INFLUENCE OF SPATIAL CHARACTERISTICS ON UTILIZATION OF URBAN PARKS IN NAIROBI CITY COUNTY, KENYA

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Influence of Spatial Characteristics on Utilization of Urban Parks in Nairobi City County, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature: …… Date: ……..

Stella Kasiva Mbiti

This thesis has been submitted for examination with our approval as university supervisors:

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DEDICATION

This work is dedicated to my family, Joseph, Brian and Lorna for consistently being a source of inspiration.

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LIST OF ACRONYMS

APHRC	African Population and Health Research Center
CAD	Computer Aided Design
CDCP	Centers for Disease Control and Prevention
CPTED	Crime Prevention through Environmental Design
DETR	Department of the Environment, Transport and the Regions
DLUS	Department of Landscape, University of Sheffield
GIS	Geographic Information System
JICA	Japan International Cooperation Agency
NCC	Nairobi City County
PPS	Project for Public Spaces
RCMRD	Regional Centre for Mapping of Resources for Development
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
TERB	Theory of Environmentally Responsible Behaviour
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UN	United Nations
USA	United States of America

ABSTRACT

In spite of the vital roles of urban parks in cities, parks in Nairobi City County (NCC) continue to suffer excessive variation in use. However, the factors influencing this variability are not yet explained empirically. In practice, the design, management and rehabilitation processes of urban parks within NCC are based on unstructured methods such as periodic survey, to establish the challenges facing the parks and possible intervention measures. These processes are subjective and unreliable and are therefore likely to give unauthentic practices such as park designs, rehabilitation and management guidelines since they do not adequately take into account the many factors that influence park use. Eventually, this may lead to fast decline in quality, congestion, under use and obsolescence. This study investigates the contribution of spatial characteristics on urban parks utilization in NCC in Kenya. From literature, 13 spatial characteristics were observed for analysis namely: size of space, surface material, accessibility, visual connectivity, adjacent neighbourhood characteristics, vegetation characteristics, environmental quality, built environment, distance to park spaces, security, overall design layout, space aesthetics and park features. In order to achieve the study aim, three specific objectives were set as follows: to analyse independent variables that have a significant relationship with the dependent variable for use in regression analysis in the study of urban parks; to determine the extent to which particular independent variables predict park utilization and to formulate guidelines for enhancement of utilization of urban parks in NCC in Kenya. The study adopted a quantitative research strategy and a survey research design. Data were collected from a random sample of convex spaces generated from the six gazetted urban parks base maps. An observation schedule and an interview schedule were used to collect the data and analysis carried out using the Statistical Package for Social Sciences (SPSS for Windows Version 20). Statistical procedures adopted in the study include correlation analysis and multiple linear regression and the significance of the relationships was tested at 95 percent confidence level. Results of the study reveal a significant relationship between spatial characteristics and urban park utilization. Eight independent variables were found to have a significant correlation with the dependent variable hence considered for regression analysis. Nine (9) predictive models useful in explaining which specific predictor variable explains a specific response surrogate and to what measure were development. Eventually, design guidelines that inform park designs at various stages of park development were formulated. It is concluded that spatial characteristics play a significant role in park utilization. To optimize park utilization in NCC, these factors should be purposively considered in park design and the development process, following the models developed in this study. Finally, further research should be pursued to increase the explanatory power (R^2 values) of the independent variables, and to establish other empirical models for parks in other 46 counties of Kenya.

Key terms: Urban parks, park utilization, spatial characteristics, park participation, engagement in park activities.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The rapid growth of population, as well as industrialization has resulted in a wide range of outcomes in urban areas. The global urban population was 58 percent in the year 2018 and projected to rise to 68 percent by 2050 (United Nations, 2018). The rising trend in urbanisation indicates that more than half of this growth would occur in developing regions, posing complex and systemic problems on the urban environment (Asibey, Poku-Boansi & Bamfo, 2018). Since urbanization is a threat to the urban built environment, it is critical for consideration in urban planning, design and development processes. In the developing regions, environmental, health, socio-economic and aesthetic concerns have sparkled interests towards the role that urban parks play in contributing to the quality of lives of the urbanites (Byrne & Sipe, 2010).

Globally, urban parks define cities and raise the visual landscape value; contribute to the overall environmental aesthetics which in turn positively impacts on the overall image of the city; act as lungs in cities giving city residents a pleasant escape from the hustles and bustles of the city; enhance mobility in cities and urban areas and improve access to basic services; facilitate urban renewal; contribute to psycho-social wellbeing of city residents; stimulate economic activities and investments; preserve historical and cultural assets and make the city's environment safer and crime free. (Bedimo-Rung, 2005; Mitchell & Popham, 2008; Bowler, Buyun, Knight & Pullin, 2010; Byrne & Sipe, 2010; Haq, 2011; Makworo & Mireri, 2011). Thus, park and recreation agencies have thus become key players in improving avenues to encourage physical activity, and improve environmental quality in the urban environments (Asibey et al., 2018).

Urban Parks being a key component of public spaces in cities are fundamental features of the landscape of any town or city. They come in many shapes and sizes, designs and layouts, dispersed throughout the city and located within or near to almost every community, regardless of their class, status or power. They may contain simple or multiple features and facilities that are designed to perform a variety of functions. Increasingly, it is understood that healthy cities must include, spatially functional urban settings among many other aspects, good quality, viable and accessible urban parks and urban nature (Comedia & Demos, 1995; Department of the Environment, Transport and the Regions, 2000).

Despite the awakening sense of their role and need, interventions in practice, urban policy and management, particularly in the developing countries have excluded issues on environment particularly urban parks. This has led to degeneration and challenges in the use of urban parks and green spaces in many developing countries (Adjei-Mensah, 2014; Asibey et al., 2018).

Urban parks in many cities of the world are under threat as many related studies point to either under use or non use of such facilities. There is evidence to indicate relatively little use or a decrease in use of parks in urban areas. Non-use of parks by large proportions of the community has resulted in a pattern of under-use of many parks/spaces. Consequently, the use of urban parks has become a crucial topic for discussion to urban park designers and planners as the assumed link between use of urban parks and spatial characteristics is becoming visible to design agendas (Gold, 1972/77; Department of Landscape, University of Sheffield, 2001 & Urban Parks Forum, 2001; Veal, 2014).

Concerns about urban parks have largely targeted: addressing disparities in park distribution; improving access to parks; addressing pressing health issues through understanding the built environment and its influence on promoting healthy lifestyles; meeting recreational needs; use of urban parks by residents; park facility maintenance and aesthetics (Kaczynski, Potwarka, & Saelens, 2008;Chona, Wolch, & Wilson, 2010;

Center for Disease Control and Prevention. 2011; Dajun, 2011; Adjei-Mensah, 2014; Asibey et al., 2018). However, considering the daunting challenges of city authorities, the deteriorating nature of urban parks and the challenges facing their use, particularly in developing regions, there is need to rethink at the current practices or management models.

According to Madden (2000), urban parks in the developed world are in a superior environmental state, in regard to utilization following restoration through design to increase their use. However, at some point some parks experienced environmental decline, characterized by decline in use, insecurity, crime and dilapidation of park facilities. It is important to note that spatial design interventions took centre stage in rehabilitation of the declining parks making them more responsive.

Available literature on the deterioration and challenges in the use of urban parks in developing regions, particularly Kenya, reveals the numerous challenges responsible city authorities encounter in managing them (Makworo & Mireri, 2011). Remarkably, little is known about the role of spatial characteristics in the utilization of urban parks in Kenya. Locally, studies on urban parks of Nairobi City County have focused on their provision, politics, development, management and planning of neighbourhood open spaces revealing several of the challenges. These include human wildlife conflict, decline in biodiversity; neglect; solid waste management; pollution; crime and vandalism; dilapidation of park facilities and amenities; soil erosion; under use and over-crowding. The studies have attributed these challenges to institutional weaknesses in authorities and agencies mandated to manage them, competing land uses, poor planning and inadequate provision of cities' recreational amenities (Ikawa, 2010; Kariuki, 2011; Makworo & Mireri, 2011).

As cities grow demographically and morphologically, and as they compete with one another to create the best business hubs and attract investments, the provision for high quality public spaces becomes an important marketing tool. A report by Nairobi City County (2016) indicates that corporates are attracted to locations offering well designed

and well managed public spaces which in turn attract highly skilled employees and services. The spatial characteristics is paramount as it determines both the diversity and efficiency with which these exchanges can be transacted (Mossop, 2001; Pretty, Hine & Peacock, 2006). Moreover, this could be important in improving access to the available urban parks, and in the attainment of the Sustainable Development Goal (SDG 11.7) – to provide universal access to safe, inclusive and accessible, green and public spaces, in particular, for women and children, older persons and persons with disabilities (UN, 2016).

Premised on this, the study sought to examine the influence of spatial characteristics on utilization of urban parks in Nairobi City, Kenya.

1.2 Philosophical Orientation of the Study

This study embraces positivism as its epistemological position. The philosophy of positivism believes that only factual knowledge gained through observation (the senses), including measurement is trustworthy. In positivism, the researcher must be independent. His roles are limited to data collection and interpretation in an objective way. Concepts are operationalised so that they can be measured and units of analysis should be reduced to simplest terms. Findings are observable and quantifiable leading to statistical analyses. In positivism, sampling requires large numbers selected randomly (Cohen, Mckenzie, Sehgal, Williamson, Golinelli & Lurie, 2007; Ramanathan, 2008). Positivism advocates for the application of the methods of natural sciences to the study of social reality and beyond. It entails five principles namely; phenomenalism; deductivism; inductivism; objectivity and a clear distinction between scientific statements and normative statements (Bryman, 2008).

The ontological position of positivism is one of realism. Realism is the view that objects have an existence independent of the knower. Thus, a discoverable reality exists independently of the researcher. Most positivists assume that reality is not mediated by our senses. Language fulfills a representational role as it is connected to the world by

some designative function; consequently, words owe their meaning to the objects which they name or designate. The positivist epistemology is one of objectivism. Positivists go forth into the world impartially, discovering absolute knowledge about an objective reality. The researcher and the researched are independent entities. Meaning solely resides in objects, not in the conscience of the researcher, and it is the aim of the researcher to obtain this meaning (Cohen, Mckenzie, Sehgal, Williamson, Golinelli & Lurie, 2007; Ramanathan, 2008; Bryman, 2008).

Some variables may be hidden from the researcher and only become known when their effects are evident. Therefore, predictions could be correct due to random reasons. No scientific explanation of human behavior is ever complete. Inferential statistical tests are often misused and their results are often misinterpreted. Researchers may select an incorrect statistical test. For example, if data is not distributed normally, then a non-parametric test is required. Deduction from empirical generalization is rarely explanatory. Positivistic generalizations ignore the intentionality of the individual, thus actions are not fully understood (Cohen, Mckenzie, Sehgal, Williamson, Golinelli & Lurie, 2007; Ramanathan, 2008).

1.3 Statement of the Problem

Despite their crucial roles in the lives of the populace, majority of urban parks in Nairobi City County have continued to experience notable variation in use, yet the determinants of this variability are not yet empirically explained. Urban parks are essential elements of livable cities. They help to regenerate and improve economic performance of a city; enhance and support ecology and biodiversity of the built environment; enable healthy living and lifelong learning opportunities; and foster local pride and community cohesion. Besides these vital roles, urban parks in Nairobi City County remain unresponsive to the changing needs and lifestyles of the citizens which manifest in form of variation in their utilization. This is characterized by congestion, environmental decline, under-use, dormant and neglected park spaces, monotony in usage, and dominance by some categories of users while others totally missing out.

The Nairobi City County Government has a role to play in the design, planning, and management of urban parks in Nairobi. However, despite this crucial mandate and its continued commitment in the development and rehabilitation of the existing parks to ensure that they meet user expectations, disparities in the use have persisted. Presently, the methods adopted in park use enhancement by the County have proved sub-optimal, with remarkable ineffectiveness in park designs, planning, rehabilitation and maintenance, fast decline in quality, congestion, under-use and obsolescence of park spaces. As pointed out by Koskey (1998), despite the importance of urban parks in the quality of life of the populace in Nairobi, most of them have not been given the desired attention. He avers that many urban parks in the city have since inception lacked significant modification to meet changing citizens' needs, and changing city's demography and morphology.

In view of the above, the question that this study seeks to answer and which constitutes statement of the problem is: How do spatial characteristics explain variation of use of urban parks spaces in Nairobi City County? Could failure to consider spatial characteristics in evolution of urban parks be the underlying cause of sub-optimal use of urban parks? This study aspires to enhance use of urban parks within NCC by injecting vibrancy, quality and variety in park usage. To achieve these, practices should be informed by established empirical relationships between park usage and the explanatory variables. *Findings of this study helps in explaining the spatial factors that optimize park utilization within Nairobi City County in Kenya.*

1.4 Study Aim and Objectives

The aim of this study was to establish the contribution of spatial characteristics on utilization of urban parks within NCC, for the purpose of optimizing park utilization and in the design and maintenance of the spaces.

The specific objectives of the study that assisted in achieving the above aim are:

(1) To analyse independent variables that have a significant association with the dependent variable for use in regression analysis in the study of urban parks in Nairobi City County in Kenya.
(2) To determine the degree to which particular independent variables predict park utilization in Nairobi City County in Kenya.
(3) To formulate guidelines for enhancement of utilization of urban parks in Nairobi City County in Kenya.

1.5 Study Hypotheses

Park utilization in Nairobi City County is influenced by thirteen explanatory variables. Their relationships amongst these variables may be expressed as follow:

$$\mathbf{U = \alpha + \sum \beta_i X_i + \varepsilon}$$

U – refers to Park Utilization

α - Is a constant (Y Intercept) Whose influence on U is insignificant.

βi - refers to the i^{th} regression coefficient of the i^{th} independent variable (X_i).

βi> 0 and is sufficiently large as to make X_i have a significant influence on U.

ε– is the error of fit that is considered to be so small that it can be ignored.

The explanatory variables (X_i) are:

Size of space, surface material, accessibility to the space, visual connectivity, adjacent neighborhood characteristics, vegetation characteristics, environmental quality, built environment, distance to the park, security in the space, overall design layout of space, space aesthetics and park features.

Note:

H_o- "There exists no relationship between spatial characteristics and park utilization in Nairobi City County". ($\beta i = 0$, for all regression coefficients).

H_a-There exists a relationship between spatial characteristics and park utilization in Nairobi City County. ($\beta i > 0$, for at least one regression coefficient).

1.6 Study Significance

Previous studies on urban parks in Kenya, specifically Nairobi City have focused on planning and provision, management and recreation. They have laid emphasis on park conditions in regard to environmental challenges and utilization patterns. Little attention has been paid on the influence of spatial characteristics on park utilization. Therefore, there is need to rethink the process of park development and management by the Nairobi City County. This is crucial in order to reconfirm the efficiency to deliver functional park spaces in the light of the city's rapid urbanization, related emerging challenges, changing needs and lifestyles of the city dwellers. In addition, Kenya is committed to the realization of agenda 2030 through implementation of the global SGs. Specifically; Nairobi City is keen on implementing SDG 11.5 through improvement of access to the existing urban parks. The study is therefore timely.

The study contributes to theory by:

1. Identifying the spatial characteristics that significantly influence park utilization in order to inform park designers to integrate such concerns at the park design stage for enhanced park utilization.

2. Developing prediction models of park utilization for use by park designers. The models will be helpful in identifying the key predictors of various indicators of park use and the magnitude of influence.

3. Formulation of design guidelines for reference by park designers in the park development process.

In practice, the study contributes to the following:

1. Study findings will assist park developers and the County managing authorities and agencies to clearly identify where to direct effort in their endeavour to optimize utilization of park spaces.

2. The study findings will also inform the design of urban parks in Nairobi to address the diverse user needs and the challenges facing urban parks there in. Application of the study findings also contribute to the attainment of Kenya's Vision 2030 by contributing to sustainable city growth advocated for under the economic and social pillars. The vision is inspired by the principle of sustainable development and by the need for equity in access to the benefits of a clean environment. This will lead to a healthy and more productive nation. Study findings are also helpful in realizing Agenda 21, the UN blueprint for global sustainable development guidance that aims at creating sustainable cities and also advocates for sufficient human access to city's green open spaces. Green towns' projects were implemented within the auspices of Agenda 21 and Kenya is committed to its implementation. The design and management of urban parks are part of the major ways of realizing sustainable cities.

3. Failure to have clarity on key intervention areas in urban park evolution in the city results in suboptimal utilization of these spaces. Study findings will help in resolving park use challenges faced by urban parks in Nairobi County as they will challenge designers to focus on the implications of the changes made in the urban park spatial system in terms of spatial details, dimensions, physical content and their effects on human experience on space. The prediction models will inform designers on the relevance of spatial characteristics in park design, in order to produce responsive parks.

4. Study findings will equip and encourage the custodians of urban parks within the County to query sub- Standard Park designs and development plans by relevant departments or consultants to ensure successful delivery of park development projects based on set design guidelines.

1.7 Study Justification

The study can be justified in six ways: political, economic, social, technological, environmental and legal. Nairobi City being the capital city of Kenya is very political as it is home to all the ministry headquarters. As a result, it has experienced a dramatic growth in size, population and complexity since the inception of the 1948 Master plan that targeted approximately 11,000 people. Compared to the current population that stands at approximately 4 million people, this has resulted in profound impacts on its existing urban parks that are not able to keep pace with the high demand and pressure (Kariuki (2011). In addition, Nairobi is a cosmopolitan city characterized by multicultural and multiracial society with differentiated socio-economic status. This poses a big challenge in the city's development process in ensuring integration of the diverse needs of its community. In view of the above, the selection of Nairobi as a study area is timely as this study calls for elaborate, strong and proper design guidelines that will respond to the current city's morphology, size and subsequent decline in the environment.

Environmental quality is a key influencer city's performance and functionality as it affects the quality of life of the residents. Environmental quality being one of the variables under study is a key contributor of park utilization. It is imperative to note that approximately 60% of Nairobi's population lives in the sprawling slum areas that are devoid of all the basic amenities, urban parks for recreation inclusive. People in such disadvantaged areas are most likely to lose out on the benefits of quality urban parks (African Population and Health Research Center, 2014). It is worthwhile to note that where citizens lack so much in terms of urban quality life due to lack of basic services and amenities, it is much easier and more effective to distribute quality of life through public goods such as urban parks where all have equal rights of access. Therefore, improving the quality of the existing urban park spaces within the city enhances use and its subsequent benefits to the city residents. The study therefore selects Nairobi city as a suitable study area as it presents uneven distribution of basic amenities in its external environment, with marked continued environmental degradation characterized by disparities in their utilization.

Moreover, as stated in the problem statement, one of the challenges facing the use of urban parks is inefficient designs that are technically sub-optimal and less innovative. Park designs ought to be innovative to inject vibrancy in to park spaces and enhance their use. The purpose of this study was to establish the contribution of spatial characteristics on utilization of urban parks within Nairobi City County in Kenya. The determination of the key spatial characteristics, development of predictive models and formulation of design guidelines to consider in park design, development, rehabilitation and management will lead to production of quality and functional park spaces. This will result to improved park usage which in return boosts the socio- economic growth of the city residents.

The government plays a key role of enacting legislation and policy formulation. The resultant study findings will inform the NCC and the National Government with regard to urban park design, planning, development and management. Park governing authorities and agencies such as NCC will be provided with valuable data to help in

policy formulation to enhance park utilization within the county. NCC will also be provided with the formulated design guidelines for enactment and for future use by park designers, developers and managers.

1.8 Study Questions

(1) Why are there variations in utilization of urban parks in Nairobi City County?
(2) How do spatial characteristics of these parks explain the variations in the manner in which they are used?
(3) What relationship exists between spatial characteristics and utilization of these urban parks?

1.9 Study Scope Geographical, Theoretical and Methodological,

On geographical scope, the study area is located within Nairobi City County as justified under section 1.7. It is limited to the six gazetted public urban parks which include: Uhuru Park, Central Park, Uhuru Gardens, Jeevanjee Gardens, City Park, and Nairobi Arboretum (Ref. Map 1). Gazetted parks were chosen on premise of open access to the public, equal platform for budgetary and human resource allocation and one management authority the NCC to avoid biasness in data collection.

Theoretically, the study is limited to theories of urban spatial design, choice and utility theories as detailed in Chapter two. The two sets of theories enabled the study to review and identify independent and dependent variables related to the current study respectively. The study embraces a conceptual framework which derives variables from the above theories and the physical, social and environmental characteristics of urban parks.

On the methodological scope, the study is quantitative in nature and was limited to observation and interviewing as methods of empirical investigation. Regarding the urban park space scope, park spaces consist of open spaces, walkways and driveways. A convex space forms the unit of analysis while units of observation were the convex

spaces and the park users. The analysis of the determinants of park utilization within Nairobi City County in Kenya was limited to spatial characteristics. Therefore, only variables relevant to the independent variable were considered. Thus, out of the many variables gleaned in literature review, only thirteen (13) variables were considered as described in Chapter three. As established in theoretical frameworks in Chapter two, several other variables may have an influence on park utilization, but the research only considered the 13 variables presented in the conceptual framework. Park utilization surrogates were limited to frequency of visits, average number of people visiting a space, average duration of stay, rightful use of park spaces, level of participation in active recreational activities, diversity of activities, intensity of use, gender disparity and vehicular utilization patterns.

Data sources for the study included both primary and secondary data. Primary data was urban park utilization and its determinants. Data on the spatial characteristics was collected from the urban park spaces by observing and measuring each variable appropriately. Some variables were measured by use of a measuring tape or wheel, others by use of hand-held tally counters, while others are measured by use of a Likert-Scale. The measurements were recorded in an observation schedule administered in each park convex space.

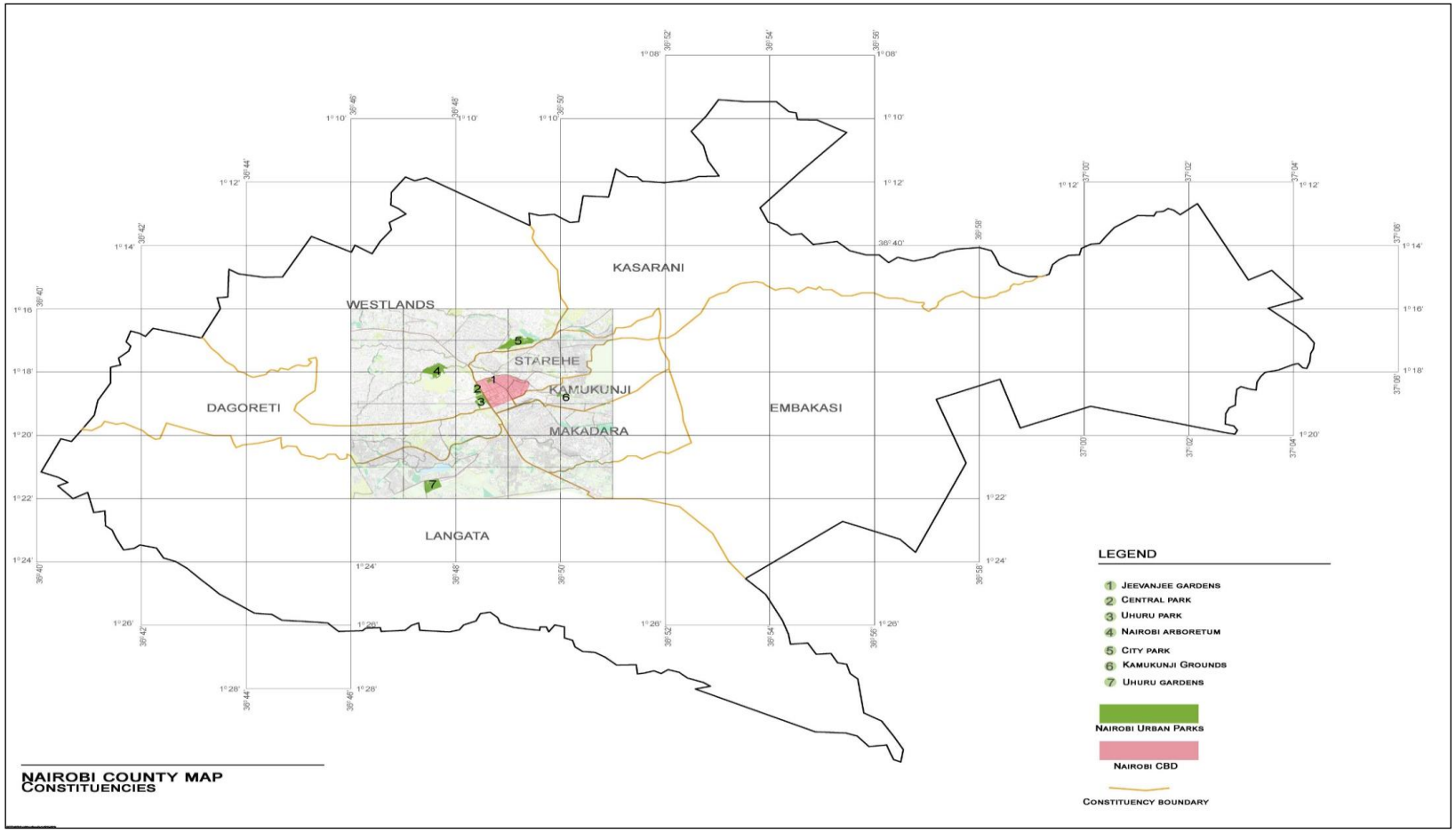
To analyse the data, the Statistical Package for Social Scientists (SPSS), Version 20.0, was used to analyse primary data. Correlation analysis was carried out to establish whether there exists a relationship between park utilization and spatial characteristics. Multiple regression was applied using the stepwise method to establish spatial variables that significantly predict various aspects of park use. Spatial variables in the regression model were discussed in regard to how they relate with the park utilization variable, that is, how they promote or minimize use. After data analysis, various forms of data presentation were used. These included matrices, predictive models, tables, and an analysis report.

1.10 Study Assumptions

This research assumes the following:

1. Other factors held constant, spatial characteristics are major determinants of urban park utilization.

2. Requirements and elements of performing urban parks can be considered at design level.



Map 1.1: A Map of Nairobi Displaying the Urban Parks in Nairobi City County. Source: Author, 2019

1.11 Study Limitations

The study had several limitations:

The first limitation was the expansiveness of the study area hence challenging to cover the 47 counties adequately. To solve this challenge, the study only focused on urban parks within Nairobi City County. The second challenge was diverse scope and status for the parks within NCC. It was not possible to study all the parks in the city hence the study limited itself to the six gazetted urban parks with the same level/platform of financial allocation, design, management and institutional control (government institutions). However, this scope (gazetted parks) translated to a low number of urban parks. To ensure reliability and validity of the study and avoidance of biasness in data collection, the researcher exhaustively considered all the gazetted urban parks in all the constituencies. The six gazetted urban parks presented a low population of six (6) if the whole park was to be considered as the unit of analysis. Since such a low population could not qualify for a quantitative research, the study settled on a convex space as the unit of analysis as opposed to the whole park hence raising the population to 341 as demonstrated in section 3.5.

1.12 Definition of Key Terms

Urban Park

According to Low, Taplin and Scheld, (2009), urban parks are located in cities to provide outdoor green space and a recreation space for residents and visitors. Common features of urban parks include walking trails, benches, picnic tables, playgrounds, and public restrooms. Some larger urban parks may have more recreation options, such as baseball fields, tennis courts, and soccer fields.

The operational definition of an urban park is a piece of public green open land for recreational use in an urban area.

Park utilization – The mode and the intensity of use of urban park for leisure and recreational purposes. For the purpose of this study, park utilization is assessed against the following indicators; frequency of visits, duration of stay, use of spaces, average number of people visiting a space, intensity of use, diversity of activities, level of participation, gender disparity and vehicular use patterns.

Spatial characteristics refer to the physical configuration of space and its components. For the purpose of this study, spatial characteristics refers to the physical elements that define spaces such as surface material, access points, size, park features and facilities, the built environment, space layout etc.

Convex spaces are two- dimensional extensions that comprise of the fewest and fattest spaces that can cover the entire layout within which all points are directly visible from all points within the space. They are the most elementary units of analysis. They are the largest units that can be fully perceived at one time within the layout and can therefore be taken to represent the local constituents of it. For the purpose of this study, convex spaces refer to sub-spaces in the urban parks developed for data collection. They include: Access routes in to and within the park and green sub spaces.

Utilization patterns-The mode of use of urban parks for leisure and recreational purposes.

Spatial design-is a concept and methodology that focuses on the layout and flow of outdoor spaces in the built environment

1.13 Study Organization

The study is organized in six chapters. Chapter I is an introduction to the study. It also looks at the importance of the expected results. Chapter II looks at literature review and the previous studies carried out in the area of study and their relevance to the present study. Similarities between various studies and their differences are highlighted for fine

tuning and for better understanding of the study problem. The factors affecting park use are identified from the literature review for use in the subsequent chapters in the study.

Chapter III describes the methodology used to carry out the study. The strategy taken in data collection, compiling and analysis in order to achieve the study objectives set out in chapter 1 of the study is also discussed. The study population establishment, sampling and sample size are discussed in this section. Chapter IV deals with data presentation and interpretation. Statistical analysis of the data collected was carried out in order to establish the statistical relationships between the dependent and independent variables. Chapter V presents discussion of results.

Chapter VI is the final part and contains summary, conclusions, recommendations and suggestion on areas of further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter one has introduced the research study, the aim, objectives, research hypothesis, the study justification and significance. From literature review of previous similar studies, the present chapter identifies the factors influencing park utilization. The methods for park use enhancement developed or adopted by other researchers in similar studies are reviewed in order to establish the existing research gap. Consequently, the most suitable methods for collecting, organising and analysing data to achieve the study aim and objectives are identified for further consideration in chapter three.

2.2 The Historical Evolution of Urban Parks

A historical review of urban parks highlights the fundamental role played by different phases in shaping the socio – physical spaces influencing the society. Urban parks influence the behavior of the population over time and the historical trends of design and function highlights the larger societal demands over a period of time. According to (Gabriel, 2011; Taylor, 1995) urban park history can be viewed through four stages: The pleasure Ground (1850-1900), The Reform Park (1900-1930), The Recreational Facility (1930-1965), and the Open Space System (1965 – Present). The three stages are discussed below.

2.2.1 Pleasure ground era (1850 – 1900)

The dramatic changes in the industrial city led to changes in the daily lives of the urbanites. Most notable were changes in occupation and labour, long working hours and growing artificial environments characterized by monotony in housing, streets and grid like pattern. This prompted designers to harness the inspiration of nature to balance the daily lives of the city workers early in the 19th century. In response to this, Frederick

Law Olmstead a famous landscape designer advocated for “a class of opposites” at the periphery of cities with an aim to link the urban and rural world in cities (Cranz, 1997; Taylor, 1995; Loughran, 2018). The linkage would evoke a sense of wilderness in the city creating a serene environment for contemplation and relaxation.

The socio-physical effects of the industrial city marked an important transition towards sedentary activities. To balance between jobs and homes, park designers responded by creating passive avenues as workers spent more time working in degraded factory conditions. The diminishing urban /pastoral wilderness offered opportunities to reclaim back the lost physical activities. Vegetation walls curved circulation and separated transportation system characterized park design at the Pleasure Ground Era. Vegetation walls acted as boundaries between the natural landscapes in the parks and the artificial city. The curved paths and trails contrasted the grid- like city streets evoking adventure in the expansive natural landscapes. Separation of the transportation system aimed at avoiding conflict between vehicles and park visitors and avoiding disruption of the relaxed natural environment. Central Park in New York designed by Frederick Law Olmstead in 1858 is a perfect example of a Pleasure Ground design (Taylor, 1995; Cranz 1997; Loughran, 2018).

The ultimate goal of the transcendental design in the Pleasure Ground Era was to inject elements of nature into the expanding urban form dominated by hard surfaces. Parks were located further away from the increasing dense cities at the periphery, a decision influenced by improved means of transportation. The peripheral location of parks diminished accessibility for the low-income individuals. This was as a result of their limited sources of income and lack of free time to travel to the parks by foot. Exclusion of low-income individuals led to marginalization of the working class by distinctive park features such as omission of lighting by park designers to preserve the natural qualities of the parks. This excluded the working class laboring for long hours during the day from visiting the parks at night during their free time. This marginalization prompted a democratic reconsideration of park accessibility by aligning park design to the growing demands and changing lifestyles in order to provide for all citizens. Though the Pleasure

Ground Era inspired the park design philosophy immensely, current ideals of neighbourhood parks originated in the Reform Era (Taylor, 1995; Cranz, 1997; Loughran, 2018).

2.2.2 Reform park era (1900 – 1930)

The ultimate goal for the Reform Park Era was to provide organized spaces for the population. The reformist movement at the eve of the 19th century led to transformation of spaces into neighbourhood parks. With an aim to maintain space for socio –physical wellbeing, Frederick Law Olmstead and others inspired the growth of the Reform Era. Ideals of improved spatial access originated at this era coupled with integration of social concerns in city planning. City planners hoped to use park design as a reforming tool to shape the social world and to respond to the effects of a fast growing population and the demands thereof. The ultimate goal for the Reform Era was provision for better services through park design to the population by promoting health and well being for the society (Taylor, 1995; Cranz, 1997; Loughran, 2018).

Increased population resulted to increased demand for leisure time hence spill over play by children in the busy city streets. This hampered circulation due to congestion and contributed to increased accidents in the streets. The increased demand for leisure time demanded more than just passive spaces for contemplation and relaxation. This prompted reformists to more spaces organization and provisions to serve the fast growing population. Issues of social equality, service to vulnerable population and improving lives, building and improving playgrounds for children were put into consideration. They focused on transforming the roles of the spaces from ornamental spaces to more functional ones in order to serve the growing population with diverse needs and changing lifestyles. In addition, they embraced organized recreational activities as a means to manage leisure time among the working class. Reformists perceived unaccounted for leisure as a threat to the society as it could easily be spent irresponsibly like in dance halls and bars. This prompted the advocates of reforms to channel time their way. Organized recreational activities were an attempt to social

control, as planned activities aimed to instill themes of leadership and ethics (Cranz, 1982; Cranz, 1997; Taylor, 1995; Loughran, 2018).

Parks in the Reform Era transformed to a more of utility based role with a shift from expansive spatial design to more functional layouts. Parks were divided into outdoor and indoor spaces. Outdoor spaces emphasized utility by replacing contemplative activities with active spaces such as playgrounds, swimming pools and running tracks. Indoor places focused on social control with assembly halls, locker rooms and gyms. Enlargement of park provisions was aimed at maximizing the available space. Maximum use of space pushed reformers to adapt to grand designs to smaller size, neighbourhood spaces in order to serve local population especially for the marginalized populations, growing population. Increased densities made space selection more difficult. Park designers began neighbourhood projects that situated playgrounds in condensed and unused areas (Taylor, 1995; Cranz, 1997; Loughran, 2018).

2.2.3 Recreational facility era (1930 – 1965)

As parks took on more of utility –based role, design because more important as designers and planners aimed at maximum functional spaces. Recreational Facility Era is characterized by massive expansion of services with fading of ideology to extent social reform through park development in the 1930's. At this Era, parks and park services were viewed as social service to the citizens hence the need to expand the services.

Designers focused on the quantity of services and facilities and the number of citizens reached without a special emphasis on the social good of these services. Robert Moses (1888- 1981) the powerful New York City parks commissioner was a great advocate of recreational facility era. During his era, he influenced expansion in parks through mass production of park equipment, features and standardization (Gold Berger, 1981; Larrivee, 2011).

The recreational era was marked with emphasis on versatility of facilities and buildings within parks to maximize utility. There was significant transition from traditional park design philosophy, to a new era of artificiality. Park elements such as benches, fences and signs multiplied contrasting the natural layout of park space while highlighting the economic effect on park design. Two historical events shaped the recreational era namely: the Great Depression and World War II which crippled the United Nation's economy, reframed the services offered by parks and caused historic employment. They also stalled park development which later picked in the 1950's with multiplication of park quantities due to sharp increases in demand for park services. Even with continued growth of park quantities, the recreational era continued the Reform era tendency to maximize smaller plots of un-used space. Leisure time in the recreational era symbolized a reward for working hard with people demanding wider variation in services provided by parks unlike in the Reform Era where leisure represented unemployment (Gold Berger, 1981; Larrivee, 2011).

2.2.4 Open space system era (1965 – present)

The open System Era went beyond the role of recreation in urban parks to exhibitionist with allotment and shaping of potential uses of a space. During this Era, park designers identified a gap with the growing disparity in demand between urban and suburban residents. There was diminishing support on park investment that was not directly beneficial to a group of people. The response to a cultural shift was in a simple way to make parks part of the existing environment instead of changing the environment of the park. The era is characterized by flexible design with use of improved tools for rapid construction to shape urban parks into personal and malleable spaces (Gold Berger, 1981; Cranz, 1982; Larrivee, 2011; Loughran, 2018).

The Era recognizes a potential value for recreation to be anywhere while promoting a participatory role for citizens. Parks were inserted into the city landscape, utilizing vacant lots and street nooks. The era is greatly influenced by previous eras with significant evolution of park design and use of natural elements such as natural earth to

evoke pleasure ground intentions. For example, earth was mounded to shape typical park facilities such as playground equipment including building of slides on the earth mounds. By 1976, the growing art influence in Open System Era design led to the first artistic playground in United States of America (Larrivee, 2011).

2.2.5 Urban parks today

The evolution of urban parks displays a chronology of park space, activities, park use and the role of society in parks through time. It also demonstrates a critical role of service to the urban citizens. Through time, the demand of citizens and capabilities of park designers have changed. The history of urban parks and recreation services demonstrates a critical role of service to the urban citizens. The changing demands of the park user illustrate the complication of delivering a service across such a diverse population. Considering the diverse and important roles of parks to the community, understanding the relationship between park spatial characteristics (design) and park users is essential to optimal use of urban parks (Larrivee, 2011; Loughran, 2018).

The behavior of individuals in utilizing parks actively or passively is largely a function of spatial characteristics of the park itself. The characteristics of urban parks function as an influential factor in park use behaviour. Therefore, examining the relationship of the two is instrumental in identifying the deterrents to increased use of urban parks.

2.3 Sustainability Debate and Use of Urban Parks

This sub-section focuses on the environmental, socio-economic, physical, built conditions and the contexts of urban parks as they determine the sustainability levels of urban parks and its consequent park use.

2.3.1 The habitat II agenda

The 1996 Habitat II global agenda focused on improving the quality of life in human settlements. Livability in cities is enhanced by the availability of social amenities

including planned open spaces. Urban aesthetics, visual order and cultural characters are reflected in these spaces. The ability of such spaces to express community feelings distinguishes them as important factor for measuring quality of urban life. Planned open spaces are outdoor libraries to read the people, feel the community and identify the socio cultural values of city people. Open spaces in urban systems include parks, gardens and road/street side planting. Open space can be categorized in three levels: at the regional level, at city level and at neighborhood level. It is necessary to maintain appropriate areas of open space, have connectivity among open spaces and make these accessible to public at each level to maintain urban sustainability.

(a) The rio earth summit and agenda 21

Sustainable development formed the main agenda at the 1992 Rio Earth Summit that hosted more than 170 heads of states and 2,400 Non-Governmental Organization representatives. Environmental agenda took centre stage in their discussions with the attendees pushing on innovative ways to address pressing environmental concerns largely focused on the need for broad-based, environmentally-focused sustainable development (Njuguna, 2010).

The immense number of participants and journalists at the Summit further launched the concept of sustainable development into the public discourse and sparked the world's interest in environment and development issues. The summit which sought to find economic-based solutions to environmental problems ended up setting the agenda for examining the interconnections between human rights, population, health, social and economic development, and environmental sustainability.

The outcome of the Rio Earth Summit was the production of three major agreements (ratified by 108 governments) and two legally binding conventions substantiated the talks. The agreements included: Agenda 21, The Rio Declaration on Environment and Development, and the Statement of Forest Principles. The conventions included: The UN Framework Convention on Climate Change and the Convention on Biological

Diversity. As a way to support the implementation of these wide-ranging Sustainable Development goals and commit to the discussions of the Summit, the UN created three institutional bodies. These include: the UN Commission on Sustainable Development, the Interagency Committee on Sustainable Development; and the High-level Advisory Board on Sustainable Development.

Kenya is committed to implementation of Agenda 21 thus, this study helps in realizing Agenda 21, the UN blueprint for global sustainable development guidance that aims at creating sustainable cities and also advocates for sufficient human access to city's green open spaces. This will be achieved through advancement of recommendations towards environmental sustainability from the study findings which is a major contributor to utilization of urban parks.

(b) Sustainability and the urban park system

According to Ibes (2014), sustainability concerns the long term maximization, balance and maintenance of social-physical, economical and environmental aspects. He asserts that sustainable urbanism and sustainable development seek to enhance the social - physical, economic and environmental systems in cities and other developed regions. Previous studies demonstrate that healthy urban parks contribute to multiple dimensions of sustainability by providing diverse ecosystem benefits which promote park use. The rich ecosystems in urban parks lead to healthy urban parks which supports the sustainability agenda by discharging a wide range of benefits such as: biodiversity protection, recreational, environmental, economic, to social integration (Bedimo – Rung, Mowen & Cohen, 2005; Low et al., 2005; Andersson, Barthel & Ahrné, 2007; Faeth, Warren, Shochat & Marussich, 2005). However, as Ibes (2014) points out degraded, unequitable and undesirable urban parks can contradict sustainability efforts hence the need to understand better the functioning of these diverse and complex human – environment systems.

Low et al., (2009); Gobster (2001) state "a sustainable urban park system provides a variety of ecosystem services across an urbanized region, emphasizing particular benefits in the most appropriate park sites and locations and satisfying the various and shifting needs and preferences of diverse human and non-human life. Each park attracts a diverse populace of ages, genders, sex, ethnic and cultural groups through various modes of transportation such as walking, biking, private and public transportation. Thus, from a holistic perspective, a sustainable urban park system fosters social cohesion and interaction, supports biological and social diversity and functioning depending on convenience and geographical appropriateness (Talen, 1998; Mitchell, Astell-Burt, Richardson, 2011).

Literature on sustainable urban park system provides a platform for the study to examine urban parks in Nairobi as a whole so as to establish the varied functions and utilization of parks at different locations of the city. This assessment will be based on the notion that, not all parks in a system can, or should, support all possible social, ecological and economic goals and activities across all temporal and spatial scales (Adhya, Plowright & Stevens, 2010).

