

Does Context Matter?

Understanding the Urban Design Requirements of Successful Neighborhood Parks

by

Sungduck Lee

A Dissertation Presented in Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy

Approved April 2013 by the  
Graduate Supervisory Committee:

Emily Talen, Chair  
Katherine Crewe  
Darren Petrucci

ARIZONA STATE UNIVERSITY

May 2013

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## ABSTRACT

Literature on the design and management of urban parks has been informed by empirical research on the value of public space in terms of economic value, public health, social, and environmental benefits. Although there is significant value in discussing these benefits, there has been a lack of understanding about the production of public space as a normative goal. Neighborhood parks have been recognized as one of the key urban public spaces that serve the social, economic, and environmental needs of adjacent neighborhoods. However, relevant studies mostly focus on the contribution of neighborhood parks as discrete space, instead of neighborhood parks as built spaces within the urban context.

This research provides a better understanding of the relationship between the context of surrounding neighborhoods and the success of neighborhood parks. The research addresses two major research questions. First, what are the major characteristics of the morphological context around neighborhood parks? Second, how do the characteristics of morphological context associate with the success of neighborhood parks? For the first question, the ‘context’ refers to the layout and configuration of urban form including blocks, parcels, and buildings; street network; pedestrian-oriented attributes; and property land uses. For the second question, the ‘success’ of neighborhood parks is defined by property/ violent crime rate. The study is based on a quarter mile buffer area around 150 neighborhood parks in the City of Chicago, Illinois.

The research employed factor and cluster analysis to develop a typology of neighborhood park contexts. Multiple regression analysis was conducted to identify the relationship between park morphological contexts and crime rate. Based on

understanding the dimensional structure of urban form elements, neighborhood park surroundings were classified into six categories. This study provided an alternative way of constructing public space typology based on surrounding urban form.

The findings of regression analysis revealed that variables associated with higher-density, permeability, and mixed-use development do not necessarily correlate with reduced property/ violent crime rates. However, some variables representing ‘traditional neighborhood’ characteristics were correlated with lower property/ violent crime rates. The study provides guidelines for urban design and physical planning strategies for neighborhood park development.

To my parents

## ACKNOWLEDGMENTS

This study would not have been possible without the guidance and encouragement from my mentor, Dr. Emily Talen. I am thankful for her advice and continuous support. I am really fortunate to have such an incredible mentor. I would like to thank my committee members, Professor Katherine Crewe and Professor Darren Petrucci for their insightful comments and involvement in my research. I would specially like to thank Professor Koschinsky for her valuable input and support for my work.

This journey would not be possible without the support from Dr. Kroelinger and Chantel Powers. I owe my gratitude to my friends in the PhD program, especially, Connie, Sohyun, Mimi, and Aparna. I am grateful to the Graduate College for the dissertation completion fellowship. I would also like to acknowledge the City of Chicago for help with providing GIS data for this research.

I would like to thank my dear friends Eundeok, Seunghoon, and Jungyun for their constant encouragement and believing in me. Finally, my heart is filled with gratitude to my family. I would have never made it this far without endless support from my parents. I also want to thank my brothers and sisters, Sewoong, Hyerim, Rahul and Runa for their patience and love. I am blessed to have a wonderful family! Thank you to Duri and Dolsun for enriching my life! A very special thank you to Tejas, for his unconditional support and love.

## TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ix
LIST OF FIGURES .....	x
CHAPTER	
1 INTRODUCTION.....	1
Background .....	1
Research questions and study objectives .....	3
Overview of Data and Methodology.....	5
Study Area.....	8
Organization of the Study .....	11
2 LITERATURE REVIEW.....	13
Introduction .....	13
Definition of Public Space in Urban Design and Planning .....	13
Diverse Perspectives for Designing Public Space .....	17
Morphological Aspect.....	17
Functional Aspect .....	20
Socio-Cultural Aspect.....	24
Political-Economic Aspect .....	25
Local/Global Context.....	25
Market Context .....	27
Regulatory Context .....	28
Public Space Typology .....	29

CHAPTER	Page
Morphological Aspect.....	29
Functional Aspect .....	35
Socio-Cultural Aspect.....	39
Politico-Economic Aspect .....	42
Value of Public Space.....	47
Neighborhood Scale Public Space.....	50
Crime and Public Space.....	51
Summary .....	57
<b>3 MORPHOLOGICAL CONTEXT OF NEIGHBORHOOD PARKS .....</b>	<b>59</b>
Introduction .....	59
Variables Associated with Urban Form .....	59
Developing Measures of Neighborhood Park Context.....	61
Blocks, Parcels, and Buildings .....	62
Street Network .....	64
Pedestrian-Oriented Attributes .....	65
Property Land Uses.....	65
Factor Analysis.....	67
Description of Neighborhood Park Context.....	70
Summary .....	71
<b>4 TYPOLOGY OF NEIGHBORHOOD PARK CONTEXT .....</b>	<b>72</b>
Introduction .....	72
Cluster Analysis .....	72



CHAPTER	Page
Classification of Park Context .....	75
Visual Presentation of Park Context Typology .....	78
Cluster 1 .....	78
Cluster 2 .....	82
Cluster 3 .....	82
Cluster 4 .....	83
Cluster 5 .....	86
Cluster 6 .....	86
Summary .....	88
<b>5 SUCCESS OF NEIGHBORHOOD PARKS .....</b>	<b>90</b>
Introduction .....	90
Variables for Multiple Regression Analysis .....	90
Control Variables .....	90
Dependent Variables .....	91
Independent Variables .....	92
Multiple Regression Analysis: Results and Discussion .....	93
Factor Scores and Property Crime .....	93
Factor Scores and Violent Crime .....	94
Urban Form Variables and Property Crime .....	96
Urban Form Variables and Violent Crime .....	97
Summary .....	98
<b>6 CONCLUSIONS .....</b>	<b>100</b>

CHAPTER	Page
Overview .....	100
Key Findings and Insights .....	101
Limitations of the Study .....	109
Recommendations for Future Research .....	109
REFERENCES .....	111
APPENDIX	
A DEFINITIONS OF PARK CLASSIFICATION IN THE CITY OF CHICAGO.....	119
B ADDITIONAL DEFINITIONS OF PUBLIC SPACE TYPOLOGIES .....	121

## LIST OF TABLES

Table		Page
1.	Research questions, methods and justification .....	7
2.	Four Major Aspects of Public Space Typology .....	47
3.	Descriptive Statistics for 23 Explanatory Variables.....	62
4.	Total Variance Explained.....	68
5.	Rotated Component Matrix.....	69
6.	Agglomeration Schedule .....	73
7.	Final Cluster Centers .....	74
8.	Number of Cases in each Cluster .....	75
9.	Descriptive Statistics for six Examples .....	79
10.	Descriptive Statistics for Control and Dependent Variables.....	91
11.	Results of multiple regression analysis: factor scores and property crime....	93
12.	Results of multiple regression analysis: factor scores and violent crime .....	95
13.	Results of multiple regression analysis: urban form variables and property crime .....	97
14.	Results of multiple regression analysis: urban form variables and violent crime .....	98

## LIST OF FIGURES

Figure	Page
1. Two main approaches of public space research .....	2
2. Conceptual framework .....	5
3. Study area: locations of 150 neighborhood parks and ¼ mile buffer areas .....	10
4. Four aspects of public space design and key elements .....	29
5. ‘Figure-ground’ diagram of Parma and Saint-Die .....	34
6. Urban park research: the relationship between different factors and benefits.	50
7. Theoretical framework .....	58
8. Six different clusters: locations of 150 neighborhood parks and ¼ mile buffer areas .....	77
9. Bauler Park as an example of cluster 1 .....	80
10. Brooks Park as an example of cluster 2 .....	81
11. Langley Park as an example of cluster 3 .....	84
12. Lake Shore Park and Seneca Park as examples of cluster 4 .....	85
13. Durso Park as an example of cluster 5 .....	87
14. Hurley Park as an example of cluster 6 .....	88

## Chapter 1

### INTRODUCTION

#### BACKGROUND

*“People do not use city open space just because it is there and because city planners or designers wish they would”* (Jacobs, 1961, p. 90).

In the urban planning and design field, public spaces have been regarded as a place for cultural, political, and economical activities within the social life of cities. Research on public space most often discusses the positive impact of public space on economic value, health, social goals, and environmental benefits (Cutts, Darby, Boone, & Brewis, 2009; Kaczyski, Potwarka, & Saelens, 2008; Sallis & Glanz, 2006; Phillips, 2000; Taylor & Harrell, 1999; Forsyth & Musacchio, 2005). These studies are an indication of understanding public space as ‘a means to social and political ends’ that would bring various benefits. Although there is significant value in discussing these benefits, there has been a lack of understanding about the production of public space as ‘a normative goal’ (Schmidt & Nemeth, 2010).

Studies on public space have heavily focused on the notion of public as ‘social life’ and interaction, rather than physical, built space within an environmental setting. For example, critics concerned with the loss of public space often refer to the loss of social interaction (social life) within public space and seldom refers to the loss of physical space itself (Kohn, 2004).

To accommodate and encourage social interaction within public spaces, as well as to obtain economic, social, health and environmental benefits, the ‘physical’ creation of public space is fundamental (Blomley, 2001). Studies of such benefits tend to focus on

public spaces as discrete spaces. These studies disregard the context *around* public spaces and focus more on the layout (physical park design) and facilities (playground, public furniture, recreational center, etc) within the space. While Loukaitous-Sideris (1995) expanded the scope of neighborhood park research beyond park boundaries to include socio-cultural context, this was limited to a consideration of facilities and layout within parks as physical characteristics for park design (Loukaitous-Sideris, 1995).

This dissertation expands the scope of park study beyond the park site by 1) considering the relationship between neighborhood parks and the morphological structure around them; and 2) investigating how the morphological context of parks – i.e., the physical characteristics of the surrounding neighborhood – relates to the success of neighborhood parks. Figure 1 illustrates the two main approaches of public space research: public space as discrete space and public space within the urban context.

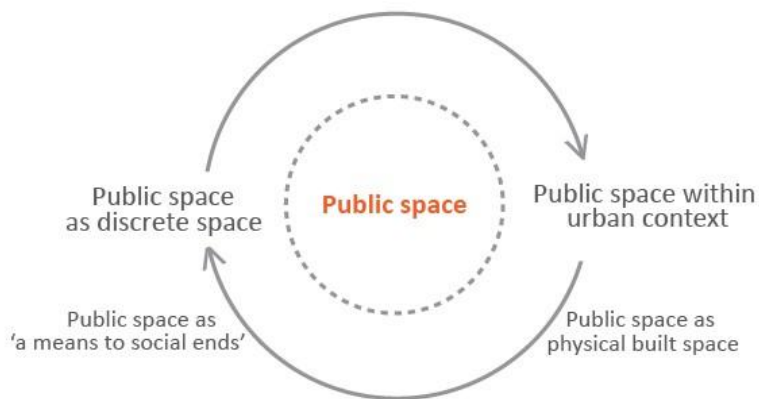


Figure 1. Two main approaches of public space research.

## RESEARCH QUESTIONS AND STUDY OBJECTIVES

Neighborhood parks are essential public open spaces, combining informal and passive activity with recreational and social purpose. While literature on neighborhood parks has often emphasized the benefits of parks on adjacent neighborhoods, there has been little focus on evaluating the context of neighborhood parks in physical terms: how can context be measured, and how does context contribute to success? Figure 2 illustrates the conceptual diagram for this research highlighting explanatory and dependent variables. The following two research questions, along with associated sub-questions, are addressed in this study:

*First, what are the major characteristics of the morphological context around neighborhood parks?*

- a. What is the relationship among the different characteristics of morphological contexts around neighborhood parks?
- b. How can these characteristics of morphological context be used to construct a typology of context for neighborhood parks?

**Justification.** This study advocates the inclusion of urban form surroundings in park research. It goes beyond the park boundary and intends to include physical characteristics of park surroundings. The goal of this research question is to acknowledge the importance of the urban context surrounding parks and to provide a methodology to measure and categorize urban form characteristics around neighborhood parks. By developing a typology of surrounding context, this study aims to develop an in-depth understanding of urban context and the inter-relationships between various urban form measures.

The current park classification developed by the Chicago Park District is based on three major criteria: 1) size of parks; 2) facilities within parks; and 3) the primary population served from the parks. This classification system does not include urban context surrounding neighborhood parks. The typology developed in this study will provide an alternative way of categorizing neighborhood parks based on the surrounding urban context. This would assist city planners, and park and recreation authorities to effectively manage and determine new locations for neighborhood parks based on urban form.

*Second, how do the characteristics of morphological context associate with the success of neighborhood parks?*

- a. Are there any associations between morphological context and the property/violent crime rate of neighborhood park surroundings?
- b. If yes, what is the nature of the relationship between morphological context and the property/violent crime rate of neighborhood park surroundings?

**Justification.** Urban form and crime related studies (Armitage et al., 2010; Schneider & Kitchen, 2007; Ellen & O'Reagan, 2009; Kinney et al., 2008; Browning et al., 2010) have focused on understanding morphological characteristics at a neighborhood scale. There has been a lack of studies specifically focusing on urban form surrounding neighborhood parks and its effect on crime rate. The goal of this research question was to understand the morphological characteristics of neighborhood park surroundings and its relationships to lower/higher crime rate. Investigating variables related to lower crime rate would assist urban designers and practitioners to develop appropriate urban design



guidelines for neighborhood parks. It will also shed light on measures on a broadened meaning of park “success.”

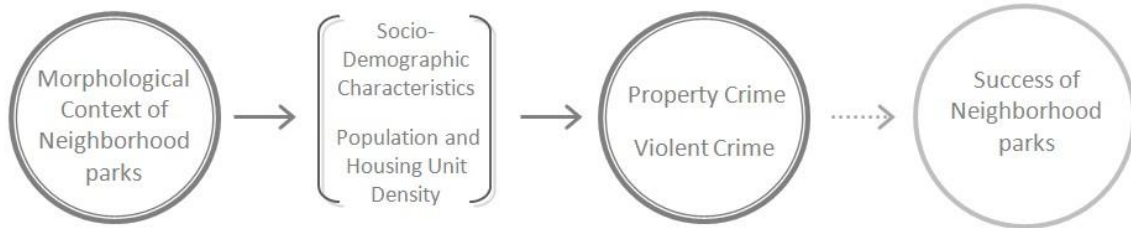


Figure 2. Conceptual framework.

The ‘context’ in this research refers to the layout and configuration of urban form around neighborhood parks. The term ‘urban form’ refers to the physical structure and pattern of urban elements including buildings, lots, blocks, streets, and intersections (Talen, 2005). The ‘success’ of neighborhood parks is determined by property and violent crime rate. This study employs a case study approach for a set of neighborhood parks in Chicago, Illinois.

## OVERVIEW OF DATA AND METHODOLOGY

This research is divided into two major phases. The first phase focused on developing an in-depth understanding of the major characteristics of morphological context around neighborhood parks in the City of Chicago. Based on a set of parcel-level urban form measures, factor analysis was conducted to understand the dimensional structure of 23 features. Cluster analysis was then employed to develop a typology of neighborhood park contexts. In the second phase, the association between morphological

context and property/ violent crime rates of neighborhood park surroundings was examined using multiple regression analysis.

A GIS-based dataset associated with morphological context was collected for this study. 23 major attributes related to 1) blocks, parcels, and buildings, 2) street network, 3) pedestrian-oriented attributes, and 4) property land uses were collected for 150 neighborhood parks in the City of Chicago. Using Geographic Information System (GIS), urban form measures were collected within a ¼ mile distance from each park. The following table summarizes the key research questions for this study, the methods for data analysis and the justification for each method.

Table 1

*Research questions, methods and justification*

Research Questions	Methods	Justification
1. What are the major characteristics of the morphological context around neighborhood parks?		
a. What is the relationship among the different characteristics of morphological contexts around neighborhood parks?	Factor Analysis,	Developing measures of neighborhood park contexts and understanding the dimensional structure of various urban form measures.
b. How can these characteristics of morphological context be used to construct a typology of context for neighborhood parks?	Cluster Analysis, Mapping Analysis	Creating a typology of urban form context for neighborhood parks, classifying groups of neighborhood park context that are relatively homogeneous within themselves and heterogeneous between each other, and mapping examples of neighborhood park contexts for each category.
2. How do the characteristics of morphological context associate with the success of neighborhood parks?		
a. Are there any associations between morphological context and the property/ violent crime rate of neighborhood park surroundings?	Multiple Regression Analysis	Exploring the relationship between the characteristics of morphological context and the property/ violent crime rate of neighborhood park surroundings.
b. If yes, what is the nature of the relationship between morphological context and the property/ violent crime rate of neighborhood park surroundings?	Multiple Regression Analysis	Understanding the morphological characteristics of neighborhood park surroundings related to lower/ higher crime rate.

## **STUDY AREA**

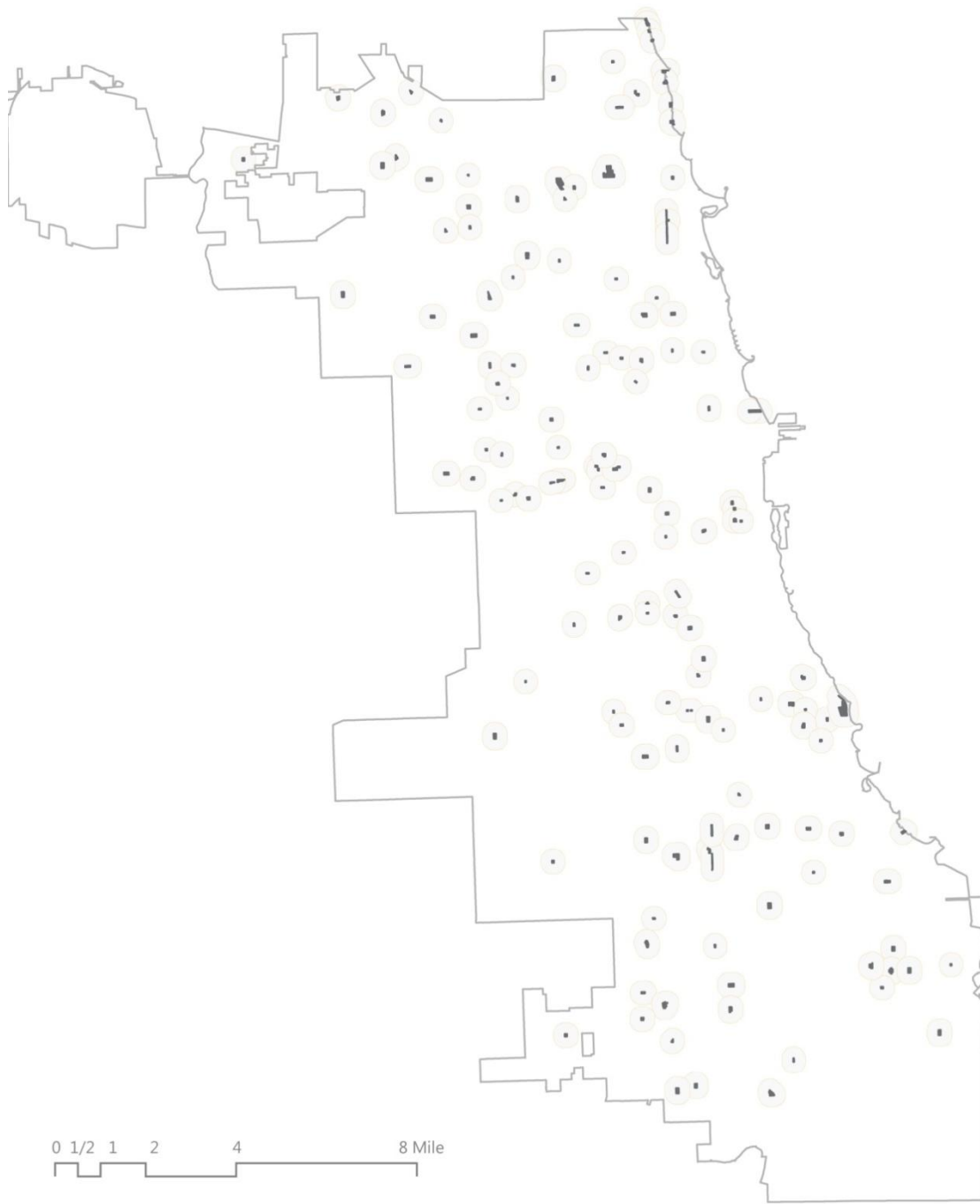
This research includes a case study to examine and understand the nature of neighborhood park context, as well as to demonstrate a methodology for classifying the surrounding context of neighborhood parks. 23 major attributes associated with morphological context, such as patterns of buildings, blocks, streets, and land use, were collected for 150 neighborhood parks in the City of Chicago. Data associated with the urban form was collected within a ¼ mile distance from each park.

