-14.05	m	pre-adolescent age	sitting	sokullu	weekend	no	social space	
375	13.45-14.05	m	adult	standing	sokullu	weekend	y	sidewalk	
377	12.45-13.05	m	highschool	sitting	sokullu	weekend	no	social space	
378	12.45-13.05	m	adult	sitting	sokullu	weekend	no	social space	
379	12.45-13.05	f	toddler	playing	sokullu	weekend	y	play space	environment
380	12.45-13.05	m	adult	standing	sokullu	weekend	y	play space	

381	12.45-13.05	f	infancy	playing	sokullu	weekend	y	play space	environment
382	12.45-13.05	f	elder	sitting	sokullu	weekend	no	social space	
384	09.45-10.05	f	adult	sitting	sokullu	weekend	no	social space	
385	11.45-12.05	f	elder	sitting	sokullu	weekend	no	social space	
386	11.45-12.05	m	elder	sitting	sokullu	weekend	no	social space	
387	11.45-12.05	f	elder	sitting	sokullu	weekend	no	social space	
388	10.45-11.05	m	infancy	playing	sokullu	weekend	y	play space	environment
389	10.45-11.05	f	adult	standing	sokullu	weekend	y	play space	
390	10.45-11.05	m	adult	standing	sokullu	weekend	no	sidewalk	
391	14.45-15.05	m	elder	sitting	sokullu	weekend	no	social space	
392	14.45-15.05	f	adult	sitting	sokullu	weekend	no	social space	
393	15.45-16.05	f	toddler	playing	sokullu	weekend	y	sidewalk	environment
394	15.45-16.05	f	adult	standing	sokullu	weekend	y	sidewalk	
395	15.45-16.05	f	adult	sitting	sokullu	weekend	no	social space	
396	15.45-16.05	f	adult	sitting	sokullu	weekend	y	social space	
397	15.45-16.05	f	adult	sitting	sokullu	weekend	y	social space	
398	15.45-16.05	f	adult	standing	sokullu	weekend	y	social space	
400	17.45-18.05	m	elder	sitting	sokullu	weekend	no	social space	
401	16.45-17.05	m	infancy	playing	sokullu	weekend	y	play space	environment
403	16.45-17.05	m	adult	standing	sokullu	weekend	y	play space	
404	16.45-17.05	m	adult	sitting	sokullu	weekend	y	social space	
405	16.45-17.05	m	adult	sitting	sokullu	weekend	y	social space	
406	17.45-18.05	m	adult	sitting	sokullu	weekend	no	social space	
407	09.45-10.05	m	elder	sitting	sk1003	weekday	no	sidewalk	
408	15.45-16.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
409	14.45-15.05	f	elder	sitting	sk1003	weekend	no	sidewalk	
410	14.45-15.05	f	adult	sitting	sk1003	weekend	no	sidewalk	
411	10.45-11.05	f	toddler	playing	sk1003	weekday	y	park	environment
412	10.45-11.05	f	adult	standing	sk1003	weekday	y	park	
413	11.45-12.05	f	basic education schools	playing	sk1003	weekday	y	park	both
414	11.45-12.05	m	basic education schools	playing	sk1003	weekday	y	park	both
415	11.45-12.05	f	basic education schools	playing	sk1003	weekday	y	park	both

416	12.45-13.05	m	elder	standing	sk1003	weekday	no	sidewalk	
418	12.45-13.05	m	basic education schools	playing	sk1003	weekday	y	park	both
419	12.45-13.05	m	basic education schools	playing	sk1003	weekday	y	park	both