(c) Urban parks for sustainable development

The Brundland report (1987) defines sustainable development as the development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs. The principles of sustainable development necessitate that any development of land resources is firmed up after balancing ecological, social and economical functions to ensure a sustainable future. Urban sustainability can only be achieved by building the economic, environmental and social health of the city.

Open spaces play a critical role in creating 'urban sustainability', meaning the pursuit and maintenance of urban form that synthesizes land development and nature preservation. One of the obvious indicators of urban sustainable development is the

quality and quantity of green spaces in the city. Greening of the city, or green urbanism, appears to be an important design concept for the sustainable urban form and there is growing realization that urban green spaces are required for creating sustainable urban forms. Open Spaces enable numerous ecosystem services leading to social, environmental, aesthetic and economic benefits to the urban populace (Cranz & Boland, 2004). The two main characters of open space that affect urban sustainability are structure and pattern. Structure - are the Vertical characteristics of landscapes including plant species, habitat types, and ecological forms. Pattern- are the horizontal characteristics like spatial arrangement, size and connectivity of landscape habitat patches (Open spaces). This study intends to establish how the sustainability status of urban parks in Nairobi affects their use by examining the characteristics of each space.

2.3.2 Balancing sustainability goals for enhanced use of urban parks

Campell (1996) point out impossibilities in balancing the different dimensions of sustainability in every situation in parks since the enhancement of one dimension often degrades the other. Instead, they emphasize on tradeoffs between the social, economic and environmental dimensions of sustainability in planning. Ibes (2014) argues that parks with negative environmental impacts are still valuable if they fulfill social or political sustainability goals, as long as other parks emphasize more ecological objectives. Forsth and Musacchio (2005) acknowledged that not all parks can be all things to all species. In this view, park values depend on the park's context. However, he gives guidelines to balance the various sustainable dimensions in urban park systems namely: connectivity; diversity, addition of park facilities and amenities and access for both human and non-human lives.

Understanding the diversity in sustainability dimensions in different parks will help the study in understanding the different function of different parks and subsequent variations in use and diversity in users. Different park locations and contexts will lead to different park functions and diversity in populace patronizing the parks.

1. Spatial Characteristics and Sustainable Use of Urban Parks

(a) Environmental Characteristics

Park use and vegetation cover influence the biodiversity potential, ecological functioning and use of park spaces (Ibes 2014). The presence of vegetation cover such as trees, grass, flowers, forested and green areas enhance park use. Parks provide an escape from hot weather in cities promoting the use of urban parks as they act as lungs and breathing spaces in cities by offering comfort, relaxation, enjoyment and cooling effect due to the microclimate present in vegetated parks (Whyte, 1980; Kaczynski, Potwarka, Smale, & Havitz, 2009). On the other hand, parks dominated by hard surfaces and sparsely covered with vegetation may deter park use especially during hot seasons (Spronken – Smith & Oke 1998; Yu & Hien, 2006). The type of landscape also determines its level of sustainability and use as it dictates also their benefits and functioning. While indigenous and undisturbed landscapes within parks support native biodiversity, non- native landscapes support a more diverse biodiversity and are more productive.

The presence of both soft (green) and hard-surfaces in urban parks promote different yet complementary sustainability roles. For instance; Green urban parks contribute to relief from stress and depression and promotes physical activity (Isenberg & Quisenberry, 2002; Pretty et al., 2006). Other spatial characteristics such as Gray hardscapes in parks including plazas, benches and paths facilitate park use for walking, relaxation, watching of nature and social activities (Jacobs, 1961; Low et al., 2005).

(b) Physical Characteristics

Physical factors such as park size, recreational amenities and facilities influence sustainable park use as discussed below:

(i) Recreational amenities and facilities in parks

According to Low et al., (2005) more and diverse recreational facilities in parks result in increased physical participation, frequent visitation and prolonged durations in parks. He points out that diversity of recreational amenities support social and cultural sustainability by attracting a broad variety of users and preferences due to diverse presence of amenities. A diverse park is effective at supporting more frequent, vigorous physical activity and prolonged durations in the park (Whyte, 1980; Neal, Samuelson, Jacobs, Whyte & Lefebvre, 2010). Nowak and Heisler (2011) established that park features influence environmental sustainability by extending and increasing park use. For instance, they found that the presence of water features such as ponds and pools, swimming pools and fountains increase and extend park use particularly during hot seasons. The same features also balance and sustain biodiversity in parks and act as a buffer to seasonal variations by being a source of water and food to native and non – native species during dry spells (Faeth et al., 2005).

(ii) Park size and proximity

Park size and distance plays an important role towards urban sustainability due to the diverse yet complementary ecosystem services that they offer. The size and distance from the serving neighbourhoods determine the range of social and ecological benefits and services they offer to the users. Larger parks offer and support more ecological/environmental ecosystems such as plants and animals than small and isolated parks. Larger parks especially if more scenic increase visitation and participation rates than small parks (Giles – Corti, Broomhall, Knuiman, Collins, Douglas, Lange, & Donovan, 2005).

Parks facilitate their use especially the presence of large parks in hot arid areas since they are usually cooler than their surroundings and act as breathing spaces in the built environment. Small neighbourhood parks report increased visitation rates and provide services closer home hence serving important social and civic functions in the society such as enhancement of social ties, interaction with nature and participation in civic life (Jacobs, 1961). Proximity to parks by the high need, low income and vulnerable immediate population in the neighbourhood is a major concern in park use as previous studies indicated increased park use levels resulting from living within walking distances (Giles- Corti et al., 2005 and Wolch, Wilson, & Fehrenbach, 2005). According to Cohen et al., (2006) distance affects delivery of services by parks as distant parks even though they might be large and more scenic are less utilized by local residents compared to closer parks.

2.4 Greenness and Openess in Urban Development

2.4.1 The concept of urban open space planning

The knowledge about the roles of urban open spaces and parks is vital in the planning process. Maruani and Amit – Cohen (2007) classifies the functions of urban parks and urban open spaces into two major categories namely; recreational and other services such as psychological, educational, health, commercial and cultural. There are three types of open spaces for consideration in the planning process: Reserved land (parks, nature centers; Semi- reserved land (reservoir watershed, family estates, and golf courses); and non- reserved land for sale and development (Beatley, 1989).

Maruani and Amit – Cohen (2007), point out combating urban growth as the main goal for development of open space plans presenting two different planning approaches: The first approach is aimed at conservation and creation of open spaces as a way of reducing urban sprawl while the second approach focuses on a different value to the society. For instance, how open spaces responds to human demands, conservation, protection and preservation of natural values. The development of growth management plans presents

the other broad approach to open space planning with open space built in as a planning measure with an aim to plan for and reduce urban sprawl. Ahern (1995) calls for integration of development plans and open space plans for better results since development leads to loss of open spaces. They argue that a comprehensive process in planning is more productive as development is intertwined with open spaces.

However, Beatley (1989) considers that the benefits of growth to the community override the importance of open spaces as they have been viewed as an after- thought in planning. He argues that unplanned open spaces lead to reaction by land use planners due to increased community demands and changing lifestyles. The creation of growth management plans by cities is as a result of competing and growing market. This was echoed by Situma (1988); Chege (1992); Koskey (1998) who asserted that, the recreational and the aesthetic environment in Nairobi's urban open spaces continue to suffer, as more attention is on commercial and industrial enterprises. This creates anxiety and a cause to worry about the importance and the attention given to open spaces in the planning process and their responsiveness to human demands in the urban community.

The urban community is diverse hence the need to take into consideration the attributes of target population such as their demographic characteristics, density, preferences and ever changing lifestyles. Proximity to urban parks and other urban green spaces has been widely adopted as a key factor in constructing models to suggest the complex and dynamic processes of urban land use and landscape changes. However, the advantage of physical proximity to parks may be offset by the quality, diversity and size of the green spaces or by individual socio characteristics which include age, safety, income and cultural concerns (Gold, 1977; Cutt, Giles-Corti, Wood, Knuiman, & Burke, 2009; Chiesura, 2004).

According to Gold (1977), access to urban facilities such as urban parks influences people's attitudes for use and to quality of life, making it a key factor in contemporary urban planning. Alexander (2002) believes that the principles of modern planning

advocate for inclusive urban development and compact design. However, these principles differ from modernist design by acknowledging that planning practice should actively address people's needs and preferences, therefore requires that accessibility research be taken a notch higher beyond spatial dimensions of proximity measures to non-spatial dimensions (e.g social and psychological factors).

2.4.2 Accessibility in urban open space planning

Urban open space planning takes into consideration attributes of the target population such as: demographic variables, density, values and preferences. Wang, Mateo-Babiano and Brown (2013) analyses current open space planning models to identify key planning criteria utilized by these models to measure access to Urban Parks and open spaces. Maruani and Amit-Cohen (2007) identified three models which are as follows: Opportunistic model; Space standards model and; Park system model.

(a) Opportunistic model

The Opportunistic model refers to land acquisitions considered due to opportunities rather than system planning outcomes. Such opportunities may arise through: land donations; demolitions and transformation of recycling (Maruani & Amit-Cohen, 2007). In the world, examples of parks that have evolved based on this model include Central Park in New York City. In Kenya, perfect examples include Jeevanjee gardens donated by Jeevanjee. Nevertheless, the opportunistic model is hardly considered as a systematic planning tool because of lack of planning principles in the model and also opportunities are largely due to chance. Contemporary urban open space planning models are concerned with questions like how much, what type of and where open space should be provided. In addition, they reveal that quantitative parameters such as population size, spatial location and distance as the common measures utilized to determine open space access.

(b) Space standard model

The Space Standard Model has the provision of minimal amount of open space per capita for target population as its guiding principle. The model is guided by quantitative matching between open space units (such as size and number) and population size in target area. Simple operationalization of the model has led to its worldwide expansion since its introduction in the 19th century. However, Maruani and Amit-Cohen (2007), criticizes it because of its disregard of the complex social and environmental systems, a criticism addressed by the park system model.

(c) Park systems model

The Park Systems model addresses the disregards of the space standards model through promotion of the systems approach towards urban open space planning. The model holistically considers the interrelationship of parks and gardens that supports continuous movement within the system. Beyond quantitative standards, it also emphasizes proximity to users and the variety of user experiences in different types of urban open spaces, from small community gardens to large metropolitan parks (Maruani & Amit-Cohen, 2007). It is relevant in this study in the comparison of use of different parks in relation to the underlying spatial issues under review.

Generally the above review reveals that the three urban park planning models focus only on the spatial characteristics such as the area, type and location of parks. Further, it indicates the use of quantitative parameters such as distance, size, spatial and population as the most common measures to determine park access and use. However, this study finds under-provision in these models due to failure to consider other important parameters in regard to park access such as user perception and opinion as well as individual characteristics. The following table gives a summary of key variables addressed in urban open space models.

Table 2.1: A summary of key variables addressed in urban open space models

Urban Open Space Planning Models	Objectives	Open space variables	Population variables	Random or Planning
Opportunistic Model	Open space provision as a result of opportunities			Random model
Space Standards Model	Open space provision as units per capita of target areas	Open space size Open space number	Population size	Planning model
Parks System Model	Open space provision interrelated system	Open space size Open space type Connectivity	Population location Distance to users	Planning model

Source: Maruani and Amit-Cohen (2007)

2.4.3 Park development and design

The use of parks for recreation and other purposes dates to the middle ages when the settings for hospitals and monasteries were based in the natural environment with therapeutic recreational courtyards (Barnes & Marcus, 1999). However, this link between the natural environment and health has weakened gradually due to technological advancement which saw the manufacturing of new medicines a move which has prompted interest in both research and practice for the use of outdoor environment and its benefits (Wang et al., 2013).

The design of recreational urban parks came as a reaction to the challenges of the industrial city of the 19th century which resulted to rapid urban population growth with

poor living conditions characterized with overcrowding, poor sewerage, air population and disease outbreaks. To remedy the situation, Fredrick Law Olmsted, an early American Architect advocated for healthy and green cities with the restorative qualities of nature in USA and Great Britain while promoting open spaces, parks, trees, wider streets and light in their designs (Ulrich et al., 1984). Similar efforts to address the challenges of the industrial city were applied by Ebenezer Howard in the USA. In his book "*Garden Cities of Tomorrow",* Howard advocated for a city rich in parks and gardens. His ideas about the garden city combined natural benefits from the country side with the social benefits from the city (Hall, 2002).

Gehl (2003) observes that the green trends in USA and Europe gradually reached Scandinavia though different due to low population compared to USA and Great Britain which saw the preservation of nature as a resource within cities. In mid 1920's, Holger Blom, a forerunner in Swedish green structure planning and a park director in Stockholm pushed for the integration of parks and green spaces in the City's Master plan. He emphasized the importance of regulations and standards to avoid encroachment to parks and green spaces.

Jan Gehl, an influential Danish architect and urban designer contributed enormously in Scandinavia. In his book "*Life Between Buildings- Using Public Space"* Gehl talked about the relationship between Architecture and public life with keen interest on the human scale. He described the city in the 21st Century as the meeting place for social interaction (Gehl, 2006). Gehl promoted walking and use of bikes as opposed to the car through the city structure and the spaces between the buildings. He argued that the spaces and activities within them not only encouraged social interaction but also physical activity (Gehl, 2006).

Towards the end of the 21st Century, new concepts in urban planning evolved such as New Urbanism in addition to the early "green" trends developed in USA and Great Britain. According to Forsyth and Musacchio (2005), New Urbanism assumed both socially and ecologically friendly city, a strategy that promotes high density and

pedestrian friendly city with parks and tree- lined streets. Green Urbanism, a development of New Urbanism promoted highly ecological and sustainable cities.

2.5 Systems View of Urban Open Spaces

Motloch (2001) defines systems as "wholes" consisting of entities and relationships that function through the interrelatedness of their parts and exhibit existential properties independent of their parts. Understanding landscape systems (ecosystems) is based on these interrelationships. Systems theory provides a framework for understanding and describing the interactive conditions of human settlements within their environments as a set of interdependent relationships. Understanding of the system is possible when the set is considered as a unit: an assemblage of interrelated elements comprising a unified whole. Systems theory holds the promise of providing the unifying theoretical field to integrate knowledge of the way nature, and society as a part of it, organizes itself through ongoing feedback and response mechanisms. This approach is particularly important to design because it is based largely on pattern recognition and organization, a fundamental principle of design thinking (Gharajedaghi, 2006).

2.5.1 Placing urban parks in a wider context

The park system model approach began towards the end of the 19th century, whereby a system of open spaces interconnected throughout the city became popular way to connect city's parks. The approach most often used in urban settings, where interrelated parks and open spaces are connected through green trails is to allow for continuous movement through the city. Open spaces in urban systems include parks, gardens and road/street side planting. Open space can be categorized in three levels: at the regional level, at city level and at neighborhood level. It is necessary to maintain appropriate areas of open space, have connectivity among open spaces and make these accessible to public at each level to maintain urban sustainability. Streets, pedestrian zones, incidental urban places and even car park should form part of the strategic view of urban open space. Streets are particularly important element of the urban space matrix as they have a

vital function in providing connectivity and linking together different open spaces (French, 1973; Gold, 1973; Heckscher, 1977; Hill & Alterman, 1977; Maruani & Amit – Cohen, 2007).

This study considers the integration of individual urban park/or park spaces into such an overall system critical and depending on where they are located in relation to each other, and to the system as a whole, as they can be used differently to play different roles and to fulfill different functions. The concept of hierarchies of open spaces is connected to the idea of catchment areas since urban parks of different sizes and providing varied functions of either of a local, district or metropolitan significance are distributed throughout the city. On this basis, depending on the size of an open space and the facilities it provides, different groups of people are willing to travel different distances to visit it. Therefore, this study aims at taking this strategic view of urban open space as something which is continuous and indivisible.

The connectivity of urban open spaces is important for a number of reasons, all associated with their functions as they lead to biodiversity sustainability since they are linked to form larger corridors to allow for movement of both air masses and species. Similarly, from the point of view of the human users of urban spaces, linked and networked spaces make movement and access to individual open spaces safer and easier access through their being all connected to an overall network. According to structural considerations too, linked spaces are more effective in articulating the urban fabric and facilitating orientation. Connectivity is also seen to enhance potential (Heckscher, 1977; Hill & Alterman, 1977; Maruani & Amit – Cohen, 2007).

2.5.2 Spatial components of urban parks

This section analyses four key spatial components of urban parks that support physical activities there in as espoused by Bedimo – Rung et al. (2005) namely: Park activity areas, park supporting areas, overall park environment and the surrounding neighbourhood.

(a) Park activity areas

Activity areas are the sections, zones, or opportunity areas within a park that are specifically designed or commonly used for physical activity. They can include sports fields and courts, swimming pools, paths or trails, playgrounds, open green spaces, or other areas where physical activity occurs.

(b) Park supporting areas

These areas include those facilities and equipments that make physical activity in parks attractive and safe to a variety of users. They contain features that may not directly promote physical activity but are nonetheless an integral part of the park visitation experience, such as community buildings, shelters, restroom/changing facilities, picnic areas, parking lots, and so on. These areas may be correlates of frequent park use, how long people stay at parks, and how active people are within the park environment.

(c) Overall park environment

Because a park is more than just the sum of its parts, it is necessary to consider the overall impression and meaning ascribed to the park as a whole. Certain park characteristics, such as aesthetic appeal, size, and diversity of programs, are not limited to specific areas of the park and must be considered as applying to the overall park. Other examples of characteristics that could be collected in the overall park category include overall park usage and accessibility to the park.

(d) Surrounding neighbourhood

Conditions in the park's surrounding neighborhood are likely to have a strong influence on how a park is used. A variety of neighborhood characteristics across several domains are likely to have an effect on how people perceive and use a park, including traffic (access), blighted or abandoned housing (aesthetics), crime (safety), and resident demographics.

2.5.3 Contextual characteristics and park use

The park's surrounding conditions are likely to greatly influence how a park is perceived and used. Context is important in providing a sense of territoriality to people, because context provides symbols that can influence the sense of territoriality and meaning (Rishbeth, 2001).

Diverse characteristics such as: Neighbourhood size, attributes, urban form and contextual land uses are key characteristics that affect people's perception and park use (Baran, Perver, Daniel, Rodríguez, Asad, Khattak, 2008; Rung et al., 2005). Bedimo Rung (2005) emphasizes the importance of analyzing the contextual park conditions since people must cross through the surrounding neighbourhood in order to enter the park. Baran et al. (2008) highlights important neighbourhood social attributes for consideration while assessing park use and neighbourhood. They include: the resident demographics such as the total population, age, gender, poverty levels, racial heterogeneity, ethnic composition and safety. Baran used census block data to calculate the total population and population by age and gender in neighbourhoods in his study to examine individual social and urban form factors in park use among youth and adults. Neighbourhood form can be measured by two indicators such as pedestrian infrastructure and street network pattern (connectivity) which measures the degree of neighbourhood accessibility a contributing factor to overall neighbourhood walkability.

Forsyth et al., (2010) measured pedestrian infrastructure by the sum of sidewalk length in the parks. Street network pattern was measured by the number of vehicular street intersections with more than two branches and the number of cul-de- sacs contained in the park's neighbourhood. The surrounding land uses also plays an important role in park use. Land uses such as the type of housing for instance low – housing density; medium and high housing densities determine the intensity and patterns of park use. Therefore this study sets to understand the surrounding unit space context and how it affects park use.

2.6 Utilization of Urban Parks

Urban parks are of a great importance for the quality of life of increasingly urbanized society. Previous studies on benefits of urban parks indicate that their presence and their components such as trees and water in the urban context contribute to the quality of life in many ways. Besides important environmental benefits such as environmental preservation, air and water purification, wind and noise filtering, temperature moderation or microclimate stabilization, urban parks also provide physical, psychological, social and economic benefits which are of crucial significance for the livability of modern cities and the well being of urban dwellers.

As reported by Bedimo et al. (2005), previous studies have explored the role of park use in enhancing a sense of human wellness. He reports that physical engagement in parks may lead to enhanced physical wellness. Evidence shows that access to parks, increases frequency of exercise. In a study published by the Centers for Disease Control and Prevention (CDCP) in the year 2002, creation of or enhanced access to places for physical activity leads to increase in the percentage of people exercising hence improved health (Paul, 2006). Other findings of a study on the impact of urban parks on surgical patients in US in 1996, found that people engaging in regular physical activity benefited from reduced risk of premature death and improved physical functioning in persons suffering from poor health; reduced risk of coronary heart disease, hypertension, colon cancer, and non-insulin-dependent diabetes; improved maintenance of muscle strength, joint structure, and joint function; weight loss and favorable redistribution of body fat; improved physical functioning in persons suffering from poor health; and healthier cardiovascular, respiratory, and endocrine systems (Paul, 2006).

Park use and experience have also been found to produce important psychological benefits as it relieves symptoms of depression and anxiety, improve moods, enhance contemplativeness, rejuvenate the city dweller, and provide a sense of peacefulness and tranquility (Ulrich, 1981; Kaplan, 1983). Other findings referenced to Ulrich (1984) indicates quick recovery to patients with direct eye contact with trees and nature through

their windows than those whose views where restricted to buildings. Contemporary studies on use of parks with vegetation and water confirms about stress reduction and mental health (Hartig, Mang, & Evans, 1991; Godbey, Geoffrey, Alan & Stephen, 1992; Schroeder, 1991).

Besides physical and psychological benefits urban parks have social benefits as they encourage use of outdoor spaces hence increasing social integration, interaction and development of social ties among communities. Kuo, Bacaioca, and Sullivan (1998) found that the components of urban parks i.e vegetation and water helps the park users to relax, renew and reduce aggression.

In addition, urban parks have reported great economic value for both municipalities and citizens. For example, air purification by trees, can lead to reduced costs of pollution reduction and prevention measures while the aesthetic, historical and recreational values of urban parks increase the attractiveness of the city and promote it as tourist destination, thus generating employment and revenues. Components of urban parks such as trees or water increase property values, and therefore tax revenues as well (Tagtow, 1990; Luttik, 2000). However, Melbourne Parks (1983); Grahn (1985); Bixler and Floyd (1997) reports a negative role of parks on people's perceptions. They point out that some surveys have reported residents' feelings of insecurity associated with vandalism, and fear of crime in deserted places.

2.7 Determinants of Park Use

Outdoor places can be referred to as qualified if they are easy to access and view; are esthetically attractive; provide diverse activities that meet the users' expectations; are safe, secure and naturally rich and well maintained. There are four key qualities of a successful space: the space is accessible; engagement in activities by users; comfort and good image; a sociable place where people meet each other and take people when they are visiting(Marcus and Francis (1998). Kent and Madden (1998) advocated for "a successful" urban park beyond physical and community qualities. They assert: "if urban

parks can evolve from their primary recreational role, into a new role as a catalyst for the community development and enhancement, parks will be an essential component in transforming and enriching our cities". Most important of all is sociability; the park should be a place to meet other people, which is an integral part of community life.

This study classifies the factors affecting the use of urban parks as follows; Location and neighbouhood context, physical characteristics, design and quality, User characteristics, Accessibility; Facilities and Activities, Park features, Measures of comfort, Perceptions, Comfort and image.

2.7.1 User characteristics and preferences

As observed by Garcia – Ramon, Ortiz and Prats (2004), the performance of public spaces should be assessed by measuring both the number of male and female users and the diversity of the people who use it, as well as the variety of activities and interrelations taking place within them. Massam (1975) points out that a number of individual level (user) characteristic can influence the use of urban parks. Bedimo – Rung et al. (2005) observes significant differences in park and outdoor recreation behavior based on demographic, socio- economic and regional characteristics such as age, gender, race/ethnicity, socio-economic status, residential and location. In his study on "The significance of parks to physical activity and public health" Bedimo established that the inner-city and poor population are much less likely to report participation in outdoor recreation activities than other metropolitan and non-metropolitan residents. Previous studies reveals that older adults, racial/ethnic minorities, females and lower income families are likely to be infrequent or non-users of parks.

Different demographic groups have varying priorities of how and what they hope to do in an urban park. For example, a study by Loukaitou-Sideris (1995) in Los Angeles to investigate cultural differentiation in the use of urban parks found that Latino users visited parks frequently and in large family groups, and often used the park for celebrations of birthdays, engagements, holidays and picnics (Loukaitou-Sideris, 1995).

He further found that “unlike other racial groups observed, Latino users actively appropriated park space, with items brought from home including steamers, balloons and blankets which help define and claim territory.

2.7.2 Park physical characteristics

The physical characteristics of a park such as: design, size and natural features are an important determinant in their usage. The level of satisfaction with reference to park design depends on the diversity of activities, comfort, sociability levels and park maintenance. Beatley, (1989) explains how design of a place affects people’s preferences by discussing seven key issues: permeability, variety, legibility, robustness, richness, visual appropriateness and personalization. They highlighted that a successful design should consider where users can go or cannot go, to what extent the opportunities provided are understood. Previous studies on Dutch landscapes and Swedish parks by Coeterier (1996) and Grahn (1991) respectively presented eight park characteristics that affect user satisfaction namely: unity, use, naturalness, spatiality, and development, sport oriented activities, variety of species and play inspiring. Jacobs (1967) emphasized the designer’s understanding of the user’s needs and requirements as the basics for successful designs of urban spaces. She stressed about safety and accessibility to urban spaces by all social groups in all hours of the day. Jacobs considered the influence of people’s presence in urban spaces on social security and safety. She expressed that safety in urban spaces can be controlled through spatial enclosure, physical organization, increased densification, mixture and efficiency of uses.

2.7.3 Park facilities, elements and maintenance

Spatial equipment and maintenance are other important factors that influence the utilization of a park. Marcus and Francis (1998) found out that the elements used in park organization influences the design of a place and that their ability to satisfy the user’s need can be used as criteria to support outdoor activities in urban parks hence their classification as qualified places. The arrangement of both living and non-living features

in a park increases their functionality, visual quality and esthetics hence increased park use. Such features include: pedestrian walkways, lighting fixtures, pavements, steps, litter bins, monuments and sculptures and vegetation. Plants play a key role in place design and enhance the visual effect and emphasis of the place. Marcus and Francis (1998) established that plants enhance parks in terms of their shape, colour and pattern, shaping spaces and dividing them into parts and enhance the microclimatic effect. Inclusion of natural properties in design such as trees, gardens, water elements and botanical landscapes increases park experiences positively. Trancik (1986) outlines five qualities necessary to overcome urban design problems which include progression of movement, enclosure of spaces, continuity of edges, axis, perspectives control and connecting outside and inside spaces. Lynch (1981) established six main factors to promote the quality of urban design. These factors include livability, meaning, compatibility, access, control and surveillance. There are ten most important qualities of urban design such as hierarchy, scale, harmony, enclosure, materials, decorations, art, signs, symptoms and caring about local community (Lynch, 1981).

2.7.4 Park size and activities

The size of a park also dictates how it is used, with greater parks being associated with more use and benefits since large spaces are more likely to be used for physical activity while smaller spaces are mostly used for activities such as socialization (Mitchell et al. 2011; Peschardt, Schipperijn & Stigsdotter, 2012). Utilization demands for green spaces that are of different characteristics may differ based on their size and the facilities there in. Herzele and Wiedemann (2003) observes that while a public space is occupied for recreational purposes during the weekends, the smaller scale parks of the city are influential in enhancing social ties. The diversity of activities influences utilization of parks. Preference for parks and other open spaces increases with increase in the diversity of physical and social activities (Olmstead, 1999; Francis, 2003).

Parks can be grouped parks into two broad categories in terms of intended occupancy namely: active and passive areas with user satisfaction level increasing through involvement in active and passive experiences. Bedimo-Rung et al. (2005) ranked physical activities into three intensity levels, sedentary, moderate and vigorous. A park can considered as a visual resource for passive activities and experiences that promote socialization in parks hence promoting sedentary behavior besides physical activities. Therefore, it is important that park designers consider passive recreational purposes in their design to enable users to watch nature and get fresh air alongside other active recreational purposes such as sport activities and play grounds.

2.7.5 Accessibility and linkage

A good place is easily accessible and easy to see since people want to see whether there is something to entice them to enter. According to Project for Public Spaces (2000) accessibility is a key factor for successful public spaces. This includes equal access for people of all abilities and walkability to and from the space with sidewalks and pedestrian cross walks. Access to urban parks increases the variety of physical activities in urban societies and park use. Connectedness of the park and surrounding area also affects levels of accessibility. Fences or barriers between the park and surrounding neighborhood are elements to consider as well as the potential impact on ease of user movement to and from the space. Visual access is important to consider as well since adequate visibility encourages activity, reduces the uneasy feeling that the park is obscured from the neighborhood, and creates a sense of safety.

Several studies have investigated the role of accessibility in the use of public spaces. Tabassum and Sharmim (2013) evaluated accessibility to parks as criteria to measure their benefits. They observed that parks can increase in use, improve social cohesion and interaction if properly more accessible and connected with their surrounding as more people patronize them. In his study to analyse accessibility of parks at the planned and unplanned urban neighbourhoods of Dhaka, Saniya established that planned parks were more accessible and responsive than the unplanned due to good connectivity and clarity

of movement routes. Abubakar and Aina (2006) reported increased access and use of public facilities as a result of planning. Studies on the relationship between park use and proximity based accessibility including distance from home and travel time suggested a significant association between physical distance/proximity and actual park use (Haq, 2011; Rosso, Auchincloss & Michael, 2011; Cohen et al., 2007; Wolff & Fitzhugh, 2011). According to these studies, the persons living in close proximity to green spaces are more likely to use them more frequently. Rosso et al., 2011 reveals that 0.5 Km or 5 minutes' walking time as the optimal distance. The ease of accessibility also determines use of parks such as the presence of circulation paths, cycle paths and less conflict points or obstruction in movement within the space. A survey by Schipperrijn, Ekholm and Stigsdotter (2010) of the use of green space in Odense, Denmark revealed that 46% of the respondents did not use the space closest to them. The study also established that poor health and accompaniment to the park by children less than 6 years of age or having a dog made people utilize the space closest to them.

2.7.6 Park features

Qualities and characteristics of parks are also important factors to consider on the use of parks. Gehl and Gemzoe (2001) pointed out that though parks may be lovely on their own, it is the people that make them a place. The presence of other people, activities, events, inspiration and stimulation comprise one of the most important qualities of public spaces altogether. According to Bedimo-Rung (2005), the physical components or on – site characteristics constitute some of the major park characteristics that influence park use. He argues that the presence or absence of a variety of attributes can be an important determinant of park's ability to promote park use and more specifically engagement in physical activities in the park. Bedimo-Rung (2005) identified park features such as facilities, programs and diversity as contributing factors to park quality. Such facilities refer to the physical facilities available in parks for use such as tennis courts, picnic tables or security lighting. Corti (1996) in his study to investigate the factors influencing use of local parks in Australia identified the availability of amenities such as swings and barbecue as among the key factors influencing park use. In addition,

he found out that variety in recreational programs or organized activities in parks to influence use. Diversity in parks, a concept that comprises the mix of park facilities, programs, users and location is a key determinant of park use. Jacobs (1993) indicates that a park with diversity is one that is used for a variety of purposes at different times of the day, week, and year. Previous studies have reported the presence of environmental features and users' subjective awareness of park features as important factors influencing behavior change in parks (Seaman, 2010 and Schipperijn et al., 2010).

2.7.7 Perceptions

Other important features influencing park use include perceptions of environmental hygiene, security and safety. Public open spaces in decline can be associated with unpleasant activities such as crime, vandalism and homelessness which may deter key user groups especially children, women and the elderly (Andrew, Hannah & Jason, 2015). A study in Australia to investigate the relationship between attributes of public open spaces and mental health found out that the quality of the space more important than the quantity. The study attributed the quality of public space to the availability of park features such as of walking paths, shade, water features, well maintained lawns, lighting, playgrounds and type of roads in the vicinity. The study also established different requirements of public open spaces by different types of user groups. For instance, while some find water features attractive and calming, parents may see them as safety hazards to their children (Andrew et al., 2015).

2.7.8 Safety

As an element of comfort and sustainable use of a space, the ability of a user to enjoy the space to its fullest extent relies on its actual and perceived safety. Bedimo –Rung (2005) refers safety as personal security of park users and an important barrier to park use. Perceived safety refers to people's perceptions and feelings of safety, while objective safety refers to actual incidents of crime. Even in well–designed public parks, feeling unsafe leads to fear, this discourages park use. The perception of an unsafe area is a

frequent deterrent of park use. Though most dependent on urban parks women, children and the elderly display the greatest levels of insecurity in parks. For a successful urban park and to invite a variety of users it must be planned, designed and managed to be a safe space for outdoor use and feeling safe. Approaches to minimizing opportunities for crime and to help park users feel less vulnerable include design changes, increased maintenance levels, provision of security patrols and emergency telephones, and introduction of new activities to generate greater levels of use (Bedimo –Rung et al., 2005).

2.7.9 Comfort and image

For an open space to be well used, it needs to be comfortable with good details that create interest. Francis (2003) argues that, for a place to be satisfying, it requires some degree of comfort without which it becomes difficult for users to have their needs met. A comfortable park includes safety measures such as bulletin boards, seating, lighting, quality designs that minimize accidents and prevent unwelcome behaviours such as crime and vandalism. Whyte (1980) talks about the importance of movable seating highlighting the tremendous transformation of Bryant Park in New York from a drug infested public space to a popular mid town haven through movable chairs.

Diversity in spaces available in the park that accommodate different activities both active and passive, well maintained lawns with shade trees contribute towards comfort in a park. Whyte (1980) argues that sun is a major factor in the use of public spaces and that relief from sun or access to sun enhances comfort in parks. Comfort is also in the form of accessibility within the space, including physical access for special needs of children, elderly and the disabled.

2.8 Predictions and Projections of Park Use

This section presents some relevant previous studies in this area which have a close link to the problem under investigation. Studies reviewed are geared towards giving projections on factors affecting park use and methodologies used to access park use.

2.8.1 Use and under – use of parks

Jane Jacob (1966/1992) in her thesis entitled 'The uses of neighbourhood parks' raised the phenomenon of non-use or under-use noting that successful neighbourhood parks complement the activity patterns of people living or and /or working in immediately adjacent built-up areas and that the absence of such complementarity results in parks which are utilized or under-utilized and tend to be neglected represent negative rather than positive features of the city.

Gold (1972) cited the idea of a non-use syndrome. He underscored that non-use of parks by large proportions of the community resulted in a pattern of under-use of many parks in his later version entitled 'Neighbourhood Parks' (Gold, 1977). According to Gold, "Under-Use" implies that there is a particular level below which the use of a park is deemed to be no longer 'normal' or 'acceptable'. Based on the analysis of neighbourhood parks in Illinois, Michigan and Californina conducted by Gold in the 1960s and early 1970s based on his observations and a review of quantitative and qualitative research by others, Gold drew three main conclusions: that the under-use of individual neighbourhood parks was widespread; that neighbourhood parks were used by only a small minority of the population ; and that part of the explanation for the non-use of neighbourhood parks was that many of them no longer met the needs of the urban resident.

Gold (1980) in his text book entitled ‘Recreation, Planning and Design’ stated that ‘Most urban parks are under-utilized or un used by a majority of the population they were intended to serve. Veal (2006) states that a review of existing literature on the use of parks indicates evidence to relatively little use or a decrease in use of some urban parks, and that only a fraction of the potential users in a given service area regularly use neighbourhood or community public parks. Bangs and Mahler (1970) reported a lack of use by the adolescent and adult population.

On measuring park usage levels, Veal (2006) states that judging a park to be ‘under-utilized’ would require a systemic approach to measuring use levels in relation to physical capacity or optimum use levels. A study of 61 parks in greater Melbourne conducted by the Melbourne and Metropolitan Board of works in 1982 presented data on the total number of visitors present at peak hours and at off-peak times. Besides, the study offered alternative ways of measuring and assessing use levels, including the use of the concept of **‘**visitor-hours’, based on hourly counts of park visitors throughout the day, and comparison between parks (Boyle & Stranchan, 1983). The number of visitor-hours accommodated by a park may be more or less than the total number of visits, depending on the average length of stay but the number of visitor- hours is a valid measure in its own right and therefore gives a very different impression of the level of park usage from a peak hour count only Veal (2006). In the Melbourne’s study, it was 20 times the number of peak-period visits. Data were presented as follows;

Table 2.2: Melbourne small parks, visit levels, 1983-Use of observations at 'peak' and 'non-peak' periods to estimate park usage.

S/No	Period	Average number of Visitors present	
	Peak hour count	Total	Per park
1)	Peak period: Weekend day, 1-4 p.m	783	13
2)	Off- peak period:Weekdays,1 hour period-(Mid-morning or Afternoon)	60-70	1
	Visitor – hours		
3)	Peak period: Weekend: all day total	4993	82
4)	Off- peak period: All day total	1226	20
	Weekly total	16,000	262

Data source: Boyle and Stranchan, 1983

In addition to the issue of just how to measure usage levels and the possibility of comparing one park with another, a question arises as to whether levels of a park might be assessed against some measure of its capacity such as environmental capacity where wear and tear suggests over-use. Bowler and Strachan (1976) suggests two alternatives to the use of capacity for evaluating use levels assessments in terms of visits per square metre and financial /economic measures. Assessment on the basis of visits per square metre would be an improvement on visit numbers alone. They used this approach in their observational study of parks in Leicester, UK. Gedikli and Ozbilen (2004) devised an algorithm to prescribe the capacity of neighbourhood parks on the basis of 0.4 square metres per individual user and corresponding areas for groups of users.

However, rather than making judgments concerning the absolute level of use of parks, Bowler and Strachan (1976) compared levels of use between parks and between various functional areas within parks. This approach is valuable in providing guidance on how design and layout affects use levels. Another method of assessing levels of use according to Veal (2006) is on the basis of costs per visit which enables park costs to be compared with cost per visit in other leisure facilities. Veal states that high costs per visit in particular parks could be associated with low visit numbers or with higher than average levels of expenditure designed to achieve high quality. Cost- benefit analysis as an assessment to the levels of park use takes account of all benefits produced by a park and all the associated costs. An alternative, and more common, approach to measuring the community's level of use of a park is the use of questionnaire- based surveys to interview residents and ask them about their use levels over a specified period of time namely the week, month or year prior to interview. Drawing on Roberts (2006); Torkildsen (2005); Veal (2006) asserts that recreational facilities as whole fail the test of equity or the test of social inclusion particularly those facilities that are under-utilised by disadvantaged members of the community.

Veal (2006) studied the use of urban parks in Sidney while examining the existing research in their levels of use and their equity. He focused his study on two themes namely; the non-use and decline. In his research, Veal reviewed the historical development of urban parks in the 19th to the early 20th century and identified a research gap of an evidence of overlooking of parks in research leisure studies of parks. He noted that majority of previous studies focused most entirely on sports, arts and recreation but failed to make a mention of urban parks.

Veal points out that the typical measure for urban parks are the overall level of use and the extent to which the facility serves all sections of the community or at least providing target groups the test of equity. His review established that the outcome of studies on the significance of urban parks presented a paradox that it might be reasonable to assume that policy makers, planners, designers and public would expect them to attract appropriately high levels of use and to serve a wide cross -section of the community. But

the neglect of accessibility and utilization patterns in academic discussions of urban park usage seemingly imply that it is not a significant component of urban park usage.

2.8.2 Park accessibility, configuration and use

Stahle (2005) in his study to measure the frequency of accessibility in urban parks, found out that the spaces will not only be visited more frequently, but will also get popular and utilized more due to increased legibility and their strategic location within the people's daily movement patterns. The study also establishes that accessibility of urban parks can be measured using Space syntax or GIS Network Analysis Technique. It was revealed that the efficiency of urban parks lies largely in its overall structure and in its function in relation to both the entire territorial context in which it is inserted, and to the envisaged users. Jiang et al. (2000) looks into the relationship between connectivity and use of urban space. He believes that space syntax provides a configurational description of an urban structure and attempts to explain human behaviours and social activities from spatial configuration point of view. The spatial configuration plays a principal role for the pedestrian mobility (Hillier, Penn, Hanson, Grajewski & Xu, 1993).

A study by Tabassum and Sharmim (2013) on accessibility analysis of parks in the old (unplanned) and new (planned) urban neighbourhoods of the city of Dhaka in Bangladesh underscores attributes such as location, road network, design quality, surrounding context, facilities and activities. The study revealed a relationship between the location of parks, the position and condition of roads on accessibility of parks. Further, it revealed that the position or location of nearby main road to a park influences accessibility, connectivity and the type of users. In the planned city, the study established that parks are easily accessible due to regular road layouts which are properly networked as a result of proper land subdivision and infrastructure. Enhanced visual and physical connectivity was found to attract a diverse category of park users at different times of the day. Efficient movement was reported as a result of clean roads with less traffic jams. Entry points to the parks were also found clear hence increased

access and use. In the old unplanned city of Dhaka, the study recorded reduced park use response levels attributed to a decline in accessibility conditions attributed to unplanned and poor vehicular maintenance, pedestrian layout, poor road networks as well as poor visual connectivity.

Moreover, Tabassum and Sharmim (2013) found a link between the adjacent neighbourhood context and the intensity and patterns of park use. The study reported a direct relationship between the adjacent neighbourhood characteristics and the category of park users, their origin, time and duration of use and the type of activity engaged in. In the planned city, the adjacent neighbourhood context was found to attract a wide category of park users who would visit at different times and for a longer duration. In the unplanned city, the study reported a highly stratified neighbourhood with a resultant broad category of park users. However, the presence of a particular category of park users was found to deter specific categories of park user from participation. It was established that the presence of street vendors and hawkers in parks of the unplanned city made the park unsuitable for use by children and students all the day long.

The study also reported a direct relationship between design quality and park use (intensity and patterns of use), type of activities engaged in and category of users. In the planned city, quality design in the parks was found to increase their responsiveness, attracting different age sets for diverse activities and for a prolonged duration. This was attributed to enhanced accessibility as a result of adequate walkways, a wide variety of facilities and amenities that were found to offer a wide variety of opportunities. Contrary, some parks in the unplanned city recorded low park response despite quality design. This was linked to poor environmental conditions (Tabassum & Sharmim, 2013)

In addition, a relationship between the level of participation and activities, location, social structure and category of park user was revealed. In the planned area, the study recorded the presence of active recreational activities as opposed to passive. Low patronage and participation by children was reported due to the social structure of high-class residential areas that do not allow children to play in the park rather encourage

indoor play facilities despite the better location and good maintenance. The unplanned area recorded comparatively better socialization with more passive activities as opposed to active activities in the planned area. Most parks were found to be mostly used by vendors, beggars or street people for sleeping and resting. The social conservative pattern, location and poor maintenance yielded to low participation by female park users (Tabassum & Sharmim, 2013).