The City of Chicago is the third largest city in the U.S. with a population of approximately 2.7 million (as of July 1, 2011, as estimated by the U.S. Census Bureau). Chicago, Illinois is located in the upper mid-western region of the US, the southeastern edge of Lake Michigan, with an area of 227 square miles (588 km<sup>2</sup>) (U.S. Census Bureau, 2011).

The City of Chicago has over 570 parks accounting for approximately 7700 acres. These public parks have been classified by the Chicago Park District based on three major criteria: 1) size of parks; 2) facilities within parks; and 3) the primary population served from the parks. This classification does not include consideration of surrounding neighborhood physical context. Classifying parks based on size and distance is a fairly simplistic way of classifying public space. Based on Definitions of Park Classifications (Chicago Park District, 2010), there are eight different types of public parks (Appendix A). Neighborhood parks are defined as “a park that is generally ½ acre to 5 acres with playground apparatus. The park may contain other indoor or outdoor recreational facilities. The primary service population for a neighborhood park lives within ¼ mile” (Chicago Park District, 2010).

National Recreation and Park Association (NRPA) provides a 'public park and open space classification scheme' which recommends the ideal location and size of various types of open space relative to the surrounding population. According to NRPA, neighborhood park is a walking distance of a ¼ to a ½ miles (0.4 -0.8km), uninterrupted by non-residential roads or other physical barriers. The minimum size of neighborhood park is from 5 acres (2ha) to optimal 7 to 10 acres (2.8 to 4.1 ha), serving 2,000 to 10,000 population (Mertes & Hall, 1995). Unfortunately, these simplistic and idealistic definitions of neighborhood park do not include consideration of surrounding physical form.

There are 154 neighborhood parks in the City of Chicago (based on definition by Chicago Park District). 150 neighborhood parks were chosen for this study. Four neighborhood parks were excluded as their ¼ mile boundaries were not within the Chicago city limit. 23 major attributes associated with urban form were collected within ¼ mile distance from each neighborhood park boundary. Figure 3 shows the locations of 150 neighborhood parks and the surrounding ¼ mile study area in the City of Chicago.



*Figure 3.* Study area: locations of 150 neighborhood parks and 1/4 mile buffer areas.

## **ORGANIZATION OF THE STUDY**

This dissertation presents a comprehensive literature review, a morphological analysis of park context, and a regression analysis of the factors contributing to neighborhood success. Chapter 2, the literature review, presents key definitions of public space from the urban design and planning field. It includes a review of diverse perspectives in designing public space, and typologies of public space from morphological, functional, socio-cultural, and political-economic perspectives. Chapter 2 also reviews literature on value of public space, neighborhood scale public space, and crime related to physical environment.

Following the literature review, Chapter 3 delves into specifics on morphological measurement. It begins with a discussion of the major characteristics of the morphological context around neighborhood parks. This chapter begins with a detailed description of data collection and measurement for 23 major attributes associated with urban form. Chapter 3 illustrates how 23 attributes are related among each other by conducting factor analysis. Based on understanding the relationship *among 23 attributes* in Chapter 3, the following chapter provides the relationship among *150 neighborhood park contexts*.

Chapter 4 describes how urban form characteristics of neighborhood park surroundings can be used to construct a typology of park context. This chapter presents the process of classifying context of neighborhood parks by conducting cluster analysis. Chapter 4 also illustrates different categories of park context and visualizes examples of each category.

Chapter 5 explores the relationship between the characteristics of morphological context and success of neighborhood parks by conducting multiple regression analysis. This chapter presents a list of variables and its interpretations followed by results and discussion from the regression analysis.

Finally, Chapter 6 summarizes the key findings, insights and limitations of this research. This chapter proposes future research directions of this research by providing a strategy for evaluating and measuring morphological context.



## **Chapter 2**

### **LITERATURE REVIEW**

#### **INTRODUCTION**

The concept of public space has been studied from various perspectives in urban planning and design. While there are many empirical evidences on the diverse benefits of public space, most studies have failed to understand its complex nature from an urban morphological and contextual perspective. A comprehensive literature review of public space will help to analyze and identify its complex characteristics and understand the study of public space within an urban context. This chapter reviews: 1) definitions of public space 2) diverse perspectives of designing public space 3) public space typology 4) crime and public space literature.

#### **DEFINITION OF PUBLIC SPACE IN URBAN DESIGN AND PLANNING**

Generally ‘public’ is defined as the opposite of ‘private’. According to the Oxford Dictionary (2010), the adjective form of public means: 1) of or concerning the people as a whole: open to or shared by all the people of an area or country; of or provided by the government rather than an independent, commercial company; of or involved in the affairs of the community, especially in government; known to many people, famous 2) done, perceived, or existing in open view. Public in its noun form means ordinary people in general, the community: a section of the community having a particular interest or connection; the people who watch or are interested in an artist, writer, or performer (Oxford Dictionary, 2010). In broad terms: “Public involves relatively open and universal social contexts, in contrast to private, which is intimate, familiar, shielded, controlled by

the individual, and shared only with family and friends” (Loukaitous-Sideris & Banerjee, 1998).

According to these definitions, it seems that the generalized definition of public space represents a wide range of possible conditions. *Public space* concerns *all* the members of a community and is used and shared by *all* the members of a community for *multi-functional* purpose. Urban public spaces have usually been “multipurpose spaces distinguishable from, and mediating between, the demarcated territories of households” (Madanipour, 1999).

The public realm, as a ‘political stage’, involves and symbolizes activities which emphasize citizenship, social relations and public participation. According to Hannah Arendt (1958), a city has a conception of a self-governing political community. She discussed three criteria of the public realm: 1. “By outlasting mortal lives, it memorialized the society and thereby conveyed a sense of its history.” 2. “It is an arena for diverse groups of peoples to engage in debate and oppositional struggles.” 3. “It is accessible to, and used by all” (Arendt, 1958). In a similar manner, Habermas (1962) characterized the public sphere as “a milieu where self-reflexive and rational social individuals come together to fashion binding collective decisions, which govern different facets of society” (Gulick, 1998). He argued that in the Bourgeois society the public sphere was well developed in various social spaces, such as coffee shops and salons, in addition to the circulation of newspapers and periodicals. According to Habermas, unmediated interaction among people was vital for advancing social justice in a true democracy (Habermas, 1962).

Although Habermas's theory offered "potential solutions to the growing fissures in urban society" (Schmidt & Nemeth, 2010), in contemporary society a series of separate but overlapping public spheres is more persuasive rather than a homogeneous 'unitary' public sphere. Thompson (1993) argued that Habermas's definition of the public sphere was based on an assumption that "individuals come together in a shared locale and engage in dialogue with one another, as equal participants in a face-to-face conversation". Fraser (1990) observed: "Habermas stops short of developing a new, post-bourgeois model of the public sphere" (Fraser, 1990, p. 58). She criticized Habermas's bourgeois public realm by suggesting a modern concept of the public sphere, and emphasized the significance of understanding various socio-economic, gender and ethnic groups involved in it (Fraser, 1990).

Boyer (1993) argued that "any contemporary references to the 'public' are by nature a universalizing construct that assumes a collective whole, while in reality the public is fragmented into marginalized groups many of whom have no voice, position or representation in the public sphere" (Boyer, 1993, p. 118). On similar lines, Young (1990) proposed a democratic ideal that emphasized diversity and difference. According to her, "socially just outcomes could only be achieved by creating universally inclusive spaces that embraced the needs and desires of a diverse citizenry" (Young, 1990; mentioned in Schmidt & Nemeth, 2010). She believed that social interaction among individuals and groups could be encouraged by making them visible in *truly public spaces* to express their diverse perspectives to the city.

In the modern era, as Boyer (1996) argued, "private interests and commercial concerns have invaded public option, and in place of the 'public sphere' a fictitious and

‘universal’ public has been constructed.” As the meaning of the public sphere has changed to reflect a more democratic conception, its relation to public spaces has also changed. As public institutions have become more dispersed, public space no longer reflects the coherent power of specific groups. Instead it continues to be redefined by people and their demands and values that compete with each other within the political arena of a city. In modern America, especially, urban public space has been defined as a place for “continuous production of symbols and spaces that frame and give meaning” to contemporary culture which means “ethnic competition, racial change, and environmental renewal and decay” (Zukin, 1995).

In the field of urban design and planning, urban parks have been discussed as one of the key urban public spaces. The traditional view defines urban parks as open spaces for providing and operating recreational facilities and programs (Walker, 2004). However, recently there has been increasing support for an alternative viewpoint that goes beyond the traditional understanding of parks. This viewpoint emphasizes the function of an urban park as a ‘true public space’ where it does not attract people only for a specific event at a specific time. Pincetl and Gearin (2005) emphasize the significance of keeping urban parks populated with informal and unprogrammed public activities. Urban parks should attempt to create accessibility for a diverse range of people while generating unscheduled and unstructured public activities.

Competing demands on public spaces and structural changes in the complex urban context call for an inclusion of varied viewpoints from different stakeholders (actors) in urban design and development. It is necessary for urban designers to take into account a wide range of considerations with a multi-dimensional viewpoint, which

includes design, socio-cultural and politico- economic aspects of urban design. The following section discusses these diverse aspects for designing public spaces.

## **DIVERSE PERSPECTIVES FOR DESIGNING PUBLIC SPACE**

As stated in the previous section, it is important to consider urban design from a multi-dimensional viewpoint. In complex urban environments, one of the major roles of urban designers is accommodating the complex demands on public space not only by *designing* physical space but also by considering the various stakeholders (actors) involved in the urban design and development process. To incorporate a multi-dimensional viewpoint, it is necessary to acknowledge the diverse aspects of urban design.

Based on the approach developed in the book *Public Places, Urban Spaces: The Dimensions of Urban Design* (Carmona et al., 2003), this section considers the context of urban design (the politico-economic aspect) and its three major dimensions (the morphological, the functional and the socio-cultural). The following section further elaborates these aspects in reference to the design where the aspects are differentiated to facilitate in-depth understanding. It is understood that in reality these dimensions overlap and work together (Carmona, Heath, Oc, & Tiesdell, 2003).

**Morphological aspect.** This aspect of urban design refers to the layout and configuration of urban form and space. Morphologically there are two types of urban space systems: ‘traditional’ and ‘modernist’. ‘Traditional’ urban space is defined by buildings. Buildings are organized in urban blocks that define ‘streets’ and ‘squares.’

‘Modernist’ urban space consists of buildings which are free-standing on landscape settings (Carmona, Heath, Oc, & Tiesdell, 2003).

The traditional conception was more dominant during the early twentieth century and was supported by Camilo Sitte (1889). A century ago, Sitte discussed the organization of public spaces in cities. Critiquing the empty public space surrounded by streets, he stressed the significance of enclosed public space. Sitte (1889) emphasized the strong relationship between public spaces and the surrounding buildings.

The modernist conception, however, had an opposite view to Sitte’s idea of enclosure in public space. Within the concept of the functional city, cars and highways across urban space took priority over the relationship between open spaces and the buildings around them. The modernists had a tendency towards vast open spaces that provided a setting for the flexible location of buildings. Rather than paying attention to the historically created public spaces, they would reshape urban space by creating large quantities of open space.

The urban morphological perspective – the study of form and shape of a settlement – is significant in terms of understanding local patterns of development and processes of changes. Conzen (1969) discussed several key elements to analyze an urban settlement: building structures, plot patterns and street patterns. Building structures, or their *block-plans*, could be defined by the area occupied by a building and defined on the ground by the lines of its containing walls. Plot patterns and their aggregation in *street-blocks* are areas unoccupied by streets and bounded by street-lines. Each urban plot represents a group of contiguous land parcels and a unit of land uses. Street patterns and their arrangement in a *street-system* refer to the open space bounded by street-lines and

used for surface traffic. The arrangement of contiguous and interdependent streets represents the street-system, which means the layout of urban blocks and public space network (Conzen, 1969).

‘Street pattern’ established one of the most significant urban design qualities of permeability, which means “the extent to which an environment allows a choice of routes both through and within it”. In relation to permeability, ‘accessibility’ is defined as the product of an interaction between an individual and the street-system. There are two types of permeability: ‘visual’ and ‘physical’. In some urban spaces there is ‘visual’ permeability but no ‘physical’ permeability (and vice versa). Small-sized street-blocks with a fine urban grain, compared with larger blocks with a coarse urban grain, tend to offer many different ways of getting through an environment – creating more permeability in both visual and physical ways. As Jane Jacobs (1961) mentioned, small-sized blocks with ‘frequent’ streets are valuable in terms of generating permeability and accessibility in an urban space (Carmona, Heath, Oc, & Tiesdell, 2003).

The street pattern also establishes a public space network in an urban environment. The public space network not only provides accesses to private property but also provides the overlap between ‘movement’ space and ‘social’ space. It encourages pedestrian movement as well as interpersonal transactions on streets which are defined as social spaces (Carmona, Heath, Oc, & Tiesdell, 2003).

In terms of the morphological structure of public space, there has been a major transformation from ‘traditional’ to ‘modernist’; ‘from buildings as constituent elements in urban blocks towards buildings as freestanding pavilions in amorphous space.’ According to modernist functionalism, the convenience of a building’s internal spaces

was the major determinant of its external form. Responding only to functional requirements, exterior building forms and its relationship to public space became a by-product of its internal space design. Modernist urban space was intended to flow freely around buildings rather than be contained by buildings (Carmona, Heath, Oc, & Tiesdell, 2003).

Public spaces designed by modern architects resulted in leftover spaces with little connection to the other public spaces of the city. It resulted in increasing concern about underused large-scale public spaces, and the concept of returning to the historical notions of public space. As Sitte pointed out, the creation of a spatial enclosure became one of the major prerequisites of designing public space (Madanipour, 1999). Lynch (1960), for example, discussed public spaces as nodes and landmarks which became a means for navigating cities. Krier (1979) discussed urban public space by analyzing the relationship between open spaces and the surrounding elements (e.g., building façades) that could affect how they were framed. To create a strong relationship between a public space and the surrounding buildings, lively and active edges and small-scale mixed land uses were seen as important conditions. This created ‘positive urban space’ – space enclosed by buildings rather than leftover spaces after the construction of buildings.

**Functional aspect.** The functional aspect of urban design essentially deals with understanding how urban places work. There are two approaches that involve the functional dimension of public space: ‘social usage’ and ‘visual.’ The ‘social usage’ approach focuses on the functioning of the environment in terms of how people use space it, while the ‘visual’ approach considers aesthetic and technical criteria such as the



distribution of building uses and patterns of mobility (Carmona, Heath, Oc, & Tiesdell, 2003).

To understand the ‘social usage’ of urban places from a human perspective, the role of the user-centered approach has been emphasized. William H. Whyte (1980) and Jan Gehl (1987) strongly advocated a user-centered approach as a way of comprehensively understanding urban places. They have demonstrated how people use public spaces and provided direction for creating livable and viable spaces.

Whyte (1980), in his book *The Social Life of Small Urban Spaces*, used observational techniques to understand user behavior within public spaces such as streets, squares and urban parks. He explored different aspects of public spaces that attract and engage people, and focused on both the interaction of users with each other and the physical setting of that space. He emphasized the need for a user-centered approach in the urban design and planning decision-making process (Whyte, 1980). Jan Gehl, in *Life Between Buildings* (1987), focused strongly on the facilitation of public life in the spaces between buildings. He emphasized the connectivity between the physical form, function and cultural activities of outdoor spaces while acknowledging that public activity between buildings is essential to urban outdoor life. In agreement with Whyte, Gehl also advocated the use of the user-centered approach as a way of understanding public life (Gehl, 1987).

Carr *et al.* (1992) discussed the ‘responsive’ characteristics of public space based on the relationship between activities and spaces as well as the use and design of public space. Carr *et al.* (1992) identified five primary needs in public space: comfort,

relaxation, passive engagement with the environment, active engagement with the environment and discovery. They define these needs in the following way:

1) Comfort is a prerequisite for the success of public spaces. The amount of time spent in a public space is an indicator of the sense of comfort. The dimension of comfort includes environmental factors, physical, social and psychological comfort. A sense of security and the physical design of that space can also affect this sense of comfort. 2) Relaxation refers to both physical and psychological comfort; this includes comfort from immediate surroundings such as natural elements and separation from traffic. 3) Passive engagement means an encounter with the physical setting without active involvement such as sitting and people-watching. Passive engagement with the environment can lead to a sense of relaxation. 4) Active engagement involves more direct engagement with a place and the people within it. 5) Discovery refers to people's desire for new experiences in public spaces (Carr, Francis, Rivlin, & Stone, 1992).

Modernist urban design based on the functional dimension focuses more on the 'visual' approach rather than the 'social usage' approach. However this Modernist approach, such as the functional zoning system and regulation of land uses have been criticized for homogeneity and mono-functional characteristics.

Jane Jacobs, for example, argued that the overlapping and interweaving of activities are significant in terms of creating vitality. She outlined four basic conditions for creating diversity. According to her, urban places should: 1) serve more than one primary function, 2) be surrounded by small blocks to encourage frequent and convenient access, 3) be surrounded by various types of buildings, 4) have a sufficiently dense concentration of people (Jacobs, 1961). As Llewelyn-Davies mentioned, in urban design

it is important to consider mixed-use development as it provides the following benefits: greater urban vitality and street life, greater opportunities for social interaction, socially diverse communities, and a greater feeling of safety through more ‘eyes on the street’ (Llewelyn-Davies, 2002).

The issue of density is significant for the functional dimension of urban design. Especially the issue of residential density, in particular, has been discussed as a way of achieving more sustainable and compact cities. According to Llewelyn-Davies (2002), higher density development brings benefits to the urban environment such as: 1) social benefits by encouraging positive interaction and diversity, 2) economic benefits by enhancing the economic viability of development, 3) transport benefits through supporting public transportation and reducing car travel, 4) environmental benefits through increasing energy efficiency, and maintaining public open space (Llewelyn-Davies, 2002).

Public space as a setting for diverse activities is also significant. On a broader scale, building a network among areas of public open spaces is crucial in terms of creating opportunities for people’s movement and activity. At a local scale, it is important to set a minimum provision of public space for community focused activities. This provision should be locally accessible and within easy walking distance from the residential areas. To achieve these goals, the development of public space should be an integrated and important part of urban design vision; it should not be considered as ‘space left over after planning’ (Carmona, Heath, Oc, & Tiesdell, 2003).

**Socio-cultural aspect.** This aspect of urban design considers the relationship between physical environment (urban space) and social/cultural activities (people and society). In terms of public space, it also implies the interrelated notion between ‘public space’ and ‘public life’. From a socio-cultural perspective, experts have discussed varied positions on the degree of environmental influence on human behavior, which include: 1) Environmental determinism which claims that the physical environment has a determining influence on human behavior by assuming environment-people interaction as a one-way process, 2) Environmental possibilism which argues that people choose from the environmental opportunities available to them, and 3) Environmental probabilmism which declares that people prefer some particular environments more than others in a given physical setting. The last two perspectives (environmental possibilism and environmental probabilmism) are based on the agreement that environmental-people interaction is not a one-way but a two-way process (Carmona, Heath, Oc, & Tiesdell, 2003).

Ideally the socio-cultural function of a public realm involves major aspects such as: a forum for political action and representation; a ‘neutral’ or common ground for social interaction, intermingling and communication; a stage for social learning, personal development and information exchange (Loukaitous-Sideris & Banerjee, 1998). Although it is hard to completely achieve these functional aspects in practice this provides an idea of the extent to which the public realm is lacking in accomplishing this ideal condition.

The concept of the public realm consists of ‘physical’ and ‘social’ facets. ‘Physical’ public realm means those urban spaces and environmental settings that support public life (either public or private-owned). ‘Socio-cultural’ public realm refers to the

activities and events within those spaces (Carmona, Heath, Oc, & Tiesdell, 2003). In this sense, public space encompasses not only streets, squares and urban open spaces but also ‘third places’ that support informal public life such as street cafes, coffee shops, bookstores, bars, hair salons and other similar gathering spots. This concept of the ‘third place’ would provide a way of understanding informal public life and its relation to the public realm (Oldenburg, 1999).

In the discourse of public realm, in addition to the issues of physical space, issues of access and accessibility have been significantly considered. In a broad and ideal definition, ‘physical’ public realm denotes all the spaces that the public can access. However it is often difficult to define ‘physical’ public space since in reality not all public spaces are accessible to everyone. The concept of ‘quasi-public’ space, such as privately-owned, managed ‘public’ space and ‘privatized’ public space, too has adversely affected the precise definition of public space. However, Banerjee (2001) argued that in the urban design process it is important to focus on the broader concept of ‘public life’ rather than on the narrow concept of ‘physical’ public space. In urban design within the public realm, ‘social’ spaces should support socio-cultural interaction and informal public life (Banerjee, 2001).