420	12.45-13.05	m	basic education schools	playing	sk1003	weekday	y	park	both
421	13.45-14.05	f	adult	sitting	sk1003	weekday	no	play space	
423	13.45-14.05	f	adult	sitting	sk1003	weekday	no	park	
428	13.45-14.05	m	infancy	playing	sk1003	weekday	y	park	environment
429	14.45-15.05	f	adult	sitting	sk1003	weekday	no	park	
432	14.45-15.05	f	adult	sitting	sk1003	weekday	no	park	
433	14.45-15.05	m	toddler	playing	sk1003	weekday	y	park	environment
434	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	park	both
435	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	park	both
436	15.45-16.05	m	infancy	playing	sk1003	weekday	y	park	environment
437	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	park	both
438	15.45-16.05	f	infancy	playing	sk1003	weekday	y	park	environment
439	15.45-16.05	m	basic education schools	playing	sk1003	weekday	y	park	both
440	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	park	both
441	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	park	both
442	15.45-16.05	f	adult	sitting	sk1003	weekday	y	play space	
443	15.45-16.05	f	pre-adolescent age	standing	sk1003	weekday	y	play space	
444	16.45-17.05	f	adult	sitting	sk1003	weekday	y	play space	
445	16.45-17.05	m	toddler	playing	sk1003	weekday	y	play space	environment
446	17.45-18.05	m	pre-adolescent age	standing	sk1003	weekday	y	play space	
447	17.45-18.05	m	pre-adolescent age	standing	sk1003	weekday	y	play space	
448	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	roadway	eachother
449	15.45-16.05	m	basic education schools	playing	sk1003	weekday	y	roadway	eachother
450	15.45-16.05	f	basic education schools	playing	sk1003	weekday	y	sidewalk	eachother
451	16.45-17.05	m	basic education schools	standing	sk1003	weekend	no	front yard	
452	16.45-17.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
453	16.45-17.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
454	16.45-17.05	m	basic education schools	playing	sk1003	weekend	y	sidewalk	eachother
455	16.45-17.05	m	pre-adolescent age	playing	sk1003	weekend	y	roadway	eachother

456	16.45-17.05	m	basic education schools	playing	sk1003	weekend	y	roadway	eachother
457	17.45-18.05	f	highschool	sitting	sk1003	weekend	no	sidewalk	
459	17.45-18.05	m	highschool	sitting	sk1003	weekend	no	sidewalk	
460	17.45-18.05	m	highschool	standing	sk1003	weekend	no	sidewalk	
461	17.45-18.05	m	highschool	standing	sk1003	weekend	no	sidewalk	
462	17.45-18.05	m	pre-adolescent age	sitting	sk1003	weekend	no	play space	
463	17.45-18.05	m	pre-adolescent age	sitting	sk1003	weekend	no	play space	
464	17.45-18.05	m	adult	standing	sk1003	weekend	y	park	
465	17.45-18.05	f	adult	standing	sk1003	weekend	y	park	
466	17.45-18.05	m	adult	standing	sk1003	weekend	y	park	
467	17.45-18.05	f	adult	standing	sk1003	weekend	y	park	
