Analysis of Activity Patterns and Design Features Relationships in Urban Public Spaces Using Direct Field Observations, Activity Maps and GIS Analysis
Mel Lastman Square in Toronto as a Case Study

by

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Author’s Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Urban public spaces have been considered an essential part of cities throughout history. Over the span of urban life, public spaces have continuously reflected the complexities of their cities' cultural, social, and economic contexts. Public spaces play a particular role in the life of urban areas, whether as memorable, accessible, or meaningful places.

However, recent researches on public spaces reveal that some are currently experiencing a decline in their physical design and in their use. Many writers and scholars of public spaces issues identify a general decline, for which the causes and prescriptions are different according to the context of urban planning and designing. Thus, in this period of change in using public spaces, it becomes important to evaluate and investigate actual use of contemporary public spaces, how and why they are used, particularly in terms of their physical deterioration and/or improvement. Therefore, an opportunity exists to reveal and understand the interrelationship between physical patterns of contemporary public spaces and people's activity patterns within such spaces.

This thesis relates to urban public spaces uses, particularly public squares, and to the relationship between their physical and activity patterns. It considers the design features of urban public space, focusing on people's activities and various forms of use – from passive to active engagement to understand the activity-physical patterns relationship in a selected urban public space. It therefore asks: How do people's activities relate to the physical patterns of an urban public space? And how are people's activities affected and encouraged by urban public space's physical features?

In order to address these questions, this thesis employs a methodology that combines direct field observations, activity mapping and Geographical Information Systems (GIS), as applied to a selected public space in Toronto, Mel Lastman Square to reveal the activity patterns that appear to be correlated with particular use of design features within the square.

Thus, the value of this thesis is in studying the relationship between the activities and the physical settings of urban public spaces through using a proposed methodology and exploring GIS as an analytical tool to describe the activity-patterns relationship. Analyzing this relationship will add insights into and complement the application of urban design theories and practice which could lead to further studies to improve the public spaces design and planning process.

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Dad, although I did not have you beside me like the past years in my life, I share everything with you and you were hearing me, looking at me through all these days that you were in hospital. You know that still I have eyes on you.

Mom, you are incredible, I cannot thank you enough for your kindness, understanding, strength and patience. You were absolutely wonderful and I am so grateful for everything that you did.

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To my father,

For his indefatigable encouragement and never-ending contribution throughout my life
Still I have eyes on you….

To my mother,

For her unparalleled mercifulness and non-exchangeable philanthropy

And to my brother!

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Chapter 1

Introduction

1.1. Introduction

This chapter introduces the problem statement, research questions, purpose statement and significance of the research as well as the thesis outline.

1.1.1. Framing of the Research Problem/Motivation

Urban public spaces have been considered an essential part of cities throughout history. It is obvious that cities and their public spaces have a very close relationship, whereby, over the span of urban life, public spaces have continuously reflected the complexities of their cities' cultural, social, and economic contexts. Public spaces play a particular role in the life of urban areas, whether as memorable, accessible, or meaningful places (Madanipour, 2010). People may feel attached to both the social and physical aspects of public spaces. Therefore, these spaces may be places for socializing, hosting the greatest number of people's interactions (Tibbalds, 2003). Moreover, their physical attributes may indicate particular meanings to the people, having a significant impact on people's perceptions, interactions and activities (Canter, 1977).

However, recent researches on public spaces reveal that some are currently experiencing a decline in their physical design and in their use (Carmona, 2010). In his article "Contemporary public space: critique and classification", Carmona (2010) mentions that the critiques in this realm begin with the attitude that public spaces are facing a physical deterioration. Many writers and scholars of public spaces issues identify a general decline, for which the causes and prescriptions are different according to the context of urban planning and designing. For example, one of the critiques that Carmona (2010) discusses relates to the phenomenon of "Invaded Space", resulting from the loss or lack of social function and experiences in urban spaces that is now over used by traffic and private cars.

Thus, in this period of change in using public spaces, it becomes important to evaluate and investigate actual use of contemporary public spaces, how and why they are used, particularly in terms of their physical deterioration and/or improvement. As some scholars of urban planning and designing, including Jan Ghel (1987) and William Whyte (1980), have argued, the use of public spaces is an empirical result of the physical qualities of space.

Therefore, an opportunity exists to reveal and understand the interrelationship between physical patterns of contemporary public spaces and people's activity patterns within these spaces. Such empirical researches on public spaces will help to find out why and how "some places work and others do not" (Whyte, 1980). Moreover, it should be possible to find out how physical settings impact the experience of activities taking place within the public spaces.

1.1.2. Problem Statement and Research Questions

This thesis relates to urban public spaces uses, particularly public squares, and to the relationship between their physical and activity patterns. It considers the design features of urban public space, focusing on people's activities and various forms of use – from "passive to active engagement" (Carmona, 2010). Therefore, it attempts to understand the activity-physical patterns relationship in urban public spaces (Golicnik, 2011). It relies on a selected public space in Toronto, Mel Lastman Square, for which data were collected from field observation (Whyte, 1980) and activity mapping (Ittleson et al. 1970) by using geographic positioning system (GPS device) to capture activity points.

The research problem addresses the lack of actual knowledge about activity patterns and their integration with physical patterns in the process of designing the contemporary urban public spaces (Golicnik, 2011). This problem forms the main reason to clarify, evaluate and analyze the relationship between physical patterns and people's activity patterns within urban public spaces. The importance of appropriate knowledge of the relationship between physical and activity patterns is argued by several scholars including Lynch (1960), Relph (1976), Canter (1977), Whyte (1980), Gehl (1987), Punter (1991), Montgomery (1998) and Carmona (2010). A literature review reveals that they have addressed this field of planning and design more than other researchers. The specific aspects that this thesis wants to investigate exist either in their research methods or in their theoretical arguments.

To obtain actual knowledge about the physical and activity patterns relationships and apply this empirical knowledge in practice, in general, this research focuses on the theories of place and takes advantage of combined methodology including field direct observation and activity mapping through using GPS devices. Thus, this thesis draws heavily on classic theoretical works, including the fundamental urban design theories of Lynch (1960) – Image of the City– and Conzen (1960) – Urban morphology– and the specific theories of place developed

by Relph (1976), Canter (1977), Punter (1991) and Montgomery (1998). In terms of the research methodology this study draws on a combination of Whyte's (1980) empirical research, which is based on field observation and Golicnik (2011) integrated method of activity mapping (Ittleson et al., 1970) and geographic information system (GIS) analysis.

Lynch (1960) pointed out five key physical elements: paths, edges, districts, nodes and landmarks that together define image of a city: "districts are structured with nodes, defined by edges, penetrated by paths, and sprinkled with landmarks…" (Lynch, 1960: 48-49). Thus, public spaces, particularly, could be nodes where activities take place and might have formed by pedestrian paths, edges and could be a memorable place for people. In his study of 'urban morphology' Conzen (1960) analyzes the physical form by focusing on the patterns of streets, blocks/parcels and buildings. From these, he derives patterns of movement.

For Relph (1976), each place has a "unique address". Without explaining how it becomes identifiable he argued that "physical setting", "activities" and "meanings" constitute the three basic elements of place identity. Drawing on Relph's work, Canter (1977) indicated places as a realm for "activities", "physical attributes" and "conceptions" (Figure 1.1).

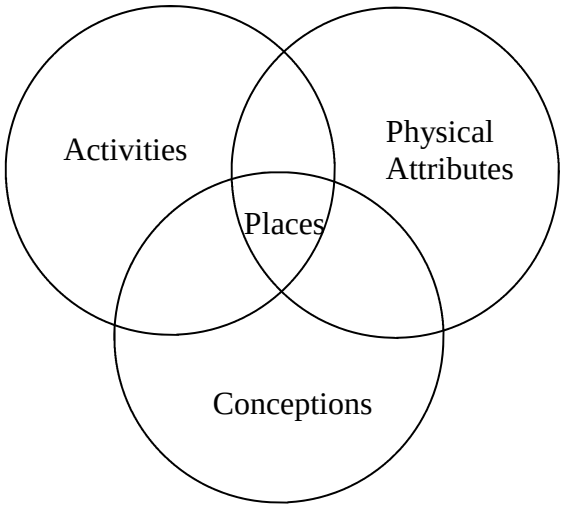


Figure 1.1. Basic Elements of Place, Canter (1977)

With respect to Canter's idea of place, Punter (1991) and Montgomery (1998) added other components and measurable variables to this idea. Montgomery (1998) emphasized that this "augmented model" identifies the quality or characteristics of a space more precisely and illustrates how design can contribute to and enhance the potential sense of place (Figure 1.2).

Montgomery (1998) believes that based on these components there is an opportunity to derive a set of principles for place making and creating successful urban spaces (Montgomery, 1998: 97).

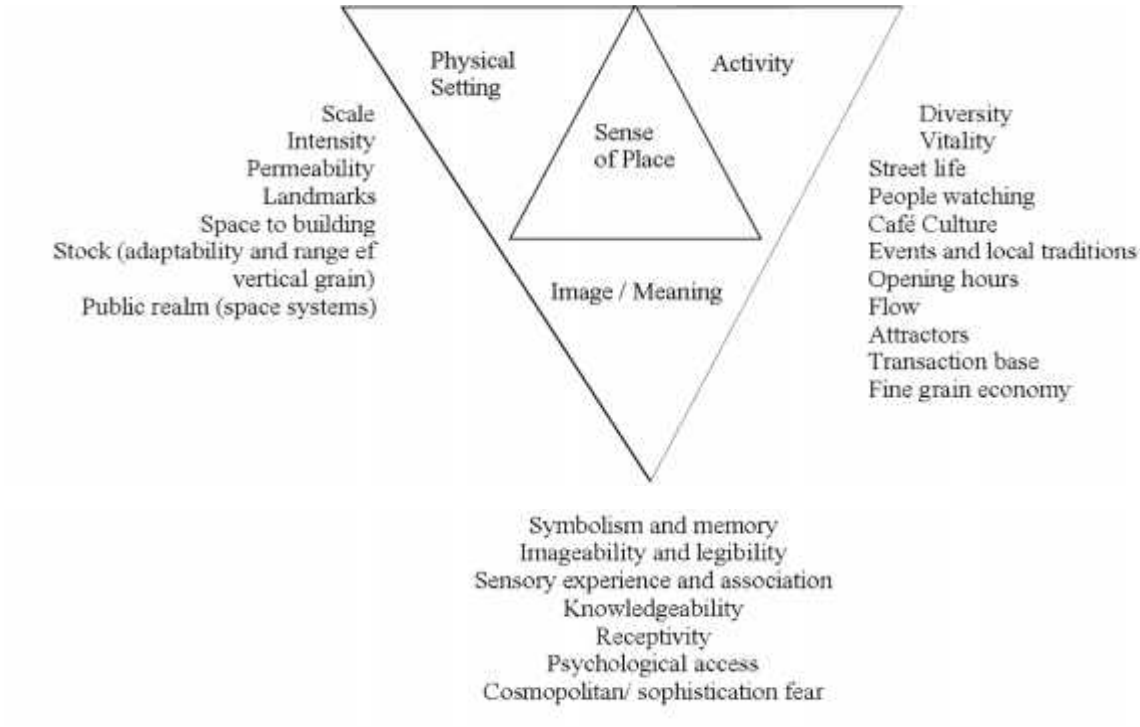


Figure 1.2. Components of Sense of Place, Montgomery (1998)

Considering theories of place, this thesis will present its conceptual and theoretical framework based on two main components of a place: physical setting and activity. The link between these two components of a place has long been evaluated by public space researchers, particularly planners and urban designers (Handy et al., 2002). To provide more clear illustration of the link's importance, however, researchers must develop an alternative framework for the relationships of the two components of physical settings and activity. Therefore, set of typologies

of the physical features and activities must be refined, and more empirical knowledge of the actual use of the space and the activity-physical patterns relationship must be developed.

According to the literature review the concepts, theories, and methods used by urban planners provide a foundation for researches penetrating to the relationship between physical settings and activities taken place within public spaces (Handy et al., 2002). The purpose of this thesis are twofold: to provide an overview of this foundation and to explore the relationship between the physical and activity patterns of a place as it contributes to the field of urban planning and designing. In doing so, the related challenges in defining characteristics and typologies of the physical settings and people's activity patterns are considered through obtaining an empirical knowledge of the actual use of the public space.

The main goal of the research is to explore and understand how physical patterns produce or reproduce different social interactions and activities and how these activity–physical pattern relationships make the public spaces work or do not work. The principle theories of place introduced above will form the foundation for this exploration. Firstly, by considering the theory of place it would be adapted for place–making principles (Montgomery, 1998) through a proposed theoretical framework. This framework would be tested through using the proposed research methodology, which combines field direct observation (Whyte, 1980), activity mapping (Ittleson et al., 1970) through using GPS to capture activity points and GIS analysis (Golicnik, 2011). Thus, the following research questions will address the goal of this study:

- How do people's activities relate to the physical patterns of an urban public space?
- How are people's activities affected and encouraged by urban public space's physical features?

Following on from the principal theories and concepts of place, this thesis will contribute to the urban design literature by synthesizing the place theories, adding as well, a practical combined methodology in data collection and analysis. Therefore, this study is an attempt to clarify how physical settings impact people's activity patterns within the urban public space. Answering such research questions will fill the gap between theory and practice in this particular part of the place–making and urban design process.

1.1.3. Focus/Purpose Statement

According to several urban designers and academic scholars such as Carmona (2010), a significant decline is occurring in people's use of public spaces and a corresponding increase in personal mobility. In general, public spaces have been experiencing a "backing off" and release in terms of their use, caused by the privatization trend (Carmona, 2010). Therefore, concerns about "placelessness" are growing, as well as about absence or loss of meaning, its consequences and the decline in meaningful space. If the use of public spaces becomes less, there will be less motivation to create new spaces and to maintain and/or improve existing ones as well (Carmona, 2010).

Accordingly, this research will explore the relationship between two main components of place – physical setting and activity – and concentrates on the relationship between physical features of the urban public space related to people's activity patterns. Moreover, it is intended to improve a better understanding about the actual use of the public spaces associated with physical settings through empirical knowledge gaining from direct observations and activity maps using a GPS device to record activity points.

Thus, this study attempts to identify the physical and activity patterns of a public space located in a diverse city, Toronto, named Mel Lastman Square. Moreover, this research applies a combination of two main methods to examine the relationship between physical and activity characteristic of the selected case study:

- Field observation, according to William Whyte's (1980) methodology looks at work done 'in the field' and extracts empirical knowledge based on activities that are taking place within the space, considering the activities' type, number of people involved, gender, group age within the place and the day, time and weather conditions.
- Activity Mapping and GIS Analysis links the data collected from direct observations with activity maps through using GPS device for marking individuals' activity points. GIS analysis will reveal the most and least areas used or that remain unused by considering activity frequencies. Through the GIS analysis and collected data, and based on place theories a more critical and analytical discussion about public spaces' physical design features and the relationship between people's activities will emerge.

Therefore, this research clarifies the role of observation and use of a GIS database in public space design and planning processes. Through the field observation, activity maps and GIS analyses, and based upon the specified theoretical framework, a more critical and analytical discussion of physical patterns and their influence on activity patterns will occur. Moreover, based on the proposed theoretical and methodological framework, a better understanding of the criteria needed to investigate the relationship between physical and activity patterns will be established (Figure 1.3).

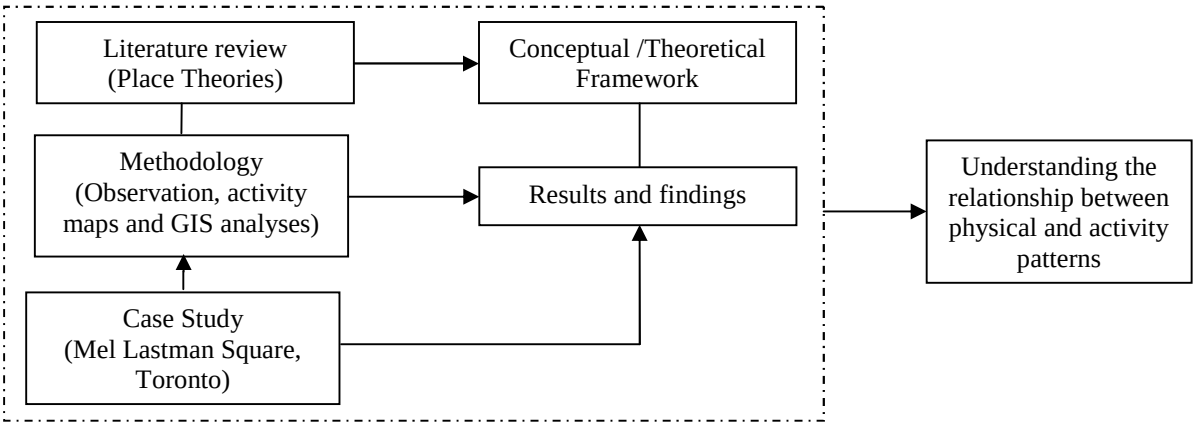


Figure 1.3. Thesis Process

1.1.4. Significance of the Research

The main significance of this research is its explanation of the relationship between spatial characteristics and activity patterns in urban public spaces. The primary contribution is a methodology that combines Whyte's (1980) work on field observation and Golicnik's (2011) work using activity maps and GIS as a spatial analysis tool in planning processes for urban public spaces.

This research will identify the existing efficiencies in designing urban public spaces, with special reference to Canadian practices. Therefore, it explores theories in this realm and based on its main subject, determines and emphasizes the interrelation between two place components. In addition, it will emphasis the importance of public life and contributes to the better understanding of people places and people's activities within them, as it defines activity and design features typologies that can help Canadian planners design new public spaces or improve existing ones accordingly. Moreover, this study will link public space design theories and

practice, add to current Canadian design and planning content, and provide directions for urban designers and planners through using real time data.

This thesis will contribute to the urban design literature by considering place theories and concepts to determine whether they are implemented in current public space designs and principles. Studying the relationship between physical settings and activities will provide a broad overview of the concepts of place theory, and identify the important role of this relationship in public spaces design processes. Therefore, this research will fill a knowledge gap in the field of urban design and clarify the role the built environment plays in creating relationships between physical settings and people's activity. Analyzing this relationship will add insight into and complement the application of urban design theories and practice which could lead to further study to improve the design and planning process.

1.1.5. Research Outline/Road Map

To achieve the research goal and to answer the research question, this research includes various chapters (Figure 1.4).

Following the research introduction, a literature review leads to the theoretical framework of this study, which is based on Relph (1976), Canter (1977), Punter (1991) and Montgomery's (1998) theory of place. It is important to understand how theories of place were developed through time and follow the evolution to contemporary patterns and designs to find out what elements were applied in their planning and design process. The focus of this review is theories and concepts of public spaces design, which are examined, to provide an understanding of what components are involved in the planning and designing of public spaces. It is through an examination of the place theory literature that the importance of the place components – physical setting, activity pattern, and meaning– are revealed. The literature pertaining to public spaces' physical setting and, more specifically, focused on people's activity and the relation between these two main components of place, is essential to this study. This thesis therefore presents the main elements, principles and characteristics of places that influence people's activity patterns within a public space. As well, it will make the argument that place theories and concepts play a major role in the public space design process and are imperative in creating socially vibrant spaces. The information and criteria derived from this literature review will be a part of the activity–physical pattern relationship analysis and will form the conceptual theoretical

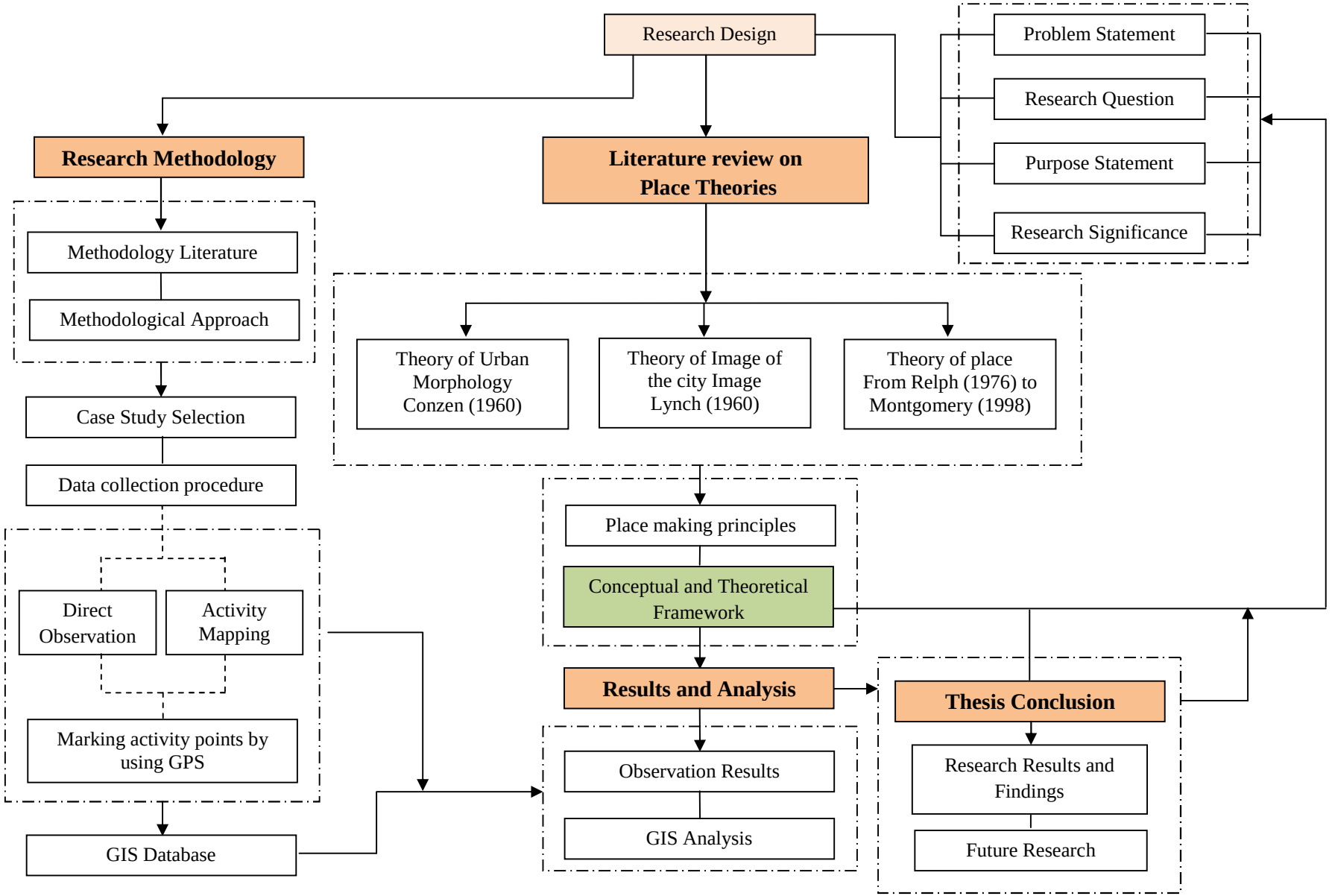
framework of the research. This framework of place theories and principles provides the basis on which the relationship between individuals' activity and physical patterns within public spaces are investigated.

Chapter Three details the research design process, the methodology of data collection and data analysis based on the conceptual and theoretical framework, along with introducing the case study. This chapter explores the methodological procedure in order to achieve the research objective. Using GIS analysis reveals that a quantitative approach is employed in this research study. The research design is exploratory and the goal is to understand and evaluate the relationship between physical patterns and people's activity within selected public space for answering the research questions. In addition, in this chapter, the data collection and management procedure will be described in detail. This part of the study provides the explanation of the direct field observation and activity mapping methods through using GPS device as well as the GIS analysis that will be applied to the case study.

The research observation results and analysis will be presented in Chapter Four. This chapter applies the proposed conceptual and theoretical framework through the research methodology and provides detailed descriptions of the collected and managed data, starting with the direct observations, activity maps and capturing activity points through using GPS device. Data analysis then continues to the GIS analysis, which includes analyzing the relationship between people's activity and physical patterns of the selected public space based on the conceptual and theoretical framework derived from place theories and principles.

Finally, based on the outputs of all the previous chapters, including the literature review, research methodology, and research analysis results, Chapter Five provides the research conclusion. This final chapter will lead to answering the research question and understanding the research significance. Finally, concludes with a discussion on possible future research based on the research's results and conclusions.

Figure 1.4 Thesis Procedure Diagram



Chapter 2

Literature Review

2.1. Introduction

Urban planning and designing research has been increasingly addressed by designers and planners to provide information for creating urban places. Urban space designers have taken an essential role in urban environmental improvement by creating conceptual, theoretical, and practical knowledge on the use of these places. Therefore, significant advances in research, design and application have been made since the appearance of earlier investigations on urban spaces, to find out people's activity patterns within these places (Cooper and Francis, 1998:71). Montgomery (1998) believes that active and vibrant urban spaces are associated with the knowledge of how to manage, develop and design cities. In this regard, he uses the term "Urbanity", which is consists of a city filled with activity, street life and urban culture.

According to Montgomery (1998) designing, developing and managing such places will proceed during a long time period and require understanding of the impacts on characteristics of urban spaces and the amount of people using it. Why do some places work and why so many new developments are experiencing deterioration in use? Generally, place making needs the understanding of place design theories and practices, the skill to design for a vibrant space and the judgment to know when a place needs to be designed and when should be left for organic growth and development according to people's needs (Montgomery, 1998: 94). Designing and planning of urban areas is essentially about place making. Peter Buchanan (1988) believes that places are not just particular spaces with physical attributes, but they accommodate different activities and interactions take place within them which provide an opportunity for using such places.

The link between the physical and activity components of a place has been take into consideration in public space design process (Handy et al., 2002: 64). By establishing an alternative framework exploring the relationship between physical and activity pattern within urban places, researchers attempt to develop more complete data on this relationship (Cooper and Francis, 1998). Therefore, urban planners' concepts, theories and methods on place and place

making, provide a foundation for researches about the relationship between the physical and activity patterns of urban spaces.

As discussed in Chapter One, the purpose of this research is to provide an overview of this theoretical and methodological underpinning. Moreover, this thesis outlines the potential methodological and theoretical contributions of public space design in the field of urban planning toward exploration of the physical-activity patterns relationship within urban public spaces.

The urban design literature on urban public spaces provides theories illustrating the link between physical attributes and the use of urban spaces. Thus, these theories intend to prescribe how to create urban spaces that people will use. The principles for creating urban spaces can be traced in concepts and theories of key thinkers in this filed. Therefore, this thesis builds on their theoretical framework and methodological research on urban spaces. For example, in terms of fundamental theories of place, Kevin Lynch's 1960 "Image of the City" described and evaluated the built environment and defined physical characteristics of a city. Considering Lynch's work, Relph (1976) and Canter (1977) investigate components of place. Drawing on their work, Punter (1991) and Montgomery (1998) intended to understand why a place is being used and how its characteristics can be improved by establishing the principles for place making based on specific components of place: physical setting, activity and meaning.

In terms of methodological research, William Whyte's (1980) observations of public plazas in New York City stand as research studies of the link between urban design attributes and people's activity patterns, using time lapse film to document these patterns in midtown Manhattan's plazas in the 1970s. Whyte's work has contributed many useful design principles such as the importance of providing comfortable "sittable" areas in open spaces. His research proves that variety in use is widely regarded as one of the prerequisites for a successful urban space. He tried to find out how activity patterns interrelate with the physical dimensions of urban spaces. In the most recent research methodology, Golicnik (2011) also works on relationships between physical settings of urban spaces and their uses. Her research focuses on an integration of activity mapping and Geographic Information System (GIS) as a spatial analysis tool and attempts to describe the patterns of use associated with physical structure of urban spaces.

This chapter attempts to cover principal theories of urban spaces, first by considering definitions, characteristics, importance, values of urban public spaces and the relationship

between people and space. Then, steps forward to theoretical concepts of place. Additionaly will form the bases for the proposed theoretical framework for this thesis according to key thinkers of the urban planning and designing field. As noted in Chapter One, a major contribution of this study is its methodological research based on William Whyte's (1980) observational studies, Ittleson et al.'s (1970) activity mapping and integrating these methods with GIS analysis according to Golicnik (2011) combined methodology. However, the methodological research will be discussed in the next chapter - Chapter Three: Research Methodology.

Therefore, this chapter focuses on theories and concepts of urban spaces, with particular attention to physical and activity dimensions of space relevant to the purpose of this research – understanding physical and activity pattern relationships within urban spaces. By reviewing design dimensions of urban spaces identified by key researchers in the urban design field, I present principles of place making focusing on already established principles of activity and physical patterns. Finally, a theoretical framework for this thesis will be proposed which is based on place theories and concepts. This framework considers the activity and physical pattern principles of place making and will be part of the methodological framework developed in the following chapter and will apply in the selected case study (Figure 2.1).

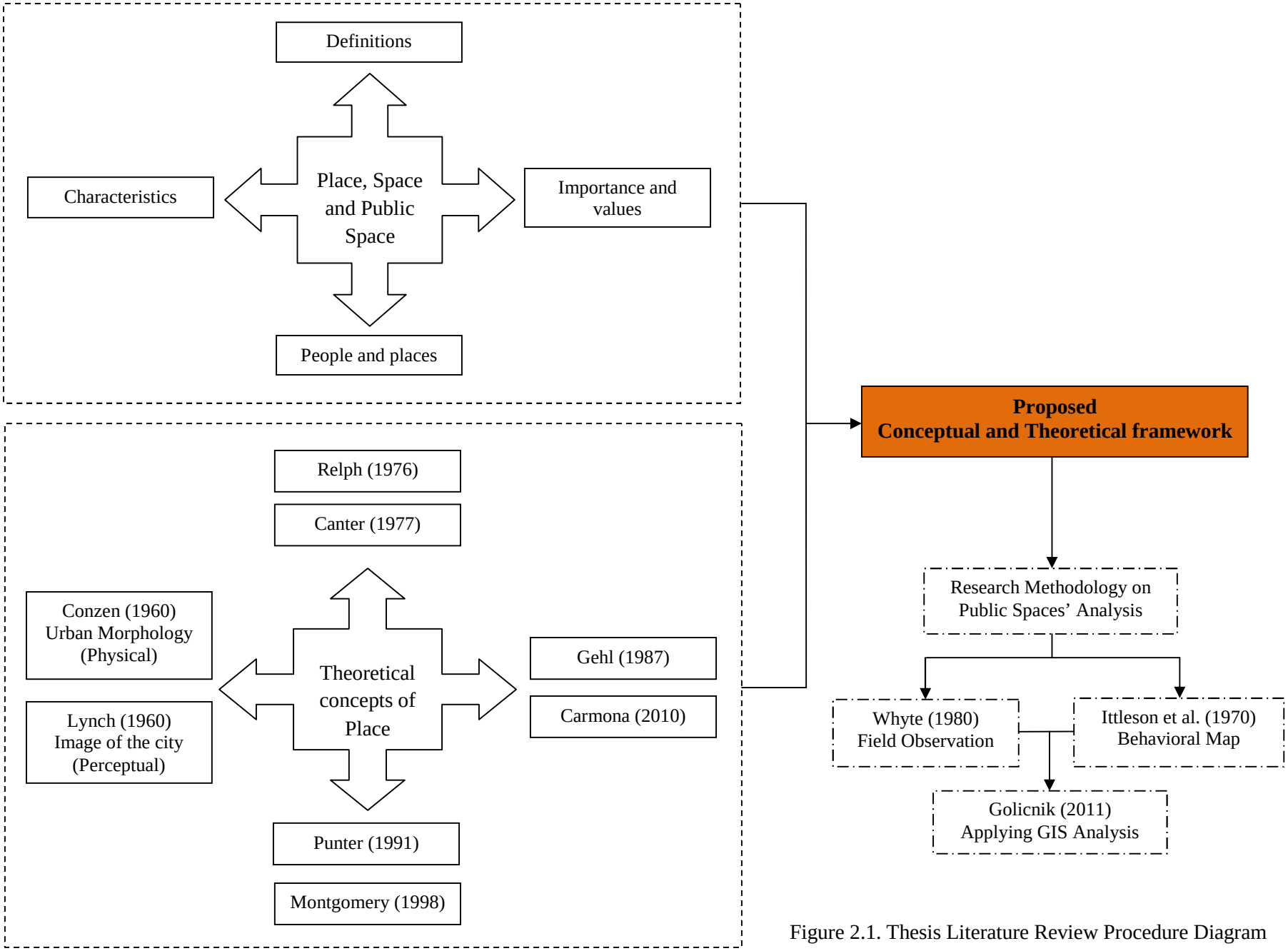


Figure 2.1. Thesis Literature Review Procedure Diagram

2.2. Place and Space

The change in the nature of urban space can be followed in the relationship between "space" and "place" in the literature: while space is considered to be more abstract and impersonal, place is identified as having meaning and value (Madanipour, 2010:6). Therefore, space is the starting point for understanding place. Norberg-Schultz (1980) believes that a place is a space with a distinct character. For Relph (1976), space provides the context for place, but derives its meaning from a particular place (Madanipour, 2010).

Places by combining "location", "locale" and "sense of place" illustrate a particular meaning. Location is defined with a specific geographical coordinates and refers to the "where" of place. Locale refers to the social interactions and includes all the visible and tangible dimensions of a place. Sense of place relates to the more intangible aspects of a place such as feelings, perceptions and emotions that the place reveals (Cresswell, 2009: 169). Places are continuously constitutes people's daily lives such as working, shopping. Thus, places are spaces when are being "used", "experienced" and "lived". (Cresswell, 2009: 170). It is difficult to define place and give a precise and practical meaning to it. The academic literature on place and the related concept of place making is being discussed in different fields of human sciences researches including geography, social anthropology, landscape architecture, architecture, environmental psychology, planning, and philosophy.

Thus, scholars are seeking to find answers on how to define a place by establishing particular criteria (Friedman, 2010). According to Friedman (2010) "Place making is everyone's job, local residents as well as official planners". Cresswell (2009) defined a place as a three dimensional space granted by people who are using it and introduces place characteristics considering social interactions, inclusiveness, performability and being dynamic. To these qualitative characteristics of urban places Friedman (2010) added three more; 1) in terms of scale, places must be small and consider pedestrian scale for more variety of social interactions, 2) in terms of use, places must be inhabited and lived in so that the physical and social aspects of the place have the opportunity to modify accordingly. This will reveal the spatial patterns as well as potential social interactions within the space, 3) in terms of place's values, places constitute an invisible and subjective attributes that are known as place attachment, place identity and sense of place (Friedman, 2010, 154-155).

2.2.1. Public Space Definition

Public space is an integral part of the public realm. The physical public realm means the series of spaces and settings that support or facilitate public life and social interaction. It is considered as sites or settings of formal and informal public life that have 'physical' (i.e. space) and 'social' (i.e. activity) dimensions. The activities and events occurring within urban spaces can make it the socio – cultural public realm (Carmona, 2010, 137). For Montgomery (1998), the public realm in a city accomplishes different functions by providing meeting places, defining spaces for local traditions and identifying meaning and identity (Montgomery, 1998: 110). The UK's Lord Rogers' Urban Task Force Report (1999) says "public space should be conceived of as an outdoor room within a neighborhood, somewhere to relax, and enjoy the urban experience, a venue for a range of different activities, from outdoor eating to street entertainment; from sport and play areas to a venue for civic or political functions; and most importantly of all a place for walking or sitting out. Public spaces work best when they establish a direct relationship between the space and the people who live and work around it" (Thompson, 2002, 61).