**Political-economic aspect.** This deals with the broad contexts that constrains and informs urban design practice. The politico-economic aspect includes local, global, market and regulatory contexts that urban design practitioners should accept as a given. Typically these contexts are outside the scope of an urban designer’s control.

**Local/global context.** All urban design projects, regardless of the project scale, are embedded within and contribute to their local context. For example, a site of an urban

design project that involves a public realm strategy could be a part of the local context. An urban development project considers the context that includes the project site as well as the immediate surroundings of the site boundary. As Francis Tibbalds (1992) emphasized, “Places matter most,” which means “the creation of places through good design is more important than the design of the individual buildings of which they are composed” (Carmona & Tiesdell, 2007). Each urban place has its own unique quality that provides the most significant design resource for an urban designer within complex urban contexts (Tibbalds, 1992).

The urban environment has become more complex as economic, social, cultural, and technological contexts change continuously. These contextual changes have increased in response to certain development pressures which include globalization, standardization of building types and styles, loss of local traditions and homogenizing regulation of the built environment. These pressures are present within both local and global dimensions (Carmona, Heath, Oc, & Tiesdell, 2003).

Practices of designing urban places are embedded not only in their local contexts but also in the global context. Within the urban design discourse, the global context has often been approached from an environmental perspective in response to the need for environmental sustainability. From an environmental perspective, the concept of sustainable development includes economic and social sustainability. For example, in addition to the environmental impact, social impact and long-term economic viability should be equally considered in the practice of urban design.

The concept of sustainable urban design aims to reduce the total environmental footprint as well as achieve self-sufficient development. Barton et al. (1995) discussed a

way of accomplishing sustainable and self-sufficient development. They understood environmental developments as a series of ‘spheres of influence’, which consist of individual buildings, neighborhoods, cities, countries and the world (from inner sphere to outer sphere). According to Barton et al. (1995), reducing the impact of the inner spheres on the outer spheres would increase the level of autonomy which eventually results in effects on the overall environmental system.

***Market context.*** Urban design practices occur within a context of market economies based on fundamental forces of supply and demand. In market economies there has been a complex overlap between the public and private sectors. Many decisions for public consequences are often made by the private sector; these decision--making processes are usually mediated by policy and regulatory systems. It is important that urban design practitioners understand urban place development projects within the context of market economies.

Profit driven market economies are often characterized by capitalism strategies. Based on the idea that development of the built environment could be a way of making profits, urban design is often a key element of these strategies (Harvey, 1989). In this context, urban design practitioners play an instrumental role in terms of motivating consumption and circulation of capital. Although urban design practitioners need better understanding about the market context of urban development processes, Madanipour (1996) pointed out two general misconceptions: 1) Built environment professionals are the main agents in shaping urban space. 2) Urban designers only provide ‘packaging’ to help developers make the main decisions (Madanipour, 1996). “The first overstates the role of designers and exposes them to criticism for aspects of development that are

outside of their control; the second understates their role in shaping the urban environment” (Carmona, Heath, Oc, & Tiesdell, 2003).

***Regulatory context.*** This provides the overall context for the detailed elaboration of public policy from a macro governmental scale. A key element of the macro regulatory context is the relationship between different layers of the government and the relative autonomy of each. For example, the autonomy of local governments provides the chance to deal with local problems and development opportunities.

One of the significant factors of the regulatory context is the idea of balance between the public and private sectors. Understanding the extent to which the private sector should be regulated is important to urban design practitioners in terms of understanding the purpose of urban design. The key issue is: whose interest does urban design serve? Is the goal to maximize profits for private sector investment, or to provide for the interest of the public sector? To an urban design practitioner, it is important to acknowledge that there are different regulatory contexts at the macro scale within which they should shape urban place development projects (Carmona, Heath, Oc, & Tiesdell, 2003).

Figure 4 characterizes the four major aspects (with key elements) of public space design: the morphological, the functional, the socio-cultural and the politico-economic. The acknowledgment and inclusion of these urban design aspects would lead to a better understanding of the complex nature of urban public space.



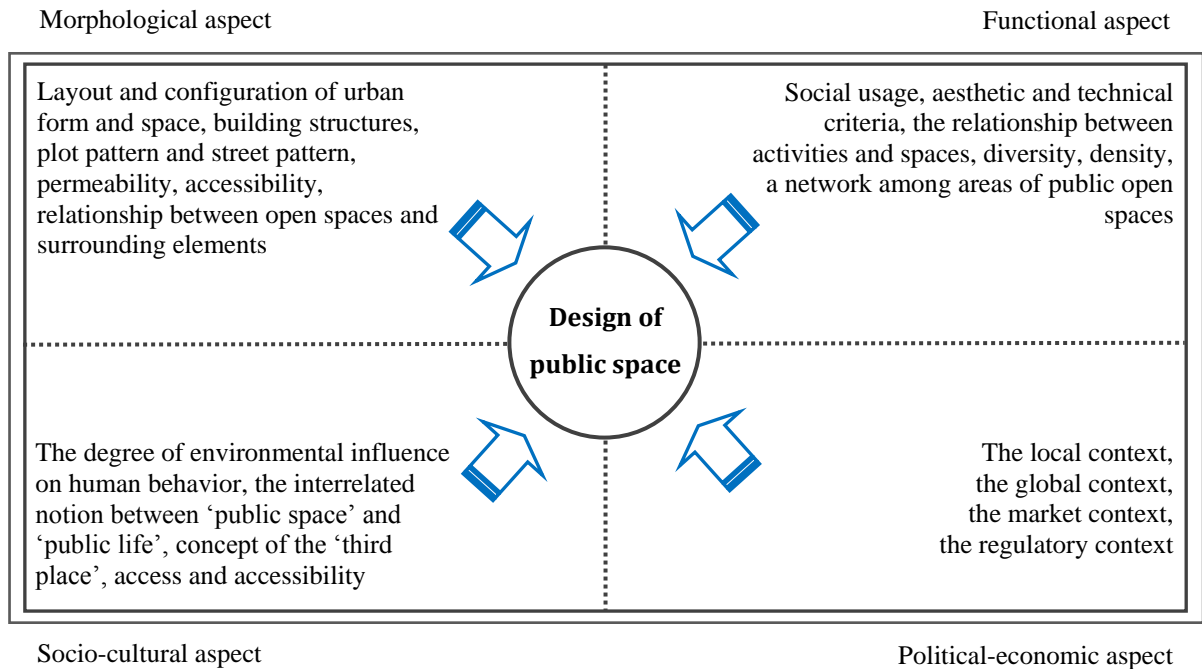


Figure 4. Four aspects of public space design and key elements.

## PUBLIC SPACE TYPOLOGY

**Morphological aspect.** In the morphological context, public space studies have analyzed the physical characteristics of public space as well as the physical context surrounding it. This includes visual and aesthetic characteristics, spatial form, plan shapes, pattern of urban blocks and streets and buildings around a public space. Many attempts have been made to classify public space according to a range of morphological characteristics.

Camilo Sitte (1889), in *City Planning: According to Artistic Principles*, analyzed a public square typology based on the visual and aesthetic characteristics of the squares in

Italy, Austria, Germany and other European cities. He defined an ‘enclosed square system’ based on the physical types of the main buildings around squares as: ‘deep’ squares surrounded by long and low buildings, and ‘wide’ squares surrounded by tall and narrow buildings. The concept of an ‘enclosed square system’ is basically derived from a series of artistic principles that Sitte tried to establish in his book. To advocate a ‘picturesque’ approach, Sitte illustrated a set of artistic principles: enclosure, freestanding sculptural mass, shape and monuments. Appendix B has further details of Sitte’s principles (1889).

During the late nineteenth century, Sitte advocated a ‘picturesque’ approach to urban space design. According to Sitte, ‘picturesque’ means “structured like a picture and possessing the formal values of an organized canvas”. Although his ideas were mainly concerned with the aesthetic components of an urban space, his principles also included a psychological viewpoint – a perception of the proportions between urban spaces, surrounding buildings and the monuments within it (Carmona, Heath, Oc, & Tiesdell, 2003).

Paul Zucker, in his book *Town and Square*, discussed spatially defined ‘archetypes’ of squares. Emphasizing a square typology defined by common characteristics in their spatial form, he discussed three space-confining elements: the row of surrounding structures (architectural frame), the expansion of the floor (plan) and the imaginary sphere of the sky above (ceiling). According to Zucker (1959, p. 6), “The forms of these three space-shaping elements are most decisively defined by the two-dimensional layout of the square.” For the final three-dimensional effect of squares, however, it is crucial that the correlation of these principal elements was based on the

constant awareness to human scale. Appendix B includes further details on Zucker's spatially defined 'archetypes' of urban square classification.

Zucker's classification differs from the concept presented by Camilo Sitte. According to Zucker, squares rarely present one pure type; for example, a square could be a closed square as well as an element of a set of grouped squares. He argued that although squares of certain types show common characteristics in their spatial form, their artistic expressions cannot be fixed into rigid categories. For Zucker (1959), the "unique relationship between the open area of the square, the surrounding buildings, and the sky above creates a genuine emotional experience comparable to the impact of any other work of art". However, Zucker's way of delineating square classification is similar to Sitte's in terms of its focus on the aesthetic effect of urban space.

In contrast to Camilo Sitte (1889) and Zucker (1959), Rob Krier presented a new morphological approach to urban space classification. He used basic geometry as his major concept of urban space classification. In his book *Urban Space* (1979), Rob Krier analyzed urban spaces and developed a typology of urban squares. According to Krier, urban spaces should be categorized into three major plan shapes: squares, circles, and triangles. Based on these basic shapes, he suggested diverse factors that could possibly modify square plans. The various ways of modifying basic shapes include: overlapping, penetrating and dividing; altering angles and dimensions; and adding or subtracting from the basic shape. The elements which can affect the framing of squares include: walls, arcades, colonnades and streets around them, and building facades and their materials in elevation. These diverse factors influence the quality of a space and determine the 'closed' or 'open' nature of square (Krier, 1979).

Rob Krier's brother, Leon Krier (1984) proposed a new identified system of an urban space in relation to the concept of the building block. He considered the building block as the most important typological element in the composition of urban spaces. According to Leon Krier, "The building block is either the instrument to form streets and squares or it results from a pattern of streets and squares." The first three types of urban spaces describe the possible dialectical connections between the building block and a public space, in preference to traditional urban spatial forms and types. The fourth type, presented by Leon Krier, is a form of Modernist urban space. He critiqued Modernist urban space design based on the fourth type which illustrates the analysis of zoning systems in modern cities. He claimed that the random distribution of both public and private buildings under the zoning system has destroyed cities. Leon Krier's four systems of urban space are described as follows:

1. The urban blocks are a result of patterns of streets and squares: the pattern is typologically classifiable.
2. The pattern of streets and squares is a result of the position of blocks: the blocks are typologically classifiable.
3. The streets and squares are precise formal types: the public 'rooms' are typologically classifiable.
4. The buildings are precise formal types: there is a random distribution of buildings standing in space (Krier, 1984).

Alexander et al. (1977) attempted a simplified typological classification based on physical shapes. He and his colleagues (1977) discussed two fundamentally different

kinds of outdoor space: ‘negative’ and ‘positive’. They advocated ‘positive’ spaces (traditional outdoor spaces) in comparison to ‘negative’ spaces (Modern-era outdoor spaces) by hypothesizing that “outdoor spaces which are merely ‘left over’ between buildings and will, in general, not be used” (Alexander et al., 1977, p. 518). These two types of spaces have totally different planned geometries with ‘figure-ground’ reversal (Figure 5). The following section describes the concept of ‘negative’ and ‘positive’ outdoor spaces:

1. Negative spaces are characterized as spaces with no formal shape. For example, the residue left over around buildings. In the plan of an environment where outdoor spaces are negative, buildings are recognized as the figure and outdoor space as the ground.
2. Positive spaces are relatively enclosed, distinct and have a definite shape. This shape is as important as the shape of the surrounding buildings. In the plan of an environment where outdoor spaces are positive, they are distinguished as figures against the ground of the buildings (Alexander, Ishikawa, & Silverstein, 1977).

Classifications from the morphological aspect tend to be diverse in terms of classifying public space typologies. The problem with such morphologically-based systems of classification is their inherent complexity. Ranging from Rob Krier’s classification based on the shape of an open space plan to Zucker’s ‘archetypes’ of the urban square based on the relationship between the square and the surrounding morphological context, these classifications are based on understanding the spatial structure and character of the urban context. The morphological aspect provides an idea of analyzing urban development patterns in urban design and planning. For example, as

Alexander et al. (1977) discussed, the ‘figure-ground’ diagram (Figure 5) shows different patterns between traditional and Modernist urban space which provide the basic point for criticizing public space design in the Modernist planning era.

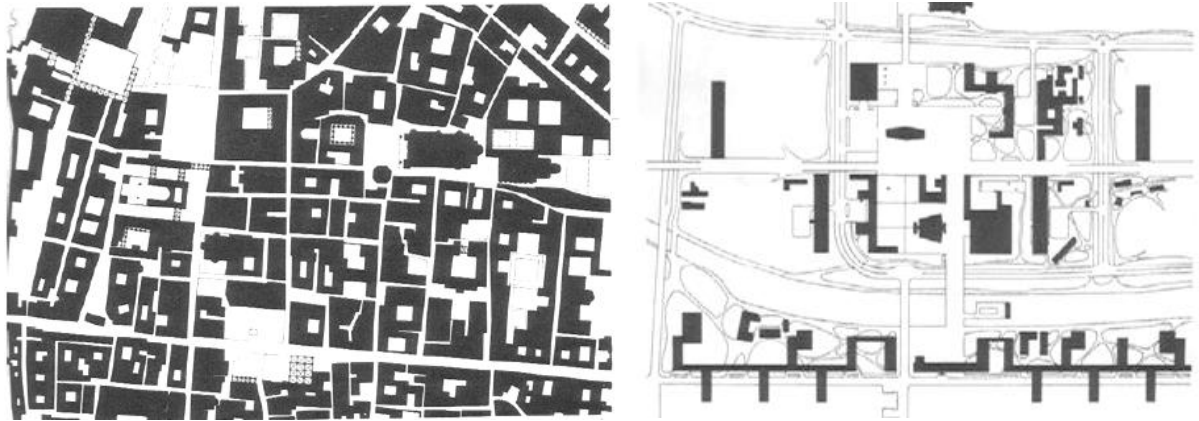


Figure 5. ‘Figure-ground’ diagram of Parma and Saint-Die (Source: Rowe and Koetter, 1978).

**Functional aspect.** Classifications for urban space have been determined by the characteristics of the surrounding urban spaces. In the morphological aspect, urban spaces have been classified by their shape and the relationship with the surrounding physical characteristics. In comparison with the morphological aspect, the issue of public space from a functional aspect involves the role, purpose and usage of public space. In functional requisites, many attempts have been made to classify public space according to functional characteristics.

Trancik (1986) classified urban space typology by the environmental function around it. In his book, *Finding Lost Space*, Trancik believed that a critical understanding of urban spaces, which have been tested by users and analyzed by designers, is crucial for designing new, successful urban spaces. He made a distinction between ‘hard’ spaces and

‘soft’ spaces to effectively discuss numerous examples of urban spaces by type. These two primary types of urban spaces – ‘hard’ spaces and ‘soft’ spaces – are defined as follows: hard spaces are principally bounded by architectural walls and are intended to function as major gathering places for social activity, and soft spaces are dominated by the natural environment, such as parks, gardens and linear greenways and are intended to provide opportunities for recreation or retreat from the built environment (Trancik, 1986).

In, *New City Spaces*, Gehl and Gemzoe (2001, p. 87) categorized 39 ‘new’ city spaces using three different criteria: types of space, history and architectural features. They selected 39 examples of public spaces (36 squares and 3 streets) from 9 cities based on their concept of ‘new’ public space. According to Gehl and Gemzoe, there is a new way of looking at public spaces and public life. Since there is an increasing incidence of indirect communication-oriented and privatized spaces, the significance of city spaces is further emphasized as meeting places. The ‘new’ public space is where people can use their senses and interact directly with their surroundings and the people within it (Gehl & Gemzoe, 2000).

These 39 examples of attractive public spaces around the world are based on 3 major criteria. Gehl and Gemzoe categorized them as renovated public space or newly designed public space. In terms of architectural features, they used criteria such as surface treatment, surface and elements, composite character, combined square and building design. In addition, they described public spaces based on functional types (Appendix B).

Carr et al.(1992), in *Public Space*, illustrated a wide variety of overlapping types of public spaces by summarizing their historical evolution. This variation in public space

types reflects their multiple uses and significance in urban life. In addition to the functional types of public space, three human dimensions of public space (the essential needs of the users, their spatial rights and the meanings they seek) are discussed as important aspects for creating successful public space (Carr, Francis, Rivlin, & Stone, 1992).

The 11 types of public space that Carr et al. (1992, p. 72) identified (Appendix B) are categorized by the different uses and functions of urban space. Based on this broad typology, the authors delineated sub-types of public space based on specific characteristics. Although they discuss an elaborate classification for public space typology, it is relevant to describe the ‘public park’ and ‘square and plaza’ in some detail. These types are selected based on two major distinctions: rigid boundaries and public purpose. As a physical feature, the ‘rigid boundaries’ represents the concept of ‘enclosure’ which is emphasized by Sitte (1889) as a primary element for public space. Zucker’s closed square, for example, is characterized by an enclosed and self-contained space (Zucker, 1959). The distinction of ‘public purpose’ indicates general public life in public spaces. For example, Gehl and Gemzoe (2001) emphasized the significance of city spaces as meeting places where people can interact with each other. In contrast to the earlier authors, Carr and his colleagues implied a more flexible definition of public space. The following section describes three types of public spaces presented by Carr and his colleagues: public parks, squares and plazas.

1. Public parks:



- a) Public/central park: publicly developed and managed open space as part of the city's zoned open space system; open space of a citywide importance; often located near the city center; often larger than the neighborhood parks
  - b) Downtown parks: green parks with grass and trees located in downtown areas; can be traditional, historic parks, or newly developed open spaces
  - c) Commons: a large green area developed in older New England cities and towns; once used as pasture area for common use, they are now used for leisure activities
  - d) Neighborhood park: open space developed in residential environments; publicly developed and managed as part of the city's zoned open space or as part of new private residential development; may include playgrounds, sport facilities, etc
  - e) Mini/vest-pocket park: small urban park bounded by buildings; may include fountain or water feature
2. Squares and plazas:
- a) Central square: square or plaza; often part of the historic development of the city center; may be formally planned or exist as a meeting place of streets; frequently publicly developed and managed
  - b) Corporate plaza: plaza developed as part of new office or commercial buildings, often in downtown areas, but also an increasing part of suburban office park development; built and managed by building owners or managers; some publicly developed examples but primarily privately developed and funded (Carr, Francis, Rivlin, & Stone, 1992).

Lynch (1981), in *Good City Form*, presented the following set of ‘open space classifications’ from a design perspective: 1) regional parks 2) urban park 3) squares or plazas 4) linear parks 5) playgrounds and playfields 6) wastelands and adventure playgrounds. Lynch’s way of classifying open space typology is similar to Carr’s and that of his colleagues but is based on more simplified criteria. Although the authors of both books approached typological classification from a functional perspective, they also considered public space within a context, which means they emphasized how people used public space and understood the context. As discussed in the previous section, Lynch’s two types of open space are categorized on two distinctions: ‘rigid boundaries’ and ‘general public purpose’.

1. The Urban parks: Urban parks are generally placed within the urban area (i.e. city center and older residential neighborhoods) for people’s daily use, such as walking, running, sitting out, picnicking and informal games. Urban parks are carefully designed and highly managed landscapes. Typical problems include required maintenance, overuse, conflicts between users and safety at night. However, they become a central image and meeting place of a city as well as an important focus for neighborhoods.
2. The Square or plazas: Lynch’s idea of a plaza comes from historic European cities. According to Lynch (1981), “Urban design might simply be a matter of plaza design.” Plazas are the places for activity at the center of an intensive urban area, enclosed by high-density structures and surrounded by streets. Major features include a fountain, benches and shelters for attracting people and facilitating meetings (Lynch, 1981).

Compared to classifications by the physical aspect, function-based typologies tend to be more straightforward and easy to classify. For example, the Urban Green Spaces Taskforce (2002) divided public space into two types: ‘green’ spaces and (hard) ‘civic’ spaces. The major logic behind function-based systems of classification is to provide a convenient way of organizing management tasks (Carmona, 2010). Due to the inherent simplicity, functionally classified types of public space are relatively easy to translate into public space regulatory policy. This classification system tends to be embedded at the decision-making level.

**Socio-cultural aspect.** From a socio-cultural aspect, the issue of public space focuses on the different users of that space and their perceptions of it. The socio-cultural aspect involves a sociological perspective such as experience of space, dominant social group and user engagement with space. Many attempts have been made to classify public space based on the sociological perspective.