468	17.45-18.05	m	pre-adolescent age	sitting	sk1003	weekend	no	sidewalk	
469	17.45-18.05	m	pre-adolescent age	sitting	sk1003	weekend	no	sidewalk	
470	11.45-12.05	m	adult	standing	sk1003	weekend	no	sidewalk	
473	12.45-13.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
474	12.45-13.05	m	basic education schools	playing	sk1003	weekend	y	front yard	eachother
475	12.45-13.05	m	basic education schools	playing	sk1003	weekend	y	front yard	eachother
476	12.45-13.05	m	basic education schools	sitting	sk1003	weekend	no	sidewalk	
477	12.45-13.05	m	basic education schools	sitting	sk1003	weekend	no	sidewalk	
478	12.45-13.05	f	adult	sitting	sk1003	weekend	y	play space	
479	12.45-13.05	m	toddler	playing	sk1003	weekend	y	play space	environment
480	12.45-13.05	f	adult	sitting	sk1003	weekend	y	play space	
481	12.45-13.05	m	highschool	sitting	sk1003	weekend	no	play space	
482	12.45-13.05	f	infancy	playing	sk1003	weekend	y	play space	environment
483	12.45-13.05	f	adult	standing	sk1003	weekend	y	play space	
484	12.45-13.05	m	infancy	playing	sk1003	weekend	y	play space	environment
485	12.45-13.05	f	adult	playing	sk1003	weekend	y	park	eachother
486	12.45-13.05	m	adult	playing	sk1003	weekend	y	park	eachother
487	12.45-13.05	m	adult	sitting	sk1003	weekend	y	park	
488	12.45-13.05	m	highschool	sitting	sk1003	weekend	y	park	
489	12.45-13.05	f	adult	standing	sk1003	weekend	y	park	
490	12.45-13.05	m	infancy	playing	sk1003	weekend	y	park	both

491	12.45-13.05	f	infancy	playing	sk1003	weekend	y	park	both
492	12.45-13.05	m	infancy	playing	sk1003	weekend	y	park	both
493	12.45-13.05	m	toddler	playing	sk1003	weekend	y	park	both
494	12.45-13.05	f	toddler	playing	sk1003	weekend	y	park	both
495	12.45-13.05	f	adult	standing	sk1003	weekend	y	front yard	
496	12.45-13.05	f	adult	standing	sk1003	weekend	y	front yard	
497	12.45-13.05	f	elder	standing	sk1003	weekend	y	roadway	
498	12.45-13.05	m	adult	standing	sk1003	weekend	y	roadway	
499	13.45-14.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
500	13.45-14.05	m	pre-adolescent age	playing	sk1003	weekend	y	sidewalk	eachother
501	13.45-14.05	m	basic education schools	sitting	sk1003	weekend	no	play space	
502	13.45-14.05	m	pre-adolescent age	playing	sk1003	weekend	y	sidewalk	eachother
504	13.45-14.05	m	basic education schools	sitting	sk1003	weekend	no	play space	
505	13.45-14.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
506	13.45-14.05	f	adult	sitting	sk1003	weekend	y	park	
507	13.45-14.05	f	infancy	playing	sk1003	weekend	y	park	environment
508	13.45-14.05	f	toddler	playing	sk1003	weekend	y	park	both
509	13.45-14.05	m	toddler	playing	sk1003	weekend	y	park	both
510	13.45-14.05	f	adult	standing	sk1003	weekend	y	park	
511	13.45-14.05	m	adult	standing	sk1003	weekend	y	park	
512	13.45-14.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