Karimi (2012) applied space syntax in a study of a configurational approach to analytical urban design. He argued that since urban design is manifested in a spatial entity, urban design process can only be enhanced effectively by analytical methods that are spatial in nature. He points out that; the analysis of spaces could bridge between space and ultimate design user; any analytical approach for use in design has to be a spatial one since urban design is about creating and shaping spaces; a spatial analytical approach should be able to directly link space with users ; such analytical approach should be capable of dealing with different scales ranging from an urban room to a public space, a neighbourhood to a district and an entire city or a region and; such a spatial analytic approach should be able to investigate a system as a whole or its parts.

Abubakar and Aina (2006) used GIS and Space Syntax methodologies in a study to analyse accessibility to urban green areas in Doha District of Damman Metropolitan area. They used accessibility as a spatial analytic measure to usability of public facilities. GIS Network Analysis Techniques were applied to measure the distance between the green spaces and the neighbourhoods they serve while Space syntax was used to evaluate the spatial configuration of the green space spaces. Syntactic analysis indicated that some junctions have higher accessibility values than others and that location of facilities has a direct relationship with accessibility and consequently use. Location and distance of the facility versus the adjacent neighbourhood was found to influence the attractiveness hence accessibility levels and use. Results also revealed that planned modern settlements provide more accessible public facilities hence increased use. Other factors of importance that the study considered to influence accessibility and use of

public facilities included the population density of the various neighbourhoods in the study area and adjacent public facilities (Abubakar & Aina, 2006).

Moreover, another study to improve pedestrian accessibility to public space through Space syntax by Reuben (2012) focused on the following key ideas: accessibility based on the location; distance; cost and time to access the facility and spatial configuration based on the degree of integration or segregation. Methodologies applied included Street Network Analysis and Location Analysis. Street Network Analysis was applied based on space and time. This was made to identify and show the service areas based on their properties that define the accessibility. It was also used to measure the level of integration, visibility and connectivity based on diversity of public spaces and capacity to offer accessibility. The method considered all streets to be at the same level in terms of space and time, measurements and constitute routes of accessibility. On the other hand, location Analysis considered different scales of the spatial structure of the city, from neighbourhood to city scale. As established by Ballaster- Olmos and Morata (2001), accessibility coverage maps were produced showing the maximum distance of service for each type of public spaces. The study coverage maps presented two scenarios; the first type showed lack of accessibility as caused by morphogenesis of the city while the second made evident that accessibility is restricted into a part of the city leaving the rest of the city without access. In terms of spatial configuration, the study recommends location of public spaces, with maximum accessibility coverage and a location surrounded by pedestrian mobility routes. This aimed at promoting use of public spaces by providing more accessibility. In terms of connectivity, the study recommends that the highest values of connectivity to gives form to the city. These provided a large number of possible decisions about selection of routes in the pedestrian movement. The study also revealed that axes with highest integration values of spatial configuration are most accessible and that by applying the global measures to the spatial configuration of Granada city the highest values of global integration are located in the city center (Talavera-Garcia, 2012).

2.8.3 Park attributes, physical activity and use

A desk review on the significance of physical activity and public health by Bedimo – Rung et al. (2005) proposed a framework describing the correlates of park use in two categories of groups: characteristics of potential park users and park characteristics (structural). The framework also gave an illustration on the extent and nature of park use as indicated by park visitation and physical activity within the park. The study indicates that park visitation considers individuals who visit the park regardless of the type of activities they pursue once there. Physical activity describes the level of activity they engages in be it sedentary, moderate or vigorous. Finally, the framework illustrated the various types of outcomes (or benefits) resulting from park usage ranging from physical, psychological, social, economic to environmental benefits (Bedimo – Rung et al., 2005).

Despite the study demonstrating a continuous growth in the prevalence of park visitation and use, it was established that certain populations are less likely to use parks. Study findings indicate that the extent and intensity of park use depends upon a variety of demographic, socio-economic and regional characteristics. It was revealed that, inner – city and poor populations are much less likely to report in park visitation and activity participation than other metropolitan and non-metropolitan residents. Other groups such as older, racial and ethnic minorities and females are more likely to be infrequent or non-users of parks. In addition, the study identified the following park utilization constraints and barriers; lack of time, money, information about parks, personal health, transportation, accessibility, safety concerns, maintenance, park facilities and park companionship (Bedimo – Rung et al., 2005).

In a study of barriers to urban park use, Scott and Jackson (1996) found that the most preferred barrier- reduction strategies were; making parks safer, providing more information about parks, providing more park activities and building parks closer to home. However, the influence of spatial characteristics on park use has remained unexplored.

The study considered four components namely; frequency of leisure, time or duration, type of leisure and the intensity of use. Data for the above mentioned categories was to be collected within specific geographical areas in or around the park including; activity areas, supporting area, the overall park and the surrounding neighbourhood. Park activity areas were considered in assessing the intensity and extent of park use. These areas designed or commonly used for physical activity such as swimming pools, paths or trails, playgrounds and open green spaces. The study considered Park supporting areas as correlates of frequent park use, how long people stay at the parks and how active people are within the park environment. These areas are the integral part of the park and include; community buildings, shelters, restrooms/changing facilities, picnic areas and parking lots. The overall park environment was considered to give an overall impression and meaning ascribed to the park as a whole. Characteristics considered by the study includes; aesthetic appeal, size, and diversity of programs, overall park usage and accessibility to the park. In addition, the surrounding neighbourhood was assessed since people cross through it in order to enter the park and that conditions in the park's surrounding neighbourhood are likely to have a strong influence on how a park is used. Characteristics assessed include; traffic (access), blighted or abandoned housing (aesthetic), crime (safety) and residential demographics. In data collection, the study considered the following six conceptual areas as the basis for assessing park environmental and policy characteristics in their relationships to park use levels; Features, condition, access, aesthetics, safety and policies (Bedimo – Rung et al., 2005; Scott & Jackson, 1996).

McCormack, Rock, Toohey, and Hignell (2010) study on the characteristics of urban parks associated park use with physical activity. The study found relationships between park attributes and use. It also suggested that accessibility of parks was important for encouraging physical activity in most but not all cases. It was revealed that park qualities are important for encouraging physical activity. These results are in keeping with findings by (Giles – Corti et al., 2005; Ries et al., 2009; Shores & West, 2008). On the other hand, Bedimo-Rung et al. (2005) revealed that park use reflected park attributes

with regard to park features, condition, accessibility, aesthetics and safety. The study revealed that physical condition of the environment can act to encourage, either permitted or prohibited behaviours. He added, that poorly maintained park environments may discourage general usage but encourage usage by people who commit minor incivilities. According to Powell, Martin and Chowdhury (2003) poor maintenance is likely to affects negatively the overall perception of park quality (aesthetics and perceptions of safety and functionality). Variety of amenities was found to support a wider range of users while provision of other park support amenities such as washrooms and water fountains was found to prolong park use. The study also established that some parks were most patronized due to some specific attributes they offer. Study findings indicated the importance of social connectedness and interaction among various park user categories. Park use by a friend, park quality and proximity were associated with park use (Ries et al., 2008).

In a study of urban parks and walking, Yujia and Perver (2013) applied space syntax theory to address concerns which are as a result of complex natural elements in an urban park. Such complexities include unclear boundary definition, visual connection and continuity in park elements. They pointed out that in Architectural spaces boundaries between spaces are defined by walls and permeability between them is controlled by doors. However, in urban parks, spaces have a large degree of permeability and adjacent spaces tend to have direct special connections. The study proposes that boundaries between spaces are interpreted based on space function and design intensions. According to Yujia and Perver (2013), the theory of space syntax posits that the system structure of space in which various activities occur can influence movement, encounter and avoidance as well as generates social cohesion. Peponis and Wineman (2002) argued that space syntax theory has two main focuses; examination of linear space and the paths of movement along these paths. They further indicate that movement and prolonged occupation are fundamental poles of user experience of space. The study indicated that people experience park environment by walking and getting access to park elements and sceneries which include the activity areas and pathways. These elements

are similar to main components of urban environment. As per the study, activity areas are designed for people to stay and engage in activity which is similar to buildings in an environment, while pathways are designed for circulation, having a similar purpose as city streets.

The study used three methodologies which include; Convex map analysis, Axial map analysis and Visibility graph analysis to analyze the natural complexities in urban parks. Convex maps were used to address challenges of boundary definitions, Axial maps to tackle visual connectivity versus spatial connectivity in parks while visibility graph analysis maps were used to identify objects that could block sight lines. Study findings revealed that application of convex maps on Rendinghu and Yuetan parks using depth maps gave the units of analysis, total number of individual spaces in each park and the level of integration of various parts of the parks. It also indicated that even though the pathways and activity zones have distinct spatial characteristics and functions their spatial characteristics do not have much impact on their configurational relations. Thus the study assigns equal weights to pathways and activity zones. Axial lines are drawn along the directions of pathway segments that connect with activity zones then new ones are added. This shows the level of integration. Since people usually engage in activity or walk mainly in activity zones and pathways, visibility of areas has significant influence on people's experience thus these areas should be highly addressed in the analysis. Engwicht (199) defines accessibility as the intensity of the possibility of interaction. Other relevant research in this area indicates that configurational measurements are correlated with number of leisure walking trips and use (Baran, Rodríguez, & Khattak 2008), pedestrian movement rates and space use and route choice (Hillier et al. 1993; Zampieri, Rigatti, & Ugalde, 2009; Ozer & Kubat, 2007).

2.9 Relevant Theories of Park Utilization and the Determinants

This study is aimed at establishing the relationship between spatial characteristics and utilization of urban parks in Nairobi City County. It assumes that the marked variation in the utilization of urban parks in Nairobi City County which has resulted to them being

non-responsive to changing needs of the city dwellers is due to underlying spatial characteristics. Therefore, this study is entrenched in theories, and other studies in the field of urban spatial planning and design.

The study will explore urban spatial design theories and theories in human behavior in the landscape in order to address the spatial and utilization issues in question in this study. Urban spatial design theories under investigation include; the space syntax theory, figure-ground theory, linkage theory and place theory, Garden City, Systems theory and theory of Island Biogeography. Models of urban open space planning under review in this study include; the opportunistic model, space standards model and the park systems models. To address the utilization issues, the study explored theories addressing human behavior in the landscape such as: Theory of Reasoned Action (TRA) & Theory of Planned Behaviour (TPB); Rational Choice Theory; Opportunity Theory & Routine Activities Theory; Behavioural Change Theory and Theory of Environmentally Responsible Behaviour (ERB).

2.9.1 Theories and models of urban spatial design

(a) Space syntax theory and methodology

The theory of space syntax advanced by Hillier addresses configurational characteristics of a space, which is the underlying structure of any space. The theory posits that the system structure of a space in which various activities occur can influence movement, encounter, and avoidance, as well as generate social relations (Hillier & Hanson, 1984). In Hillier's (1993) argument, the concept of configuration works as an important base of space syntax theory which is defined as a set of independent relations in which each is determined by its relation to all others. The concept offers the possibility of studying architectural and other kinds of spaces in an objective and rigorous way. According to Yujia and Perver (2013), the theory focuses on two main areas: the examination of linear space and the paths of movement along them; and the study of spaces in buildings and how they contribute to the reproduction of social scheme.

Two fundamental propositions explain the core concepts of space syntax; Firstly, space is intrinsic to human activity, not a background to it. Space is shaped in ways that reflects the direct interaction between space and people, and through this the space we create, or the built environment, becomes humanized (Hillier & Hanson, 1984; Hanson & Hillier, 1987). Secondly, space is fundamentally a configurational entity. Thus, there exists a strong relationship between spatial configuration and how people move through space. The study indicates that configurational analysis of the spatial network can be linked to parameters such as movements of all kind (pedestrian, vehicular, cyclist), human behaviour, visual perception, land use, population or building densities, land values, social interactions and segregation, crime and fear of crime which link physical space with people directly (Hillier & Hanson, 1984; Hillier & Penn, 1991; Hillier & Shu, 2000). Karimi (2012) describes the relevance of configurational analysis of spatial space as a powerful tool for designing, shaping, maintaining and altering spatial functions or use, as there is a direct relationship between spatial configuration and space functions. In addition, correlation of the spatial structure with the movement pattern and distribution activities as well as social behaviours makes a strong case. Therefore, the generative association between space and society, as well as the inherent comparison between spatial configuration and human activities or urban functions, make the use of space syntax in design a strong proposition.

As Hillier and Shu (2000) argues, configurational analysis of the spatial network can be linked to other layers of data in the city or a space such as movements of all kind (pedestrian, vehicular, cyclist), human behaviour, space use, population or building densities, land values, social interactions, crime, fear of crime and many other layers of information in order to build more complex models. By linking these layers to spatial configuration, through various method of correlational and regression analyses models can be created, for use in forecasting the implications of the changes that we make to the spatial system or to other features. Likewise, in advancing the theory of experiential landscape, Thwaites and Simkins (2007) propose that human experience has spatial

dimensions, and that certain spatial configurations may be beneficial to human experience of the external environment.

Similar to main components of urban environment, urban parks consist of activity zones and a connection of pathways. Activity zones in urban parks are designed for people to stay and engage in activity, similar to buildings. Pathways are designed for circulation, with a similar purpose of city streets. Based on these arguments, it is justifiable to apply space syntax theory in the analysis of urban park environment especially in circulation and use.

Space syntax is also a methodology for representing the morphology of buildings, open spaces and streets and models the spatial configurations of urban spaces using a connectivity graph representation. It provides a configurational description of an urban structure and attempts to explain human behavior and social activities from a spatial configuration point of view (Jiang, Claramunt, & Klarqvist, 2000). They regard the syntactic measure of accessibility as geometric accessibility measure. They point out that the efficiency of urban green spaces lies largely in their overall structure as an integral part of the entire system. Space syntax considers the following parameters in establishing the relationship between citizens and urban parks; behaviour pattern; the level of perception on the part of the users towards the space and; the social representation which they construct within their own social context.

(b) Place theory

Trancik (1986) a great advocate of the place theory argues that while types of spaces fall in different typologies based on their physical properties, each place is unique taking on the character of its surrounding. He points out that a space becomes place when it is given a contextual meaning derived from cultural or regional content. According to Trancik place theory is aimed at finding the best profile between the physical and cultural context and the needs of the contemporary users. In this context, the perception of design has metamorphosized according to time, place as well as researchers.

According to Lynch (1960), the urban environment, to some degree can facilitate or limit one's orientation, depending on the structure and characteristics of the physical elements of the city. Lynch (1960) studied the mental mapping process of individuals in the city and he looked at the city in parts in the attempt to define a theory of place. He embraced three concepts; *Legibility*-the mental map of the area which held the users; *Structure and identity*-the recognizable, coherent pattern of urban voids; and *Imageability* –user perception in motion and how people experience the space of the city. Lynch argued that a strong imageable city could facilitate humans' orientation in the city. Through his seminal work, "The Image of the City", Lynch classified the physical, perceptible objects of an environment into five elements: Paths, Edges, Nodes, Districts, and Landmarks. Image mapping has been used by urban planners to help identify important destinations, preferred routes of travel, and barriers in a community. However, Lynch's work has been criticized for ignoring the relational characteristics between physical elements of the urban environment (Yixiang, Perver & Robin, 2007).

An Architect and urban designer has a different approach for spatial perception with the term sequences. He uses drawings to capture the sensation of movement through space. In addition to the perception of place and the image of space, he totally addresses the physical content of the exterior city, the relationship between object and movement. He brings two dimensional plans to life by sketching perspective sequences emphasizing the powerful effect of the third dimension. Another approach to the understanding of context is the work of Appleyard (1981). Through his "Liveable Streets Project", he explores the physical and social complexities of street and developed ecology of street life. He argued that people modify their environment as defense against traffic and takes streets as spatial entity.

(c) Figure-ground theory

Figure-Ground theory is another crucial urban spatial theory advanced by Trancik (1986). It is composed of a solid-void pattern. While solid defines building masses, void means open spaces. The objective of this theory is to clarify the structure of urban

spaces in a city or district by establishing a hierarchy of spaces of different sizes that are individually enclosed but ordered directionally in relation to each other. Trancik (1986) categorizes urban solids under three types; First one is public monuments or institutions which serve as orientation points in the city fabric; second one is predominant field of urban blocks; and the third type is formed by directional or edge defining buildings that are generally non-repetitive, specialized forms and linear in circulation. On the other hand, he defines urban voids under five types such as the entry foyer space, inner block voids, network of streets and squares, public parks and gardens, linear open space system commonly related to major water features.

Trancik (1986) describes the problem of spatial design as one of connecting the form of the building to the structure of the site or of twisting and turning building's facades to create positive exterior space. In Figure-Ground theory, creating positive voids is important using vertical or horizontal buildings. On the other hand, sequence between public, semipublic and private domains is important. Torre in her study "Claiming the Public Space", thinks that getting sequences to work, circulation barriers and gaps in continuity must be minimized or eliminated. In this context, Trancik highlights, six typological patterns of solids and voids as grid, angular, curvilinear, radial/concentric, axial and organic of which most cities are built from. Similarly, just as a city or a district is composed of urban solids – voids patterns, with an established hierarchy of its spaces, so does urban parks. Therefore, the Figure – Ground theory can be explored in the designing and planning of urban parks in creation of positive and vibrant spaces and in establishment of hierarchy for different sizes of sub- spaces within them

(d) Linkage theory

Structuring and ordering of spaces in urban parks is fundamental to its use and functionality. In line with this statement, Maki (1964) emphasizes linkage as the controlling idea for ordering buildings and spaces in design. Trancik hailed the use of Linkage theory to organize a system of connects or a network that establishes a structure for ordering space (Trancik, 1986). On the other hand, Maki (1964) describes linkage as

the most important characteristic of urban exterior space and illuminates that the theory which is based on 'lines' connecting each part of city and the spatial datum from these lines relating buildings to spaces. These lines that involve streets, pedestrian roads and linear open space connect buildings to spaces.

Trancik (1986) defines three different formal types of urban space; compositional, mega and group forms. Mega form regards connection between individual spaces and includes a frame network in a hierarchical manner. Group form results from incremental accumulation of structures along an armature of communal open space and linkage is naturally and organically evolved. For instance, Tange and Norioki (1960) studies on mega forms. Tange (1960) points out the problem of containing exterior space and designed around circulation patterns. In all these three types, Maki emphases linkage as the controlling idea for ordering buildings and spaces in design. This theory informs the study on the importance of circulation and connectivity and hierarchy in park spaces and how they influence use.

(e) Garden city concept

The Garden City theory was conceived by Ebeneezer Howard in London in 1880s and 1990s with a view to react to the environmental and social legacy of Britain's industrial revolution, the results of a century of industrialization, and rapid growth, and the poor, unhealthy housing conditions that came with it. Howard's visionary work "Tommorow: A peaceful Path to Real Reform" was that of a high quality environment with ready access to open spaces, neighbourhoods, work places and good quality housing all within a new community defined by its quality design. His idea was broader providing for a general planned movement of people and industry away from the city centre. Howard's utopian ambition was to bring to the city residents opportunities of high value environments and to a much wider population (Alexander, 1992; Girling & Helphand, 1994).

The garden city model envisaged self contained communities planned on a concentric pattern with open spaces, public parks and radial boulevards. It was planned to house 32,000 people of sites of 6,000 acres surrounded by "greenbelts" and containing proportionate areas of residences, industry and agriculture. The designs were humanistic, putting people first in the way people feel when using them. A garden city would comprise four or five walkable suburbs, each with its distinct character but set within a context of attractive green spaces and through routes to encourage walking with its human interaction and health benefits (Alexander, 1992; Girling & Helphand, 1994).

In advancing the model, Howard advocated for sustainability through design as the model was committed to shared ideals for today and for the future. For environmental sustainability, garden city designs were to commit to the Zero Carbon standards as the minimum. In his model, transport was a key aspect as he advocated for walkable suburbs by designing out the need for much of local car use. Contemporary designs for urban parks too can adopt a Zero Carbon standard as a minimum through integrated and accessible transport systems based on public transport, cycling and walking designed in through the use of safe, convenient and attractive environments and routes (Alexander, 1992).

Design was a key consideration in Howard's model as it went beyond aesthetics and was about functionality and liveability hence its profound influence on garden cities. For example, from Letchworth and Welwyn Garden City through to Hampstead Garden Suburb the quality of design stands out, as the cities were attractively designed, to deal with congestion, functionality, balance and to adapt to changing demographics and lifestyles hence inspiring and attracting more contemporary people (Hall, 2002). For overall design coherence, master plans for the cities were developed through enquiry by design, drawing inspiration from the local area. According to Duany (2011), the designs increased provision for civic space, high levels of investment in public realm and gave a distinctive character for each neighbourhood.

Chris Gossop's analysis of evolution of new town concepts "From Garden Cities to New Towns: An integrated Planning Solution" reveals that the plans and formation of new towns such as Letchworth and Welwyn based on the garden city's idea aimed at minimizing the time wasted travelling to and from work leaving no time and energy for leisure and recreation hence low intensity of use (Chris, 2006). For instance, at Welwyne Garden City, a man's house will be near his work in a pure and healthy atmosphere. He will have time and energy after his work for leisure and recreation. A well designed city with fine buildings and public open spaces offers an attractive environment and increases the use of public parks. The plan for garden cities was to provide a ring of suburb towns as specified in the plan which were to provide for a major decentralization of people from the inner parts of the city to an outer zone beyond a newly defined green belt. The new towns from the center of the city were aimed at helping to channel pressure away from the capital center and also strike a balance in the use of facilities such as public parks located at various levels of the city (Chris, 2006). In the light of the above analysis of the garden city concept, the overall master plan of any city should echo the original garden city designs in providing invitive and accessible public parks, linking them to the wider city population through functional streets, cycle ways and walkways.

In this concept, the design of public parks should invite use and enjoyment, leisure, recreation, sport and play. Activities should be put together in well designed, self and well managed spaces that link different residential areas, commercial and industrial areas, attractive places that frame development and bind communities together. For increased usage and sustainability, accessible and walkable public spaces should design out the need for much of local car use. The car should be accommodated but the pedestrian and cyclist celebrated. Integrated and accessible transport based on public transport cycling and walking should be designed in through the use of safe, convenient and attractive environment and route.

Economic viability was another key element in Howard's model as it included appropriate commercial space for both local employment and retail with easy commuting distance. Chris (2016) argued that, a higher quality place which is well connected will deliver better values and consequently better returns on investment. He adds, higher standards of design of both private and public realm will drive higher levels of demand and use.

Fundamental to the garden city concept was the neighbourhood concept that has found its way into the design of most new towns, with the neighbourhood structure giving the opportunities to live within easy walking range of facilities needed on day to day basis such as public open spaces and parks thus increasing their usage. Another idea brought out by the garden city concept was balance between homes and jobs to encourage walkable distances and to attract a variety of employment to avoid over dependence on a single employer hence imbalance in use of facilities. Another idea was social balance with the desirability of encouraging people of all social classes to move to a new town with a practical incentive to attract every kind of employer and retailer to the town. In addition, creating value through design was of great importance in the garden city concept as a high quality place with well connected spaces attracts different opportunities and social classes hence influencing its use. Nairobi city being a garden city, the design and sustainability principles of new garden cities are persuasive, and established examples make a powerful case and such ideas and concepts can be applied in the design and planning of urban parks too. Of relevance to the current study, there should be an earnest attempt made to design circulation routes from the overcrowded park spaces to sparsely populated spaces.

(f) The systems theory

A system is a group of components which are interrelated to each other in such a way that changes in one component can affect some, or all, the other components. It is appreciated that many of the disciplines that examine the empirical world describe aspects of it in terms of systems. There are, therefore, many specific systems--the

economic system, engineering systems, (water supply systems, telephone systems), social and biological systems and so forth. The theory of general systems has been developed in order to explain and explore the general behavior that is common to all of the various empirical systems found within the different disciplines. As such, it is interdisciplinary in nature and finds a place between the level of complete generalisation of mathematics and the level of specific relations within each academic field (Wallén, 1996; Checkland & Scholes, 1990; Motloch, 2001).

A systems theory is hence a theoretical perspective that analyzes a phenomenon seen as a whole and not as simply the sum of elementary parts. The focus is on the interactions and on the relationships between parts in order to understand an entity's organization, functioning and outcomes. The focus is on the interactions and on the relationships between parts in order to understand an entity's organization, functioning and outcomes. This perspective implies a dialogue between holism and reductionism (Wallén, 1996; Checkland & Scholes, 1990; Motloch, 2001).

The relevance of this body of theory to this study is three fold. First, many aspects of the urban parks in Nairobi will be regarded as systems and a general understanding of system behavior adds to better understanding of the entire urban park system and the interacting regional processes. The interdisciplinary nature of the approach is particularly useful as the interests to study various interacting spatial and utilization variables are widespread. Some aspects of general systems theory are concerned with ways of understanding and predicting the behavior of very large and complex systems (Wallén, 1996; Checkland & Scholes, 1990; Motloch, 2001).

The second use for general systems is in the control of regional processes. The study's findings must not only establish, but must also be able to frame regional design guidelines towards a sustainable city's urban park system. Cybernetics, which is the "science of communication and control", provides a number of guidelines to the control of complex systems. Some of the ways in which these concepts have been applied to "process planning". In order to aid their decision making, the regional planners will

often marshall their information and understanding in the form of a model. Models usually consist of components linked together and are, therefore, systems themselves. Thus, in the third place, systems theory not only helps in the understanding of regional processes but also in their modeling.

(g) Theory of island biogeography

The theory of Island Biogeography presents urban park values and was coined in the year 1967, by ecologists Robert, MacArthur and Wilson. The theory predicts that two factors; the size of park and distance from concentrated human habitation influence the diversity of park values. It posits that the diversity of human values for parks will increase with park size while the diversity of park values decreases further from concentrated areas of human habitation (Hengeveld, MacArthur & Wilson, 1967/2001).

This theory attempted to predict the number of species that would exist on a newly created island. The theory posits that the two factors size of island and distance from the mainland combine to regulate the balance between species immigration and extinction rates in highland populations. It predicts that smaller islands tend to have fewer species while islands closer to the mainland have higher numbers of species. Other variables identified include size, distance and species diversity. Further, it highlights the relationship between the variables such as: (a) species diversity increases with island size; and (b) species diversity decreases with distance from mainland. The theory shows an explicit casual mechanism (Equilibrium theory of immigration and extinction) (Hengeveld, MacArthur & Wilson, 1967/2001).

The theory of Island Biogeography has been applied in a variety of terrestrial settings where islands are created through physical isolation such as mountains or fragmented natural landscaped through urbanization, agriculture and forestry practices. Islands and mainlands can be mean fully ascribed to a set of physical settings. The variables of island size and distance from the mainland can be plotted against the observed distribution of a measurable variable such as the number of species present. The size and

distance influences the observed distribution of plant and animal species, diversity of species (Brown, 2008).

For the purpose of this study, the structure of this theory can be extended to the realm of human geography and the visual islands of urban parks within urban areas. Parks areas with contrasting, neighbourhood context may be viewed as islands and mainlands. This study views urban parks/spaces as islands of relatively distinctive land use and value surrounded by neighbourhoods with contrasting land use. the physical occupation of island parksspaces by humans for various park uses is balanced by countervailing force of physical displacement driven by degradation, conflict, security, or crowding. Similar to the theory of island biogeography, an equilibrium point may be reached wherein the rate of park appropriation or use intersects the rate of park displacement. Spatial variables of park size and distance from concentrated human habitation are posited to influence the distribution of human values associated with urban parks (Hengeveld, MacArthur & Wilson, 1967/2001; Brown, 2008).

Thus, the theory of island biogeography can be extrapolated to the theory of urban park values which states: All else being equal, the diversity of human values for urban parks will increase with urban park size while the diversity of human park values will decrease the further one moves from concentrated areas of human habitation.

2.9.2 Theories of human behaviour in the landscape

(a) Theory of reasoned action (TRA) and Theory of planned behaviour (TPB)

To understand the park user behavior in urban parks in Nairobi City, the study requires examination of both the behavior and the influences underlying the behavior to be effective .The Theory of Reasoned Action (TRA) and its development; the Theory of Planned Behaviour (TPB) predicts human behavioural intentions and subsequent actions. The Theory of Reasoned Action (TRA) was developed in 1967 by Icek Ajzen and Martin Fishbein and expanded by early 1970's. By 1980 the theory was used to

study human behavior and develop appropriate interventions. By 1988, the Theory of Planned Behaviour (TPB) was added to the existing model of Theory of Reasoned Behaviour to address the inadequacies identified by Ajzen and Fishbein through their research using the Theory of Reasoned Action (TRA). Ajzen and Fishbein (1980) suggests that intention predicts behavior. However, to explore the differences between visitor characteristics, trip characteristics and motivation between urban proximate and urban distant wilderness, the intention to perform a given behavior cannot be used to predict the extent, magnitude and frequency of action (Fishbein & Ajzen, 1975; Ajzen and Fishbein 1980; Ajzen, 1991; Bobek & Hatfield, 2003; Lezin, 2007).

As the Theory of Reasoned Action began to take hold in social science, Ajzen and other researcher realized that this theory was not adequate and had several limitations (Godin & Kok, 1996). One of the greatest limitations was with people who have little or feel they have little power over their behaviors and attitudes. Ajzen described the aspects of behavior and attitudes as being on a continuum from one of little control to one of great control. To balance these observations, Ajzen added a third element to the original theory. This element is the concept of *perceived behavioral control*. The addition of this element has resulted in the newer theory known as the Theory of Planned Behavior.

The purpose of the Theory was: (a) to predict and understand motivational influences on behavior that is not under the individual's volitional control; (b) to identify how and where to target strategies for changing behavior; and (c) to explain virtually any human behavior such as why a person buys a new car, votes against a certain candidate, is absent from work or engages in premarital sexual intercourse. The theory of Reasoned Action provides a framework to study attitudes toward behaviors. According to the theory, the most important determinant of a person's behavior is behavior intent. The individual's intention to perform a behavior is a combination of attitude toward performing the behavior and subjective norm. The individual's attitude toward the behavior includes; Behavioral belief, evaluations of behavioral outcome, subjective norm, normative beliefs, and the motivation to comply (Fishbein & Ajzen, 1975; Ajzen & Fishbein 1980; Ajzen, 1991; Bobek & Hatfield, 2003; Lezin, 2007).

If a person perceives that the outcome from performing a behavior is positive, she/he will have a positive attitude forward performing that behavior. The opposite can also be stated if the behavior is thought to be negative. If relevant others see performing the behavior as positive and the individual is motivated to meet the exceptions of relevant others, then a positive subjective norm is expected. If relevant others see the behavior as negative, and the individual wants to meet the expectations of these "others", then the experience is likely to be a negative subjective norm for the individual. Attitudes and subjective norm are measured on scales (as an example the Likert Scale) using phrases or terms such as like/unlike, good/bad, and agree/disagree. The intent to perform a behavior depends upon the product of the measures of attitude and subjective norm. A positive product indicates behavioral intent (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980; Ajzen, 1991; Bobek & Hatfield, 2003; Lezin, 2007).

TRA works most successfully when applied to behaviors that are under a person's volitional control. If behaviors are not fully under volitional control, even though a person may be highly motivated by her own attitudes and subjective norm, she may not actually perform the behavior due to intervening environmental conditions. The Theory of Planned Behavior (TPB) was developed to predict behaviors in which individuals have incomplete volition (wish, choice) control. The major difference between TRA and TPB is the addition of a third determinant of behavioral intention, perceived behavioral control. Perceived Behavioral control is determined by two factors; Control Beliefs and Perceived Power. Perceived behavioral control indicates that a person's motivation is influenced by how difficult the behaviors are perceived to be, as well as the perception of how successfully the individual can, or cannot, perform the activity. If a person holds strong control beliefs about the existence of factors that will facilitate a behavior, then the individual will have high perceived control over a behavior. Conversely, the person will have a low perception of control if she holds strong control beliefs that impede the behavior. This perception can reflect past experiences, anticipation of upcoming circumstances, and the attitudes of the influential norms that surround the individual

(Fishbein & Ajzen, 1975; Ajzen & Fishbein 1980; Ajzen, 1991; Bobek & Hatfield, 2003; Lezin, 2007).

In the context of this study, park use behavior is not completely under user's volitional control, but subject to a wide range deterrent such as spatial characteristics such as safety, accessibility, means of transport, distance and park features. Therefore, Theory of Planned Behaviour (TPB) provides a more appropriate model to explain park use intentions and behavior, perceptions, variation in use of parks, distribution of activities and extent and intensity of park use as well as the frequency of park visits.

(b) Rational Choice Theory

Rational choice theory explains social phenomena as outcomes of individual action that can be construed as rational. The perceived failure of rehabilitative ideas, and high crime rates during the 1970s and 1980s, led the focus and concentration to analyzing criminal decision-making processes, first advocated in the classical school (i.e., offenders as rational and calculating). The significant crime increase during those two decades terrified the public, with criminals being portrayed as heartless and dangerous rather than people deserving of public sympathy. Rather than waste community dollars on unfruitful rehabilitation programs, the public responded with severe punishment to criminals. In order to bring the crime rates down, politicians embraced this approach in the 1980s by passing "Get Tough on Crime" measures. In addition, punitive new laws that demanded mandatory prison sentences for drug offenders were passed resulting to skyrocketing of prison populations. This resulted to the emergence of the rational choice theory whose key elements of rational choice explanations are individual preferences, beliefs and constraints. The basic elements of rational choice theory are: people are rational; people freely choose both law-abiding and criminal behavior based on their rational calculations; people's choices are toward maximizing pleasure and minimizing pain; individuals choose to commit a crime after calculating whether the potential rewards outweigh the potential risks and; criminals can be deterred from committing crimes if the potential risks seem too certain or severe (Powers, 1973; Glasser, 1999).

The weaknesses of rational choice theory echo the weaknesses of the classical school, because the classical school relies heavily on the concept of rational thought. Rational choice theorists fail to address the fact decision making is based on numerous factors rather than the calculation of costs versus benefits. Rationality is also practically impossible to test. How does one know what an offender was thinking right before he or she committed a crime? Finally, not all offenders and not all behaviors are rational (Vold, Bernard & Snipes, 2002; Williams & McShane, 2004). This theory cannot explain crimes committed by offenders as a result of the spatial configuration of spaces. Thus, park designers should be intentional in their designs to influence user's perceptions and decision making positively. In short, rational choice theory assumes that the decision making of offenders is rational and that offenders respond to environmental cues (Cohen & Felson, 1979). Thus, consideration of the influence of spatial characteristics on user decision making and behaviour by this study is vital (Powers, 1973; Glasser, 1999).

(c) Opportunistic Theory and Routine Activities Theory

Routine activities theory focuses on criminal events and ignores the importance of criminal motivations in behavior. As the principle proponents of the theory, Cohen and Felson (1979) did not deny the existence of criminal inclinations, but took them as a given, thereby virtually dismissing what was central to most contemporary criminology at the time. This is one factor which set routine activities theory apart from other criminological theories of the 1960s and 1970s. It is primarily concerned with criminal events instead of socioeconomic issues or racial motivations for an attack (Clarke & Felson, 1993).

Routine activities theory assumes that, for a crime to occur, there have to be three minimal elements: a motivated offender, a suitable target, and the absence of capable guardians (Clarke & Felson, 1993; Cohen & Felson, 1979). A likely offender is anyone who for any reason might commit a crime. A suitable target of crime is any person or object likely to be taken or attacked by the offender. The word "target" was selected to

avoid the moral implications of the word "victim," and to treat persons and property exactly the same as objects with a position in time and space. The third minimal element, the capable guardian, in most cases is not seen to be a policeman or security guard. That is because, in their view, the persons likely to prevent a crime are not policemen who are seldom around to discover crimes in the act, but rather neighbors, friends, relatives, and bystanders or even the owner of the property targeted (Clarke & Felson 1993). The absence of the capable guardian is a crucial element to this theory. An offender must find a target in the absence of guardians. The moment that happens, a crime may occur (Cohen & Felson 1979).

Routine activities refers to what individuals do during the course of a day in terms of going to work, being at home, heading out to the shops, and so forth. These authors looked at the interaction of targets, potential offenders, and control agents as producing the crime event. They cited the growth in the number of automobiles and popular electronics as affecting crime rates, because they make attractive targets, are portable, easily stolen, and sold or traded for drugs without difficulty. The rational choice, opportunity, and routine activities theories are all integral to the urban Design and crime literature, because they assume that potential offenders are rational and will recognize environmental cues that prevent him or her from committing a crime. Building on the idea that potential offenders are rational enough to understand environmental signals which will influence their behavior is the background of the understanding the role of spatial characteristics on user behaviour and in the utilization of urban parks. It justifies the importance of investigating certain spatial characteristics in parks including the adjacent neighborhood characteristics, visual connectivity and accessibility (Cohen & Felson 1979; Clarke & Felson 1993).

(d) Behavioural Change Theory

This model links knowledge to attitudes and attitudes to behavour. It argues that if people were better informed, they would become more aware of environmental problems and consequently, would be motivated to behave in an environmentally

responsible manner (Boudreau, 2010). However, research questioned the legitimacy of the principles of human behavioural model which was not supported for a long time (Ajzen & Fishbein, 1980). Consequently, researchers hypothesized that a multitude of variables interact in different degrees to influence the embracing of environmentally responsible behaviour. The behavioural model, though very simplistic, provides a base for the consideration of possible relationship existing between environmental knowledge, environmental awareness and attitude and how these can translate to action or inaction. A good knowledge of environmental variables may not necessarily imply good and sustainable environmental behavior. On the other hand, lack of environmental knowledge or awareness may also not necessarily imply a poor environmental practice. Therefore other intervening factors such as spatial characteristics need to be considered such as size, accessibility, connectivity (Ajzen & Fishbein, 1980; Boudreau, 2010).

(e) Theory of Environmentally Responsible Behaviour (ERB)

The ERB theory was proposed by Hines, Hungerford and Tomera in 1987. The model argues that possessing an intention of acting is a major factor influencing ERB (Hines, Hungerford & Tomera, 1987). It indicates that the intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility, and knowledge suggests whether a person would adopt a behavior or not. According to the model, the internal control centre has a very considerable impact on the intention of acting, which determines an individual's ERB substantially. This model also highlights the existence of a relationship between the control centre, attitudes of individuals and their intention to act. The authors asserted that the control centre directly affects an individual's attitudes which can lead to an improved intention of acting and improved behaviour. Thus, the theory concentrates more on existing interactions between parameters that are purely user related excluding spatial related parameters. However, design could have an influence on user attitude on behaviour in space especially the element of comfort and other spatial characteristics in park spaces (Hines et al., 1987).

2.10 Literature gap

Urban parks add value to communities yet for all their positive attributes, urban parks within Nairobi City County continue to vary in their utilization. Several research studies relating to utilization of urban parks have been conducted at various scales and contexts, with an aim of identifying existing relationships between various park attributes. However, the above literature points out at paucity of information on the utilization of urban parks unlike other types of leisure facilities which are commercial in nature. Secondly, literature points out neglect of urban parks in academia discourse of leisure and recreation policies, with majority ignoring urban parks and their use. Moreover, majority of researches only focus on the user and ignore the physical environment/or the spatial characteristics in measuring park utilization. Veal (2006) recommends a systematic approach to measure the utilization of urban parks in relation to physical/spatial capacity or optimum use levels.

Literature pointed out that despite a considerable percentage of the global urban population being found within the urban settings within which a considerable high rate of urbanization takes place, little research has been undertaken on the utilization of public green spaces such as urban parks (Willemse, 2012). Moreover, similar studies previously carried out in other countries as detailed earlier in this chapter, might not be directly useful in Nairobi, Kenya due to the significant difference in their respective prevailing geographical settings and conditions. In addition, most of these studies make mention of other types of recreational facilities such as sport fields, arts, country side recreation but not urban parks. Conversely, a large percentage of the existing local research studies focus solely on their utilization vis a viz their provision and environmental degradation. Although some determinants of park utilization have variously been identified in previous local studies, the empirical relationships amongst the variables has not yet been established (Ikawa, 2010; Makworo & Mireri, 2011; Kariuki, 2011; Beveridge, 2014). Hitherto, the relationships are explained in heuristic and/or qualitative terms.

Consequently, there is a need to look into the utilization of the urban parks within the developing countries, with a bias to their spatial characteristics. *In a nutshell, there lacks research work establishing the contribution of spatial characteristics to utilization of urban parks within Nairobi City County, Kenya. This study therefore intends to use empirical data collected locally from the urban parks within Nairobi County in Kenya, in order to bridge this gap.* In the next chapter, an appropriate research strategy for collection and analysis of urban park utilization and the presumed determinants is identified. This process is aimed at defining appropriate statistical regression models for predicting urban park utilization at the design, development and management stages.

2.11 Theoretical Framework

From the review of the literature and theories related to the utilization of urban parks and spatial characteristics, the theoretical framework for the study is constructed as shown in figure 2.1 overleaf.