Wallin (1998) in his article, *The Stranger on the Green*, discussed two types of public spaces: ‘proxemic’ spaces and ‘dystemic’ spaces. The concept of proxemic spaces was described by renowned anthropologist Edward T. Hall (1966) to explain social space and personal perception. The concept of dystemic spaces, as a parallel concept with proxemic spaces, was invented by Greenbie (1988) to describe the impersonal use of space and abstract relationships among users. They described each typology of public space from different user perspectives:

1. Proxemic spaces: According to Hall (1966) people use ‘proxemic spaces’ as an expression of local culture or as a specialized elaboration of culture. Although proxemic is quite close in meaning to its adjective form, proxemic relationships

can be very modern. For example, a professional society, a scientific discipline or a trendy youth culture. It includes values, myths and rituals that bind people together. Proxemic defines three different types of space: 1) fixed-feature space which comprises immobile objects 2) semi-fixed-feature space which comprises movable objects 3) informal space that includes individual space around the body, determining the personal distance among people. These types are directly dependent on people from various cultures.

2. Dystemic spaces: According to Greenbie (1988), people from various social groups use 'dystemic spaces' as "the worldwide locale of a community of strangers". The concept includes both greater social distance and larger physical scale. It means all sorts of industrial relationships and places in cosmopolitan areas, such as a shopping mall or an airport (Wallin, 1998).

Based on the understanding of *proxemic* and *dystemic* public spaces, Wallin (1998) emphasized the human need for different types of space; people require safe habitats to nurture them emotionally as well as to stimulate abstract thought. It indicates not only the distinction between private and public but also between proxemic and dystemic public space. According to Carmona (2010), the categorization between proxemic and dystemic is a fundamental public space typology that provides a critical view of contemporary public space.

Dines and his colleagues presented a public space typology based on user perception and their social engagement with public space. In their research, Dines et al. (2006) considered the potential benefits as well as adverse effects of public space by examining people's narratives about urban places. They emphasized people's day-to-day

relationships with the built environment and other aspects of urban settings. Appendix A has further details on the five types of public space suggested by Dines and his colleagues.

Following the socio-cultural perspective, Burgers (1999) presented a public space typology based on users and their perception of public space. Although his categorization follows the same approach as Dines et al. (2006), Burgers emphasized public space classification based on a dominant social group. In contrast Dines and his colleagues focused more on how individuals perceive public space. Burgers classified a series of landscapes based on the domains of various social sectors or interest groups:

1. Erected public space: Landscapes of fast-rising economic and government potential
2. Displayed space: Landscapes of temptation and seduction
3. Exalted space: Landscapes of excitement and ecstasy
4. Exposed space: Landscapes of reflection and idolization
5. Colored space: Landscapes of immigrants and minorities
6. Marginalized space: landscapes of deviance and deprivation (mentioned in Carmona, 2010)

In reality, the classifications based on the socio-cultural aspect are not mutually exclusive. For example, in the public space types suggested by Dines et al. (2006), such public spaces could be simultaneously categorized in both 'everyday places' and 'social environment'. Public space categorizations from the socio-cultural aspect tend to be ambiguous. Although they profoundly influences the quality of public space and

strategies for better management, this understanding of how spaces are perceived and used is difficult to apply at the strategic decision-making level for planners and designers.

**Political-economic aspect.** From this aspect, planning practitioners and academics have discussed the issue of public space typology in relation to ownership and responsibility in society. The issue of public space from a politico-economic aspect involves power relationships, means of control, design strategies for exclusion and degree of inclusion. There have been many attempts to classify public space in terms of this perspective.

Gulick (1998) discussed a public space typology based on the public experience of space. In his article, *The "Disappearance of Public Space": An Ecological Marxist and Lefebvrian Approach*, Gulick (1998) points out that there is growing awareness of “the disappearance of public space” in response to social and spatial changes in the contemporary capitalist metropolis. According to Gulick, it is significant that planning practitioners and academics offer a coherent and consistent definition of ‘public space’ in their discourse. Gulick (1998) defined the following public spaces:

1. **Public property:** Physical public spaces such as streets, parks, vacant government-owned buildings and plazas are owned by the government or state and used by marginal social groups. In this sense, the closure or sale of ‘public property’ could be an aspect of ‘disappearance of public space’, such as libraries, beaches and playgrounds. These ‘disappeared’ public properties are limited only for marginal social groups, not for all people.
2. **Semiotic space:** ‘Democratic semiotic spaces’ are built and designed by the ‘intentions’ of specialists or social systems which decode the relationship between

representation and power. ‘Semiotic’ spaces are described as places that are ‘sensually experienced and visually consumed’ without a formal process of controlling the actions of subjects. The various relationships among physical, historical and ideological characteristics in a built environment would generate the spatial identities of ‘semiotic’ public spaces.

3. Public sphere: ‘Public sphere’ means a place where citizens come together to interact socially and politically with each other. It represents a physical setting for encounters as well as a process of republican self-governance (Gulick, 1998).

Gulick clarified that these definitions are based on the different values and perspectives of public space as well as the diverse problems of current urban life. He emphasized the significance of understanding the overarching connotations of ‘public space’ and differentiations among these definitions. As Gulick pointed out, Killian (1998) also mentioned an increasing concern for the ‘loss of public spaces’ and ‘the decline of public life’. In his article, *Public and Private, Power and Space*, Killian approached the debate of a ‘lost public’ by discussing the relationship between ‘public’ and ‘private’. He argued that while spaces cannot be categorized as simply ‘public’ or ‘private’, the concepts should be considered in the discussion of urban space. For him, the meanings of public and private are not situated at opposite ends. Publicity and privacy, according to Killian, are not characteristics of space but expressions of coexisting power relationships in space. Based on this concept, he identified urban public space either as a site for impersonal contact or for representation. The following section further elaborates this idea:

1. Public space as the site of contact: Referring to Jacobs's and Sennett's work, Killian emphasized the significance of informal public contact that is neither intimate nor anonymous. Individuals in public space have the right to interact in public without the requirement of any format at any level. He commented that public space should be designed with regard to the potential for informal public contact. Killian believed that planners should consider ways in which public life shapes and forms space rather than considering that physical forms lead to certain social outcomes.
2. Public space as the site of representation: Mainly referring to Lefebvre's work, Killian approached public space as a socially constructed place, the site of representation. The concept of 'representation' is not about the existence of space itself but about the way 'public spaces' are socially constructed. In this concept, socially constructed ideologies such as negotiations over physical security, cultural identity and social and geographical community are affected by and affect those who appear in public space, which creates the issue of social exclusion (Killian, 1998).

Killian argued that debates for each type of public space are concerned with publicity and privacy in space. He proposed that urban spaces could be characterized by both 'public' and 'private'. The issues of social exclusion, restricted access, and activity could be situated by understanding the co-existing power relationships between public and private. The two approaches to public space discussed by Killian (the site of contact and the site of representation) refer to Gulick's public sphere and semiotic public spaces



respectively. Although their approaches towards categorizing types of public space are different, the context behind their typology is similar.

Van Melik et al. (2007) presented a public space typology based on the design and management of public space. They discussed the two major issues of ‘fear’ and ‘fantasy’ in public space. First, a growing anxiety about crime forces people to avoid using public spaces. Second, a growing demand for urban entertainment tempts people to seek new experiences and fantasy in public spaces. Based on the idea of control, Van Melik and his colleagues distinguished the following two types of public spaces:

1. Secured Public Space: It is characterized by implementing measures to create a sense of safety. For example, using Closed Circuit Television and surveillance, influencing people’s behavior, and excluding certain groups.
2. Themed Public Space: To improve the sense of public safety, themed public spaces aim to create an ambience and stimulate activity to attract more people to them. Based on the assumption that crowded places are safer, various activities in public spaces would encourage self-policing (Van Melik, Van Aalst, & Van Weesep, 2007).

The issue of controlling public space is frequently discussed in terms of inclusion and exclusion within public space. Malone (2002) identified public spaces as ‘open’ or ‘closed’ spaces based on the concept of acceptance of difference and diversity. She emphasized that space boundaries matter as they are socially constructed. According to Malone (2002), “[Boundaries] construct our sense of identity in the places we inhabit and they organize our social space through geographies of power.” A discussion about ‘open’ and ‘closed’ spaces would lead to a better understanding of geographies of power in

public space, especially in terms of exclusionary practices. The following are the two types of public spaces described by Malone (2002):

1. Open Space: Open spaces, as *weakly* classified spaces with *weakly* defined boundaries, are characterized by social mixing and diversity. Public spaces for carnivals and festivals and public parks are included in open spaces that tolerate difference, diverse cultural activities and identities.
2. Closed Space: Closed spaces, as *strongly* classified spaces with *strongly* defined boundaries, are characterized by internal homogeneity and order. Public spaces such as shopping malls, churches and schools are included in closed spaces that maintain boundaries by excluding unwanted activities, objects and people. There is less tolerance for differences and diversity here (Malone, 2002).

The issue of exclusionary public space can be discussed in terms of physical design strategies. Flusty (1997), for example, discussed a typology of public space based on exclusionary tactics to intercept particular individuals or social groups. Appendix B has further details on the five types of public spaces presented by Flusty (1997).

Similar to the socio-cultural aspect, classifications from the politico-economic aspect tend to be categorized in ambiguous ways. Although these typologies reflect questions related to ownership and responsibility, they do not indicate whether spaces are privately or publicly managed. Instead the politico-economic aspect provides an idea about ownership and control of public space that can result in the better management of public spaces. Table 2 illustrates four major aspects and the key characteristics discussed in this section.

Table 2

*Four Major Aspects of Public Space Typology*

Aspects	Key Authors	Key Characteristics	Pros/Cons	Impact on Public Space Research
<b>Morphological aspect</b>	Sitte Zucker Krier, R. Krier, L. Alexander et al.	Visual and aesthetic characteristics, spatial form, plan shapes, pattern of urban blocks and streets, pattern of buildings around public space	Diversity and complexity of classification system	Understanding the spatial structure and character of urban context, providing an idea of analyzing urban development patterns in urban design and planning
<b>Functional aspect</b>	Trancik Gehl & Gomzoe Carr et al. Lynch	The role, purpose, and usage of public space	Straightforward to translate into public space regulation policy	Providing convenient way of organizing management tasks
<b>Socio-cultural aspect</b>	Wallin Hall Greenbie Dines et al. Burgers	Experience of space, dominant social group, user engagement with space	Ambiguity of classification system, difficulty of application at decision making level	Understanding users of public space and their perceptions of it
<b>Political-economic aspect</b>	Gulick Killian Van Melik et al. Malone Flusty	Power relationships, means of control, design strategies for exclusionary, degree of inclusion	Ambiguity of classification system	Reflection of ownership and responsibility, understanding how public space is managed

**VALUE OF PUBLIC SPACE**

Various studies have shown that public space has the potential to positively influence a wide range of outcomes. This section reviews various benefits of public space including 1) economic value, 2) impact on physical and mental health, 3) promoting social goals, and 4) the environmental value. The following section discusses these benefits in further detail.

To understand the economic benefits of public space, Phillips (2000) studied real estate impacts on public parks which suggested that urban parks increase property prices

around them (Phillips, 2000). High quality parks can impact significantly the local economy in terms of stimulating property value. Similarly, Peiser and Schwann (1993) emphasized positive aspects of green public spaces, which have affected residents' preference toward specific areas for living (Peiser & Schwann, 1993). In addition, public space can have economic impact on businesses by increasing commercial trading (DoE and ATCM, 1997).

A number of researchers have highlighted the significance of parks and their impact on residents' physical and mental health. In a recent study, Cutts et al. (2009) discussed the correlation between park accessibility and obesity, based on the assumption that built environment shapes people's daily health. Authors found that higher levels of physical activities tend to be related to frequent accessibility to urban parks (Cutts, Darby, Boone, & Brewis, 2009; Kaczyski, Potwarka, & Sealens, 2008). Sallis and Glanz (2006) emphasized that the design and management of parks and playgrounds is effective in term of increasing physical activity (Sallis & Glanz, 2006). In addition to physical health, studies have explored the relation of parks to mental health. Halpern (1995) conducted research on the relationship between residents' mental health and the quality of outdoor environment. According to Halpern, the improvement of the outdoor environment around residences leads to 'substantial improvements' in residents' mental health (Halpern, 1995).

In terms of promoting social goals, public space provides an opportunity for the development of children and young people. Taylor et al. (1998) emphasized the importance of green open space that encourages children to play with each other. The authors found that in green open spaces, children have higher levels of creative activities

and opportunities to interact with adults (Taylor, Wiley, Kuo, & Sullivan, 1998). Many studies support the relationship between active public space and crime reduction. Encouraging people to use public parks is one way of dealing with the issue of crime. The reduction in crime can occur through increased natural surveillance and interaction between diverse groups of people within a community (McKay, 1998). To encourage safety within a community, Taylor and Harrell (1996) introduced an alternative and practical approach from an environmental design perspective. They focused more on specific physical interventions consisting of implications and solutions for crime or ‘fear of crime’ (Taylor & Harrell, 1999).

From an ecological perspective, public space, especially urban parks, are considered a part of larger environmental system, as well as social and contextual networks. From this perspective, urban parks have been ignored by ecologists under the pretense that urban parks are less effective to natural ecosystems and ecological processes. However, recent research demonstrates significant benefits from small urban parks. Parks are now considered to be small patches of open space in an urban environment. They improve connections among natural open areas as well as between people and green areas. This aspect of urban context is significant from an ecological perspective. For example, there is a growing concern about the edge of urban parks and how they affect the connection between urban parks and their surrounding areas (Forsyth & Musacchio, 2005).

Figure 6 illustrates the relationship between different factors, aspects and its benefits in urban park research. Highlighted boxes indicate variables that this study is focused on.

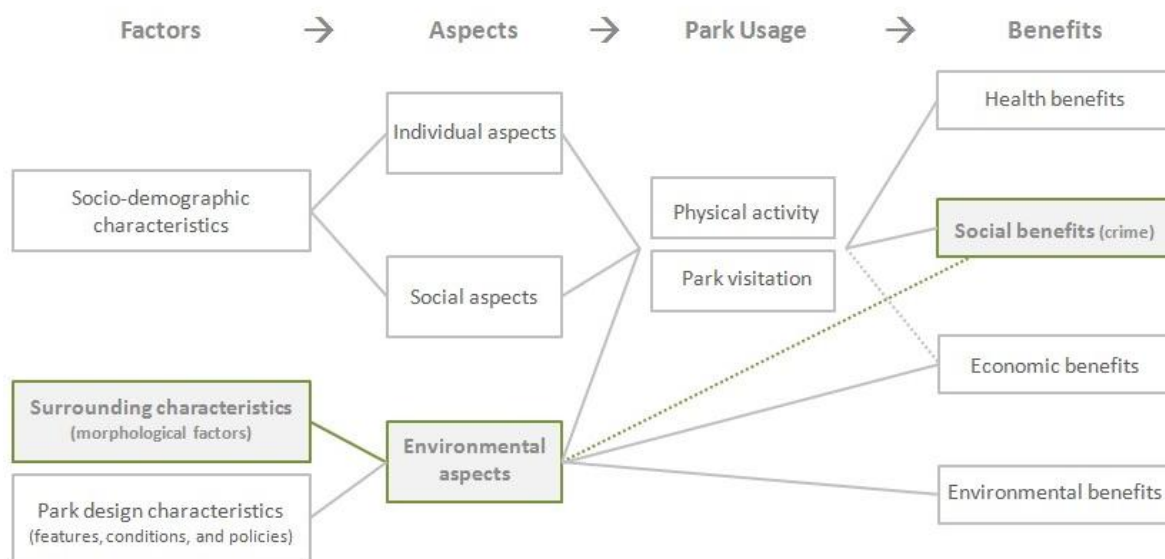


Figure 6. Urban park research: the relationship between different factors and benefits.

## NEIGHBORHOOD SCALE PUBLIC SPACE

The neighborhood parks, as Francis (2003) mentioned, are the most frequently studied topic of urban open space within the United States. The provision of neighborhood parks in residential areas has been an important part of urban planning. Studies on neighborhood parks and small urban parks recognize their contribution to the adjacent neighborhoods' needs for recreational amenities and pleasant environments (Forsyth & Musacchio, 2005). According to Kaplan et al., neighborhood parks can provide a high frequency of opportunities for people to experience 'nearby nature' in their everyday life (Kaplan, Kaplan, & Ryan, 1998).

The interests in neighborhood parks is underpinned by empirical evidence of the value of public space that includes economic value, public health, social and

environmental benefits (Phillips, 2000; Cutts et al., 2009; Halpern, 1995; Taylor et al., 1998; McKay, 1998; Forsyth & Musacchio, 2005). Understanding the nature and role of public open spaces in the modern era, this research is intended to understand the morphological characteristics of park surroundings and their relationship with the success of neighborhood parks.

Urban parks have been discussed as public open spaces for providing and operating a recreational programming. However, recently there has been an increasing focus on understanding the function of urban parks as a ‘true public space’ that is populated with informal and unstructured public activities. The provision of urban parks on a neighborhood scale has been an important part of urban design and planning and reflects the contribution of neighborhood parks and small urban parks towards fulfilling the social, economic and environmental needs of the adjacent neighborhoods.

Neighborhood parks have been recognized as important physical environments for satisfying the needs of adjacent neighborhoods (Francis, 2003). However, relevant studies mostly focus on the contribution of neighborhood parks as discrete spaces instead of built spaces within the urban context. Most research on the relationships between the physical urban form and the success of neighborhood parks has lacked the understanding of characteristics of the built environments around parks. Also there is a lack of understanding of specificity and detail of measuring urban form.

## **CRIME AND PUBLIC SPACE**

Literature shows that the physical environment influences criminal behavior. Examples of crime being associated with the physical environment are prevalent in our

daily life: “High walls are built to keep criminals out; locks are meant to keep people from entering unless they have a key” (Brantingham and Brantingham, 1993, p. 3). There are many clues in history that people have considered this relationship (between crime and physical environment) from a physical determinist point of view. Medieval cities were mostly walled cities with a few controlled entry gates (Gold, 1970). King Edward I of England published the Statute of Winchester of 1285 to reform the system of Watch and Ward and in this statute, he attempted to control highway robbery by forcing adjacent property owners to maintain trees and bushes along the highway (Plucknett, 1960, p. 90).

During the 18th and 19th centuries, the street lighting system was introduced to increase safety, reduce crime and provide visibility to people in London and Paris. People could see and be seen by others at night effectively improving public safety (Lowman, 1983). Henry Mayhew (1861) described St. Giles, one of the criminal neighborhood ‘rookeries’ in London, as a cluster of streets and buildings “connected by roof, yard, and cellar” that makes the place like ‘a rabbit warren’ (Mayhew, 1861, p. 299). Criminal neighborhoods tended to have a physical urban form that supported crime and criminal lifestyles. Enrico Ferri (1896) argued that from a physical determinist viewpoint, “wide streets and large and airy dwellings with public lighting and the destruction of slums prevent robbery with violence, concealment of stolen foods, and indecent assaults” (Ferri, 1896, p. 123).

Studies from past decades, however, have shown that the relationship between crime and physical environment is much more complex than physical determinism. Researchers and experts in environmental criminology consider crime as an individual behavior influenced by an individual’s perceptions and understanding of the surrounding



environment, and how the surrounding environment motivates criminal behavior (e.g. Carter & Hill, 1979; Wilson & Hernstein, 1985; Cornish & Clarke, 1986; Felson, 1987; Barlow, 1990).

One of the major research issues discussed in environmental criminology is an action-oriented strategy (Brantingham & Brantingham, 1993). Researchers in the planning field have been engaged in discovering environmental design strategies for reducing crime. Appleyard (1981) considered 'safety from crime' as one of the major indicators of livable streets and recommended strategies for them. In their case study in Binghamton, New York, the Institute for Architecture and Urban Studies (IAUS) (1986) proposed a set of street design interventions to achieve the normative characteristics of the urban street. According to IAUS, "increasing safety from crime" is one of the key social normative goals (IAUS, 1986, p. 344).

These 'strategy-oriented' efforts are part of situational crime prevention developments in the UK. Situational crime prevention is focused on 'the settings for crime' to reduce opportunities for committing criminal acts. Situational crime prevention "introduces discrete managerial and environmental change" that would be undertaken by public and private organizations and agencies. The major idea of situational crime prevention is not "improvement of society or its institutions, but merely to make criminal action less attractive to offenders" (Clarke, 1997, p. 2). Clarke defines the following features of situational crime prevention that reduce opportunities for committing crime:

1. Features are directed at highly specific forms of crime
2. Features involve the management, design or manipulation of the immediate environment in as systematic and permanent a way as possible

3. Features make crime more difficult and risky, or less rewarding and excusable as judged by a wide range of offenders (Clarke, 1997, p. 4)

Within the urban planning and design, there are two major streams of ‘action-oriented’ environmental criminology research in the US – ‘defensible space’ (Newman, 1972) and ‘Crime Prevention Through Environmental Design (CPTED)’ (Jeffery, 1971) – that use design strategies for urban places to reduce crime opportunities.