513	13.45-14.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
514	14.45-15.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
515	14.45-15.05	m	elder	sitting	sk1003	weekend	no	sidewalk	
516	14.45-15.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
517	14.45-15.05	m	pre-adolescent age	playing	sk1003	weekend	y	roadway	eachother
518	14.45-15.05	m	basic education schools	playing	sk1003	weekend	y	play space	eachother
519	14.45-15.05	m	pre-adolescent age	playing	sk1003	weekend	y	sidewalk	eachother
520	14.45-15.05	m	basic education schools	playing	sk1003	weekend	y	sidewalk	eachother
521	14.45-15.05	m	pre-adolescent age	playing	sk1003	weekend	y	play space	eachother
524	14.45-15.05	f	adult	standing	sk1003	weekend	y	park	
525	14.45-15.05	f	infancy	playing	sk1003	weekend	y	park	environment

526	14.45-15.05	f	infancy	playing	sk1003	weekend	y	park	both
527	14.45-15.05	m	adult	standing	sk1003	weekend	y	park	
528	14.45-15.05	f	adult	standing	sk1003	weekend	y	park	
529	14.45-15.05	m	toddler	playing	sk1003	weekend	y	park	both
530	14.45-15.05	f	adult	standing	sk1003	weekend	y	park	
531	14.45-15.05	f	pre-adolescent age	standing	sk1003	weekend	y	park	
532	14.45-15.05	m	basic education schools	playing	sk1003	weekend	y	park	environment
533	15.45-16.05	f	toddler	playing	sk1003	weekend	y	play space	environment
534	15.45-16.05	f	adult	standing	sk1003	weekend	y	play space	
535	15.45-16.05	m	toddler	playing	sk1003	weekend	y	play space	environment
536	15.45-16.05	f	adult	standing	sk1003	weekend	y	play space	
537	15.45-16.05	m	toddler	playing	sk1003	weekend	y	park	environment
538	15.45-16.05	m	basic education schools	playing	sk1003	weekend	y	park	both
539	15.45-16.05	m	basic education schools	playing	sk1003	weekend	y	park	both
540	15.45-16.05	m	basic education schools	playing	sk1003	weekend	y	park	both
541	15.45-16.05	f	basic education schools	playing	sk1003	weekend	y	park	both
542	15.45-16.05	f	basic education schools	playing	sk1003	weekend	y	park	both
543	15.45-16.05	f	basic education schools	playing	sk1003	weekend	y	park	both
544	15.45-16.05	f	basic education schools	playing	sk1003	weekend	y	park	both
545	15.45-16.05	m	basic education schools	playing	sk1003	weekend	y	park	both
546	15.45-16.05	f	adult	sitting	sk1003	weekend	y	park	
548	15.45-16.05	f	adult	standing	sk1003	weekend	y	park	
549	15.45-16.05	m	pre-adolescent age	sitting	av. özdemir	weekend	no	play space	
550	15.45-16.05	m	pre-adolescent age	standing	av. özdemir	weekend	no	play space	
551	13.45-14.05	m	highschool	standing	av. özdemir	weekend	y	bike lane	
552	13.45-14.05	m	highschool	standing	av. özdemir	weekend	y	sidewalk	
553	13.45-14.05	m	highschool	standing	av. özdemir	weekend	y	bike lane	
554	13.45-14.05	f	highschool	standing	av. özdemir	weekend	y	sidewalk	