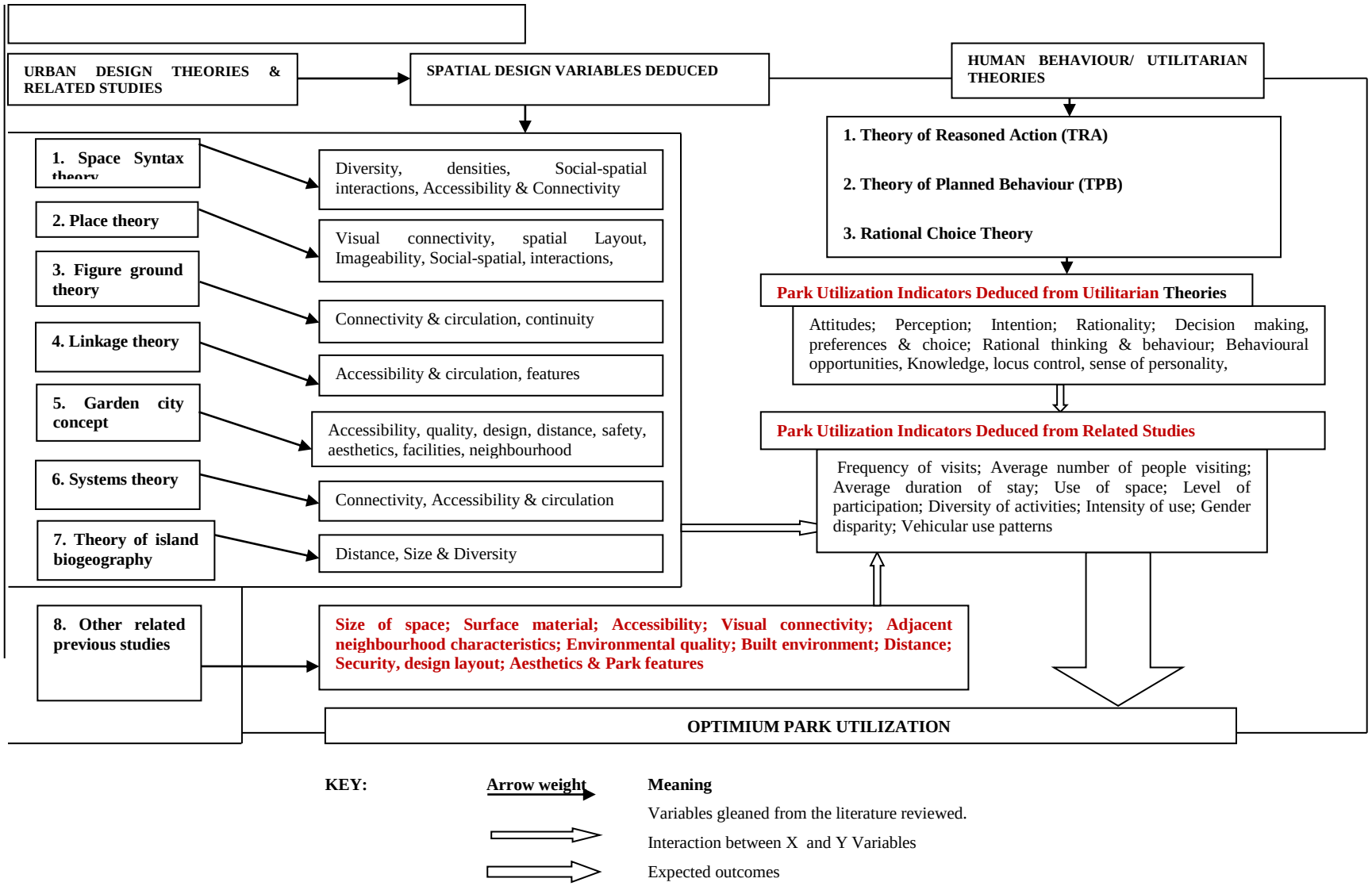


Figure 2.1: Theoretical Framework

A summary of Y and X variables gleaned from the study are presented in the 2.2 below.

Table 2.3: Summary of variables identified in literature review

No.	Park Utilization (Y)	Explanatory Variables (X)
1.	Attitudes	Diversity
2.	Perception	Density
3.	Intention	Social –Spatial Interactions
4.	Rationality	Accessibility
5.	Decision Making	Connectivity
6.	Preferences & Choice	Spatial Layout
7.	Gender /Personality	Size
8.	Behaviour	Continuity
9.	Knowledge	Features & facilities
10.	Locus Control	Quality
11.	Participation levels	Safety & security
12.	Duration of stay	Aesthetics
13.	Frequency of visit	Neighbourhood character
14.	Diversity	Distance
15.	Intensity	Design
16.		Imageability

2.12 Conceptual Framework

Out of the many variables observed in literature review, the study identified those relevant to the current study (Y and X variables). Thirteen (13) X variables were selected and nine (9) Y surrogates. These were used in the formulation of a conceptual framework as indicated in figure 2.2 overleaf.

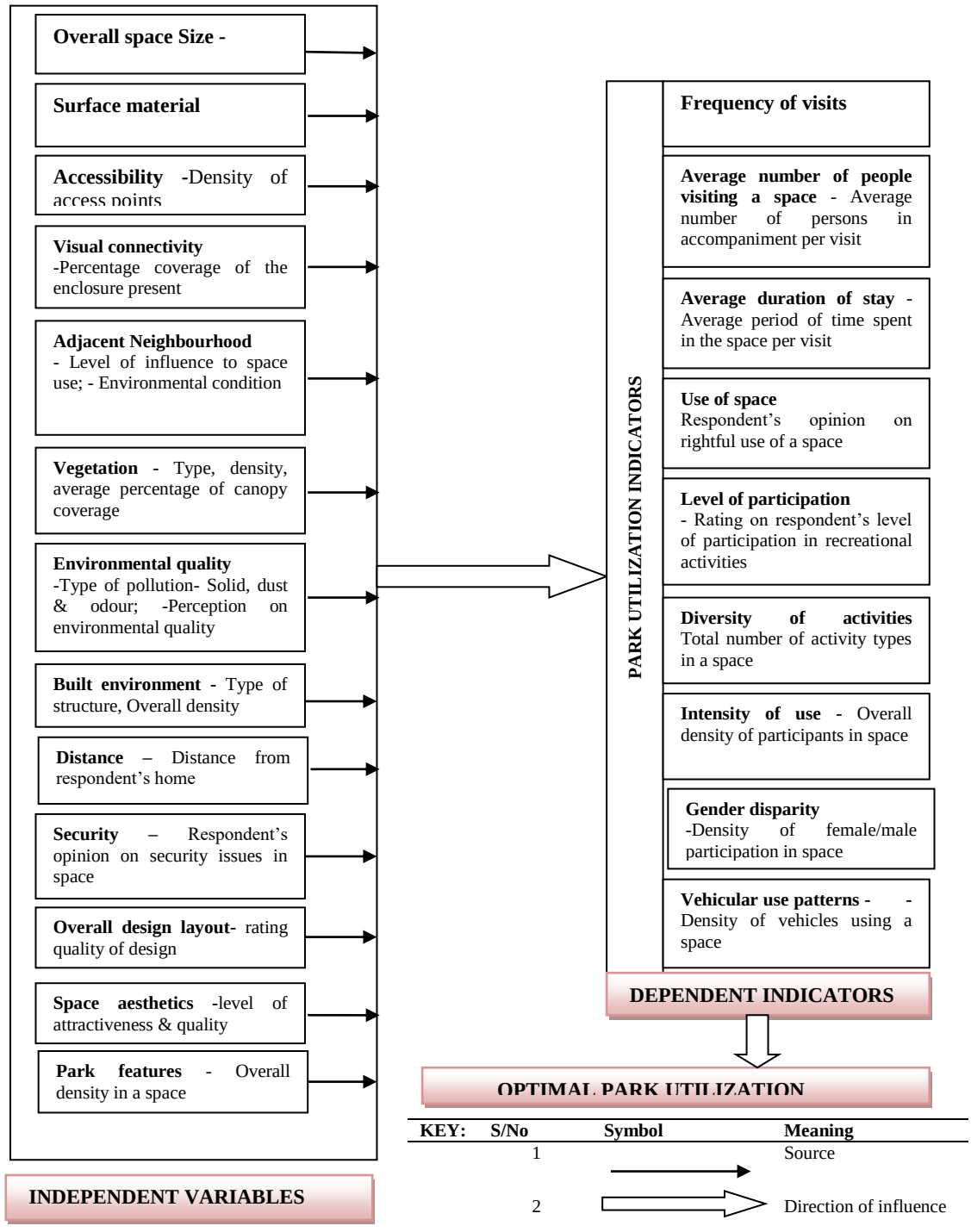


Figure 2.2: Conceptual Framework

2.13 Discussion

This Chapter reviewed the literature relating to the utilization of urban parks and spatial characteristics. The chapter discussed and reviewed literature which culminated to a theoretical framework. Relevant study variables as indicated in the conceptual framework were identified for the two broad variables for use in the study and literature gaps identified. The next chapter will discuss the research methodology applied in data collection and analysis.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Chapter II reviewed literature related to factors that influence utilization of parks. The current chapter describes the methodology used to collect data which was used to test the hypotheses. It focuses on the research strategy and design, population and sampling, variables in the study, data collection, data analysis, validity and reliability and ethical considerations. Finally, reliable methods and valid concepts adopted in the study are shown.

3.2 Research Strategy

The study employed a quantitative research approach which was found appropriate to test the research hypothesis established in Chapter I. This was established by developing statistical models through the analysis of spatial variables as identified in Chapter II. Literature reviewed unveiled a wide range of determinants of park utilization such as: park physical characteristics (design, size, distance, design layout, accessibility, circulation, connectivity); park facilities and amenities; activities; user characteristics; park features; comfort; aesthetics and; contextual characteristics.

The quantitative strategy helps in focusing on specific characteristics of park spatial units such as pathways, sub-spaces and other activity zones.

3.3 Research Design

The research design adopted in this study was survey design. Bryman (2008) underscores this strategy as the most suitable for addressing research questions which require quantifiable data on many cases at a single point in time. According to Kothari (2004) a survey research can be conducted through varied and mixed data collection

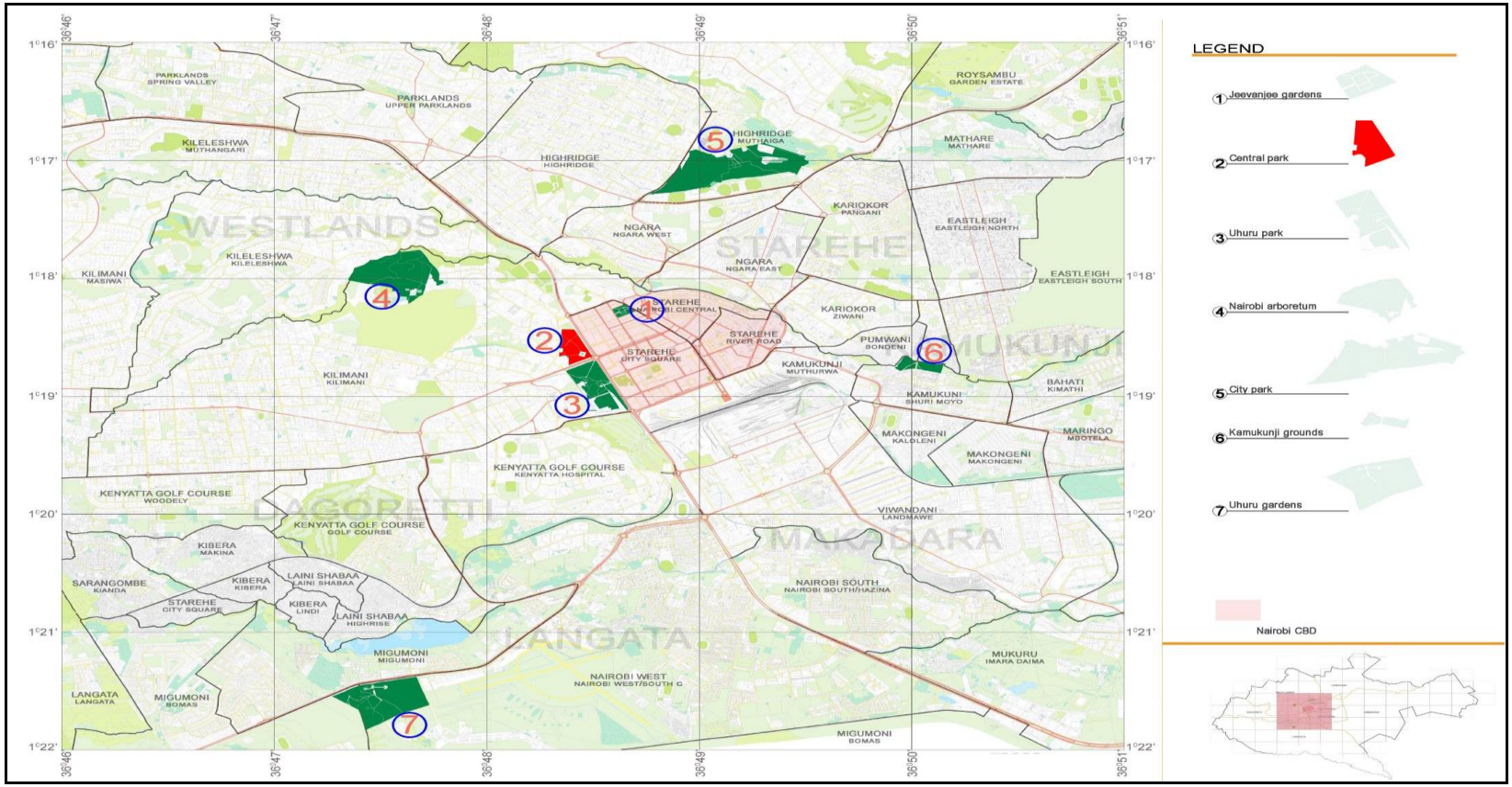
modes. For example, data can be collected using instruments other than questionnaires, such as pedometers, tape measures, counters, observation, photographs, sketches, recorders etc. In addition, he points out that, a survey research is an observational study that analyses data from a population, or a representative subset, at a specific point in time, meaning that the researcher records information about their subjects without manipulating the study environment.

The study measured the levels of park use without interfering or influencing park users to participate in use of the facility or advise them to modify their behavior. The key characteristic of a survey research is that it can compare different subjects at a single point in time. It is a snapshot study. In line with this, the study drew to what fitted to the frame and looked into park use levels at one point in time and disregarded past and future park use levels. Another advantage of a survey research is that, it allows the researcher to compare many variables at the same time. The current study looked at several spatial variables such as size, accessibility, park features, surface material, visual connectivity, adjacent neighbourhood, vegetation characteristics, pollution, design layout and aesthetics in relation to one dependent variable which is park utilization.

3.4 Study Area

The study was conducted within the six gazetted urban parks in Nairobi City County by the year 2015 and in line with the study design in section 3.3. These included:

1. Uhuru Park
2. Central Park
3. Jeevanjee Gardens
4. City Park
5. Nairobi Arboretum and,
6. Uhuru Gardens (Ref. Map 1.1 & 3.1)



Map. 3.1: A map of Nairobi City County Displaying the Geographical Distribution of the Six Gazetted Urban Parks;

Source**:** Author, 2019

Note: Out of the total seven (7) urban parks in NCC, only the gazetted six (6) parks by 2015 were included in the study. Thus, Kamukunji Grounds was excluded.

3.5 Study Population

3.5.1 Target population and unit of analysis

The target population for the current study was all the convex spaces in the six gazetted urban parks within Nairobi City County as displayed on Map 3.1. The population totaled to 341 spaces as explained later in this chapter. The spaces included both access routes into and within the park, and sub-spaces there in. The study's unit of analysis was the convex space while the unit of observation was the convex space and the park user visiting the space.

3.5.2 Computation of study population

Hillier and Hanson (1984) posits that the spatial configuration of space in which various activities occur can influence its use or avoidance. Abukakar and Aina (2006) concurs by asserting that the efficiency of urban green spaces lies largely in its overall structure. The theory of space syntax Peponis and Wineman (2002) examines two things: (a) Linear spaces and paths of movement along the spaces and (b) Examines spaces in buildings.

Similar to the components of the urban environment, urban parks includes activity zones and pathways connecting them. Activity zones offer spaces for people to stay and engage in like buildings do; while pathways are designed for circulation with similar purpose to city streets (Zhai & Baran, 2013).

Based on the above similarities and the fact that the theory of space syntax addresses configurational characteristics of space which is its underlying structure, the study applied space syntax methodology in the development of the study population and in the study of spatial characteristics of urban parks in Nairobi city. Convex maps were applied to structure the parks into smaller units (convex spaces) which eventually formed the study population.

(a) Space syntax assumptions

According to Hillier (1996 & 1984), space syntax deals with spatial problems and seeks to answer the following questions; how to measure the configurational properties of spatial systems; the role of configuration in movement, co-presence and higher order social phenomenon and the nature of the relationship between social organization and spatial configuration. According to Peponis and Wineman (2002), configuration refers to the overall pattern that emerges from pair-wise connection. It is the way in which spaces are related to one another, not only pair-wise but with respect to the overall pattern that they constitute. Configuration of spatial layouts refers to the pattern connections between defined units of spaces.

Some previous studies have demonstrated that syntax variables correlate with human spatial preferences and that certain spaces are defined by space syntax can be expected to contain more human movement (Hillier, 1987; Peponis & Wineman, 2002).

(b) Space syntax spatial units

The body of space syntax theory rests on space syntax spatial units. The theory proposes two conventional ways of breaking up a configuration into constituent spaces namely; convex spaces and axial lines. Convex spaces are the most elementary units of analysis. They are two- dimensional extensions that comprise of the fewest and fattest spaces that can cover the entire layout within which all points are directly visible from all points within the space. They are the largest units that can be fully perceived at one time within the layout and can therefore be taken to represent the local constituents of it.

Axial lines refer to linear extension of spaces and are represented by an axial map. Axial map comprises the least number of straight lines that must be drawn in order to cover all the available connections from one convex space to the other. The map captures the sense of connections that a person gets while moving about a building and so calls the

global constituents of a layout. Axial lines represent the longest views across spaces whose full area may not be visible.

(c) Application of convex maps to establish the study population

According to Penn, Conroy, Dalton, Dekker, Moltran and Turner (1997) the first step of space syntax theory is construction of a representation map with an aim to reduce continuous open spaces to a finite number of discrete elements or spaces. Construction of convex maps for the six gazetted urban parks in Nairobi City County forms a prerequisite to the establishment of the study population. The convex maps are based on maps obtained from the Regional Centre for Mapping of Resources for Development (RCMRD) in Kenya, JICA and Google maps. A reconnaissance survey of the study led to production of an up to date representation of the study area. The study adopts a procedure recommended by Hillier and Hanson (1984); applied by Zhai and Baran (2013) in the study of urban parks and walking through the application of space syntax in Beijing, China.

(d) Procedure of producing convex spaces for the study area

(1) ArchiCAD and Arc GIS were used to prepare base maps for the six urban parks.
(2) The study settled on two broad categories of convex spaces for production: (a) Open spaces where activity occurs, and (b) Access routes which includes the pathways and driveways adjacent and within the park.
(3) The boundary of each convex space was established based on the space function and its spatial characteristics.
(4) The study viewed access routes and open spaces (activity zones) as different spaces with boundaries between them since they have distinct functions.
(5) Boundaries between access routes were defined at the location of junction. For instance; (a) where three path segments joined together at the same junction, then this junction was viewed as a boundary among the adjacent path segment. (b) Each path segment was considered as an individual space as different pathways

lead to different spaces with distinct features and designed for different purposes. Therefore, the above principles guided the establishment of different path segments.

(6) Spatial characteristics and functions guided the establishment of the open spaces in each park. For example: (a) Access to different activity zone exhibiting varied and distinct spatial characteristics may imply that the spaces are designed as different spaces. (b) Distinct functions of individual open spaces divides two sub-open spaces thus viewing them as different sub open spaces (activity zones). Thus, the establishment of different sub open spaces in this study was based on the above premise.

(7) After the establishment of all the draft convex spaces both open spaces and access routes into and within the parks , the study undertook a reconnaissance survey for each park to countercheck the two sets of convex spaces as they appear on ground and to identify any omitted spaces for purposes of inclusion in the respective convex maps and spaces.

(8) After the reconnaissance study, the draft convex maps for each park were updated and final convex maps developed representing numerous coded convex spaces (open spaces and access routes) for each park.

(9) Thereafter, coding for each park and convex space both Access routes and open spaces within individual parks was done taking into consideration the type of space for purposes of identification and establishment of the population as shown below.

Coding for convex spaces;

*(a) Access routes were represented by code **"A"** while open spaces were coded **"S".***

Coding for individual parks

Nairobi Arboretum was coded (R), Central Park (C), City Park (T), Jeevanjee Garden (J), Uhuru Gardens (H) and Uhuru Park (U)

(10) After coding all the convex spaces for each park, the population size was established by tallying all spaces per category per park and then summing them all to attain the overall population for each category. The overall study population attained totaled to 341 convex spaces with 76 open spaces, 227 access routes within the park and 38 Access adjacent/ into the park as displayed on the table 3.1 and section 3.6.5.

(11) After establishment of the study population both for the open spaces and the access routes, the study proceeded to determine the sample size attaining a grand total study sample size of 185 convex spaces as outlined in section 3.6.1. Out of the 185 sample size, 62 were open spaces, 94 access routes within the park and 29 access routes into the park as indicated in table 3.2.

(12) A geographical presentation of the study population and representative sample spaces is displayed using maps in section 3.6.5.

Table 3.1: Summary of developed study population from the six urban parks

			Convex spaces			
S/No	**Park Name**	**Park Code**	**Open spaces**	**Access routes within and to the park**		**Grand Total**
				Within the park	**Into the park**	
1.	Nairobi Arboretum	R	13	40	6	59
2.	Central Park	C	9	12	6	27
3.	City park	T	16	52	2	70
4.	Jeevanjee Gardens	J	16	17	8	41
5.	Uhuru Gardens	H	11	64	8	83
6.	Uhuru Park	U	11	42	8	61
Total (Population)			76	227	38	341

Source: Author, 2019

3.6 Determination of study sample size

As pointed out by Neuman (2002), the main factors considered in determining the sample size is the need to keep it manageable enough while enabling the study to derive detailed data at an affordable terms. According to Yamane (1967) the following formula may be used to calculate the size of a sample.

$$n = \frac{N}{1 + Ne^2}$$

Where;

n = sample size

N = Population

e = Margin of error (0.05)

Application of the above formula to this study is as follows:

$$n = \frac{341}{1 + 341 \times (0.05)^2}$$

$$= 341/1.8525 = 184.5$$

Sample size is Approximately 185 spaces

After computing the above equation using the given population size of 341 for Open Spaces (76 Spaces), Access Routes within the park (227 spaces) and Access Routes into the park (38). The results indicated a sample size of 185 spaces.

3.6.1 Determination of sample size per park

After attaining a sample size of 185, proportionate distribution was used to determine the sample size per park since the study area comprised six different parks constituting different numbers in terms of convex spaces. The number of convex spaces from each park was determined by their number relative to the entire population as indicated in table 3.2 below;

Table 3.2: Sample size per park

S/No.	Park	Population (N)	Proportion	Sample size (n)
1.	Nairobi Arboretum	59	0.17302	32
2.	Central park	27	0.0792	15
3.	City park	70	0.2053	39
4.	Jeevanjee gardens	41	0.1202	22
5.	Uhuru gardens	83	0.2434	43
6.	Uhuru park	61	0.1789	34
	TOTAL	341		185

Source: Author, 2019

3.6.2 Determination of sample size per space category

As indicated in table 3.1.each park presented three categories of convex spaces for investigation namely; open spaces, access routes within the park and access routes into the park. After obtaining the sample size per park, the study further applied proportionate sampling to determine the sample size per space category per park. This was determined by their number relative to the entire population as indicated in table 3.3.

Table 3.3: Sample size per park per space category

S/No.	Park Name	Specification	Sample size distribution per space category			Sample size per park
			Open space	Access within the park	Access into the park	
1.	Nairobi Arboretum	Population	13	40	6	
		Proportion	0.2203	0.6779	0.1016	
		Sample size	7	22	3	32
2.	Central park	Population	9	12	6	
		Proportion	0.3333	0.4444	0.2222	
		Sample size	5	7	3	15
3.	City park	Population	16	52	2	
		Proportion	0.2285	0.7428	0.0285	
		Sample size	9	28	2	39
4.	Jeevanjee gardens	Population	16	17	8	
		Proportion	0.3902	0.4146	0.1951	
		Sample size	9	9	4	22
5.	Uhuru gardens	Population	11	64	8	
		Proportion	0.1325	0.7710	0.0963	
		Sample size	6	33	4	43
6.	Uhuru park	Population	11	42	8	
		Proportion	0.1803	0.6885	0.1311	
		Sample size	6	23	5	34
	Total sample size		42	122	21	185

Source: Author, 2019

3.6.3 Determination of representative samples per space category

Using the standardized random tables as recommended by Mugenda and Mugenda (2003), simple random sampling was applied to select representative samples out of the overall sample size for each space category per park as shown in table 3.4.

3.6.4 Selection of respondents

Convenience sampling was employed in selection of park users for interview on utilization of urban park spaces. Convenience sampling is applied in situations where additional inputs are not necessary for the principal research. The method allows the

researcher to choose respondents without considering whether they represent the entire population or not. It considers the readily available sample. There are no criteria required to be a part of the sample. Thus, it becomes incredibly simplified to include elements in this sample. All components of the population are eligible and dependent on the researcher's proximity to get involved in the sample.

To collect information on respondent's use of space, the study applied convenience sampling to collect data from the conveniently available respondents in the sampled park spaces. Any available member of the target population at the time of data collection was approached and asked for participation in the research. Using this technique, it was possible to collect respondent's opinions, perceptions and viewpoints in regard to space use. One interview schedule per space was administered. To reduce on biasness, observation method was used to complement the information gathered (Kothari, 2004).

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Table 3.4: A Summary of representative samples per space category for the six urban parks

S/No	PARK NAME	PARK CODE	REPRESENTATIVE CONVEX SPACES			SAMPLE SIZE PER PARK
			SUB SPACES	ACCESS ROUTES		
				Access routes within the park	Access into the park	
1.	Nairobi Arboretum	R	Sample size = 7 RS 1, RS 5, RS 7, RS 9, RS 10, RS 11, RS 13	Sample size =22 RA 1, RA 4, RA 5, RA 6, RA 8, RA 9, RA 10, RA 11, RA 14, RA 17, RA 18, RA 19, RA 20, RA 22, RA 23, RA 27, RA 28, RA 29, RA 33, RA 34, RA 36, RA 37	Sample size= 3 RAF 32, RAF 33, RAD 36	32
2.	Central Park	C	Sample size = 5 CS 14, CS 16, CS 17, CS 19, CS 22	Sample size = 7 CA 42, CA 43, CA 46, CA 47, CA 48, CA 49, CA 50	Sample size = 3 CAF 9, CAF 10, CAF 11	15
3.	City park	T	Sample size = 9 TS 23, TS 25, TS 26, TS 28, TS 30, TS 32, TS 35, TS 36, TS 38	Sample size = 28 TA 53, TA 55, TA 56, TA 57, TA 58, TA 59, TA 60, TA 62, TA 63, TA 64, TA 65, TA 67, TA 70, TA 72, TA 73, TA 74, TA 75, TA 76, TA 77, TA 78, TA 79, TA 81, TA 82, TA 89, TA 92, TA 99, TA 100, TA 102	Sample size = 2 TAF 21, TAD 22	39
4.	Jeevanjee Gardens	J	Sample size = 9 JS 39, JS 40, JS 42, JS 43, JS 44, JS 47, JS 48, JS 50, JS 54	Sample size = 9 JA 105, JA 106, JA 109, JA 110, JA 112, JA 114, JA 117, JA 120, JA 121	Sample size = 4 JAF 2, JAF 4, JAD 5, JAD 7	22
5.	Uhuru Gardens	H	Sample size = 6 HS 55, HS 57, HS 59, HS 61, HS 62, HS 63	Sample size = 33 HA 123, HA 124, HA 125, HA 127, HA 131, HA 132, HA 133, HA 135, HA 136, HA 137, HA 142, HA 143, HA 144, HA 145, HA 146, HA 147, HA 148, HA 150, HA 151, HA 152, HA 153, HA 154, HA 156, HA 157, HA 159, HA 162, HA 163, HA 165, HA 167, HA 178, HA 182, HA 184, HA 185	Sample size = 4 HAF 23, HAF 26, HAD 27, HAD 30	43
6.	Uhuru Park	U	Sample size = 6 US 66, US 69, US 70, US 72, US 74, US 75	Sample size = 23 UA 186, UA 188, UA 189, UA 190, UA 191, UA 192, UA 194, UA 195, UA 197, UA 198, UA 201, UA 202, UA 203, UA 205, UA 206, UA 210, UA 211, UA 212, UA 216, UA 219, UA 223, UA 224, UA 226	Sample size = 5 UAF 13, UAF 15, UAF 16, UAD 17, UAD 19	34
Total Representative Sample			42	122	21	185

Source: Author, 2019

3.6.5 Presentation of representative samples for the six parks

Figures 3.1 to 3.11 displays the representative samples for the six urban parks (open spaces and access routes).