Public space as a fundamental part of the public realm is penetrating in social sciences and humanities disciplines. Thus, the UK government has adopted the following definition of public space (Carmona et al. 2010: 137):

> Public space relates to all those parts of the built and natural environment where the public have free access. It encompasses: all the streets, squares and other rights of way, whether predominantly in residential, commercial or community/civic uses; the open spaces and parks; and the "public-private" spaces where public access is unrestricted (at least during daylight hours). It includes the interfaces with key internal and private spaces to which the public normally has free access.

Cooper and Francis (1998) gave a definition drawn from the work of Lynch (1981) who argues that open space is open when it is accessible; "urban open spaces are defined as publicly accessible open places designed and built for human activity and enjoyment including parks and downtown plazas" (Cooper and Francis, 1998: 76).

2.2.2. Public Space Characteristics

According to Carr et al. (1992), in terms of use and design, public space characterized in three main categories. Thus, these places as well as being "meaningful" – allowing people to make rich linkage and attachments with place, being "Democratic" – protecting the right of user groups, being accessible to all groups and providing for freedom of action – should be "Responsive" – to address residents' needs (Carmona, 2010, 208-209).

A set of features is considered to list the principle public space characteristics and will provide people's primary needs within the public spaces:

- Safety: Feeling safe in an open space has been identified in several studies as an important prerequisite for people's use of a place particularly for women, children and elderly (Copper and Francis, 1998: 89).
- Comfort: This is another theme in urban open space research. Adequate and comfortable seating, solar access, and protection from wind, rain, and other climate elements have been considered as important reasons for open space use and satisfaction (Cooper and Francis, 1998: 90). For Carmona (2010) successful public spaces provide comfort environment for the residents which are measured by people's activity duration as well as considering environmental (sun, wind…), physical (seating choices…), psychological (space character…) situations as sense of comfort. Physical design and/or management strategies can improve the sense of comfort (Carmona, 2010: 209).
- Aesthetics, Public art and Perception: These are important aspects of landscape quality but not understood appropriately. How people perceive a space may contribute to the space use or lack of use. (Cooper and Francis, 1998: 91).
- Meaning: There is a growing awareness that use of an open space may not in itself be enough to make a space successful. The larger meaning of an environment for people is an important dimension of urban quality. Appleyard (1979) has argued that the environment serves as a social and political symbol filled with meaning. Open spaces can have a larger "connectedness" for people, as seen for example in the national attachment to Times Square in New York City or local attachment to a central park in a small town. Some researchers have discussed that people do not have to use the space since it has a particular meaning or value to them. The fact that a space is considered as an important symbol or reference may be

enough for people to attach meaning to the open space even though they are not using it (Cooper and Francis 1998, : 91)

- Control and participation: The amount and freedom and control a space offers have been suggested as the basis for people's use and enjoyment of an open space (Lynch, 1981). Use participation in the design and management process can directly contribute to the later satisfaction of nonparticipating users (Cooper and Francis, 1998: 91).
- Publicness: Public access is a critical factor to open space quality. Lynch (1981) defines accessibility in terms of open-space rights such as the right of presence, use and action. Lynch's concept of spatial rights provides a useful measure of the effective "Publicness" of an open space (Cooper and Francis, 1998: 92).
- Natural systems and environmental quality: open spaces are part of a larger natural system critical to healthy city life. A growing body of research is focused on the relationship between people and the natural environment (Cooper and Francis, 1998: 93).
- Economic benefits and impacts: some research has centered on the economic impacts and benefits of urban open spaces (Cooper and Francis, 1998: 94).

2.2.3. Public Space's Importance and Value

The importance of public space as a spatial component of a city can be traced in the "relation and communication" between objects and places within the city. This role presents the "interactive relationship" between people's activity and the physical structure of a space (Frick, 2007). On the other hand, urban public spaces offer many other interactive opportunities simultaneously, including communication paths, vibrant trade, social interaction context or a venue for political events (Pugalis, 2009). Tibbalds (2003) points out that public space is the most important part of the cities as presents "public life", "civic culture" and accommodates the human interactions.

Urban Public spaces have several types of value (Varena and Tiesdell, 2010). As public spaces provide an environment for social interaction as well as political displays and actions they introduce political and social dimensions. Moreover, public spaces are the representative of symbolic values of particular society. Therefore, "symbolic presentation" of public spaces is another value dimension in the public realm (Jacob and Hellstrom, 2010). Considering these

three main values of public spaces, Jacob and Hellstrom (2010) develop the dimensions of public space values that can be categorized as follows:

- Leisure and play: refers to recreational purposes which will also increase the richness of choices for the residents.
- Power and organization: represents the planners' role and power in creating, intervening, organizing and managing the public spaces.
- Utilities and change: refers to the flexibility of public space in time of change.
- Identity and unity: depicts public space as city's and people's identity and provides an experience of uniqueness for the public.

2.2.4. Public Space and People

Patsy Healey (2005) in an editorial wrote that the core of a planning focus is the interrelation between people and place, activities and territories: "Places are as much social nodes as physical sites, evident in the meanings given to them as much as in the interactions which take place within them ... It is impossible to avoid the intense and deep conflicts that routinely surface when planning interventions aimed to improve particular place qualities are initiated ...Where do planners start in considering our core focus of 'people and place' relations?" (Healey, 2005:5). Such investigation attempts to explore the interrelations between people and place, and the implications of this relation for planning practice (Stephenson, 2010, 9). The structure of the built environment identifies the places where particular activities take place, and determines which areas are to be used by whom and what for. In general, it identifies social interaction, movement patterns, and human activities (Bornberg, 2008).

Carmona (2010) believes that understanding the relationship between people (society) and their environment (space) is a necessary component of urban design and considers it in a social dimension (Carmona, 2010, 133). People and built environment are obviously related: it is difficult to see a 'space' as being without social context, and equally, a social context without a spatial component. People and their environment are interactively related and affect each other. Carmona (2010) believes that by creating the built environment, urban designers influence patterns of use and, thus, of social life. He then adds that physical features are thus neither the exclusive nor necessarily the dominant influence on activity patterns, though what people are

able to do is constrained by environmental opportunities provided for them. Therefore, pattern of activity not only depends on situation but also depends on social, cultural and perceptual context (Carmona, 2010: 134). It is worth mentioning that a valuable distinction between 'potential' and 'effective' environments exists, whereby a physical setting is a potential environment, providing a range of environmental opportunities regarding what people are able to do (Carmona, 2010, 133-134). Thus, while designers create potential environments, people create effective environments. The relationship between people and their environment is, thus, best conceived as a continuous bilateral process in which people create and modify spaces while at the same time being influenced by those spaces. Rather than determining people's activity, urban design can be seen as a means of addressing the probabilities of particular activities occurring within the space (Carmona, 2010, 134).

2.3. Theoretical Concepts of Place

The main subject that is discussed in the literature review is the theoretical concepts of place and urban public spaces. Reviewing the theoretical concepts of place and urban public spaces will provide an understanding of place theories and the evolution over time and will clarify the important aspects of public spaces that remain constant or may have been changed or forgotten. The examination of the theoretical concepts of public space includes those aspects related to investigating people – place connections, and associated activities. This review will provide insight into why and how these concepts are essential in place making and intend to find out the physical and activity patterns related to the use of these spaces.

This section explains the relationships between people and environment by defining the concept of place, considering the physical realm and psychological processes that leads to understand the urban spaces, in order to create them and use them (Canter, 1977: 1). Thus, it begins with a description of morphological and perceptual dimensions of urban design and follows with place theory and dimensions of place focusing on public spaces. Then it attempts to determine the principles of activity and physical dimensions of a place, and based on these, a conceptual theoretical framework for this research will be proposed.

2.3.1. Morphological Dimension

According to Conzen (1960) urban areas can be distinguished by several elements, including street patterns, plot/block patterns, and building footprints. Conzen (1960) introduced "Urban Morphology" as the study of changing patterns and processes of physical form over time. The morphological dimension of place is "the configuration of urban form and space, and the spatial patterns of infrastructure that support it" (Carmona, 2010: 77). According to Conzen (1960) morphological elements include:

- Street pattern: Street pattern is the layout of urban blocks and movement networks between those blocks.
- Block/Plot patterns: Blocks are the result of street connections and are well defined by a group of independent buildings plots. Subdivision of urban blocks results in plots or lots.
- Buildings footprint: The process of building development on each plot will lead to a building footprint.

Considering the Street and Block patterns, the street pattern forms the foundation for urban blocks. The street and block pattern determine people's movement and activity patterns and define the character of each area (Carmona, 2010: 97).Regarding space attributes and considering the block and street patterns, an area with smaller blocks offers a greater choice of movement channels and creates a more permeable space than one with larger blocks. Small blocks are often advocated for a variety of reasons including vitality, urbanity, permeability, legibility, walkability and the social use of space (Carmona, 2010: 81-99). Carmona (2010) believes that the street pattern establishes the main elements of the urban spaces network. This network of urban spaces is the realm of "movement space" and "social space", which provide spaces for people to participate in different types of economic, social and cultural activities (Carmona, 2010: 83).

2.3.2. Perceptual Dimension

Lynch and Rodwin (1958) believe that physical form of spaces have obvious effects on people's activities taking place within them: "A city is the characteristic physical and social unit of civilization. It possesses size, density, grain, outline and pattern as the basic aspects of the city's physical form. The people who live in it shape these properties and are shaped by them"

(Lynch and Rodwin, 1958). The value of perceptual dimension of urban design is the emphasis placed on people and how they perceive, value and determine particular meaning for the urban spaces. In his research, Lynch (1960) identified five key physical elements – paths, edges, districts, nodes and landmarks – that contribute to configure the image of a city: "districts are structured with nodes, defined by edges, penetrated by paths, and sprinkled with landmarks…elements regularly overlap and pierce one another" (Lynch, 1960: 47-49):

- Paths: In Lynch's research, paths were often the principle elements in people's image with the other elements such as special uses and features along paths.
- Nodes: Lynch (1960) believed that nodes are point references. They may be primarily intersections, or simply 'thematic concentrations' of a particular use/function or physical significance character.
- Landmarks: As the other types of point references, landmarks are considered as the external element for people. Some landmarks in terms of scale functions are local and some are functional at the greater scale. Lynch (1960: 78-79) argued that a landmark's key physical characteristic is "singularity", and "Uniqueness". The way an environment is used may also strengthen a landmark's significance through, for example, its location at an intersection involving paths or because of a particular activity associated with it (Carmona, 2010: 116).
- Edges: As linear elements, edges are different from paths and do not function as paths. They may be more or less penetrable barriers or lines along which two area are connected and related together.
- Districts: Lynch (1960) identifies different areas of the city with particular and recognizable characters which each person is able to distinguish different districts from each other.

2.3.3. Theory of Place

Theorists within urban design thought such as Relph (1976), Canter (1977), Punter (1991) and most recently reinterpreted by Montgomery (1998), present the place components and the relationships between them. For Relph (1976), each place has a "unique address"; without explaining how it becomes identifiable he argues that "physical setting", "activities" and

"meanings" constitute the three basic elements of place. Canter (1977), then began his theory by addressing these two questions (Canter, 1977: 158): 1) what are the main components which integrate to create places? and 2) What procedures are available for identifying places and their attributes?

Answering to these questions was possible with reference to the conceptual diagram of the components of places. Therefore, drawing on Relph's work, Canter (1977) introduced places as a function of "activities", "physical attributes" and "conceptions" (Figure 2.2).

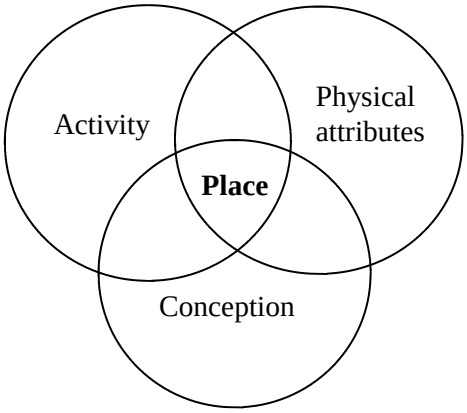


Figure 2.2. A Conceptual Diagram for the Components of Place, Canter (1977)

This model indicates that the potential relationships among actions, conceptions and physical attributes will lead to creating a place. Canter (1977) introduces the "identification process" of the place starting with any of the main components. Thus, in this process it is important to find out what activity is associated with, or is anticipated to take place within a given place; what the physical features or settings are; and what conceptions people hold of that activity within the physical environments. Focusing on the three components of place it is possible to look for those aspects of physical attributes that have the greatest likelihood of linking to the other components of the place such as activities (Canter, 1977: 159). Procedures of identification of place involve the range of activities taking place within them and the physical setting of the place. This could be followed by finding out how people identify the main components of the places of interest through sketching or by giving a description of a place including the feeling about the place and how people feel about it, what they do within it. Some places may be more specifically described than others, with specific activity patterns associate with them. The other way could be direct observation based on information concerning what

happens where (Canter, 1977: 31-44 and 160-161). The procedures for identifying and describing places provide a valuable link to design decision making. These procedures have the potential of being used during the design process, to indicate the nature and the characteristic of the places being produced. Thus, Canter (1977) emphasize that to investigate places there are three process or methods that can lead to characterizing places: sketching, which reflects the physical attributes; description such as conceptions; and activity mapping, which is representative of activities and indicates who does what where (Canter, 1977: 160-161).

Building on Relph and Canter's ideas, Punter's (1991) work provides more detail on components of a place and linked these components with urban design principles (Figure 2.3).

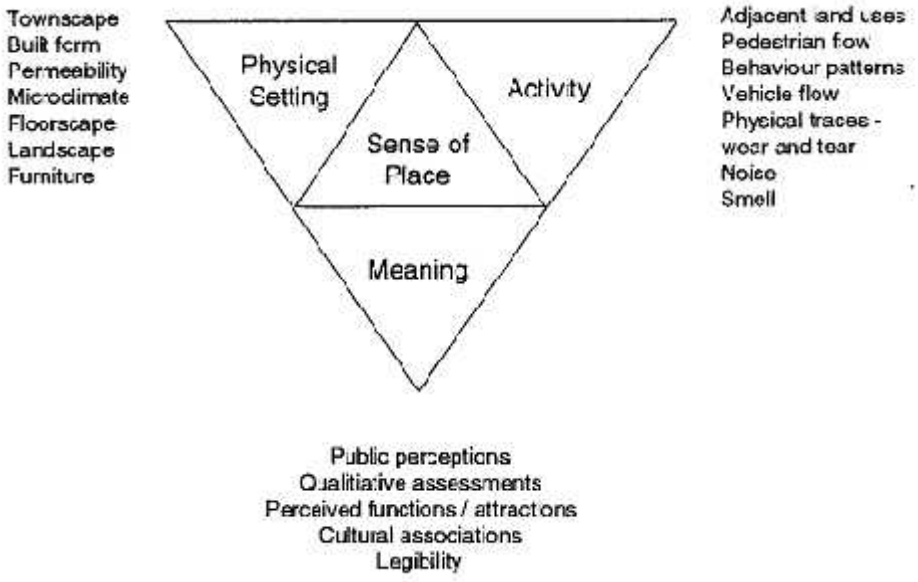


Figure 2.3. Components of Sense of Place, Punter (1991)

Very soon after, Montgomery (1998) derived a model including all the components of place; physical setting, activity and image. His model is the most recent reinterpretation of the components of place and indicates the relationships between them (Montgomery, 1998, 96). He emphasized that this model will identify the quality or characteristics of a place more precisely and illustrates how design can contribute to and enhance the potential sense of place (Figure 2.4). Montgomery (1998) believes that, according to these components and the associated detailed attributes, this opportunity exists to make out a set of design principles for introducing and creating urban spaces (Montgomery, 1998: 97).

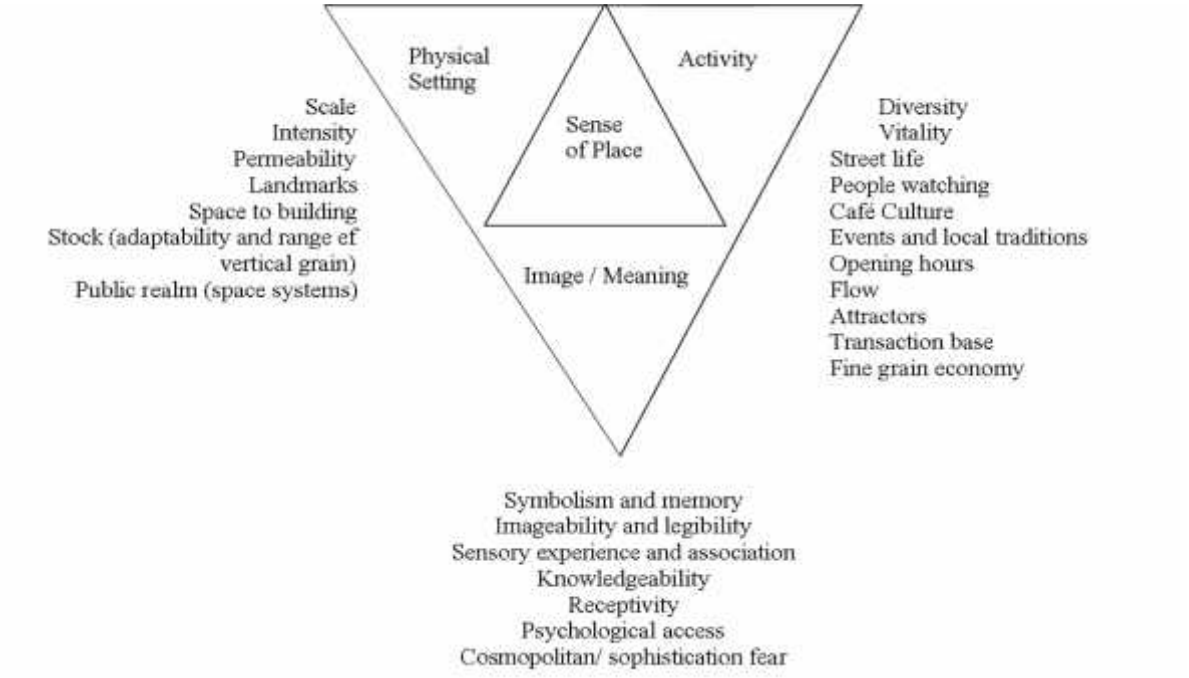


Figure 2.4. Components of Sense of Place, Montgomery (1998)

2.3.4. Principles of Place-Making: Activities and Physical Pattern

In identifying the processes of place making, it is important to find out who uses a space and how the space is being used to present the activity pattern and, following that, to form physical patterns. In addition, the reasons why certain spaces are not used, or are used in a different way from what designers or managers intended, have been well documented. For example, use or "Livability" according to Appleyard (1981) is a dimension often employed to measure the success of urban spaces. Whyte (1980) argues that use of a space is a major factor of success. When a space is empty it simply does not work (Cooper and Francis, 1998: 88-89). Therefore, understanding the different effects of various physical settings on human activities and the potential relationships is an analytical skill of the urban planner to find out whether the space is working or not (Lynch and Rodwin, 1958: 201). To conduct urban form analysis, Lynch and Rodwin (1958) considered the physical features and activity distribution and effective relationship at the urban scale. They emphasized that the pattern of activities and the physical pattern are often working independently of each other, and thus they must be investigated separately in an analytical studies to understand the effect of either. By such clear distinction of this two place component, it is possible to explore the interaction between activity and physical pattern, and to find out any significant effects.

According to Canter (1977) to understand a successful place in relation to the place components, including activities and experiences, one should consider the purpose of place, not only what the place is in terms of physical setting but also what it is for (Canter, 1977: 106). Thus, the important aspect is the recognition of the causes of activity patterns rather than the activities themselves, as the activity might relate to the physical setting (Canter, 1977: 1). The main point is not only the recognition of activities and physical form, but also the understanding of these places and how they affect activities to occur. Canter (1977) believes that to get the answer, one should find out what people think about a place (Canter, 1977: 6).

All in all, the goal of this section is to introduce place making principles in order to develop and understand physical and activity qualities and the potential interactions within the space. This is an attempt to understand the presented physical pattern and explore the actual activities associated with spatial patterns.

2.3.4.1. Activity Pattern

Regarding the concept of place, finding potential relationships between types of place and types of activities requires identifying patterns of activity in a place. Many places have clearly defined activity patterns associated with them. Some activities are appropriate to certain places, and some places may be characterized with particular activities (Canter, 1977: 116). According to Canter (1977), the issue is that some places have very specific functions and appropriate categories of activities, while for others are more difficult to identify particular activities. Their character thus derives from the range of activities they accommodate. Therefore, most places are somewhere between these two extremes and understanding place differentiation relates to the pattern of activities taking place within them (Canter, 1977: 117).

For Carmona (2010), “movement” is fundamental to understanding how places work. Pedestrian flow and movement within public spaces is necessary factor for urban experience and vitality. Where people choose to sit in public space is often based on available choices for people-watching and provides opportunities for related activities such as social and cultural interactions (Carmona, 2010: 201). Carmona (2010) stated that successful “people places” may be considered as destinations (go to places) but there are also places on the way to many other places (go through places). Therefore, there is a movement to and movement through places (Carmona, 2010: 202). Hillier et al. (1993) explored the relationship between pedestrian

movement and the configuration of urban space, and thereafter the relationship with pedestrian densities and land uses. Based on this research, movement densities can be accurately predicted by analyzing spatial configuration. The configuration of space, particularly its effect on visual permeability, is most important in determining movement densities (Carmona, 2010: 203). To encourage pedestrian movement and support a vital and viable range of uses connectivity among active places is essential (Carmona, 2010: 203). This connectedness with the surrounding thus identifies the density of use and forms the activity patterns (Carmona, 2010). Within such spaces presence of people and the number of them who chose the space to use also identifies the success level of space in terms of use. Jacobs (1961) argued that bringing people to the street will lead to vitality. Therefore, the design of successful spaces will support and facilitate the people's activities (Carmona, 2010: 208). Urban designers, thus, need to learn how to make better people places by observing existing places and through dialogue with their users and stakeholders (Carmona, 2010: 132). Vital and peopled urban public spaces provide people's need and desires. In other words, people need to feel psychologically comfortable or engaged enough to want to stay and play within the space (Carmona, 2010: 206). In terms of being engaged to stay in a place, Carmona (2010) identifies two major types of engagement:

- Passive engagement: this type of engagement with the environment relates to a sense of relaxation which will require appropriate physical settings in a place while there is no need to become actively involved. Sitting and people watching are among the primary form of passive engagement (Carmona, 2010: 209). Whyte (1980:13), for example, found that "what attracts people is other people", which will also bring life and activity to a place. This type of engagement often takes place next to the pedestrian flow while design features also provide sitting choices such as fountains, benches on walkways.
- Active engagement: this type of engagement represents an active experience within a place and will often result in social interaction among the involved people. Carmona (2010) believes that successful "people places" provide opportunities for different levels of engagement and the design of a space can create such opportunities. The configuration of design features also can result in what Whyte (1980: 94) named "triangulation". This is the space capacity by which some "external stimulus" has the chance to happen within the space and provide a linkage among people. The arrangement of different elements more or less lead to social interaction. These elements could include small-scale

components; public artworks, play equipment, street furniture, sculptures, fountains or transition points inside and outsides; doorways, colonnades, porches and stairways which will create places for meeting (Carmona, 2010: 211).

According to Jan Gehl (1987), one of the most important attributes of public spaces is people activity. Gehl's (1987) principle attitude in public space design is that people attract each other: "If given the choice between walking on a deserted or a lively street, most people in most situations will choose the lively street. If the choice is between sitting in a private backyard or in a semiprivate front yard with a view of the street, people will often choose the front of the house where there is more to see' (Gehl, 1987). In terms of activities typology, Gehl (1987) distinguishes three main types; necessary/functional activities, optional/recreational activities and social activities that take place based on public space characteristics. According to this typology, the optional activities reveal the relationship between design features offered by the space and people activities while necessary activities could happen regardless of the physical attributes of the space. It is the potential activities that defined people places with different opportunities such as eating, sitting, playing. As the third typology, social activities are the result of other types of activities and rather depend on the involved people within the space than physical features of the space. He also stated that optional activities are most affected by the environmental qualities and often lead to "social cohesion" of space (Golicnik, 2010).

Gehl's (1987) final argument derived from his researches result and activity typologies is that "it is possible to influence some aspects of activities, such as how long the individual activities last, which activity types can develop and, how many people use public spaces, through the design and physical settings". It is worth mentioning that Gehl (1987) believes that spaces become meaningful and attractive when all activities of all types occur in combination.

2.3.4.1.1. The Principles of Activity Pattern

To define a framework of activity pattern based on passive and active engagement, the following principles of activity pattern can be identified in a place. Montgomery (1998) considers two main concepts, diversity and vitality, which will define the range of activities within a place, and also defines several indicators:

- Vitality: this concept refers to the number of present people within the space during day and night, and is measured based on the number of cultural events taking place and the active street life. Montgomery (1998) believes that vitality distinguishes successful urban spaces from those that are not working. He emphasizes on a transaction base of urban spaces as key element for vitality. Moreover, he states that the urban vitality depends on the possibility for economic, social and cultural transactions taking place within the space over time which will lead to a pattern of diverse associated activities, increase complexity and dynamic quality of the public realm.
- Diversity: this concept is related to urban vitality however separated from it and includes primary uses and activities. Montgomery (1998) believes that "Combinations of mixtures of activities" is a key to generate diversity in order to create successful urban places. Diversity also depends on population density which will lead to social interactions within the urban spaces (Montgomery, 1998). In terms of mixed use diversity, Jacobs (1961) distinguishes two types of primary uses and secondary uses. The first type of uses is people attractors such as offices, residences, café, restaurant or shops. However, urban diversity is achievable where primary uses are combined with the secondary ones. Jacobs (1961) defined secondary uses to serve primary users. These types of uses can respond to variety needs of people associated with primary uses. Therefore, these two types of activities depend on the presence of people within the space (Jacobs, 1961).

According to the above mentioned concepts of vitality and diversity, Montgomery (1998) defines number of principles to create a successful urban space through promoting pedestrian flows and movement, creating people attractors, considering diversity of primary and secondary uses, developing population density, motivating evening economy and extending opening hours, encouraging street life and people watching and generating a fine–grained economy. Thereupon, for achieving these principles Montgomery (1998) considers key indicators such as extending variety of uses, coordinating local businesses, determine opening hours, providing street markets, cinemas, cafes, restaurants and meeting points and considering cultural diversity for the users, availability of public areas such as gardens and squares for offering cultural programs, providing mixed uses and small scale investments, offering different property sizes and prices, providing different types, styles and designs for buildings and streetscapes and create active street life.

It is worth mentioning that urban vitality and diversity for Holland et al. (2007) is achievable rather through culturally and economically events and programs than space physical settings. In this regard Pugalis (2009) commented that festivals and cultural events are the great experiences for the spaces but for the rest of the time such places appear to be dull. However, such activities create opportunities for people to use the space and as a result will add to the uniqueness of the space.

2.3.4.2. Physical Pattern

Lynch (1981) offers basic design qualities in place making process: Vitality, Sense, Access, Control and Fit. Through vitality he believes that a city allows range of diverse activities within the city. For Lynch, sensible city is achieved through from and functions relationships which make it legible. Accessibility for a city allows all different groups of people to use resources and services. Lynch stated that a city with good control is organized in way that citizens have a role in spaces management as they are working and living. The fifth criterion, fit, refers to creating the relationship between activities and physical form of a place. Considering the physical pattern, fit provides the building, spaces and networks for people who are using them and activities are taking place within them. Thus, this fit is formed by different types of physical settings and the range of various activities (Montgomery, 1998).

The following section introduces principles of physical pattern that relates to types of activities occurring within the place. For this thesis, the main focus will be on the relationship between physical settings of public spaces and the activities taking place within them. Investigating the physical dimension will lead to understand whether designed spaces are determined by the types of planned activities. Identifying the form and structure of urban spaces is thus essential to finding out whether the designed spaces are adaptable and able to accommodate people activity (Carmona, 2010).

2.3.4.2.1. The Principles of Physical Pattern

To define a framework of physical pattern based on design principles examining the related urban design literature is needed. In order to introduce essential qualities that are important to people who are using the space, design principles and qualities that were most frequently discussed in both theoretical and empirical researches are investigated. Accordingly, similar concepts are clustered and distinguished based on the related principles. This effort led to

the set of related urban design qualities for the built environment used to define principles of physical pattern for this research.

The power of the research approach is in providing simple physical features to understand how built environment qualities as well as patterns of particular qualities affect people activity within the urban spaces. Thus, these principles are essential in creating relationship between physical and activity pattern. The following are the chosen principles: Density, Mixed use, Human Scale, Permeability, Linkage, Landmark, Visual enclosure, Architecture and Green space:

- Density: refers to the amount of activity found in an area. In the field of design it is defined as population or building square footage per unit of area (Handy et al., 2002: 66).
- Mixed used: is defined as different land uses within a given area. A mixed-use area consists of residential as well as commercial activities and perhaps other land uses.
- Human Scale: refers to size, articulation of physical elements such as buildings that matches the proportions of human. There are physical features and elements that contribute the human scale such as trees, space furniture and pavement textures (Ewing and Handy, 2009: 77). Usually the ratio of building height to street width is defined as human scale. Thus, this quality has a close relationship with intensity (Montgomery, 1998: 106).
- Permeability: is an important place quality related to the street and block pattern which allows people a choice of ways through and within the built environment. Permeability is two folded. Visual permeability refers to the ability to see the routs through a space, while physical permeability refers to the ability to move through a space (Carmona, 2010: 81).
- Connectivity: is defined as the available alternatives ways between spaces or buildings (Handy et al, 2002: 66).
- Imageability and Legibility: Kevin Lynch (1960) defines imageability as a quality of a space that make it recognizable, memorable and distinguishable. Imageability is related to specific physical elements that create the place uniqueness (Ewing et al., 2006). Moreover, imageability is result of the other urban design qualities of a space such as human scale, permeability, connectivity, enclosure (Ewing and Handy, 2009). When the spatial structure of a space is understandable and recognizable and there is the opportunity to define a coherent pattern for it, that space has legibility (Lynch, 1960). By providing people with

sense of orientation and reference points the legibility of space would improve (Ewing et al., 2006).

- Landmarks: For Lynch (1960) landmark is not specifically a great structure but it can be location or a significant physical feature within the context of the area or the city. Landmarks are main components of imageability since they act as unique visual points, meeting places or small scale structures in the urban setting (Ewing and Handy, 2009 and Montgomery, 1998).
- Enclosure: is resulted when lines of sight in outdoor spaces are blocked and the space is defined by buildings, walls, lines of trees and other vertical physical features (Ewing and Handy, 2009).
- Complexity: refers to verity of physical features and generally "visual richness" of a space. Thus, specifically, it depends on diversity of architectural design of buildings their shape and size, diversity in street furniture, landscape designing which as a result will lead to diversity in people activity (Ewing and Handy, 2009)
- Aesthetic qualities: refer to architectural style of built environment and will add to the attractiveness as well as identity of space (Handy et al., 2002). Montgomery (1998) commented that to achieve urbanity and diversity within urban spaces aesthetic architectural styles are needed.
- Green and water space: is an essential parameter to daily or recreational urban life (Montgomery, 1998).

2.3.5. Proposed Conceptual Map and Theoretical Framework

The conceptual theoretical framework underlying this study is based on physical and functional attributes described by physical and activity principles. Moreover, this framework will be developed according to the research methodology by considering the role of observation and activity map as intervening between the physical features of the built environment and activities to define the physical and activity patterns (Figure 2.5). Therefore, all of the factors– physical and activity principles and observation outcomes– determine the overall patterns of activity within the space. By examining the first part of this framework through the theoretical framework –the link between physical and activity principles – will contribute to a better

understanding of the way physical patterns of the built environment affect activity patterns and people activities. The next chapter addresses the research methodology.

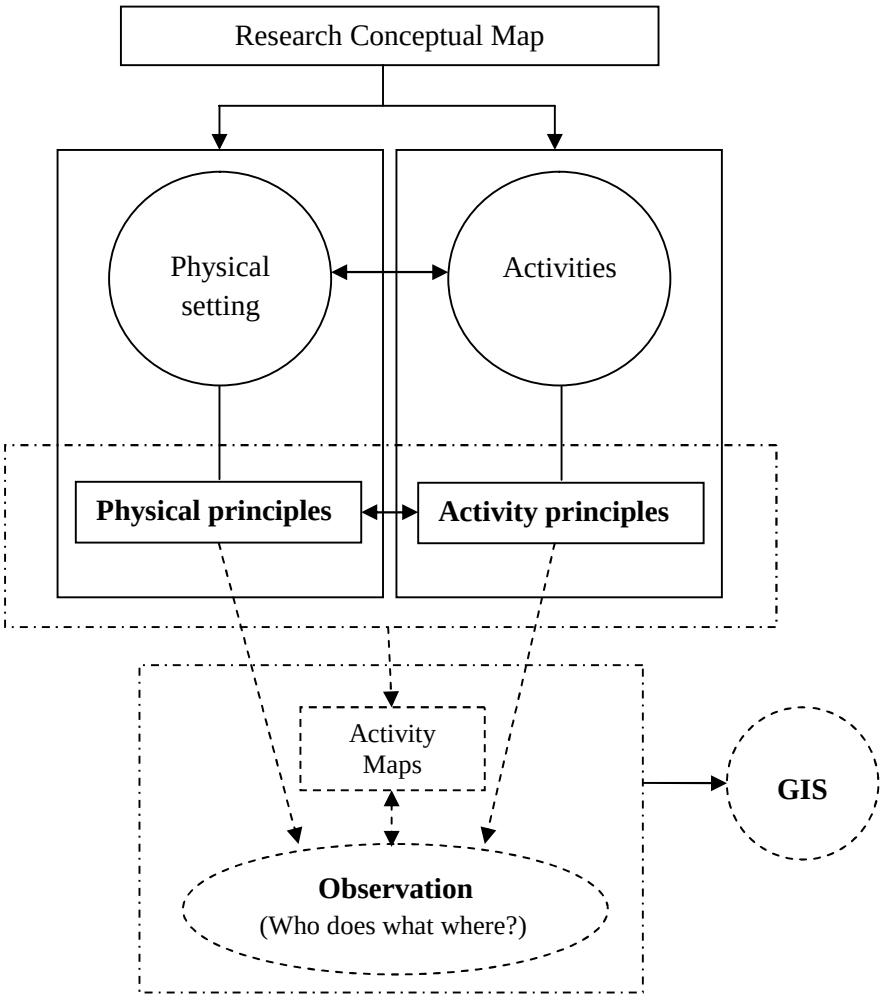


Figure 2.5. Conceptual Map

The aim of the proposed conceptual theoretical framework (Table 2.1) is to contribute to the field of urban design research, considering the particular value of potential relationship between people activity and physical settings of space. Defining the theoretical framework in terms of investigating activity and physical patterns relationship is a kind of conceptualization of activities and physical settings typologies within the urban design discourse. This framework is established based on Gehl's (1987) and Carmona's (2010) types of activity as well as required place principles and characteristics that bring people together. These principles clarify why

particular places work and others not. According to Gehl (1987) the related types of activity to the physical setting and quality of space is the “optional activities” that bring people together in a place to eat, drink, listen to music, participate in a playful activity such as dancing. Thus, these types of activity include passive or active engagement. This framework is helpful to identify different types of activities and integrate them into urban design practice to explore their relationship with the physical design settings of urban spaces.