555	14.45-15.05	m	elder	sitting	akat	weekday	no	sidewalk	
556	14.45-15.05	f	adult	sitting	akat	weekday	y	sidewalk	
557	14.45-15.05	f	elder	sitting	akat	weekday	y	sidewalk	
558	14.45-15.05	f	adult	sitting	akat	weekday	y	sidewalk	

559	14.45-15.05	f	elder	sitting	akat	weekday	y	sidewalk	
560	14.45-15.05	m	infancy	playing	akat	weekday	y	play space	environment
561	16.45-17.05	f	infancy	playing	akat	weekend	y	sidewalk	environment
562	16.45-17.05	f	basic education schools	playing	akat	weekend	y	play space	both
563	16.45-17.05	m	basic education schools	playing	akat	weekend	y	play space	both
564	16.45-17.05	m	basic education schools	playing	akat	weekend	y	play space	both
565	16.45-17.05	f	infancy	playing	akat	weekend	y	play space	environment
566	16.45-17.05	f	basic education schools	playing	akat	weekend	y	play space	both
567	16.45-17.05	m	basic education schools	playing	akat	weekend	y	play space	both
568	16.45-17.05	m	basic education schools	playing	akat	weekend	y	play space	both
569	17.45-18.05	f	adult	sitting	akat	weekend	no	sidewalk	

B. Street Usage by Cars and Passers-by

OBJECTID	TimeSequence	StartDate	EndDate	Car	Pedestrian	Parked Car	Day	Street	total_car	total_pedestrian
1	07.45-08.05	7:45	8:05	11	226	5	weekday	Sokullu	33	678
2	08.45-09.05	8:45	9:05	15	39	5	weekday	Sokullu	45	117
3	09.45-10.05	9:45	10:05	13	21	4	weekday	Sokullu	39	63
4	10.45-11.05	10:45	11:05	9	28	4	weekday	Sokullu	27	84
5	11.45-12.05	11:45	12:05	11	68	5	weekday	Sokullu	33	204
6	12.45-13.05	12:45	13:05	5	171	4	weekday	Sokullu	15	513
7	13.45-14.05	13:45	14:05	4	49	6	weekday	Sokullu	12	147
8	14.45-15.05	14:45	15:05	12	35	6	weekday	Sokullu	36	105
9	15.45-16.05	15:45	16:05	7	31	5	weekday	Sokullu	21	93
10	16.45-17.05	16:45	17:05	15	89	5	weekday	Sokullu	45	267
11	17.45-18.05	17:45	18:05	11	133	6	weekday	Sokullu	33	399
12	07.45-08.05	7:45	8:05	7	13	6	weekend	Sokullu	21	39
13	08.45-09.05	8:45	9:05	16	22	6	weekend	Sokullu	48	66
14	09.45-10.05	9:45	10:05	12	19	4	weekend	Sokullu	36	57
15	10.45-11.05	10:45	11:05	11	43	5	weekend	Sokullu	33	129
16	11.45-12.05	11:45	12:05	14	39	6	weekend	Sokullu	42	117
17	12.45-13.05	12:45	13:05	19	63	7	weekend	Sokullu	57	189
18	13.45-14.05	13:45	14:05	13	78	6	weekend	Sokullu	39	234
19	14.45-15.05	14:45	15:05	16	57	4	weekend	Sokullu	48	171
20	15.45-16.05	15:45	16:05	22	85	5	weekend	Sokullu	66	255
21	16.45-17.05	16:45	17:05	17	103	5	weekend	Sokullu	51	309
22	17.45-18.05	17:45	18:05	15	62	6	weekend	Sokullu	45	186
23	07.45-08.05	7:45	8:05	0	15	9	weekend	1002-1003	0	45
24	07.45-08.05	7:45	8:05	1	7	0	weekend	1002-1003	3	21
25	07.45-08.05	7:45	8:05	0	18	3	weekend	1002-1003	0	54
26	08.45-09.05	8:45	9:05	16	2	9	weekend	1002-1003	48	6
27	08.45-09.05	8:45	9:05	15	13	0	weekend	1002-1003	45	39
28	08.45-09.05	8:45	9:05	12	11	3	weekend	1002-1003	36	33