The concept of ‘defensible space’ was developed by Newman (1972) who believed in using architectural form to “rescue public housing in the United States from the depredations of crime” (Clarke, 1997, p. 7). In his initial book, Newman (1972) suggested public housing design strategies to create ‘defensible space’ by increasing surveillance and reducing anonymity.

His design strategy intends to create a definite distinction between private/semi-private space and semi-public/public space, focusing on site characteristics such as building height, stairway and hallway design for public housing. This detailed design strategy, he believed, encourages residents to take responsibility for the public areas to exclude potential offenders (Newman, 1972). Newman (1973) presents the following elements of ‘defensible space’:

1. The capacity of the physical environment to create perceived zones of territorial influence
2. The capacity of physical design to provide surveillance opportunities for residents and their agents
3. The capacity of design to influence the perception of a project’s uniqueness, isolation and stigma

4. The influence of geographical juxtaposition with 'safe zones' on the security of adjacent areas (Newman, 1973, p. 50)

In addition to Newman's 'defensible space', the concept CPTED was developed to provide an environmental design strategy that could discourage criminal behavior. While the concept of 'defensible space' was developed in the public housing environment, CPTED extended its basic concept beyond the residential context. The CPTED concept, first mentioned by Jeffery (1971), is based on the assumption that "the proper design and effective use of the built environment can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in the quality of life" (Crowe, 2000).

The idea of CPTED includes three major strategies: natural access control, natural surveillance, and territorial reinforcement (Crowe, 2000, p. 36). Access control deals with directly managing access to a crime target by implementing a design strategy. There are three types of access control strategies: 1) organized (e.g., guards), 2) mechanical (e.g., locks), and 3) natural (e.g., spatial definition). The concept of surveillance is to facilitate observation. Surveillance could be combined with access control in order to create a perception of risk in offenders by keeping potential criminals under observation. Surveillance strategy is also classified into three types: 1) organized (e.g., police patrol) 2) mechanical (e.g., lighting) and 3) natural (e.g., windows). The idea of CPTED intends to develop design plans that emphasize natural strategies rather than organized and mechanical strategies because natural strategies "exploited the opportunities of the given environment both to naturally and routinely facilitate access control and surveillance" (Crowe, 2000, p. 37).

The concept of territoriality is based on the relationship between physical design and a sense of territoriality. Similar to Newman's (1972) 'territorial instinct', the territoriality reinforcement idea is to create a sense of territorial influence through physical design so that potential criminals perceive that territoriality. Natural access control and natural surveillance could be overlapped with territoriality in terms of promoting "more responsiveness by users in protecting their territory (e.g., more security awareness, reporting, reacting) and...greater perception of risk by offenders" (Crowe, 2000, p. 37).

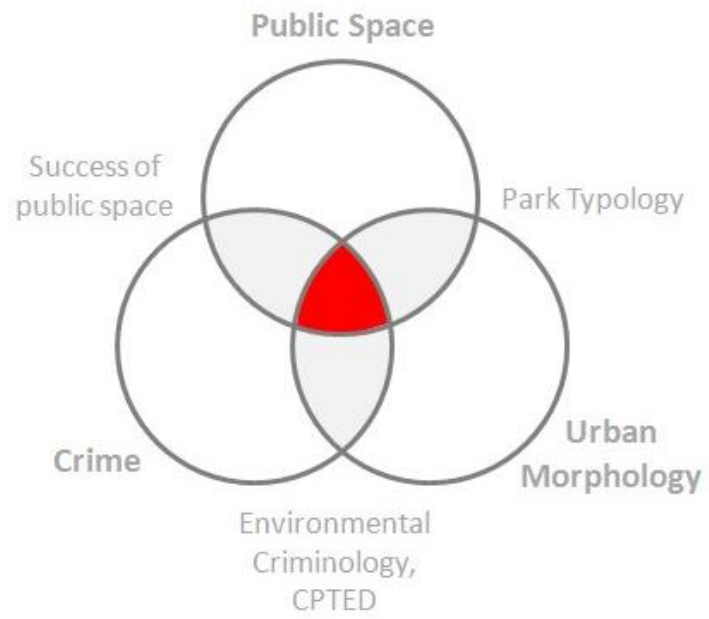
These two major streams, Newman's defensible space and Jeffery's CPTED, have been influenced by Jane Jacobs's (1961) ideas about the relationship between crime and the layout of streets and land uses (Clarke, 1997; Cozens & Hillier, 2012). Jacobs emphasized the fundamental aspects of safety which could be managed by urban design elements and land uses. She mentioned three major qualities to accomplish street safety in urban environments:

1. There must be a clear demarcation between what is public space and what is private space
2. There must be eyes on the street, eyes belonging to those we might call the natural proprietors of the street. The buildings on a street, equipped to handle strangers and insure the safety of both residents and strangers, must be oriented to the street...
3. The sidewalk must have users on it fairly continuously both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers (Jacobs, 1961, p. 35).

These key ideas discussed by Jane Jacobs are incorporated in the major ideas of ‘defensible space’ and ‘CPTED’ (Cozen, 2008; Schneider & Kitchen, 2007). The concept of ‘eyes on the street’ has been one of the most renowned safety assumptions in the planning field. Saville and Cleveland mentioned that “what is significant about Jacobs’s ‘eyes on the street’ are not the sightlines or even the streets, but the eyes” (Saville and Cleveland, 1997, p. 1). This ‘eyes on the street’ concept is associated with higher-density, permeability and mixed-use development which could be promoted by changing and improving urban form and land uses (Cozens, 2011; Cozens & Hillier, 2012).

## **SUMMARY**

This chapter reviewed literature on public space to systematize the diverse aspects of public space design in order to provide a guideline to better understand the diverse demands of public space and the structural changes in a complex urban context. Figure 7 illustrates the theoretical framework that includes the major topics reviewed in this chapter.



*Figure 7.* Theoretical framework.

## **Chapter 3**

### **MORPHOLOGICAL CONTEXT OF NEIGHBORHOOD PARKS**

#### **INTRODUCTION**

In order to explore the relationship between the morphological context and the success of neighborhood parks, it is necessary to discuss major characteristics of the morphological context around neighborhood parks. This chapter aims to answer the following research questions. What are the major characteristics of the morphological context around neighborhood parks? What is the relationship among the different characteristics of morphological context around neighborhood parks? This chapter describes data collection and measurement for 23 variables associated with urban form and also describes the interdependency between variables using factor analysis.

#### **VARIABLES ASSOCIATED WITH URBAN FORM**

In urban morphological research, at the most elemental level, morphological analysis is based on three fundamental elements of form, resolution, and time.

- 1) Urban form is defined by three fundamental physical elements: buildings with their corresponding open spaces, plots or lots, and streets.
- 2) Urban form can be interpreted at multiple resolutions. Commonly, urban forms are recognized at four different scales; building/ lot, street/block, city, and region.
- 3) Urban form can only be understood historically since the elements of which it is comprised undergo continuous transformation and replacement (Moudon, 1997).

In *Alnwick, Northumberland: A study in town-plan analysis*, Conzen (1969) presented the concept of a 'plan unit' as a way to connect the fundamental elements of form, resolution, and time. A plan unit is defined as a group of buildings, open spaces, lots, and streets. As the smallest cell of the city, 'plan units' or 'tissues' are a combination of two major elements: the individual parcel of land, together with its building or buildings and open spaces. The 'plan units' or 'tissues' form a cohesive whole "either because they were all built at the same time or within the same constraints, or because they underwent a common process of transformation" (Moudon, 1997, p.7). Urban tissue can be defined as the 'cohesive whole' involving three logical systems:

- 1) The logic of roads in their double roles of movement and distribution
- 2) The logic of plot subdivisions, where land holdings are built up and where private and public initiatives take place
- 3) The logic of buildings that contain different activities (Panerai, Castex, Depaule, & Samuels, 2004)

The first phase of this research involves a comprehensive study for in-depth understanding of the major characteristics of morphological context around neighborhood parks. Based on the discussion above, 23 attributes related to neighborhood-scale urban form were chosen as explanatory variables. All 23 attributes were collected within a ¼ mile distance from 150 neighborhood park boundaries using ESRI Arc GIS software (see figure 2 in Chapter1). The 23 attributes were classified into four categories: 1) blocks, parcels, and buildings, 2) street networks, 3) pedestrian-oriented attributes, and 4) property land uses.



- 1) Blocks, parcels, and buildings: This category included block size (perimeter), block size (area), block count, parcel size (perimeter), parcel size (area), parcel count, parcel setback, building size (perimeter), building size (area), and building setback.
- 2) Street networks: Street length, intersection count, and cul-de-sac count were included in this category.
- 3) Pedestrian-oriented attributes: This category included sidewalk, bike route, tree canopy, and bus stop.
- 4) Property land uses: This category included single family residential, multi-family residential, big-box commercial, neighborhood-scale commercial, mixed use, and industrial land uses.

## **DEVELOPING MEASURES OF NEIGHBORHOOD PARK CONTEXT**

Acknowledging the morphological aspect of urban design and public open space, this research is intended to demonstrate the relationship between the morphological context around neighborhood parks and the success of neighborhood parks. This section explains and describes how each explanatory variable was defined and measured. Table 3 presents the summary statistics for all 23 variables. Variables were retrieved from the City of Chicago data portal website.

Table 3

*Descriptive Statistics for 23 Explanatory Variables*

<b>Variables</b>	<b>Unit of Measures</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
STREETLENGTH	Feet	172.952	27.415	96.168	268.967
INTERSECTION	Counts	0.552	0.197	0.209	1.596
CULDESAC	Counts	0.026	0.022	0.000	0.115
BLOCKSIZE(P)	Feet	2035.993	305.663	1465.745	3488.285
BLOCKSIZE(A)	Acre	5.362	2.261	2.725	21.134
BLOCKNUMBER	Counts	0.205	0.047	0.083	0.355
PARCELSIZE(P)	Feet	356.147	59.542	262.251	734.959
PARCELSIZE(A)	Acre	0.164	0.097	0.072	0.816
PARCELSETBACK	Feet	95.346	8.400	75.406	125.131
PARCELNUMBER	Counts	5.189	1.617	1.559	9.451
BUILDINGFOOTPRINT(P)	Feet	175.254	67.171	104.652	589.572
BUILDINGFOOTPRINT(A)	Acre	0.050	0.052	0.015	0.458
BUILDINGSETBACK	Feet	97.595	9.542	73.473	141.794
SIDEWALKS(A)	Acre	0.044	0.010	0.018	0.083
TREECANOPY	Acre	0.182	0.089	0.037	0.490
BUSSTOP	Counts	0.091	0.048	0.000	0.235
BIKEROUTE	Feet	25.272	18.448	0.000	78.395
INDUSTRIALCORRIDOR	Acre	0.071	0.145	0.000	0.738
%SINGLEFAMILY	Acre	24.61%	20.81%	0.19%	91.84%
%MULTIFAMILY	Acre	27.67%	16.79%	0.23%	66.06%
%MIXEDUSE	Acre	1.64%	2.00%	0.00%	11.61%
%NEIGHBORSCALECOM	Acre	5.82%	4.80%	0.00%	25.34%
%BIGCOMMERCIAL	Acre	1.44%	3.73%	0.00%	26.39%

**Blocks, Parcels, and Buildings.** 1) Block size (perimeter): Mean value of block perimeters was measured in feet. Blocks were measured only if centroid points of blocks were located within a quarter mile distance from park boundary.

- 2) Block size (area): Mean value of block areas was measured in acres. Blocks were measured in only if centroid points of blocks were located within a quarter mile distance from park boundary.
- 3) Block count: Block count was determined based on the number of blocks divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Blocks were counted if centroid points of blocks were located within a quarter mile distance from park boundary.
- 4) Parcel size (perimeter): Mean value of parcel perimeters was measured in feet. Parcels were measured if centroid points of parcels were located within a quarter mile distance from park boundary.
- 5) Parcel size (area): Mean value of parcel areas was measured in acres. Parcels were measured if centroid points of parcels were located within a quarter mile distance from park boundary.
- 6) Parcel count: Parcel count was determined based on the number of parcels divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Parcels were counted if centroid points of parcels were located within a quarter mile distance from park boundary.
- 7) Parcel setback: Mean value of the straight-line distance from every parcel centroid point to the nearest street center line was included as parcel setback. Parcels were included if centroid points of parcels were located within a quarter mile distance from park boundary.

8) Building size (perimeter): Mean value of building perimeters was measured in feet. Buildings were included if centroid points of buildings were located within a quarter mile distance from park boundary.

9) Building size (area): Mean value of building areas was measured in acres. Buildings were measured only if centroid points of buildings were located within a quarter mile distance from park boundary.

10) Building setback: Mean value of the straight-line distance from every building centroid point to the nearest street center line was calculated as building setback. Buildings were measured if centroid points of buildings were located within a quarter mile distance from park boundary.

**Street Network.** 11) Street length: Street length was calculated based on cumulated street length (measured in feet) divided by the  $\frac{1}{4}$  mile buffer area (park area excluded) of neighborhood park. Street lengths were measured if they were located within a quarter mile distance from park boundary.

12) Intersection count: Intersection count was calculated based on number of intersections divided by the  $\frac{1}{4}$  mile buffer area (park area excluded) of neighborhood park. Intersections were included if they were located within a quarter mile distance from neighborhood park boundary.

13) Cul-de-sac count: Cul-de-sac count was calculated based on number of cul-de-sacs divided by the  $\frac{1}{4}$  mile buffer area (park area excluded) of neighborhood park. Cul-de-sacs were included if they were located within a quarter mile distance from park boundary.

**Pedestrian-Oriented Attributes.** 14) Sidewalk: Sidewalks were calculated based on cumulated value of sidewalk area (measured in acre) divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Sidewalk areas were measured if they were located within a quarter mile distance from park boundary.

15) Bike route: Bike routes were measured based on cumulated bike route length (measured in feet) divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Bike route lengths were measured if they were located within a quarter mile distance from park boundary.

16) Tree canopy: Tree canopy was calculated based on cumulated value of tree canopy area (measured in acre) divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Tree canopy areas were measured if they were located within a quarter mile distance from park boundary.

17) Bus stop: Bus stop count was calculated based on number of bus stops divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Bus stops were counted if they were located within a quarter mile distance from park boundary.

**Property Land Uses.** 18) Single family residential: Percentage of single family residential parcels was calculated based on cumulated value of single family residential area (measured in acre) divided by cumulated value of all parcel area. Parcels were measured when centroid points of parcels were located within a quarter mile distance from park boundary. Detached single family homes were included.

19) Multi-family residential: Percentage of multi-family residential parcels was calculated based on cumulated value of multi-family residential area (measured in acre) divided by cumulated value of all parcel area. Parcels were measured if centroid points of parcels were located within a quarter mile distance from park boundary. Attached/ duplex single family homes, town homes, condos, and apartment housings were included.

20) Big-box commercial: Percentage of big-box commercial parcels was calculated based on cumulated value of big-box commercial area (measured in acre) divided by cumulated value of all parcel area. Parcels were included if centroid points of parcels were located within a quarter mile distance from park boundary. Super stores, warehouse stores, shopping malls, regional shopping centers, and wholesale stores (which hire more than 25 employees) were included.

21) Neighborhood-scale commercial: Percentage of neighborhood-scale commercial parcels was calculated based on cumulated value of neighborhood-scale commercial area (measured in acre) divided by cumulated value of all parcel area. Parcels were included if centroid points of parcels were located within a quarter mile distance from park boundary. Retail stores such as corner store, convenience stores, groceries, neighborhood/ community shopping centers and department stores (which hire less than or equal to 25 employees) were included.

22) Mixed use: Percentage of residential involved mixed-use parcels was calculated based on cumulated value of mixed-use area (measured in acre) divided by cumulated value of all parcel area. Parcels were measured if centroid points of parcels were located within a quarter mile distance from park boundary.

Mixed uses including residential land use such as commercial/ residential buildings and office/ residential buildings were included.

23) Industrial: Industrial area was calculated based on cumulated value of industrial corridor area (measured in acre) divided by the ¼ mile buffer area (park area excluded) of neighborhood park. Industrial corridor areas were measured if they were located within a quarter mile distance from park boundary.

## **FACTOR ANALYSIS**

To understand the dimensional structure of the 23 variables, factor analysis was conducted. Factor analysis is a descriptive data reduction technique that is useful to reduce measures and variables into a smaller set of components. Principle component analysis was used as an extraction method. For the rotation method, Varimax with Kaiser Normalization was chosen to simplify interpretation of factor analysis.

The results are presented in Table 4 and Table 5. Table 4 shows that a total of five components were extracted from 23 variables. In the Total Variance Explained table, under 'Rotation Sums of Squared Loadings,' the '% of Variance' shows the total variability accounted for each component. For example, component 1 accounted for 20.962% of the variability in all 23 variables. 'Cumulative %' shows that the extracted factors reproduced 72.257% of the total variation among the 23 variables. Factor analysis revealed that the first 5 factors have Eigen Values greater than one (> 1).

Table 4

*Total Variance Explained*

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	Variance%	Cumulative%	Total	Variance%	Cumulative%
1	6.329	27.518	27.518	4.821	20.962	20.962
2	4.626	20.112	47.63	4.642	20.182	41.144
3	2.339	10.168	57.799	2.764	12.015	53.159
4	1.934	8.409	66.207	2.3	10.001	63.16
5	1.391	6.049	72.257	2.092	9.097	<b>72.257</b>
6	1.002	4.358	76.615			
7	0.961	4.18	80.795			
8	0.752	3.268	84.063			
9	0.652	2.835	86.898			
10	0.525	2.282	89.18			
11	0.453	1.97	91.151			
12	0.416	1.808	92.958			
13	0.368	1.6	94.558			
14	0.259	1.125	95.683			
15	0.195	0.847	96.53			
16	0.171	0.744	97.274			
17	0.166	0.722	97.995			
18	0.139	0.603	98.599			
19	0.108	0.468	99.067			
20	0.084	0.364	99.43			
21	0.073	0.318	99.749			
22	0.041	0.178	99.926			
23	0.017	0.074	100			

Extraction Method: Principal Component Analysis.

The variables are listed in Rotated Component Matrix (Table 5) in the order of factor loading values. As indicated in Table 5, variables grouped in one component had a stronger relationship with each other. Highlighted factor loadings indicate strong



relationship between variables. The following section discusses the interpretation of Table 5 and the analysis of relationships among different variables.

Table 5

*Rotated Component Matrix\**

Variables	Component				
	factor 1	factor 2	factor 3	factor 4	factor 5
PARCELSIZE(P)	.876	.310	-.094	-.199	.016
PARCELSIZE(A)	.880	.223	.025	-.208	-.061
PARCELNUMBER	-.618	-.417	.058	.533	.096
BUILDINGFOOTPRINT(P)	.885	.082	.257	.002	.261
BUILDINGFOOTPRINT(A)	.938	-.068	.195	.057	.088
%BIGCOMMERCIAL	.795	-.106	.204	.182	-.091
STREETLENGTH	.064	-.680	.110	.468	.316
INTERSECTION	-.203	-.646	.406	-.028	.075
BLOCKSIZE(P)	.014	.850	.058	-.173	-.007
BLOCKSIZE(A)	.093	.795	.115	-.107	.108
BLOCKNUMBER	.122	-.826	.133	.043	.259
PARCELSETBACK	.400	.658	-.219	-.124	.170
BUILDINGSETBACK	.226	.764	-.283	.082	.156
TREECANOPY	-.098	.363	-.633	.018	.442
BUSSTOP	.322	-.141	.487	.282	.198
%SINGLEFAMILY	-.272	.021	-.786	.186	-.076
%NEIGHBORSCALECOM	.091	-.107	.671	.001	.032
CULDESAC	.023	-.045	.123	-.675	.366
SIDEWALK(A)	-.002	-.334	-.039	.785	.300
%MIXEDUSE	-.342	-.146	.474	.521	.193
BIKEROUTE	.087	-.056	.236	-.165	.586
INDUSTRIALCORRIDOR	-.025	.071	.188	-.147	-.750
%MULTIFAMILY	-.038	.245	.478	.323	.591

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

\*Rotation converged in 10 iterations.

## **DESCRIPTION OF NEIGHBORHOOD PARK CONTEXT**

The Rotated Component Matrix (Table 5) illustrates the factor loadings for all 23 variables. The highlighted factor loadings indicate the most strongly loaded variables. Factor loadings were used to understand the factor structure of all variables. Based on these factor loadings, the following descriptive titles were created for each factor component: 1) Urban Core Commercial, 2) Less Permeable Low Density, 3) Neighborhood Scale Commercial, 4) Walkable Mixed Use, and 5) Bikeable Multi Family.