Table 2.1. Theoretical Framework

Place Components	**Principles**			
Activity	**Types of Activity**	Necessary Optional Social	Active Engagement	Population density
				Pedestrian flows and movements
				Vitality and Diversity
				People attractors
				Cultural and Social events
			Passive Engagement	people watching
Physical Setting	Density			
	Mixed use			
	Human Scale			
	Permeability			
	Connectivity			
	Imageability and legibility			
	Landmarks			
	Enclosure			
	Complexity			
	Architectural style			
	Green/Water space			

2.4. Conclusion

Urban designers and planners, both in practical and academic environment have accomplished considerable efforts in the urban public spaces realm. Designing, developing and improving urban spaces needs the conception of place theories and place components as well as the empirical knowledge of the use of these spaces. Thus, conceptual, theoretical, and practical frameworks were determine particularly focusing on the relationships between place components such as activity and physical patterns within public spaces.

In order to understand the actual use of public spaces and its relationship with design of such spaces this research in the first step started to review the theoretical background of the urban public spaces. Through the examination of the place theories and literature it became apparent that there is an opportunity to explore place components relations. Therefore, this thesis intends to shed light on the importance of place components interrelations and the lack of empirical knowledge of urban public space's use. Accordingly, academics and practitioners undertake case study researches to create criteria and principles that would define and determine the potential relationship among place components, activity and physical settings in particular.

By combining the theoretical concepts of place this research focuses on the relationship between activity and physical setting of a space and how these two affect each other. Moreover, it illustrates the importance of empirical knowledge by considering the theoretical framework's principles and applying them on a case study. Thus, this research determines the actual concepts and principles of urban public spaces use that are currently being undervalued by both designers and people who are using the space. Based upon the literature review and the proposed theoretical framework including principles of activity and physical settings this research applies a proposed methodology to explore the potential relationships between two above mentioned place components. Research methodology is introduced in the following chapter.

Chapter 3

Research Methodology

3.1. Introduction

This chapter details the research methodology as derived from a review of studies that address similar research goals and questions. Specifically, it describes the approach, research design and process, including the data collection tactics, data management and data analysis based on the research conceptual and theoretical framework. It also discusses the process and rationale for selecting the case study. The primary data for this thesis are derived from direct observations in a selected public square located in the North York District of Toronto, Ontario, named Mel Lastman Square. This urban public space provides a range of people's activities as well as a range of design elements and physical features.

Through describing and exploring the activity patterns in relation to physical design features within public spaces such as public squares this chapter introduces research methods to determine the actual use of the space and how people use or do not use such spaces. It established a combination of direct observations, activity mapping, capturing activity points using GPS and GIS analysis, pertaining to the research case study. Therefore, this research methodology generally employs "empirical evidence" to describe the activity-physical features relationship within a public space (Golicnik, 2010).

This study is expected to reveal common patterns of activities identified with particular physical features of public spaces. Thus, this research shows the application of the chosen methodology in exploring the activity-physical features relationship, and in supporting the design principles that could be of benefits for future design processes. It demonstrates how physical features in the chosen case study affect activity patterns, and also introduces a starting point for further studies using the same methods in other locations (Golicnik, 2010). The value of the research methodology is in providing designers with tools to enable them to understand the needs and types of people's activities, and to determine physical features that cater to these diverse needs and activities.

According to Frick (2007), designing and planning public spaces lacks an empirical knowledge on how people use the space. This means that there is not enough information about public spaces' actual and predicted patterns of use. Thus, new research methodologies that

employs more innovated ways of exploring and understanding actual use of public spaces are needed (Golicnik, 2010: 38). From the methodological point of view, this research is an attempt to address the need for such methods through a mixed methodology – direct field observation, activity mapping and GIS analysis – in order to find out the actual use of public spaces through gaining the empirical knowledge of how people interact with the physical features within these spaces.

The methodological procedure of this study intends to achieve the research objective by employing an exploratory research design. Therefore, it chooses a case study for answering the research question. Choosing Mel Lastman Square in the city of Toronto provides an opportunity to collect detailed information of people's activities using data collection procedures through determined observational sessions and GPS to capture individuals' activity points in real time.

Subsequent sections consist of reviewing the methodologies of similar studies and the descriptions of the proposed methodological approach of this thesis.

3.2. Methodology Literature

In this thesis, I want to understand people's activity patterns related to the physical features of public spaces based on the principles of urban design theories, including Lynch (1960), Conzen (1960) and place theories developed by Canter (1977), Punter (1991) and Montgomery (1998). This study examines how people's activities relate to the physical design of public spaces and whether physical features affect type and level of people's activities.

This section reviews those studies pertaining to public space design that address similar research questions using various empirical methods of analysis. These methods are used for understanding and exploring the context and components of the built environment. Moreover, such methods determine the interrelations of place components and enlighten the development and improvement of the urban spaces and the decision making process. Urban design research involves the morphological, perceptual, social and functional dimensions of urban spaces (Carmona, 2010), and particularly contains their physical form and the activities of the people who use them. Thus, common topics for urban design research include the exploring and analysis aspects of "activity", "accessibility" and "livability" (Carmona, 2010). Therefore, to inform successful design, development and management processes, analytical methods can be used in various ways.

Throughout urban planning and design thought and practice, many scholars over the past decades have conducted several empirical research projects on public space design and public life to find out the activity – physical features relationship using different methodologies. Many studies pertaining to the design and use of public spaces are based on first-hand direct field observations such as Whyte's "The Social Life of Small Urban Spaces" (1980) in New York; Gehl's "Space between Buildings: Using Public Space" (1987) in Scandinavia; Cooper and Francis's "Public Spaces: Design Guidelines for Urban Open Spaces" (1998). Moreover, considerable advances have been applied in different studies using various tools for open space evaluation (Appleyard, 1979). Researchers such as Whyte (1980), Gehl (1987) and Cooper and Francis (1998) have used diverse methods to record peoples' activities within urban public spaces, from videotaping to activity mapping. Thus, qualitative and quantitative methodological advances have provided new and improved methods for analytical research on urban public spaces (Cooper and Francis, 1998: 94).

Likewise, the uses of contemporary public spaces throughout the cities are changing, according to current technological developments to address people's needs and wants (Sepe, 2009). Thus, in order to explore the "changing nature" and "complexity of contemporary urban areas", new and innovative methodologies and tools are currently being developed and applied at the primary stages of the design and planning process (Sepe, 2009). These methods and tools can be combined and applied to analyze and evaluate contemporary public spaces.

Currently, Geographical Information Systems (GIS) is used as a powerful analytical tool in planning practice (Al-Kodmany, 2000). Thus, there is an opportunity to investigate relationship between peoples' activity patterns and design of a place through using this tool. Applying GIS spatial analysis and combining it with the direct field observation methods provide a way to addresses the lack of empirical knowledge about a public space's actual patterns of use. According to Golicink and Thompson (2010) and Al-Kodmany (2000), "GIS has been little used in detailed mapping of open space usage", however, this thesis attempts to provide a starting point for taking advantage of using both GIS and GPS at the urban design scale.

This study, from a methodological point of view, emphasizes the linkage between direct observation, activity mapping method and GIS analysis to develop another way of looking at activity – physical features relationship. Creating the activity paper maps in combination with

observation data using GPS to capture activity points and entering them into GIS lead to generating activity patterns maps which gain a better understanding of urban space actual use.

The following part of the research methodology provides an overview of the methodological literature based on previous researches on public spaces using direct field observation, activity mapping, and recently, taking advantage of GIS analysis.

3.2.1. Direct Field Observation

Canter (1977) believed that direct field observation provides researchers with direct experience and understanding of a space. In order to provide people's activities patterns the researcher could record types and locations of the activities taking place within the space. Indeed, Canter (1977) established that the relationship between people and spaces does have a significant influence on the evaluation and exploration of physical features within the space.

According to the Project for Public Spaces (2005), observing a space results in finding out how it is used, rather than how a designer predicts and thinks it should be used. In general, successful designers produce detailed knowledge of urban spaces based on "first-hand experience" that will express how physical features affect individuals' activities in using a space (Carmona, 2010: 208).

Michelson (2011) introduces two forms of observation: participant and non-participant. In participant observation, the researcher considers himself/herself as a participant to experience more or less the same phenomena as those normally present at the study area. To get the accurate knowledge about the actual situation, the participant observer needs to develop skills to adapt his/her activities to the ongoing activities within the study area. Thus, this form of observation takes time. Non-participant observation involves visual concentration on interaction between individual activities and physical traces of them without the observer being an insider (Michelson, 2011). The second form of observations tracks and records the movement and interaction of people with the built environment on related maps. This type of observation is useful in understanding how the built environment affects activities through recording types of activities that are taking place by people within the urban space. These observations could be organized by recording types of activities through notes, photographing, mapping, or a combination of these techniques.

Photography in the field observations has become a popular and widely used method in public space research. In “The Social Life of Small Urban Spaces” (1980), time lapse photography and inexpensive super 8mm film provided the data from which much of Whyte’s research findings were drawn. Whyte (1980) suggested that through observation, designers can find out about people’s needs within public spaces. Considering this empirical knowledge will result in designing and creating more livable and vital spaces. Therefore, Whyte (1980) believed designers should “look hard, with a clean, clear mind, and then look again and believe what is seen”; in his opinion this is the power of direct observation (Whyte, 1980). He pointed out that design involves a comprehensive understanding of how people use spaces, and how they actually would like to use them.

Likewise, in the “Life between buildings: using public space” (1987), Gehl applied ordered series of observations on the urban environment and on physical factors that influence the use of public space. He has used observational methods in his research, making direct observations and records of where and how people occupy and use urban spaces, changing unused spaces into spaces that people intend to use them. Gehl (1987) intended to explore and investigate the potential relationships between activities and physical settings within the spaces between buildings. He counted how many people were within the space, identifies what they were doing and what elements make a space to work by documenting his observations with photographs and maps. Gehl’s research concentrates on the activities that people carry out in urban public spaces, focusing particularly on the influence of built environment and physical features on fundamental activities.

The following section reviews activity mapping method that public space researchers during direct observation sessions apply to collect actual information of how people use the space in relation to the physical design features throughout the public space.

3.2.2. Activity Mapping

Along with direct observations, for data collection in urban studies and researches, activity mapping also has been used as a method since Ittelson et al. (1970) first used the term. Ittleson et al. (1970) introduced the “activity map” in environmental psychology for a summary of the observed frequency of activities (Canter, 1977: 44). This method involves recording the patterns of peoples’ activities within a space on a map. Ittelson et al. (1970) pointed out that how

people perceive and experience the urban environment affects what they do within it and as a result influences how they experience a place. Therefore, activity mapping is a method of observing people's activities and movements relate to physical characteristics of built environment components and attributes (Cosco et al., 2010). Recording the location and types of peoples' activities simultaneously results in activity maps that will help to understand the actual activity patterns related to physical built environment settings.

Therefore, activity maps provide descriptions of how the activities of people are allocated within a space. Moreover, they demonstrate what types of activities are taking place. As part of the data collection procedure, the main advantage of such maps is in the possibility of considering physical features related to people's activities types (Golicnik, 2011). Activity maps give a clear understanding of research questions and problems through identifying types and frequencies of activities and demonstrating the relationships with a particular physical feature within the space (Golicnik, 2010). Moreover, activity maps graphically display the relationships between physical features of space and the activity patterns of people who are using the space.

Cohen et al. (2007) maintain that new methods are required to examine relationship between activity patterns and the physical features within the space. Their research focuses on community parks where measuring activity and associated variables are challenging because of the changing context and highly variable numbers and characteristics of parks users. Thus, they developed a systematic observation protocol, "A System for Observing Play and Recreation in Communities", based on particular codes and measurement protocols. The proposed system was tested by observing individuals in park areas and mapping their activities. Data were collected in a six month observation period that covered seven days of the week in each park. Every observation session in a day consisted of four time sections each of which lasted for one hour (7:30 am, 12:30 pm, 3:30 pm, and 6:30 pm). To facilitate observation recording, the parks were divided into target areas with potential for activity, such as a grassy play area, playgrounds, etc. The target areas were visited in an established order each time period (Cohen et al., 2007). During each observation of a target area, observers completed coding form by entering the observation start time and codes to describe the existing conditions and characteristics of the area and whether it was occupied for activities. Observers entered the activities that each individual was engaged in and simultaneously record each person age and ethnic/race group. They transferred these data onto the recording form and then did another observation to record the

physical activity level of each person as sedentary, walking, or vigorous. Observers then moved to the next designated area on the park map to complete next observations.

Likewise, a recent study by the City of Saskatoon (2011) "Public Spaces: Activity and Urban Form", illustrated and analyzed the relationship between public spaces and public life. Its methodology was derived from the works of Jan Gehl (1987). The researchers examined activities and use of urban spaces in Saskatoon's City Center by observing peoples' activities within public spaces and also by conducting surveys with people regarding their use of public space. The data collected describes where and how many people sit, stand, walk, cycle and play in the study area. The proposed "Strategic Framework" in this study used site surveys, direct observation, and public surveys at chosen locations within the City Center area. To examine the activity patterns of the public realm, two types of public life surveys were performed: pedestrian/cycling traffic and stationary activity counts. Counting approximately 57000 people in a pedestrian daytime traffic survey illustrated how people's space use differs throughout the day. The count was for 30 minutes of each hour from 7 am to 8 pm weekday to get the hourly average in a week. For the Saskatoon's City Center research, activity mapping was conducted for 30 minutes of each hour to record where people were engaged in activities such as sitting, standing, playing at different times of a day. The data were collected on different days throughout the week to present average weekday activities.

Direct field observations along with creating activity maps can uncover how a space is being used and to what extent the physical features affect the types of activities. However, to gain the advantages of current technologies, an opportunity exists to enter collected data into GIS in order to conduct different analysis based on types of data. Thus, the following section reviews recent studies that establish such methodology combination.

3.2.3. GIS Analysis and Activity Mapping

Although urban planners have been using Geographic Information Systems (GIS) at the macro level of urban and regional planning, particularly for environmental, ecological and natural resources applications, the technology has been used far less frequently at the micro level of planning and design projects such as urban public space design (Al-Kodmany, 2000: 5). Al-Kodmany (2000) considered the lack of GIS data at the local level as one of the main reasons.

Using GIS for mapping local areas in detail reveals the effective role of this analytical tool in a city's problem-solving and decision-making processes at the local level (Al-Kodmany, 2000: 6).

As Geographic Information Systems (GIS) is a popular and powerful analytical tool in the planning practice, there is an opportunity to investigate peoples' activity patterns within public spaces using this tool. Applying GIS analysis methods provide a way to investigate activity patterns associated with the physical settings of the public spaces. Although GIS is currently applied in the planning process (Al-kodmany, 2000), and provides organized databases for analyzing collected data, due to the lack of information at the urban design scale it has been little used in the design process of physical elements related to peoples' activities (Golicnik, 2011). Therefore, there is a need for profound investigation and concentration on a methodology that employs GIS as an analytical tool in understanding activity-physical features relationships within public spaces. Several studies have conducted research on activity and built environment relationships using a combination of observation mapping and GIS analysis.

Cosco et al. (2010), for example, developed activity mapping as a direct observation method to explore the activity and design patterns relationship. They maintain that early examples of activity mapping used manual data collection methods by pencil on a paper map to illustrate results visually. Moreover, they maintain that GIS now offers opportunities to manage and analyze data more efficiently. Using GIS analytical tools also facilitate the use of data collected from GPS devices. Cosco et al. (2010) believe that activity mapping is a method for collecting data and also applicable in recording "activity intensity" associated with different types of physical settings. To represent the sensitivity of activity mapping, Cosco et al. (2010) worked on data from two areas with similar size and numbers of physical settings and different site design and types of physical features. Observers used a paper map to record activity locations, type and physical features by walking through the areas in a predefined clockwise and counterclockwise direction to cover the whole area while preventing overlaps. Site observations for completing four maps per session include 55 minutes for the first area and 46 minutes for the second study area. Each colored point on a map showed the activity level and location within the determined areas such as gathering area, open area, pathway, play equipment and sand play.

In a recent study, Golicnik (2011) analyzed the physical settings of two urban open spaces in the UK and Solvenia, using both GIS and activity mapping. Initial site observations led to dividing the study area into sub-areas that were feasible in an observation session. The data

collection on the range of activities involved systematic observation sessions on different days of the week at different times of the day (morning, early afternoon, afternoon and late afternoon) within a month. The observation performed with 10 minutes walking through each sub-area and manually collecting data including duration of an activity, age group, movement direction, and weather conditions. Data were then imported into a GIS map using ArcMap. Golicnik (2011) defined "an open ended set of symbols" to record observed activity types on the study area map at a scale of 1:1000. According to Golicnik (2011) activity maps briefly present the distribution of activities within the space. GIS analysis tools can lead to a better understanding of activity patterns. For example, "overlay" tool can combine data layer based on location and present characteristics of all occurred activities within the space such as number of engaged people, age group, gender, and all the other recorded attributes. Golicnik (2011) methodology resulted in creating an explicit database that provides the opportunity to explore activity patterns in relation to design layout on daily maps or composite maps that reveal the common patterns of activities with the space.

Moreover, Golicnik (2011) believes that the combination of GIS and activity mapping provides a powerful methodology based on empirical knowledge of actual use of space associated with physical design. Regarding the accuracy of recorded activity locations, on map Golicnik (2011) believed that the use of Geographic Positioning Systems (GPS) for recording activity locations might offer a more accurate database. However, she considered some practical limitations of implementing GPS including the possibility that observers with GPS might disturb people's privacy and the likelihood that providing users with GPS units may affect their use of space. Considering these limitations Golicnik (2011) did not use GPS in her research.

The following section introduces a methodological approach of this thesis. I derived this research design framework by reviewing various studies surrounding public space researches that use observation, activity mapping and GIS in their methodology. Similar to some of those studies, I used a mixed method of direct field observation, activity maps and GIS analysis to find out the relationship between physical configuration and people's activity patterns.

3.3. Research Methodological Approach

According to the reviewed past research methodologies pertaining to analyze activity-physical features relationships within public spaces, particularly public squares and the conceptual theoretical framework of place theories this thesis combines direct observation method using activity maps and GIS analysis (Figure 3.1). The methodological approach for data collection and management demonstrates the relationship between daily uses of the space related to the physical design features within public spaces.

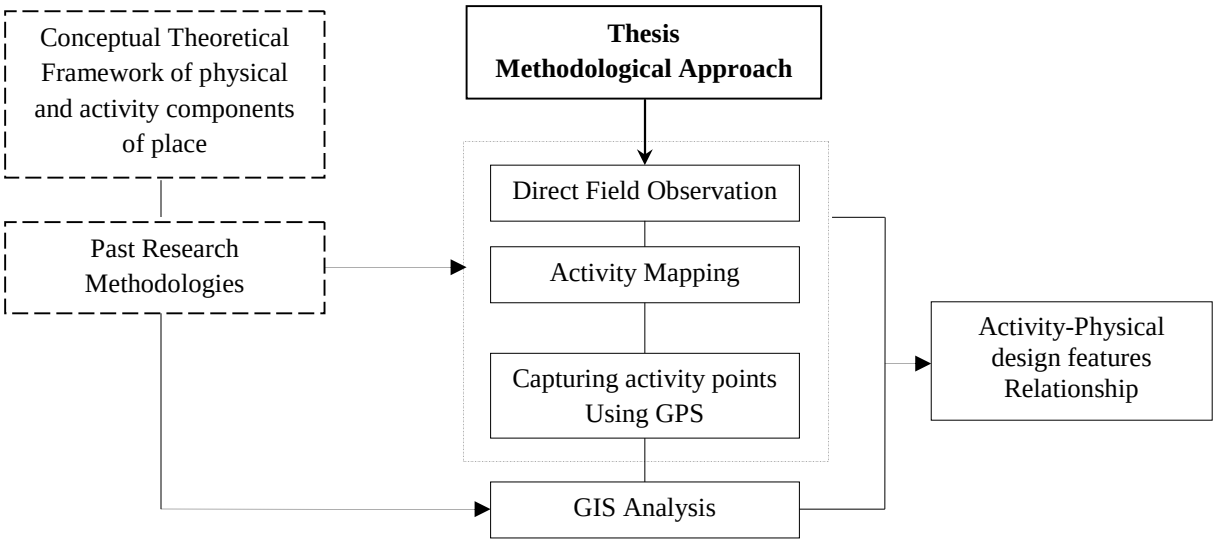


Figure 3.1. Research Methodological Approach

In order to conduct this research, I employed and chose a case study as the qualitative strategy of inquiry. According to Creswell (2009), the qualitative strategy explores in depth the activity pattern related to the physical pattern of public spaces, within the case study. In addition, detailed information is collected using observation during a certain period of time (Creswell, 2009: 13). Data collection entails regarding qualitative observations based on the activities of people at the selected study sites. In the field notes, the observer records activities in an unstructured or semi structured way and often augments their notes with visual materials in the form of photographs and videotapes (Creswell, 2009: 181).

For this research I chose direct field observation using activity maps and Geographic Positioning Systems (GPS) to record people's activities type and location within the selected case study. The research design adapted in this thesis consists of three major components; case

study selection, data collection and management, data analysis which are detailed in the following sections.

3.3.1. Case Study Selection Procedure

Case studies allow exploration of theories and provide opportunities understanding and examining them at the ground (Baxter & Jack, 2008, p. 544). Thus, within this study, where the goal is to provide insight into how peoples' activities relate to the physical pattern of public spaces, a case study is appropriate since it serves as laboratory for testing theoretical and methodological theories and concepts (Cresswell, 2009).

The case study of Mel Lastman Square within the city of Toronto has been selected for two main reasons. First, Toronto has an international reputation as a multicultural and diverse city; therefore, there may be a variety of proportions of uses and needs regarding public space use. Second, in particular, Mel Lastman Square, in the North York district of Toronto consists of a range of design configurations that lead to various types of activities.

In order to understand the relationship between physical and activity patterns within a public space, Toronto's Mel Lastman Square was selected as the study site. The goal is to select a public square with varying levels of physical features and activity patterns. This public space was selected according to the place theories and conceptual theoretical framework derived from the literature review. In particular, this square includes those characteristics that are introduced in the theoretical framework, such as different types of people's activities, pedestrian flows and movements. It also is composed of different sort of physical features such as walkways, and space furniture.

Based on the set of selection criteria (Table 3.1) derived from the conceptual theoretical framework (Chapter Two), direct observations and activity mapping approaches applied to this public space. It is important to determine the level and types of activities within the space (i.e. passive or active engagement) as well as the number of people using the space during the observation period. Importantly, the physical dimensions of Mel-Lastman Square according to the literature review on place making principles were also considered as selection criteria, such as green and water spaces within the square and the design layout.

Table 3.1. Case Study Selection Criteria

Place Components	Principles			
Activity	**Types of Activity**	Necessary Optional Social	Active Engagement	Population density
				Pedestrian flows and movements
				Vitality and Diversity
				People attractors
				Cultural and Social events
			Passive Engagement	people watching
Physical Setting	Density			
	Mixed use			
	Human Scale			
	Permeability			
	Connectivity			
	Imageability and legibility			
	Landmarks			
	Enclosure			
	Complexity			
	Architectural style			
	Green/Water space			

3.3.1.1. Introduction on Case Study

The North York Civic Square, renamed “Mel Lastman Square”, was designed in 1989 to provide a space for civic activities and link the surrounding mixed uses such as shops, restaurants and public transport. The square provides a quiet environment compatible for passive engagement such as sitting, relaxing and eating lunch. However, this square also hosts various local, social and cultural community events throughout the year.

Mel Lastman Square is surrounded by Yonge Street to the east, the Toronto District School Board to the south, North York Civic Centre to the west, and the Central Library to the north and provides approximately 20,000 sq.feet of a space for activities to take place away from the busy traffic on the street (Figure 3.2).

The main entrance is landmarked with a fountain under a large sign at the Yonge Street and an artificial stream that flows through the space surrounded with benches at the two sides.

The other part of the square includes a tree-lined pathway with a court garden that provides a number of benches and tables for people. A pool is located in the lower level of the square and serves as a relaxing focal point in the summer and a skating rink in the winter. The Square also features an outdoor theatre for a number of events and festivities.

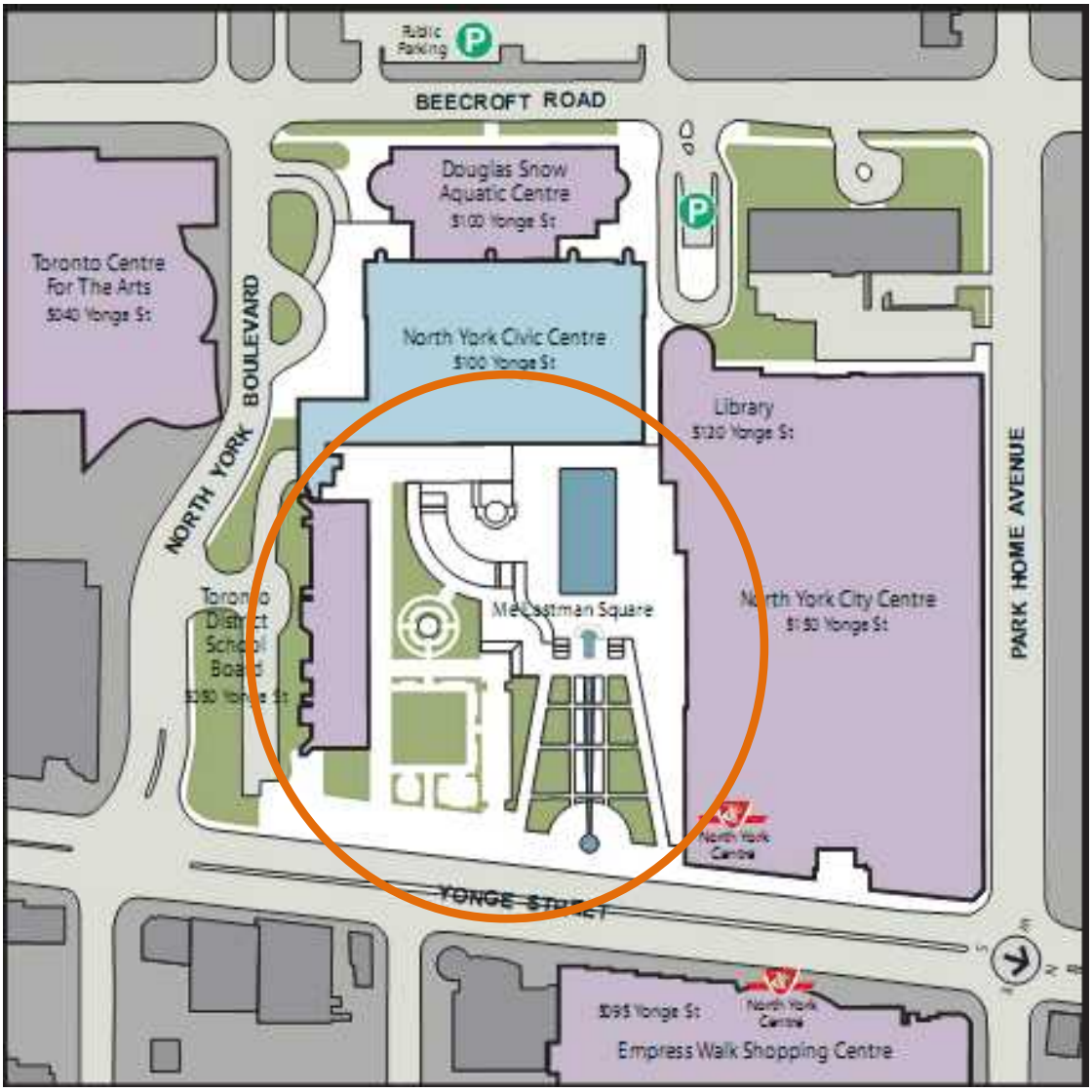


Figure 3.2. Mel Lastman Square

(North York Civic Centre - Enterprise Toronto: http://www.enterprisetoronto.com/files/content)

3.3.2. Data Collection and Management Procedure

Data collection and management procedures are the essential parts of this research prior to data analysis process. Applying a mixed method for gathering data requires time to manage data accordingly. The data collection procedure for this study is essentially based on an "observational protocol" (Creswell, 2009: 181) for recording the types of activities associated with using the physical design features of the case study through direct observation, activity mapping and using GPS. The observation protocol includes an observation schedule, descriptive notes, and information about the date, time, and number of people attending the place (Creswell, 2009: 182).

Direct observation and activity maps in combination with using GPS for capturing activity points create an "empirical database" (Golicnik, 2010) of activity-physical interaction within the public space. Such empirical database is able to reveal the common pattern of the space use related to the space physical design features. The data collection and management procedure for this study consists of three main steps (Figure 3.3):

- Data Preparation: that first determines required field data based on theoretical conceptual framework of this research. Second, describes the preparation of GPS device and paper maps for collecting data at the study field.
- Field Data Collection: that includes direct observations according the assigned times, activity mapping on paper maps and capturing activity points using prepared GPS device.
- Post-Field data processing: that first involves creating a database in ArcMap GIS by importing collected data from a GPS device along with activity maps and creating required attribute tables. Second, using ArcMap GIS analysis tools and creating required analytical tables and daily/composite activity maps with regard to applicable GIS analysis tools.

The following sub-sections describe each data collection steps that underpin the research methodology.

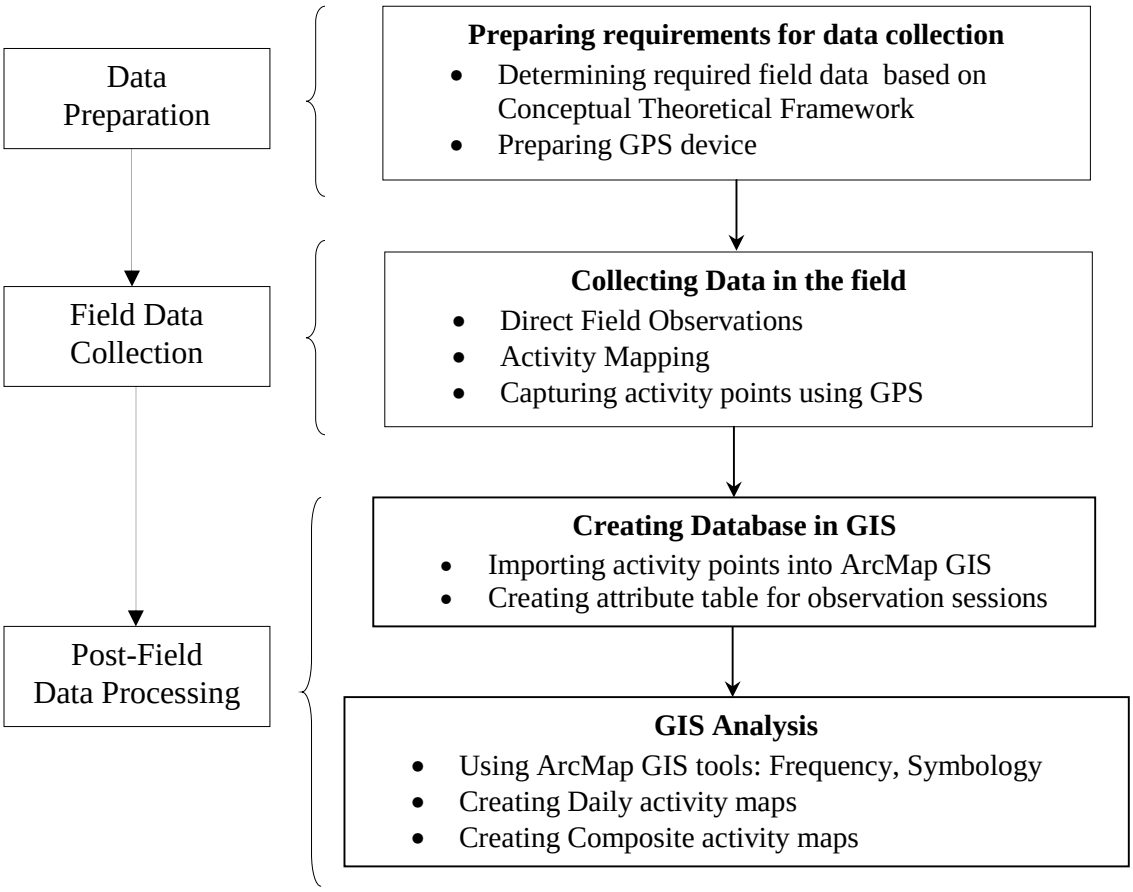


Figure 3.3. Data Collection and Management Procedure

3.3.2.1. Data Preparation

The first step in data collection and management procedure involves data preparation. According to the research methodology approach required field data should be determined based on the conceptual theoretical framework considering activity and physical features components. Moreover, capturing activity points at the field needs the prepared GPS device. Thus, this sub-section reviews the data preparation process prior to the field data collection.

3.3.2.1.1. Data based on Conceptual Theoretical Framework

The detailed literature review presented in Chapter Two that describes place theory and place-making principles is used as a data collection framework for this thesis. This framework includes dimensions of two place components: activity and physical setting. In terms of activity, two general categories were considered: passive and active engagement (Carmona, 2010). This framework was used as a reference for collecting data during the observations period, and especially for creating activity maps based on types of activities that were taking place associated with physical design features within the study area (Table 3.2).

According to the activity principles, the number of people who are using the space will define the density of population and will affect the vitality of the space. People's presence at the space depends on the space attractions and the diversity of uses that the space provides. Typical passive activities in urban squares include sitting which usually follows diverse purposes for people watching, talking, eating, and reading. Active engagement in urban square usually includes activities such as walking, playing, cycling, exercising and taking photos. Based on the conceptual theoretical framework, the following physical design features deemed to be critical within the space including paths, edges, furniture and natural features (Table3.3.2.1). Such design features derived from determined physical principles of urban spaces such as design layouts that defines paths, edges through space and landmarks within the space that attract people to stay and use the space.