29	09.45-10.05	9:45	10:05	11	11	9	weekend	1002-1003	33	33
30	09.45-10.05	9:45	10:05	2	23	0	weekend	1002-1003	6	69

31	09.45-10.05	9:45	10:05	7	6	2	weekend	1002-1003	21	18
32	10.45-11.05	10:45	11:05	6	8	9	weekend	1002-1003	18	24
33	10.45-11.05	10:45	11:05	17	17	0	weekend	1002-1003	51	51
34	10.45-11.05	10:45	11:05	8	7	4	weekend	1002-1003	24	21
35	11.45-12.05	11:45	12:05	0	28	10	weekend	1002-1003	0	84
36	11.45-12.05	11:45	12:05	2	9	0	weekend	1002-1003	6	27
37	11.45-12.05	11:45	12:05	17	2	4	weekend	1002-1003	51	6
38	12.45-13.05	12:45	13:05	17	27	9	weekend	1002-1003	51	81
39	12.45-13.05	12:45	13:05	3	12	0	weekend	1002-1003	9	36
40	12.45-13.05	12:45	13:05	9	20	4	weekend	1002-1003	27	60
41	13.45-14.05	13:45	14:05	15	10	6	weekend	1002-1003	45	30
42	13.45-14.05	13:45	14:05	3	11	0	weekend	1002-1003	9	33
43	13.45-14.05	13:45	14:05	10	11	4	weekend	1002-1003	30	33
44	14.45-15.05	14:45	15:05	2	3	7	weekend	1002-1003	6	9
45	14.45-15.05	14:45	15:05	2	4	0	weekend	1002-1003	6	12
46	14.45-15.05	14:45	15:05	3	4	2	weekend	1002-1003	9	12
47	15.45-16.05	15:45	16:05	8	10	7	weekend	1002-1003	24	30
48	15.45-16.05	15:45	16:05	10	8	0	weekend	1002-1003	30	24
49	15.45-16.05	15:45	16:05	12	11	2	weekend	1002-1003	36	33
50	16.45-17.05	16:45	17:05	3	9	12	weekend	1002-1003	9	27
51	16.45-17.05	16:45	17:05	3	11	0	weekend	1002-1003	9	33
52	16.45-17.05	16:45	17:05	4	6	3	weekend	1002-1003	12	18
53	17.45-18.05	17:45	18:05	14	20	12	weekend	1002-1003	42	60
54	17.45-18.05	17:45	18:05	6	12	0	weekend	1002-1003	18	36
55	17.45-18.05	17:45	18:05	10	10	4	weekend	1002-1003	30	30
56	07.45-08.05	7:45	8:05	3	16	7	weekday	1002-1003	9	48
57	07.45-08.05	7:45	8:05	5	5	0	weekday	1002-1003	15	15
58	07.45-08.05	7:45	8:05	4	16	2	weekday	1002-1003	12	48
59	08.45-09.05	8:45	9:05	21	2	7	weekday	1002-1003	63	6
60	08.45-09.05	8:45	9:05	7	19	0	weekday	1002-1003	21	57
61	08.45-09.05	8:45	9:05	17	23	2	weekday	1002-1003	51	69
62	09.45-10.05	9:45	10:05	0	26	6	weekday	1002-1003	0	78

63	09.45-10.05	9:45	10:05	10	13	0	weekday	1002-1003	30	39
64	09.45-10.05	9:45	10:05	19	1	2	weekday	1002-1003	57	3
65	10.45-11.05	10:45	11:05	6	14	6	weekday	1002-1003	18	42
66	10.45-11.05	10:45	11:05	10	14	0	weekday	1002-1003	30	42
67	10.45-11.05	10:45	11:05	10	9	2	weekday	1002-1003	30	27
68	11.45-12.05	11:45	12:05	8	5	6	weekday	1002-1003	24	15
69	11.45-12.05	11:45	12:05	3	28	0	weekday	1002-1003	9	84
70	11.45-12.05	11:45	12:05	11	21	2	weekday	1002-1003	33	63
71	12.45-13.05	12:45	13:05	14	3	7	weekday	1002-1003	42	9
72	12.45-13.05	12:45	13:05	18	22	0	weekday	1002-1003	54	66
73	12.45-13.05	12:45	13:05	15	19	1	weekday	1002-1003	45	57
74	13.45-14.05	13:45	14:05	15	6	7	weekday	1002-1003	45	18
75	13.45-14.05	13:45	14:05	10	3	0	weekday	1002-1003	30	9
76	13.45-14.05	13:45	14:05	19	4	1	weekday	1002-1003	57	12