1) Urban Core Commercial: This factor component is associated with 1) longer parcel perimeters, 2) larger area of parcels, 3) less numbers of parcels, 4) longer building footprint perimeters, 5) larger area of building footprints, and 6) higher percentage of non-neighborhood scale, big-box commercial land use.

2) Less Permeable Low Density: This factor component is associated with 1) less street miles, 2) less numbers of intersections, 3) longer block perimeters, 4) larger area of blocks, 5) less numbers of blocks, 6) longer distance of parcel setbacks, and 7) longer distance of building setbacks.

3) Neighborhood Scale Commercial: This factor component is associated with 1) smaller area of tree canopies, 2) higher number of bus stops, 3) lower percentage of single family residential, and 4) higher percentage of neighborhood scale commercial use.

4) Walkable Mixed Use: This factor component is associated with 1) less number of cul-de-sacs, 2) larger area of sidewalks, and 3) higher percentage of residential involved mixed use.

5) Bikeable Multi Family: This factor component is associated with 1) more bike route miles, 2) smaller area of industrial corridors, and 3) higher percentage of multi-family residential use.

## **SUMMARY**

A primary purpose of this chapter was to explore major characteristics of morphological context of 150 neighborhood parks in the City of Chicago. Based on a review of fundamental elements of urban form, 23 attributes were chosen for this study. Quantitative measures of urban form were developed including blocks, parcels, and buildings; street network; pedestrian-oriented attributes; and property land uses. Datasets of 23 variables were employed as explanatory variables for factor analysis. A result of factor analysis showed that the dimensional structure of 23 variables consisted of 5 factor components. Variables included in one factor component had a stronger relationship with each other. Descriptive titles of 5 factor components were created based on characteristics of variables involved in each factor component. Based on in-depth understanding of park surrounding context, the following chapter discusses how these urban form data can be used to construct a typology of context for neighborhood parks.

## **Chapter 4**

### **TYOLOGY OF NEIGHBORHOOD PARK CONTEXT**

#### **INTRODUCTION**

This chapter aims to answer the following research questions. How can urban form characteristics of neighborhood park context be used to construct a typology of context for neighborhood parks? Cluster analysis was conducted to classify the surrounding context of neighborhood parks. This chapter describes the process of classifying the context of 150 neighborhood parks, and visually illustrates six different categories of neighborhood park context.

#### **CLUSTER ANALYSIS**

The primary objective of this study is to understand and distinguish the varied morphological context of 150 neighborhood parks. This research employs cluster analysis using SPSS to create a typology of urban form context for neighborhood parks. Cluster analysis is a method of combining cases (neighborhood parks) into groups based on their similarity. Cluster analysis is intended to classify groups of neighborhood parks context that are relatively homogeneous within themselves and heterogeneous between each other based on a defined set of variables.

Cluster analysis includes two key steps: 1) Hierarchical and 2) K-Means cluster analysis. Hierarchical cluster analysis was conducted to define the number of clusters or groups. The number of clusters was identified using the distance of “coefficients” when the step makes a bigger jump in Agglomeration Schedule (Table 6). In this study, six clusters were decided by subtracting 144 from 150 (number of variables). K-Means

cluster analysis was conducted to create groups among 150 neighborhood park context using a predefined number (six) from the hierarchical cluster analysis. The five regression factor scores identified from the factor analysis were used as explanatory variables for cluster analysis. Factor scores are combined scores for each case (150 neighborhood parks) and each factor component.

Table 6

*Agglomeration Schedule*

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	65	91	0.017	0	0	75
2	86	120	0.052	0	0	48
3	45	146	0.101	0	0	77
4	71	72	0.154	0	0	34
5	2	13	0.207	0	0	46
6	21	127	0.262	0	0	36
7	94	106	0.332	0	0	33
8	33	124	0.409	0	0	61
9	53	70	0.491	0	0	55
10	102	129	0.574	0	0	68
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
141	1	11	259.445	126	137	145
142	4	19	282.401	140	114	146
143	8	41	305.990	131	136	147
<b>144</b>	2	6	332.700	139	138	147
145	1	44	376.993	141	135	146
146	1	4	452.184	145	142	148
147	2	8	536.672	144	143	148
148	1	2	627.894	146	147	149
149	1	9	745.000	148	99	0

Based on hierarchical cluster analysis, a six-cluster solution was considered optimum. Final Cluster Centers (Table 7), as a result of K-Means cluster analysis, presents characteristics of six clusters. Characteristics of different categories of neighborhood park surroundings could be identified by interpreting mean component values in Table 7 (numbers of each regression factor score on each cluster). The key to interpreting the results was to understand the relationship between mean component values in Final Cluster Centers (Table 7) and factor component meanings in Rotated Component Matrix in factor analysis (Table 5). For example, characteristics of neighborhood park context classified into Cluster1 is far from ‘Urban Core Commercial’ factor characteristics (-0.49022) and extremely similar to ‘Walkable Mixed Use’ factor characteristics (1.02926).

Table 7

*Final Cluster Centers*

	cluster 1	cluster 2	cluster 3	cluster 4	cluster 5	cluster 6
REGR factor score 1	<b>-.49022</b>	.60270	-.03399	<b>6.95349</b>	.05525	-.22815
REGR factor score 2	-.11485	<b>1.44851</b>	<b>.41000</b>	<b>-2.10669</b>	<b>-.86614</b>	-.28168
REGR factor score 3	<b>.52364</b>	-.08851	.34373	-.29671	<b>.55657</b>	<b>-1.29701</b>
REGR factor score 4	<b>1.02926</b>	<b>-.46660</b>	-.19885	<b>2.21155</b>	<b>-1.12537</b>	-.00123
REGR factor score 5	.33653	<b>1.09576</b>	<b>-1.4724</b>	-.06405	.17524	-.04003

Six different categories were identified by ‘Cluster Membership’ which help understanding locations of 150 neighborhood parks by typology. Table 8 provides additional information on the number of neighborhood parks in each typology (cluster). The following section discusses characteristics of neighborhood park surroundings for each category, and visualizes examples for each category.

Table 8

*Number of Cases in Each Cluster*

Cluster	cluster 1	cluster 2	cluster 3	cluster 4	cluster 5	cluster 6
No. of Cases	40	21	27	2	27	33

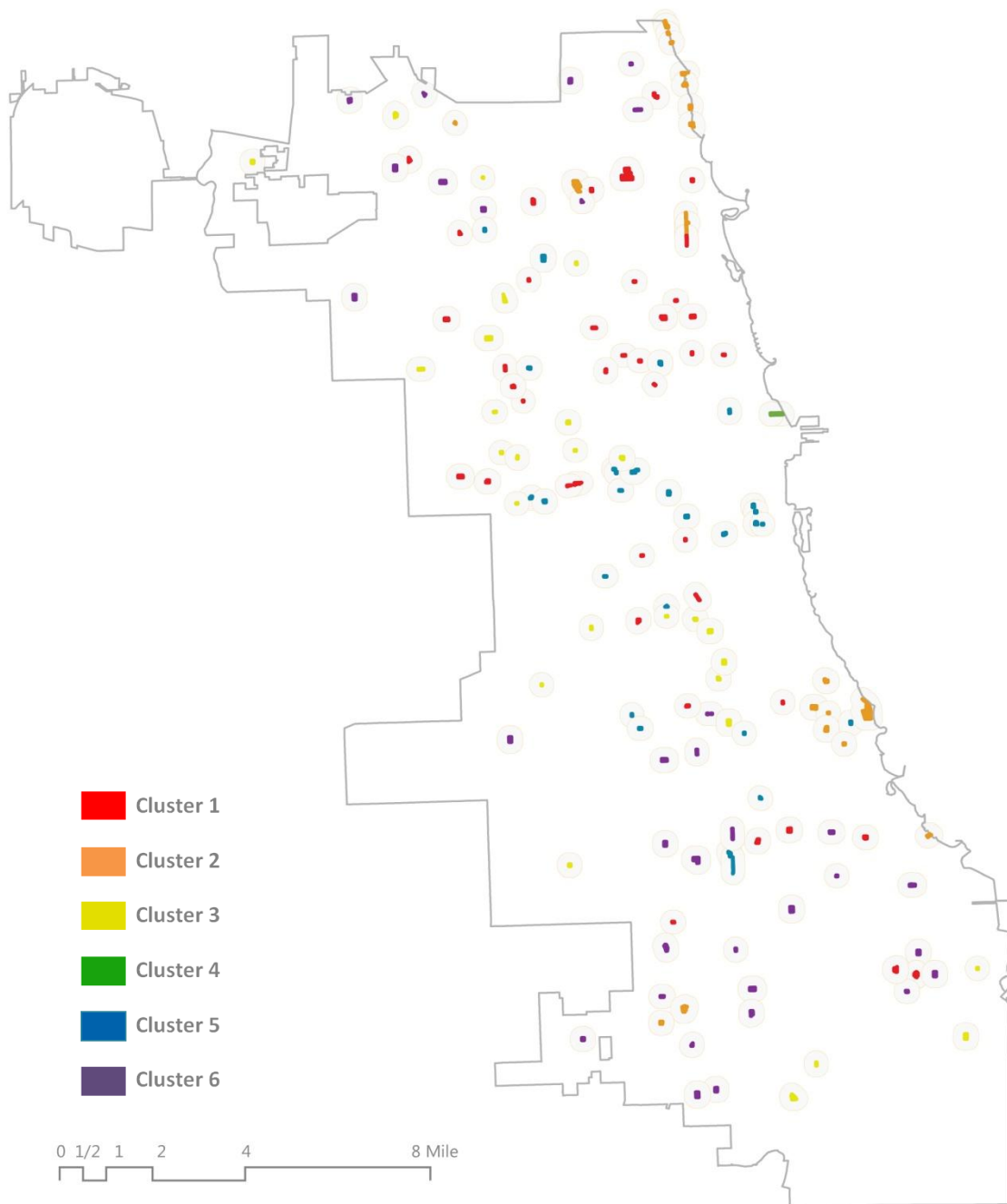
**CLASSIFICATION OF PARK CONTEXT**

Table 7 (Final Cluster Centers) summarizes results of cluster analysis and presents a typology of 150 neighborhood park surroundings. A total of 6 categories (clusters) were identified for surrounding urban form context. Characteristics of each category could be identified by interpreting mean component values in Table 7. Mean component value is a relative value. Figure 8 illustrates 6 different clusters with locations of 150 neighborhood parks and their quarter mile buffer area.

- 1) Cluster 1 includes 40 neighborhood park contexts (Table 8). Park contexts categorized in cluster 1 have characteristics which are far from ‘Urban Core Commercial’ factor (-0.49022). These park surroundings are extremely similar to ‘Walkable Mixed Use’ factor (1.02926) and reasonably similar to ‘Neighborhood Scale Commercial’ factor (0.52364).
- 2) Cluster 2 contains 21 neighborhood park surroundings. As illustrated in Table 7, characteristics of park surroundings classified in Cluster 2 are extremely similar to ‘Less Permeable Low Density’ (1.44850) and ‘Bikeable Multi Family’ (1.09580). Surrounding urban form of these parks had less ‘Walkable Mixed Use’ (-0.46660) characteristics.

- 3) Cluster 3 includes 27 cases of neighborhood park contexts, which have quite similar to 'Less Permeable Low Density' (0.41000) characteristics and have extremely dissimilar from 'Bikeable Multi Family' (-1.47240) characteristics.
- 4) Cluster 4 includes only 2 neighborhood park contexts. Park surroundings categorized into cluster 4 have a strong similarity with 'Urban Core Commercial' (6.95349) and 'Walkable Mixed Use' (2.21155) and dissimilarity with 'Less Permeable Low Density' (-2.10669) characteristics.
- 5) Cluster 5 includes 27 cases of neighborhood park surroundings. Characteristics are similar to 'Neighborhood Scale Commercial' (0.55657), and very dissimilar from 'Walkable Mixed Use' (-1.12537) and 'Less Permeable Low Density' (-0.86614) characteristics.
- 6) Cluster 6 contains 33 surrounding contexts of neighborhood parks. Surrounding form characteristics demonstrate a strong dissimilarity with 'Neighborhood Scale Commercial' (-1.29701), and do not have particular similarity to any factor characteristics.





*Figure 8.* 6 different clusters: locations of 150 neighborhood parks and 1/4 mile buffer areas.

## VISUAL PRESENTATION OF PARK CONTEXT TYPOLOGY

The following section describes characteristics of typology for each neighborhood park surrounding typology. Figures support this discussion by providing examples from six different categories of park contexts. Each example is visualized with major attributes of urban form such as blocks, parcels, building footprints, streets, intersections, cul-de-sacs, and tree canopy. Table 9 shows descriptive statistics of 6 neighborhood parks with normalized value (mean, value per acre, and percentage) of urban form variables. Density refers to ‘floor area ratio’ as a way of measuring urban areas in this section.

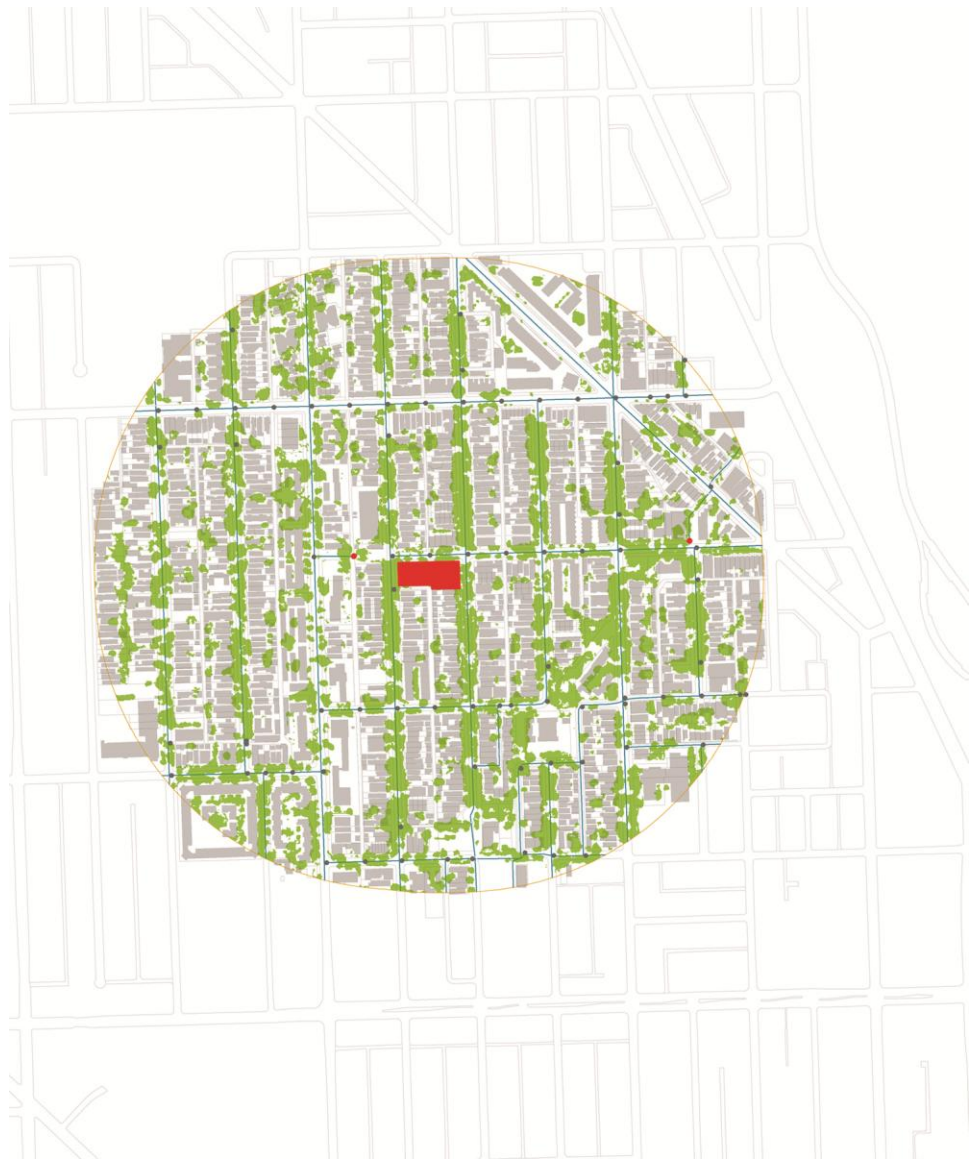
**Cluster 1.** 26.7% (40 out of 150 total) of neighborhood park surroundings were classified into cluster 1. Tables 5 and 7 illustrate that the park context for this cluster involved more residential-related mixed uses and neighborhood-scale commercial uses. Adjacent urban form consisted of relatively smaller size of parcels and building footprints, and more number of parcels. These park contexts included larger sidewalk area, more number of bus stops, and less number of cul-de-sacs which represent features of a walkable neighborhood.

Figure 9 illustrates surrounding contexts of Bauler Park as an example of cluster 1. As visualized in Figure 9, Bauler Park neighborhood has characteristics such as grid street networks, less cul-de-sacs, small lot size and building footprints. Although a value of mean component for regression factor score 3 (0.52364) represents less tree canopy area in Bauler Park neighborhood, this area has continuous tree canopy along streets. In spite of continuous street trees, the tree canopy score is lower as the data includes both street trees and trees in private properties.

Table 9

*Descriptive Statistics for 6 Examples*

	<b>cluster 1</b>	<b>cluster 2</b>	<b>cluster 3</b>	<b>cluster 4</b>	<b>cluster 5</b>	<b>cluster 6</b>
<b>Variables</b>	Bauler	Brooks	Langley	Lakeshore	Durso	Hurley
STREETLENGTH	201.58	156.88	155.15	254.18	230.02	150.88
INTERSECTION	0.54	0.37	0.35	0.43	0.81	0.34
CULDESAC	0.01	0.01	0.03	0.01	0.11	0
BLOCKSIZE(P)	1941.62	2364.37	2077.96	1618.58	1465.75	2309.8
BLOCKSIZE(A)	4.62	7.15	5.85	3.22	3.11	6.2
BLOCKNUMBER	0.22	0.15	0.16	0.31	0.35	0.17
PARCELSIZE(P)	278.72	350.31	357.07	734.96	381.9	416.37
PARCELSIZE(A)	0.08	0.14	0.19	0.82	0.24	0.2
PARCELSETBACK	84.32	113.55	94.8	102.34	84.06	115.07
PARCELNUMBER	8.25	5.06	3.82	1.98	3.16	3.77
BUILDINGFOOTPRINT(P)	173.3	201.34	133.22	589.57	346.78	148.67
BUILDINGFOOTPRINT(A)	0.04	0.05	0.04	0.46	0.17	0.03
BUILDINGSETBACK	90.17	110.37	93.3	98.03	73.47	118.69
SIDEWALKS(A)	0.05	0.04	0.03	0.06	0.04	0.05
TREECANOPY	0.26	0.18	0.15	0.08	0.06	0.49
BUSSTOP	0.12	0.06	0.06	0.21	0.11	0
BIKEROUTE	32.61	43.42	13.19	41.07	16.38	17.81
INDUSTRIALCORRIDOR	0	0	0.31	0	0	0
%SINGLEFAMILY	28%	14%	2%	2%	1%	78%
%MULTIFAMILY	57%	47%	28%	20%	15%	3%
%MIXEDUSE	2%	0%	1%	0%	1%	0%
%NEIGHBORSCALECOM	1%	1%	3%	7%	16%	1%
%BIGCOMMERCIAL	0%	1%	2%	26%	10%	0%



*Figure 9.* Bauler Park as an example of cluster 1.



*Figure 10.* Brooks Park as an example of cluster 2.

**Cluster 2.** 14% (21 out of 150 total) of neighborhood park surroundings were classified into cluster 2. Tables 5 and 7 show that park contexts classified in cluster 2 included more multi-family residential units. Park surroundings were characterized as lower density neighborhoods with a less connected street network based on shorter street length, less number of intersections, larger size of blocks, and longer distances of parcel and building setbacks. Adjacent neighborhoods of parks had less sidewalk area and more number of cul-de-sacs, although there were more bike routes.

Figure 10 illustrates the adjacent context of Brooks Park as an example of cluster 2. A quarter mile buffer area of Brooks Park contains less number of blocks with relatively larger size. Most blocks include parcels and buildings with longer setback distance, which can be collectively attributed to a low density neighborhood. As illustrated in Figure 10 and Table 9, Brooks Park neighborhood includes less features of a walkable neighborhood such as street trees and sidewalks.