Table 3.2. Activity and Physical Components and Theoretical Principles

<table>
<tr><th colspan="2">Activity Component</th><th>Activity Principles</th></tr>
<tr><th>Activity Level</th><th>Activity Types</th><td rowspan="17">• Vitality and Density of population: Number of people using the space
• People attractors
• Diversity of space use</td></tr>
<tr><td rowspan="8">Passive engagement</td><td>Sitting</td></tr>
<tr><td>Sitting with a child</td></tr>
<tr><td>Sitting with a Pram</td></tr>
<tr><td>Sitting on a wheelchair</td></tr>
<tr><td>Standing</td></tr>
<tr><td>Standing with a child</td></tr>
<tr><td>Standing with a Pram</td></tr>
<tr><td>Laying down on lawn or bench</td></tr>
<tr><td rowspan="9">Active engagement</td><td>Cycling</td></tr>
<tr><td>Exercising</td></tr>
<tr><td>Taking photo</td></tr>
<tr><td>Playing</td></tr>
<tr><td>Playing music</td></tr>
<tr><td>Walking</td></tr>
<tr><td>Walking with a child</td></tr>
<tr><td>Walking with a pram</td></tr>
<tr><td>Walking with a wheelchair</td></tr>
<tr><th colspan="2">Physical Component</th><th>Physical Principles</th></tr>
<tr><th colspan="2">Design Features</th><td rowspan="2">• Design lay out
• Landmark
• Grass and water space</td></tr>
<tr><td colspan="2">Paths, Edges, Furniture, Natural Features</td></tr>
</table>

3.3.2.1.2. Preparing GPS device for Capturing Activity Points

Using and integrating Geographic Positioning Systems (GPS) in the public spaces research allows traces of peoples' activities in or through space to be recorded geographically referenced data (Golicnik, 2010). In this study, and in order to record the location of activities accurately, I used a mobile GIS device, Trimble JUNO GPS with ESRI ArcPad software.

Mobile GIS introduces changes to data collection procedures when compared to traditional paper-based field map methods. It allows to be visualized in an interactive manner and compare to other GIS data collection methods can improve field work productivity and data

accuracy. Recent developments in mobile GIS provide the ability to access real-time data and manage data observations in the office or GIS lab.

The ESRI ArcPad software that was installed on the GPS unit provides mapping, GIS query and some basic data management capabilities. Data collection with ArcPad increases the accuracy and efficiency of data collection and provides access to spatial data in the field. Moreover, ArcPad offers integration with an optional GPS for real-time data capture (ESRI White Paper, 2004). In addition, ArcPad supports data editing, creating and updating in the field through editing tools.

Prior to using ArcPad in the field study, it was necessary to assemble baseline GIS data for Mel Lastman Square. Ideally, detailed design scale data that represented buildings and various design features of Mel Lastman Square (e.g. benches, paths, etc.) would be available. Unfortunately, the publicly available spatial data for Mel Lastman Square were both relatively coarse in resolution and were lacking key design features. The available Adobe PdF map dataset of Mel Lastman square doesn't contain spatial reference information and it does not align properly with the data that were going to be collected within the field. To work around these shortcomings, the detailed Adobe PdF image of Mel Lastman Square created by the North York Civic Center was georefrenced in ArcGIS and imported into ArcPad software so that I was able to collect data and mark activity points while observing the site. Through the georefrencing process each pixel in the PdF image was associated with a real world geographic coordinate.

ArcPad software allows creating, deleting and moving points, lines and polygon features in ESRI shapefile format. In addition to recording location information as a point, line or polygon, attribute data that describes the characteristics of the real world that a given point represents (e.g. names, types, etc.) can also be recorded in a shapefile. By adding a new location (tapping the screen or input from a GPS) a form opens automatically to fill attribute data associated with the marked location and stores it in the same shapefile.

Prior to capturing activity points at the study field and creating point features with GPS in ArcPad, a new point shapefile layer was created. Fields representing point ID, Date and Time according to the observation protocol (Morning, Afternoon and Evening) were added to the new point shapefile. Both the activity point layer in a shapefile format and the imported georefrenced map of Mel Lastman square were loaded on the GPS device prior to capturing activity points within the study site.

3.3.2.2. Field Data Collection

The essential step in data collection and management procedure of this study is the field data collection. The methods that I used in this methodology approach include direct field observation through photographing and videotaping and walking through the space creating activity maps and using GPS to establish an empirical database of activities related to physical design features of Mel Lastman Square.

3.3.2.2.1. Direct Field Observations

Direct observations as a qualitative data collection method are used to record activities and physical aspects of a site without interviewing people and recording responses to questions (Patton, 2002). In addition, direct observations are useful when direct information is wanted and/or when one is trying to understand the relationship between individuals' activities and the built environment in which they are located. In this thesis, direct field observations are carried out to detail the type and level of peoples' activities through videotaping and photography and walking through the space creating activity maps using GPS to capture the activity points.

Prior to the field data collection, I conducted an initial observation to assess the area in terms of where to place the camera for the videotaping and ensure visibility to all parts of the site. The initial observation provided an opportunity to inspect the site to identify areas of activities within the space. On this basis, I divided the square into four sub-areas with different design configurations including: a) area with a fountain and a water stream, b) a tree-lined area with a garden court, c) a theatre area, and d) a pool area. Thus, each session of observation covered every part of the site while avoiding overlaps as illustrated in Figure 3.4.

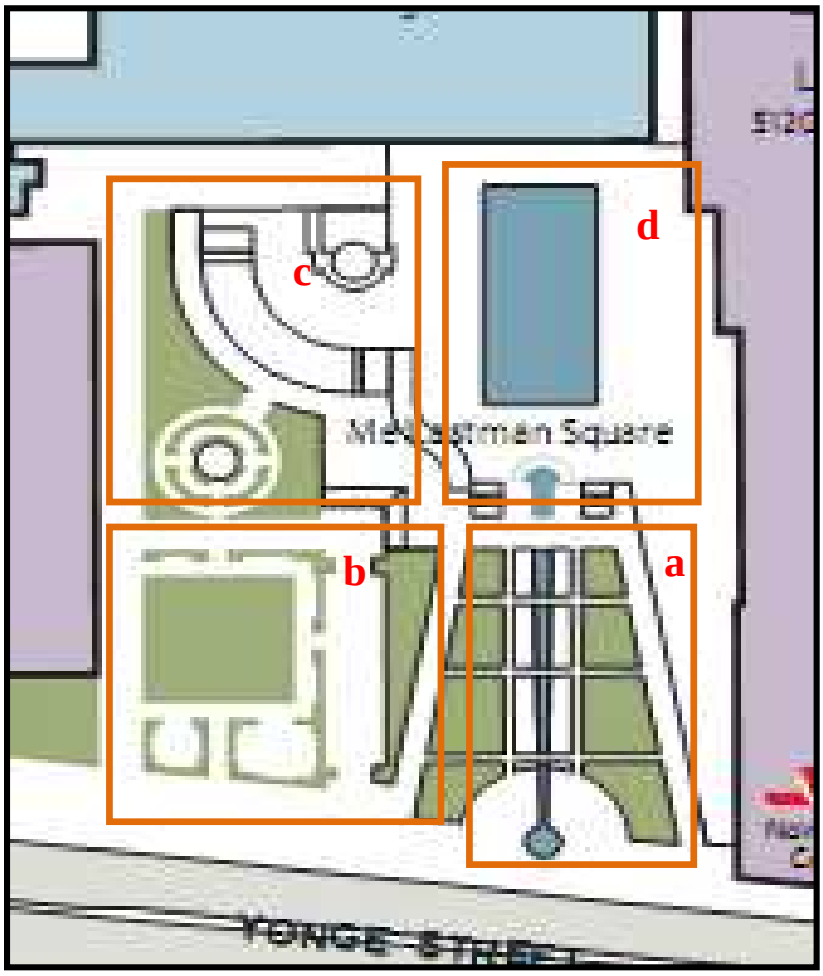


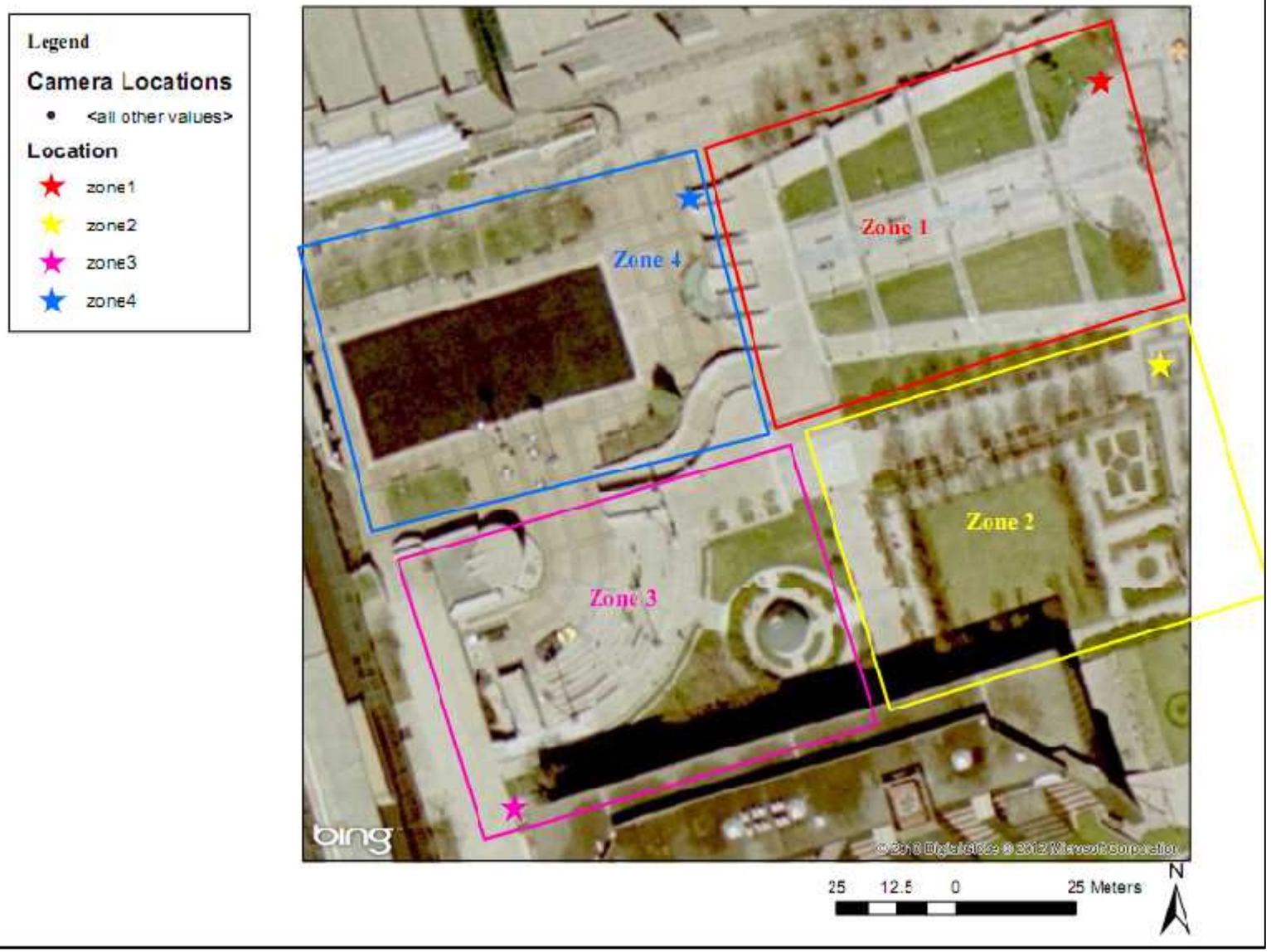
Figure 3.4. Four parts of Mel Lastman Square for Direct Field Observation

The detailed data collection of the Mel Lastman Square involved several observation sessions on weekdays as well as weekends in July 2012. This month was chosen because the weather is usually warm and offers opportunities for outdoor activities most days. Observation sessions followed scheduled timing to record different activity types at different times of the day (Golicnik, 2010). Data were collected on two weekdays as well as a weekend. Initial observations indicated that weekdays generally have identical usage patterns. Thus, to have similarity with weekend, Tuesday and Friday were chosen as weekdays and Saturday and Sunday as weekends. In terms of timing, three time periods for observation were determined: Morning (10 am -12 pm), Afternoon (12 pm – 2 pm) and Evening (5 pm – 7 pm). All of the sub-areas of the square were observed during each of these periods. As there are four sub-areas, and one session of observation is two hours (120 minutes), there was an opportunity to scan each sub-area for 30 minutes.

The observation protocol involved a systematic observation based on videotaping and photography and walking through the sub-areas and creating activity maps using GPS to locate the activities on a GIS map.

The first method for recording peoples' activity within the space includes direct observation by using a camera and videotaping determined parts of the space where a wide view over a space was provided. The camera locations are illustrated in the Figure 3.5 As it is shown in the following map, there are four particular zones that the camera was stood on the determined points. In order to collect accurate and constant data, an assistant was stood by the camera, while I continued the direct field observation by walking through the space to create the activity maps and marking the activity points using GPS. According to the observation protocol, previously described, each zone was observed for 30 minutes and within two hours the whole parts of the Mel Lastman Square was covered.

Figure 3.5. Mel Lastman Square Camera Locations



3.3.2.2.2. Activity Mapping

Walking through each zone with a paper map of the Mel Lastman Square while that zone is being observed and videotaped allowed each individual's activity to be recorded on a map (Figure 3.6). Each activity point was assigned a unique numeric ID. Peoples' activities were recorded on the paper map along with marking activity points with GPS (will be described in the subsequent section) to save time while each activity was taking place. These maps were used as complementary information in the data management while accompanied by required information such as activity type and activity location. Each session of observation and data collection yielded a daily pattern of activity through each activity map and thus reveals the common location for particular activities that are quite often chosen/or not chosen by people. A daily pattern of activity also reveals when people use the space for particular activities. Thus, the activity maps will reveal the frequency and diversity of the activities in each observation session.

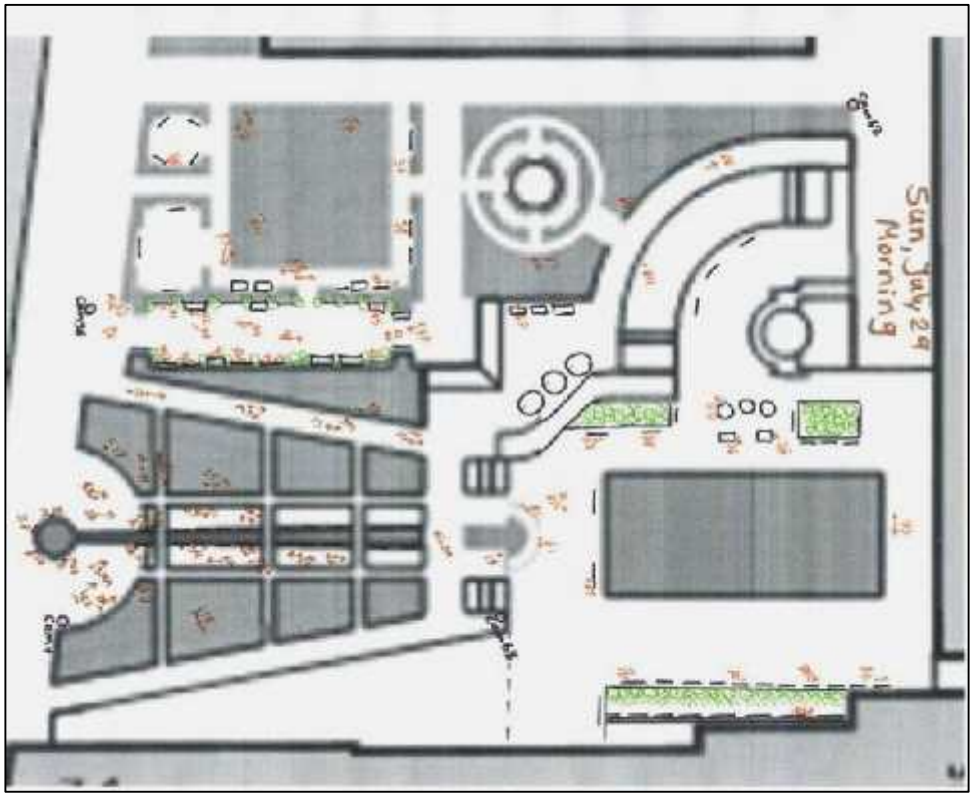


Figure 3.6. Sample of Activity Map - Mel Lastman Square

Therefore, collecting data required defined typologies for each activity as well as for the physical design features. Defining these typologies contributes to creating activity maps as well as symbolizing data in ArcMap GIS. Prior to starting the data collection, typologies were determined for each required data element including activity level, activity location and design features. Each observation was classified according to the activity typology represented in Table 3.3. The activity classes in this table were based on public space previous researches particularly Carmona (2010), Whyte (1980) and Gehl (1987).

Table 3.3. Activity Typology

Activity Level	Activity Type
Passive	Sit
	Sit-Child
	Sit-Pram
	Sit-Wheelchair
	Stand
	Stand-Child
	Stand-Pram
	Lay
Active	Cycle
	Exercise
	Photo
	Play
	Play-Music
	Walk
	Walk-Child
	Walk-Pram
	Walk-Wheelchair

In terms of passive activities, people tend to sit alone, with a friend, family or their child while carrying a pram. Some people prefer to stand along walkways and talk with a friend or watch their surrounding while their child is playing. As Mel Lastman Square is a quiet space, some people find it an appropriate place to relax and lay down on a bench or on grass spaces. Active uses range from leisurely walks, with a friend or their child while carrying a pram. Some may choose to cycle around or play, playing music, exercise or even they find nice sceneries to take photos. Another thing that is worth mentioning is that the place is to some extent appropriate to host people who use a wheelchair.

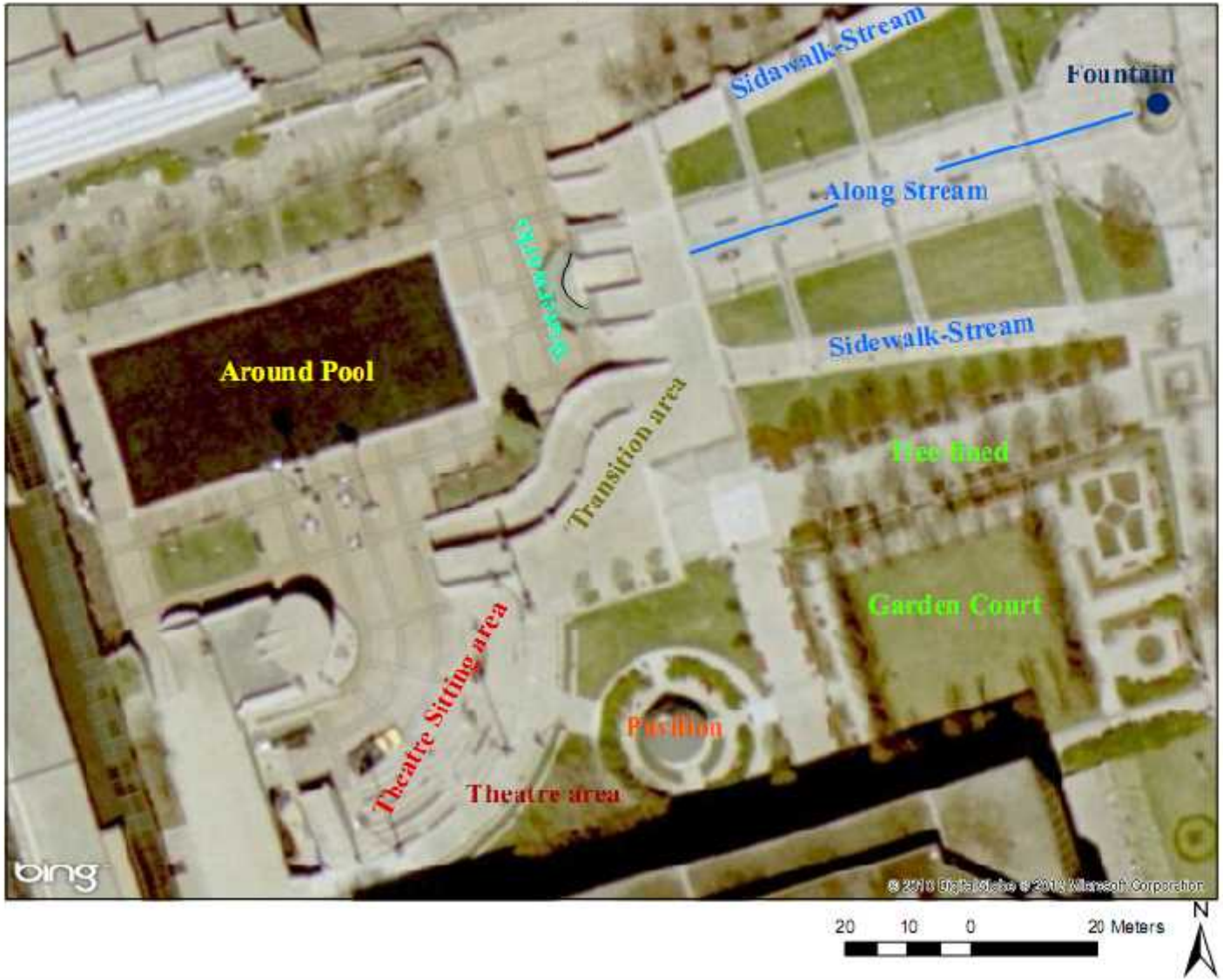
The following Table 3.4 outlines the diversity of physical design features and the possible activity locations of each parts of the square. Four main categories were considered for existing design features within the space. Mel Lastman Square features two of Lynch's (1960) five physical elements, namely paths and edges. Paths were characterized according to their location, for example walkways along stream, tree-lined corridor or around the pool (Figure 3.7). The edges are designed as sitting area where there is a theatre podium, or people choose to sit on the edges of entrance fountain or on the edges of the designed waterworks or the steps around the pool. In addition to edges and paths, urban furniture such as benches, tables and round tables distributed throughout the space were considered key design features. Natural features, specifically grass spaces, were the field design features.

Table 3.4**.** Design Features Typology and Activity Locations

Design Features		**Activity Location**
Paths	Walkway	Along Stream
		Around Pool
		Garden Court
		Theatre area
		Transition area
		Tree-lined
Edges	Edge	Around Pool
		Fountain
		Theatre sitting area
		Waterworks
Furniture	Bench	Along Stream
		Around Pool
		Pavilion
		Theatre area
		Tree-lined
	Table	Around Pool
		Transition area
		Tree-lined
	Round Table	Around Pool
		Transition area
Natural Features	Grass space	Along Stream
		Around Pool
		Garden Court
		Theatre area

Mel Lastman Square

Figure 3.7. Activity Locations



The following diagram illustrates the potential relationship among activity level, activity type, design features, and activity locations within the space considering the defined typologies for each. It shows that for example what kind of active or passive activities are possible to take place within the space. In addition, it presents the relationship between design features and the possible activity location. For instance, round tables which usually are occupied for passive activities such as sitting are located around the pool and the transition area (Figure 3.8).

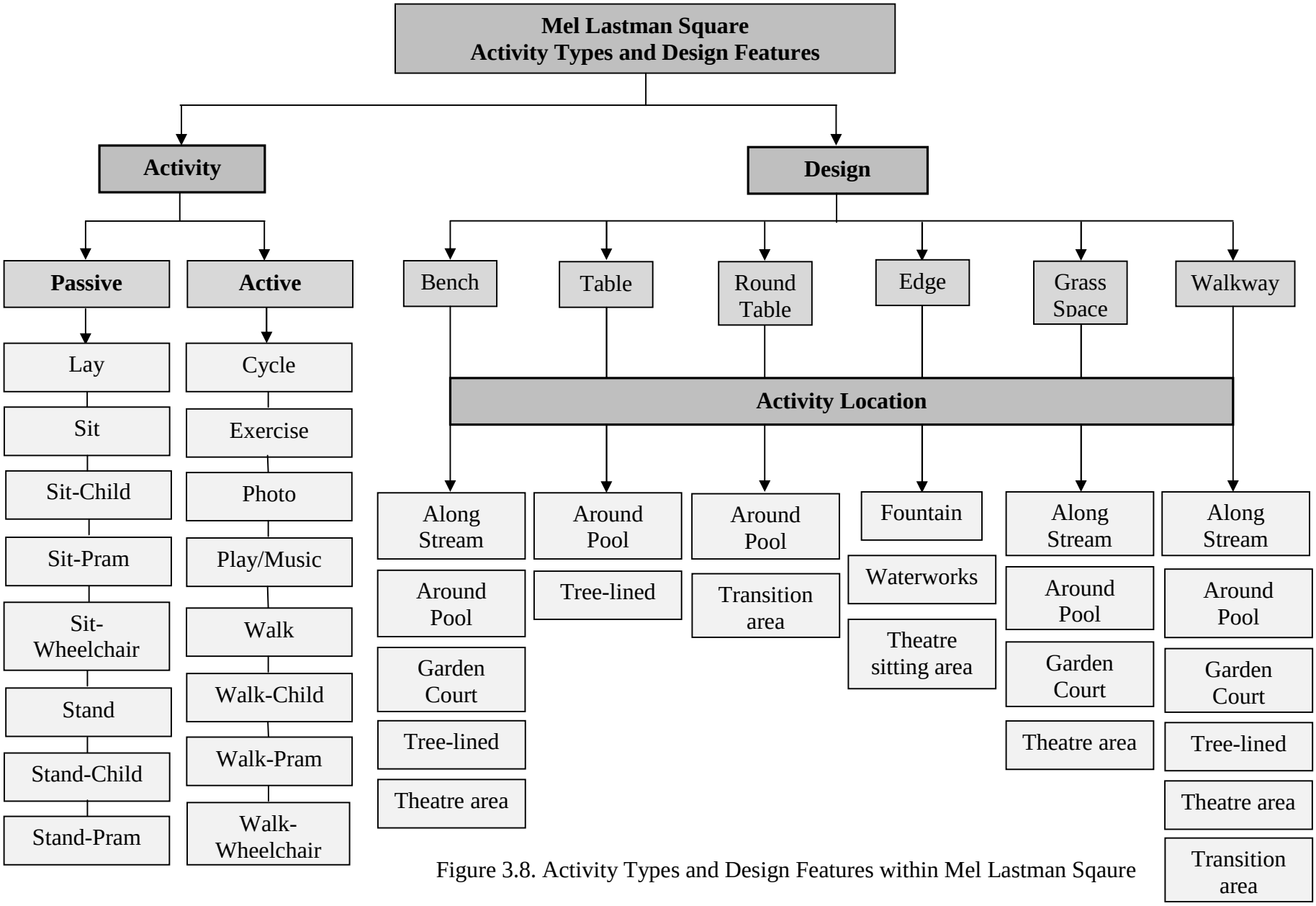


Figure 3.8. Activity Types and Design Features within Mel Lastman Sqaure

3.3.2.2.3. Capturing Activity Points using GPS/Mobile GIS

It is worth mentioning that this part of the observation was conducted through GPS (Trimble JUNO) using the ArcPad software. As I needed to mark the activity points, I had to walk through the sub-areas within the Mel Lastman Square and record the location and types of activities along with creating activity maps. Using GPS device provided an opportunity to mark the individuals' activity points on a GIS map while recording data such as the Date and Time for each activity point. Using the GPS in this way facilitates the recording of activities of anyone who happens to be in the observed space during the observation period.

On the field the MobileGIS was turned on and through using the ArcPad software the georefrenced map of the Mel Lastman Square was opened. To start using the GPS the satellite icon was added to the screen map and the GPS was activated. The GPS window shows the constellation of satellites. Red symbols were unavailable satellites, blue were satellites expected to come into view, and black ones were currently used satellites. It may take five minutes for the GPS to figure out where it is. Thus, it is best to plan GPS data collection when there is adequate satellite coverage for the study area. When the red icon on the map turns into cross-hairs then it was ready to start taking, recording and collecting activity points. Enabling the GPS tab in ArcPad gave this opportunity to mark each activity point on the georeferenced map of Mel Lastman Square.

Once the GPS was activated, I selected the point tool to click on the map and mark the point where an activity was taking place. A form also brought up to add previously defined attributes such as activity point ID, Date and Time. I added a sequential ID while I was creating related activity map at the same time and record each point with the same ID number on the activity map. Therefore, each point was assigned a unique numeric ID which was similar to the ID Field in marking activity points on GPS.

3.3.2.3. Post-Field Data Processing

Recording the fundamental real time data in ArcPad using MobileGIS and the capabilities of this software provides the opportunity to manage data later using the more full-features ArcMap GIS software that runs on desktop computers. After completing all the data collection during observation sessions, activity maps along with activity point layers marked with GPS, these data were imported into the desktop ArcMap GIS. This section describes the post-data management process which was mostly dealing with creating attribute tables in ArcMap and adding required fields to it according to the recorded data on the activity maps and captured activity points. For this research, post-field data management process at the first place includes creating attribute tables which provide characteristics for recorded points considering timing, design features and activity types.

One of the most important parts of this study is the post-field data management process. In general, dealing with GIS data requires organized data which makes the analysis easier and quicker. Marked activity points within the Mel Lastman Square provided with ID, Time and Date formed the basic fields of the attribute table in ArcMap. As four observation sessions were conducted for each session separate point shapefiles were used. Moreover, to be more organized all observation point features were loaded into a file geodatabase that incorporated all collected data, stored points and attribute data within a single relational database environment.

For this study, individuals' activities in Mel Lastman Square were recorded as single point locations. The geographic coordinates for each point was determined using ArcPad software that was installed on a Trimble Juno GPS. A series of symbols for each point was defined to permit key characteristics of the activity to be recorded. The activities included passive and active ones such as sitting, walking, playing.

The attribute table for each session which includes different data field was completed according to the collected data on activity maps. Three fields already existed, activity points ID, Data and Time. Thus, by using the "editor", required fields including Activity Level, Activity Type, Design Feature, and Activity Location were added to the attribute table. These data were recorded on related activity maps for each observation sessions. Thus, I have to use the activity maps that were revised once according to the video recording in terms of accuracy and being reliable. As a result, the final table is provided with all required data, and each point on a map

represents an individual person with according attributes and will provide the answers for the following questions:

- To what Gender and Age group each individual person belongs?
- What is the activity level and activity type for each individual person?
- Where does each activity take place (Design Feature, Activity Location)?
- How long does each activity take (Duration)?

The main attribute fields that were focused on to answer the research questions include: Timing, Activity Level, Activity Type, Design Features and Activity Locations. Most of the GIS analysis was based on these attributes to examine the relationship between activity pattern and design features within the Mel Lastman Square.

The proposed combined methodology for data collection provides a valuable opportunity to ease the data collection and management process. Recording people's activity on activity maps accompanied by some other information such as age group, along with using GPS to capture activity points on a GIS map resulted in more accurate and reliable data. Completing the attribute data was the most essential part of the post-field data management process. Each activity point on GIS map had a particular ID number, date and time; the other values were added to the attribute table using the activity maps. At this stage data management constitutes of matching each marked point on GIS map with the recorded points on activity maps.

Moreover, I have to determine supplementary fields such as activity level, activity type, design feature and design location for each point. Thus, the completed attribute table represented the required information about each point. Having the point layer accompanied with the attribute table provides opportunities for related analysis to understand the relationship between activity and design features patterns. Following section provides an introductory to possible GIS analysis according to type of the collected data also associated with the activity maps.

3.3.2.3.1. Possible GIS Analysis

Part of the value of this thesis lays in the combination of using GIS with other data collection methods; direct field observations and activity mapping. GIS as an analytical tool is currently in use in urban planning processes and spatial analysis (Al-Kodmany, 2000). GIS provides opportunities to analyze data at the regional scale, but has been little applied for more detailed scale such as in designing public spaces and mapping people's activity. As an analytical

and visualization tool, GIS will be used in this research to illustrate the physical design features of places in relation to peoples' activity patterns.

This research combined observation and activity maps with GIS analysis to reveal pattern of use related to design features. Applying GIS requires database creation and analysis tools that this sub-section introduces. The data from every observation session, recorded on a paper activity map and the accurate location of observed activities were marked on a map through ArcPad software in Mobile GIS using GPS on the site. Thus, there was the opportunity to use the created points' layer in ArcMap GIS. This methodology created a useful database of observations that can be explored in GIS in a number of different ways such as investigating total number of activity types, number of engaged people regarding the design features, and activity locations.

In GIS, there is an opportunity to conduct different analysis according to the available data. Specifically, the analysis tool box in GIS includes spatial statistical analysis and contains a powerful set of tools that perform the most fundamental GIS operations such as performing overlays, creating buffers or performing proximity. Applying such analysis highly depends on the available data layers. For this research according to the collected data within the Mel Lastman square, and the available base map the best analysis relates to "Frequency" from statistics toolset. This tool works with the attribute table and a set of fields to create a new table containing unique field values with the number of occurrences of each unique field value. Through using this tool and considering the attribute table there was a possibility to investigate the relationship between individual activities and design features. Moreover, defining certain "Symbology" for activity types, activity locations and design features within the space provided the opportunity to visualize activity patterns on a map.

According to the collected data also there is an opportunity to create a daily pattern of activity using a GIS map. Moreover, by using the GIS it is also possible to create a "composite map" of activity pattern to understand how and where certain activities occur and thus shed light on how people typically use the space. Thus, this type of analysis assists in understanding the linkages between the physical structure of the public space and the spatial distribution of its design features on the one hand, and how people orientate themselves to use these features within the public space on the other hand. Consequently, not only would this shed light on those

design features within the public space that are most and least used, but also how certain design features impact how users choose the location of their activities.

3.4. Data Collection Limitations

It is important to bear in mind the limitation of using GPS in urban areas surrounded by high structures and/or trees since the quality of GPS locations can be degraded in these contexts. Therefore, the practical use of GPS was considerable, while the Mel Lastman square was surrounded with high buildings and the GPS receives signals from different satellites, the marked points on the map had some error which led to use the editor tool in ArcMap GIS and rechecking and matching each point by referring to the activity map and video recording which seems very helpful at this stage. Thus, the limitations of findings would base either on accuracy of data collection with GPS or consideration of other relevant aspects that may affect this process such as availability of GIS data maps.

3.5. Conclusion

In order to answer the research questions set out for this thesis, an explanatory case study approach was employed parallel to quantitative analysis that was followed in GIS analysis. Through direct field observation, activity mapping and GIS analysis this research shed light on a contemporary designed public space and its pattern of use. Mel Lastman Square in the City of Toronto was chosen due to having different levels of activity as well as a range in design features to understand the physical settings impact on peoples' activity pattern. Collecting the required data for investigating abovementioned relationship through the described methodologies, consequently, will reveal the activity pattern of people within the selected site and can exploited to better regulate people's flows throughout the public space associated with the design features.

Chapter 4

Research Observation Results and Analysis

4.1. Introduction

The structure of this chapter is based on the data collection methods employed within this study and contains the research observation results and analysis. The data collection methods include direct field observations, activity maps and using GPS to collect activity points within the Mel Lastman Square. Particular attention was paid to the use of the design features and activity locations and how design elements affect the activities of the people. Understanding these relationships required determining the common patterns of use, similarities, differences and expectations of use through observation period by analyzing the collected data.

The following sections include the observation results, research data analysis and findings with particular reference to the relationships among people's activity type, use of design features and activity locations within the Mel Lastman Square.

4.2. Observation Results

During the four observation sessions of Mel Lastman Square there were noticeable mix of people within the space and variety of activities occurring. There were a large number of people meeting with friends for a morning coffee, lunch or an after work meeting. People were out, walking their children and socializing. Some were sitting while others were taking their surroundings on a leisurely walk. There were numbers of seniors who were sitting and sharing their life experiences. All the activities' types and location were recorded both on paper activity maps and mobile GIS map by marking activity points using Juno GPS.