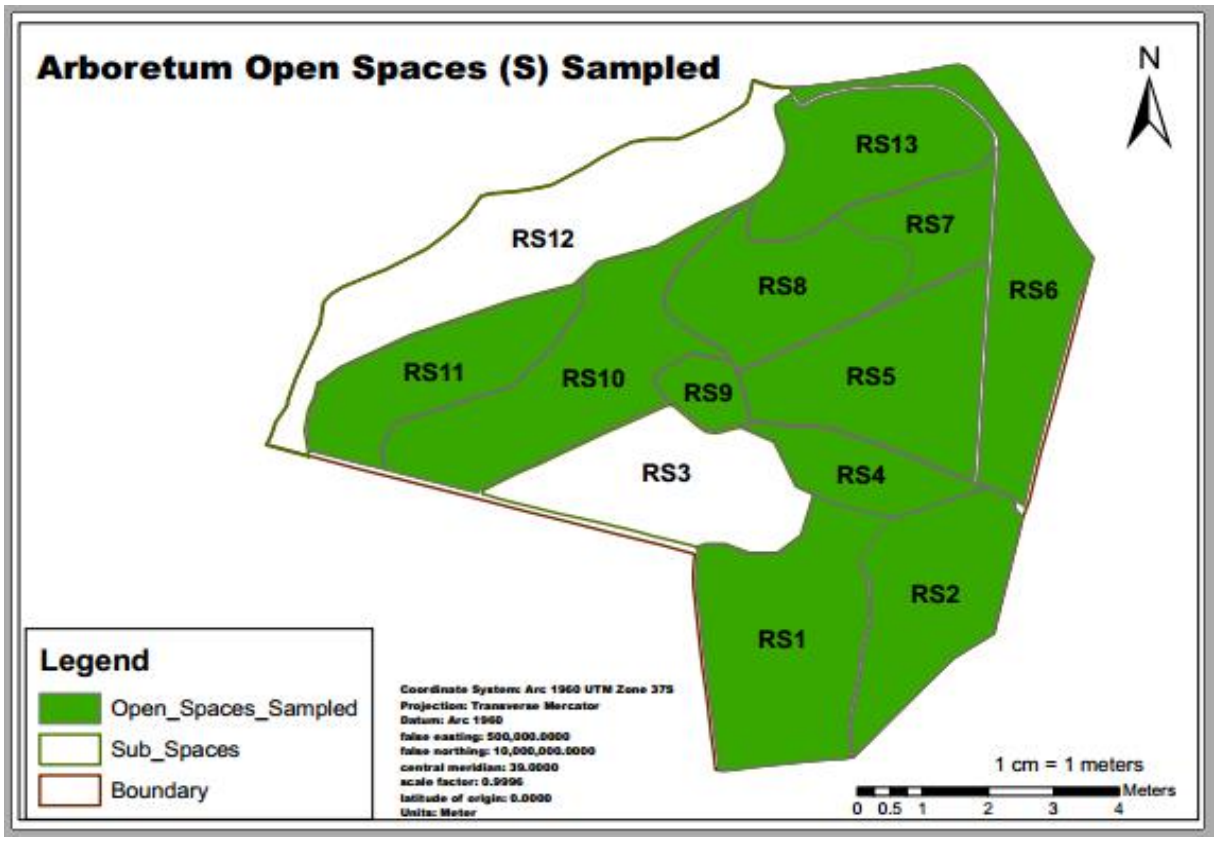

Figure 3.1: Representative samples for open spaces in Nairobi Arboretum

Source: Author, 2019

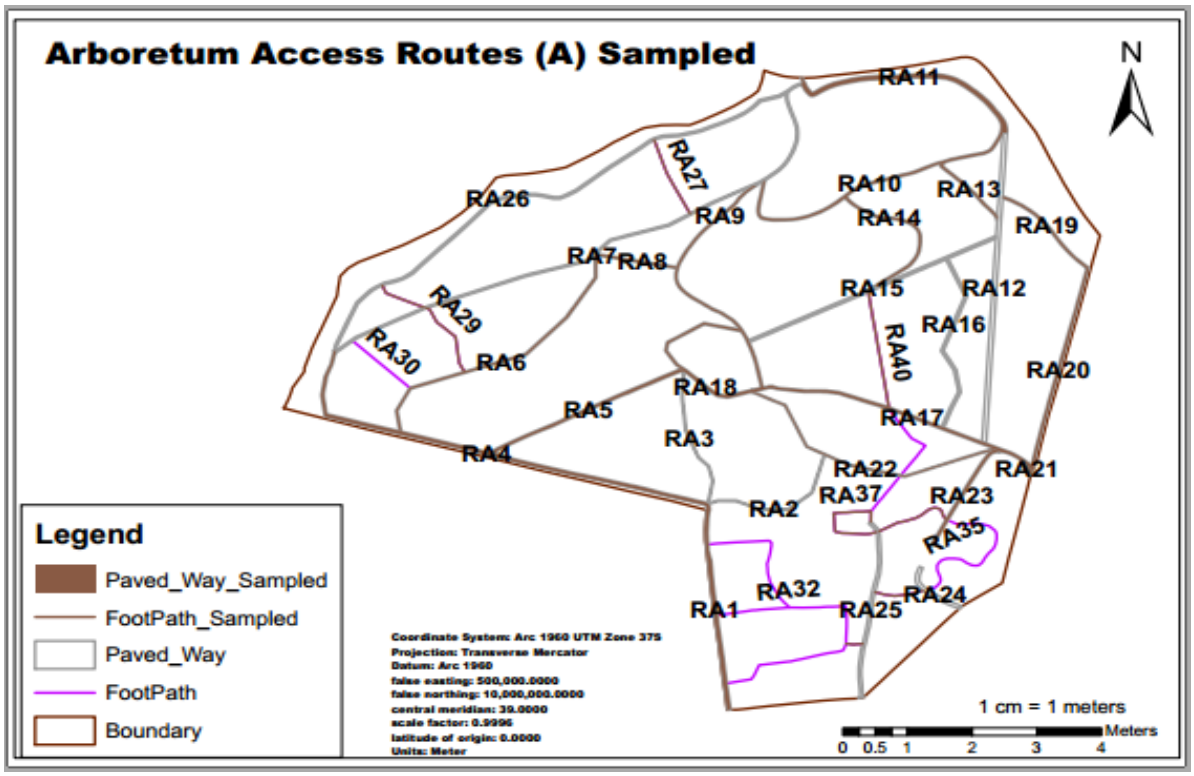

Figure 3.2: Representative samples for access routes in Nairobi Arboretum

Source: Author, 2019

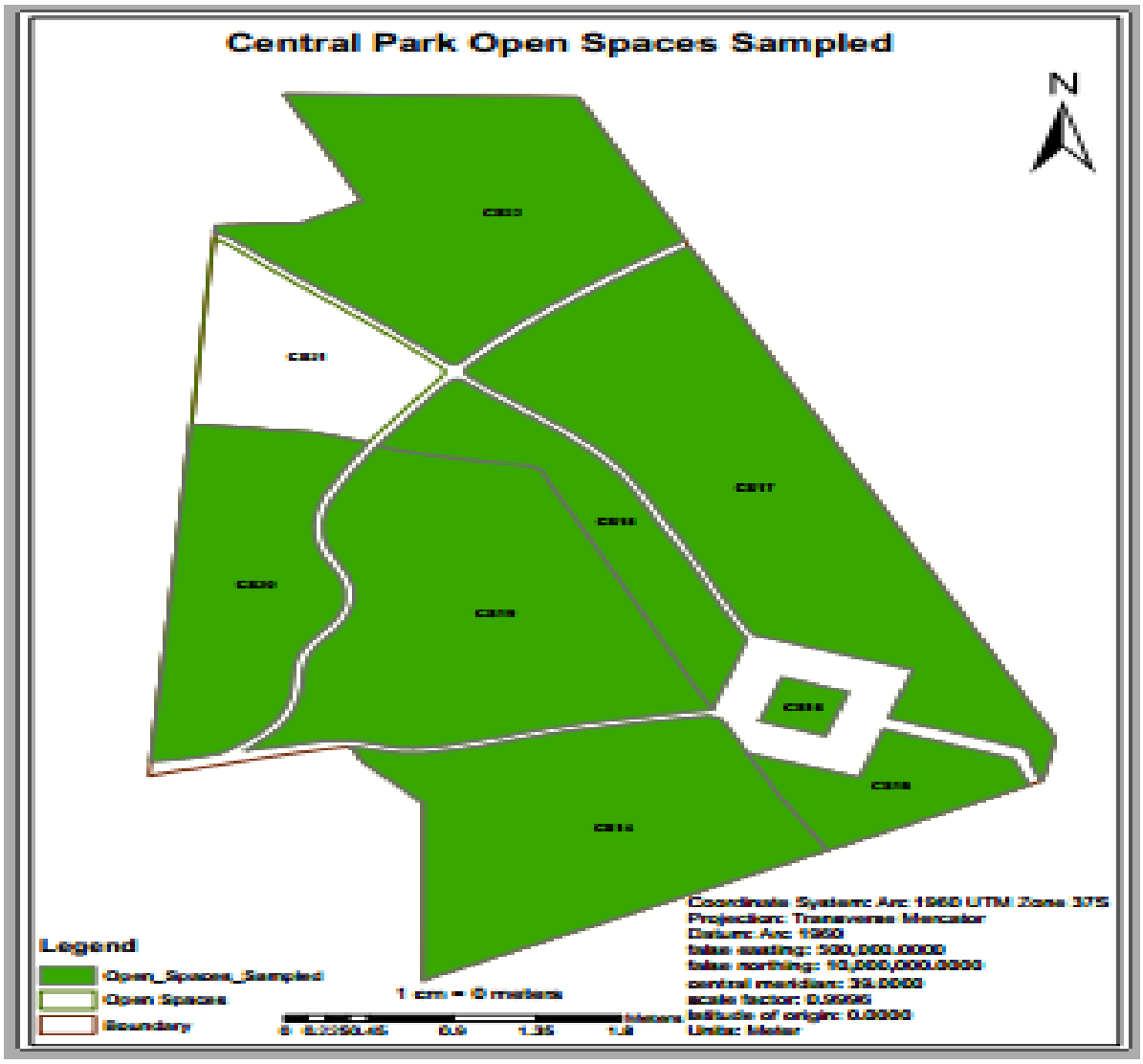

Figure 3.3: Representative samples for open spaces in Central Park

Source: Author, 2019

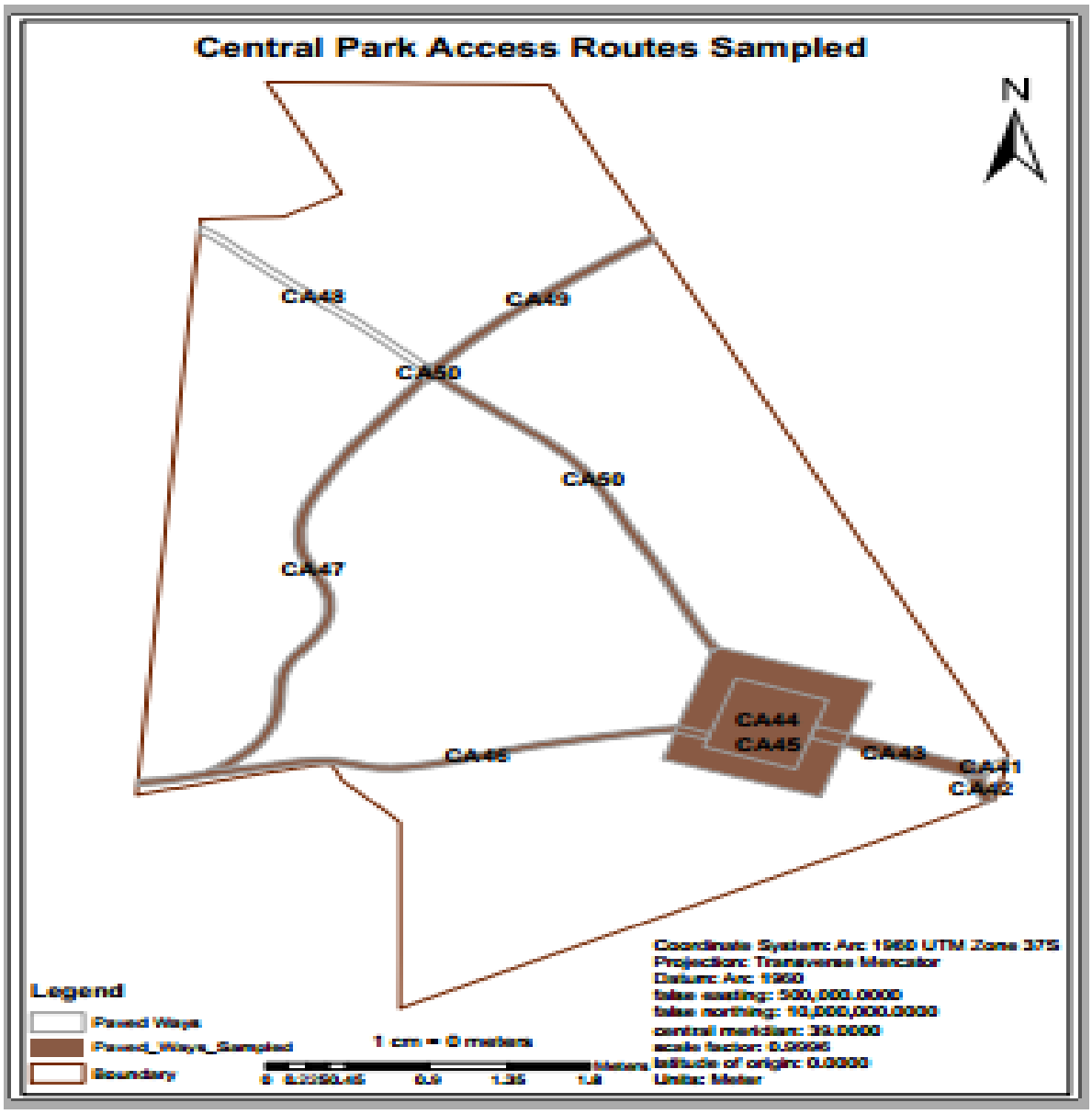

Figure 3.4: Representative samples for access routes in Central Park

Source: Author, 2019

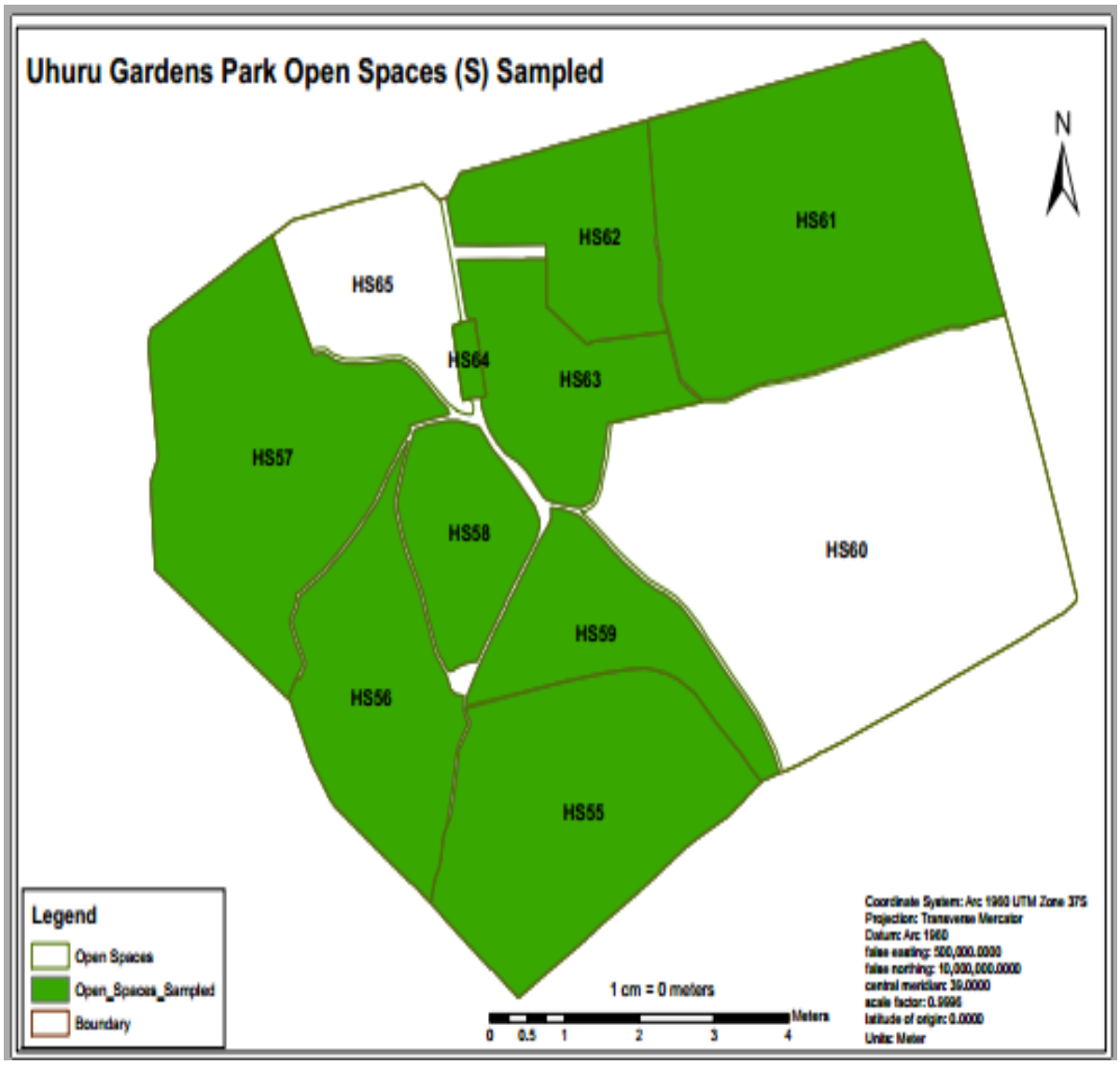

Figure 3.5: Representative samples for open spaces in Uhuru Gardens

Source: Author, 2019

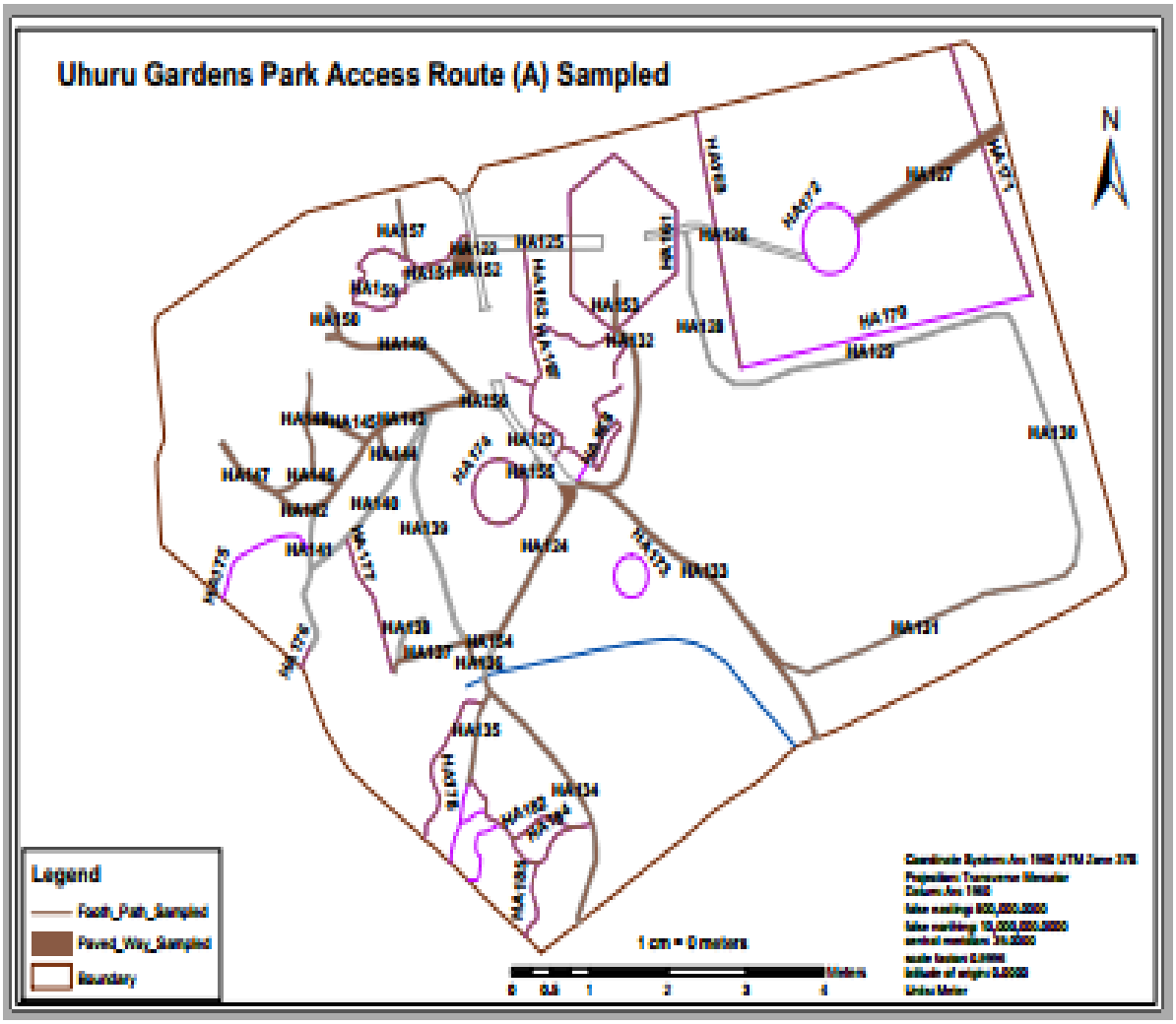

Figure 3.6: Representative samples for access routes in Uhuru Gardens

Source: Author, 2019

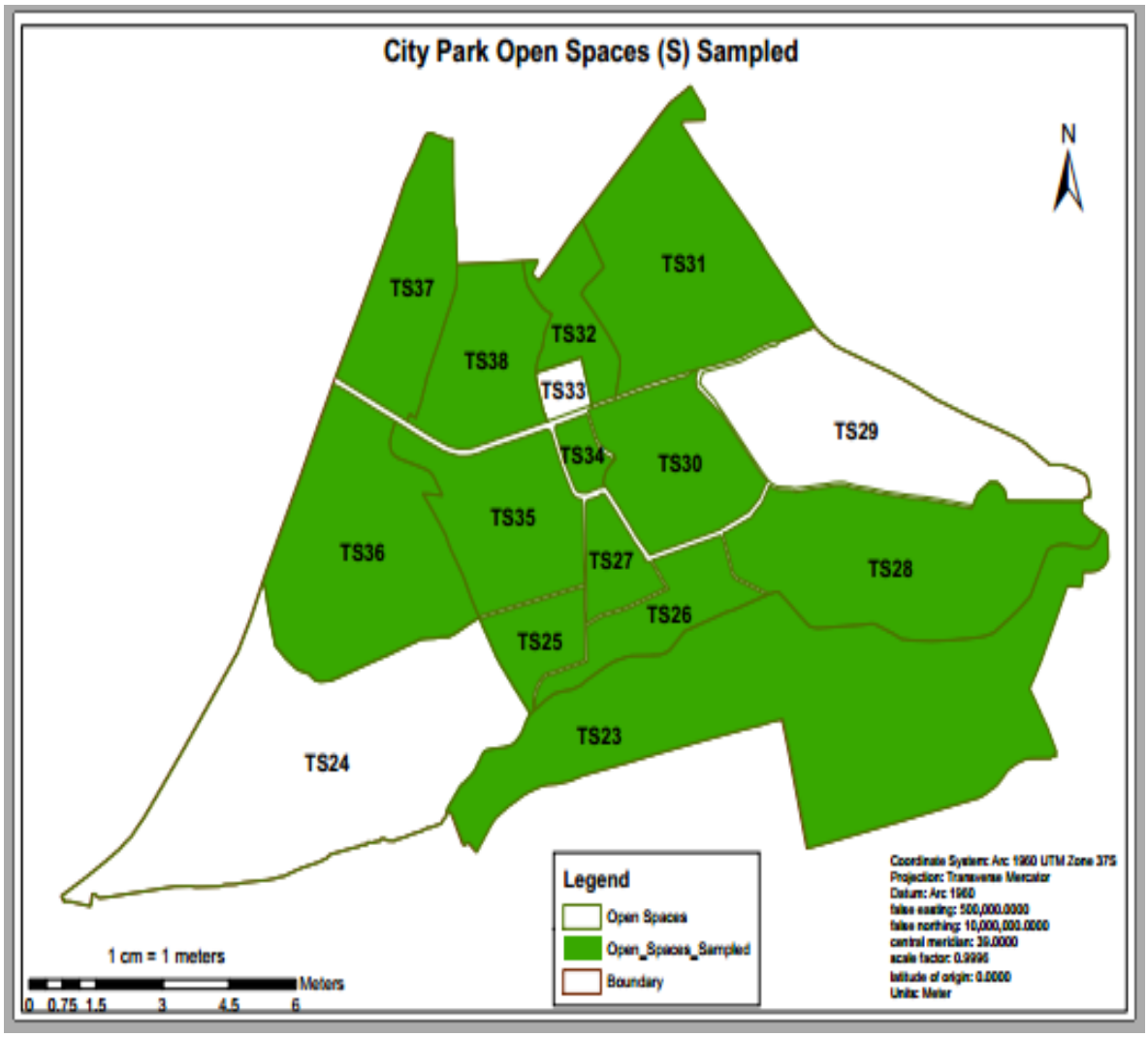

Figure 3.7: Representative samples for open spaces in City Park

Source: Author, 2019

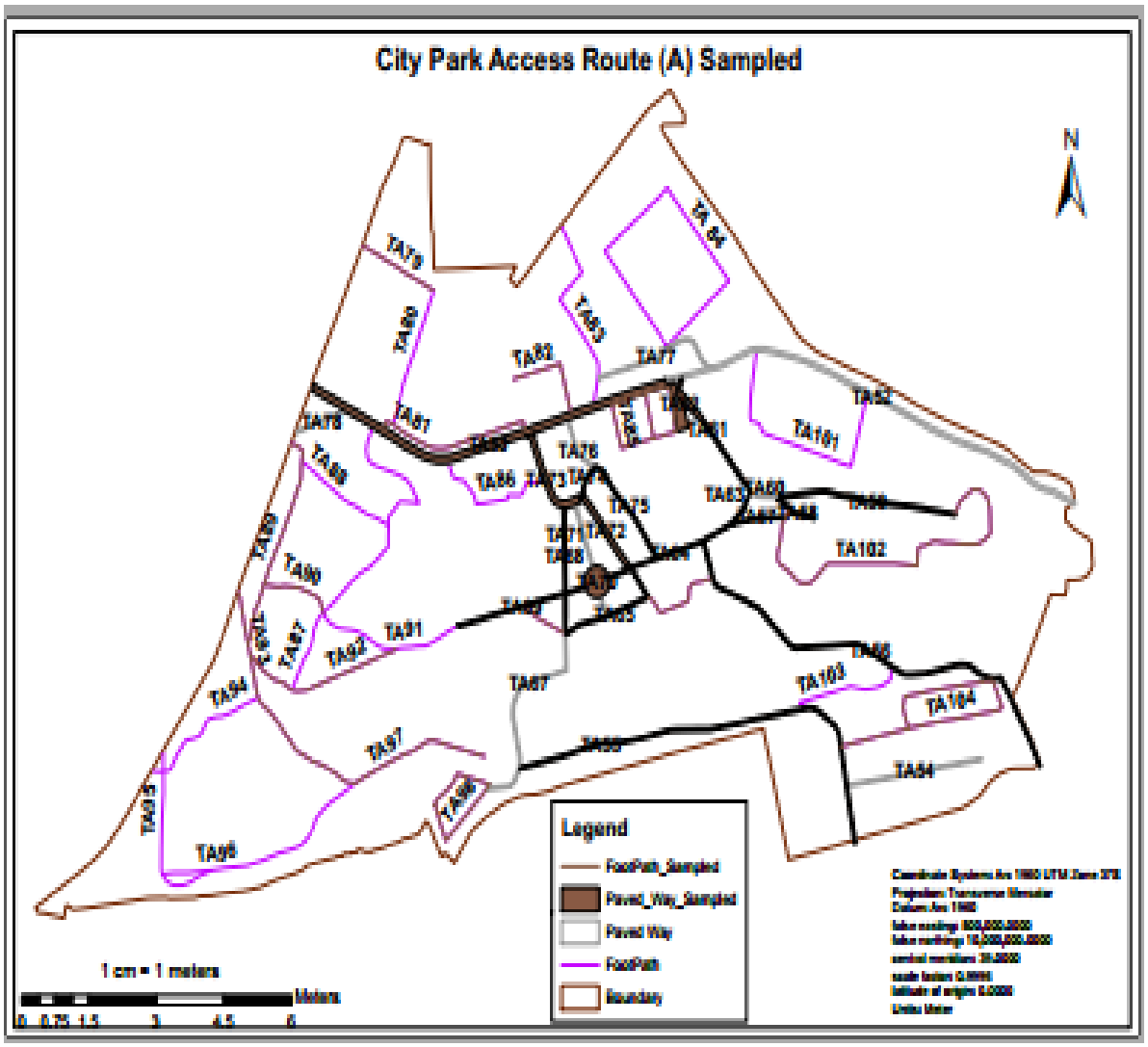

Figure 3.8: Representative samples for access routes in City Park

Source: Author, 2019

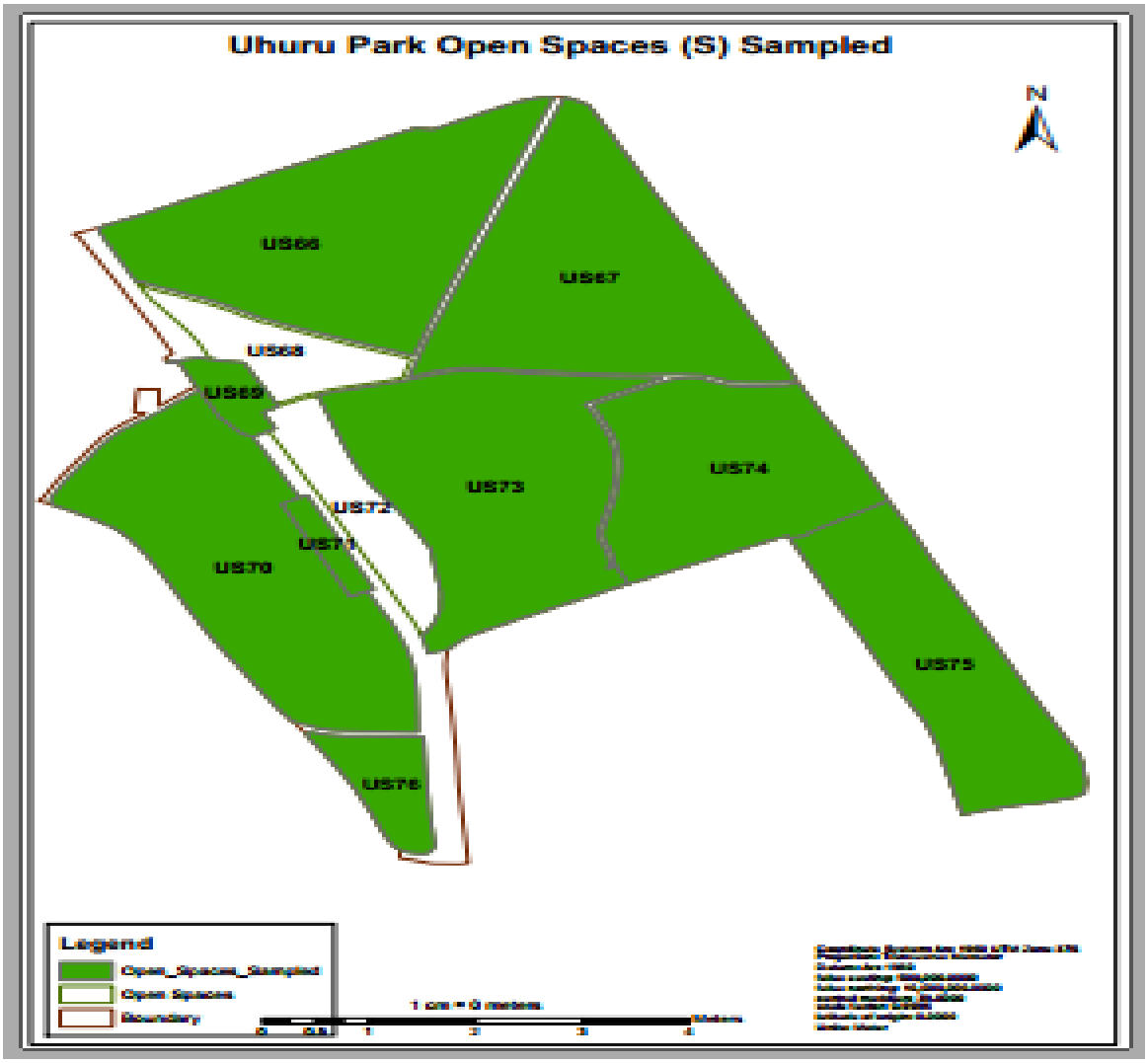

Figure 3.9: Representative samples for open spaces in Uhuru Park

Source: Author, 2019

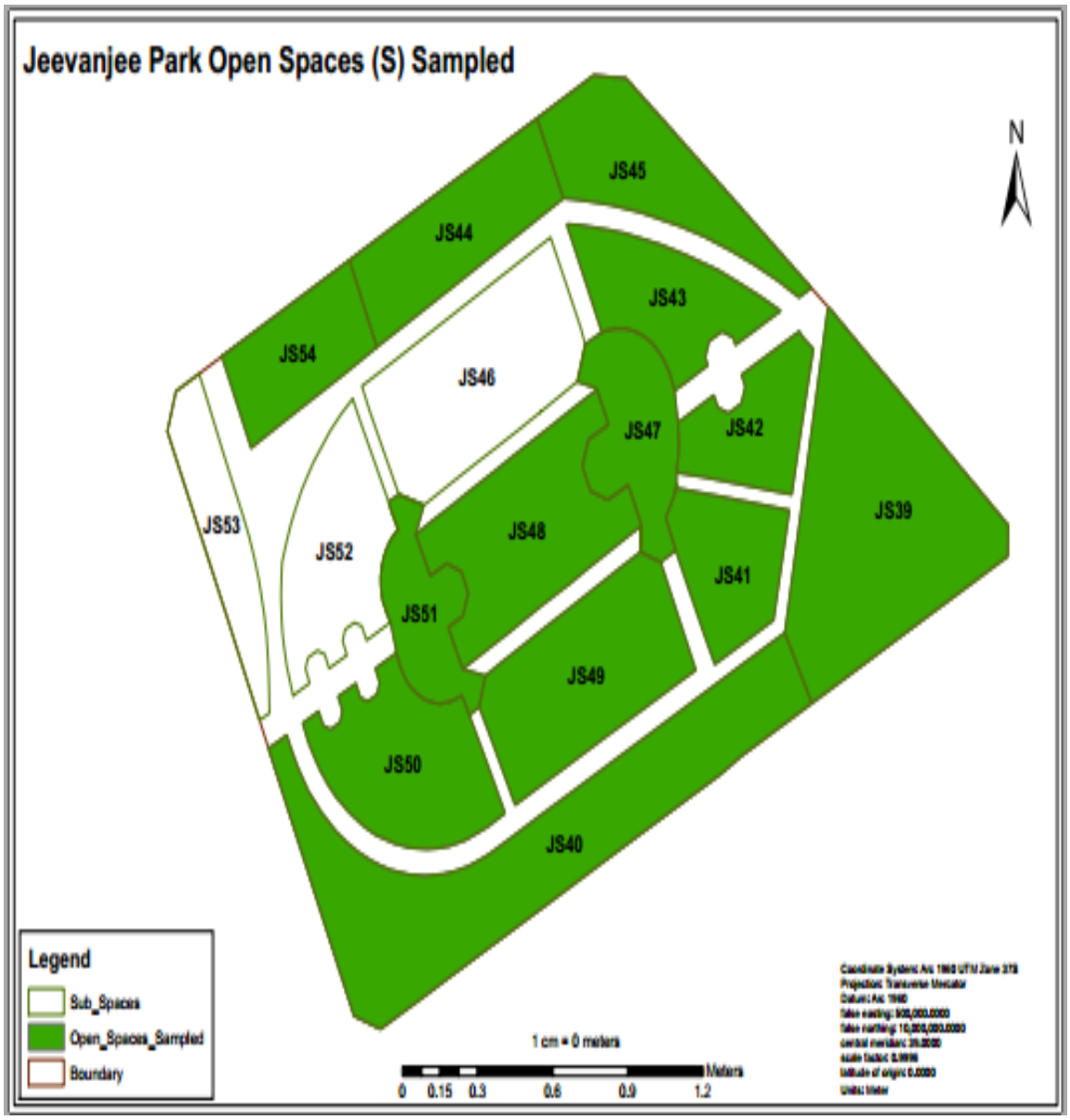

Figure 3.10: Representative samples for open spaces in Jeevanjee Gardens

Source: Author, 2019

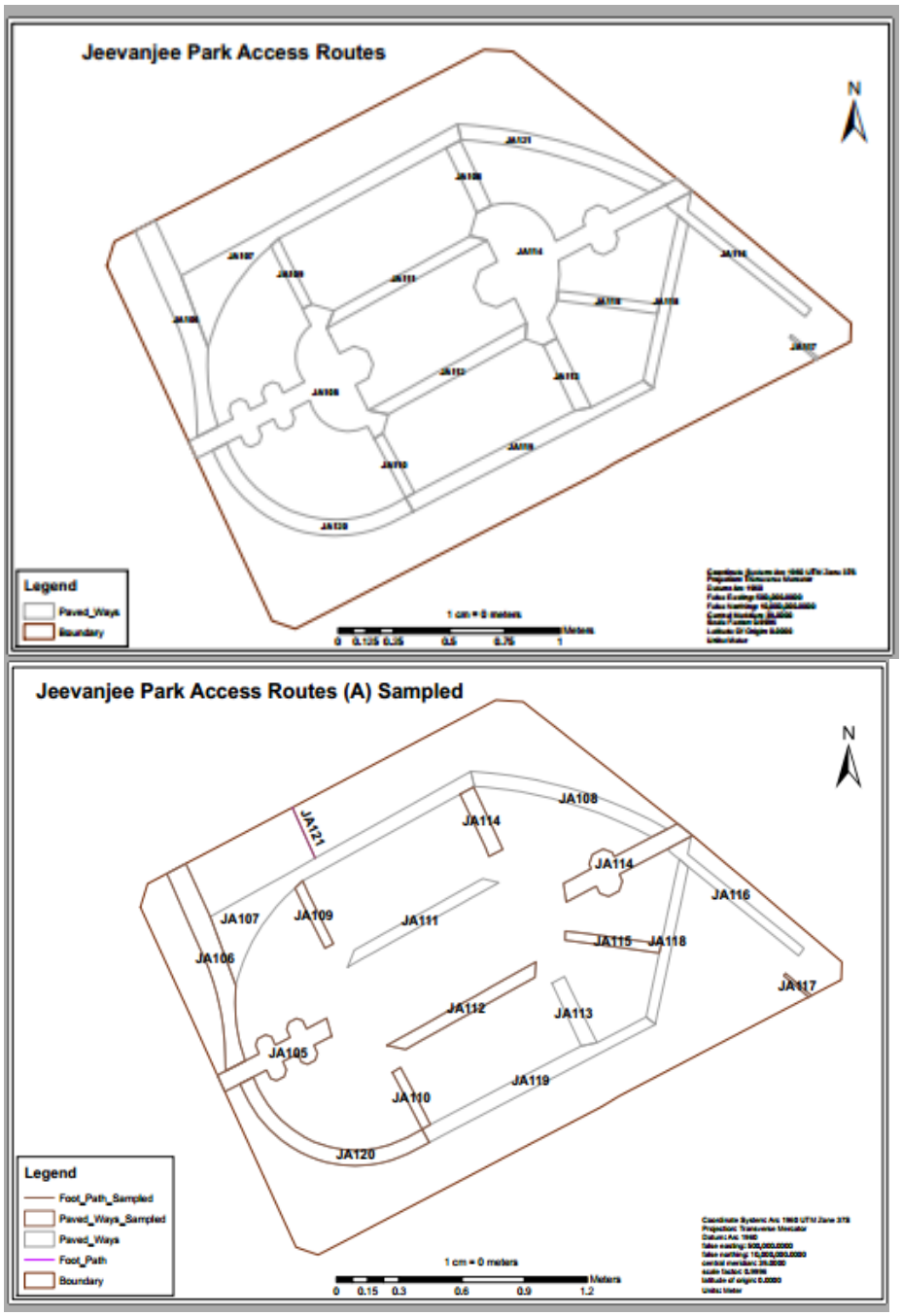

Figure 3.11: Representative samples for access routes in Jeevanjee Gardens

Source: Author, 2019

3.7 Variables and their Measurements

3.7.1 Independent variables

The study independent variables were: Size of Space (SS), Surface Material (SM), Accessibility to the Space (AS), Visual Connectivity (VC), Adjacent Neighborhood Characteristics (NC), Vegetation Characteristics (VE), Environmental Quality (EQ), Built Environment (BE), Distance to the Park (DP), Security in the Space (SE), Overall design layout of space (DL) and Space Aesthetics (SA). Each variable was measured as explained below:

(1) Size of Space (SS)

The size of the space referred to the area of a space calculated in square metres.

(2) Surface Material (SM)

This was taken to be the condition of the finish material. A Likert scale of 1 to 5 was used to rate the condition where:

1 = Very poor 2 = Poor 3 = Moderate

4 = Good and 5= Very good.

(3) Accessibility to the Space (AS)

Accessibility referred to the overall ease of entering into a space. This was measured as a ratio of the total number of access points that connect directly to a space and the area of space in square metres. This was presented as a percentage.

$$AS = \left(\frac{\text{Total number of access points}}{\text{area of space } (M^2)} * 100\right)$$

(4) Visual Connectivity (VC)

This referred to the level of visual connectivity of the space to the adjacent neighborhood in percentage. This was measured using a Likert scale of 1 to 5 as follows:

1 = 0 – 20% - Extremely low connectivity 2 = 21 – 40% - Very low connectivity

3 = 41 – 60% - Moderate connectivity 4 = 61 – 80% - Very high connectivity 5= 81 – 100% - Extremely high connectivity

(5) Adjacent Neighborhood Characteristics (NC)

Adjacent Neighbourhood refers to the bordering landuses/activities to the space under investigation. Adjacent neighbourhood characteristics were measured using three indicators namely: the level of influence to space use by the adjacent land uses-measured on a Likert scale where 1 represented least influential and 5 represented extremely influential.; Environmental condition was measured on a 5-point Likert scale where 1 represented very poor and 5 represented very good. Finally the overall ease of accessibility to the adjacent neighborhood was measured on a 5-point Likert scale where 1 was very difficult and 5 very easy. A total score was then calculated and an average value obtained to represent Adjacent Neighborhood Characteristics.

(6) Vegetation Characteristics (VE)

This was taken to be the average percentage of canopy coverage i.e. trees canopy diameter, shrubs and ground covers such as grass, flowers etc.

1= 0 – 20% - Extremely low density 2 = 21 – 40% - Very low density

3 = 41 – 60% - Moderate density 4 = 61 – 80% - Very high density

5 = 81 – 100% - Extremely high density

(7) Environmental Quality (EQ)

This variable was measured using three indicators namely: i) solid waste ii) dust pollution and iii) odour pollution. The observer rated them in a 5-point Likert scale where 1 represented very dirty/very dusty/very foul while 5 represented very clean/very fragrant.

(8) Built Environment (BE)

This was calculated as the overall density of structures in the space. This is as illustrated below:

$$BE = \left(\frac{\text{Total number of permanent and temporarlly structures}}{\text{area of space } (M^2)} * 100\right)$$

(9) Distance to the Park (DP)

The distance to the park referred to the travel distance to the park from the respondent's house. This was measured in a 5 point scale where 1 represented less than 500m, 2 represented 500m-1 km, 3 represented 1-3km, 4 represented 3-5km and 5 represented more than 5km.

(10) Security in the Space (SE)

This was measured on a 5-point Likert scale where the respondents were asked to give their opinion on security issues to the space upon visit with score 1 representing strongly disagree while 5 represented strongly agree. An average score was used to represent the overall security in the space.

(11) Overall design layout of space (DL)

The indicator used to measure this variable was the quality of design in a space.

This was measured on a 5-point Likert scale where:

1 = very poor 2= Poor 3 = Moderate

4= Good 5= Very good.

(12) Space Aesthetics (SA)

Indicator used was the visual appearance and attractiveness of a space. This was measured on a 5-point Likert scale where:

1 = very poor 2 = Poor 3 = Moderate

4 = good 5= very good.

(13) Park Features (PF)

This was taken to be the overall density of features in space. This was calculated as follows:

$$PF = \left(\frac{\text{Total number of park features in the space}}{\text{area of space } (M^2)} * 100\%\right)$$

3.7.2 Dependent variable

The dependent variable was Park utilization. It was indicated by nine surrogates namely: Frequency of Visit (FV), Average number of people visiting (NV), Average duration of Stay in a Space (DS), Use of space (US), Level of participation in active recreation (LP), Diversity of activities in the space (DA), Intensity of use (IU), Gender Disparity (GD) and Vehicular use patterns (VU). Each of the surrogates is explained below:

(1) Frequency of visit (FV)

Frequency of visit was taken to be how often the respondents visited the space in a period of one year. The number of times the respondent visits was then categorized and measured on a 5-point Likert scale as follows:

1 = Once in a year 2 = Not more than twice in a year

3 = Occasionally (every month but not every week) 4 = Frequently (at least once in a week)

5= Always (more than thrice a week)

(2) Average number of people visiting (NV)

This was taken as the most preferred size of company a user usually is in while in the park space. It was measured on a 5-point Likert scale as follows:

1 = visit the park alone 2 = one who visits with one friend

3 = one who visits in a group of 2-5 people 4 = those who visit in a group of 5-10 people

5= those visiting in a large group of more than 10 people

(3) Average Duration of stay (DS)

This referred to the approximate time one stays in the park space. It was measured on a 5-point Likert scale as follows:

1 = Less than an hour 2 = not more than an hour

3 = not more than 2 hours 4 = not more than 3 hours 5= more than 3 hours

(4) Use of space (US)

This was taken to be the opinion of the respondent on whether the space is used for the right purpose or not. This was measured on a 5-point Likert scale where;

1 = Strongly disagree 2 = Disagree 3 = Neutral

4 = Agree 5=Strongly agree.

(5) Level of participation (LP)

This referred to the level of user participation in active activities in a space whenever they visited. Respondents were required to rate their level of participation in active recreational activities in the space using a 5 –point Likert scale where 1 represented very inactive while 5 was extremely active.

(6) Diversity of activities in the park (DA)

This refers to the different categories of activities the user engaged in per unit area while they visited the park spaces. It was taken to be the overall density of activities in a space represented as a percentage as shown below.

$$DA = \left(\frac{\text{Total number of activities types in space}}{\text{area of space } (M^2)} * 100\%\right)$$

The data was categorized in five groups based on equal percentiles of the cases (NB: not equal width but percentiles). A score of 1 to 5 was then accorded as follows:

1 = Below 0.02931 - Extremely low diversity

2 =0.02932 - 0.18804 - Very low diversity

3 = .18805 - .47422 - Moderately diverse

4 = 0.47423 - 0.87351 - Very high diversity

5= above 0.87351 - Extremely high diversity

(7) Intensity of use (IU)

This was taken to be the overall density of participants in space calculated as follows:

$$IU = \left(\frac{\text{Total number of participants in space}}{\text{area of space } (M^2)} * 100\%\right)$$

The data was categorized in five groups based on equal percentiles of the cases. A score of 1 to 5 was then accorded as follows:

1 = Below 0.20739 - Extremely low intensity of space use

2 = 0.20740 – 1.32860 - Very low intensity of space use

3 = 1.32861 – 2.86568 - Moderate intensity of space use

4 = 2.86569 -5.95259 - Very high intensity of space use

5= above 5.95259 - Extremely high intensity of space use

(8) Gender disparity (GD)

This was taken to be the density of female and male participation in space expressed in percentage as follows:

$$GD = \left(\frac{\text{Total number of female participants in space}}{\text{area of space } (M^2)} * 100\%\right)$$

The data was categorized in five groups based on equal percentiles of the cases. A score of 1 to 5 was then accorded as follows:

1 = Below 0.17167 - Extremely low gender parity

2 = 0.17168 - 1.15964 - Very low gender parity

3 = 1.15965 - 2.67857 - Moderate gender parity

4 = 2.67858 - 5.95722 - Very high gender parity

5= above 5.95723 - Extremely high gender parity

(9) Vehicular use patterns (VU)

This was taken to be the density of vehicles using the space calculated as follows:

Vehicular use patterns = $\left(\frac{\text{Total number of parked vehicles in space}}{\text{area of space } (M^2)} * 100\%\right)$

The data was categorized in five groups based on equal percentiles of the cases. A score of 1 to 5 was then accorded as follows:

1 = Below 0.17167 - Extremely low density

2 = 0.17168 - 1.15964 - Very low density

3 = 1.15965 - 2.67857 - Moderate density

4 = 2.67858 - 5.95722 - Very high density

5 = above 5.95723 - Extremely high density

3.8 Data Collection

3.8.1 Data collection methods, instruments and process

(a) Observation method

According to Walliman (2011), this technique involves recording of events, situations or things experienced with the researcher's senses and perhaps with the help of instruments. Observation schedules and checklists were used as a guide to the information a researcher was required to gather. Instruments used included tape measures and measuring wheels for measuring distances, cameras for taking

photographs as well as counting machines to record the number of users in a space. The study integrated other closely related techniques such as behavior mapping to capture the user behavior without asking the respondent. Information was recorded on the schedules provided for each variable.

Kothari (2004) points out three types of observations: Structured and unstructured observation; Participant and non-participant observation and; Controlled and uncontrolled observation. The study used both structured and non-participant methods. Structured observation was aided by a structured observation schedule which spelled out the variables of observation and style of recording as well as the instruments and procedure for recording. Non -participant method was adopted meaning that the researcher and the researched were independent entities hence excluding the observer's opinion on various aspects of space versus behaviour of the space users.

In line with the observation schedule, the researcher sought information through direct observation on both park utilization and spatial characteristics variables. One observation schedule per sample space was filled. The following independent variables were examined; space size, overall space design layout, aesthetics, surface material, accessibility, visual characteristics, adjacent neighbourhood characteristics, vegetation, park features, proximity and environmental quality. The dependent variable was investigated based on the following indicators/surrogates: intensity of use, level of participation, purpose of visit and distribution of activities.

(b) Interview method

According to Kothari (1996), this method of data collection involves presentation of oral –verbal stimuli and reply in terms of oral- verbal responses. This method is applied through personal interviews or telephone interviews where possible. The current study applied personal interviews to complement the observation method by collection data on some variables. This entailed the interviewer asking questions in a face-to- face contact with the respondent (s).

Either structured or unstructured interview schedules are used in collecting information through the method of personal interviews. In structured personal interview, the interviewer follows a rigid procedure laid down, asking questions in a form and order prescribed. Unstructured interviews on the other hand are flexible as they do not follow a system of predetermined questions and standardized techniques of recording information (Kothari (1996). This study used structured personal interviews which involved the use of a set of predetermined questions and of highly standardized techniques of recording information. Variables whose data were collected through this method was presented in the urban park interview schedule (Ref. Appendix iv).

Variable (K) – Preferred mode of transport to the park; measured on a five point scale of 1 -5.

Variable (M) – Approximate distance to the park; measured on a five point scale of 1 – 5.

Variable (L) – Approximate time taken from the house to the park; measured on a five point scale of 1 – 5)

Variable (N) – Overall ease of accessibility and circulation in a space; measured on a five point scale of 1- 5.

Variable (P) – Factors that influence user's visit; five categories of factors provided for choice.

Variable (R) – Opinion on security in spaces; measured on a five point scale of 1 – 5.

Variable (S) – Frequency of visit to park spaces in a year; measured on a five point scale of 1-5.

Variable (T) – Average number of people visiting in a group; measured on a five point scale of 1-5 and;

Variable (U)- Average duration of stay in the space; measured on a five point scale of 1-5.

(1) Recruitment and training of research assistants

Four research assistants trained in the fields of Landscape Architecture and Environmental planning were recruited. The principal researcher trained them prior to the pilot and main data collection exercises for quality results. The nature and scope of the study was thoroughly explained in order to understand the implications of questions listed on the questionnaires. They were encouraged to be honest, sincere, and hardworking and to be patience and persevere. Each question in the interview schedule was discussed for clarity and better understanding.

(2) Interview schedule structure

The interview schedule was structured under four major sections; (i) Space code and Researcher's details (ii) Respondent's details (iii) Park Spatial characteristics and (iv) Park utilization trend.

(i) Section I: Space code and Researcher's details

This section aimed at collection information on the name of the park, space category to indicate whether access route or an open space, Space code as specified on the sample maps, researcher's name and timing of data collection specifying the date, day and time of data collection).

(ii) Section II: Respondent's details

This section aimed at gathering socio-demographic information on respondents' including their nationality, gender, marital status, age, level of education, employment status and location of residence, home ownership status and duration of stay in the neighbourhood..

(iii) Section III: Park spatial characteristics

This section aimed at measuring the respondent's attitudes, opinions and perceptions on park spatial characteristics and how they influence space use. For example; travel distance, travel time, mode of transport used, cost of travelling and security.

(iv) Section IV: Park utilization details

This section was aimed at collecting data on respondents' frequency of visit, company during visitation, average duration of visit, purpose of visit and level of participation. A five point Likert scale was used in all questions as indicated in Appendix IV. Point One was always the lowest whereas Point 5 was the highest.

(3) Interview schedule administration

The study employed an on- site participation approach in completing the schedules. This approach entailed completion of 185 questionnaires by people visiting various spaces in the parks. During data collection, the research assistants went along with the schedules to the respondents in the respective sampled spaces as marked on the sample maps provided for each park in section 3.6.5.

3.8.3 Pre-Tests and Pilot Survey

A pilot study was carried out at Jevanjee gardens in Nairobi City County, with a sample size of 31 convex spaces. This exercise was helpful in refining the study's data collection tools both the interview and the observation schedule to the final format used.

3.9 Data Analysis

Data collected were thoroughly scrutinized in order to detect and clean any errors during recording. The study adopted a quantitative data analysis which entailed correlation and regression analysis. The Statistical Package for Social Sciences (SPSS, version 20) was used to analyse the data.

(a) Correlation analysis

The study performed a correlation analysis to determine whether there exists a relationship between the dependant variable (Park utilization) and independent variables. The analysis also tested collinearlity between the independent variables. A correlation matrix was then prepared indicating the strength, direction and the relationship between all the variables. The independent variables that strongly related to the dependent variable were then identified and determined from the table. Scatter plots were then produced for every independent variable (X) and dependent variable (Y) in order to establish the best fitting straight line (regression line) for the model produced. All the independent variables that strongly related to the dependent variable (Park utilization) were determined for the next stage of analysis.

(b) Regression analysis

According to Kothari (2004), regression is the determination of a statistical relationship between two or more variables. A regression analysis generates an equation to describe the statistical relationship between one or more predictors and the response variable and to predict new observation. Regression results identify the direction, size and statistical significance of the relationship between a dependent and independent variables.

Multiple regression was used to identify the strength of the effect that the independent variables have on a dependent variable and to forecast the effects or impacts of changes. That is, multiple linear regression analysis helps us to understand how much will the dependent variable change when due to change the independent variables. Walliman

(2011) recommends multivariate analysis such as multiple regression to analyze the relationship between more than two variables. He states that multiple regression technique measures the effects of two or more independent variables on a single dependent variable measured on interval or ratio. Based on the above argument and information, this study used multiple regression technique to measure the effects of several independent (spatial) variables against one dependent variable which is park utilization. Multiple regressions were conducted to produce optimal regression equations.

3.10 Ethical Considerations

To ensure that this study was conducted in an ethical manner all necessary precautions were taken. The study undertook the following ethical considerations as follows. Firstly, this research was officially authorized by the relevant Kenyan authorities, the National Commission for Science, Technology, and Innovation, as required by law and a research permit granted. This authorization is in Appendix I. Secondly, the study respondents were clearly informed and assured of anonymity and confidentiality for their participation in the study which was voluntary. They were also assured that non-participation would not affect them in any way and that that they were free to withdraw their participation at any stage without consequences as indicated in Appendix II. Thirdly, all aspects of the research were explained to the participants. Fourthly, personal data such as names of the respondents were left out of data collection tools to achieve anonymity in accordance with Appendix III – IV. Information obtained from, on and about a participant during this research was treated with confidentiality.

3.11 Validity and Reliability of the Research Instruments

According to Kothari (2004) validity is the ability of an instrument to measure the variable it is intended to measure. He points out that every measuring instrument is designed for a specific measurement or construct. There are four types of validity for measuring instruments designed to collect quantitative data namely: Construct validity,

Content validity, Criterion validity, and Face validity. To enhance content validity, the current study subjected the data collection instruments to a review by experts, who evaluated the constructs the instruments were set to measure and gave suggestions. This was made to ensure good coverage of the study variables and to meet the intent of the study questions and hypothesis as indicated by Mugenda (2008). The study engaged the following people in the evaluation; researcher's supervisors, a statistician and other experts in the field of study.