**Cluster 3.** 18% (27 out of 150 total) of neighborhood park contexts were categorized into cluster 3. As Table 5 and 7 illustrated, park surroundings in cluster 3 involve more industrial land uses and less multi-family residential. Parks in cluster 3 had features of lower density and a less connected street network which are similar to characteristics of park surroundings in cluster 2. These features are shorter street length, with less number of intersections, larger sizes of blocks, and longer distances of parcel and building setback.

Figure 11 shows surrounding contexts of Langley Park as an example of cluster 3. Although the park itself is located within a residential neighborhood area, a quarter mile buffer area of Langley Park includes a large portion of industrial corridor. Conflict

between residential and industrial land uses in the Langley Park neighborhood creates two extremely different urban form characteristics in terms of block, parcel, building size, and street pattern. More cul-de-sacs are found as there are less street connections between two distinct land uses.

**Cluster 4.** Only 1.3% (2 out of 150 total) of neighborhood park surroundings were classified into cluster 4. Table 5 and 7 illustrate that the park context in this cluster involved more big-box commercial and residential-related mixed use. Adjacent urban form had the characteristics of a well-connected street network such as longer street length with more number of intersections, and smaller size of blocks. These neighborhood parks illustrated higher density surroundings. High density was defined by the following features: 1) Larger size of parcels and building footprints, but smaller size of blocks, 2) shorter distance of parcel and building setback, and 3) more number of blocks with less number of parcels.

Figure 12 shows the adjacent neighborhood of Lake Shore Park and Seneca Park, which were classified into cluster 4. As both parks are located in the Central Business District, park surroundings have characteristics of typical downtown including larger size of parcels and building footprints, and higher building to land ratio. A quarter mile buffer areas of these two parks have a well connected street network with a large area of sidewalk.



*Figure 11.* Langley Park as an example of cluster 3.





*Figure 12.* Lake Shore Park and Seneca Park as examples of cluster 4.

**Cluster 5.** 18% (27 out of 150 total) of the neighborhood park contexts were classified into cluster 5. Tables 5 and 7 show that park contexts for this cluster included a higher percentage of neighborhood scale commercial but a lower percentage of mixed-use and single family residential uses. These park contexts showed features of less-walkable neighborhoods including smaller sidewalk areas, less tree canopy, and more number of cul-de-sacs. However, park surroundings included longer street length, more number of intersections, and smaller size of blocks, which represent features of permeability.

Figure 13 illustrates a quarter mile buffer area of Durso Park as an example of cluster 5. Surroundings of this neighborhood park show both urban and suburban characteristics: A fine-grained and less-walkable environment. Characteristics of a fine-grained urban fabric consist of smaller blocks and shorter distance of parcel and building setback in close proximity. Features such as less tree canopy and more numbers of cul-de-sacs can be attributed to a less-walkable neighborhood.

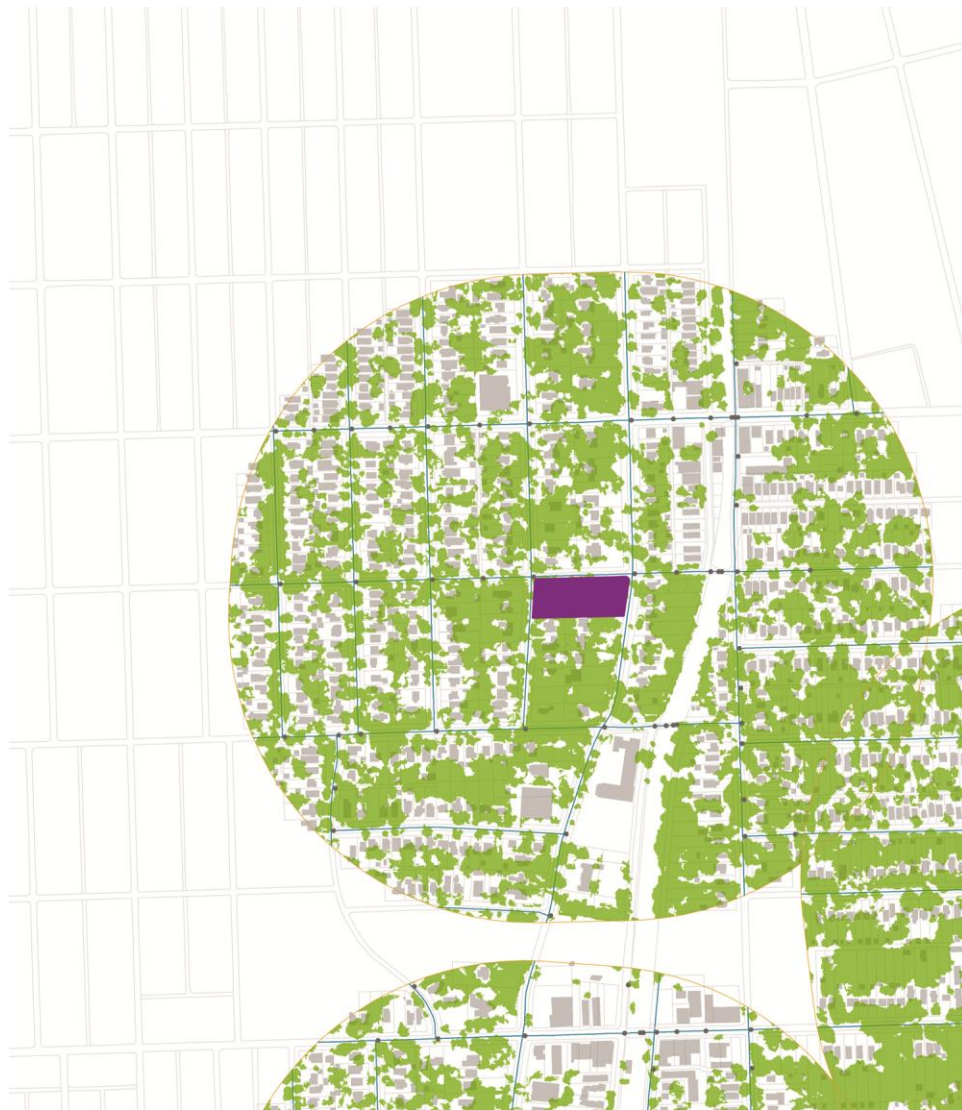
**Cluster 6.** 22% (33 out of 150 total) of neighborhood park surroundings were categorized in cluster 6. Cluster 6 demonstrated characteristics of single family residential with larger area of tree canopy. The adjacent neighborhood involves less number of bus stops and lower percentage of neighborhood scale commercial which are main characteristics of suburban neighborhood area (Table 5 and 7).

Figure 14 illustrates the Hurley Park neighborhood as an example of cluster 6. The park neighborhood includes a larger area of tree canopy from both street trees and trees in private properties. As Figure 14 shows, Hurley Park neighborhood has

characteristics of typical suburban residential area such as large size of blocks, detached single family houses, and less connected street network.



*Figure 13.* Durso Park as an example of cluster 5.



*Figure 14.* Hurley Park as an example of cluster 6.

## **SUMMARY**

This chapter examined the process of creating a typology of neighborhood park contexts using cluster analysis. Five regression factor scores identified from factor analysis (discussed in Chapter 3) were used as explanatory variables for cluster analysis. Six categories of neighborhood park surroundings were identified. Characteristics of each

category have been discussed and examples of neighborhood park contexts were illustrated. The following chapter will discuss the relationship between the characteristics of morphological context and success of neighborhood parks.

## Chapter 5

### SUCCESS OF NEIGHBORHOOD PARKS

#### INTRODUCTION

This chapter explores the relationship between the characteristics of morphological context and the success of neighborhood parks. As this research employs crime rate as an indicator of successful neighborhood parks, the following two questions are addressed in this chapter. Are there any associations between morphological context and property/ violent crime rate of neighborhood park surrounding? If yes, what is the nature of the relationship between the morphological context and the property/ violent crime rates of the neighborhood park surroundings? This chapter describes how independent, control, and dependent variables were collected and measured to conduct multiple regression analysis, followed by results and discussion from the regression analysis.

#### VARIABLES FOR MULTIPLE REGRESSION ANALYSIS

**Control Variables.** In order to understand the relationship between the characteristics of morphological context and crime rate, socio-demographic and income characteristics of park surrounding were required to be held constant. Socio-demographic characteristics by block group division were collected from U.S. Census data (U.S. Census Bureau, 2010). Block groups were selected using ArcGIS if centroid points of block groups were located within a quarter mile distance from park boundary. Socio-demographic variables include: 1) Housing unit density (per acre), 2) population density

(per acre), 3) Hispanic (percentage), 4) non-Hispanic White (percentage), 5) non-Hispanic African American (percentage), and 6) non-Hispanic Asian (percentage).

Average housing price (per square foot) was used as an indicator of income status. Housing price data in the City of Chicago was collected from Core Logic (2012). Core Logic accumulated transaction information of housing sales for 2011 that was initially collected by the Cook County Recorder’s Offices. Home sales transactions were selected (using ArcGIS) if they were located within a quarter mile distance from a park boundary.

Table 10

*Descriptive Statistics for Control and Dependent Variables*

	<b>Unit of Measures</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Control Variables</b>					
Housing Unit Density	per Acre	13.990	11.463	2.324	78.175
Population Density	per Acre	29.204	17.710	5.598	121.988
Hispanic	Percentage	0.224	0.260	0.007	0.912
Non-Hispanic White	Percentage	0.303	0.294	0.001	0.894
Non-Hispanic African American	Percentage	0.402	0.400	0.002	0.986
Non-Hispanic Asian	Percentage	0.053	0.069	0.000	0.321
Average housing price	per Sq. Ft.	126.938	93.084	14.299	402.234
<b>Dependent Variables</b>					
Property Crime	per 1000 population	18.344	11.460	2.18	58.49
Violent Crime	per 1000 population	43.905	35.757	3.14	162.79

**Dependent Variables.** Crime rates were used as an indicator of successful neighborhood parks. The crime data was collected from Research and Development Division of the Chicago Police Department, and downloaded from the City of Chicago Data Portal website. Crime rate was determined based on the number of crime incidents

per 1000 population. Crime incidents that occurred in 2010 were counted by block group division. Block groups were selected using ArcGIS if centroid points of block groups were located within a quarter mile distance from park boundary.

Property crime includes Index Crime (major crime) related to property such as burglary, motor vehicle theft, arson, and larceny. Violent crime includes Index Crime (major crime) related to violence such as homicide, crime sexual assault, robbery, assault, and battery. Crime classification codes were derived from the Federal Bureau of Investigation's (FBI) National Incident-Based Reporting System (NIBRS), and Uniform Crime Reporting (UCR) Program.

**Independent Variables.** Two sets of independent variables were used for multiple regression analysis: five regression factor scores, and nine individual variables associated with urban form.

Regression factor scores were used as independent variables for multiple regression analysis. The result of factor analysis illustrated that the first five factors have Eigen Values greater than one. The five regression factor scores are combined scores for each case (150 neighborhood parks) and each factor component. Using factor scores as independent variables is more reliable than using inter-dependent variables in order to avoid multicollinearity (Yakubu et al., 2009).

Nine variables associated with urban form were used as independent variables to gain in-depth understanding of relationships between individual variables and crime rate. Variables included: 1) parcel count, 2) street length, 3) intersection count, 4) block count, 5) building setback, 6) tree canopy, 7) cul-de-sac count, 8) sidewalk, and 9) bike route. These variables are described in detail in Chapter 3 (p. 62).



## MULTIPLE REGRESSION ANALYSIS: RESULTS AND DISCUSSION

**Factor Scores and Property Crime.** Regression factor score values of five factor components were considered as independent variables in multiple regression analysis. These five factor scores were used to determine the relationship between characteristics of morphological context and property crime rates of neighborhood park surroundings.

The results of multiple regression analysis are presented in Table 11. Table 11 shows that Factor 2 and Factor 3 had significant linear relationships with property crime rate ( $p < 0.05$ ). As seen in Table 11, Factor 2 had negative b coefficient value. The negative b coefficient value for Factor 2 indicated direct relationships in which higher numeric values for regression factor scores were associated with lower numeric values for property crime rate. Factor 3 had positive b coefficient values. The positive b coefficient values for Factor 3 indicated direct relationships in which higher numeric values for regression factor scores were associated with higher numeric values for property crime rate. The following section describes and interprets the relationship between variables associated with each factor and property crime rate. Descriptive titles of each factor component are mentioned in parentheses.

Table 11

*Results of multiple regression analysis: factor scores and property crime*

<b>Variables</b>	<b>Coefficients</b>	<b>SE</b>	<b>T-Value</b>	<b>P-Value</b>
FAC1_1	-1.064	0.814	-1.306	.194
FAC2_1	<b>-1.857</b>	0.631	-2.942	<b>.004</b>
FAC3_1	<b>2.394</b>	0.623	3.841	<b>.000</b>
FAC4_1	-0.146	0.571	-0.256	.799
FAC5_1	-0.246	0.747	-0.329	.742

S = 6.316, R-sq = 72.10%, R-sq (adj) = 69.60% (P<0.05)

The negative b coefficient value of Factor 2 (-1.857) implied that variables associated with Factor 2 (Less Permeable Low Density) were negatively related to higher property crime rate. 1) Less street miles, 2) less number of intersection, 3) longer block perimeter, 4) larger area of block, 5) less number of block, 6) longer distance of parcel setback, and 7) longer distance of building setback lead to decrease in property crime for neighborhood park surrounding.

The b coefficient value of Factor 3 (2.394) meant that variables associated with Factor 3 (Neighborhood Scale Commercial) were positively related to higher property crime rate. 1) Smaller area of tree canopy, 2) more number of bus stops, 3) lower percentage of single family residential, and 4) higher percentage of neighborhood scale commercial use could lead to an increase in property crime rate for neighborhood park surroundings.

**Factor Scores and Violent Crime.** Five factor scores were used to determine the relationship between characteristics of morphological context and violent crime rates of neighborhood park surroundings.

The results of multiple regression analysis are presented in Table 12. Table 12 shows that Factor 1, Factor 2, and Factor 3 were found to have significant linear relationships with violent crime rate ( $p < 0.05$ ). Table 12 describes how Factor 1 and Factor 3 had positive b coefficient values. The positive b coefficient values indicated direct relationships in which higher numeric values for regression factor scores were associated with higher numeric values for violent crime rate. Factor 2 in Table 12 had negative value, indicating a relationship in which lower numeric value of Factor 2 was associated with higher numeric value of violent crime rate. The following section

describes and interprets the relationship between variables associated with each factor and violent crime rate. Descriptive titles of each factor component are mentioned in parenthesis.

Table 12

*Results of multiple regression analysis: factor scores and violent crime*

<b>Variables</b>	<b>Coefficients</b>	<b>SE</b>	<b>T-Value</b>	<b>P-Value</b>
FAC1_1	<b>5.628</b>	2.081	2.704	<b>.008</b>
FAC2_1	<b>-6.361</b>	1.613	-3.943	<b>.000</b>
FAC3_1	<b>10.428</b>	1.593	6.544	<b>.000</b>
FAC4_1	-0.781	1.460	-0.535	.593
FAC5_1	-1.053	1.909	-0.552	.582

S = 16.145, R-sq = 81.30%, R-sq (adj) = 79.60% (P<0.05)

The b coefficient value of Factor 1 (5.628) meant that variables associated with Factor 1 (Urban Core Commercial) were positively related to higher violent crime rate. 1) Longer parcel perimeter, 2) larger area of parcel, 3) less number of parcel, 4) longer building footprint perimeter, 5) larger area of building footprint, and 6) higher percentage of non-neighborhood scale, big-box commercial land use were related to higher violent crime rate for neighborhood park surroundings.

The negative b coefficient value of Factor 2 (-6.361) implied that variables associated with Factor 2 (Less Permeable Low Density) were negatively related to higher violent crime rate. 1) Less street miles, 2) less number of intersection, 3) longer block perimeter, 4) larger area of block, 5) less number of block, 6) longer distance of parcel setback, and 7) longer distance of building setback lead to decrease in violent crime for neighborhood park surrounding.

The positive value of b coefficient (10.428) for Factor 3 indicated that variables associated with Factor 3 (Neighborhood Scale Commercial) were positively related to higher violent crime rates. Higher violent crime rates for neighborhood park surrounding was related to 1) smaller area of tree canopy, 2) more number of bus stops, 3) lower percentage of single family residential, and 4) higher percentage of neighborhood scale commercial use.

Regression factor scores were used in the first multiple regression analysis to understand the relationship between characteristics of morphological context and crime rates of neighborhood park surroundings. In addition to factor scores, nine individual variables were considered in multiple regression analysis to understand the direct relationship individual variables with property and violent crime. Nine variables which represented major elements of urban form were chosen by verifying variance inflation factors ( $VIF < 10$ ) in order to avoid multicollinearity between variables (Table 13 and 14). The following section describes relationships between variables associated with urban form and crime rates.

**Urban Form Variables and Property Crime.** Nine variables associated with urban form were used as independent variables in multiple regression analysis to establish significant variable(s) affecting on property crime rates. Variables included: 1) parcel count, 2) street length, 3) intersection count, 4) block count, 5) building setback, 6) tree canopy, 7) cul-de-sac count, 8) sidewalk, and 9) bike route.

Table 13

*Results of multiple regression analysis: urban form variables and property crime*

<b>Variables</b>	<b>Coefficients</b>	<b>SE</b>	<b>T-Value</b>	<b>P-Value</b>	<b>VIF</b>
STREETLENGTH	-0.024	0.037	-0.659	.511	3.929
INTERSECTION	<b>16.471</b>	3.963	4.156	<b>.000</b>	2.320
CULDESAC	18.500	27.376	0.676	.500	1.438
BLOCKNUMBER	-22.331	19.135	-1.167	.245	3.102
PARCELNUMBER	0.523	0.571	0.915	.362	3.261
BUILDINGSETBACK	-0.124	0.084	-1.472	.143	2.471
SIDEWALKS(A)	37.227	95.015	0.392	.696	3.581
TREECANOPY	-1.763	8.265	-0.213	.831	2.052
BIKEROUTE	-0.010	0.035	-0.291	.772	1.564

S = 6.247, R-sq = 73.50 %, R-sq (adj) = 70.30 % (P<0.05)

The results of multiple regression analysis are presented in Table 13. Table 13 shows that intersection had significant linear relationships with property crime rate ( $p < 0.05$ ). The positive b coefficient values of intersection (16.471) indicated direct positive relationships with property crime rate. Higher numeric value for number of intersection was associated with higher numeric values for property crime rate. The result showed more number of intersections was related to higher property crime rate for neighborhood park surroundings.

**Urban Form Variables and Violent Crime.** Nine independent variables associated with urban form were used in multiple regression analysis to determine significant variable(s) affecting on violent crime rates. 1) Parcel count, 2) street length, 3) intersection count, 4) block count, 5) building setback, 6) tree canopy, 7) cul-de-sac count, 8) sidewalk, and 9) bike route were considered in this regression analysis.

Table 14

*Results of multiple regression analysis: urban form variables and violent crime*

<b>Variables</b>	<b>Coefficients</b>	<b>SE</b>	<b>T-Value</b>	<b>P-Value</b>	<b>VIF</b>
STREETLENGTH	0.036	0.100	0.365	.716	3.929
INTERSECTION	<b>44.082</b>	10.712	4.115	<b>.000</b>	2.320
CULDESAC	6.290	73.994	0.085	.932	1.438
BLOCKNUMBER	-44.218	51.720	-0.855	.394	3.102
PARCELNUMBER	-1.565	1.545	-1.013	.313	3.261
BUILDINGSETBACK	-0.311	0.228	-1.364	.175	2.471
SIDEWALKS(A)	33.781	256.817	0.132	.896	3.581
TREECANOPY	<b>-45.201</b>	22.339	-2.023	<b>.045</b>	2.052
BIKEROUTE	-0.124	0.094	-1.320	.189	1.564

S = 16.885, R-sq = 80.10 %, R-sq (adj) = 77.70 % (P<0.05)

Table 14 illustrates that intersection and tree canopy were considered to have significant linear relationships with violent crime rate ( $p < 0.05$ ). The positive b coefficient value of intersection (44.082) indicated direct positive relationships with violent crime rate. The result shows more number of intersections was associated with higher violent crime rate for neighborhood park surroundings. The b coefficient value of tree canopy (-45.201) informed that tree canopy area was negatively related to higher violent crime rate. Result indicated that larger area of tree canopy could lead to decrease in violent crime for neighborhood park surrounding.

## **SUMMARY**

A primary purpose of this chapter was to explore the relationship between the characteristics of morphological context and property/ violent crime rate. Multiple regression analysis was conducted using two sets of independent variables: five

regression factor scores and nine individual variables associated with urban form. Results showed that some factors and individual variables were strongly related to property and violent crime rate. Following chapter discusses insights and implications for this research. Key limitations and future research opportunities are also discussed in the following chapter.

## Chapter 6

### CONCLUSIONS

#### OVERVIEW

In reference to urban public space, various studies have discussed the impact of public space on economic value, health, social goals, and environment benefits.