The following subsections will discuss observation results according to the explained data collection procedure in the Chapter 3. This procedure involves with three main theme including the activity level/type, use of the design features and the activity location with respect to the timing of the activities throughout the observation period.

4.2.1. Activity Level and Activity Type

During the first observation day, Tuesday 24th, July 2012, a total number of people whose activity points were marked on the activity map and GPS, was 310 (Appendix 1). In the morning time the space inhabited 104 people (33%), in the afternoon 126 people were enjoying the space at the lunch time (40%). In the evening 80 (25%) people were using the space according to the number of points that were marked on the activity map and captured with the GPS with particular attention to the activity type and location (Appendix 2).

With regard to the activity level and activity type, according to the collected data in Tuesday, approximately 65% of people were engaged in passive activities during different times of the day. In other words they were mostly sitting and enjoying the nice and calm environment of the space (Figure 4.1). Among these passive activities, sitting (alone, with a friend, child or pram) was prominent with 59% of all the presented people. At the active level, walking constitutes approximately 28% while playing and cycling formed around 5% of all the activities (Appendix 1).

Friday, 27 July 2012, was assigned to be the second observation day during weekdays. People were out and varieties of activities, mostly passive activities (72%) were going on (Appendix 3). Among 309 individuals who were presented in the Mel Lastman Square on Friday, 85 of them used the space in the morning and 121 of them enjoyed the space at the lunch time and rest of them came to the square to spend their evening (Appendix 4).

According to the collected data on Friday, among the passive activities, obviously sitting during different times of the day was the prominent one and consists 60% of the presented population. At the other activity level, walking was prominent at 20% while other activities were taking place such as playing (2%), exercising (1%) and taking photo (Appendix 3). Therefore, the most remarkable activity either in the morning, afternoon or evening was sitting as a passive prominent activity (Figure 4.2).

The third observation day was assigned to be a weekend day, Saturday 28 July, 2012. During this observation session varieties of activities were going on while the total observed and counted people were 334 (Appendix 5). In the most populated day within the observation period, approximately 54% of people used the space in the evening and 30% of them enjoyed the outdoor environment at the lunch time while the rest of them chose the morning to spend their time (Appendix 6).

Regarding the activity level most people were enjoying passive activities (66%) and 111 out of 334 were active within the space. According to the collected data the most prominent passive activity during this observation session was sitting (46%) while other types of passive activities were taking place including lying on a bench, standing. Among active level of activities, playing was noticeable even though constitutes approximately 4% of the total counted people. Obviously, the observation data shows that walking was the remarkable activity at the active level with 28%. Exercising, cycling and taking photo were also taking place and constitute 2% of all the activities (Figure 4.3).

For the last observation session, data were collected on Sunday, 29 July 2012. Interestingly, this session was the least populated day with 267 people, even though it was a weekend (Appendix 7). Approximately, 82% of the observed people were adults and noticeably, almost 11% of them were seniors who were mostly sitting and enjoying the peaceful environment. Among 267 counted people, 40% of them enjoyed their Sunday evening in the square while in the morning and at the lunch time the square was almost occupied with 70-80 people (Appendix 8).

In this observation session two third of activities were passive including sitting which constituted over 50% of the total (Appendix 7). Among the active activities, walking was most popular with more than 20% people involved, other activities such as playing, cycling, exercising, taking photo, playing music were also noticeable and consisted more than 10% of all the ongoing activities (Figure 4.4).

According to the collected data, with regard to the timing, Sunday morning was the less populated time, 81 people were out within the space. More than 40% were seated and others were walking, playing, cycling or exercising.

The following maps illustrate how activities vary by activity type during the observation sessions (Figure 4.1- 4.4)[1].

[1]. See appendix 9-1, 9-2, 9-3, 9-4 for activity level maps during the observation period.

Mel Lastman Square

Figure 4.1. Daily Activity Pattern-Weekday (Tuesday)

Mel Lastman Square

Figure 4.2. Daily Activity Pattern-Weekday(Friday)

Mel Lastman Square

Figure 4.3. Daily Activity Pattern-Weekend (Saturday)

Mel Lastman Square

Figure 4.4. Daily Acitivity Pattern-Weekend (Sunday)

4.2.2. Use of the Design Features

With regard to the use of the design features within the Mel Lastman Square, according to the observation on Tuesday (24th, July 2012), 31% of people were sitting on a benches located within the Mel Lastman Square (Appendix 1). Tables were the second design feature choices that people preferred to use for sitting (16%). Grass spaces were among the other popular sitting areas (5%) as well as edges (5%) which were mostly located in a peaceful and quiet environment far away from the street (Figure 4.5). A number of people who were walking or standing (37%) within the square used the designed walkways. During all of the observing times, benches and tables were among the most popular sitting choices. At the lunch time people were intended to use any type of sitting choices including benches (25%), edge (5%) and tables (15%) throughout the square to sit and eat their lunch (Appendix 2).

Similarly, the observation results for the timing on Friday (27th, July 2012) reveal that most populated time was at the lunch time while the space was occupied by 121 people (40%) and the most occupied design feature constitutes benches at 43%. Obviously, the first activity which people spend most of the time on it was sitting preferably on benches (34%) or tables (12%) provided within the space (Appendix 3 and 4). The least activities were taking place in the morning while in total 85 people (27%) were out. However, it is worth noting that this time belonged to those who were interested in exercising (3%) and cycling (2%) therefore walkways were also used at the remarkable percentage of 29% (Figure 4.6).

As for sitting activity on the most populated observation session, Saturday (28th, July 2012), the data revealed that people also preferred to sit on edges (10%) and grass space (6%) within the square however, not surprisingly most of them were sited on the provided benches throughout the square (24%). Interestingly, 6% of people were seated on tables that constitutes far less than expected percentage of usage (Appendix 5). According to the collected data, half of the people were on the walkways, standing or walking within the square (Figure 4.7). With regard to the timing more than half of the people at the lunch time and in the evening were on the walkways, walking or standing (Appendix 6). Benches were occupied almost at the same percentage (20-25%) throughout the day as well as tables (5-7%). However, round table, edges and grass space usage went up in the evening as more people came to enjoy the Saturday evening.

On Sunday (29th, July 2012) as the least populated observation session, uses of benches were among the most popular sitting choices for the people (26%) whereas roundtables were occupied by 3% of people throughout the day (Appendix 7). Tables (10%) and edges (10%) were the other sitting choices that people depending on their desire choose to have a sit on (Figure 4.8). With regard to the timing, Sunday evening around 40% of the people intended to come and use the space while benches were among most popular sitting choices throughout the day (20-30%) and the tables' and edges' use also remained the same throughout the day (Appendix 8).

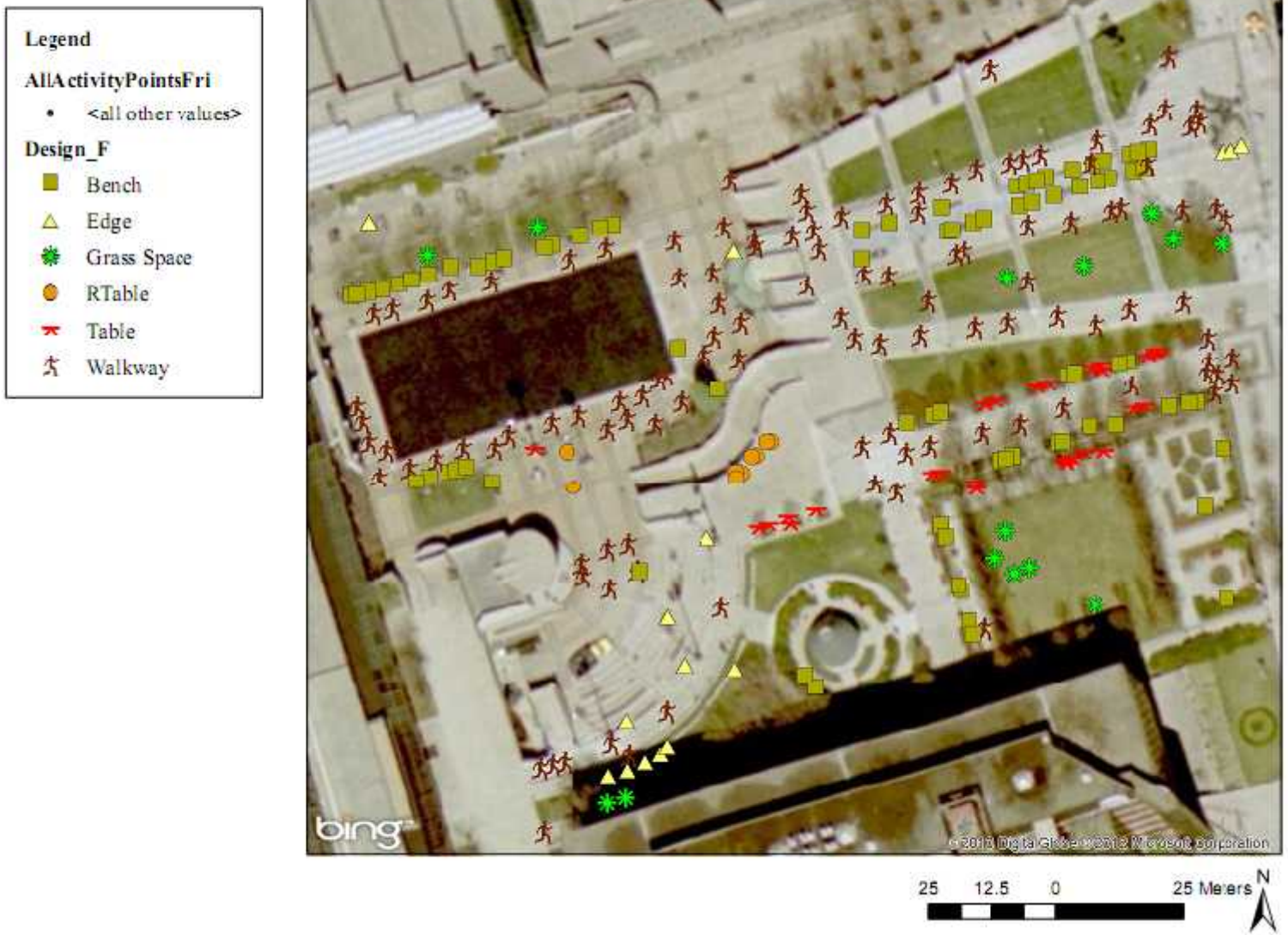
The following maps illustrate the daily use of the design features within the Mel Lastman Square (Figure 4.5 - 4.8).

Mel Lastman Square

Figure 4.5. Daily Use of Design Features-Weekday (Tuesday)

Mel Lastman Square

Figure 4.6. Daily Use of Design Features Level-Weekday(Friday)



Mel Lastman Square

Figure 4.7. Daily Use of Design Features-Weekend (Saturday)

Mel Lastman Square

Figure 4.8. Daily Use of Design Features-Weekend (Sunday)

4.2.3. Activity Location

According to the Tuesday observation (24th, July 2012) it is obvious that areas around the pool, the tree-lined path and along the stream constituted the most preferable activity location areas as in total they inhabited 64% of the people (Appendix1). The garden court (11%) and the theatre area (8%) are the other parts of the space that provide choices mostly for sitting and other types of activities (Figure 4.9).

Similarly, on Friday (27th, July 2012), benches around the pool (24%), along the stream (22%) or the tree-lined path (20%) constitute the sitting choices (Appendix3). According to the collected data people were also occupying other parts of the square such as the garden court (9%), the theatre area (7%) and less than 1% were using the pavilion and the theatre sitting area (Figure 4.10).

Obviously, on Saturday (28th, July 2012) areas around the pool, along the stream and the tree-lined path were locations that apparently people enjoyed most for sitting as in total they were occupied by 60% of people. Interestingly, some people preferred to experience sitting on the edges that where located around the theatre area (9%), the theatre sitting area (1%) with concrete bleachers or the entrance fountain (3%) (Appendix5). During the observation, other parts of the square such as garden court (5%) and the pavilion (1%) were also occupied by people who were interested to enjoy more peaceful areas (Figure 4.11)

Benches and tables provided along the tree-lined path (21%) and around the pool (19%), along the stream (17%) and garden court (14%) were among most popular sitting choices on Sunday (29th, July 2012) (Appendix7). Edges around the fountain (3%), the theatre area (6%) and the theatre sitting area (2%) were among other options for people to play around or sit on (Figure 4.12).

The following maps illustrate how the activities vary according to the different locations throughout the Mel Lastman Square (Figure 4.9 - 4.12).

Mel Lastman Square

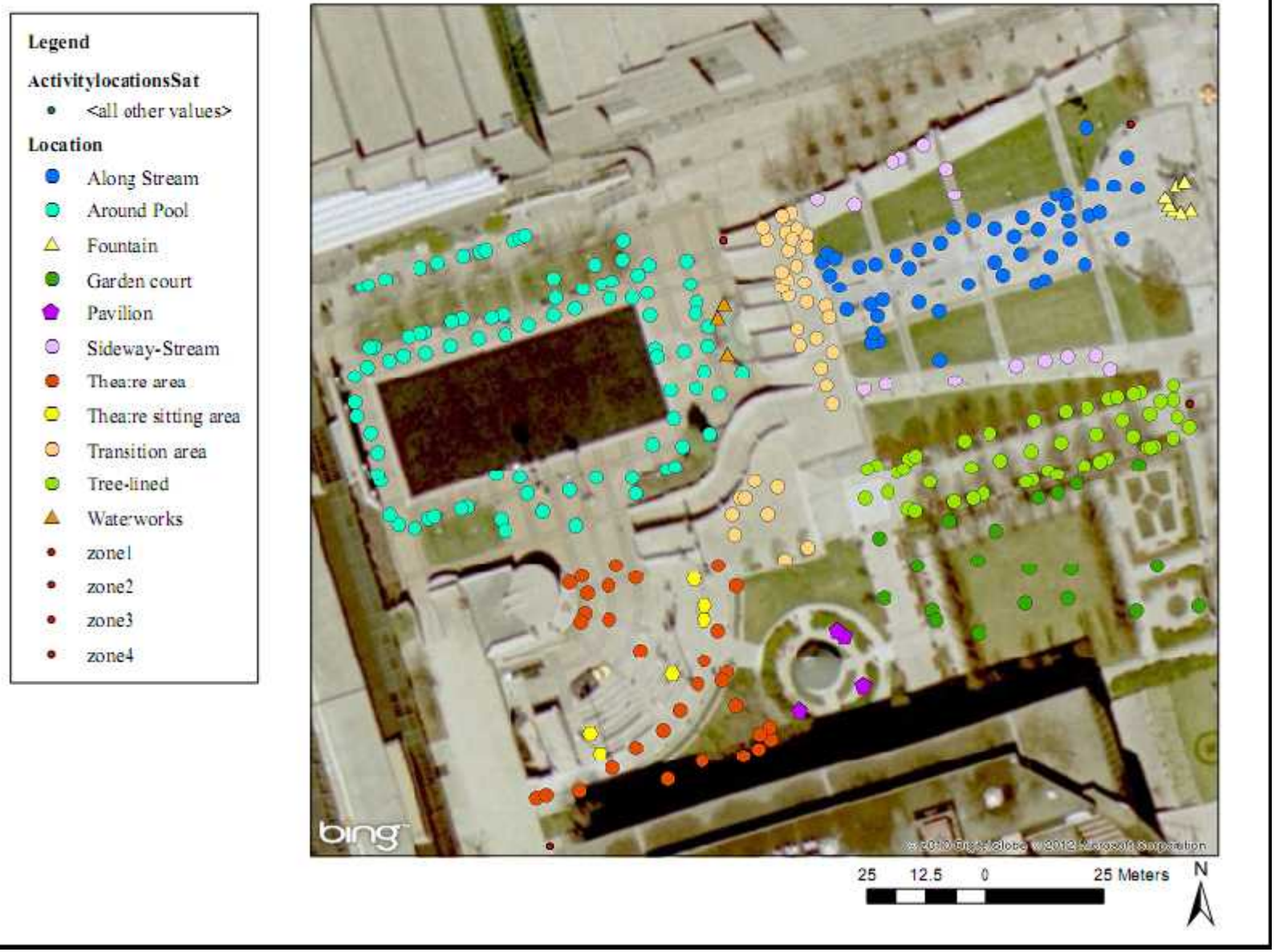
Figure 4.9. Daily Activity Locations-Weekday (Tuesday)

Mel Lastman Square

Figure 4.10. Daily Activity Locations-Weekday Friday

Mel Lastman Square

Figure 4.11. Daily Acitivity Locations-Weekend (Saturday)



Mel Lastman Square

Figure 4.12. Daily Activity Locations-Weekend (Sunday)

4.3. Research Data Analysis and Findings

The following sections address the analysis of the pattern of use within the Mel Lastman Square by examining the relationship between actual use of design features and activity type regarding the collected data. The applied analyses consider the frequency of activity types related to the design features use in order to answer the following research questions: a) How do people's activities relate to the physical patterns of the Mel Lastman Square? b) How are activities influenced and encouraged by physical settings of the Mel Lastman Square?

Answering these questions based on available empirical observation data requires consideration of activity types, activity level and the number of people who use the space. Thus, an overview of number of people involved in activities per day regarding the existing design features will reveal the pattern of use, the similarities, differences, expectations and the possible relationship between people's activity and actual use of the design features.

Daily observation maps of Mel Lastman Square illustrate how people use the space typically throughout a day whereas composite map of all daily observations provide the opportunity to reveal the common pattern of use. In order to find out the pattern of use throughout the observation period with regard to weekdays' and weekend's similarities and differences, three main relationships were examined:

a) Relationship between activity type and use of the design features
b) Relationship between activity type and activity location
c) Relationship among activity type, design features and activity location

To understand the spatial structure of the collected activity points, the analysis take advantage of using "Symbology" in addition to using the "Frequency" tool in ArcMap GIS. This tool reads an attribute table of observation data and a set of fields such as activity type, activity location and design features and creates a new table containing unique field values and the number of occurrences of each unique field value. Calculating frequency with the "Frequency" tool is an appropriate way to find out how many of activities fall into a given category such as activity location or use of design features. The frequency distribution of activity points' data will reveal the typical use of the space. The "Frequency" tool was used on the composite data map, weekdays and weekends to find out the above mentioned relationships (Figure 4.13) and investigate differences, similarities of the pattern of use during the observation period.

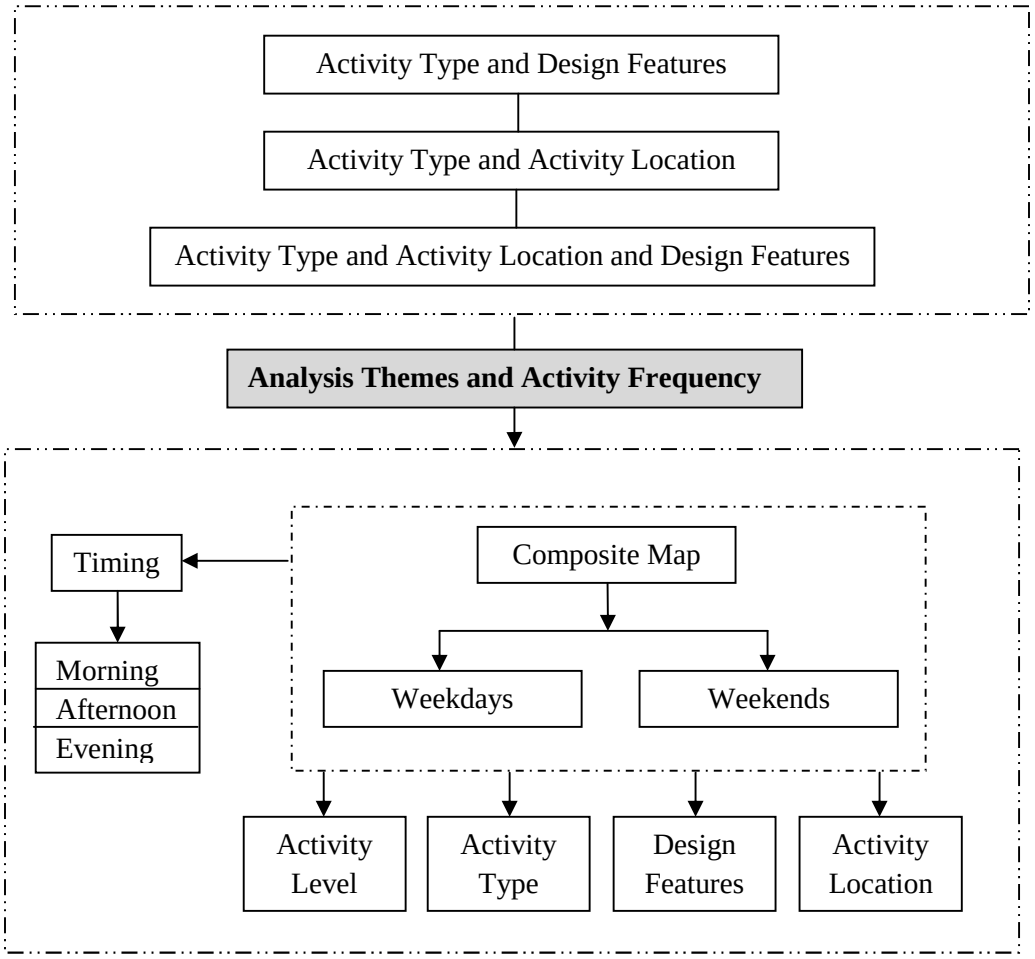


Figure 4.13.Analysis Themes and Activity Frequency Diagram

4.3.1. Analyzing the Relationship between Activity Type and Design Features

In order to understand how the design features affect the activity types within the Mel Lastman Square the frequency of activity types related to the use of the design features were determined. This frequency reveals the common activity type that is occurring within the square most of the time regarding the use of the related design feature. Considering the expectations that are based on observation results, the goal of analyzing this relationship is to derive the similarities and differences of activity types in relation to the use of the design features throughout the observation period. Analyzing the composite map reveals the common pattern of use within the Mel Lastman Square and analyzing the weekdays' and weekend's activity type and use of the design features determined the similarities and differences of the space use.

4.3.1.1. Analyzing Activity Type and Design Features relationship in Composite Map

The activity points in the composite map illustrate the patterns of activities and the design features use across all four observation sessions. For example, according to the collected data (Appendix 10) approximately 67% of Mel Lastman Square activities were passive and less than 40% of activities belong to the active level (Appendix 11-1). Sitting, in general, comprised the largest share of the passive activities at almost 55% of all observations.

Turning to the level of activities, as for the active type, it is worth mentioning that playing had the second place with almost 4% which was usually taking place in the grass space mostly located in the garden court. Obviously, among the active types of activities walking was the prominent activity (approximately 23%) which was taking place within the designed walkways of the square (Figure 4.14). Collected data show (Appendix 10) that benches were among the first group of preferred design features and almost 30% of the sitting activity belongs to the use of benches. People were also intended to use tables (almost 11%) and interestingly used edges (7%), grass space (6%) as a sitting choice (Figure 4.15).

According to the timing, in general, evenings (38%) and then afternoons were hosting the most percentage of people whereas in the mornings (26%) the least activities were taking place. Thus, sitting was the prominent activity throughout the day (54%). Benches (29%) and then tables (11%) were among the most popular sitting choices whole day while at the lunch time the percentage use went up. The use of the edges and the grass space in the evening also was noticeable (Appendix 12).

Mel Lastman Square

Figure 4.14. Activity Patterns-Composit Map

Mel Lastman Square

Figure 4.15. Use of Design Features-Composite Map

To find out how design features affect people's activity type, consideration of how many people were using the space regarding the design features throughout the all observation sessions is required. In the other words, to understand the activity type and the use of the design features relationship determining the activity frequency is needed. The Table 4.1 is the outcome of working with "Symbology" and using the "Frequency" tool by selecting two attribute fields of activity type and design features. Thus, the result displayed how many people were doing what (activity type) and were using what type of design features.

As can be seen from the Table 4.1, for the active level of activities, the highest rank went for walking within walkways which in total was 23% with the frequency of 295 out of 1220 and the second rank belonged to playing within the grass space at 2% with the frequency of 47 out of 1220. The least activities that were taking place include taking photo and walking within the grass space each for less than 1% with the frequency of 1.

Turning to the activity level, for the passive activities, sitting on a bench with 26% took the highest rank among the other passive activities whereas lying on a bench, sitting on grass with a child and standing with a pram on grass took the least percentage which is less than 1%. Sitting on a table, on an edge are among the second preferable design features that people choose to use (Table 4.1). Another passive activity that can be seen and is noticeable is standing on the walkway which constitutes almost 10% of the activities within the space with the frequency of 121 out of 1220.

Through these comparisons and results of observations one of the major findings is beginning to shine through as "Sittable Space". William Whyte (1980) in his landmark book on urban public space "The Social Life of Small Urban Spaces" wrote that "people tend to sit where there are places to sit" as they do like to use "basics" within a space. Through the detailed observations of plazas and parks in New York City, Whyte (1980) found comfortable seating choices to be the primary and essential component of urban public spaces. He examined many correlations between space use and the physical environment and found that one of the major factors in space use is sittable space that should be designed for people to sit, not for "architectural punctuation". People are adaptable to use space in a way they feel comfortable and are able find a place to sit whether it is a bench or it is a concrete sittable edge if the dimensions are right. The Project for Public Spaces (2005) also referred to the good public spaces that give people a flexible choice for seating.

Table 4.1. Activity Type and Design Features – All Observation Sessions

Activity Level	Activity Type	Design Features	Frequency	Percentage
Active	Cycle	Walkway	19	1.56
	Exercise	Grass Space	10	0.82
		Walkway	2	0.16
	Photo	Grass Space	1	0.08
		Walkway	10	0.82
	Play	Grass Space	29	2.38
		Walkway	18	1.48
	Play-Music	Walkway	13	1.07
	Walk	Grass Space	1	0.08
		Walkway	228	18.69
	Walk-Child	Walkway	27	2.21
	Walk-Pram	Walkway	37	3.03
	Walk-Wheelchair	Walkway	2	0.16
Passive	Lay	Bench	1	0.08
		Grass Space	2	0.16
	Sit	Bench	328	26.89
		Edge	76	6.23
		Grass Space	29	2.38
		Round Table	42	3.44
		Table	110	9.02
	Sit-Child	Bench	7	0.57
		Edge	9	0.74
		Grass Space	1	0.08
		Round Table	2	0.16
		Table	8	0.66
	Sit-Pram	Bench	23	1.89
		Edge	9	0.74
		Round Table	4	0.33
		Table	19	1.56
	Sit-Wheelchair	Walkway	7	0.57
	Stand	Grass Space	10	0.82
		Walkway	121	9.92
	Stand-Child	Walkway	3	0.25
	Stand-Pram	Grass Space	1	0.08
		Walkway	11	0.90
	Total		**1220**	**100**

4.3.1.2. Analyzing Activity Type and Design Features relationship in Weekdays and Weekend

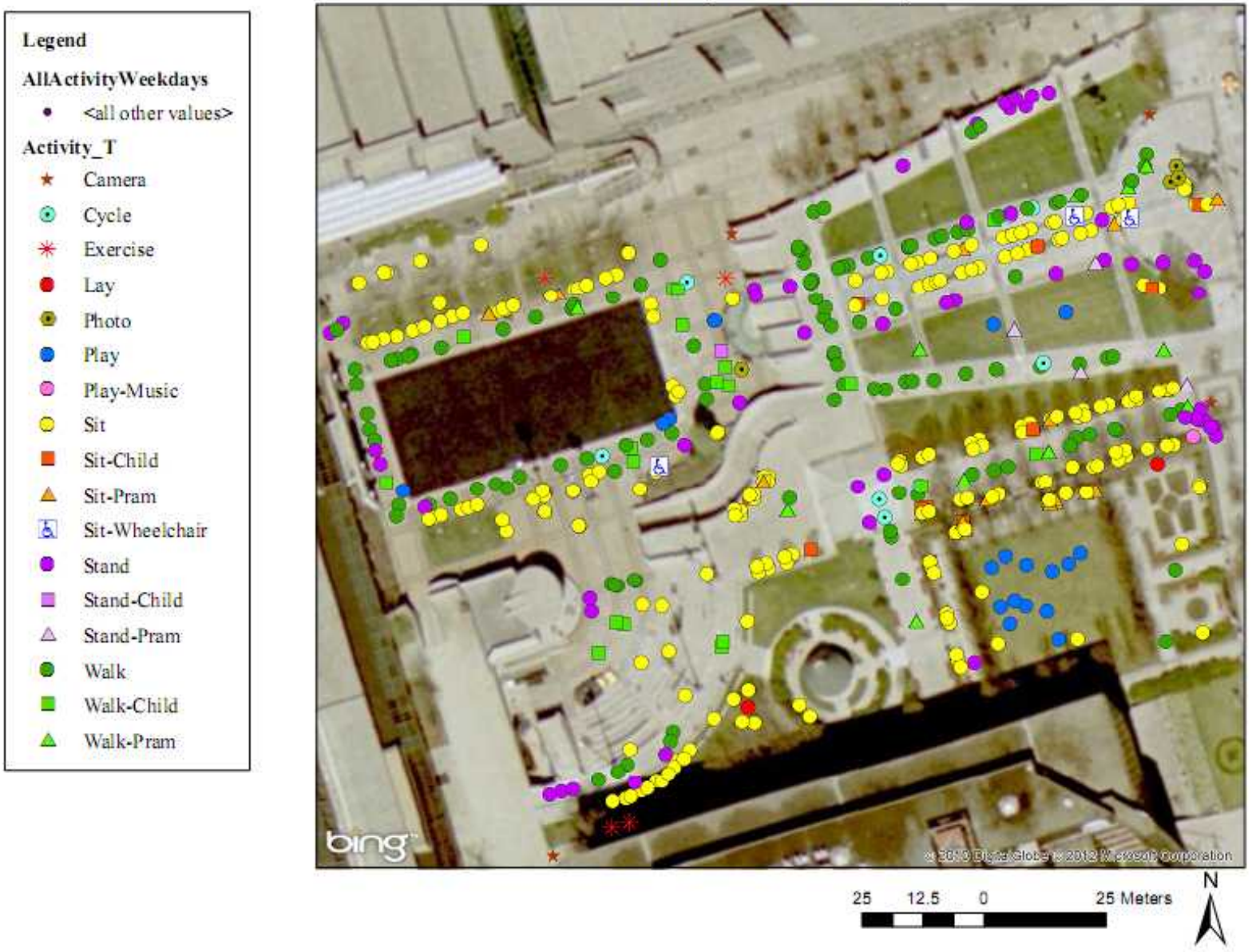
Beginning with the activity level during the weekdays, as the collected data reveal (Appendix 13), approximately 69% of activities were taking place at the passive level (Appendix 11-2). First of all it is clear that sitting activity had the greatest percentage of activities which is almost 59% including all types of sitting (Figure 4.16). The worth pointing out results regarding the active level was that at the second place after walking, playing had the highest percentage among other activities which was 3% and revealed that children constituted small percentage of the involved population (almost 2%). Due to the highest percentage of sitting activity, design features for sitting choices such as benches (33%) and tables (14%) were mostly occupied.

According to the timing of the weekdays' activities (Appendix 14), afternoons were the most populated time for weekdays (39%) whereas evening and after work hours were not as populated as lunch time. Obviously, in the afternoon benches and tables were mostly occupied by people (Figure 4.17).

Similarly during weekend the collected data revealed that approximately 65% of activities belonged to the passive activities (Appendix 11-3 and 15). Obviously, among passive activities, sitting had the highest rank which constituted 50% of all activities. As for the active ones, playing possessed the second rank with 4% and admitted that 4% of involved populations were children. Other noticeably activities were cycling, exercising, taking photo and playing music with 1% for each. It is worth mentioning that apparently during weekend; more disabled people had this opportunity to enjoy the space for either walking or sitting using a wheelchair as 1% of the population belonged to them (Figure 4.18). Regarding the use of design features during weekend, walkways were allocated to leisurely walking and benches had the highest rank of occupation for the sitting activity which was 24%. It is also worth pointing out that edges had the second rank in using for sitting (10%) and after that the grass spaces hold the third place with 8% (Figure 4.19).

According to the timing, most obviously of all, it can be seen that weekend evening had the highest number of involved people (47%) whereas in the morning the lowest numbers of people were presented. It is apparent that morning belonged to playing, exercising and cycling (Appendix 16).

Figure 4.16. **Mel Lastman Sqaure Activity Patterns-Weekdays**

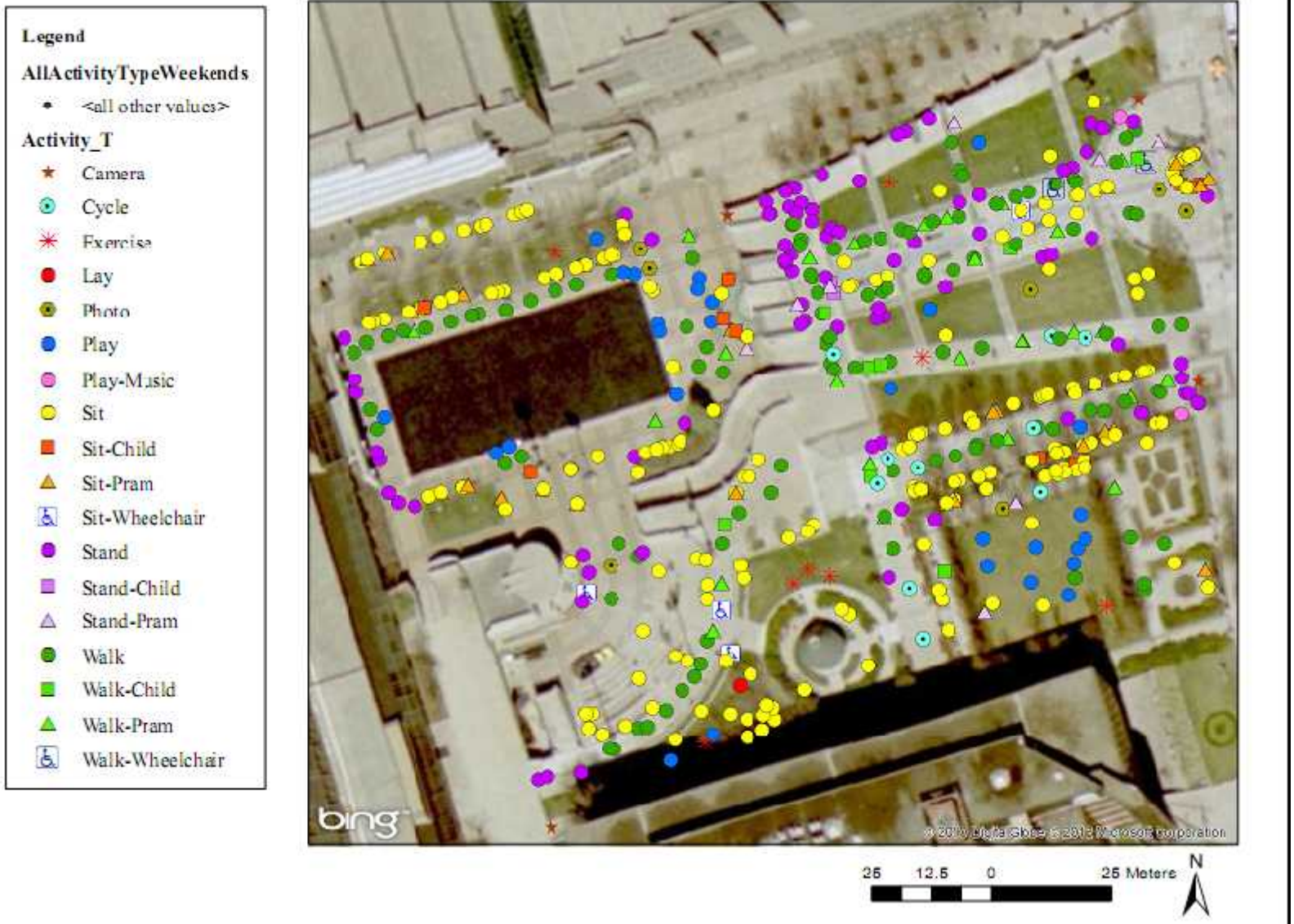


Mel Lastman Sqaure

Figure 4.17. Use of Design Features-Weekdays

Mel Lastman Square

Figure 4.18. Activity Pattern-Weekends



Mel Lastman Square

Figure 4.19. Use of Design Features-Weekends

Understanding the weekdays' and weekend's activity type and design features relationship required using "Symbology" and "Frequency" tool which work on the two fields of activity type and design features. The outcome revealed the number of people who were using the space at the time regarding the use of the related design feature.