77	14.45-15.05	14:45	15:05	14	14	7	weekday	1002-1003	42	42
78	14.45-15.05	14:45	15:05	5	6	0	weekday	1002-1003	15	18
79	14.45-15.05	14:45	15:05	19	22	2	weekday	1002-1003	57	66
80	15.45-16.05	15:45	16:05	16	18	6	weekday	1002-1003	48	54
81	15.45-16.05	15:45	16:05	5	5	0	weekday	1002-1003	15	15
82	15.45-16.05	15:45	16:05	5	25	2	weekday	1002-1003	15	75
83	16.45-17.05	16:45	17:05	20	21	7	weekday	1002-1003	60	63
84	16.45-17.05	16:45	17:05	16	10	0	weekday	1002-1003	48	30
85	16.45-17.05	16:45	17:05	17	28	2	weekday	1002-1003	51	84
86	17.45-18.05	17:45	18:05	3	2	7	weekday	1002-1003	9	6
87	17.45-18.05	17:45	18:05	13	28	0	weekday	1002-1003	39	84
88	17.45-18.05	17:45	18:05	9	17	2	weekday	1002-1003	27	51
89	07.45-08.05	7:45	8:05	13	6	0	weekday	Akat	39	18
90	07.45-08.05	7:45	8:05	7	28	7	weekday	Akat	21	84
91	07.45-08.05	7:45	8:05	9	17	1	weekday	Akat	27	51
92	08.45-09.05	8:45	9:05	10	10	0	weekday	Akat	30	30
93	08.45-09.05	8:45	9:05	17	12	6	weekday	Akat	51	36
94	08.45-09.05	8:45	9:05	14	13	1	weekday	Akat	42	39

95	09.45-10.05	9:45	10:05	12	2	0	weekday	Akat	36	6
96	09.45-10.05	9:45	10:05	1	5	6	weekday	Akat	3	15
97	09.45-10.05	9:45	10:05	11	8	1	weekday	Akat	33	24
98	10.45-11.05	10:45	11:05	1	7	0	weekday	Akat	3	21
99	10.45-11.05	10:45	11:05	15	4	6	weekday	Akat	45	12
100	10.45-11.05	10:45	11:05	9	16	1	weekday	Akat	27	48
101	11.45-12.05	11:45	12:05	10	9	0	weekday	Akat	30	27
102	11.45-12.05	11:45	12:05	14	3	6	weekday	Akat	42	9
103	11.45-12.05	11:45	12:05	16	17	1	weekday	Akat	48	51
104	12.45-13.05	12:45	13:05	5	9	0	weekday	Akat	15	27
105	12.45-13.05	12:45	13:05	1	3	5	weekday	Akat	3	9
106	12.45-13.05	12:45	13:05	2	16	1	weekday	Akat	6	48
107	13.45-14.05	13:45	14:05	15	20	0	weekday	Akat	45	60
108	13.45-14.05	13:45	14:05	7	25	5	weekday	Akat	21	75
109	13.45-14.05	13:45	14:05	0	26	1	weekday	Akat	0	78
110	14.45-15.05	14:45	15:05	13	17	0	weekday	Akat	39	51
111	14.45-15.05	14:45	15:05	5	0	6	weekday	Akat	15	0
112	14.45-15.05	14:45	15:05	15	8	1	weekday	Akat	45	24
113	15.45-16.05	15:45	16:05	1	8	0	weekday	Akat	3	24
114	15.45-16.05	15:45	16:05	1	9	6	weekday	Akat	3	27
115	15.45-16.05	15:45	16:05	13	13	1	weekday	Akat	39	39
116	16.45-17.05	16:45	17:05	14	11	0	weekday	Akat	42	33
117	16.45-17.05	16:45	17:05	5	17	6	weekday	Akat	15	51
118	16.45-17.05	16:45	17:05	0	5	1	weekday	Akat	0	15
119	17.45-18.05	17:45	18:05	13	0	0	weekday	Akat	39	0
120	17.45-18.05	17:45	18:05	7	16	6	weekday	Akat	21	48
121	17.45-18.05	17:45	18:05	9	5	1	weekday	Akat	27	15
122	07.45-08.05	7:45	8:05	10	10	0	weekend	Akat	30	30
123	07.45-08.05	7:45	8:05	13	25	5	weekend	Akat	39	75
124	07.45-08.05	7:45	8:05	12	0	2	weekend	Akat	36	0
125	08.45-09.05	8:45	9:05	15	23	0	weekend	Akat	45	69
126	08.45-09.05	8:45	9:05	11	24	5	weekend	Akat	33	72

127	08.45-09.05	8:45	9:05	19	22	2	weekend	Akat	57	66