Construct validity was achieved through theoretically derived hypotheses, involving the concepts under investigation as recommended by Mugenda (2008). Face validity was also conducted to check whether the instrument contained the important items to be measured. The research design adopted by the study enhanced criterion validity as the status quo in park spaces was maintained during data collection. A pilot study was useful in revising the data instruments to be both concise and precise.

To reduce on participant variability, respondents were kept at ease by comfortably sitting under a shade to avoid fatigue and for maximum cooperation as they responded to all questions. To reduce the researcher variability, research assistants were properly trained to understand the study objectives, variables under investigation and the respective constructs and to consistently adhere to procedures. Additionally, research assistants were trained to be extra careful to avoid errors when recording data. Environmental variability was reduced by having the respondents interviewed under a shade or while seated to reduce on discomfort. To validate researcher's techniques, multiple methods are used to simultaneously observe different traits of complex phenomena as long as the methods are related to what the researcher wants to do as recommended by Zeisel (1981). The research design employed in this study enables the combination of interview method to check the responses from the observation method.

3.12 Discussion

This chapter discussed the research strategy and design for the study, detailed the research methods used as well as the instruments of data collection: the operational definition of the study variables was done, how the variables were measured, how they were pretested, and how the data were analysed. The chapter also discussed the study site, the target population and sample size. The ethical considerations for this research have also been discussed. Finally, a discussion on the validity and reliability of the data collected using the given instruments was done. The next chapter presents data analysis, interpretation, and presentation.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

Chapter three explained the methodology followed in this study. The present chapter shows how the methods were applied and results obtained. The chapter is organized in two main parts namely; Correlation and Regression analysis. Regression equations for prediction of the determinants of park use were developed exhibiting a coefficient of determination ranging from 0.089 to 0.879. Finally, park design guidelines were formulated to guide the NCC in the design and development of parks within the county.

4.2 Correlation between Park Utilization and the Explanatory Variables

Through correlation analysis, the study sought to establish the strength, direction and significance of the relationship between the nine (9) different measures of the dependent variable (Park utilization) namely: Frequency of visit (FV); Average number of people visiting (NV); Average Duration of stay (DS); Use of space (US); Level of participation (LP); Diversity of activities in the park (DA); Intensity of use (IU); Gender disparity (GD) and Vehicular use patterns (VU).

The independent variables were: Size of Space (SS), Surface Material (SM), Accessibility to the Space (AS), Visual Connectivity (VC), Adjacent Neighborhood Characteristics (NC), Vegetation Characteristics (VE), Environmental Quality (EQ), Built Environment (BE), Distance to the Park (DP), Security (SE), Overall design layout of space (DL), Space Aesthetics (SA) and Park Features (PF).

Each of the variables had a null and an alternative hypothesis as follows:

- Null hypothesis ($H_{\circ}$): There is no correlation between the dependent variable and the independent variable being considered.

- The alternative hypothesis ($H_{a)}$): There is a significant correlation between the dependent variable and the independent variable being considered.

Table 4.1 to 4.10 gives a summary of the results of the correlation analysis as contained in the correlation matrices displayed in appendix v. The table also shows the hypothesis testing carried out using SPSS, which was achieved through performing a Pearson's correlation.

4.2.1 Correlation between frequency of visits and independent variables

The correlation between frequency of visits (an indicator of the dependent variable) and all the thirteen independent variables was investigated. Frequency of visit was measured as how often the user visited the space in a period of one year. This was rated in a Five point Likert Scale ranging from 1 – 5, where '(1) represented Yearly (Once a year)'; (2) not more than twice in a year; (3) occasionally-every month but not every week; (4) frequently-at least once in a week and; (5) represented always-more than thrice a week. Point Five was the highest value and One the lowest.

The hypotheses stated as below;

- Null hypothesis ($H_{\circ}$): There is no correlation between the frequency of visit and the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the frequency of visit and the independent variables.

Correlation analysis results revealed that there was statistically significant positive linear relationship between frequency of visit and Security in park spaces, r=0.272; p= 0.000 as indicated in table 4.1. However, no significant correlation was found between frequency of visit and the remaining twelve independent variables namely; Size of Space, Surface Material, Accessibility to the Space, Visual Connectivity, Adjacent Neighborhood Characteristics, Vegetation Characteristics, Environmental Quality, Built Environment,

Distance to the Park, Overall design layout of space , Space Aesthetics and Park Features.

Table 4.1: Summary of significant independent variable; frequency of visits

Code	Independent Variable	Coefficients	Conclusion
SE	Security in the space	r = 0.272	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.2 Correlation between average number of people visiting a space and independent variables

Average number of people visiting in a group refers to the most preferred type of company a user usually is in while visiting the space. The user could be alone or in a company. Respondent's company during space visits was assessed by use of a Five point Likert Scale ranging from '(1) Alone ' to '(5) In a group of more than 10 people'. Point Five was the highest value whereas One the lowest.

The hypotheses stated as below;

- Null hypothesis ($H_{\circ}$): There is no correlation between the average number of people visiting and the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the average number of people visiting and the independent variables.

Correlation analysis results in table 4.2 indicated a statistically significant positive linear relationship between the average number of people visiting a park space and only two independent variables namely; the built environment, r= 0.55; p = 0.000 and Park features, r=0.275; p = 0.000.

Table 4.2: Summary of significant independent variables; average number of people visiting a space

Codes	Independent Variable	Coefficient	Conclusion
BE	Built environment	r = 0.555	There is a significant correlation
		p = 0.000	Reject the null hypothesis
PF	Park features	r = 0.275	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

No significant correlation was found between average number of people visiting and the remaining eleven independent variables which include; Size of Space, Surface Material, Accessibility to the Space, Visual Connectivity, Adjacent Neighborhood Characteristics, Vegetation Characteristics, Environmental Quality, Distance to the Park, Security in the Space, Overall design layout of space and Space Aesthetics.

4.2.3 Correlation between average duration of stay and independent variables

Average duration of stay was considered as the approximate time one stays in the park spaces. This was measured by use of a Five point Likert Scale ranging from point 1 to 5. Less than an hour was coded to be (1), not more than an hour was taken to be (2), not more than 2 hours was taken to be (3), not more than 3 hours was taken to be (4) while more than 3 hours was taken to be (5).

The hypotheses stated as below;

- Null hypothesis ($H_{\circ}$): There is no correlation between the average duration of stay in space and the independent variables.

- The alternative hypothesis (H_a): There is a significant correlation between the average duration of stay in space and the independent variables.

Results in table 4.3 indicated a statistically significant positive linear relationship between Average duration of stay in a park space and Size of space, r=0.132; p = 0.043. There was no significant correlation found between average duration of stay and the remaining twelve independent variables.

Table 4.3: Significant independent variables; average duration of stay

Code	Independent Variable	Coefficients	Conclusion
SS	Size of space	r = 0.132 p = 0.043	There is a significant correlation Reject the null hypothesis

4.2.4 Correlation between space use and independent variables

Space use was taken to be the opinion of the respondent on whether the space is used for the right purpose or not. This was measured on a 5-point Likert scale ranging from 1 to 5 where (1) was strongly disagree and (5) was strongly agree.

The hypotheses stated as below;

- Null hypothesis ($H_\circ$): There is no correlation between space use and the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between space use and the independent variables.

Results in table 4.4 point out that, there was a statistically significant positive linear relationship between Visual connectivity, r= 0.162; p = 0.015. It was also revealed that there was a statistically significant negative linear relationship between Space use and Security in space,

r= - 0.237; p = 0.000.

Table 4.4: Summary of significant independent variables; space use

Codes	Independent Variables	Coefficients	Conclusion
VC	Visual connectivity	r = 0.162	There is a significant correlation
		p = 0.015	Reject the null hypothesis
SE	Security in space	r = - 0.237	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.5 Correlation between the level of participation and independent variables

The study investigated the relationship between the level of user's participation in recreational activities and all the independent variables (spatial characteristics). The respondents were required to rate their level of participation in active recreational activities in the space whenever they visited. A 5-point Likert scale ranging from 1 to 5 was used, where point (1) was not active while (5) was extremely active.

The hypotheses stated as below;

- Null hypothesis ($H_{\circ}$): There is no correlation between the level of participation in park spaces and the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the level of participation in park spaces and the independent variables.

Results of correlation analysis displayed in table 4.5 below indicated a statistically significant positive linear relationship between the Level of participation and Size of space, r=0.153; p = 0.018 and Space aesthetics, r= 0.168; p = 0.010.

Table 4.5: Summary of significant independent variables; level of participation

Codes	Independent Variables	Coefficients	Conclusion
SS	Size of space	r = 0.153	There is a significant correlation
		p = 0.018	Reject the null hypothesis
SA	Space Aesthetics	r = 0.168	There is a significant correlation
		p = 0.010	Reject the null hypothesis

Source: Author, 2019

4.2.6 Correlation between diversity of activities in the space and independent variables

The relationship between the diversity of activities in a park space and all the independent variables (spatial characteristics) was investigated. Diversity of activities in a space refers to the different categories of activities the user engaged in per unit area while they visited park spaces.

The hypotheses stated as below;

- Null hypothesis ($H_{\circ}$): There is no correlation between the diversity of activities in the park spaces and all the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the diversity of activities in the park space and all the independent variables.

As shown in table 4.6, a statistically significant positive linear relationship was established between the Diversity of activities in park spaces and four independent variables namely; Accessibility to park spaces, r=0.747; p = 0.000; Visual connectivity, r=0.170; p = 0.012; Built environment, r=0.348; p = 0.000 and Park features, r=0.525; p = 0.000. Results also indicated a statistically significant negative relationship between Diversity of activities in the park and Size of space, r= - 0.219; p = 0.001 and

Security in space, r= - 0.180; p = 0.007. It was found out that there was no correlation between diversity of activities in park spaces and surface material, Adjacent neighbourhood characteristics, Vegetation characteristics, Environmental quality, Distance to the park, Overall design layout and space aesthetics.

Table 4.6: Summary of significant independent variables; diversity of activities

Codes	Independent Variables	Coefficients	Conclusion
SS	Size of space	r = - 0.219	There is a significant correlation
		p = 0.001	Reject the null hypothesis
AS	Accessibility to the space	r = 0.747	There is a significant correlation
		p = 0.000	Reject the null hypothesis
VC	Visual connectivity	r = 0.170	There is a significant correlation
		p = 0.012	Reject the null hypothesis
BE	Built environment	r = 0.348	There is a significant correlation
		p = 0.000	Reject the null hypothesis
SE	Security in the space	r = - 0.180	There is a significant correlation
		p = 0.007	Reject the null hypothesis
PF	Park features	r = 0.525	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.7 Correlation between intensity of space use and independent variables

The study investigated the correlation between the Intensity of space use and all the independent variables. Intensity of use was taken to be the overall density of participants in space per square metre.

The hypotheses stated as follows;

- Null hypothesis ($H_{\circ}$): There is no correlation between the intensity of space use and all the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the intensity of space use and all the independent variables.

Results of Pearson's correlation analysis in table 4.7 indicated that there was a statistically significant positive linear relationship between Intensity of space use and four independent variables namely; Accessibility to space, r= 0.798; p = 0.000; Adjacent neighbourhood characteristics, r= 0.185; p = 0.006; Built environment, r= 0.548; p = 0.000 and Park features, r= 0.567; p = 0.000.

Results also indicated a statistically significant negative linear relationship between Intensity of space use and Size of space, r= -0.146; p = 0.029. There was no correlation found between intensity of space use and the remaining eight independent variables which include; Accessibility to the space, Visual connectivity, Vegetation characteristics, Environmental quality, Distance to space, Security in space and Overall design layout of space.

Table 4.7: Summary of significant independent variables; intensity of space use

Codes	Independent Variables	Coefficients	Conclusion
SS	Size of space	r = - 0.146	There is a significant correlation
		p = 0.029	Reject the null hypothesis
AS	Accessibility to the space	r = 0.798	There is a significant correlation
		p = 0.000	Reject the null hypothesis
NC	Adjacent neighbourhood characteristics	r = 0.185	There is a significant correlation
		p = 0.006	Reject the null hypothesis
BE	Built environment	r = 0.548	There is a significant correlation
		p = 0.000	Reject the null hypothesis
PF	Park features	r = 0.567	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.8 Correlation between gender disparity and independent variables

Gender disparity was taken to be the density of female participation in space per square metre. The correlation between gender disparity and all the independent variables was investigated.

Hypotheses stated as follows;

- Null hypothesis ($H_{\circ}$): There is no correlation between gender disparity and all the independent variables.
- The alternative hypothesis (H_a): There is a significant correlation between the intensity of space use and all the independent variables.

According to table 4.8, correlation analysis results indicated that there was a statistically significant positive linear relationship between gender disparity in space and Accessibility to the space, r= 0.798; p = 0.000; Adjacent neighbourhood characteristics, r= 0.193; p = 0.003; Built environment, r= 0.549; p = 0.000 and Park features, r= 0.553; p = 0.000.

Results also indicated a statistically significant negative linear relationship between gender disparity in space and Size of space, r= -0.140; p = 0.032. There was no correlation between gender disparity and Surface material, Visual connectivity, Vegetation characteristics, Environmental quality, Distance to the park, Security in the space, overall design layout and Space aesthetics.

Table 4.8: Summary of significant independent variables; gender disparity

Codes	Independent Variables	Correlation	Conclusion
SS	Size of space	r = - 0.140	There is a significant correlation
		p = 0.032	Reject the null hypothesis
AS	Accessibility to the space	r = 0.798	There is a significant correlation
		p = 0.000	Reject the null hypothesis
NC	Adjacent neighbourhood characteristics	r = 0.193	There is a significant correlation
		p = 0.003	Reject the null hypothesis
BE	Built environment	r = 0.549	There is a significant correlation
		p = 0.000	Reject the null hypothesis
PF	Park features	r = 0.553	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.9 Correlation between vehicular use patterns and Independent variables

The density of vehicles using the space per square metre was established and its correlation with all the independent variables investigated. As indicated in table 4.9, correlation analysis results found out a statistically significant positive linear relationship between Vehicular use patterns and Adjacent neighbourhood characteristics, r= 0.191; p = 0.005; Built environment, r= 0.649; p = 0.000 and Park features, r= 0.455; p = 0.000. The study found no correlation between vehicular use patterns and remaining ten independent variables namely; Size of space, surface material, Accessibility to space, Visual connectivity, Vegetation characteristics, Environmental quality, Distance to the park, Security in space, Overall design layout of space and Space aesthetics.

Table 4.9: Summary of significant independent variables; vehicular use patterns

Codes	Independent Variables	Coefficients	Conclusion
NC	Adjacent neighbourhood characteristics	r = 0.191	There is a significant correlation
		p = 0.005	Reject the null hypothesis
BE	Built environment	r = 0.649	There is a significant correlation
		p = 0.000	Reject the null hypothesis
PF	Park features	r = 0.455	There is a significant correlation
		p = 0.000	Reject the null hypothesis

Source: Author, 2019

4.2.10 Summary of independent variables that have a significant correlation with the dependent variable

Table 4.10 displays the eight independent variables were found to have a significant correlation with the respective dependent variable surrogates namely: Size of Space (SS), Accessibility to the Space (AS), Visual Connectivity (VC), Adjacent

Neighborhood Characteristics (NC), Built Environment (BE), and Security (SE), Space Aesthetics (SA) and Park Features (PF). The variables were used in regression analyses of the study.

Table 4.10: Summary of all the independent variables that have a significant correlation with dependent variable

	Dependent variable		**Significant Independent variables**			
S/No.	Code	Y -Surrogates	Code	Variable	r-Value	P-Value
1.	FV	Frequency of visit	SE	Security in space	0.272	0.000
2.	NV	Average number of people visiting a space	BE	Built Environment	0.555	0.000
			PF	Park features	0.275	0.000
3.	DS	Average duration of stay	SS	Size of space	0.132	0.043
4.	US	Use of space	VC	Visual connectivity	0.162	0.015
			SE	Security in space	-0.237	0.000
5.	LP	Level of participation	SS	Size of space	0.153	0.018
			SA	Space aesthetics	0.168	0.010
6.	DA	Diversity of activities	SS	Size of space	-0.219	0.001
			AS	Accessibility in a space	0.747	0.000
			VC	Visual connectivity	0.170	0.012
			BE	Built environment	0.348	0.000
			SE	Security in space	-0.180	0.007
			PF	Park features	0.525	0.000
7.	IU	Intensity of space use	SS	Size of space	-0.146	0.029
			AS	Accessibility in space	0.798	0.000
			NC	Adjacent neighbourhood characteristics	0.185	0.006
			BE	Built environment	0.548	0.000
			PF	Park features	0.567	0.000
8.	GD	Gender disparity	SS	Size of space	-0.140	0.032
			AS	Accessibility in space	0.798	0.000
			NC	Adjacent neighbourhood characteristics	0.193	0.003
			BE	Built environment	0.549	0.000
			PF	Park features	0.553	0.000
9.	VU	Vehicular use patterns	NC	Adjacent neighbourhood characteristics	0.191	0.005
			BE	Built environment	0.649	0.000
			PF	Park features	0.455	0.000

Source: Author, 2019

Table 4.11: Nature of influence of the 8 significant independent variables on the respective dependent surrogates

Nature of influence	Independent variables	Correlation Coefficients (r)	Influence on Park Utilization
1.Statistically significant, positive & strong	i) Accessibility	0.747; 0798	Diversity of activities ; Intensity of use
	ii) Built Environment	0.555; 0.548	Diversity of activities; Intensity of use; Gender disparity; Vehicular use patterns
	iii) Park features	0.525; 0.567; 0.549; 0.649	Diversity of activities ; Intensity of use; Gender disparity; Vehicular features
2.Statistically significant, positive & moderate	i) Built Environment	0.348	Diversity of activities
	ii) Park Features	0.455	Vehicular use patterns
3.Statistically significant, positive & weak	i) Security in space	0.272	Frequency of visits;
	ii) Park features	0.275	Average no. of people visiting
	iii) Visual connectivity	0.162; 0.170	Use of space; Diversity of activities
	iv) Size of space	0.132; 0.153	Average duration of stay; Level of participation.
	v) Space aesthetics	0.168	Level of participation
	vi) Adjacent neighbourhood	0.185; 0.193; 0.191	Intensity of use; Gender disparity; Vehicular use patterns
4.Inverse relationship	i) Security in space	-0.237	Diversity of activities
	ii) Size of space	-0.219; -0.146; -0.140	Diversity of activities; Intensity of use; Gender disparity

Source: Author, 2019

4.3 Regression Analysis

Multiple linear regression was conducted with each surrogate of Park Utilization (Y) as the dependent variable and the respective significant independent variables. The following eight independent variables found to have a significant correlation with the respective dependent variable indicators were considered at this stage. This included; Size of Space (SS), Accessibility to the Space (AS), Visual Connectivity (VC), Adjacent Neighborhood Characteristics (NC), Built Environment (BE), and Security in the Space (SE), Space Aesthetics (SA) and Park Features (PF).

The relationship between dependent and independent variables was investigated using Pearson product moment correlation coefficient. Preliminary analysis was performed to ensure no violation of the assumption or normality, linearity, multicollinearity and homoscedasticity. This justified the choice of method of analysis. Regression analysis results were presented in three Tables namely, Model Summary, Model Coefficient table as indicated in Appendix V.

Table 4.11 displays a summary of regression results giving a total of 9 prediction models.

Table 4.12: Summary of regression results

S/No.	Y_1 Surrogates	β_0	SS	AS	NC	BE	SE	SA	PF	Adjusted R^2	F- value	Sig. P - value	Percent %
1.	FV	-28.23					66.902			0.089	18.841	0.000[b]	8.9
2.	NV	8.66				155.34				0.303	38.605	0.000[b]	30.5
3.	DS	4.256	8.08E-5							0.710	15.127	0.000[b]	71
4.	US	4.531					-0.225			0.450	9.305	0.003[b]	45
5.	LP	1.454	1.37E-5					0.25		0.047	5.414	0.005[b]	47
6.	DA	-0.067		0.490		0.505			0.273	0.879	394.746	0.000[b]	87.9
7.	IU	-5.03		0.936	1.743	4.420			2.379	0.532	48.945	0.000[b]	53.2
8.	GD	-4.98		0.947	1.72	4.80			2.265	0.540	50.542	0.000[b]	54
9.	VU	-1.72			0.597	5.82				0.460	73.794	0.000[b]	46

Source: Author, 2019

Note:

The model is significant at P- value < 0.05

β_0 Interpretation - The constant means that (i) when the X variable changes by 0, the Y variable changed by B0 units.

(ii) **β_0** is unique for each model.

Table 4.13: Variable codes

	Dependent Variable Surrogates			Independent variables	
S/No	Codes	Surrogate	S/No	Codes	Variables
Y1.	FV	Frequency of visits	X1.	SS	Size of space
Y2.	NV	Average number of people visiting a space	X2.	SM	Surface material
Y3.	DS	Average duration of stay	X3.	AS	Accessibility to the space
Y4.	US	Use of space	X4.	VC	Visual connectivity
Y5.	LP	Level of participation	X5.	NC	Adjacent neighbourhood characteristics
Y6.	DA	Diversity of activities in a park space	X6.	VE	Vegetation characteristics
Y7.	IU	Intensity of use	X7.	EQ	Environmental quality
Y8.	GD	Gender disparity	X8.	BE	Built environment
Y9.	VU	Vehicular use patterns	X9.	DP	Distance to park spaces
			X10.	SE	Security in the space
			X11.	DL	Overall design layout
			X12.	SA	Space aesthetics
			X13.	PF	Park features

Source: Author, 2019

From the Table 4.11 above, the study developed nine (9) prediction models as follows:

Equation 4.1:

Frequency of Visit (FV) = -28.23 + 66.902 SE (8.9%)

Equation 4.2:

Average number of people visiting (NV) = 8.66 + 155.34 BE (30.3%)

Equation 4.3:

Average duration of stay (DS) =4.256 + 8.08E-5 SS (71%)

Equation 4.4:

Use of space (US) = 4.531 + -0.225 SE (45%)

Equation 4.5:

Level of participation (LP) = 1.454 + 1.37E-5 SS+ 0.250 SA (4.7%)

Equation 4.6:

Diversity of activities in the park (DA) = -0.067 + 0.490 AS + 0.505 BE + 0.273 PF (87.9%)

Equation 4.7:

Intensity of use (IU) = -5.03 + 0.936 AS + 1.743 NC + 4.420 BE + 2.379 PF (53.2%)

Equation 4.8:

Gender disparity (GD) = -4.98 + 0.947 AS + 1.72 NC + 4.80 BE + 2.265 PF (54%)

Equation 4. 9:

Vehicular use patterns (VU) = -1.72 + 0.597 NC+ 5.82 BE (46%)

4.3.1 Regression between frequency of visit to a space and significant independent variables

Multiple regression between the dependent variable measure, Frequency of Visit (FV) with security in park spaces revealed that, Security (SE) significantly explained variation in the frequency of visit to a space by 8.9 percent. This was indicated by a coefficient of determination (R^2) value of 0.089. The model whose prediction is significant at 95 percent confidence level is illustrated by Equation 4.1 below.

Eq. 4.1: Frequency of visit (FV) = -28.23 + 66.902 SE

R^2= 0.089

SS = Size of space

The above prediction model indicates a statistically positive linear relationship between frequency of space visit and size of space. This suggests that, holding all other factors constant, a unit increase in Security (SE), increases Frequency of Visit by 66.902 units, implying that the larger the space, the higher the frequency of visits. This result is as expected in the conceptual framework since the user can engage in a variety of activities which becomes a push factor.

4.3.2 Regression between average number of people visiting a space and significant independent variables

The study also sought to understand the relationship between the average number of people visiting a space in a group and the significant independent variables in a park space. A multiple regression analysis between the dependent variable measure versus the built environment and park features was performed. Analysis results demonstrated that Built environment (BE) significantly explained 30.5 percent of the variation in the average number of people visiting park spaces. This was indicated by a coefficient of determination (R^2) value of 0.303.

The model whose prediction is significant at 95 percent confidence level is illustrated by Equation 4.2 below.

Eq. 4.2: Average number of people visiting (NV) = 8.66 + 155.34 BE

R^2= 0.303

BE= Built environment

The above equation demonstrates that, holding all other factors constant, a unit increase in the built environment (BE) increases the average number of people visiting a space by155.34 units, implying that the higher the number of recreational structures in a park space (both temporal and permanent), the larger the groups of those visiting such a space. This could be associated to the presence of ample space for any form of activity be it group activity of or individual.

4.3.3 Regression between average duration of stay in a space and significant independent variables

Results of a multiple regression between the Average duration of stay (DS) with Size of park Spaces (SS) revealed that, size of space significantly explained up to 71 percent of the variation in the average duration of stay in space. This was indicated by a coefficient of determination ($R^{2)}$ value of 0.710. The model which is predictive at 95 percent confidence level is illustrated by Equation 4.3 below.

Eq. 4.3: Average duration of stay (DS) =4.256 + 8.08E-5 SS

R^2= 0.710

SS= Size of space

The above model shows that, there exists a statistically significant positive linear relationship between average duration of stay and the size of space. This suggests that, a unit increase in size of a space increases the average duration of stay in a space by 8.08E-5 units, implying that the larger the space, the longer the duration of stay in a space possibly due to privacy and relaxed atmosphere in the space.

4.3.4 Regression between use of space and significant independent variables

Multiple regression analysis between the use of space use versus visual connectivity and security in spaces reveals that 45 percent of the variation in the dependent variable

(Space use) is significantly explained by security. This is indicated by a coefficient of determination (R^2) value of 0.450. The model which is illustrated in Equation 4.4 is predictive at 95 percent confidence level.

Eq. 4.4: Purpose of space use (US) = 4.531 + -0.225 SE

R^2= 0.450

SE= Security in the space

This prediction indicates a statistically significant positive linear relationship between space use and visual connectivity. The model demonstrates that a unit increase in security lowers the use of a park space by -0.225 units. This implies that the more the security in a park space, the less the participation in the rightful use of that space. This could be attributed to unease and tension for some category of users engaging in illegal activities such as drug peddling and illegal business deals.

4.3.5 Regression between level of participation in a space and significant independent variables

The results of multiple regression analysis between the level of participation versus size of space and space aesthetics indicate that, the size of a space significantly explained 4.7 percent of the variation in the level of participation of space users. This was indicated by a coefficient of determination (R^2) value of 0.047. The model which is predictive at 95 percent confidence level shows a statistically significant positive linear relationship between the level of participation and the size of a space as illustrated in Equation 4.5 below.

Eq. 4.5: Level of participation in a space (LP) = 1.454 + 1.37E-5 SS+ 0.250 SA

R^2= 0.047

SS = Size of space

SA = Space aesthetics

This prediction demonstrates that, a unit increase in the size of a space and space aesthetics increases the level of participation in park spaces by 1.37E-5 and 0.250 units respectively. This implies that the larger the size of the space and the more aesthetically the space the higher the level of participation in active activities upon visitation.

4.3.6 Regression between the diversity of activities in a space and significant independent variables

Diversity of activities in a space was regressed against six independent variables namely; size of space, accessibility to the space, visual connectivity, built environment, security in space and park features. Results of the multiple regression analysis revealed that 87.9 percent variability in the diversity of activities in a space was significantly explained by three explanatory variables namely; accessibility to space, Built environment and Park features. This variability was indicated by a coefficient of determination (R^2) value of 0.879. The prediction model which is illustrated in Equation 4.6 indicates a statistically significant positive linear relationship between the diversity of activities in a space and accessibility, built environment and park features.

Eq. 4.6: Diversity of activities in a space (DA) = -0.067 + 0.490 AS + 0.505 BE + 0.273 PF

R^2= 0.879

AS=Accessibility to space

BE= Built environment

PF= Park features

The model which is predictive at 95 percent confidence level shows that, a unit increase in accessibility to a space, the built environment, and park features results to an increase the diversity of activities in park spaces by 0.490, 0.505 and 0.273 units respectively.

These findings imply that, an increase in either of them, while holding other factors constant, results to an increase in the diversity of activities in a space.

4.3.7 Regression between intensity of use and the significant independent variables

Multiple regression analysis between the intensity of space use versus five independent variables namely: size of space, accessibility to the space, adjacent neighbourhood characteristics, built environment and park features revealed that four independent variables explained variability in the intensity of space use by 53.2 percent. The four predictor variables include; accessibility in a space, adjacent neighbourhood characteristics, built environment and park features. This was indicated by a coefficient of determination (R^2) value of 0.532. The model which is illustrated in Equation 4.7 indicates a statistically significant positive linear relationship between the intensity of space use and accessibility to the space, adjacent neighbourhood characteristics, built environment and park features.

Eq. 4.7: Intensity of space use (IU) = -5.03 + 0.936 AS + 1.743 NC + 4.420 BE + 2.379PF

R^2= 0.532

AS= Accessibility in space

NC= Adjacent neighbourhood characteristics

BE = Built environment

PF= Park features

Model 4.7 above demonstrates that, a unit increase in accessibility to a space, its adjacent neighbourhood characteristics, built environment and park features increases the intensity of space use by 0.936, 1.743, 4.420 and 2.379 units respectively. These

findings imply that an increase in either of them, while holding other factors constant, results to an increase in the intensity of space use.

4.3.8 Regression between gender disparity in space and the significant independent variables

Gender disparity was regressed against five independent variables namely size of space, accessibility to the space, adjacent neighbourhood characteristics, built environment and park features. Results indicated that 54 percent of variation in gender disparity in space is significantly explained by a combination of four independent variables; accessibility in space, adjacent neighbourhood characteristics, built environment and park features. This was indicated by a coefficient of determination (R^2) value of 0.824. The model which is predictive at 95 percent confidence level is illustrated in Equation 4.8.

Eq. 4.8: Gender disparity (GD) = -4.98 + 0.947 AS + 1.72 NC + 4.80 BE + 2.265 PF

R^2= 0.540

AS = Accessibility in a space

NC= Adjacent neighbourhood characteristics

BE= Built environment

PF= Park features

The prediction shows that four predictor variables namely: accessibility in a space, adjacent neighbourhood characteristics, built environment and park features have a statistically significant positive and linear relationship with gender disparity. The model indicates that a unit increase in the accessibility to a space, adjacent neighbourhood characteristics, the built environment and park features increases gender disparity by 0.947, 1.72, 4.80 and 2.265 units respectively. This suggests that an increase in the either

of the four predictor variables, holding all other factors constant, results to an increase in gender disparity in space.

4.3.9 Regression between vehicular use patterns and independent variables

Multiple regression analysis between vehicular use patterns and three significant independent variables; adjacent neighbourhood characteristics, built environment and park features shows that 46 percent of variation in vehicular use patterns in a space is significantly explained by a combination of two predictor variables namely: vegetation characteristics and environmental quality. This was indicated by a coefficient of determination (R^2) value of 0.460. The model which is predictive at 95 percent confidence level is illustrated in Equation 4.9.

Eq. 4.9: Vehicular use patterns (VU) = -1.72 + 0.597 NC+ 5.82 BE

R^2= 0.460

NC= Adjacent neighbourhood characteristics

BE= Built Environment

The prediction shows a statistically significant linear relationship between vehicular use patterns and adjacent neighbourhood characteristics and the built environment. The model indicates that a unit increase in the adjacent neighbourhood characteristics and the built environment increases vehicular use patterns by 0.597 and 5.82 units respectively. This suggests that an increase in the either of the two independent variables, holding all other factors constant, results to diversified vehicular use patterns in park spaces.

4.3.10 Discussion

This Chapter focused on data analysis and Interpretation. Correlation analysis revealed a correlation between park utilization and spatial characteristics. As earlier indicated, regression results led to the development of a total of nine (9) prediction models of park

utilization. The models will be useful to the park designer and the governing authorities in the following phases of park development;

i) Design and development

ii) Maintenance and

iii) Rehabilitation

Specifically, the models will be beneficial in the following ways;

a) Use of the models will ensure that all aspects of park utilization and their respective explanatory variables are well taken care of during park design and development stages.

b) It is possible for the park designer to understand specifically which predictor variable to change for optimal park use.

c) Use of the models is cost cutting and economical to the client as they give guidance on key area of focus, since less attention will be paid to less predictive variables depending on his/her objective.

The low values of R^2 could be linked to

(i) The manner in which the variables were constructed. Attributes not considered in the measurement of variables in this study are potential areas for further research.
(ii) Other factors influencing park utilization not considered in this study such as social-economic, demographics and political factors.

4.4 Formulation of Design Guidelines for Urban Parks in Nairobi City County

The Nairobi City County is a creation of the Constitution of Kenya 2010 and successor of the defunct City Council of Nairobi. It operates under the auspices of the Cities and Urban Areas Act, The Devolved Governments Act and a host of other Acts. The NCC is charged with the responsibility of providing a variety of services to residents within its area of jurisdiction. These include the services that were hitherto provided by the defunct City Council and the ones that have been transferred from the national government. In line with agenda 2030, Sustainable Development Goal (SDG) 11, the County of Nairobi aspires to provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.

To optimize park usage, this study has formulated park design guidelines for the NCC to consider enacting for future use by park designers and developers within the County. Park designs need to consider sustainable strategies that include: designs that are compliant with park security; accessible and well connected to the neighbourhoods; durable and comfortable park facilities; innovative; ease of maintenance and attractive.

The formulated guidelines displayed in table 4.14 are based on the 9 prediction models developed in the study. The guidelines consider eight (8) spatial characteristics that were found to critically influence park utilization within Nairobi City County namely:- Size of Space, Accessibility to the park Spaces, Visual Connectivity, Adjacent Neighborhood Characteristics, Built Environment, Security in park Spaces, Space Aesthetics and Park Features.

4.4.1 Park Design Principles

Based on the nine (9) predictive models, the study came up with the following five (5) principles which should be read, considered and implemented together with the formulated design guidelines for more responsive and optimal use of urban parks.

(i) Urban parks/park spaces must be accessible to the public and well connected to the adjacent neighbourhood.

Nairobi City County is committed to creating and maintaining equitable access throughout the city and access to quality services such as urban open spaces. This has been articulated in the Nairobi County Integrated Development Plan 2018-2022.

(ii) Optimal useability.

Ensure access to a variety of facilities and activities to cater for a wider category of users.

(iii) Urban parks/Park spaces and their facilities should offer a variety of safe, attractive and user friendly environment.

People will not use spaces that they do not feel safe in. The level of comfort that a person feels when using a park space is directly related to the level of safety that they feel and perceive.

(iv) Urban parks should provide park features and facilities that are vibrant, attractive, comfortable, durable and easy to maintain.

Urban park designs should provide aesthetically appealing, comfortable spaces and facilities. The choice of materials should ensure durability and longevity for easy maintenance. Spaces should attract a variety of activities through the elements and the aesthetic value of the materials there in.

(v) Urban park designs must be innovative

Ensure that urban park designs are innovative in regard to form, function and response to the existing environment and the immediate environs. A site specific design response rather than a generic design response is required for each urban setting, site and city.

(vi) Urban parks must be cost effective

Park maintenance costs and asset costs represent a significant part of the NCC's budget. These costs are ultimately passed onto the city residents through the payment of taxes. To ensure effective use of the NCC budget and resources, parks design should consider maintenance costs and implications in their design proposals. The principle ensures efficiency of the park department in NCC. This can be achieved through appropriate selection of material, quality design, proper and suitable location of park facilities while ensuring that the infrastructure is used as intended.

4.4.2 Proposed Nairobi City County Park Guidelines

The study has formulated a total of 27 park design guidelines for the NCC to consider for enactment as indicated in table 4.14.

Table 4.14: General park design guidelines for Nairobi City County, Kenya

S/No	Principles		General Guidelines	Importance
1.	Urban parks must be accessible to the public and well connected to the adjacent neighbourhood.	1.	Provide several access/egress points at the park/space perimeter.	Provides choice in access and egress Allows for more flexibility in circulation
		2.	Provide a hard surfaced walkways that traverses spaces within the park and links into park facilities such as shelters, seats, barbeques, playgrounds etc	To promote walkable neighbourhoods and enhance pedestrian and cycle path networks. To allow unassisted equitable access by all people.
		3.	Provide easy access via public transport where appropriate.	Allows equitable access for all people.
		4.	Provide easy access via the walking and cycling network	Allows equitable access for all people
		5.	Where practicable, provide spaces that are connected with a broader open space network.	Allows equitable access for all people.
		6.	Include access provisions consistent with the intent of the Persons with Disabilities Act, 2003 of Kenya and other relevant Disability Standards in all specifications for the design of urban park spaces, amenities and facilities.	Allows unassisted equitable access to park amenities and facilities by all people.
2.	Useability	7.	Provide spaces that are sufficient in size and shape to cater for its intended purpose.	Improves engagement in a wider variety of activities.
		8.	Provide spaces that are adaptable and that cater for multiple users and types of activities.	Attracts varied groups in the park spaces.
3.	Urban parks and their facilities should offer a variety of safe, attractive and user friendly environment.	9.	Create multiple access/egress points along the park perimeter.	Allows for people to have multiple escape routes while in danger.

		10.	Locate signage at the frontages of the park for good visibility.	Clearly identifies the park for visitors from outside the immediate environs.
		11.	Maintain clear sight lines across activity areas.	Increases the capacity for passive and active surveillance.
		12.	Maintain clear sight lines to potential hazard zones such as water bodies, open drains, car parks and roads.	Assists in reducing the potential risk of harm that may be caused by natural and built infrastructure within parks.
		13.	Use low shrubs (500mm) and groundcover planting that do not interrupt sight lines or create possible 'hiding' spots.	Makes users feel more comfortable as they have good sight lines through the space and the potential for 'hiding' is significantly reduced.
		14.	Plan and design parks to avoid user conflicts.	Increase enjoyment and safety for users.
		15.	Design parks in accordance with Crime Prevention through Environmental Design (CPTED) principles.	Increases peoples comfort levels as they will feel safer and will be safer.
4.	Urban Parks should provide park features and facilities that are vibrant, attractive, comfortable, durable and easy to maintain.	16.	Provide seating areas including moveable tables and chairs.	Promote social gathering, outdoor picnics, and people watching.
		17.	Provide special amenities such as special paving, sculptural benches, and fountains	Makes each park space unique
		18.	Provide programmed activities coordinated with the Parks Department at NCC.	Leads to vibrant spaces and engagement in park activities.
		19.	Incorporate interactive elements that enliven parks such as musical chime sculptures, splash fountains, and rock climbing walls and boulders etc	Increases participation in active activities.
		20.	Integrate artwork as a design element in murals, benches, paving designs, fountains, and other features	Improves the aesthetic value in park spaces

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5.	Urban parks must be innovative	21.	Where possible, locate parks/park spaces adjacent to activity generators.	Creates synergies that will increase the use of the park and the adjacent activity generator
		22.	Park designs should allow for temporary events.	Increases the capacity of the immediate neighbouhoods to offer and hold outdoor events of all different types and sizes hence increasing the revenue
		23.	Use innovative design and detailing to enhance and protect park features; natural; cultural and heritage features and values.	Contributes to the character of the park/space and the user's enjoyment.
6.	Urban Parks must be cost effective	24.	Plan and design parks/park spaces to establish cost effective maintenance programs.	Poorly designed parks are a liability to maintenance budgets, which ultimately result in redesign of the park. Maintenance costs are a significant part of the City's budget.
		25.	Plan and design parks and facilities for energy and water conservation, optimised lifecycle and selection of materials with low embodied energy.	Ensures effective use of the City's budget resources and County's commitment to sustainability
		26.	Select materials and park facilities/items that are easily maintained, cleaned and replaced if damaged.	Ensures durability and the long term design intent of the Park is maintained and afforded.
		27.	Do not over design or over equip parks/ spaces	This may result in an inefficient maintenance cost.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

As indicated in section 1.8 of this study, the research questions states as follows: i) Why are there variations in intensities of use of urban parks in Nairobi City County? ii) How do spatial characteristics explain the variations in the manner in which parks are used? and iii) What relationship exists between spatial characteristics and utilization of these urban parks? To answer the above study questions, this study sought to analyse independent variables that have significant association with the dependent variable for use in regression analysis in the study of urban parks in Nairobi City County; to determine the degree to which particular independent variables predict park utilization and to formulate guidelines for enhancement of utilization of urban parks in Nairobi City County in Kenya.

Park utilization was explained by the following indicators; Frequency of visit, Average number of people visiting, Average Duration of stay, Use of space, Level of participation, Diversity of activities in the park, Intensity of use, Gender disparity and Vehicular use patterns. The study investigated the influence of the following factors on park utilization; Size of space, Surface Material, Accessibility to the Space, Visual Connectivity, Adjacent Neighborhood Characteristics, Vegetation Characteristics, Environmental Quality, Built Environment, Distance to the Park, Security in the Space, Overall design layout of space, Space Aesthetics and Park Features. In addition, the study extended previous studies that examined one or more of the above listed spatial characteristics but with more generalized findings. The study revealed eight factors that significantly predicted park utilization namely: Size of Space, Accessibility to the park Spaces, Visual Connectivity, Adjacent Neighborhood Characteristics, Built Environment, Security in park Spaces, Space Aesthetics and Park Features.

5.2 Park Utilization versus Accessibility

Park spaces that are well connected to the adjacent neighbourhood can improve park use. This study found out that park spaces with adequate access routes that are in good condition are easily accessible. This was found to attract diverse categories of users who in turn engage in diverse activities hence improving park use (Ref. Figure 5.1 & 5.2). Abubakar and Aina (2006) define accessibility as the simplicity with which activities in the society can be reached, including public services. They underscored that the circulation system of a park forms the infrastructure of framework that links all the activities and support areas together. The study highlights that good access and linkage includes aspects such as ease of visiting the park by various means of transport, as well as the creation of functional coherence between the inside of the park and the immediate surroundings. Bedimo-Rung et al., (2005); Lynch, (1981) supports these findings and emphasise that the system must not only be able to handle the signed flows but also influence the surrounding activities. Lynch (1960) underscores the importance of paths as the predominant elements in the image of a site.

The current study investigated the type of access routes (pedestrian, cyclist path or vehicular) and the density of access points to a space. Correlation analysis results found out that there exists a relationship between park use and accessibility ($r= 0.232$; $p= 0.002$). Specifically, the results revealed that there exists a relationship between the number of access points to a space and the diversity of activities there in ($r=0.747$; $p=0.000$). The high correlation coefficient between accessibility and diversity of activities in a space supports the premise that the circulation system of a park influences the activities there in. Sakip, Akhir and Omar (2015) posits that parks that are properly and more accessible improve social cohesion, interaction and attract more users. They add that such parks provide places for physical activities.