The following Table 4.2 shows the activity type and the use of the design feature relationship in weekdays. Starting with the active level, it is obvious that walking is the prominent activity happening along the walkways with almost 20% of involved people with the frequency of 119 out of 619 individuals. Another worth pointing activity was playing which possessed 2% of interested individuals playing on the grass space with the frequency of 14. As it is displayed in Table 4.2, exercising either on the grass space or walkway was among the lowest ranked activities with the frequency of 4 it constitutes less than 1% of total activities. Turning to the passive activities, it is clear that sitting on a bench is among the highest selected choice (31%) with the frequency of 195 out of 619 individuals. People were also intended to choose tables (11%) and other kinds of sitting choices. Interestingly, choosing to sit on an edge was at the same level with choosing round tables (4%) with the frequency of 27 and 30.

Considering the weekend's analysis and the Table 4.3, for the activity type at the active level, walking through walkways possessed the highest rank approximately 18% with the frequency of 109. According to the analysis outcome, playing on grass space or walkway was the second interested activity through weekend with the frequency of 28. People intended to exercise mostly on grass spaces with the frequency of 7 as well as cycling on walkways with the frequency of 10 during the weekend. Turning to the level of activities, sitting on benches (22%) were among the highest selected choices while edges (7%) and tables (6%) allocate the second position. People also were interested to sit on grass spaces (3%).

The sitting frequencies, 300 out of 619, confirms what William Whyte (1980) found on how people tend to find a sittable space within the space. Through comparison of the weekend and weekdays it is obvious that sitting was the prominent passive activity for both, however, during the weekday number of people who were sitting was approximately 10% more than weekend which is due to the number of people who use the space at the lunch time. Interestingly, the sitting frequencies show that people were tend to use edges and grass spaces as sitting choices during the weekend more than weekdays while benches were among greater choice of sitting for weekdays.

Table 4.2. Activity type and Design Features – Weekdays

Activity Level	Activity Type	Design Features	Frequency	Percentage
Active	Cycle	Walkway	9	1.45
	Exercise	Grass Space	3	0.48
		Walkway	1	0.16
	Photo	Walkway	4	0.65
	Play	Grass Space	14	2.26
		Walkway	5	0.81
	Play-Music	Walkway	6	0.97
	Walk	Walkway	119	19.22
	Walk-Child	Walkway	19	3.07
	Walk-Pram	Walkway	11	1.78
Passive	Lay	Bench	1	0.16
		Grass Space	1	0.16
	Sit	Bench	195	31.50
		Edge	30	4.85
		Grass Space	9	1.45
		Round Table	27	4.36
		Table	70	11.31
	Sit-Child	Bench	4	0.65
		Edge	1	0.16
		Grass Space	1	0.16
		Round Table	2	0.33
		Table	5	0.81
	Sit-Pram	Bench	8	1.29
		Edge	1	0.16
		Round Table	1	0.16
		Table	13	2.10
	Sit-Wheelchair	Walkway	3	0.48
	Stand	Grass Space	2	0.32
		Walkway	49	7.92
	Stand-Child	Walkway	1	0.16
	Stand-Pram	Walkway	4	0.65
	Total		**619**	**100**

Table 4.3. Activity type and Design Features – Weekends

Activity Level	Activity Type	Design Features	Frequency	Percentage
Active	Cycle	Walkway	10	1.66
	Exercise	Grass Space	7	1.16
		Walkway	1	0.17
	Photo	Walkway	7	0.10
	Play	Grass Space	15	2.50
		Walkway	13	2.16
	Play-Music	Walkway	7	1.16
	Walk	Grass Space	1	0.17
		Walkway	109	18.30
	Walk-Child	Walkway	8	1.33
	Walk-Pram	Walkway	26	4.33
	Walk-Wheelchair	Walkway	2	0.33
Passive	Lay	Grass Space	1	0.17
	Sit	Bench	133	22.13
		Edge	46	7.65
		Grass Space	20	3.33
		Round Table	15	2.50
		Table	40	6.66
	Sit-Child	Bench	3	0.50
		Edge	8	1.33
		Table	3	0.50
	Sit-Pram	Bench	15	2.50
		Edge	8	1.33
		Round Table	3	0.50
		Table	6	0.10
	Sit-Wheelchair	Walkway	4	0.67
	Stand	Grass Space	8	1.33
		Walkway	72	11.98
	Stand-Child	Walkway	2	0.33
	Stand-Pram	Grass Space	1	0.17
		Walkway	7	1.16
Total			**601**	**100**

4.3.2. Analyzing the Relationship between Activity Type and Activity Location

In order to understand how different locations affect the activity types within the Mel Lastman Square the frequency of activity types related to the activity location were determined. This frequency reveals the common activity type that is occurring within the square most of the time at the particular location. Considering the expectations that are based on observation results, the goal of analyzing this relationship is to derive the similarities and differences of activity types in relation to the activity location throughout the observation period. Analyzing the composite map reveals the common pattern of use within the Mel Lastman Square and analyzing the weekdays' and weekend's activity type and activity location determined the similarities and differences of the space use.

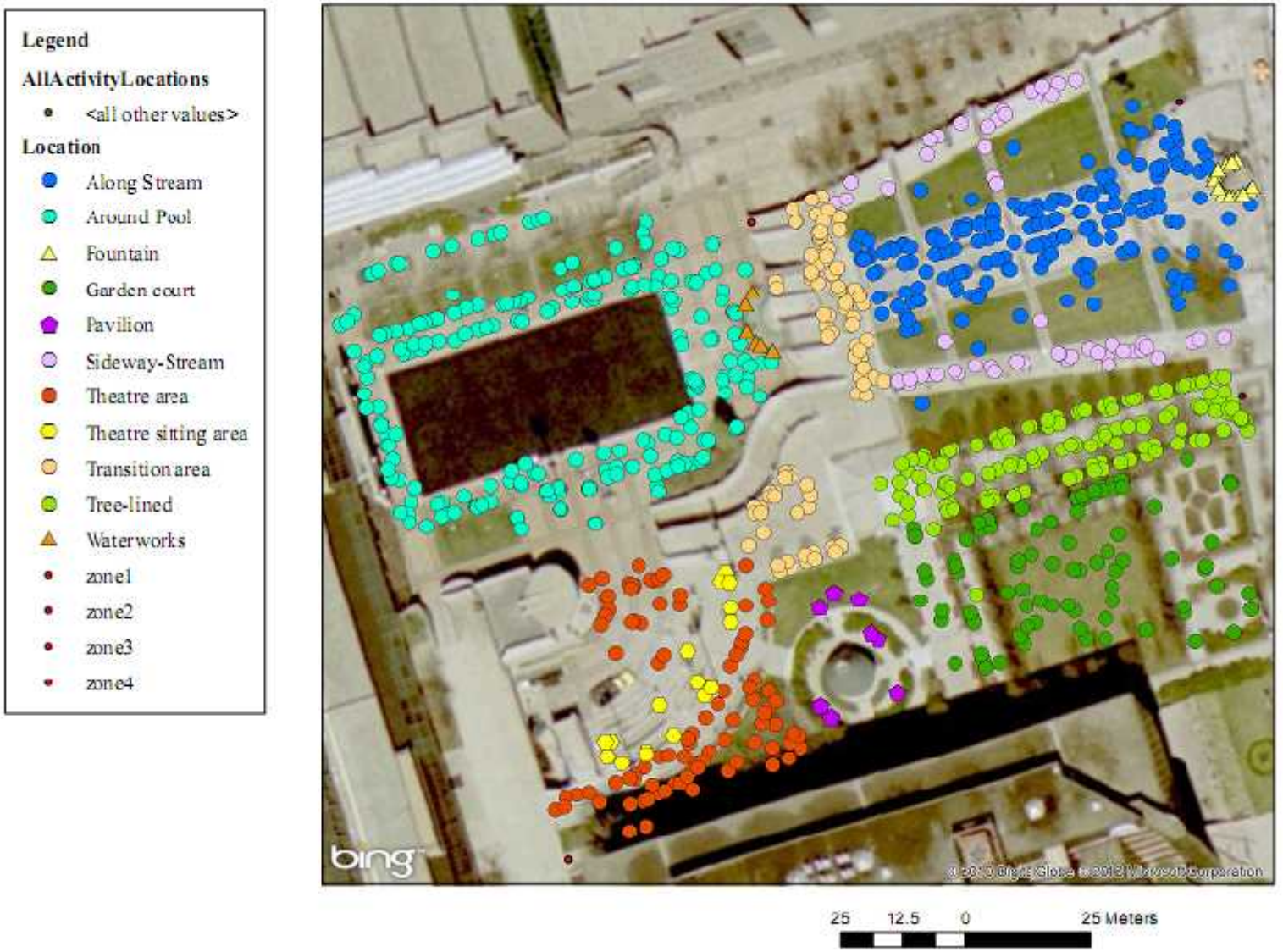
4.3.2.1. Analyzing Activity Type and Location relationship in Composite Map

For the activity location during the observation period, according to the collected data (Appendix10), it is apparent that most of the activities occurred around the pool (24%), along the tree-lined path (20%) or along the stream (17%). The Garden court inhabited 10% of both active and passive activities such as playing and sitting. Some parts of the square were hosted the least amount of activities (almost 1%) such the theatre sitting area which is designed as a sitting space and the pavilion where less than a 1% of total activities took place (Figure 4.20). Interestingly, the fountain located at the entrance of the square attracted 2% of activities such as sitting on the edge also the almost 1% of activities took place around the waterworks in the lower level of the square.

These results indicate what William Whyte (1980) argues; "People like water (waterfalls, rapids, water tunnels, streams, fountains, pools), water should be touchable, don't threaten to electrocute people if they put their feet in it". That is why people were interested to sit on the edges around the fountain or the waterworks (Figure 4.20). In addition, the composite map reveals what Whyte (1980) refers to as natural elements (sun, wind, trees, and water). "People tend to sit in the sun if the temperature is comfortable; but, people like the option of sitting in the shade when there is sun. People like to sit under trees with a view of the action; thus, trees should be related closely to the sitting spaces".

Mel Lastman Square

Figure 4.20. Activity Locations-Composit Map



Working with the “Symbology” tab and the “Frequency” tool assisted in figuring out the relationship between activity type and activity locations within the Mel Lastman Square. The following Table 4.4 gains a better understanding of how often activities took place within the particular location through indicating active and passive activities with frequencies more than 5. Starting with the active level, it is obvious from the Table 4.4 that walking around the pool and along the stream accounted for 5% and 4% of all the activities with the frequency of 51 and 57 whereas walking within the garden court took the least percentage less than 1% with the frequency of 11. Focusing on walking with pram, again most accessible and comfortable part apparently was along the stream with frequency of 10 whereas other parts of the square seemed to be the least accessible with the frequency of less than 5. Most noticeably of all activities, are the chosen locations for playing within the garden court and around the pool with the frequency of 21 and 18 that make them desirable places for playing. Also worth noting is that people were motivated to play music along the tree-lined corridor with the frequency of 12.

Turning to the types of activities, for the passive ones, it is obvious from the Table 4.4 that almost 14% of people are interested to choose sitting areas around the pool or the tree-lined path with the frequency between 150 and 165. According to the following table, the least desirable voluntary choice for sitting was the pavilion with less than 1% and frequency of 6 and then the theatre sitting area with almost 1%. People who were carrying a pram preferred to use benches or tables within the garden court, the tree-lined path or around the pool.

Analyzing the relationship between the activity type and activity location within the Mel Lastman Square also indicates what Whyte (1980) has found in his research. As he examined the correlations between space use and the physical environment he figured out that one of the major factors in the actual use of the space is accessibility to the sittable space.

As the relationship between the activity type and activity location within the Mal Lastman Square reveals people like to sit where they tend to, on benches or tables located under trees with a view of the activity. The analyzed relationship between activity type and location proofs how people are interested to do their activities close to the stream, water, fountain and pool (Whyte1980) which are located in the different part of the Mel Lastman Square. Such activities according to the Jan Gehl (1987) are defined as optional activities which are related to what the place has to offer and how they are affected by design features. Thus, optional activities such as sitting, standing, leisure walking or playing depend on the quality of the physical

environment and occur with increasing frequency.. According to the Table 4.4, Mel Lastman square provides such conditions for people to participate in active or passive activities with the optional characteristics.

Table 4.4. Activity Type and Activity Location -All Observation Sessions

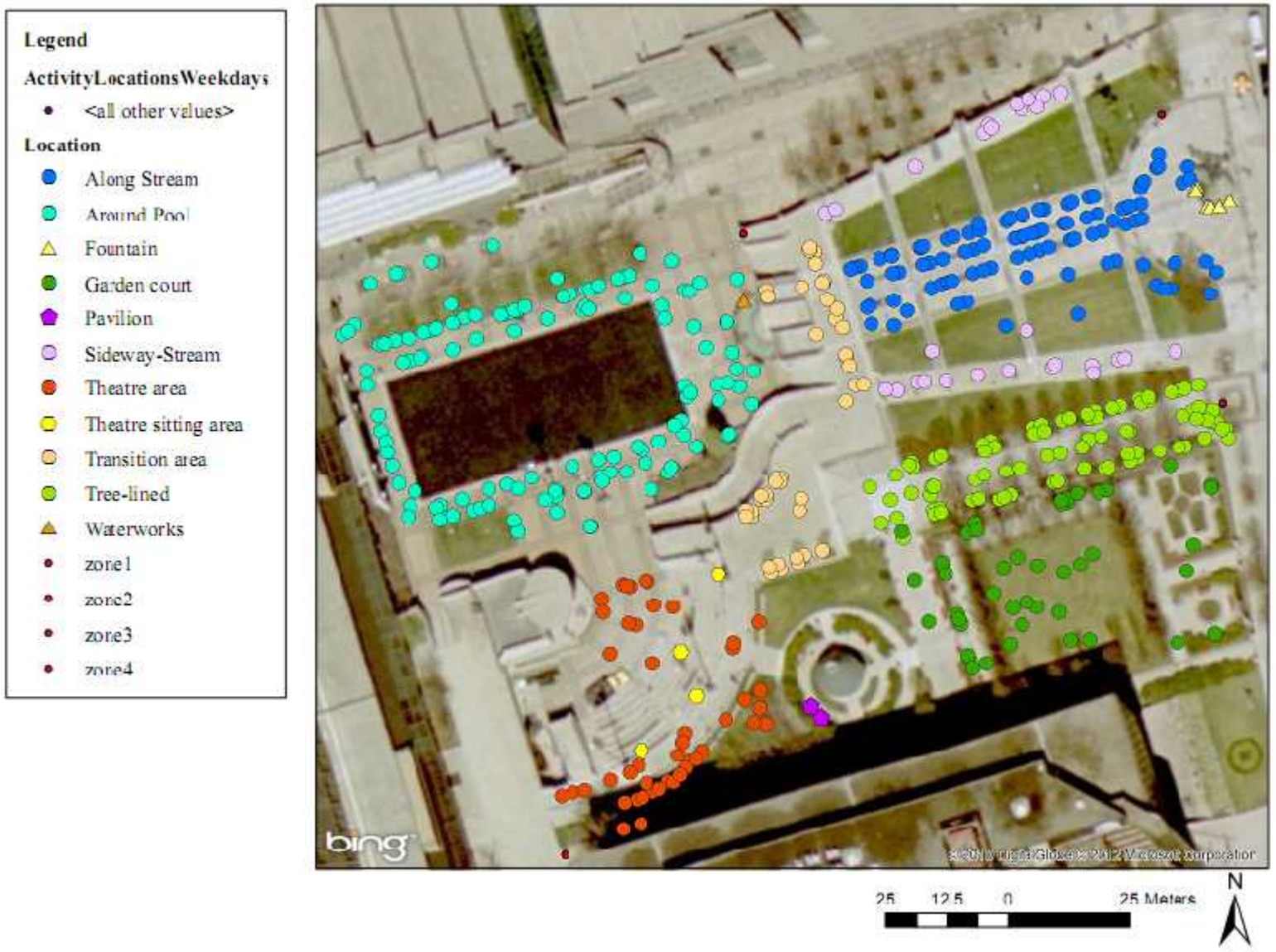
Activity Level	Activity Type	Activity Location	Frequency>5	Percentage
Active	Cycling	Tree-lined	7	0.63
	Photo	Along Stream	6	0.54
	Play	Along Stream	5	0.45
		Around Pool	18	1.62
		Garden Court	21	1.89
	Play-Music	Tree-lined	12	1.08
	Walk	Along Stream	51	4.60
		Around Pool	57	5.14
		Garden Court	11	0.99
		Sideway-Around Stream	25	2.25
		Theatre area	26	2.34
		Transition area	33	2.97
		Tree-lined	26	2.34
	Walk-Child	Around Pool	10	0.90
		Theatre area	5	0.45
	Walk-Pram	Along Stream	10	0.90
		Around Pool	5	0.45
		Sideway-Around Stream	7	0.63
Passive	Sit	Around Stream	88	7.94
		Around Pool	164	14.80
		Fountain	16	1.44
		Garden Court	61	5.50
		Pavilion	6	0.54
		Theatre area	39	3.51
		Theatre sitting area	17	1.53
		Transition area	39	3.51
		Tree-lined	150	13.53
		Waterworks	5	0.45
	Sit-Child	Fountain	6	0.54
		Tree-lined	6	0.54
	Sit-Pram	Around Pool	15	1.35
		Fountain	6	0.54
		Garden Court	14	1.26
		Tree-lined	13	1.17
	Stand	Around Stream	35	3.15
		Around Pool	19	1.71
		Sideway-Around Stream	14	1.26
		Theatre area	14	1.26
		Transition area	24	2.16
		Tree-lined	22	1.98
	Total		1108	100

4.3.2.2. Analyzing Activity Type and Activity Location relationship in Weekdays and Weekend

Understanding the similarities and differences in activity type related to the activity location was possible through conducting a comparison between weekdays and weekend observation. During the weekdays usually people spend their time around the pool (24%), the tree-lined path (21%) or along the stream (19%) (Figure 4.21) these locations were mostly inviting people to sit and enjoy the space with the elements such as the stream, pool and tree canopy. There were other parts of the space such as garden court (10%) and the theatre area (7%) that were occupied due to existing design features such as grass areas and edges as the sitting choices. Among all of the activity locations, the pavilion and the theatre sitting area apparently hosted the least percentage of activities (less than 1%) (Appendix13).

Mel Lastman Sqaure

Figure 4.21. Activity Locations-Weekdays



Similarly, during the weekend areas around the pool (24%), the three-lined path (19%) and the along stream were also the most populated locations among all the other parts of the Mel Lastman Square (Appendix 15). The pavilion was again the least occupied location (1%) during the weekend. According to the collected data during the weekend people were more intended to use the grass areas and the edges around the theatre area (8%), the garden court (9%) and the theatre sitting area (2%). As people like water (Whyte 1980) weekend observation proofs that the fountain (3%) and the waterworks (1%) in the lower level of the square is inviting people to sit on the edges and enjoy the space (Figure 4.22).

In general, when it comes to comparing the activity type and activity location pattern within the Mel Lastman Square a common pattern of use is revealed regardless of the number of people using the space.

Mel Lastman Square

Figure 4.22. Activity Locations-Weekends

To find out how people's activity related to activity location within the Mel Lastman Square, during weekdays Symbology and Frequency tool were used in ArcMap. Considering the activities with the frequency more than 5, the analysis results are shown in the following Table 4.5.

With regard to the active level, most of the people intended to be active in walking around the pool with the frequency of 35 and along the stream with the frequency of 24. People also chose walkways along the tree-lined path to enjoy walking under the shade and parents enjoy walking with their child around the pool. Playing on the grass spaces of garden court is another worth pointing activity that children were interested in as it is shown in the Table 4.5. Water also attracted children to play around the pool. Another worth pointing activity during the weekdays is related to the playing along the tree-lined path.

Turning to the activity level and considering the passive activities (Table 4.5), sitting around pool with the frequency of 87, along the tree-lined path with the frequency of 82 and along the stream with the frequency of 64 was the prominent passive activity. People were also interested to choose garden court and theatre area as sitting choices whereas pavilion and theatre sitting area were among the least choices for sitting. It is apparent from the Table 4.5, that people carrying a pram were mostly interested to sit in the garden court or the tree-lined path.

Interestingly, in the comparison of the pattern of use between weekdays and the composite map there are some common areas where particular activities with almost similar frequencies took place such as around the pool, along the stream and along the tree-lined path. These parts of the square are furnished with natural elements such as trees and with the design features such as stream, fountain and pool that as a result attract people. In addition, these locations offer different choices (bench, table and edges) for sitting as the prominent passive activity.

Thus, what William Whyte (1980) find out regarding the use of space and the sittable space and what Jan Gehl (1987) distinguished as optional activities once again is indicating through the Mel Lastman Square's pattern of use considering frequencies of activity types related to the activity location.

Table 4.5. Activity Type and Activity Location– Weekdays

Activity Level	Activity Type	Activity Location	Frequency>5	Percentage
Active	Play	Around Pool	5	0.76
		Garden Court	12	1.83
	Play-Music	Tree-lined	6	0.91
	Walk	Along Stream	24	3.66
		Around Pool	35	5.35
		Sideway- Along Stream	15	2.29
		Theatre area	11	1.68
		Transition area	17	2.59
		Tree-lined	13	1.98
	Walk-Child	Around Pool	10	1.52
		Theatre area	5	0.76
Passive	Sit	Around Stream	64	9.78
		Around Pool	87	13.30
		Fountain	5	0.76
		Garden Court	35	5.35
		Theatre area	21	3.21
		Transition area	30	2.58
		Tree-lined	82	12.53
	Sit-Pram	Garden Court	10	1.52
		Tree-lined	6	0.91
	Stand	Around Stream	13	1.98
		Around Pool	7	1.07
		Sideway-Around Stream	8	1.22
		Theatre area	7	1.07
		Tree-lined	11	1.68
	Stand-Pram	Around Stream	24	3.66
		Around Pool	35	5.35
		Sideway-Around Stream	15	2.29
		Theatre area	11	1.68
		Transition area	17	2.59
		Tree-lined	13	1.98
	Total		**654**	**100**

Considering two attribute fields of activity type and activity location provides the opportunity to find out the existing relationship between the type and location of activities within the Mel Lastman Square during the weekend. Focusing on activities with frequency more than 5 the following Table 4.6 indicates the most frequent activities taking place within the most used locations of Mel Lastman Square.

Beginning with the active level, walking along the stream and around the pool was the prominent activity during weekend with the frequency over 20. Walking activity was also going on the theatre area as well as tree-lined path with frequency over 10. According to the collected data those who were carrying a pram preferred to walk along stream. Playing activity during weekends was mostly taking place around the pool as well as in the garden court. In addition the tree-lined path was inviting people who were interested to play music.

Turning to the activity level and focusing on passive activities, sitting around the pool with the frequency over 70 and the tree-lined path with the frequency over 60 was the remarkable passive activity. According to the following table, garden court and along the stream were among the other prominent sitting area with frequency over 20. Those who were carrying a pram preferred to be around the pool and those with child intended to sit on the edge of the entrance fountain as well as being around the waterworks and the pool. There were some parts of the Mel Lastman square that was expected to be occupied with more and more hosted more activities during the weekend such as the pavilion however there were not much difference between the frequency of activities in weekdays and weekends. Expectedly, the theatre sitting area was among those locations where people intended to choose as the sittable space during the weekend.

According to the analyzed relationship between activity type and activity location within the Mel Lastman square similar pattern of use is revealed however there is differences in the frequency of activities and number of participating people. It was expected that Mel Lastman Square invited more people and as a result more activities during the weekend. However, regardless of the number of people again the major factor of Whyte's (1980) research is worth to point to, namely "Sittable Space". People in both weekdays and weekends were looking for spaces with various choices of sitting such as benches, tables, grass areas or edges. People tend to do their optional activities (Gelh 1987) where there was a design feature such as the stream, fountain, pool or trees.

Table 4.6. Activity Type, Activity Location - Weekends

Activity Level	Activity Type	Activity Location	Frequency>5	Percentage
Active	Play	Around Pool	13	2.57
		Garden Court	9	1.78
	Play-Music	Tree-lined	6	1.19
	Walk	Around Stream	27	5.35
		Around Pool	22	4.36
		Garden Court	7	1.38
		Sideway-Around Stream	10	1.98
		Theatre area	15	2.97
		Transition area	16	3.17
		Tree-lined	13	2.57
	Walk-Pram	Around Stream	7	1.38
		Sideway-Around Stream	5	0.99
Passive	Sit	Around Stream	24	4.76
		Around Pool	77	15.27
		Fountain	11	2.18
		Garden Court	26	5.15
		Theatre area	18	3.57
		Theatre sitting area	13	2.57
		Transition area	9	1.78
		Tree-lined	68	13.49
	Sit-Child	Fountain	5	0.99
	Sit-Pram	Around Pool	13	2.57
		Fountain	5	0.99
		Tree-lined	7	1.38
	Stand	Around Stream	22	4.36
		Around Pool	12	2.38
		Sideway-Around Stream	6	1.19
		Theatre area	7	1.38
		Transition area	20	3.96
		Tree-lined	11	2.18
	Total		**504**	**100**

4.3.3. Analyzing the Relationship among Activity Type, Use of Design Features and Activity Location

Examining the relationships among the three main themes of the analysis together including activity type, design features and activity location reveals the actual pattern of space use. Such examination is base on the empirical knowledge gained from direct field observations and activity mapping using GPS to indicate how the physical design features of the Mel Lastman Square affects the activity type with regard to the activity location. The analysis of the activity-physical patterns relationship considers the observation period as well as weekdays and weekends observations. The following subsections discuss the analysis that reveals the similarities, differences and the common pattern of the space use.

4.3.3.1. Analyzing Activity Type, Use of Design Features and Activity Location relationships in Composite Map

To examine the relationship among activity type, the use of the design features and activity location within the Mel Lastman Square, the "Frequency" tool as a statistics analysis tool from the ArcMap toolbox was applied. This time three main fields of activity locations, activity type and design features were taking into consideration for determining the activity frequency. The following Table 4.7 shows the activities with the frequency more than 10 to reveal the most desirable activity locations and design features.

According to the Table 4.7, the main thing that can be observed is that activities were taking place mostly around the pool (26%) and the three-lined path and along the stream were among the other most crowded areas with almost 20% of involved population. It is apparent that benches around the pool, along the stream and benches and tables along the tree-lined path were among the most popular areas for sitting. For walking, people preferred to choose walkways around the pool or along the stream whereas the garden court's walkways were among the least populated places. It is also worth pointing that grass spaces within the garden court and walkway around the pool were used by children and parents as playing areas rather than other parts of the space. Another trend that can be observed is that theatre sitting area, designed with concrete bleachers, was empty most of the time and during the observation period it was occupied with almost 1% of the population. However, it should be pointed that the edges around the theatre

area surrounded with the grass spaces, were among people's sitting choices rather than the designed theatre sitting area.

Table 4.7. Frequency and Activity Location, Type, Design Features-All Observation Sessions

Activity Location	Activity Type	Design Features	Frequency > 10	Percentage
Along Stream	Sit	Bench	75	19.05
		Grass Space	10	
	Sit-Pram	Bench	11	
	Stand	Grass Space	10	
		Walkway	25	
	Walk	Walkway	51	
	Walk-Pram	Walkway	10	
Sideway-Stream	Stand	Walkway	14	3.87
	Walk	Walkway	25	
Around Pool	Sit	Bench	119	26.39
		Edge	17	
		Table	10	
		Round Table	17	
	Walk	Walkway	57	
	Walk-Child	Walkway	10	
	Play	Walkway	17	
	Stand	walkway	19	
Garden Court	Sit	Bench	37	9.82
		Table	18	
	Sit-Pram	Table	13	
	Play	Grass Space	21	
	Walk	Walkway	10	
Fountain	Sit	Edge	16	1.59
Theatre area	Sit	Edge	21	7.24
		Grass Space	12	
	Stand	Walkway	14	
	Walk	Walkway	26	
Theatre sitting area	Sit	Edge	17	1.39
Transition area	Sit	Table	14	9.52
		Round Table	25	
	Stand	Walkway	24	
	Walk	Walkway	33	
Tree-Lined	Sit	Bench	68	20.83
		Table	82	
	Stand	Walkway	22	
	Play-Music	Walkway	12	
	Walk	Walkway	26	
Total			**1008**	**100**

4.3.3.2. Analyzing Activity Type, Use of Design Features and Activity Location relationships in Weekdays and Weekends

Applying the "Frequency" as a statistic analysis tool in ArcMap to find out the relationship among activity type, design feature and activity location, revealed that during weekdays, the tree-lined paths, the area around the pool and along the stream were most accessible parts for people to be active within them. People chose those areas as the sitting space to use benches and tables (Table 4.8). The garden court was also considered as an accessible area for sitting and sometimes playing. Although there is a designed sitting edges around the theatre area, people were rather intended to use edges around theatre area surrounded with grass spaces.

According to the following Table, most of the sitting activity during the weekdays was taking place along the tree-lined path with the frequency of 82 which reveals that people like to sit under the tree and that is why Whyte (1980) believes that trees should be related closely to the sitting spaces.

Table 4.8. Frequency, Activity location, Activity Type, Design Features - Weekdays

Activity Location	Activity Type	Design Features	Frequency > 10	Percentage
Along Stream	Sit	Bench	60	21.40
	Stand	Walkway	11	
	Walk	Walkway	24	
Sideway-Stream	Walk	Walkway	15	3.38
Around Pool	Sit	Bench	65	24.77
	Walk	Walkway	35	
	Walk-Child	Walkway	10	
Garden Court	Sit-Pram	Bench	24	10.36
	Sit-Pram	Table	10	
	Play	Grass Space	12	
Theatre area	Sit	Edge	15	5.63
	Walk	Walkway	11	
Transition area	Sit	Table	11	10.58
		Round Table	19	
	Walk	Walkway	17	
Tree-Lined	Sit	Bench	39	23.87
		Table	43	
	Stand	Walkway	11	
	Walk	Walkway	13	
Total			**444**	**100**

Running the “Frequency” tool in ArcMap for the weekends to figure out the relationship among activity type, activity location and the use of design features revealed that areas around the pool, the tree-lined path and along the stream are among the more desirable parts of the space. It is apparent from the following Table 4.9 that activities taking place around the pool were among the prominent ones such as sitting on a bench. Tree-lined path also possessed the highest frequency in sitting activity. It is worth mentioning that sitting on the edge was also remarkable on both entrance fountain area and theatre designed sitting area during the weekend.

Considering the activity types, people intended to do optional activities (Gehl, 1987) such as sitting, standing and leisure walking within the space as they were looking for sittable spaces around the pool (benches or edge) or along the tree-lined area (benches or tables) to sit under the tree. Once again the most common activity both during the weekdays and weekend is the sitting activity within the sittable space (Whyte 1980) while the differences related to the number of involved people.

Table 4.9. Frequency, Activity location, Activity Type, Design Features – Weekends

Activity Location	Activity Type	Design Features	Frequency > 10	Percentage
Along Stream	Sit	Bench	15	15.77
	Stand	Walkway	14	
	Walk	Walkway	27	
Sideway-Stream	Walk	Walkway	10	2.82
Around Pool	Sit	Bench	54	28.17
		Edge	12	
	Walk	Walkway	22	
	Play	Walkway	12	
Garden Court	Sit	Bench	13	6.48
		Table	10	
Fountain	Sit	Edge	11	3.10
Theatre area	Walk	Walkway	15	4.23
Theatre sitting area	Sit	Edge	13	3.66
Transition area	Stand	Walkway	20	10.14
	Walk	Walkway	16	
Tree-Lined	Sit	Bench	42	25.63
		Table	25	
	Stand	Walkway	11	
	Walk	Walkway	13	
Total			**355**	**100**

4.3.4. Analyzing Sitting, Walking and Cycling Activity Frequency - All Observation Sessions

According to the data analysis it is obvious that sitting and walking were among those optional activities that were typical within the space while people were using different related design features and locations. Table 4.10 displays sitting frequency considering design features and location. During the observation period, 674 people out of 1220 were counted as using sittable spaces. To understand the relationship between the passive activity of sitting and the related design feature, the frequency tool was applied considering two other fields of design features and activity locations. The Table bellow illustrates the sitting frequency. According to Whyte (1980) people mostly tend to sit where there is a choice particularly close to the stream, pool or trees.