Practically and theoretically, urban public space has been considered as a tool to promote these benefits on adjacent neighborhoods. However, there is a lack of understanding of public space as an actual ‘built space’ within an urban context.

In the urban design and planning literature, little attention has been given to the features of morphological context and its relationship with the success of neighborhood parks. This research provides an exploratory examination of the relationship between morphological context of surrounding neighborhoods and the success of neighborhood parks.

This study contributes to the body of knowledge in four diverse ways. First, at a methodological level, this research provides a strategy for evaluating and measuring morphological context. Second, this research adds to the practical knowledge by creating a typology of urban public space contexts at a neighborhood scale. Third, this research provides an empirical contribution by applying the typology of neighborhood park contexts on selected parks. Last, on a broader scale, this research contributes to urban design and planning policy by suggesting a typology based on neighborhood parks contexts. It would assist urban designers and practitioners to develop appropriate urban design guidelines for neighborhood parks.



## **KEY FINDINGS AND INSIGHTS**

This study aims to evaluate the context of neighborhood parks, and understand the relationship between the features of morphological context and the success of neighborhood parks. In this study, the ‘context’ corresponds to the layout and configuration of urban form. The ‘urban form’ refers to the physical structure and pattern of urban elements. Features related to blocks, parcels, and buildings; street networks; pedestrian-oriented attributes; and property land uses are included in this study. The ‘success’ of neighborhood parks is defined by property and violent crime rates.

This research demonstrates a methodology for classifying the surrounding context of neighborhood parks. Twenty three major attributes associated with morphological context were collected for 150 neighborhood parks in the City of Chicago. Data associated with the urban form was collected within ¼ mile distance from each park using Geographic Information System (GIS). Based on a set of parcel-level urban form measures, factor analysis was conducted to understand the dimensional structure of 23 features. Then, cluster analysis was employed to develop a typology of neighborhood park context. Lastly, multiple regression analysis was conducted to understand the association between morphological context and property/ violent crime rate of neighborhood park surroundings. This section presents key insights for each research question.

1. What are the major characteristics of morphological context around neighborhood parks?

- a. What is the relationship among the different characteristics of morphological context around neighborhood parks?

- Twenty three features related to 1) blocks, parcels, and buildings, 2) street networks, 3) pedestrian-oriented attributes, and 4) property land uses were included in this study. The result of factor analysis shows that five groups of factors were extracted from 23 urban form features. Features grouped in each factor indicate a strong relationship with each other.
- The first factor, ‘Urban Core Commercial’ includes six interdependent features such as 1) longer parcel perimeter, 2) larger area of parcel, 3) less number of parcel, 4) longer building footprint perimeter, 5) larger area of building footprint, and 6) higher percentage of non-neighborhood scale, big-box commercial land use.
- The second factor includes ‘Less Permeable Low Density’ characteristics such as 1) less street miles, 2) less number of intersection, 3) longer block perimeter, 4) larger area of block, 5) less number of block, 6) longer distance of parcel setback, and 7) longer distance of building setback.
- The third factor, ‘Neighborhood Scale Commercial’ includes variables such as 1) smaller area of tree canopy, 2) more number of bus stops, 3) lower percentage of single family residential, and 4) higher percentage of neighborhood scale commercial use.
- The fourth factor reflects ‘Walkable Mixed Use’ characteristics such as 1) less number of cul-de-sacs, 2) larger area of sidewalk, and 3) higher percentage of residential involved mixed use.

- The fifth factor relates to ‘Bikeable Multi Family’ characteristics such as 1) more bike route miles, 2) smaller area of industrial corridor, and 3) higher percentage of multi-family residential use.

b. How can these characteristics of morphological context be used to construct a typology of context for neighborhood parks?

- Cluster analysis was employed to understand the variation in context of neighborhood parks based on their homogeneity and heterogeneity within the predetermined set of variables. The result of cluster analysis shows that neighborhood park contexts are classified into 6 categories (Clusters). Although the Chicago Park District (2010) classifies all 150 parks into one (neighborhood parks) category, this study provides an alternative typology based on surrounding urban form.
- 40 park contexts (26.7%) categorized into Cluster 1 are extremely similar to ‘Walkable Mixed Use’ and reasonably similar to ‘Neighborhood Scale Commercial’ factor characteristics. These park surroundings are dissimilar to ‘Urban Core Commercial’ factor characteristics. These neighborhood park surroundings have features of *traditional neighborhoods* including mixed uses (residential involved), neighborhood scale commercial, fine-grain parcel/ building size, and pedestrian-friendly features.
- 21 park surroundings (14%) classified into Cluster 2 have characteristics which are extremely similar to ‘Less Permeable Low Density’ and ‘Bikeable Multi Family,’ and dissimilar to ‘Walkable Mixed Use’ characteristics. Parks classified into this category are located in

neighborhoods with *suburban sprawl* characteristics in terms of street network and ‘floor area ratio’ density. Park contexts in this category include more multi-family residential units and less residential-involved mixed uses.

- 27 park contexts (18%) categorized into Cluster 3 are quite similar to ‘Less Permeable Low Density’ characteristics, and extremely dissimilar from ‘Bikeable Multi Family’ characteristics. This category is similar to Cluster 2 in terms of *suburban sprawl* characteristics; low street connectivity and low ‘floor area ratio’ density. Park surroundings in Cluster 3 are typically located adjacent to industrial corridor area.
- Only 2 park surroundings (1.3%) are classified into Cluster 4. These park surroundings have a strong similarity with ‘Urban Core Commercial’ and ‘Walkable Mixed Use,’ and dissimilarity with ‘Less Permeable Low Density’ characteristics. These neighborhood park surroundings have *typical downtown* characteristics such as higher building to land ratio, pedestrian-friendly features, and well connected street network. Park surroundings in Cluster 4 include more big-box commercial and residential-involved mixed uses.
- 27 park surroundings (18%) classified into Cluster 5 have characteristics which are similar to ‘Neighborhood Scale Commercial,’ and very dissimilar from ‘Walkable Mixed Use’ and ‘Less Permeable Low Density.’ Parks classified into this category are located in neighborhoods with features of both *traditional neighborhoods* and *suburban sprawl*;

these neighborhoods are dense and well-connected in terms of street network although not quite walkable. Park surroundings in Cluster 5 include more neighborhood scale commercial and less residential-involved mixed uses.

- 33 park contexts (22%) classified into Cluster 6 are strongly dissimilar to ‘Neighborhood Scale Commercial,’ and do not have particular similarity to any other factor characteristics. Neighborhood park surroundings categorized into this type have features of *suburban sprawl* in terms of residential subdivision characteristics. Parks in Cluster 6 are located in neighborhoods majorly consisted of single family residential use.
- The six categories above indicate the complexity of urban form surrounding neighborhood parks. These parks are classified as neighborhood parks based on three major criteria: 1) size of parks, 2) facilities within parks, and 3) the distance served from neighborhood served (Chicago Park District, 2010). But the classification system does not account for any variation in the morphological surrounding of parks. As seen in Cluster 5, park surroundings demonstrate overlapping characteristics of both *the traditional neighborhood* and *suburban sprawl* development. This research could provide an alternative system of park classification based on surrounding urban form. This will assist city planners, and park and recreation authorities to effectively determine new locations for neighborhood parks based on urban surroundings.

2. How does the characteristic of morphological context associate with the success of neighborhood parks (property/ violent crime rate)?

a. Are there any associations between morphological context and property/ violent crime rate of neighborhood park surrounding?

- Multiple regression analysis was conducted using two sets of independent variables: 1) five regression factor scores and 2) nine individual variables associated with urban form. The results indicated that some factors and individual variables are strongly related to property and violent crime rates.
- Two factors ('Less Permeable Low Density' and 'Neighborhood Scale Commercial') demonstrate significant linear relationships with property crime rate.
- Three factors included in regression analysis ('Urban Core Commercial,' 'Less Permeable Low Density,' and 'Neighborhood Scale Commercial') demonstrate significant linear relationships with violent crime rate.
- Only one element of urban form (intersection) shows significant linear relationships with property crime rate.
- Two measurements of urban form (intersection and tree canopy) show significant linear relationships with violent crime rate.

b. If yes, what is the nature of relationship between morphological context and property/ violent crime rate of neighborhood park surrounding?

- Characteristics of variables associated with 'Neighborhood Scale Commercial' are positively related to higher property and violent crime

rates. Land uses including 1) lower percentage of single family residential and 2) higher percentage of neighborhood scale commercial use lead to increase in property and violent crime rates.

- Characteristics of variables associated with ‘Less Permeable and Low Density’ are negatively related to higher property and violent crime rates. Urban form features including 1) more street length, 2) more number of intersections, 3) smaller size of block, and 4) shorter setback distance of buildings/ parcels lead to increase in property and violent crime rates.
- Variables representing accessibility are associated with more property and violent crime rates. For example, ‘Neighborhood scale commercial’ relates to higher property and violent crime rate as these land uses offer more opportunities for interactions with strangers.
- Variables related to more permeable layouts increase property and violent crime rate. 1) More street miles, 2) more number of intersections, 3) smaller size of blocks, and 4) more number of blocks increase permeability, which provides easy access to potential property and violent crime targets.
- Property and violent crime is less frequent in areas with higher percentage of single family residential area.
- The finding shows that ‘more number of intersections’ lead to increase in property and violent crime for neighborhood park surroundings.

- Variables associated with ‘Urban Core Commercial’ characteristics indicate strong relationships with violent crime. However, this factor is not significantly related to property crime rate.
- Higher violent crime rate is associated with 1) larger size of parcels, 2) larger size of building footprints, and 3) higher percentage of big box commercial land use.
- An urban form variable, ‘smaller area of tree canopy’ leads to increase in violent crime for neighborhood park surroundings.
- The results of regression analysis do not necessarily coincide with environmental criminology literature. For example, the ‘eyes on the street’ concept by Jane Jacobs is associated with higher-density, permeability and mixed-use development which could be promoted by changing and improving urban form and land uses. The results from this study indicate that variables associated with higher-density, permeability and mixed-use development do not necessarily reduce property and violent crime rate. However, it is important to note that there are some variables representing *the traditional neighborhood* characteristics which relate to lower property and violent crime rate. As mentioned above, variables related to lower crime rate could provide some guidelines for urban design and physical planning strategies for neighborhood park development.



## **LIMITATIONS OF THE STUDY**

This study was limited to only 23 variables related to urban form and property use. The park surroundings classified in this study were limited to a quarter mile buffer area. Urban form and property use beyond this range was not considered for analysis.

Typology of neighborhood park surroundings was restricted to parks within the City of Chicago limits. Although the study provides a comprehensive classification of park surroundings based on morphological aspects, the findings of this study are contextual and cannot be entirely applicable to other cities.

Various aspects such as economic value, health improvements, social goals, environment benefits, and crime have been used as indicators of successful public space. This study employs crime rates as the only indicator of successful neighborhood parks.

This study also includes several limitations in terms of data availability and reliability. Urban form data used for this study does not include variables related to three dimensional urban forms. For example, building heights were not included as a variable for analysis as such data was unavailable in GIS format. The GIS data obtained from municipalities might have some discrepancies. In addition, not all GIS layers were updated during the same time frame. This could have adversely affected the findings of this study. To maintain data consistency, the most recently updated GIS data was used for this study. In spite of this, some inconsistencies related to data could not be avoided.

## **RECOMMENDATIONS FOR FUTURE RESEARCH**

This research accounts for various urban form variables. However, including variables related to street-level urban form would help to accurately identify physical

environment at a pedestrian level (e.g., pedestrian traffic signal and sidewalk connectivity). In addition to crime data, adopting qualitative methods to obtain user-centric data would further strengthen this study. For example, using qualitative techniques, park usage data could be collected and used as an indicator of successful neighborhood park.

The focus of this study was limited to identifying a typology of ‘neighborhood park’ surroundings. Future studies could focus on understanding morphological context for other categories of public spaces. Using the same methodological framework, comparative studies could be conducted in other U.S. cities. Comparing morphological context of public spaces in different geographical, economic, social, and political areas would provide valuable insights for public space design and management.

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APPENDIX A

DEFINITIONS OF PARK CLASSIFICATION IN THE CITY OF CHICAGO

Types of Park	Description (Chicago Park District, 2010)
Magnet park	A large park in excess of 50 acres that contains a combination of indoor and outdoor facilities that regularly attracts large numbers of persons from the entire metropolitan area and beyond.
Citywide park	A large park of at least 50 acres that contains a combination of indoor and outdoor facilities which attract patrons from the entire city, but which primarily serve the population living within one mile. Citywide parks have a Class A or Class B field house and at least one magnet facility, such as a zoo, museum, cultural center, conservatory, marine major lakefront beach, stadium, sports center, or golf course. Citywide parks also contain a variety of passive and active recreational areas including playground apparatus.
Regional park	A park that is generally from 15 to 50 acres that has a Class A or Class B field house. Regional parks also contain a variety of passive and active outdoor recreational areas including playground apparatus. The primary service population for a regional park lives within $\frac{3}{4}$ mile. Exceptions: Regional parks include those with more than 50 acres that do not have a magnet facility and those from 5 to 15 acres that have both a Class C or Class D field house and a magnet facility.
Community park	A park that is generally from 5 to 15 acres with playground apparatus and a variety of other indoor and outdoor recreational facilities. The primary service population for a community park lives within $\frac{1}{2}$ mile. Exception: Community parks include those with more than 15 acres that have a Class C or Class D field house and parks with less than five acres that do have a Class A field house, Class B field house, or a magnet facility.
Neighborhood park	A park that is generally $\frac{1}{2}$ acre to 5 acres with playground apparatus. The park may contain other indoor or outdoor recreational facilities. Indoor facilities shall not exceed the size of a Class C or Class D field house. The primary service population for a neighborhood park lives within $\frac{1}{4}$ mile.
Mini-park	A park less than $\frac{1}{2}$ acre in size with playground apparatus. The park may or may not contain other indoor or outdoor recreational facilities. Indoor facilities do not exceed the size of a Class D field house. A mini-park serves the population within $\frac{1}{10}$ mile, i.e., a portion of a neighborhood.
Passive park	A landscaped park without indoor or outdoor facilities for active recreation. Such a park may be used informally for active recreation, but there are no designated playing fields. Such a park may have fixtures and accessory uses, such as parking, benches, paths, walkways, and drinking fountains.
Unimproved park	Park land acquired for future park development.

## APPENDIX B

### ADDITIONAL DEFINITIONS OF PUBLIC SPACE TYPOLOGIES

Authors	Characteristics of public space typology
Sitte (1889)	<ol style="list-style-type: none"> <li>1. Enclosure: Sitte believed that ‘public squares should be enclosed entities’. As the most important principle, the concept of enclosure is the primary element for designing square and the intersection with streets.</li> <li>2.</li> <li>3. Freestanding sculptural mass: For Sitte, buildings should be linked together rather than being freestanding building. The mass of buildings and its façade define public squares while creating a better sense of enclosure.</li> <li>4.</li> <li>5. Shape: Sitte identified two different square types based on the proportion between squares and major buildings around them. According to Sitte, the depth of a square is related to the height of main building, while the corresponding width is related to the perspective effect.</li> <li>6.</li> <li>7. Monuments: Sitte focused on the proper placement of statues, fountains, and monuments in public squares. He emphasized the placement of monuments based on functional logic, and also underlined the significance of aesthetic aspect of monuments (Carmona, Heath, Oc, &amp; Tiesdell, 2003).</li> </ol>
Zucker (1959)	<ol style="list-style-type: none"> <li>1. The closed square (space self-contained): Shaping by regular geometric forms, the closed square is characterized by an enclosed and self-contained space which is interrupted only by streets. Zucker emphasized significance of architectural elements around squares, such as repetition of similar building types and façade types, to enhance the sense of enclosure.</li> <li>2.</li> <li>3. The dominated square (space directed): Zucker explained that the dominated square is characterized by a building or group of buildings towards which the space is directed, and to which all surrounding structures are related. To create a strong ‘sense of space’, the dominant feature could be something other than a building, such as a particular view or an architecturally developed fountain.</li> <li>4.</li> <li>5. The nuclear square (space formed around a center): Zucker believed that a central feature is sufficient to create a ‘sense of space’ around itself. In a nuclear square, the nucleus governs the effective size of urban spaces.</li> <li>6.</li> <li>7. Grouped squares (space units combined): Zucker described an aesthetical and visual impact on a group of squares. Each square can be a meaningful link for a group of squares as well as gain additional significance from it. Beyond the effect of physical connection among them, he also emphasized that the successive mental images can be integrated into an entire group.</li> <li>8.</li> <li>9. The amorphous square (space unlimited): Although the amorphous</li> </ol>

	square appears unorganized and formless in terms of physical characteristics, they can provide a sense of space that relates to the size of them (Zucker, 1959).
Gehl & Gemzoe (2000)	<ol style="list-style-type: none"> <li>1. Main city square: The central square in a city, town or quarter.</li> <li>2.</li> <li>3. Recreational square: Public space with the primary function of meeting place or recreational activity. Lively squares as well as spaces with a more passive recreational character come under this category.</li> <li>4.</li> <li>5. Promenade: It provides furniture for stationary activities that provides the momentum or direction to spaces.</li> <li>6.</li> <li>7. Traffic square: The main function of this type of public space is to facilitate the circulation of traffic as well as the interchange between different modes of transport. The selected squares emphasize concern for public transport passengers.</li> <li>8.</li> <li>9. Monumental square: This type of public space provides a pause in the city fabric and often has symbolic importance. The forecourts of monumental buildings also fall under this category (Gehl &amp; Gemzoe, 2000).</li> </ol>
Carr et al. (1992)	<ol style="list-style-type: none"> <li>1. Public parks (public/ central park, downtown parks, commons, neighborhood park, mini/vest-pocket park),</li> <li>2.</li> <li>3. Squares and plazas (central square, corporate plaza),</li> <li>4.</li> <li>5. Memorials,</li> <li>6.</li> <li>7. Markets (farmers' markets),</li> <li>8.</li> <li>9. Streets (pedestrian sidewalks, pedestrian mall, transit mall, traffic restricted streets, town trails),</li> <li>10.</li> <li>11. Playgrounds (playground, schoolyard),</li> <li>12.</li> <li>13. Community open spaces (community garden/ park),</li> <li>14.</li> <li>15. Greenways and parkways(interconnected recreational and natural areas),</li> <li>16.</li> <li>17. Atrium/ indoor market places (atrium, marketplace/downtown shopping center),</li> <li>18.</li> <li>19. Found/ neighborhood spaces (found spaces/ everyday open spaces),</li> <li>20.</li> <li>21. Waterfronts (waterfronts, harbors, beaches, riverfronts, piers, lakefronts) (Carr, Francis, Rivlin, &amp; Stone, 1992).</li> </ol>
Dines et al. (2006)	<ol style="list-style-type: none"> <li>1. Everyday places: Everyday public spaces, from local streets and footpaths to parks and market, are characterized by the special or</li> </ol>

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	<p>unique elements of everyday spaces that may not be determined by aesthetical criteria and/or perceptions.</p> <p>2.</p> <p>3. Places of meaning: Beyond physical settings of public space, the subjective memories accumulated over time have an important influence on meaning of place, both positively and negatively.</p> <p>4.</p> <p>5. Social environments: Public spaces provide opportunities as places of encouraging interaction and supporting social networks between users, both fleeting and more meaningful.</p> <p>6.</p> <p>7. Places of retreat: Public spaces not only provide social environment but also present opportunities that people can be alone or with a small group. Places of retreat can be divided into three basic types: 1) opportunities for reflection, 2) opportunities to escape from the pressures of domestic life, and 3) opportunities to get away from the hustle and bustle of the city.</p> <p>8.</p> <p>9. Negative spaces: The experience of public space includes antisocial behavior such as racism and disruptive behavior. It is mainly caused by the absence of social relations with people, rather than the physical characteristics of public space (Dines, Cattell, Gesler, &amp; Curtis, 2006).</p>
Flusty (1997)	<p>1. Stealthy space: Spaces that cannot be found i.e. camouflaged or obscured by intervening objects or grade changes.</p> <p>2.</p> <p>3. Slippery space: Spaces that cannot be reached due to contorted, protracted, or missing paths of approach.</p>
Flusty (1997) cont.	<p>4.</p> <p>5. Crusty space: Spaces that cannot be accessed, due to obstructions such as walls, gates, and checkpoints.</p> <p>6.</p> <p>7. Prickly space: Spaces that cannot be comfortably occupied. It is commonly defended by details, for example, wall-mounted sprinkler heads activated to clear loiterers or ledges sloped to inhibit sitting.</p> <p>8.</p> <p>9. Jittery space: Spaces that cannot be utilized unobserved due to active monitoring by roving patrols and/or surveillance technologies (Flusty, 1997).</p>

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