128	09.45-10.05	9:45	10:05	14	5	0	weekend	Akat	42	15
129	09.45-10.05	9:45	10:05	18	4	5	weekend	Akat	54	12
130	09.45-10.05	9:45	10:05	18	5	2	weekend	Akat	54	15
131	10.45-11.05	10:45	11:05	9	15	0	weekend	Akat	27	45
132	10.45-11.05	10:45	11:05	4	8	5	weekend	Akat	12	24
133	10.45-11.05	10:45	11:05	8	12	2	weekend	Akat	24	36
134	11.45-12.05	11:45	12:05	5	5	0	weekend	Akat	15	15
135	11.45-12.05	11:45	12:05	18	10	5	weekend	Akat	54	30
136	11.45-12.05	11:45	12:05	8	11	2	weekend	Akat	24	33
137	12.45-13.05	12:45	13:05	10	15	0	weekend	Akat	30	45
138	12.45-13.05	12:45	13:05	6	24	5	weekend	Akat	18	72
139	12.45-13.05	12:45	13:05	11	22	2	weekend	Akat	33	66
140	13.45-14.05	13:45	14:05	18	9	0	weekend	Akat	54	27
141	13.45-14.05	13:45	14:05	2	5	5	weekend	Akat	6	15
142	13.45-14.05	13:45	14:05	0	24	2	weekend	Akat	0	72
143	14.45-15.05	14:45	15:05	11	12	0	weekend	Akat	33	36
144	14.45-15.05	14:45	15:05	6	5	3	weekend	Akat	18	15
145	14.45-15.05	14:45	15:05	17	20	4	weekend	Akat	51	60
146	15.45-16.05	15:45	16:05	15	27	0	weekend	Akat	45	81
147	15.45-16.05	15:45	16:05	21	7	5	weekend	Akat	63	21
148	15.45-16.05	15:45	16:05	18	20	0	weekend	Akat	54	60
149	16.45-17.05	16:45	17:05	1	29	0	weekend	Akat	3	87
150	16.45-17.05	16:45	17:05	1	4	6	weekend	Akat	3	12
151	16.45-17.05	16:45	17:05	5	23	0	weekend	Akat	15	69
152	17.45-18.05	17:45	18:05	7	32	0	weekend	Akat	21	96
153	17.45-18.05	17:45	18:05	6	15	6	weekend	Akat	18	45
154	17.45-18.05	17:45	18:05	14	7	0	weekend	Akat	42	21
155	07.45-08.05	7:45	8:05	0	4	7	weekend	Av. Özdemir	0	12
156	08.45-09.05	8:45	9:05	0	25	7	weekend	Av. Özdemir	0	75
157	09.45-10.05	9:45	10:05	3	5	7	weekend	Av. Özdemir	9	15
158	10.45-11.05	10:45	11:05	0	0	7	weekend	Av. Özdemir	0	0

159	11.45-12.05	11:45	12:05	6	25	7	weekend	Av. Özdemir	18	75
160	12.45-13.05	12:45	13:05	0	5	7	weekend	Av. Özdemir	0	15
161	13.45-14.05	13:45	14:05	9	17	8	weekend	Av. Özdemir	27	51
162	14.45-15.05	14:45	15:05	3	16	6	weekend	Av. Özdemir	9	48
163	15.45-16.05	15:45	16:05	1	0	7	weekend	Av. Özdemir	3	0
164	16.45-17.05	16:45	17:05	0	18	6	weekend	Av. Özdemir	0	54
165	17.45-18.05	17:45	18:05	3	5	6	weekend	Av. Özdemir	9	15
166	07.45-08.05	7:45	8:05	1	9	8	weekday	Av. Özdemir	3	27
167	08.45-09.05	8:45	9:05	4	26	8	weekday	Av. Özdemir	12	78
168	09.45-10.05	9:45	10:05	1	0	10	weekday	Av. Özdemir	3	0
169	10.45-11.05	10:45	11:05	0	0	7	weekday	Av. Özdemir	0	0
170	11.45-12.05	11:45	12:05	0	3	6	weekday	Av. Özdemir	0	9
171	12.45-13.05	12:45	13:05	2	2	6	weekday	Av. Özdemir	6	6
172	13.45-14.05	13:45	14:05	3	18	6	weekday	Av. Özdemir	9	54
173	14.45-15.05	14:45	15:05	0	11	6	weekday	Av. Özdemir	0	33
174	15.45-16.05	15:45	16:05	4	0	6	weekday	Av. Özdemir	12	0
175	16.45-17.05	16:45	17:05	3	22	6	weekday	Av. Özdemir	9	66
176	17.45-18.05	17:45	18:05	5	11	7	weekday	Av. Özdemir	15	33