Table 4.10. Sitting Frequency- All Observation Sessions

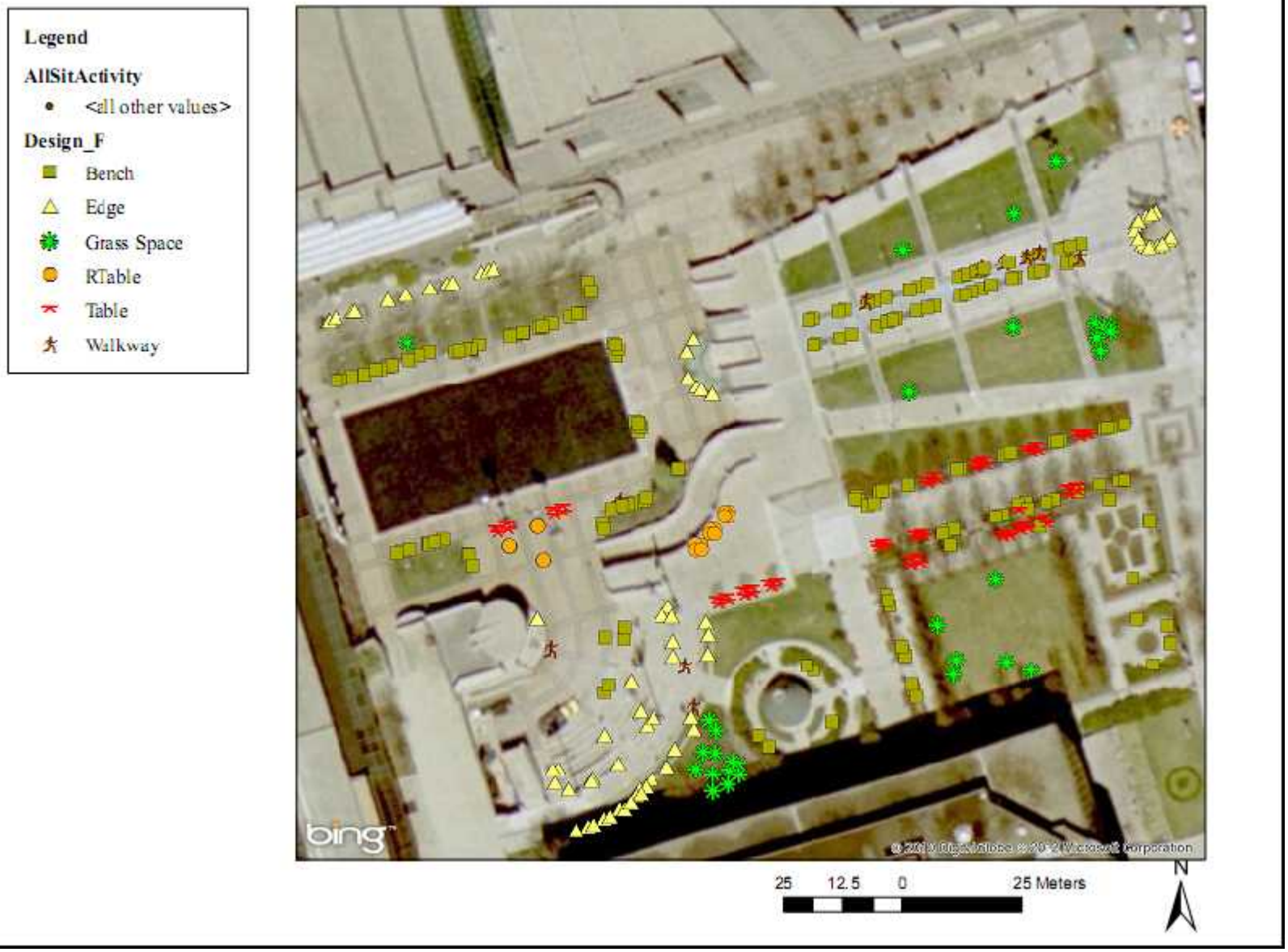
Activity Type	Design Feature	Location	Sitting Frequency	Percentage
Sit	Grass Space	Around Pool	1	0.15
	Walkway	Around Pool	1	0.15
	Walkway	Along Stream	3	0.46
	Walkway	Theatre area	3	0.46
	Bench	Pavilion	6	0.93
	Bench	Theatre area	6	0.93
	Grass Space	Garden Court	6	0.93
	Edge	Waterworks	9	1.40
	Grass Space	Along Stream	11	1.70
	Table	Around Pool	11	1.70
	Grass Space	Theatre area	12	1.85
	Table	Transition area	15	2.32
	Edge	Theatre sitting area	17	2.63
	Edge	Around Pool	19	2.94
	Round Table	Around Pool	19	2.94
	Edge	Theatre area	21	3.25
	Edge	Fountain	28	4.33
	Round Table	Transition area	29	4.48
	Table	Garden Court	33	5.10
	Bench	Garden Court	39	6.03
	Table	Tree-lined	78	12.06
	Bench	Around Stream	84	12.98
	Bench	Tree-lined	91	14.06
	Bench	Around Pool	132	20.40
	Total		**647**	**100**

Thus, according to the Table 4.10, it is obvious that the most frequent location for sitting activity is around the pool while people choose provided benches to sit on. At the second level the benches along the tree-lined and along the stream allocated the highest amount of people. It is worth pointing that edges around theatre area, entrance fountain's edge were almost at the same level of sitting choices for the people. Meanwhile, edges of designed sitting area of theatre podium accommodated 2% of involved people. There are areas where people had the least desire to use as sitting area although they were provided with sitting choices such as benches within pavilion and around the theater area.

The following map displays the design features locations within the space and the activity points illustrate the frequency of sitting activity (Figure 4.23). As it is shown in the map most the sitting activity was occurring around the pool, along the stream and around the pool.

Mel Lastman Square

Figure 4.23. Sitting Activity- Design Features and Locations Frequency



Turning to analyzing walking and cycling activity frequency, it can be seen that most of the activity was taken place around the pool and along the stream. The second positions belonged to walkways along the tree-lined path. Meanwhile the least occupied part for walking was walkways within the garden court (Table 4.11).

Table 4.11. Walking and Cycling Frequency-All Observation Sessions

Activity Type	Design Feature	Location	Frequency	Percentage
Walking and Cycling	Walkway	Garden Court	17	5.41
		Theatre area	33	10.51
		Sideway-Stream	37	11.78
		Transition area	40	12.74
		Tree-lined	44	14.01
		Along Stream	69	21.97
		Around Pool	74	23.57
		Total	**314**	**100**

The following map displays the walking and cycling activity location and the points illustrate the frequency rate (Figure 4.24).

Mel Lastman Square

Figure 4.24. Walking and Cycling Activity- Locations Frequency

4.4. Conclusion

The majority of this study is based on empirical knowledge gained by direct observations, activity maps and using GPS for capturing activity points within the Mel Lastman Square. This knowledge is of key importance in urban design and planning practice. Applying these methods to obtain the actual use of the space and examine potential relationships between the use of design features and activities might bring additional insights and criteria for designing and planning process of urban public spaces.

The observational results and the related analysis in this study were based on timing, activity type, level and the use of design features as well as activity locations within the Mel Lastman Square. To begin with timing, a comparison of results from daily observations and composite map revealed that the space in an overall overview hosted almost 40% of the people in the evening time while approximately 25% belonged to the morning. This occupancy differentiates according to the daily observations, during weekdays 40% of the people attended the space in the afternoon while the number of people in the morning and evening was the same almost 30%. In addition, during the weekends almost 50% of people were attending in the evening which is expected, while around 20% of them were using the space in the morning.

It is worth pointing that Mel Lastman Square is both a weekday and a weekend space since the actual use for these different times of the week in overall was approximately equal according to the collected and analyzed data.

Turning to the activity level and type, according to the data analysis and findings, and reviewing the observation sessions' collected data and activity maps, it becomes apparent that the design features within the space do have considerable influence on the level and types of activities. The level of activities appeared to increase in accordance with the number of involved people in active activities taking place within different part of the space. According to the collected data, zone number one two and four were occupied with almost 90% of the people whereas the zone number three (theatre area) had the fewest number of presented people and as a result the lowest levels of activity. The level of activity within the theatre area, podium part of the space, was minimal in comparison to the other parts of the space. When observing this part of the space in terms of the levels of activity occurring and how the design features of the space contribute to the use, a variety of elements were lacking. Additionally, because of defining the space for particular activity such as programmed events the area did not host as many as people

in daily time and therefore less diversity resulting in level and types activity. This space invites people only when there is an event planning. Considering the active level and activity type, walking around the pool and along the stream occupied more people than other walkways within the space. For passive activities, most people (almost 80%) preferred to use sitting areas around the pool, along the tree-lined path and along the stream.

According to the activity maps and Tables provided in the observation results and data analysis and findings, it is worth to mention the relationship between design features and the activity pattern. In general, when examining the data it was evident that the physical form and design features of the theatre area did not meet the needs of its most users. Little has been done to encourage a people-friendly environment for daily ordinary use rather than event days. The podium was surrounded with concrete bleachers edges that face toward the stage which is appropriate when there is a program taking place on the stage. However, providing different choices of seating and walking ways within the other parts of the space such as tree-lined path and around the pool indicate that such diversity in design features will allow greater number of people to use the space. Thus, considering design diversity in turn attracts higher numbers of people to the area and increases the potential for active or passive activities.

Therefore, when examining the design features of different parts of the space it was noted that tree-lined path had greater variation in seating choices (benches, tables, grass space) and desirable walking paths surrounded with trees, that better accommodated people and different activities. This part of the space is lined with tree canopy which adds to the sense of enclosures (Jacobs, 1961) and invites greater number of people especially seniors, to sit and enjoy the shade (Whyte, 1980). This area is furnished with tables and benches. There is a good definition of space with a strong line of trees in this area. The garden court area beside this particular part of the space is nicely landscaped with flower and there are also a number of benches and tables. This part also provides a grassed area for children to play. This area allows moms to place their prams beside tables and benches and have an eye on their kids so that children can enjoy their time playing within the grass space. The benches also provide a place for parents to sit down and relax while their children are playing.

The physical design of the entrance space is aesthetically pleasing and directs attention to the fountain. The numbers of benches provided along the water stream allow users to sit down and relax within the space which add to the accessibility of this part of the space (Whyte, 1980).

Another form that contributes to the pleasant atmosphere found within the space is the pool area down the ending part of the square. This part is furnished with benches and numbers of round tables around the pool. Overall, when reviewing the observation results it becomes apparent that the form of the space does have considerable influence on the level and types of activities that take place, for example where to sit, walk and play. When looking at how the form of the space influences the activities of the user, it becomes apparent that the seating areas found in the four defined parts of the space, are the areas where the greatest amounts of passive activities occur. Thus, the frequency of sitting activity also is a way to understand how the design features contribute to or inhabits the level of activities and these varying levels of activity in the four parts of the space can be attributed to the physical form of the space.

In general, the observation results, analysis and findings with regard to the relationship among the activity level/type, the use of the design features and activity location along with the frequency of the activities reveal the actual pattern of use within the Mel Lastman Square. Such pattern supports William Whyte's (1980) and Jan Gehl's (1987) findings regarding the use of public spaces and types of activities within such spaces.

In his landmark research Whyte (1980) examined many correlations between space use and the physical environments. His research turns out that it is very important to have many choices of places to sit. Such choices should be built based on the basic designs while considering the sittability of the design features. Thus, one of the major factors in space use was "sittable space" (Whyte 1980). With regard to the role of natural elements (sun, wind, trees, and water), Whyte also indicates that "people tend to sit in the sun if the temperature is comfortable; but, people like the option of sitting in the shade when there is sun". Therefore, people like to sit under trees which are related closely to the sitting spaces. People also like touchable water such as streams, fountains, pools. Considering all these, Mel Lastman Square provides a space with variety of design features to define a sittable space. Such space also provides opportunities for optional activities (Gehl, 1987) such as sitting, standing walking and playing.

In conclusion, obtaining empirical knowledge about activity patterns and the use of design features of the space through observation methods is of key importance in understanding the actual use of the space and has an important role in planning and designing public spaces. In addition, it might bring additional practical insights, thoughts and criteria about the relationship between design features of the space and activities taking place within the space.

Chapter 5

Research Conclusions, Findings and Future Research

5.1. Introduction

This thesis set out to improve understanding of the relationships between activity patterns, the actual use of public squares, and design features of the urban space. It therefore reviews theories of urban public spaces in order to understand the components of the space and their potential relationships. According to this research's purpose, the main focus is on the two components of space – activity and physical settings. Investigating the activity and physical setting relationships requires both theoretical and methodological frameworks. Thus, the literature review on public spaces leads to the introduction of a theoretical framework which provides practical principles for conducting this study. Moreover, the lack of knowledge on the actual use of urban public spaces resulted in the development of a methodology that combined direct observations, activity maps and Geographic Information Systems (GIS). This method is a key contribution of this research as the data collection procedure and use of analytical provided an approach that revealed the common patterns of activities that appear to be affected by particular urban design features. The knowledge gained about the actual use of the space by using activity maps, GPS, and GIS is seen as a valuable addition to the current research approaches in urban design and planning both to describe the actual use of the space revealed by activity patterns correlated with the space design features and to incorporate the findings into the design and planning process.

The following sections revisit the thesis findings and discuss the contributions that this research makes to theory and planning methods procedure.

5.2. Research Questions and Findings

This thesis examines the interaction between activity patterns and the design features of the urban space and focuses on: 1) how people's activities relate to the design features of an urban public square, and 2) how activities are influenced and encouraged by design features. In order to address these questions, this research employs a combined method to understand the importance of empirical knowledge about the actual use of the urban space. In addition, a thorough review of urban public space literature and research methodologies resulted in

proposing a particular theoretical and methodological framework for this study which is applied to Mel Lastman Square in the city of Toronto. Thus, the applied combined method, the analysis results and findings reveal the activity pattern correlated with the design features of the Mel Lastman square. The following sub sections explain three main aspects of the research contribution; theoretical, methodological and planning practice.

5.2.1. Theoretical Contribution

The literature review on public urban spaces provides theories of place and the linkages between the physical dimension and the use of the urban space. The principles for creating urban spaces that are widely accepted by today's urban planners and designers can be traced in the writings of key thinkers of this field such as Canter (1977), Punter (1991), Montgomery (1998), Whyte (1980), Gehl (1987) and Carmona (2010). This research is built their theoretical framework that defines components of place and methods for recording and analyzing people's activity within the public spaces.

Examining place theories and urban public spaces literature provided an opportunity to explore place components relationships and principles. In addition, such examination shed light on the importance of determining theoretical framework with regard to activity and physical setting typologies. According to Carmona (2010), people's activities in terms of engagement level are categorized in two main levels; passive and active. Additionally, this study considers particular activity types (White, 1988 and Gehl 1987) with regard to level of activity and considering the actual use of the Mel Lastman Square. Such typologies determine how to explore people's activity within the space. Moreover, activity types provide the opportunity to define the space's design features. For this study, design features' typology were distinguished regarding their location and distribution throughout Mel Lastman square. Thus, the main theoretical contribution of this study through examining activity - physical setting relationship is in determining related typologies according to the different urban design contexts.

5.2.2. Methodological Contribution

In addition to the fundamental design theories, this thesis took advantage of GIS analysis in investigating and describing the relationships between physical setting of urban public spaces and their uses. According to Al-kodmany (2000), Golicnik (2010) and Thompson (2010), GIS has been little used in detailed mapping of urban spaces at building or design scale.

This study attempted to provide a starting point in taking advantage of GIS at the urban design scale both in data collection procedure and in data analysis process. To understand the relationship between activity pattern and design features within the space this research employs a hybrid method composed of direct field observations (Whyte, 1980), activity maps (Ittelson et al., 1970) and GIS analysis (Golicnik, 2010). In doing so, this study provides additional insight into data collection, data management and data analysis procedures at the design scale.

This approach contributes to an understanding of how the elements of direct observations and activity mapping which have traditionally been used in design can be complemented by GPS collection of activity points and subsequent analysis of the recorded data in GIS. By managing collected data through ArcMap GIS software, a database of citizen's activities with respect to existing design features was created to represent each individual's use of the study area to be examined with respect to time, age, gender, and activity type, and activity level, use of the design feature and the activity location. This database coupled with aerial imagery of the study site, provided several analytical opportunities that were explored using ArcMap GIS software. It is clear from the research results and analysis presented in Chapter Four that the relationship between people's activities and use of the design examined through cartographic symbolization of the activity point data and applying "Frequency" as the statistics analysis. Effective use of symbology and frequency for each one of the attribute fields considering observation sessions, weekdays and weekends and also creating composite maps revealed the activity patterns and illustrated the actual use of the design features within the space. The maps and tables created through this process demonstrate the potential relationship between activities that took place during the observation periods and the existing design features throughout the space.

Through this methodology, an "empirical knowledge" (Golicnik, 2010) is employed to describe the activity-physical features relationship within the Mel Lastman Square. According to the observation results and analysis, common patterns of activity are identified with regard to the particular physical features of the study area. The value of this research methodology is in providing designers with tools to enable them to understand the needs and types of users' activities, and to determine physical features that cater to these diverse needs and activities.

Therefore, from the methodological point of view, this research provides a replicable and transferable mechanism to invest the actual use of public spaces through gaining the empirical knowledge of how people interact with the physical features within these spaces. As exploratory

research, choosing Mel Lastman Square in the city of Toronto provided an opportunity to collect detailed information of people's activities, within an urban space that features a number of urban designed features that are characteristics of many other communities in North American cities of similar vintage. The manually collected data on activity maps along with recorded activity points with GPS transferred into ArcMap GIS to establish a database – attribute table – for necessary analysis with regard to the purpose of the research.

A significant contribution of this research lies in the empirical basis it provides for the design decision-making, a key gap noted by Frick (2007) among others. This empirical foundation is built upon the method in which new techniques are used to reliably collect and manage activity data and explore interrelationships with design features. This combination of direct observation, activity mapping and using GPS and GIS analysis provides a supportive tool for urban designers and planners. Through applying this method, practitioners could illustrate empirical knowledge of the actual urban public spaces' use with regard to the physical design features and therefore present the results and analysis in a visual language (Golicnik, 2010) that is familiar and useful for the designers.

5.2.3. Planning Practice Contribution

This thesis aims to investigate the relationship between activity pattern and the use of design features through applying a combined methodology of direct observation, activity map and using GPS capturing activity points and GIS analysis. The goal is to understand the actual use of the space by creating an empirical knowledge base. It was discovered that the design features have discernible impacts on activity patterns and locations throughout the space. It was important to identify the activity level, activity and design features typology in order to explore the existing relationships. Creating a database that includes this information is of real value at the urban design scale.

The methods used in this study have been used separately in various studies but their potential in combination contributes to planning practice in terms of improving the accuracy of collected activity data. The empirical knowledge derived from both activity maps and GPS capturing activity points extends traditional research approaches on urban design processes. Such databases of the urban spaces actual uses could foster design templates and provide a starting point for further urban public space evaluations and analysis, particularly with respect to public

participation processes in planning and design (Golicnik, 2010). Using mobile GIS such as ArcPad to produce and use databases is of key importance for similar future studies. Having and using this technology and equipment for recording data directly in the field and considering people's priority in the use of design features would be very helpful and efficient in data collection and preparation for further design analysis.

The combined research method and analytical approach based on available and collected data directly deals with the relationship between activities, uses and the space. Therefore, applying this effective and efficient method resulted in obtaining actual knowledge about existing physical settings - activity relations as well as offering a tool for evaluating the quality of space relative to citizens' needs. Moreover, it provides a tool for designers and urban studies professionals to estimate the actual use of a space by different groups (e.g. seniors, youth, etc) and at different times (Golicnik, 2005). Urban planners and designers often construct design alternatives that show their expectations of activities by type and location. However, through empirical data, it is possible to show that designers' understandings may differ from the actual use of the designed spaces based on the people's needs.

5.2.4. Practical Contribution

Considering the observation results and analysis in this study, it is possible to see them as proof of Whyte's (1980) attitude that what people want and seek for within the public spaces would be clear through the direct field observations. In his landmark book "The Social Life of Small Urban Areas", Whyte (1980) examined many correlations between space use and the physical environment and figured out that one of the major factors in the actual use of the space is the "Sittable Space". He found that comfortable seating choices are the primary and essential component of urban public spaces. Similarly, the Project for Public Spaces (2005) also referred to the good public spaces that give people a flexible choice for seating. This is the similar finding for Mel Lastman Square. The biggest majority of people using the Mel Lastman Square (67.5%) were engaged in passive activities such as sitting.

Considering the activity locations within Mel Lastman Square, the analysis revealed that the most occupied areas (64%) were along the stream, around the pool and tree-lined corridor with 40% of benches and tables usage. These results indicate what Whyte (1980) argues; "people like water, streams, fountains, pools and trees". However, the designed sitting area around the

theatre podium only hosted almost 1.3% of presented people over the observation period. Thus, this area is vacant most of the time during the days without any program. Also according to the activity type, location and frequency it is obvious that the least frequent sitting activity occur in the pavilion and around the theater sitting area. Whereas, sitting on the benches, tables along the tree-lined path, along the stream and around the pool constitutes the most frequent passive and active engagements. Activities such as sitting as optional activities (Gehl, 1987) are related to what the place has to offer and how they affected by design features. Thus, they depend on the quality of the physical environment and occur with increasing frequency within the space.

Thus, every activity accomplished by people, passive or active, takes place with regard to their needs and perceptions of the space. In this way, the presence of people in a particular part of the space demonstrates the possibilities of the space to be used and probability of the design features to be occupied. Such empirical knowledge could be put in to work in planning and designing public spaces. Through this research and using Mel Lastman square as a case study, the actual knowledge gained by activity mapping, GPS and observation that could be lead to an effective and responsive design process for other similar public spaces. Therefore, the revealed pattern of use reflects the spatial potential of particular part of the space and the empirical knowledge reveals such patterns of use which could provide an additional perspective in urban public space's design.

5.3. Research Limitations

According to the available GIS data maps for the Mel Lastman Square, it became apparent that using GIS for mapping local areas in detail was far less frequent at this micro level of planning and design. Hence, Al-kodmany (2000) focused on the lack of detailed GIS data at building and design feature scale. To some degree, this data gap has been reduced in recent years as cities increasingly integrate Computer Aided Design (CAD) and GIS data resources.

In terms of data collection limitations, it is important to bear in mind the limitation of using MobileGIS, here Trimble Juno GPS, and the detailed GIS map of the Mel Lastman Square was not available. To address this limitation, I had to use a georeferenced map which would result in some degree of error even though using GPS and capturing the activity points provide a more accurate way of locating the people. In addition, due to the practical use of GPS at the urban design scale which affects the location of marked points on the GIS map, I had to use the

editor tool in ArcMap. Thus, I rechecked and matched each point by referring to the activity maps and videotapes which seems very helpful at this stage and move the displaced points.

Therefore, the limitations of findings would be based either on accuracy of data collection with GPS or consideration of other relevant aspects that may affect this process such as availability of GIS data maps.

5.4. Future Research

As an exploratory study, this research has made significance progress in introducing a combined methodology in data collection, management and analysis at the urban design scale using recent technologies such as GPS and GIS. Additionally, this research acknowledge that current GIS data at the local level have limited the use of these technology in the public spaces' research and even though GIS offers opportunities for data collections and analysis, it has been little used for detailed mapping of urban public spaces.

Throughout this study, it was documented that the observation results and empirical knowledge expose the impact of design features on activity patterns and the actual use of the space. However, the research results answer the questions based on researcher observations and analysis considering two components of place, physical and activity. While this research narrows the gap between theory and practice in public space design by understanding the relationship between actual use and design features of the space, the questions have arisen relating to the third component of the place, meaning, which is outside the scope of this research.

For this research investigating the people's activity and the existing relation with the physical attributes of the space formed the answers to the research questions, however, there is a significant opportunity to consider people's perception of the space as well in future researches using the methods proposed in this study.

People interact with places in their everyday lives. Interactions with places are based on the meaning people assign to them (Jordan, 1998). On one hand, places provide an activity context according to their physical form. On the other hand, places give a sense of meaning to their user which is a fundamental component of social interaction (Jordan, 1998). The core of a planning focus is the interconnection of people and place, and of activities. Places are as much social nodes as physical sites, and the meanings given to them are based on the interactions which take place within them (Stephenson, 2010). The structure of the built environment

identifies the places where particular activities take place, and determine which areas are to be used by whom and what for. In general, it identifies social interaction, movement patterns, and human behavior (Bornberg, 2008).

Carmona (2010) believes that understanding the relationship between people (society) and their environment (space) is a necessary component of urban design. People are not passive, they affect and change the environment as it affects and changes their activity pattern. Urban places in the contemporary city are changing by modification in response to their user's needs and technological development (Sepe, 2009). Therefore, in order to explore the "changing nature" and "complexity of contemporary urban areas", new and innovative methodologies and approaches relevant to visual analytical tools are currently under application and implication (Sepe, 2009). These methods could apply approaches to analyze and illustrate contemporary place identity and place perceptions.

As GIS is becoming popular and powerful analytical tool in the planning practice, there is an opportunity to investigate people's sense of place through this tool. Applying methods and using GIS as a powerful visual tool provide a way that enable identification of those elements not shown in traditional mapping which create identity of place, sense of place, and attempts to make them readable. Therefore there is an opportunity to open a door toward including people's perception of a place as GIS information and database through using mobile GIS and activity maps. In order to obtain more complete information about how people feel about a place, public participation is an essential element. In this regard, one of the advantages of the future research on this aspect of place component is in exploring public participation GIS (PPGIS), as a visual analytical tool which is currently usable in spatial analysis and planning for urban places to help identifying sense of place and place identity elements defined through people perceptions. The purpose of such investigation is to explore different ways of mapping sense of place through PPGIS and mobile GIS and identifying barriers and opportunities facing planning practitioners in implementing PPGIS for mapping sense of place.

In order to achieve the objective mentioned above, in proposed future research the following questions should be answered: 1) how can the concept of place be represented within PPGIS?, 2) How do people value places and what do they map through PPGIS?, 3) How can the meaning of a place be assign through PPGIS?, and 4) How can PPGIS include spatial information that helps designers make decisions about sense of place?

According to the results of this research, integration of Place theory, considering all three components of place with Public Participation GIS and using mobile GIS to identify the place elements is one significant area of proposed future research. People define complex meaning and structures of places and based on such meaning they decide about activities patterns. Current GIS do not easily illustrate mapping of these activities occurring on places relative to the meaning of place. Integrating a model of how people conceptualize and perceive places into GIS will therefore increase the usefulness of these systems. If concepts of place become a fundamental component of GIS, then GIS will be able to make important decisions about places according to people's sense of place (Jordan 1998).

Although GIS is currently applied in planning processes (Al-kodmany, 2000), and offers opportunities for existing data analysis, it has been little used in mapping intangible designing elements (Golicnik, 2011). This shows a need for profound investigation and concentration on GIS as an analytical visual tool for mapping non-readable qualitative component of place. Sieber (2006) believes that PPGIS is a specific approach for engaging the public in decision making process through integrating local knowledge, contextualizing complex spatial information, and allowing participants to interact with input data, analyzing proposed alternatives and empowering individuals and groups. Achieving a PPGIS approach in planning process requires integrating local knowledge in creating GIS database and working to incorporate intangible information, such as how people value a place or describe their sense of place (Talen, 2000).

In general, the significance of this type of studies takes three aspects, from theoretical, practical and methodological points of view. In the instance, research will focus on the theories of place, place making and linking literature with public participation and GIS (PPGIS), the second will link theory and practice and will show the importance of applying visual tools (GIS) in designing process, people engagement in decision making process while the third, will consider the development of technology in data collection and analysis.

References

Al-Koodmany, K., (2000),"GIS in the urban landscape: Reconfiguring neighborhood planning and design processes", Journal of Landscape Research, 25 (1), 5-28.

Applyard, D., (1979),"Why buildings are known: A predictive tool for architects and planners, in Broadbent, G., Bunt, R., and Lioners, T., (1980),"Meaning and behavior in the built environment", John Willey and Sons, Chichester.

Applyard, D., (1981),"Livable Street", University of California Press, Berekeley.

Baxter, P., and Jack, S., (2008),"Qualitative Case Study Methodology: Study design and implementation for Novic researchers", The Qualitative Report, 13 (4), 544-559.

Bornberg . R., (2008),"Identity by spatial design: Topos, a principle derived from historic and vernacular cultures", Urban Design International, 13, 182–200.

Canter, D., (1976),"The Psychology of Place", Architectural Press, London.

Carmona, M., Tiesdell,S., Heath,T., and Oc,T., (2010), "public places public spaces: The dimensions of urban design", Archtectural press, UK.

Carr, S., Francis, M., Rivilin, L.G., Stone, A.M., (1992),"Public Space", Cambridge university Press, Cambridge.

Cohen, D., Mckenzie,T., Sehgal, A., Williamson, S., Golineli, D., Lurie, N., (2007),"Contribution of Public Parks to Physical Activity", American Journal of Public Health, 97(3), 509-514.

Conzen, M.P. (1960),"Alnwick: A study in Town Planning Analysis, Transactions", Institute of British Geographers, 27, 1-122.

Cooper, M.C, Francis, C, (1998),"People Places: Design guidelines for urban open space", John Wiley & Aons Inc. Toronto.

Cosco, N., Moore, R., Islam, M., (2010),"Behaviour Mapping: A method for linking preschool physical activity and outdoor design", Medicine and science in sports and exercise, American College of Sports Medicine, 513-519.

Cresswell, J., (2009),"Research design, qualitative, quantitative, and mixed methods approaches", (3rd ed), Sage.

Ewing, R., and Handy, S., (2009),"Measuring the Unmeasurable: Urban Design Qualities Related to Walkability", Journal of Urban Design, 14 (1), 65-84.

Ewing, R., Handy, S., Brownson, R., Clemente, O. & Winston, E. (2006),"Identifying and measuring urban design qualities related to walkability", Journal of Physical Activity and Health, 3, 223–240.

Frick, D., (2007),"Spatial Synergy and Supportiveness of space", Journal of Urban Design, 12:2, 261-274.

Friedmann, J., (2010),"Place and Place-Making in Cities: A Global Perspective", Planning Theory & Practice, 11: 2, 149 -165.

Gehl, J, (1987),"life between buildings: using public space, Van nostrand reinhold company, New York.

Gehl, J., and Gemzoe, L., (1996),"Public Spaces – Public Life", Copenhagen, Denmark: The Danish Architectural Press.

Golicnik, B., (2010),“Emerging relationships between design and use of urban park spaces”, Journal of Landscape and Urban Planning, 94 (1), 38-53.
Golicnik, B., (2011),“Analysis of patterns of spatial occupancy in urban open space using behavior maps and GIS”, Journam of Urban Design International, 16 (1), 36-50.
Handy, S., Boarnet,M., Ewing.,R., Killikgsworth, R., (2002),“How the built environment affects physical activity, views from urban planning”, American Journal of Preventive Medicine, 23 (2), 64-73.
Hillier, B., Penn, A., Hanson, J., T. Grojewski, J Xu, (1993),“Natural movement: or, configuration and attraction in urban pedestrian movement”, Environment and planning B: Planning and Deisgn, 20, 29-66.
Holland, C., Clark, A., Katz, J. and Peace, S. (2007),“Social Interactions in Urban Public Places”. London: The Policy Press.
Itelson, W.H., Rivilin, L.G. and Prohansky, H.M, (1970),“The use of behavioral maps in environmental psychology”, Journal of Environmental Psychology: Man and his Physical Setting, 658-668.
Jacob, M. Hellström,T, (2010),“Public-space planning in four Nordic cities: Symbolic values in tension”, Geoforum 41, 657-665.
Jacobs, J. (1961),“The Death and Life of Great American Cities: The Failure of Modern Town Planning”, Peregrine Books, London.
Jordan, T., Raubal, M., Gartrell, B., and Egenhofer, M., (1998),“An affordance-based model of place in GIS”, Eighth International Symposium on Spatial Data Handling, Vancouver, Canada.
Lynch K., and Rodwin, L., (1958),“A Theory of Urban Form”, Journal of the American Institute of Planners, 24 (4), 201-214.
Lynch, K. (1981),“A theory of good city form”, MIT Press, Cambridge.
Lynch, K. (1960),“The Image of the City”, MIT Press, Cambridge, Mass.
Madanipour,A. ,(2010),“Whose Public Space? International case studies in urban design and development”, London; New York: Routledge.
Michelson, W., (2011),“Sociological influences companion to urban design”, In “Influences of Sociology on Urban Design” Edited by Tridib Banerjeaa and Anastasia Loukaitou-Sideris (2011), Routledge.
Mongomery, J., (1998),“Making a city: Urbanity, Vitality and Urban Design”, Journal of Urban Design, 3, 93-116.
Norberg-Schulz, C., (1980),“Genius loci: Towards a phenomenology of architecture”, New York: Rizzoli.
Patton,M.Q., (2002),“Purposeful sampling. In qualitative research and evaluation methods” (3rd ed) Thousand Oaks, CA: Sage.
PPS-Project for Public Spaces, 2005,“How to turn a place around: a handbook for creating successful public spaces”, PPS, New York.
Pugalis, L., (2009),“The culture and economics of urban public space design: public and professional perceptions”, Journal of urban design, 14, 215-230.
Punter, J., (1991),“Participation in the Design of Urban Space”, Landscape Design, Issue 200, 24-27.
Relph, E., (1976),“Place and Placelessness”, Pion, London.
Sepe, M., (2009),“PlaceMaker Method: Planning ’Walkability’ by Mapping Place Identity”,

Journal of Urban Design, 14: 4, 463 — 487.
Sieber, R., (2006),"Public participation geographic information systems: A literature review and framework", Annals of the Association of American Geographers, 96(3): 491-507.
Stephenson, J., (2010),"People and Place", Planning Theory & Practice, 11: 1, 9-21.
Talen, E., (2000),"Bottom-up GIS: A new tool for individual and group expression in participatory planning", Journal of the American Planning Association, 66 (3), 279- 294.
Thompson, C., (2002),"Urban open space in the 21st century", Journal of Landscape and Urban Planning, 60 (2), 59-72.
Tibbalds, F., (2003),"Making people- friendly towns", Spon Press.
Urban Task Force (1999),"Towards and urban renaissance", Urban Task Force, London.
Varna, G., and Tiesdell, S., (2010),"Assessing the Publicness of Public Space:The Star Model of Publicness", Journal of Urban Design, 15: 4, 575 — 598.
Whyte, William.H, (1980),"The Social Life of Small Urban Spaces", The Conservation Foundation, Washington, D.C.
"Public Spaces, Activity and Urban Form", City of Saskatoon, Strategic Framework-City Center Plan, Phase 1, 2011.