Multiple regression analysis results revealed accessibility as a key predictor of diversity in park spaces significantly explaining up to 87.9 percent variability, a relationship expressed by the equation below;

Diversity of activities in a space (DA) = -0.067 + 0.490 AS + 0.505 BE + 0.273 PF

R^2 = 0.879; AS= Accessibility into a space; BE=Built environment; PF= Park features

Other findings from previous studies support the above results. For example, a study by Sakip et al, (2015) on the determinant factors of successful public parks in Malaysia found out that efficient accessibility to parks and its immediate environs attract diverse activities and users. Another study on Accessibility analysis of parks at urban Neighbourhood in Dhaka by Tabassum and Sharmin (2013) found out that, properly accessible parks have the capacity to improve social cohesion and interaction. Fan et al, (2011) in the study on "Neighbourhood green, social support, physical activity and stress" in six majority –minority neighbourhoods" confirms that access to parks increases diverse social interactions. Gobster and Paul (1998) found out that the parks located within a diverse neighbourhood attracted a diverse category of users. Findings about accessibility to park spaces suggest proper and adequate access to spaces as a key factor in the designing of parks. In this regard it is paramount that the planners and park designers consider this important element at the onset of design.

Proximity to a park influences park use since some park users have constrained mobility, for lack of personal vehicles or unaffordable bus fares to the park hence the necessity to have a park close to home (Ries et al., 2008 & Cohen et al., 2006). Herzele & Wiedeman (2003) argues that walking to a park is an important precondition for access and use of it. In support of this literature, Das & Horniball (2016), reports that easy access and short distance to parks increase the number of visits and that people in close proximity to a park use it more frequently. They report that people living close (<0.5 km) visited the parks more frequently like more than four times per week. Wilbur et al., (2002) positively associates the availability of parks within walking distance to park use, while

the necessity of driving to a park often deters its use. Ries et al., (2008) points out that increasing facility availability may promote physical activity while Babey et al. (2008) reported increased and regular participation in physical activities with easy access to parks. Contrary, to these findings, the current study found no significant correlation between distance to the park and park use as confirmed by the low correlation coefficient ($r= 0.034$; $p = 0.645$). The current study associates the desire by residents to travel to parks far from their residence in search for specific activity based park features that could be lacking in the nearby parks. This finding is supported by other studies that found no link between proximity of the park and physical activities (Adkins, 2004). Kaczynki et al., (2014) associated certain park features with park based physical activities hence the need to travel far away from home. Such features include play grounds, walking/cycling routes, wooded area, a water feature, car parks, bike racks and pleasant views.

Figure 5.1: Easy access into and within Jevanjee gradens enhances use of its sub-spaces

Figure 5.2: Easy and proper access into and within City Park enhances use of its sub-spaces

5.3 Park Utilization versus Park Features

The adequacy levels, condition and diversity of park features are key determinants to improvement of park use hence the need to understand their importance. The current study sought to investigate the type, presence or absence of facilities, adequacy levels, condition and diversity of park features in the park spaces. The study revealed that park features that are of good quality, diverse and adequate greatly improve park use. Such features attract more and diverse categories of users as well as encouraging their engagement in various activities (Ref. Figure 5.3 & 5.4). Correlation analysis results indicated a strong relationship between park features and diversity of activities in a space (r= 0.525; p= 0.000); intensity of space use (r= 0.567); p= 0.000); and gender disparity (r= 0.553; p= 0.000) while moderate relationship was reported between park

features and average number of people visiting a space (r= 0.275; p= 0.000); and vehicular use patterns (r= 0.455; p= 0.000). Bedimo – Rung et al (2005) supports these findings by positively associating availability of park features with participation levels in a park. They argue that diversity of park features in park spaces presents the user with an opportunity to engage in diverse activities at different times of the day. They observed that parks have the capacity to offer settings for diverse categories of activities ranging from social, physical, economic, ecological, psychological and cultural. The current study observed that spaces with a wide variety of park features attracted a diverse category of users who in turn engaged in diverse categories of activities.

Figure 5.3: Dilapidated Park features at City Park act as deterrents of Park use

Figure 5.4: Park features that of good condition and variety attract a diverse category of users in Uhuru Park and Uhuru gardens respectively

Multiple regression analysis results revealed that up to 87.9 percent, 53.2 percent and 54.0 percent variability in diversity of activities in park spaces, intensity of use and gender disparity respectively was significantly predicted by park features among other factors as expressed by the equations below.

i) Diversity of activities in a space (DA) = -0.067 + 0.490 AS + 0.505 BE + 0.273 PF

R^2= 87.9 Percent; AS= Accessibility in space; BE= Built environment; PF= Park features

ii) Intensity of space use (IU) = -5.03 + 0.936 AS + 1.743 NC + 4.420 BE + 2.379PF

R^2= 53.2 Percent; AS= Accessibility in space; NC= Adjacent neighbourhood characteristics; PF_3 = Park features

iii) Gender disparity (GD) = -4.98 + 0.947 AS + 1.72 NC + 4.80 BE + 2.265 PF

R^2= 54.0 Percent; AS= Accessibility in space; NC= Adjacent neighbourhood characteristics; BE= Built environment; PF = Park features

The above results are consistent with findings from other previous studies. For instance, a study Corti et al. (1996) demonstrated that the availability of park features such as swings and barbecue equipments as among the important features influencing the intensity of use of local parks. Lack of park features discourages users from visiting parks. In addition, some park users decline to use the park due to lack of proper facilities for specific activities. In support of these findings and those of the current study on park feature's influence on diversity of activities, Costigan, Jenny, David, Alison and Anna (2017); Kaczynki et al. (2014) associated certain park features with specific park based physical activities. Examples of such features include a walking/ cycling route, water features, fitness station, basket ball pitch, tennis court, Skate Park, pleasant views, bike racks and car parking. In support of these findings, Davis, Edmondson, Heinemeyer, Leake & Gaston (2016) found that adolescents actively participated in sports when sport facilities were available and adequate in their neighbourhood parks.

Costigan et al., (2017) positively linked the number of features present in a park with park –based physical activities while Das and Horniball (2016) reported that inconsistent availability may lead to less physical activity. Kaczynki et al., (2014) found considerable differences in associations between park features and participation in activities according to gender. The current study findings therefore suggest that adequacy, condition, consistence in availability and variety of park features promote the diversity of activities and improve gender disparity hence improved park utilization.

5.4 Park Utilization versus Size of Space

The impact of size of a park space on park use cannot be undermined. It can influence the level of user participation in activities, duration of stay as well as the intensity of space use. Kaczynski et al., (2009) & Schipperijn et al., (2010) underscores that size and shape of a space influences people's perception and experience in urban environments. Nubani and Wineman (2005) based the spatial accessibility of a park space on the size, proximity and location of the park, which in turn contributes to its use. The current study reported inconsistent findings on the relationship between space size and park use. Study findings were inconsistent on the relationship between size of space and the average duration of stay in a space, level of participation and intensity of space. Correlation analysis results suggested a statistically significant and positive linear relationship between size of space and average duration of stay in park spaces (r= 0.132; p= 0.043) and level of participation (r= 0.153; p= 0.018).

However, results also indicated a statistically significant and negative relationship between size of space and intensity of use (r= - 0.146; p= 0.029) and gender disparity (r= - 0.140; p= 0.032). Multiple regression analysis results indicate that up to 71 percent and 47 percent variability in average duration of stay in space and user level of participation respectively is significantly explained by the size of park space as expressed in the equations below.

i) Average duration of stay in a space (DS) = 4.256 + 8.08E-5 SS

R^2= 71 percent *SS= Size of space*

ii) Level of participation in a space (LP) = 1.454 + 1.37E-5 SS+ 0.250 SA

R^2= 47 percent *SS= Size of space* *SA = Space Aesthetics*

Based on the low proportions of activities present, intensity of use and gender disparity in the spaces, this study associates inadequacy and composition of park features to space

sizes hence its use. Large park spaces give room for adequacy and variety of facilities (Ref. Figure 5.5). This is confirmed by other previous studies that demonstrate the influence of space size on intensity of use. Giles-Corti et al.,(2005); Kaczynski et al. (2008) point out that utilization demands for parks spaces that are of different characteristics may differ on the account of their size and the facilities they encompass. A study by Das and Honiball (2016) on the "evaluation of accessibility challenges of public parks in residential areas of South African cities revealed that parks vary in sizes, and that some parks have limited sizes, hence large numbers of users in large spaces is found to be an exception. The study also revealed that the variations in the density of users do not necessarily depend on the variation in the sizes, meaning that an increase in area of a park space may not necessarily increase the number of users significantly. Berggren – Barring and Grahn (1995) found that the experience and use declines with elongated and scattered space.

Other previous studies have shown that parks of different sizes are utilized for different purposes and by different categories of users. Overweight adolescent prefer a large park for privacy purposes, as they felt insecure about their appearance and about being big, which may deter them from participating in physical activities. Large park spaces attract maximum number of users as they contain a broad variety of facilities thus engaging in various types of activities (Das & Honiball, 2014). According to Karin, Peschardt, Ulrika, K. Stigsdotter, Jasper Schipperrijn (2014), large parks have health benefits even though smaller parks like pocket parks are reported to offer space for socializing and mental restoration (Ref. Figure 5.6). A study by Peschardt et al, (2012) on the use of nine small public urban green spaces indicated that the small spaces were mainly used for socializing, rest and restitution.

Contrary to these findings, a study by Kaczynski et al (2008) reported that participation in the park was not associated with park size but rather users preferred parks with a variety of attributes as opposed to parks of a particular size. They pointed out that acceptable levels of tranquility were not achieved in park spaces less than 1 ha due to high levels of traffic noise and low levels of natural sounds. Based on this argument, the

current study recommends designation of different sizes of spaces in parks for different uses. In addition, the designer and management should consider providing different facilities in different spaces for different uses and users.

Figure 5.5: Large spaces offering room for the user to engage in a variety of activities at Uhuru Park

Figure 5.6: Medium spaces offer privacy to the user to engage in personal activities at Central park and Jevanjee gardens

5.5 Park Utilization versus Social Environment

A safe and comfortable social setting promotes accessibility to parks and participation in activities there in. The social environment refers to the well-being of park users (safety and security). Safety is an important park barrier and refers to the personal security of park users. Bedimo –Rung et al. (2005) categorizes safety as perceived safety referring to people's perceptions and feelings of safety or objective safety referring to actual incidents of crime (Bedimo –Rung et al., 2005). Perceptions have different views related to age, races, religions, gender and experiences. A safe setting is more likely to promote outdoor activity in urban areas (Loukaitou –sideris, 2007). Ries et al. (2008) found out that girls rarely used outdoor parks because they are fearful of crime and exposure to dangerous situations. Users perceive social disturbances as a sign that gangs control the park and do not want to become involved. Molnar, Gortmaker, Bull, & Bika (2004) indicate that social disturbances may deter the adolescents from frequently using the park. This study found out that spaces that are poorly connected visually and neglected deter users from visiting (Ref. Figure 5.7).

The present study linked security in park spaces to park utilization. In particular, correlation analysis results indicated a relationship between the frequency of visits to a park and security ($r = 0.272$; $p = 0.000$). Multiple regression analysis results show that security in park spaces explained variation in frequency of visits by 8.9 percent as expressed in the equation below.

i) Frequency of visit to a space (FV) = -28.23 + 66.902 SS

R^2= 8.9 percent; *SE= Security*

These finding align with the study by Mc Cormack et al., (2010) indicating that social disturbances in a park such as the presence of undesirable park users such as loiterers deter adolescents from frequenting parks as they cause fear and are concerned about their safety. This finding highlights the importance of providing park users with safe

and secure public parks. Enclosed spaces give users an opportunity to sit and use a park space safely thereby giving individuals a feeling of safety, being away and an opportunity to hide (Appleton, 1975; Gehl, 2003), as defined in the two theories by Appleton.

Spaces that connect well visually feel safe and secure, are used for the right purposes and the density of use is high. In addition, park spaces that are protected from external dangers are likely to attract a broad category of users hence increased use. The present study associated visual connectivity with the purpose by which a certain space is used for. Correlation analysis results linked park use with visual connectivity (r= 0.299; p =0.000). Specifically, results indicated a relationship between visual connectivity and purpose of space use (r= 0.162; p= 0015); diversity of activities in a space (r= 0.170; p= 0.012). A study by Nordh and Ostby (2013) found that areas that are poorly shielded from the surroundings were related to low probability of restoration. This is also supported by the 'Attention Restoration and The Prospect Refuge Theory, both which describe people's need for safe environment where disturbance from the outside is considered a threat to the need for restoration experience.

Figure 5.7: Unkempt and secluded spaces invoke fear to users hence deter them from use

5.6 Park Utilization versus Park Aesthetics and Environmental Quality

The current study revealed that the aesthetic appeal of a park has a link to space use. Park aesthetic qualities such as the presence of enjoyable sceneries and incorporating natural like elements promote parks use (Danis et al., 2016 & Bedimo-Rung eta al., 2005). However, the presence of litter and lack of cleanliness may negatively affect the aesthetics of the park (Mc Cormack et al., 2010). Aesthetically attractive spaces were found to attract a diverse category of uses and users in space and vice versa (Ref. Figure 5.8 & 5.9). Correlation analysis results of the present study associated park use and aesthetics ($r = 0.205$; $p = 0.006$). Specifically, results indicated a correlation between the level of participation in park activities and aesthetics ($r = 0.168$; $p = 0.010$). This finding

is supported by other studies that have suggested that the aesthetic appeal of a park may affect the physical activity there in (Humpel, Owe & Leslie, 2002). The condition of park features plays a key role in park use. Bedimo-Rung et al., (2005) suggest that people not only choose to visit a park because of the features located in it but also because of their condition. Poorly maintained park features sent a message of a breakdown in accepted civil behaviour in space and such conditions provides signals on how to behave (Bedimo –Rung et al., 2005).

Figure 5.8: Aesthetically appealing spaces at Uhuru park, Jevanjee garden and City park attract a diverse category of users

Figure 5.9: Unclean park spaces deter users from park spaces

5.7 Park Utilization versus Adjacent Neighbourhood Characteristics

The neighbourhood context influences the type of use, categories of users, level of use and time of park use. Bedimo – Rung et al. (2005) points out a variety of neighbourhood characteristics that influence people's perceptions and use of a park namely: access, condition and aesthetics, safety and resident demographics. This study found a link between the adjacent neighbourhood characteristics and park use.

Correlation analysis results indicated a relationship between park use and the adjacent neighbourhood characteristics ($r = 0.295$; $p = 0.000$). The study linked variation in the intensity of park space use, gender disparity and vehicular use patterns in the park to the adjacent neighbourhood characteristics ($r = 0.185$; $p = 0.006$); ($r = 0.193$; $p = 0.003$); and ($r= 0191$; $p = 0.005$) respectively. Study findings reported varied neighbouhood characteristics and land uses ranging from residential estates, commercial, educational, religious as well as transportation. The different neighbourhoods serving the study area consists of diverse residents with different cultural, racial and ethnic groups. A diverse neighbourhood composition results to a variety of social and activity groups within the parks, consequently influencing its intensity of use. It was found out that the cultural, racial and ethnic diversity in the park's neighbourhoods was coupled with a related

social diversity of park users of different ages, marital status, education level, employment status and nationality with varying visit time schedules and activity interests. Jacobs (1961) underscores that this social diversity can provide a consistent flow of use throughout the park spaces, throughout the day and prevent it from becoming a vacuum.

Multiple regression analyses results revealed that the adjacent neighbourhood characteristics among other variables explained up to 53.2 and 54 percent variation in the intensity of space use and gender disparity in space respectively as shown in the following equations.

i) Intensity of space use (IU) = -5.03 + 0.936 AS + 1.743 NC + 4.420 BE + 2.379PF

R^2= 53.2 percent; AS=Accessibility in space; NC= Adjacent neighbourhood characteristics; BE= Built environment; PF= Park features

ii) Gender disparity (GD) = -4.98 + 0.947 AS + 1.72 NC + 4.80 BE + 2.265 PF

R^2= 54 percent; AS= Accessibility in space; NC= Adjacent neighbourhood characteristics; BE= Built environment; PF= Park features

Other previous studies support the study findings. For example: a study by Sakip, Akhir and Omar (2015) on "the determinant factors of successful public parks in Malaysia" found out that parks that are well connected to the surrounding neighbourhood enhance park use as they attract diverse users and activities. Consequently, it was found out that more users in park spaces led to creation of more activities and opportunities. Gobster & Paul (1998) studied parks located within two different and diverse heterogeneous neighbouhoods and found out that it attracted residents from both neighbourhoods fostering diverse social interactions that may not otherwise have occurred.

Tabassum and Sharmim, (2013) found out that neighbourhood context influences the intensity of use and utilization patterns in a park. They found that a neighbourhood with

a wide range of mixed land uses attracts different categories of social-economic and cultural classes, ages and categories. They also found out that the type of neighbourhood can decrease usage of a nearby park by the presence of undesirable groups such as street boys. Parks surrounded by diverse social institutions such as churches, mosques and schools attracts diverse cultures in the nearby parks Tabassum and Sharmim, (2013). Park surrounded by diverse commercial mixes encourages use by different social economic classes. Parks located near main roads influences accessibility either negatively or positively. The position of main road influences the type of uses to access the park for. Parks surrounded by planned neighbourhoods are safer and well connected visually.

The current study findings and argument demonstrates the importance of taking the adjacent neighbourhood characteristics into account in the design of parks as they have an influence on its use.

5.8 Park use versus Overall Design Layout

There is a Correlation between park use and overall design ($r = 0.183$; $p = 0.014$). Francis (2003) and Herzele et al.,(2003) express that he level of satisfaction with reference to the design of a park is dependent upon the diversity of activities offered, comfort, appropriateness for socialization and maintenance. Natural properties such as trees, gardens, water elements and botanical landscapes included in the design of a park space increase positively the experiences.

5.9 Conclusion

In conclusion, eight (8) critical predictors of park utilization were unveiled namely: size of space, adjacent neighbourhood characteristics, built environment, park features, and accessibility to space, space aesthetics, security and park features. The next chapter, presents the summary, conclusions and recommendations made from the foregoing observations, and suggests potential areas for further research.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The previous chapter presented a discussion of the research findings. The current chapter presents a summary of the research findings and conclusions. Thereafter, recommendations are made for the enhancement of park use in NCC. Finally, areas of further research that will enrich knowledge in the subject of park optimization are suggested.

6.2 Summary of Findings

The study found that there exists a relationship between park utilization and its determinants. Multiple regression results revealed the following four surrogates out of the nine as key indicators of park utilization namely; intensity of space use, gender disparity, average duration of stay and diversity of activities with significant variability of 53 percent, 54 percent, 71 percent and 88 percent respectively upon interaction with different independent variables. Key predictors to park utilization were found to be; accessibility, built environment, park features, adjacent neighbourhood characteristics and size of space. Accessibility, built environment and park features jointly explained the variability of diversity of activities in a space up to 88 percent. This implies that park spaces with adequate, variety and good condition access points, built environment and park features recorded broad categories of users engaging in diverse recreational activities. Size of space alone significantly explained the variability of average duration of stay in space up to 71 percent. This implies that the larger the space the longer the period of stay and participation in recreational activities in park spaces. This is could be attributed to feelings of security due to increased surveillance as a result of active spaces. As indicated under discussion section, this could be attributed to privacy and adequate room for participation in diverse activities.

Up to 54 percent variability of gender disparity in park spaces was jointly explained by four variables namely; accessibility, adjacent neighbourhood characteristics, built environment and park features. This implies that easily accessible and quality spaces which are properly equipped with a variety and adequate facilities adjacent to neighbourhoods that are properly accessible and of good condition and characterized with compatible activities attract a good representation of gender in spaces. Spaces that were in poor condition and difficult to access were found to be a security threat especially to female space users as they attracted unwanted groups such as vagrants who in turn engaged in illegal activities hence scaring them away. Moreover, the study found spaces with inadequate facilities less vibrant and unpopular a scenario that was seen to cause fear to some category of users hence imbalance in gender representation and participation in activities. Four independent variables jointly explained intensity of space use up to 53 percent namely; accessibility, adjacent neighbourhood characteristics, built environment and park features. Implying that spaces that were found to be easily accessible, with adequate and a wide variety of facilities and located adjacent to good condition, properly accessible neighbourhoods with compatible activities were highly visited.

Other important indicators of park utilization though with low variability as revealed by the study included; level of participation, vehicular use patterns, use of space, average number of people visiting a space and frequency of visit with a variability of 47 percent, 46 percent, 45 percent, 30.5 percent and 8.9 percent respectively.

6.3 Conclusion on the Aim and Objectives of the Study

As specified in Chapter 1, the aim of this study was to establish the contribution of spatial characteristics on utilization of urban parks within NCC, for the purpose of optimizing park utilization and in the design and maintenance of the spaces.

The objectives of the study were stated as follows:

1. To analyse independent variables that has a significant association with the dependent variable for use in regression analysis in the study of urban parks in Nairobi City County in Kenya
2. To determine the degree to which particular independent variables predict park utilization in Nairobi City County in Kenya.
3. To formulate guidelines for enhancement of utilization of urban parks in Nairobi City County in Kenya.

6.3.1 Objective 1: To analyse independent variables that has a significant association with the dependent variable for use in regression analysis in the study of urban parks in Nairobi City County in Kenya

The above objective was achieved through correlation analysis. A correlation matrix was produced depicting the relationship between the dependent and the explanatory variables and also between the explanatory variables themselves.

Correlation analysis results revealed that there exist a relationship between park utilization and its determinant factors. A statistically significant relationship was found between park utilization and eight explanatory factors namely; security, built environment, park features, size of space, space aesthetics, visual connectivity and adjacent neighbourhood characteristics. It was established that different independent variables correlated differently with the dependent variable. The correlation coefficients (r) ranged from -0.140 to 0.798.

A statistically significant positive and strong correlation was posted between the dependent variable surrogates and three independent variables namely; accessibility, built environment and park features. The three independent variables were found to strongly depict park utilization by influencing the average number people visiting a space, diversity of activities, intensity of use, gender disparity and vehicular use

patterns. A high correlation coefficient of r= 0.747; r= 0.798; and r= 0.798 between the diversity of activities in a space, intensity of space use and gender disparity versus accessibility respectively depicts a statistically significant positive and strong influence to park utilization. This implies that properly and easily accessible park spaces lead to engagement in a wide range of activities by park users, increased use of spaces and improved gender representation in park spaces.

Conversely, a moderate relationship was depicted between diversity of activities versus the built environment (r= 0.348) and vehicular use patterns versus park features (r= 0.455), (ref. table 4.11). Implying that, provision of good quality/condition and a wide variety of structures in a park spaces such as kiosks and social halls, shelter, pavilion etc, attracts diverse categories of users who in turn engage in a wide range of activities. In addition, adequate and quality park features such as parking lots, lighting, shelter affects vehicular patterns of space use. For example, the presence of a parking lot in a park will attract vehicular use during visits, while the presence of lighting system will prolong the duration of stay in park spaces till late hours. The following six independent variables related differently with different dependent variable surrogates and showed a weak relationship with a correlation coefficient (r) range of 0.132 to 0.275 (ref. table 4.11). They include: security, park features, size of space, visual connectivity, aesthetics and adjacent neighbourhood characteristics. Dependent variable surrogates that were weakly influenced by the above independent variables included; frequency of visits, average number of people visiting a space, average duration of stay in a space, space use, level of participation, diversity of activities and intensity of space use. Two independent variables namely; security and size of space depicted statistically significant and inverse relationships with some dependent variable surrogates (ref. table 4.11). Dependent variable surrogates influenced negatively by the above two variables include; use of space, diversity of activities and gender disparity.

6.3.2 Objective 2: To determine the degree to which particular independent variables predict park utilization in Nairobi City County in Kenya

To achieve the above objective, multiple linear regressions for each of the response surrogates for the dependent variable and the significant explanatory variables were conducted. A summary of the results of each of the response surrogates on all the determinants (predictor variables) of park utilization as indicated in table 4.12 resulted in the development of nine (9) predictive models. This was useful in explaining which specific predictor variable explains a specific response dependent surrogate and to what measure. The study used R squared to test for the goodness of fit of the model. As indicated in the table, the R^2 values of regression equation range from 0.089 to 0.879 implying that the variability of the dependent variables can be jointly explained by the independent variables up to 87.9 percent. This means that the different response surrogates of park utilization are specifically and differently predicted by different predictor variables and to different variability percentages.

Security in space was found to be a key predictor to the frequency of visits to park spaces explaining up to 8.9 percent variability while the built environment significantly predicted the average number of people visiting a space by 30.5 percent. Up to 45 percent variation in the rightful use of spaces in the park was significantly explained by security in park spaces. The study also revealed that size of space and space aesthetics as critical predictors to the level of participation in active recreational activities. Combinations of three predictor variables were found to explain variation in the diversity of activities in a space by 87.9 percent namely; accessibility to space, built environment and park features. On the other hand, accessibility to park spaces, adjacent neighbourhood characteristics, built environment and park features predicted the intensity of space use up to 53.2 percent. The study also revealed that four independent variables explained the variations in gender disparity up to 54 percent namely; accessibility in space, adjacent neighbourhood characteristics, built environment and park features. Vehicular use patterns in park spaces was explained by the adjacent neighbourhood characteristics and built environment by 46 percent.

The resultant models are outlined in section 4.3

The direction of influence of some predictor variables such as, security in park spaces is not as expected in the conceptual framework due to its inverse relationship with one response surrogate (use of space) as revealed by the study. The rest of the predictor variables have a positive linear relationship with the respective response dependent surrogates.

Whereas the percentage of variation in some of the dependent surrogates were significantly predicted and explained by one independent variable, results also revealed that other dependent surrogates were significantly predicted and explained by a combination of more than one independent variable.

Regressing each of the dependent surrogates on the eight (8) significant independent variables each with a resultant R^2 and a predictive model as stated by equation (i) to (ix) has the following benefits in the study of urban park utilization;

(i) It is possible to understand specifically which predictor variable significantly explains a specific park utilization surrogate.

(ii) One can advise from a point of knowledge what predictor variable to change for optimal park utilization and with what amount of unit measure.

(iii) It will be easy to advise on designing and development of special parks in terms of use category.

(iv) It is cost cutting and economical to the client as less attention will be paid to less predictive variables depending on his/her objective.

Therefore, from the above nine prediction models developed in by the study and the discussion thereof, anyone seeking advise on point of reference to optimize urban park

utilization within Nairobi County, in Kenya can be advised on what factor to change in order to enhance their utility.

6.3.3 Objective 3: To formulate park design guidelines for enhancement of utilization of urban parks Nairobi County, Kenya

From the study findings, a total of 27 general park design guidelines were formulated to guide in the design and development of urban parks within Nairobi City County as indicated in table 4.14. The formulation of the design guidelines was based on the nine (9) predictive models developed in the study (ref. section 4.3). They were structured along six (6) principles for consideration along with the guidelines namely: Urban parks must be accessible to the public and well connected to the adjacent neighbourhood; Useability; Urban parks and their facilities should offer a variety of safe, attractive and user friendly environment; Urban Parks should provide park features and facilities that are vibrant, attractive, comfortable, durable and easy to maintain; Urban parks must be innovative; and Urban Parks must be cost effective. NCC should consider enacting the formulated guidelines for future use by park designers and developers.

6.4 General Conclusions

6.4.1 Conclusion on research problem

The study sought to provide a solution to the following problem statement outlined in Chapter 1; **"In spite of the benefits in the lives of the populace, many urban parks in Nairobi City County have continued to experience excessive variation in use, yet the determinants of this variability are not yet empirically explained."**

Through correlation analysis, the study identified and analysed eight independent variables that significantly correlate with park utilization namely: Size of space, Accessibility to the space, Visual connectivity, Adjacent neighbourhood characteristics, Built environment, Security in space, Space aesthetics and Park features. Regression analysis depicted the direction, size and the statistical significance of their relationship

with the respective response variables. The following four independent variables were found to be insignificantly correlated to park utilization dependent variables; surface material, vegetation characteristics, environmental quality and distance to the park. This implies that, the population from which the study sample was selected, the four variables were not affecting park utilization in a significant way. This may possibly be the reasons;

(i) These factors could have been more of constant variables since all the spaces in the population from which the samples were taken were affected to the same degree by the prevailing environment.
(ii) Some degree of the insignificant variables may be integrated in the other explanatory variables.

The study regressed all the response surrogates against their respective significant predictor variables to produce nine (9) predictive models based on statistical methods. They are therefore objective and reliable for use in optimizing park utilization. The prediction models developed therefore provide the solution to the problem identified and stated in Chapter 1.

6.4.2 Implications on Theory

This study has exploited mainly two sets of literature namely; Firstly, previous research and writing on park use and spatial design and planning; Secondly, Theories in urban design and human behaviour in the Landscape. The study identified and discussed all the variables related to park use and spatial characteristics under theoretical framework. A conceptual framework was developed indicating the most relevant dependent variable measures and explanatory variables. In this section, a summary of the most theoretical contribution to research on park use enhancement is presented.

a. Implications on theories of park use

A review of theories and literature on park use provided valuable insights on objective and reliable methods of optimizing park use. Behavioural theories reviewed in Chapter II concentrated on personal determinants of human behaviour. They described the most determinant of a person's behavior in space as behaviour intent which is influenced by personal feelings, perceptions, attitudes and choice. In addition to the existing literature on theories of park use and user behaviour, It was revealed that a person's behaviour in a park space is not completely under the user's volitional control but subject to a wider range of spatial deterrents such as accessibility, park features, condition, safety and distance. In regard to these findings, scientific based prediction models were generated which provide useful insights on how to enhance park use. The models generated present a pragmatic approach to solving problems of variation in park use levels and patterns. The study has demonstrated that besides the personal feelings and attitudes that influence one's behaviour in a space, spatial characteristics play a critical role in park user behaviours. The prediction models generated are interrelated and that consideration for intercourse among the various models is fundamental to realization of optimal park use. In this regard, this study contributes to the existing body of knowledge on scientifically based and objective methods for enhancing park use.

B. Implications on theories of spatial design and planning

By reviewing spatial design and planning, the study provides valuable insights to the considerations into the scope that spatial design addresses. As presented in Chapters I and II, the existing theories and concepts on spatial planning and design are not able to functionally explain the variations that exist in park use. The theories and concepts have focused on addressing the spatial configuration of park spaces without systematic account of the inherent design contributions to use of the spaces. They have concentrated in identifying the relevant spatial variables considered in park design without paying keen attention on their actual contribution to park use. They fail to pay attention to the interplay of various spatial variables in design that influence use of park

spaces. In addition, the theories fall short of elaborating the specific contribution of each variable considered in design towards enhancement of park use. However, the focus by this study to develop predictive models that are based on statistical methods has resulted in identifying specific spatial variables to consider in park design hence enhance use. Therefore, this study contributes to the existing body of knowledge by; (i) Providing statistically based, objective and reliable methods for optimizing park utilization within Nairobi City County and ii) Formulating design guidelines for reference by park designers and managing authorities in the design and development processes of urban parks.

6.4.3 Policy Implications

This study has found out that spatial characteristics significantly explain the variation in park utilization in the urban parks within Nairobi County, Kenya. The significant predictive spatial characteristics revealed by the study included; Size of space, Accessibility to the space, Visual connectivity, Adjacent neighbourhood characteristics, Built environment, Security in space, Overall design space layout, Space aesthetics and Park features. The study also discovered the following measures of park use levels in urban parks namely; frequency of visits, average number of people visiting a space, average duration of stay, use of space, level of participation, diversity of activities in a park space, intensity of use, gender disparity and vehicular use patterns. Empirical prediction models developed and design guidelines formulated by the study will be useful in policy formulation and reviews. Such policies will guide the process of design, planning, rehabilitation and management of parks and make the process more objective and reliable.

6.4.5 Methodological Implications

The present study has been carried out from a wide empirical perspective that has generalization of results as its primary goal. The study is designed as a survey using the space syntax method as a guide to the overall approach. The empirical setting

represents the whole idea of a survey research. Generally, quantitative method of data collection is adopted. This approach is scientific and rigorous, representing a positivist approach. The study uses structured observation as a method of data collection. Use of interviewing is limited to circumstances when a variable is not manifest in the parks spaces. Accuracy in preparation of urban park convex maps is an important aspect in sampling and collection of data. In order to gather reliable data, research assistants have to be trained. To avoid distortion of results, consistency in data collection time frame throughout the entire duration of data collection is necessary. Quantitative data analysis methods (correlation and regression) are applied. This approach is scientific and rigorous, representing a positivist approach. The results of this study also illustrate the value of regression analysis for the identification of the spatial characteristics influencing park utilization. The insights obtained provide a useful basis for decision making by the landscape architects in the design of urban parks.

6.4.6 Practical implications

The methodology used by the current study aids park designers, developers and managers to intentionally consider the variables that affect park utilization.

Table 6.1 overleaf gives a summary of findings and recommendations derived in the study

6.5 Recommendations

6.5.1 General recommendations

For new parks, every park designers should carefully incorporate each of the eight statistically significant explanatory variables in the design, and at any phase of park development in accordance with the models developed for each of the surrogates of park utilization.

For maintenance purposes, the governing authorities should make use of the developed predictive models, for guidance in identifying key and priority areas for intervention in maintenance and attention in budget allocations.

For rehabilitation of existing parks, a diagnostic survey for the affected park should be carried out to identify the weakest aspect of park utilization then respond accordingly using the formulas/models developed.

6.5.2 Specific recommendations

The following table gives a summary of findings and recommendations derived in this study.

Table 6.1: Findings and recommendations

	Finding	Section	Recommendations
1.	Security in the spaces is a significant predictor variable in frequency of visit to a space.	4.3.1	Size of park spaces should be planned and designed for in relation to the space activity and user designation and target. The type of activity should be a pointer to the size of space. Designing the space is vital to ensure the appropriate facilities, adequate provision and a responsive design. The management should seek to provide adequate spaces to increase user frequency of visitation. Security could be enhanced by use of appropriate plant type, lighting, increased surveillance and ensuring good condition for park features.
2.	Built environment is a significant predictor variable in the number of	4.3.2	Adequate, comfortable and well maintained facilities and structures that can accommodate different group sizes that visit for different purposes should be designed and provided in park spaces. A variety of

	people visiting a space.		the facilities will attract different sets of visitor groups.
3.	Size of park space is a significant predictor variable in the average duration of stay in a space	4.3.3	There is need to plan for and create park spaces of different sizes that can comfortably accommodate various groups, categories of users and activities for prolonged and adequate stay in the spaces. To increase the duration of stay in a space, designers should consider integrating the privacy and comfort of space users in planning, zoning and design of park spaces.
4.	Security in space is a significant predictor variable in the manner in which a space is used.	4.3.4.	There is need to promote security in park spaces, to improve user perceptions and use of park spaces. Adequate security in spaces will promote rightful use of the spaces and deter unwanted space users such as vagrants. To achieve this, designers should consider the most appropriate design elements for each space according to its proposed use. Examples include: appropriate plant type, lighting and condition of park features.
5.	Size of park spaces and space aesthetics are significant predictor variables in the level of participation in active recreational activities.	4.3.5	There is need to create adequate and considerable sizes of park spaces that are aesthetically appealing and able to accommodate quality and diverse park features as well as creating ample environments that will encourage different categories of users to participate in diverse activities that range from sedentary to active. Space aesthetics should be considered by providing

			pleasant views that will attract different gender for variety of use in the space. Careful plant selection of different colours, shape; inclusion of water bodies, sculptures and overall design arrangement of elements in space would promote aesthetics. The designs should recommend the most appropriate size of a space and aesthetic material based on the activity, projected number of participants and provide the relevant facilities for use in order to increase user participation.
6.	Accessibility, Built environment and park features are significant predictors in the diversity of activities in a space.	4.3.6	Designers and planners need to integrate proper access and linkages to park spaces, consider quality and relevant park features and structures for creation of more diverse park spaces and forms that will in turn attract diverse activities and users. Different types and qualities of access routes should be provided to accommodate different types of activities such as jogging, cycling etc. A variety of park features that are of good quality and properly designed should be provided to accommodate different activities as well as diverse categories of users.
7.	Accessibility in space, adjacent neighbourhood characteristics and park features are significant predictor variables in the	4.3.7	Access routes of different types and high quality to and within park spaces should be considered in park design so as to attract more users hence increased intensity of use. Connectivity and condition of adjacent

	intensity of space use.		neighbourhood should be enhanced and its diverse demographic characteristics considered in the design of adjacent park spaces to attract and accommodate the diverse cultural, socio- economic and ethnic groups. Well connected neighbourhoods that are of good quality and categories will translate to increased visitation to the nearby park spaces. Diverse and high quality park features should be recommended and designed for various park spaces. They should be well maintained for user comfort and increased attraction of a diverse user category.
8.	Accessibility in space, adjacent neighbourhood characteristics, built environment and park features are significant predictor variables in gender disparity in space.	4.3.8	To promote gender equity in park spaces, spaces should be made more and properly accessible and well connected to the adjacent neighbourhood. The neighbourhoods need to be kept in good condition and secure. This will increase visitation in spaces especially by female users. Diverse and quality park features that are favourable and convenient to each gender should be designed and recommended in different spaces for different purposes. Their condition should be maintained for user comfort.
9.	Adjacent neighbourhood characteristics and built environment are significant predictor variables in vehicular use	4.3.9	Adjacent neighbouhood characteristics should be put into considerations in designing parking spaces and driveways in park spaces. Driveways should be least encouraged inside the parks other than service routes. Adjacent neighbourhood activities need to be taken into account. For example; uses that may

	patterns.	trigger explosion, should not be located next to parking lots or driveways. Parking lots should be located near the entrance of parks for efficient use of spaces. Additional structures should be erected in parking lots where necessary to provide shade. Such a move will lead to an organized vehicular use pattern in a park.
10.	Nine (9) models for enhancing park utilization were developed with an R square value of up to 0.879	Designers, planners, policy makers, management and developers should make reference to these models and integrate the relevant factors in their practice to optimize park utilization. Park Designers should use the models to make high quality and effective designs that address the changing needs and lifestyles in the urban society. Planners need them for critical space planning in order to create standard and most accurate spatial plans, systems and models. Policy makers need them to create relevant, up to date and effective policies for high quality park spaces and lives of the urbanites. Developers should make use of the models for planning, budgeting and resource acquisition.
11.	The 27 formulated Park Design Guidelines	Park designers need the guidelines for quality and optimal park designs.

Source: Author, 2019

6.6 Final Conclusion

The study makes the following conclusions;

The spatial characteristics that critically influence park utilization within Nairobi City County are eight (8) namely:- Size of Space, Accessibility to the park Spaces, Visual Connectivity, Adjacent Neighborhood Characteristics, Built Environment, Security in park Spaces, Space Aesthetics and Park Features. A prediction model for each of the nine (9) surrogates of park utilization has been developed in this study, forming a basis for the formulation of general park design guidelines to guide in the design of urban parks for optimal park use. Since the developed models are based on statistical methods, they are therefore objective and reliable for use in optimizing park utilization.

6.7 Areas of Further Research

Study prediction models demonstrated varied effectiveness in optimizing park utilization. It was revealed that some models explain up to very low variability percentage of the dependent surrogates by their respective independent variables regressed against it. This is supported by R^2 values of regression equations range from 0.089 to 0.879. Though the models developed can help a park designer to optimize park utilization by balancing the respective predictor variables, this study recommends the following.

i) Further research to improve and increase the coefficient of determination of the models that are low in percentages for better results without compromising their user friendliness. The remaining percentages not explained by the respective nine prediction models can be explained by;

(i) Other factors not explored by the study such as political, policy, institutional, social, economic, culture and ethnicity, environmental, demographics etc

(ii) Non- linear relationships between each Y measure of Park utilization and its respective predictor variables as specified by the prediction models.

(iii) The factors considered in the study but lacked construct validity and therefore were thrown out of the model through backward regression.

ii) Prototype prediction models with improved coefficient of determination, which can be applied across all urban parks in Kenya, are required. This is necessary because the developed prediction models may not be applicable to other counties whose their environmental and geographical settings are significantly different from the ones considered in this study.

iii) Further study using the following methods: Non-linear regression modeling, descriptive statistics, multivariate analysis

iv) Change the unit of analysis from a convex space to the whole park and extent the scope of the study to country wide. Also include other categories of parks such as private and neighbouhood to extent the scope.

v) Further study using other research strategies such as qualitative research: Thematic analysis and N-Vivo procedures.

vi) Simulation and scenarios analysis

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APPENDICES

Appendix 1: Research Permit/Authorization letter

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 020 400 7000,
0713 788787,0735404245
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/67569/19185** Date: **21st September,2017**

Stella Kasiva Mbiti
Jomo Kenyatta University of Agriculture & Technology
P.O. Box 62000-00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The influence of spatial characteristics on utilization of urban parks in Nairobi City"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **21st September, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

THIS IS TO CERTIFY THAT:
MS. STELLA KASIVA MBITI
of JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, 62000-200 NAIROBI,has been permitted to conduct research in *Nairobi County*

on the topic: *THE INFLUENCE OF SPATIAL CHARACTERISTICS ON UTILIZATION OF URBAN PARKS IN NAIROBI CITY*

for the period ending:
21st September,2018

Permit No : NACOSTI/P/17/67569/19185
Date Of Issue : 21st September,2017
Fee Recieved :Ksh 2000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. **The License is valid for the proposed research, research site specified period.**
2. **Both the Licence and any rights thereunder are non-transferable.**
3. **Upon request of the Commission, the Licensee shall submit a progress report.**
4. **The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.**
5. **Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.**
6. **This Licence does not give authority to transfer research materials.**
7. **The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.**
8. **The Commission reserves the right to modify the conditions of this Licence including its cancellation without prior notice.**

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No.A 15881

CONDITIONS: see back page

Appendix II: Cover Letter to Data Collection Tools

STELLA KASIVA MBITI,

JOMO KENYATTA UNIVERSITY OF AGRICULTURE & TECHNOLOGY,

P.O BOX 62000

NAIROBI, KENYA.

Dear Respondent,

I am a student at Jomo Kenyatta University of Agriculture and Technology pursuing a PhD degree in Landscape Architecture. The title of my research is **"Influence of Spatial Characteristics on Utilization of Urban Parks in Nairobi City County, Kenya"** and you have been selected as a respondent among the park users visiting this Park. Your anonymity is guaranteed and all of your answers are confidential. The information provided will be used for academic purposes only.

I hereby kindly request you to assist in filling the attached interview schedule.

Thank you in advance for accepting to co-operate.