Appendices

Appendix 1. Daily Observation – Weekday – Tuesday

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	107	34.52	Cycle	7	2.26	Bench	98	31.61	Along Stream	52	16.77
			Play	10	3.23	Edge	17	5.48	Sideway Stream	17	5.48
			Play-Music	3	0.97	Grass Space	16	5.16	Around Pool	78	25.16
			Walk	73	23.55	Round Table	14	4.19	Fountain	4	1.29
			Walk-Child	9	2.90	Table	49	16.13	Garden Court	37	11.94
			Walk-Pram	5	1.61	Walkway	116	37.42	Theatre area	25	8.06
Passive	203	65.48	Lay	2	0.65				Transition area	28	9.03
			Sit	167	53.87				Tree-lined	69	22.26
			Sit –Child	7	2.26						
			Sit- Pram	10	3.23						
			Stand	17	5.48						
Total	310	100	**Total**	310	100	**Total**	310	100	**Total**	310	100

Appendix 2. Timing and Activity Observation – Weekday – Tuesday

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	3	2.88	1	0.79	3	3.75	Bench	27	25.96	50	39.68	21	26.25
Play	2	1.92	3	2.38	5	6.25	Edge	6	5.77	9	7.14	2	2.5
Play-Music	1	0.96	1	0.79	1	1.25	Grass Space	3	2.88	8	6.35	5	6.25
Walk	30	28.85	22	17.46	21	26.25	Round Table	5	4.81	8	6.35	1	1.25
Walk-Child	2	1.92	3	2.38	4	5	Table	16	15.38	18	14.29	15	18.75
Walk-Pram	2	1.92	1	0.79	2	2.5	Walkway	47	45.19	33	26.19	36	45
Lay	1	0.96	1	0.79	0	0							
Sit	48	46.15	80	63.49	39	48.75							
Sit –Child	2	1.92	5	3.97	0	0							
Sit- Pram	4	3.85	4	3.17	2	2.5							
Stand	9	8.65	5	3.97	3	3.75							
Total	104	100	126	100	80	100	**Total**	104	100	126	100	80	100

Appendix 3. Daily Observation – Weekday – Friday

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	84	27.18	Cycle	2	0.65	Bench	108	34.95	Along Stream	70	22.65
			Exercise	4	1.29	Edge	15	4.85	Sideway Stream	11	3.56
			Photo	4	1.29	Grass Space	14	4.53	Around Pool	76	24.60
			Play	9	2.91	Round Table	16	5.18	Fountain	3	0.97
			Play-Music	3	0.97	Table	39	12.62	Garden Court	29	9.39
			Walk	46	14.89	Walkway	117	37.86	Pavilion	2	0.65
			Walk-Child	10	3.24				Theatre area	22	7.12
			Walk-Pram	6	1.94				Theatre sitting area	4	1.29
Passive	225	72.82	Sit	164	53.07				Transition area	29	9.39
			Sit -Child	6	1.94				Tree-lined	62	20.06
			Sit- Pram	13	4.21				Waterworks	1	0.32
			Sit-Wheelchair	3	0.97						
			Stand	34	11						
			Stand-Child	1	0.32						
			Stand- Pram	4	1.29						
Total	309	100	**Total**	309	100	**Total**	309	100	**Total**	309	100

Appendix 4. Timing and Activity Observation –Weekday – Friday

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	2	2.35	0	0	0	0	Bench	29	34.12	53	43.80	26	25.24
Exercise	3	3.53	0	0	1	0.97	Edge	5	5.88	4	3.31	6	5.83
Photo	3	3.53	0	0	1	0.97	Grass Space	6	7.06	3	2.48	5	4.85
Play	3	3.53	3	2.47	3	2.91	Round Table	4	4.70	7	5.79	5	4.85
Play-Music	1	1.18	1	0.83	1	0.97	Table	12	14.12	12	9.92	15	14.56
Walk	10	11.76	25	20.66	11	10.68	Walkway	29	34.12	42	34.71	46	44.66
Walk-Child	2	2.35	2	1.65	6	5.83							
Walk-Pram	2	2.35	0	0	4	3.88							
Sit	43	50.59	76	62.81	45	43.69							
Sit –Child	1	1.18	2	1.65	3	2.91							
Sit- Pram	7	8.24	1	0.83	5	4.85							
Sit-Wheelchair	0	0	1	0.83	2	1.94							
Stand	6	7.06	10	8.26	18	17.48							
Stand-Child	1	1.18	0	0	0	0							
Stand-Pram	1	1.18	0	0	3	2.91							
Total	85	100	121	100	103	100	**Total**	85	100	121	100	103	100

Appendix 5. Daily Observation – Weekend – Saturday

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	111	33.23	Cycle	1	0.30	Bench	80	23.95	Along Stream	49	14.67
			Exercise	2	0.60	Edge	34	10.18	Sideway Stream	15	4.49
			Photo	4	1.20	Grass Space	23	6.89	Around Pool	95	28.44
			Play	15	4.49	Round Table	10	3.00	Fountain	11	3.29
			Play-Music	3	0.90	Table	20	5.99	Garden Court	20	5.99
			Walk	65	19.46	Walkway	167	50	Pavilion	4	1.20
			Walk-Child	3	0.90				Theatre area	33	9.88
			Walk-Pram	17	5.09				Theatre sitting area	6	1.80
			Walk-Wheelchair	1	0.30				Transition area	37	11.08
Passive	223	66.77	Lay	1	0,30				Tree-lined	61	18.26
			Sit	132	39.52				Waterworks	3	0.90
			Sit -Child	7	2.10						
			Sit- Pram	12	3.60						
			Sit-Wheelchair	3	0.90						
			Stand	63	18.86						
			Stand-Child	2	0.60						
			Stand- Pram	3	0.90						
Total	334	100	**Total**	334	100	**Total**	334	100	**Total**	334	100

Appendix 6. Timing and Activity Observation – Weekend – Saturday

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	0	0	0	0	1	0.55	Bench	13	25.49	21	20.39	46	25.55
Exercise	2	3.92	0	0	0	0	Edge	3	5.88	8	7.77	23	12.77
Photo	1	1.96	3	2.91	0	0	Grass Space	4	7.84	6	5.82	13	7.22
Play	4	7.84	1	0.97	10	5.55	Round Table	1	1.96	2	1.94	7	3.88
Play-Music	1	1.96	1	0.97	1	0.55	Table	4	7.84	6	5.83	10	5.55
Walk	13	25.49	29	28.15	23	12.77	Walkway	26	50.98	60	58.25	81	45
Walk-Child	1	1.96	2	1.94	0	0							
Walk-Pram	1	1.96	4	3.88	12	6.66							
Walk-Wheelchair	0	0	0	0	1	0.55							
Lay	0	0	1	0.97	0	0							
Sit	17	33.33	28	27.18	87	48.33							
Sit –Child	3	5.88	3	2.91	1	0.55							
Sit- Pram	1	1.96	6	5.82	5	2.77							
Sit-Wheelchair	0	0	1	0.97	2	1.11							
Stand	5	9.80	22	21.36	36	20							
Stand-Child	1	1.96	1	0.97	0	0							
Stand- Pram	1	1.96	1	0.97	0	0							
Total	51	100	103	100	180	100	**Total**	51	100	103	100	180	100

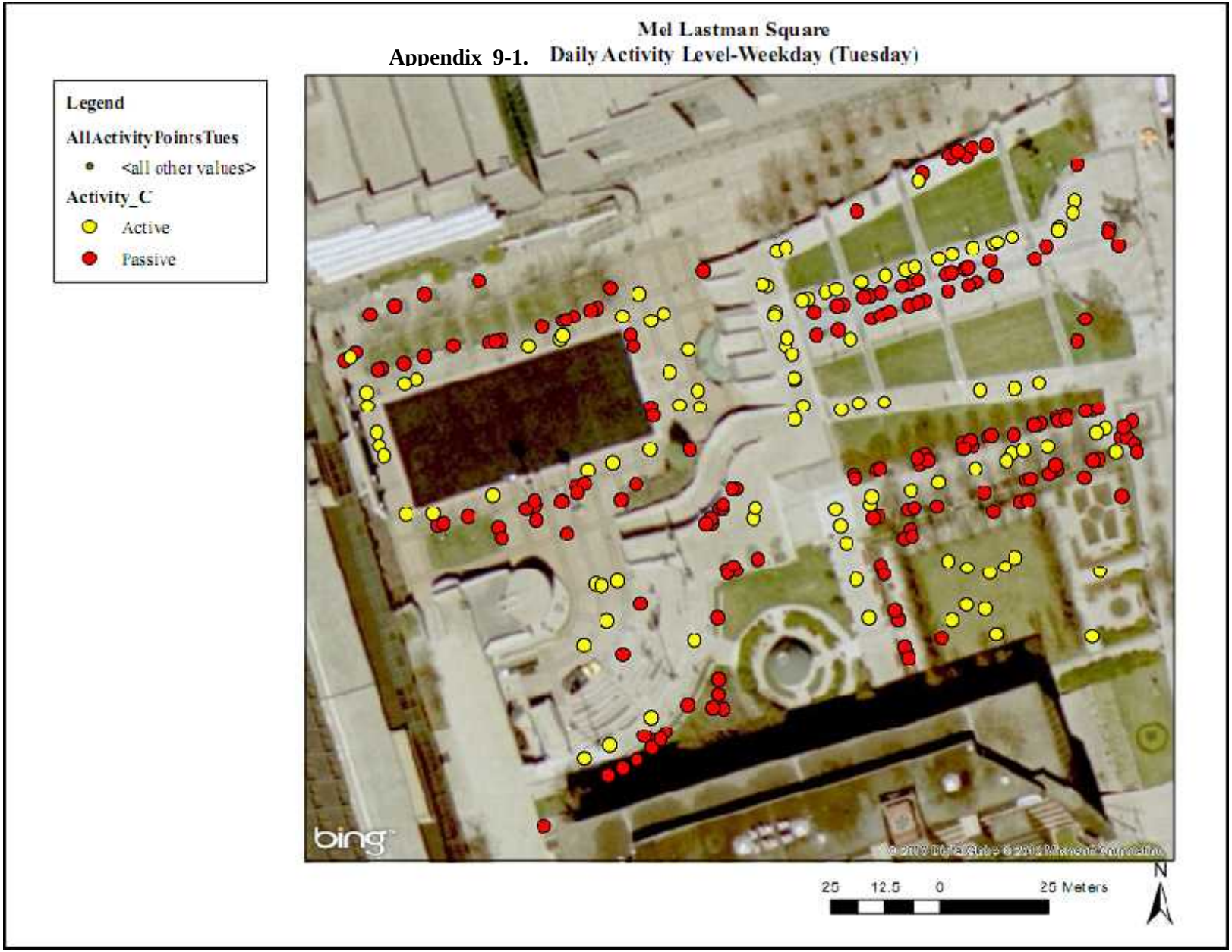
Appendix 7. Daily Observation – Weekend – Sunday

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	95	33.58	Cycle	9	3.37	Bench	70		Along Stream	47	17.60
			Exercise	6	2.25	Edge	28		Sideway Stream	12	4.49
			Photo	3	1.12	Grass Space	31		Around Pool	53	19.85
			Play	13	4.87	Round Table	8		Fountain	10	3.75
			Play-Music	4	1.50	Table	29		Garden Court	38	14.23
			Walk	45	16.85	Walkway	101		Pavilion	3	1.12
			Walk-Child	5	1.87				Theatre area	17	6.37
			Walk-Pram	9	3.37				Theatre sitting area	7	2.62
			Walk-Wheelchair	1	0.37				Transition area	18	6.74
Passive	172	66.42	Sit	122	45.69				Tree-lined	57	21.35
			Sit -Child	7	2.62				Waterworks	5	1,87
			Sit- Pram	20	7.49						
			Sit-Wheelchair	1	0.37						
			Stand	17	6.37						
			Stand- Pram	5	1.87						
Total	267	100	**Total**	267	100	**Total**	267	100	**Total**	267	100

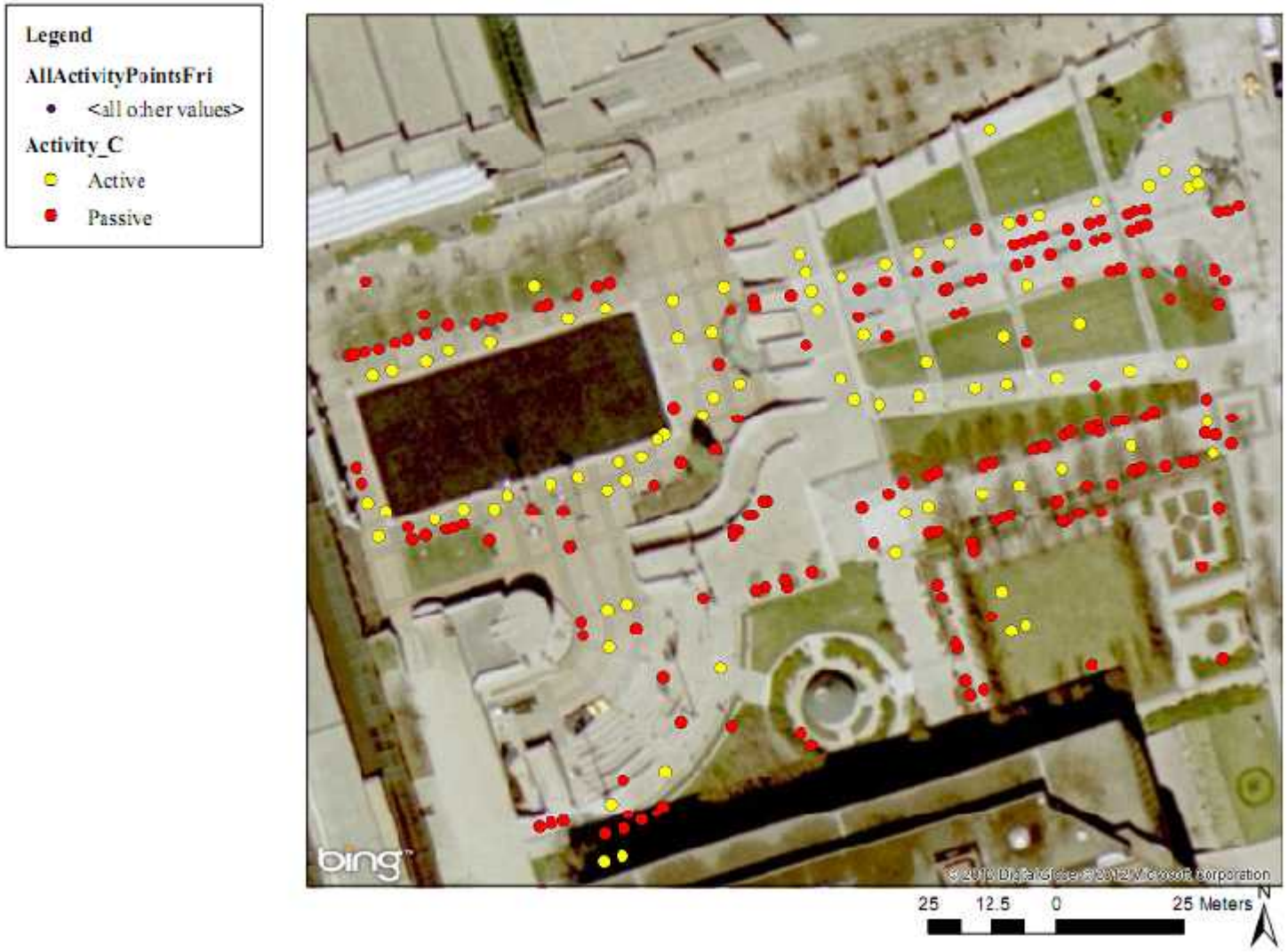
Appendix 8. Timing and Activity Observation – Weekend – Sunday

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No	%
Cycle	3	3.70	4	5.13	2	1.85	Bench	16	19.75	22	28.20	32	29.63
Exercise	3	3.70	2	2.56	1	0.93	Edge	10	12.35	7	8.97	11	10.19
Photo	1	1.23	0	0	2	1.85	Grass Space	12	14.81	8	10.26	11	10.19
Play	4	4.94	7	8.97	2	1.85	Round Table	3	3.70	2	2.56	3	2.77
Play-Music	1	1.23	1	1.28	2	1.85	Table	6	7.40	10	12.82	13	12.04
Walk	16	19.75	13	16.66	16	14.81	Walkway	38	46.91	29	37.18	38	35.19
Walk-Child	2	2.47	2	2.56	1	0.93							
Walk-Pram	6	7.41	2	2.56	1	0.93							
Walk-Wheelchair	0	0	0	0	1	0.93							
Sit	29	35.80	29	37.18	64	59.26							
Sit -Child	3	3.70	3	3.85	1	0.93							
Sit- Pram	6	7.41	11	1.28	3	2.77							
Sit-Wheelchair	0	0	0	0	1	0.93							
Stand	7	8.64	2	2.56	8	7.41							
Stand- Pram	0	0	2	2.56	3	2.77							
Total	81	100	78	100	108	100	**Total**	81	100	78	100	108	100

Appendix 9-1. Mel Lastman Square Daily Activity Level-Weekday (Tuesday)

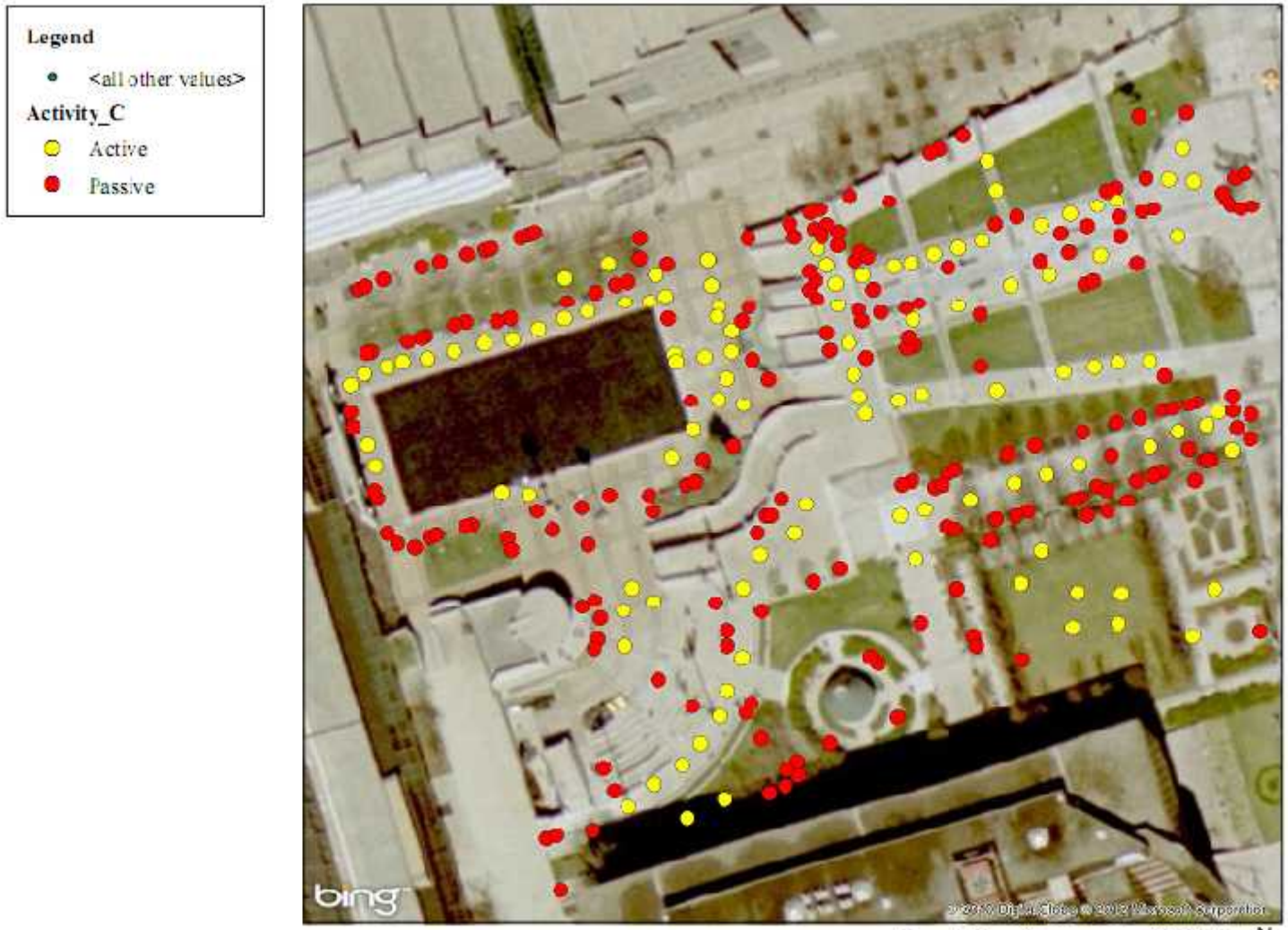


Appendix 9-2. Mel Lastman Square
Daily Activity Level-Weekday(Friday)



Mel Lastman Square

Appendix 9-3. Daily Activity Level-Weekend (Saturday)



Appendix 9-4. Mel Lastman Square Daily Acitivity Level-Weekend (Sunday)

Appendix 10. All Observation Sessions

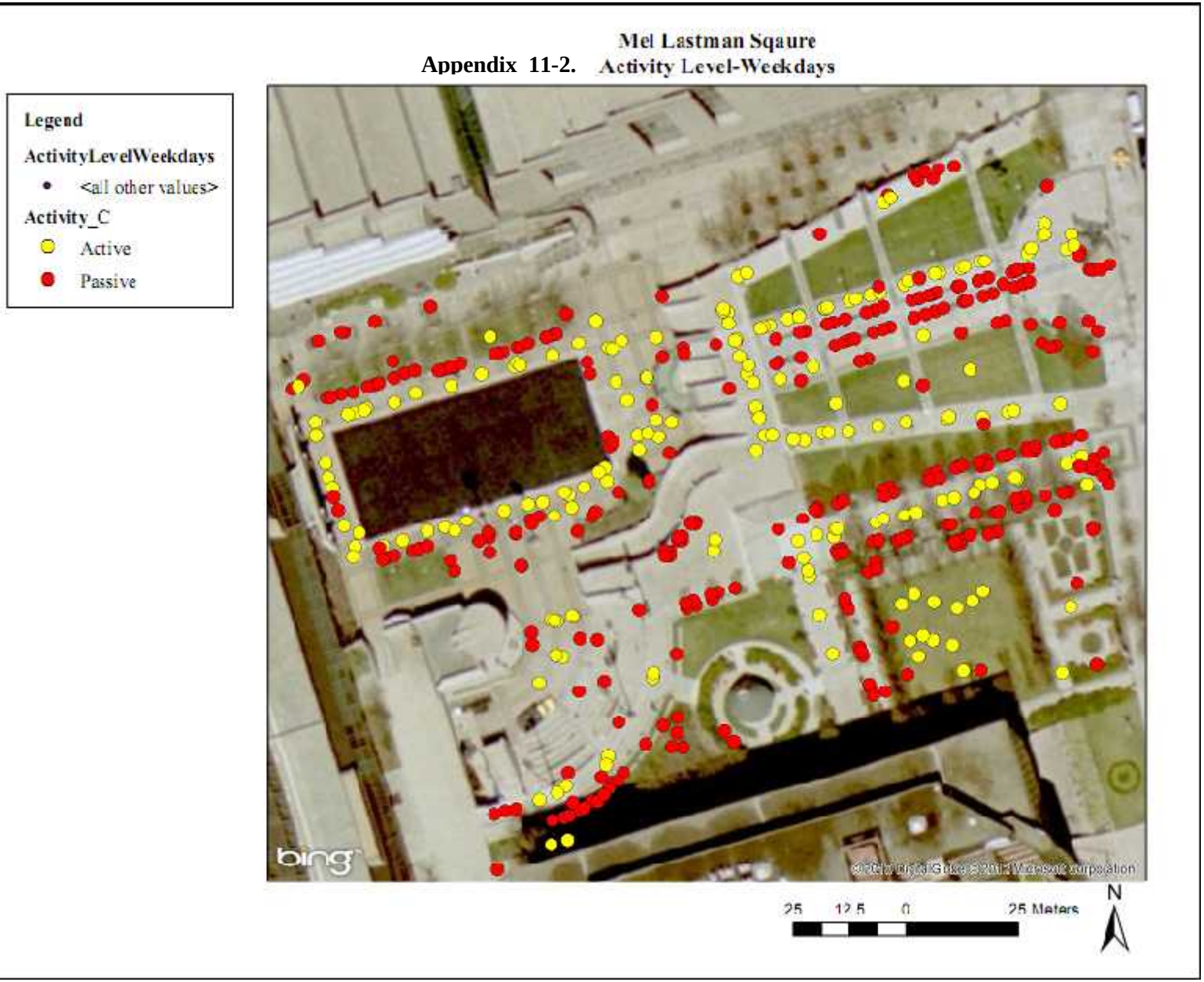
Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	397	32.54	Cycle	19	1.56	Bench	356	29.18	Along Stream	218	17.87
			Exercise	12	0.98	Edge	94	7.70	Around Pool	302	24.75
			Photo	11	0.90	Grass Space	84	0.69	Fountain	28	2.30
			Play	47	3.85	Round Table	48	3.93	Garden Court	124	10.16
			Play-Music	13	1.07	Table	137	11.23	Pavilion	9	0.74
			Walk	229	18.77	Walkway	501	41.06	Sideway Stream	55	4.51
			Walk-Child	27	2.21				Theatre area	97	7.95
			Walk-Pram	37	3.03				Theatre sitting area	17	1.39
			Walk-Wheelchair	2	0.16				Transition area	112	9.18
Passive	823	67.46	Lay	3	0.25				Tree-lined	249	20.41
			Sit	585	47.95				Waterworks	9	0.74
			Sit -Child	27	2.21						
			Sit- Pram	55	4.51						
			Sit-Wheelchair	7	0.57						
			Stand	131	10.74						
			Stand-Child	3	0.25						
			Stand- Pram	12	0.98						
Total	1220	100	Total	1220	100	**Total**	1220	100	Total	1220	100

Mel Lastman Square

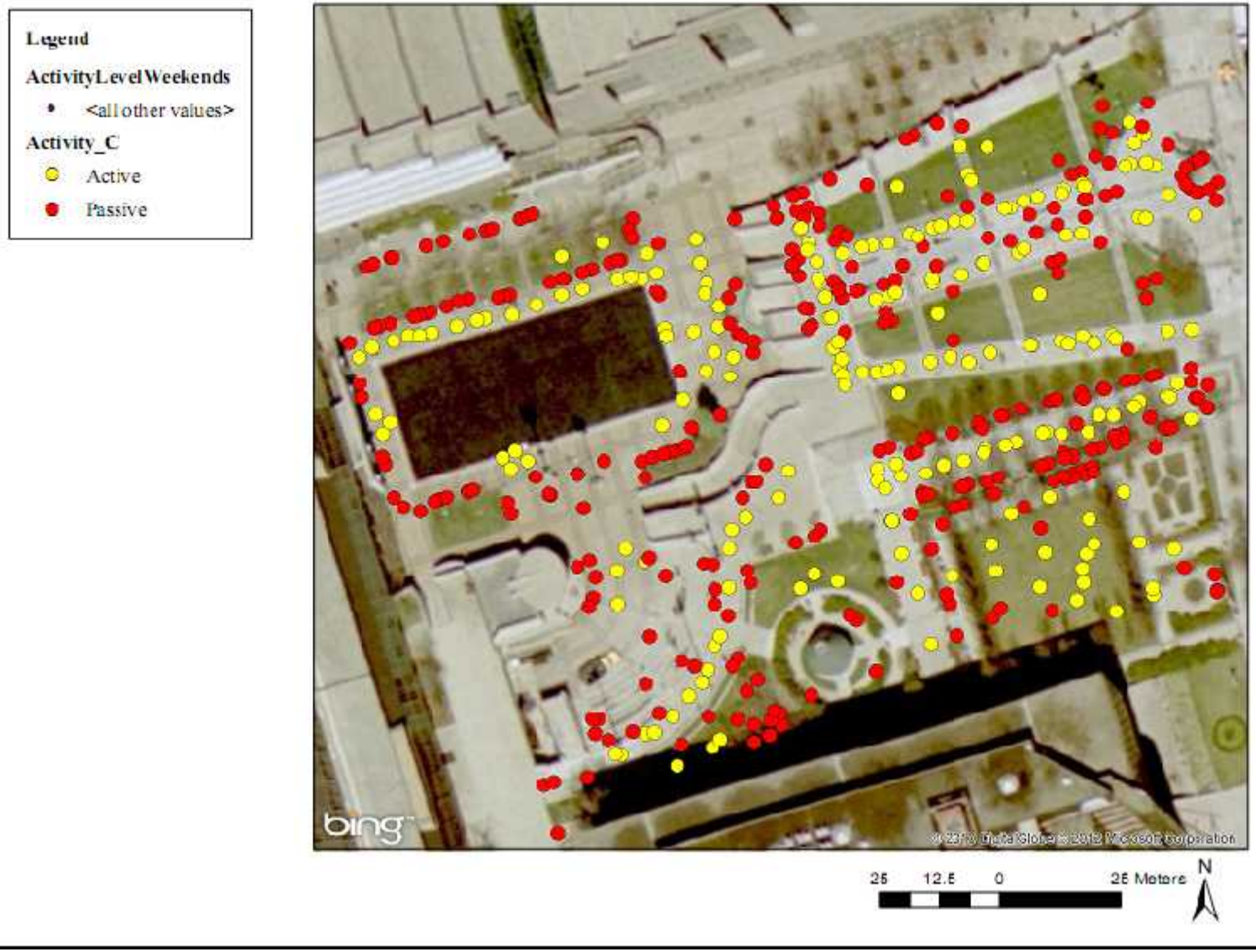
Appendix 11-1. Activity Level-Composit Map

Mel Lastman Sqaure

Appendix 11-2. Activity Level-Weekdays



Appendix 11-3. Mel Lastman Square
Activity Level-Weekends



Appendix 12. Timing and All Activity Observation Sessions

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	8	2.49	5	1.17	6	1.27	Bench	85	26.48	146	34.11	125	26.54
Exercise	8	2.49	2	0.47	2	0.42	Edge	24	7.48	28	6.54	42	8.92
Photo	5	1.56	3	0.70	3	0.64	Grass Space	25	7.79	25	5.84	34	7.22
Play	13	4.05	14	3.27	20	0.42	Round Table	13	4.05	19	4.44	16	3.40
Play-Music	4	1.25	4	0.93	5	1.06	Table	38	11.84	46	10.75	53	11.25
Walk	69	21.50	89	20.79	71	15.07	Walkway	136	42.37	164	38.32	201	42.68
Walk-Child	7	2.18	9	2.10	11	2.34							
Walk-Pram	11	3.43	7	1.64	19	4.03							
Walk-Wheelchair	0	0	0	0	2	0.42							
Lay	1	0.312	2	0.47	0	0							
Sit	137	42.68	213	49.77	235	49.89							
Sit -Child	9	2.80	13	3.04	5	1.06							
Sit- Pram	18	5.61	22	5.14	15	3.18							
Sit-Wheelchair	0	0	2	0.47	5	1.06							
Stand	27	8.41	39	9.11	65	13.80							
Stand-Child	2	0.62	1	0.23	0	0							
Stand- Pram	2	0.62	3	0.70	7	1.49							
Total	321	100	428	100	471	100	**Total**	321	100	428	100	471	100

Appendix 13. All Observations – Weekdays

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	191	30.86	Cycle	9	1.45	Bench	206	33.28	Along Stream	122	19.71
			Exercise	4	0.65	Edge	32	5.17	Sideway Stream	28	4.52
			Photo	4	0.65	Grass Space	30	4.85	Around Pool	154	24.88
			Play	19	3.07	Round Table	30	4.85	Fountain	7	1.14
			Play-Music	6	0.97	Table	88	14.22	Garden Court	66	10.66
			Walk	119	19.22	Walkway	233	37.64	Pavilion	2	0.32
			Walk-Child	19	3.07				Theatre area	47	7.59
			Walk-Pram	11	1.78				Theatre sitting area	4	0.65
Passive	428	69.14	Lay	2	0.32				Transition area	57	9.21
			Sit	331	53.47				Tree-lined	131	21.16
			Sit -Child	13	2.10				Waterworks	1	0.16
			Sit- Pram	23	3.72						
			Sit-Wheelchair	3	0.48						
			Stand	51	8.24						
			Stand-Child	1	0.16						
			Stand- Pram	4	0.65						
Total	619	100	Total	619	100	**Total**	619	100	Total	619	100

Appendix 14. Timing and Activity Observations – Weekdays

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	5	2.65	1	0.40	3	1.64	Bench	56	29.63	103	41.70	47	25.68
Exercise	3	1.59	0	0	1	0.55	Edge	11	5.82	13	5.26	8	4.37
Photo	3	1.59	0	0	1	0.55	Grass Space	9	4.76	11	4.45	10	5.46
Play	5	2.65	6	2.43	8	4.37	Round Table	9	4.76	15	6.07	6	3.28
Play-Music	2	1.06	2	0.81	2	1.10	Table	28	14.81	30	12.15	30	16.39
Walk	40	21.16	47	19.03	32	17.49	Walkway	76	40.21	75	30.36	82	44.81
Walk-Child	4	2.12	5	2.02	10	5.46							
Walk-Pram	4	2.12	1	0.40	6	3.28							
Lay	1	0.53	1	0.40	0	0							
Sit	91	48.15	156	63.16	84	45.90							
Sit -Child	3	1.59	7	2.83	3	1.64							
Sit- Pram	11	5.82	5	2.02	7	3.83							
Sit-Wheelchair	0	0	1	0.40	2	1.10							
Stand	15	7.94	15	6.07	21	11.48							
Stand-Child	1	0.53	0	0	0	0							
Stand- Pram	1	0.53	0	0	3	1.64							
Total	189	100	247	100	183	100	**Total**	189	100	247	100	183	100

Appendix 15. All Observations – Weekends

Activity Level	No.	%	Activity Type	No.	%	Design Features	No.	%	Activity Location	No.	%
Active	206	34.28	Cycle	10	1.66	Bench	150	24.96	Along Stream	96	15.97
			Exercise	8	1.29	Edge	62	10.32	Sideway Stream	27	4.50
			Photo	7	1.16	Grass Space	54	8.99	Around Pool	148	24.63
			Play	28	4.66	Round Table	18	3.00	Fountain	21	3.49
			Play-Music	7	1.16	Table	49	8.15	Garden Court	58	9.65
			Walk	110	18.30	Walkway	268	44.60	Pavilion	7	1.16
			Walk-Child	8	13.31				Theatre area	50	8.32
			Walk-Pram	26	4.33				Theatre sitting area	13	2.16
			Walk-Wheelchair	2	0.33				Transition area	55	9.15
Passive	395	65.72	Lay	1	0.17				Tree-lined	118	19.63
			Sit	254	42.26				Waterworks	8	1.33
			Sit -Child	14	2.33						
			Sit- Pram	32	5.32						
			Sit-Wheelchair	4	0.67						
			Stand	80	13.31						
			Stand-Child	2	0.33						
			Stand- Pram	8	1.33						
Total	601	100	Total	601	100	**Total**	601	100	Total	601	100

Appendix 16. Timing and Activity Observations – Weekends

Activity Type	Morning		Afternoon		Evening		Design Features	Morning		Afternoon		Evening	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%
Cycle	3	2.27	4	2.21	3	1.04	Bench	29	21.97	43	23.76	78	27.08
Exercise	5	3.79	2	1.10	1	0.35	Edge	13	9.85	15	8.29	34	11.81
Photo	2	1.51	3	1.66	2	0.69	Grass Space	16	12.12	14	7.73	24	8.33
Play	8	6.06	8	4.42	12	4.17	Round Table	4	3.03	4	2.21	10	3.47
Play-Music	2	1.51	2	1.10	3	1.04	Table	10	7.58	16	8.84	23	7.99
Walk	29	21.97	42	23.20	39	13.54	Walkway	60	45.45	89	49.17	119	41.32
Walk-Child	3	2.27	4	2.21	1	0.35							
Walk-Pram	7	5.30	6	3.31	13	4.51							
Walk-wheelchair	0	0	0	0	2	0.69							
Lay	0	0	1	0.55	0	0							
Sit	46	34.85	57	31.49	151	52.43							
Sit -Child	6	4.55	6	3.31	2	0.69							
Sit- Pram	7	5.30	17	9.39	8	2.77							
Sit-Wheelchair	0	0	1	0.55	3	1.04							
Stand	12	9.10	24	13.26	44	15.28							
Stand-Child	1	0.76	1	0.55	0	0							
Stand- Pram	1	0.76	3	1.66	4	1.38							
Total	132	100	181	100	288	100	**Total**	132	100	181	100	288	100