Yours Faithfully,

Stella Kasiva Mbiti

AB442-2168/2015

Appendix III: Urban Park Observation Schedule

I

W1-2-60-1-6

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

NFLUENCE OF SPATIAL CHARACTERISTICS ON UTILIZATION OF URBAN PARKS IN NAIROBI CITY COUNTY, KENYA

PARK SPACE AND RESEARCHER'S DETAILS

Park Name/Code: _____ Space Category: _____ Space Code:_____

Name of Research /Asst.: _____Time: _____ Date : _____

(I) SPATIAL VARIABLES

Space Dimensions

A1. Length of the space in Metres: _____

A2. Width of the space in Metres: _____

A3. Area of the space in Square Metres: _____

B. Overall design layout of the space

(1) Very poor ☐ (2) Poor☐ (3) Fair ☐ (4) Good☐ (5) ☐ Very good

C. Space aesthetics

(1) Very poor ☐ (2) Poor ☐ (3) Fair ☐ (4) Good ☐ (5) ☐ Very good

<u>Surface Material</u>

D: Percentage Coverage of Surface Material

S/No.	Surface Material	Percentage (%)
D1.	**Soft surface material** -Grass soft lawn	
D2.	**Hard surface** - PCC Slabs, Natural stones, Ballast, Steel, Stone walls	
D3.	**Sand**	
D4.	**Water**	
D5.	**Bare soil**	
D6.	Others (Specify)	

E: Condition of surface material in "B" above. Tick appropriately.

S/No.	Surface Material	Condition				
		Very Poor =1	**Poor=2**	**Fair= 3**	**Good = 4**	**Very Good = 5**
E1.	**Soft surface** -Grass soft lawn					
E2.	**Hard surface** - PCC Slabs, Natural stones, Ballast, Steel, Stone walls					
E3.	**Sand**					
E4.	**Water**					
E5.	**Bare soil**					
E6.	Others (Specify)					

<u>Accessibility to the Space</u>

F1: Total number of access points that connect directly to this space _____

G: Density of access points to a space per case.

S/No	Category of access point	No. of access points per category of means	No. of access points per means per M^2
G1.	Paved Walkways		
G2.	Drive way		
G3.	Unpaved Walkways		

Visual Connectivity

H: Percentage coverage by enclosure material.

S/No.	Type of Material	% Coverage
H1.	Live fence	
H2.	Barbed wire	
H3.	Concrete stone wall	
H4.	Metallic rails	
H5.	Wooden rails	
H6.	Ground covers	
H7.	Open	
H8.	Other (Specify):	

J1. Level of visual connectivity of the space to the adjacent neighbourhood

_____

Adjacent Neighbourhood characteristics

K1. Land use type in the adjacent neighbourhood. Tick appropriately.

(6) Commercial (2) Residential (3) Recreational (4) Transportation (5) Agricultural

(7) Other: Specify _____

K2. Rate the level of influence to space use by the adjacent land uses ticked above.

(1) Least influential ☐ (2) Not very influential ☐ (3) Fairly influential ☐

(4) Very influential ☐ (5) Extremely influential ☐

K3. Rate the Environmental Condition of adjacent neighbourhood.

(1) Very poor ☐ (2) Poor ☐ (3) Fair ☐ (4) Good ☐ (5) Very good ☐

K4.Road category in the neighbourhood adjacent to the space. Tick appropriately.

(1) Pedestrian walkway (2) Dual carriageway (3) Single carriageway (4) Super highway

K5. Rate the overall ease of accessibility to the adjacent neighbourhood

(1) Very difficult ☐ (2) Difficulty ☐ (3) Fair ☐ (4) Easy ☐ (5) Very easy ☐

K6. Rate the level of influence to space use by the adjacent neighbourhood

(1) Least influential ☐ (2) Not very influential ☐ (3) Fairly influential ☐

(4) Very influential ☐ (5) Extremely influential ☐

<u>Vegetation Characteristics</u>

L: Vegetation density in percentage.

S/No.	Vegetation type	Percentage canopy coverage (%)
L1.	Trees canopy diameters	
L2.	Shrubs	
L3.	Ground covers (flowers, grass)	

M1: **Average tree height** in Metres : _____

M2: Average shrub height in Metres: _____

M3: General Vegetation condition

(1) Very poor ☐ (2) Poor☐ (3) Fair ☐ (4) Good ☐ (5) ☐ Very good

Park Features

N: Density of Park Features in the space.

S/No.	Type of Feature	Total Number in the space	Number per M^2
	Facilities		
N1.	Play ground **(Soccer, tennis, basket ball, Skating e.t.c)**		
N2.	Water ponds		
N3.	Boating area		
N4.	Play facility **(Swings, bouncing castle etc**		
N5.	Paved walkways		
N6.	Shaded walkways		
	Amenities		
N7.	Benches		
N8.	Washrooms		
N9.	Lighting		
N10.	Dust bins		
N11.	Parking lot		
N12.	Water fountains		
N13.	Wildlife area		
N14.	Hawking/Kiosks		
N15.	Pavilion		
N16.	Shelter/Pergola		
N17.	Social/ Entertainment hall		
N18.	Historical features **(Arts, sculptures, monuments, statues)**		
N19.	Educational features**(botanical garden, Plant nursery)**		
N 20.	**Overall density of features in space**		

P1: General adequacy levels of features in the space

1. Very inadequate ☐ 2. Inadequate ☐ 3. Fair☐ 4. Adequate☐ 5. Very ☐ adequate

P2. General park feature condition in the space

1. Very poor ☐ 2. Poor ☐ 3. Fair ☐ 4. Good ☐ 5. Very ☐ good

P3: For the features marked present in "N" above, rate their level of comfort to users.

1. Very uncomfortable ☐ 2. Uncomfortable ☐ 3. Fair comfortable ☐

4. Comfortable ☐ 5. Very Comfortable☐

Environmental quality

Q: Type of garbage in the space

S/No.	Type of garbage	Tick	S/No.	Type of garbage	Tick
Q1.	Paper		AA7.	Metals	
Q2.	Construction/Demolition debris		AA8.	Used oil containers	
Q3	Organic waste		AA9.	Human waste	
Q4.	Plastic		AA10.	Medical waste	
Q5.	Textiles		AA11.	Cut off vegetation	
Q6.	Old tyres				

R: Percentage area occupied by solid waste _____

S: Please rate the environmental quality of the space

Description	1	2	3	4	5
S1. Solid waste	Very dirty	Dirty	Fair	Clean	Very Clean
S2. Dust pollution	Very dusty	dusty	Fair	Clean	Very clean
S3. Odour pollution	Very foul	Foul	Fair	Fragrant	Very fragrant

Built environment

T: Density of buildings in the space

S/No.		Total No. in space	No. per M^2
T1.	Permanent structures in space		
T2.	Temporally structures in space		
T3.	**Overall density of structures in the space**		

(II) UTILIZATION TRENDS

Activity Characteristics

U. Type of activities in the space

S/No.	Activity Type	Tick	Specify the activity	Location of activity
U1.	**Passive stationary recreational activities** – e.g sitting, sleeping, Reading, relaxing, eating, drinking, sunbathing etc			
U2.	**Social recreational activities** – e.g Meeting friends, family outings, attend events, picnicking , entertainment enjoyment,			
U3.	**Active transport** – e.g Cycling, driving			
U4.	**Active stationary recreational activities** – e.g Playing soccer, volley ball			
U5.	**Active Mobile recreational**			

	activities – e.g Recreational walking, running, jogging			
U6.	**Economical activities e.g** Hawking, vending, kiosks			
U7.	**Spiritual activities** e.g preaching, praying			

V. Diversity of activities in the space

Total Number of activities types in space	**No. of activity types per M^2**

W: Density of participants in the space.

S/No.	**Activity Type**	**No. of Participants**	**No. of participants per M^2**
W1.	**Passive stationary recreational activities** – e.g sitting, sleeping, Reading, relaxing, eating, drinking, sunbathing etc		
W2.	**Social recreational activities** – e.g Meeting friends, family outings, events, picnicking , entertainment enjoyment, praying, preaching, singing		
W3.	**Active transport –** e.g Cycling, driving		
W4.	**Active stationary recreational activities –** e.g Playing soccer, volley ball		
W5.	**Active Mobile recreational activities –** e.g Recreational walking, running, jogging		
W6.	**Economical activities** e.g Hawking, vending, kiosks		
W7.	**Spiritual activities** e.g preaching, praying, singing		
W8.	**Overall density of participants in space**		

X. Rate **user's Level of participation in active recreational activities** in the space

1. Not active ☐ 2. Least active ☐ 3. Fairly active ☐ 4. Very active ☐ 5. Extremely active

User Characteristics

Y: Gender density in space use.

S/No.	SEX	Total No. in space	No. per M^2
Y1.	Female		
Y2.	Male		

Z: Density of persons with disabilities.

S/No.	User Physical Condition	Total No. in space	No. per M^2
Z1.	Person with Disabilities **(Wheel chaired/ Crutches/ Blind**		

Vehicular use patterns

AA: Density of vehicles using the space

S/No.	Vehicle category	No. of vehicles in the space	No. of vehicles per M^2
AA1.	Parked vehicles		
AA2.	Mobile vehicles		

X: Percentage of parking in different surfaces

S/No.	Surface	No. of Vehicles	No. of vehicles per M^2
AB1.	Tarmac		
AB2.	Grass		
AB3.	Paved area		
AB4.	Bare soil		

……END……

Appendix IV: Urban Park User Interview Schedule

W1-2-60-1-6

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

THE INFLUENCE OF SPATIAL CHARACTERISTICS ON UTILIZATION OF URBAN PARKS IN NAIROBI CITY

DECLARATION

I am a PhD student at JKUAT in the Department of Landscape Architecture. This interview schedule is part of my field study on "Influence of Spatial Characteristics on Utilization of Urban Parks in Nairobi City". You have been selected as a respondent among the park users visiting this Park. Your anonymity is guaranteed and all of your answers are confidential. The information provided will be used for academic purposes only.

SECTION I: - SPACE/ RESEARCHER DETAILS

Park Name/Code: _____ Space Category: _____ Space Code: _____ Name of Researcher: _____Date: _____ Time: _____

SECTION II: - PARK SPATIAL VARIABLES

Accessibility

K. What is your most preferred mode of transport to the park?

(K1)Walking ☐ (K2) Cycling ☐ (K3) Public transport ☐ (K4) Private ☐ car (K5)Motor cycle ☐

L. Approximately how long does your journey to the park? Please tick one choice only

(L1) Less than 15 minutes ☐ (L2) 15 - 30 minutes ☐

(L3) 30 – 45 minutes ☐ (L4) 45 – 60 minutes ☐

(L5) More than 1 hour ☐

M. Kindly estimate the travel distance to the park from your house.

(M1) <500m ☐ (M2) 500m – 1km ☐ (M3) 1 km – 3km ☐ (M4) 3 km - 5 ☐ Km (M5) >5 Km ☐

N. Please rate the overall ease of accessibility and circulation in this space.

S/No.	Variables:	Very difficult (1)	Difficult (2)	Moderately difficult (3)	Easy (4)	Very easy (5)
N1.	Accessibility					
N2.	Circulation					

P. From the list below, please indicate the factors that influence your visit to the space

S/No.	Factors	Tick
P1.	Cost of travelling	
P2.	Distance from home	
P3.	Time of travel	
P4.	Location	

Q: From the factors ticked in "P" above, rate their level of influence to your space visit. Responses range from **(1) Least influential to (5) Extremely.** Tick as appropriate.

S/No.	Factors	Least influential (1)	Not very influential (2)	Moderately influential (3)	Very Influential (4)	Extremely influential (5)
Q1.	Cost of travelling					
Q2.	Distance from home					
Q3.	Travel Time					
Q4.	Location					

Security in the space

R: On a 5 point scale, please indicate your opinion on the following **security issues** to your space visit.

S/No.	Variable: Security	Strongly disagree (1)	Disagree (2)	Somehow disagree (3)	Agree (4)	Strongly Agree (5)
R1.	I feel **insecure** when visiting this space					
R2.	**Crime rates** at the space are high					
R3.	There high presence of **Homeless** persons in the space					
R4.	There is presence of **illegal activities** in the space					
R5.	There is regular police patrols in the space and surrounding					

SECTION III: PARK UTILIZATION TRENDS

Frequency of visit

S. How often do you visit this space in a year? _____

Average number of people visiting in a group

T. Whenever you visit this space, how many people do you come with? _____

Average Duration of Stay in a space

U. Approximately how long do you stay in this space whenever you visit the park? _____

Purpose of space Visitation

V. Please tick the purpose of visiting the space

S/No.	Purpose of visit	Tick	S/No.	Purpose of visit	Tick
V1.	Transition route		V4.	Passing time	
V2.	Business/Work		V5.	Recreation	
V3.	Meeting				

W. In your opinion, do you think the space is used for the right purpose?

(W1) Strongly disagree ☐ (W2) Disagree ☐ (W3) Somehow disagree ☐

(W4) Agree ☐ (W5) Strongly agree ☐

Level of participation

X. Rate your level of participation in active recreational activities in the space whenever you visit.

1. Not active ☐ 2. Least active ☐ 3. Fairly active ☐ 4. Very active ☐

5. Extremely active ☐

THANK YOU FOR YOUR TIME AND RESPONSE.

Appendix V: Correlations Matrices of Each Y Surrogate

Key for Y surrogates and Xs

	Dependent Variable Surrogates			Independent variables	
S/No	**Codes**	**Surrogate**	**S/No**	**Codes**	**Variables**
Y1.	**FV**	Frequency of visits	**X1.**	**SS**	Size of space
Y2.	**NV**	Average number of people visiting a space	**X2.**	**SM**	Surface material
Y3.	**DS**	Average duration of stay	**X3.**	**AS**	Accessibility to the space
Y4.	**US**	Use of space	**X4.**	**VC**	Visual connectivity
Y5.	**LP**	Level of participation	**X5.**	**NC**	Adjacent neighbourhood characteristics
Y6.	**DA**	Diversity of activities in a park space	**X6.**	**VE**	Vegetation characteristics
Y7.	**IU**	Intensity of use	**X7.**	**EQ**	Environmental quality
Y8.	**GD**	Gender disparity	**X8.**	**BE**	Built environment
Y9.	**VU**	Vehicular use patterns	**X9.**	**DP**	Distance to park spaces
			X10.	**SE**	Security in the space
			X11.	**DL**	Overall design layout
			X12.	**SA**	Space aesthetics
			X13.	**PF**	Park features

Note that in the correlation tables, all the variables highlighted in yellow are significant. The regression table gives a model with only the significant variables; therefore any variable included in the model indicates that it is significant.

(a) Frequency of visit (Y1)

Correlations															
		Y1	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y1	r	1													
	p														
X1	r	.063	1												
	p	.331													
X2	r	-.129	.055	1											
	p	.155	.542												
X3		-.099	-.143*	-.076	1										
	p	.126	.027	.399											
X4	r	.036	-.355**	-.196*	.170*	1									
	p	.589	.000	.033	.010										
X5	r	-.051	-.081	.600**	.044	.010	1								
	p	.434	.213	.000	.501	.878									
X6	r	.049	-.004	-.166	.042	.014	-.089	1							
	p	.484	.953	.086	.553	.849	.202								
X7	r	-.054	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.405	.698	.000	.340	.874	.000	.619							
X8	r	-.043	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.540	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.072	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.272	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	.272**	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.000	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	-.024	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.713	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.000	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.999	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	-.076	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.242	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
**. Correlation is significant at the 0.01 level (2-tailed).															
*. Correlation is significant at the 0.05 level (2-tailed).															

(b) Average number of people visiting (Y2)

Correlations															
		Y2	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y2	r	1													
	p														
X1	r	-.044	1												
	p	.497													
X2	r	-.083	.055	1											
	p	.358	.542												
X3	r	-.011	-.143*	-.076	1										
	p	.866	.027	.399											
X4	r	.020	-.355**	-.196*	.170*	1									
	p	.762	.000	.033	.010										
X5	r	-.017	-.081	.600**	.044	.010	1								
	p	.800	.213	.000	.501	.878									
X6	r	.015	-.004	-.166	.042	.014	-.089	1							
	p	.835	.953	.086	.553	.849	.202								
X7	r	-.040	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.535	.698	.000	.340	.874	.000	.619							
X8	r	.555**	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.000	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.050	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.449	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.093	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.154	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	-.032	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.632	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	-.062	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.348	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.275**	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.000	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
**. Correlation is significant at the 0.01 level (2-tailed).															
*. Correlation is significant at the 0.05 level (2-tailed).															

(c) Average Duration of stay (Y3)

Correlations															
		Y3	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y3	r	1													
	p														
X1	r	.132*	1												
	p	.043													
X2	r	-.128	.055	1											
	p	.161	.542												
X3	r	-.030	-.143*	-.076	1										
	p	.647	.027	.399											
X4	r	.020	-.355**	-.196*	.170*	1									
	p	.763	.000	.033	.010										
X5	r	-.056	-.081	.600**	.044	.010	1								
	p	.394	.213	.000	.501	.878									
X6	r	-.052	-.004	-.166	.042	.014	-.089	1							
	p	.466	.953	.086	.553	.849	.202								
X7	r	.033	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.616	.698	.000	.340	.874	.000	.619							
X8	r	.004	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.951	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.071	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.282	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.019	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.778	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.008	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.899	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.084	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.207	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	-.028	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.669	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
*. Correlation is significant at the 0.05 level (2-tailed).															
**. Correlation is significant at the 0.01 level (2-tailed).															

(d) Purpose of Space Visitation (Y4)

Correlations															
		Y4	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y4	r	1													
	p														
X1	r	-.059	1												
	p	.364													
X2	r	-.119	.055	1											
	p	.189	.542												
X3	r	-.003	-.143*	-.076	1										
	p	.969	.027	.399											
X4	r	.162*	-.355**	-.196*	.170*	1									
	p	.015	.000	.033	.010										
X5	r	.114	-.081	.600**	.044	.010	1								
	p	.080	.213	.000	.501	.878									
X6	r	.006	-.004	-.166	.042	.014	-.089	1							
	p	.931	.953	.086	.553	.849	.202								
X7	r	.017	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.796	.698	.000	.340	.874	.000	.619							
X8	r	.016	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.824	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.063	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.335	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.237**	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.000	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.087	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.188	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.075	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.254	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.109	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167**	.120	1
	p	.096	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
*. Correlation is significant at the 0.05 level (2-tailed).															
**. Correlation is significant at the 0.01 level (2-tailed).															

(e) Level of participation (Y5)

Correlations															
		Y5	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y5	r	1													
	p														
X1	r	.153*	1												
	p	.018													
X2	r	-.031	.055	1											
	p	.730	.542												
X3	r	.108	-.143*	-.076	1										
	p	.096	.027	.399											
X4	r	.077	-.355**	-.196*	.170*	1									
	p	.248	.000	.033	.010										
X5	r	.057	-.081	.600**	.044	.010	1								
	p	.385	.213	.000	.501	.878									
X6	r	.000	-.004	-.166	.042	.014	-.089	1							
	p	.996	.953	.086	.553	.849	.202								
X7	r	.059	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.366	.698	.000	.340	.874	.000	.619							
X8	r	.036	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.601	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.052	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.428	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.064	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.329	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	-.002	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.981	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.168*	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.010	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.028	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.665	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
*. Correlation is significant at the 0.05 level (2-tailed).															
**. Correlation is significant at the 0.01 level (2-tailed).															

(f) Diversity of activities in the park (Y6)

Correlations															
		Y6	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y6	r	1													
	p														
X1	r	-219**	1												
	p	.001													
X2	r	-.084	.055	1											
	p	.368	.542												
X3	r	.747**	-.143*	-.076	1										
	p	.000	.027	.399											
X4	r	.170*	-.355**	-.196*	.170*	1									
	p	.012	.000	.033	.010										
X5	r	.108	-.081	.600**	.044	.010	1								
	p	.103	.213	.000	.501	.878									
X6	r	.065	-.004	-.166	.042	.014	-.089	1							
	p	.366	.953	.086	.553	.849	.202								
X7	r	.026	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.699	.698	.000	.340	.874	.000	.619							
X8	r	.348**	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.000	.557	.908	.987	.130	.387	.901	.698						
X9	r	.056	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.407	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.180**	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.007	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.058	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.384	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.078	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.243	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.525**	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.000	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
**. Correlation is significant at the 0.01 level (2-tailed).															
*. Correlation is significant at the 0.05 level (2-tailed).															

(g) Intensity of use (Y7)

Correlations															
		Y7	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y7	r	1													
	p														
X1	r	-.146*	1												
	p	.029													
X2	r	-.010	.055	1											
	p	.916	.542												
X3	r	.798**	-.143*	-.076	1										
	p	.000	.027	.399											
X4	r	.068	-.355**	-.196*	.170*	1									
	p	.321	.000	.033	.010										
X5	r	.185**	-.081	.600**	.044	.010	1								
	p	.006	.213	.000	.501	.878									
X6	r	.020	-.004	-.166	.042	.014	-.089	1							
	p	.781	.953	.086	.553	.849	.202								
X7	r	.043	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.524	.698	.000	.340	.874	.000	.619							
X8	r	.548**	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p)	.000	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.011	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.871	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.105	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.121	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.052	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.441	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.047	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.490	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.567**	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.000	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
*. Correlation is significant at the 0.05 level (2-tailed).															
**. Correlation is significant at the 0.01 level (2-tailed).															

(h) Gender disparity (Y8)

Correlations															
		Y8	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y8	r	1													
	p														
X1	r	-.140*	1												
	p	.032													
X2	r	-.013	.055	1											
	p	.883	.542												
X3	r	.798**	-.143*	-.076	1										
	p	.000	.027	.399											
X4	r	.057	-.355**	-.196*	.170*	1									
	p	.405	.000	.033	.010										
X5	r	.193**	-.081	.600**	.044	.010	1								
	p	.003	.213	.000	.501	.878									
X6	r	.027	-.004	-.166	.042	.014	-.089	1							
	p	.698	.953	.086	.553	.849	.202								
X7	r	.058	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.377	.698	.000	.340	.874	.000	.619							
X8	r	.549**	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.000	.557	.908	.987	.130	.387	.901	.698						
X9	r	-.003	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p)	.965	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.099	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.134	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.058	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.387	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.054	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.420	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.553**	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.000	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
*. Correlation is significant at the 0.05 level (2-tailed).															
**. Correlation is significant at the 0.01 level (2-tailed).															

(i) Vehicular use patterns (Y9)

Correlations															
		Y9	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Y9	r	1													
	p														
X1	r	-.067	1												
	p	.320													
X2	r	.096	.055	1											
	p	.299	.542												
X3	r	-.006	-.143*	-.076	1										
	p	.934	.027	.399											
X4	r	-.073	-.355**	-.196*	.170*	1									
	p	.299	.000	.033	.010										
X5	r	.191**	-.081	.600**	.044	.010	1								
	p	.005	.213	.000	.501	.878									
X6	r	-.012	-.004	-.166	.042	.014	-.089	1							
	p	.868	.953	.086	.553	.849	.202								
X7	r	.025	.025	.620**	.062	-.011	.290**	-.035	1						
	p	.713	.698	.000	.340	.874	.000	.619							
X8	r	.649**	-.041	.011	-.001	-.108	.060	.009	-.027	1					
	p	.000	.557	.908	.987	.130	.387	.901	.698						
X9	r	.001	-.018	.061	.007	-.093	.046	-.098	.085	-.040	1				
	p	.988	.783	.506	.921	.168	.487	.163	.192	.564					
X10	r	-.075	.038	-.150	-.211**	-.090	-.048	.067	-.202**	-.023	-.014	1			
	p	.273	.562	.100	.001	.182	.467	.340	.002	.738	.828				
X11	r	.044	-.100	.733**	-.016	.085	.683**	-.125	.505**	.034	.077	-.095	1		
	p	.525	.125	.000	.802	.208	.000	.077	.000	.625	.242	.151			
X12	r	.014	-.029	.318**	.034	.080	.513**	-.130	.289**	-.028	.091	-.141*	.635**	1	
	p	.837	.659	.000	.599	.234	.000	.066	.000	.688	.168	.032	.000		
X13	r	.455**	-.189**	-.061	.337**	.037	.218**	.032	.047	.674**	.016	-.112	.167*	.120	1
	p	.000	.003	.503	.000	.587	.001	.649	.467	.000	.807	.089	.011	.067	
**. Correlation is significant at the 0.01 level (2-tailed).															
*. Correlation is significant at the 0.05 level (2-tailed).															

Appendix VI: Regression Results

Key: Variable codes

	Dependent Variable Surrogates			Independent variables	
S/No	**Codes**	**Surrogates**	**S/No**	**Codes**	**Variables**
Y1.	**FV**	Frequency of visits	**X1.**	**SS**	Size of space
Y2.	**NV**	Average number of people visiting a space	**X2.**	**SM**	Surface material
Y3.	**DS**	Average duration of stay	**X3.**	**AS**	Accessibility to the space
Y4.	**US**	Use of space	**X4.**	**VC**	Visual connectivity
Y5.	**LP**	Level of participation	**X5.**	**NC**	Adjacent neighbourhood characteristics
Y6.	**DA**	Diversity of activities in a park space	**X6.**	**VE**	Vegetation characteristics
Y7.	**IU**	Intensity of use	**X7.**	**EQ**	Environmental quality
Y8.	**GD**	Gender disparity	**X8.**	**BE**	Built environment
Y9.	**VU**	Vehicular use patterns	**X9.**	**DP**	Distance to park spaces
			X10.	**SE**	Security in the space
			X11.	**DL**	Overall design layout
			X12.	**SA**	Space aesthetics
			X13.	**PF**	Park features

Source: Author, 2019

(i) Y1 –Frequency of Visits

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.306[a]	.094	.089	128.294

a. Predictors: (Constant), X10

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	310113.781	1	310113.781	18.841	.000[b]
	Residual	2995599.328	182	16459.337		
	Total	3305713.109	183			

a. Dependent Variable: Y1

b. Predictors: (Constant), X10

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-28.225	43.559		-.648	.518
	X10	66.902	15.413	.306	4.341	.000

a. Dependent Variable: Y1

(ii) Y2 – Average Number of People Visiting a Space

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.558[a]	.311	.303	86.980

a. Predictors: (Constant), X13, X8

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	584139.224	2	292069.612	38.605	.000[b]
	Residual	1293700.086	171	7565.498		
	Total	1877839.310	173			

a. Dependent Variable: Y2

b. Predictors: (Constant), X13, X8

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.529	8.084		1.426	.156
	X8	168.000	26.927	.602	6.239	.000
	X13	-4.283	6.859	-.060	-.624	.533

a. Dependent Variable: Y2

(iii) Y3 – Average Duration of Stay

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276[a]	.076	.071	3.80766

a. Predictors: (Constant), X1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	219.316	1	219.316	15.127	.000[b]
	Residual	2667.677	184	14.498		
	Total	2886.993	185			

a. Dependent Variable: Y3

b. Predictors: (Constant), X1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.256	.304		14.002	.000
	X1	8.081E-5	.000	.276	3.889	.000

a. Dependent Variable: Y3

(iv) Y4 – Use of Space

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.225[a]	.051	.045	.612

a. Predictors: (Constant), X10

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.479	1	3.479	9.305	.003[b]
	Residual	65.066	174	.374		
	Total	68.545	175			

a. Dependent Variable: Y4

b. Predictors: (Constant), X10

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.531	.209		21.669	.000
	X10	-.225	.074	-.225	-3.050	.003

a. Dependent Variable: Y4

(v) Y5 – Level of Participation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.178[a]	.032	.026	1.145
2	.240[b]	.058	.047	1.133

a. Predictors: (Constant), X12

b. Predictors: (Constant), X12, X1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.616	1	7.616	5.809	.017[b]
	Residual	233.384	178	1.311		
	Total	241.000	179			
2	Regression	13.894	2	6.947	5.414	.005[c]
	Residual	227.106	177	1.283		
	Total	241.000	179			

a. Dependent Variable: Y5

b. Predictors: (Constant), X12

c. Predictors: (Constant), X12, X1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.554	.268		5.790	.000
	X12	.243	.101	.178	2.410	.017
2	(Constant)	1.454	.269		5.399	.000
	X12	.250	.100	.183	2.509	.013
	X1	1.371E-5	.000	.161	2.212	.028

a. Dependent Variable: Y5

(vi) Y6- Diversity of Activities in a Park Space

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.849[a]	.720	.718	.75079112
2	.935[b]	.874	.872	.50593129
3	.939[c]	.882	.879	.49122842

a. Predictors: (Constant), X3

b. Predictors: (Constant), X3, X13

c. Predictors: (Constant), X3, X13, X8

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	233.377	1	233.377	414.018	.000[b]
	Residual	90.754	161	.564		
	Total	324.130	162			
2	Regression	283.176	2	141.588	553.150	.000[c]
	Residual	40.955	160	.256		
	Total	324.130	162			
3	Regression	285.763	3	95.254	394.746	.000[d]
	Residual	38.368	159	.241		
	Total	324.130	162			

a. Dependent Variable: Y6

b. Predictors: (Constant), X3

c. Predictors: (Constant), X3, X13

d. Predictors: (Constant), X3, X13, X8

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.165	.066		2.517	.013
	X3	.506	.025	.849	20.347	.000
2	(Constant)	-.116	.049		-2.394	.018
	X3	.485	.017	.813	28.823	.000
	X13	.372	.027	.394	13.948	.000
3	(Constant)	-.067	.050		-1.347	.180
	X3	.490	.016	.823	29.865	.000
	X13	.273	.040	.289	6.855	.000
	X8	.505	.154	.137	3.274	.001

a. Dependent Variable: Y6

(vii) Y7- Intensity of Use

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.663[a]	.440	.437	5.94629538
2	.713[b]	.508	.502	5.59117205
3	.724[c]	.524	.516	5.51341562
4	.737[d]	.543	.532	5.42201490

a. Predictors: (Constant), X13

b. Predictors: (Constant), X13, X3

c. Predictors: (Constant), X13, X3, X5

d. Predictors: (Constant), X13, X3, X5, X8

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4666.106	1	4666.106	131.966	.000[b]
	Residual	5940.216	168	35.358		
	Total	10606.322	169			
2	Regression	5385.700	2	2692.850	86.140	.000[c]
	Residual	5220.621	167	31.261		
	Total	10606.322	169			
3	Regression	5560.295	3	1853.432	60.973	.000[d]
	Residual	5046.027	166	30.398		
	Total	10606.322	169			
4	Regression	5755.611	4	1438.903	48.945	.000[e]
	Residual	4850.711	165	29.398		
	Total	10606.322	169			

a. Dependent Variable: Y7

b. Predictors: (Constant), X13

c. Predictors: (Constant), X13, X3

d. Predictors: (Constant), X13, X3, X5

e. Predictors: (Constant), X13, X3, X5, X8

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.395	.522		2.672	.008
	X13	3.553	.309	.663	11.488	.000
2	(Constant)	.476	.527		.904	.367
	X13	3.426	.292	.640	11.734	.000
	X3	.889	.185	.262	4.798	.000
3	(Constant)	-4.579	2.172		-2.108	.037
	X13	3.265	.296	.610	11.041	.000
	X3	.886	.183	.260	4.845	.000

	X5	1.487	.620	.132	2.397	.018
4	(Constant)	-5.028	2.143		-2.346	.020
	X13	2.379	.450	.444	5.286	.000
	X3	.936	.181	.275	5.174	.000
	X5	1.743	.618	.155	2.820	.005
	X8	4.420	1.715	.211	2.578	.011

a. Dependent Variable: Y7

(viii) Y8- Gender Disparity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.664[a]	.442	.438	5.85529537
2	.716[b]	.512	.507	5.48753747
3	.727[c]	.529	.520	5.41198506
4	.742[d]	.551	.540	5.30003210

a. Predictors: (Constant), X13

b. Predictors: (Constant), X13, X3

c. Predictors: (Constant), X13, X3, X8

d. Predictors: (Constant), X13, X3, X8, X5

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4554.100	1	4554.100	132.833	.000[b]
	Residual	5759.793	168	34.284		
	Total	10313.893	169			
2	Regression	5285.011	2	2642.505	87.753	.000[c]
	Residual	5028.882	167	30.113		
	Total	10313.893	169			
3	Regression	5451.822	3	1817.274	62.045	.000[d]

	Residual	4862.071	166	29.290		
	Total	10313.893	169			
4	Regression	5678.987	4	1419.747	50.542	.000[e]
	Residual	4634.906	165	28.090		
	Total	10313.893	169			

a. Dependent Variable: Y8

b. Predictors: (Constant), X13

c. Predictors: (Constant), X13, X3

d. Predictors: (Constant), X13, X3, X8

e. Predictors: (Constant), X13, X3, X8, X5

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.333	.514		2.594	.010
	X13	3.510	.305	.664	11.525	.000
2	(Constant)	.407	.517		.787	.432
	X13	3.382	.287	.640	11.803	.000
	X3	.896	.182	.267	4.927	.000
3	(Constant)	.793	.535		1.482	.140
	X13	2.600	.433	.492	6.007	.000
	X3	.942	.180	.281	5.221	.000
	X8	4.031	1.689	.195	2.386	.018
4	(Constant)	-4.976	2.095		-2.375	.019
	X13	2.265	.440	.429	5.147	.000
	X3	.947	.177	.282	5.357	.000
	X8	4.799	1.676	.232	2.863	.005
	X5	1.718	.604	.154	2.844	.005

a. Dependent Variable: Y8

(ix) Y9- Vehicular Use Patterns

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.671[a]	.450	.447	2.45487992
2	.683[b]	.466	.460	2.42569185

a. Predictors: (Constant), X8

b. Predictors: (Constant), X8, X5

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	838.305	1	838.305	139.105	.000[b]
	Residual	1024.494	170	6.026		
	Total	1862.799	171			
2	Regression	868.406	2	434.203	73.794	.000[c]
	Residual	994.393	169	5.884		
	Total	1862.799	171			

a. Dependent Variable: Y9

b. Predictors: (Constant), X8

c. Predictors: (Constant), X8, X5

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.358	.189		1.898	.059
	X8	5.900	.500	.671	11.794	.000
2	(Constant)	-1.721	.938		-1.835	.068
	X8	5.821	.496	.662	11.747	.000
	X5	.597	.264	.127	2.262	.025

a. Dependent Variable: Y9

Appendix VII: Test for Assumptions of Parametric Tests

Test for the assumptions made by parametric tests were performed to confirm whether they were violated or not. These assumptions include normality of residuals, homogeneity of variance (homoscedasticity) and multicollinearity assumptions.

(a) Normality

The residuals (error terms in a regression model) are assumed to be normally distributed. To test for this, Kolmogrov Smirnov and Shapiro Wilk tests were conducted and a normal Q-Q graph was plotted. The results were presented in Table (i) and Figure (i).

(i) Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.078	178	.061	.990	178	.234

a. Lilliefors Significance Correction

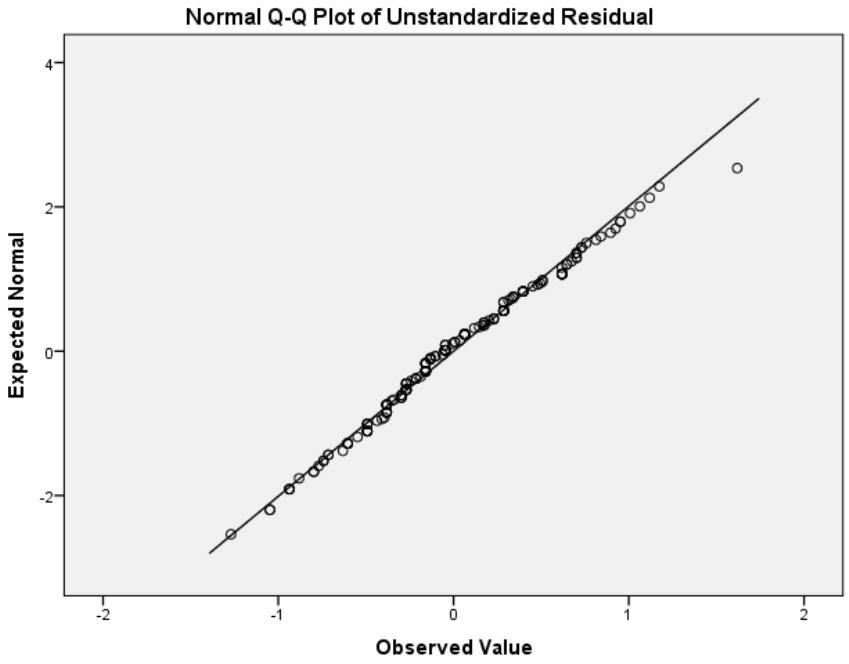


Figure (i): Normal Q-Q plot for the Residuals

The results indicated that the normality assumption was not violated as the p-values for the Kolmogrov Smirnov and Shapiro Wilk tests were greater than 0.05 therefore failing to reject the null hypothesis that the residuals are normally distributed. Again, the normal Q-Q plot showed that the points tended to lie on the diagonal line indicating that there was no violation of the normality assumption.

(b) Homoscedasticity

Homoscedasticity is the constancy of variance. In regression analysis, the residuals are assumed to be the same across all values of the independent variables. A residual scatter plot for predicted scores and standardized residual values also known as errors of prediction was used to test for homoscedasticity.

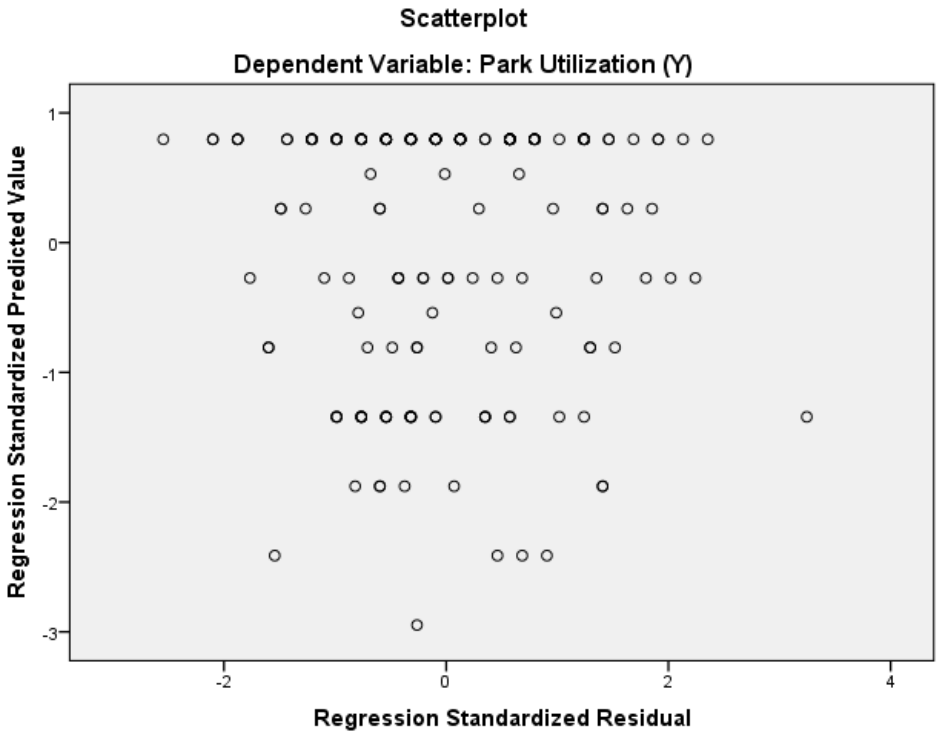
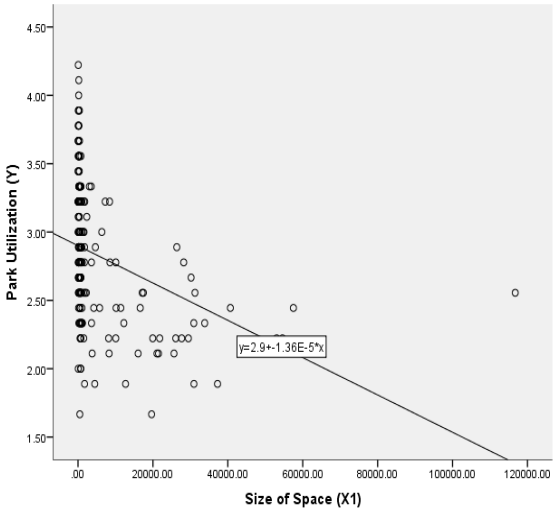
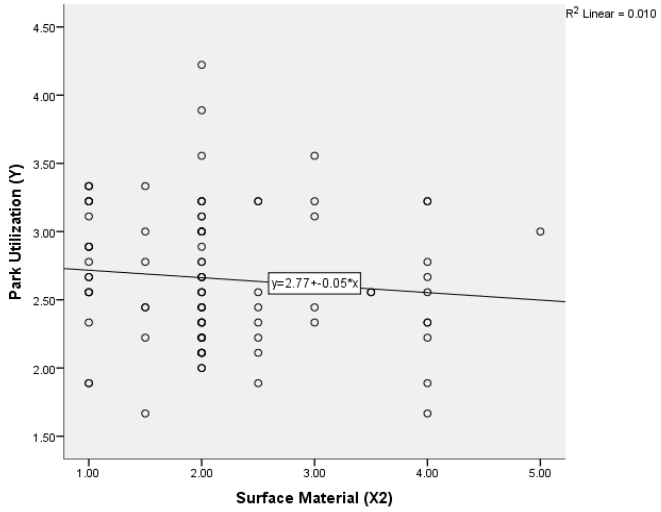


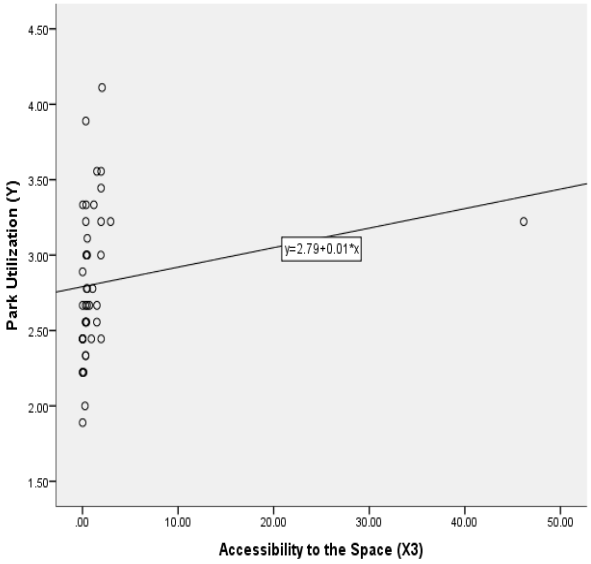
Figure (ii): A scatter plot of the predicted values and residual values

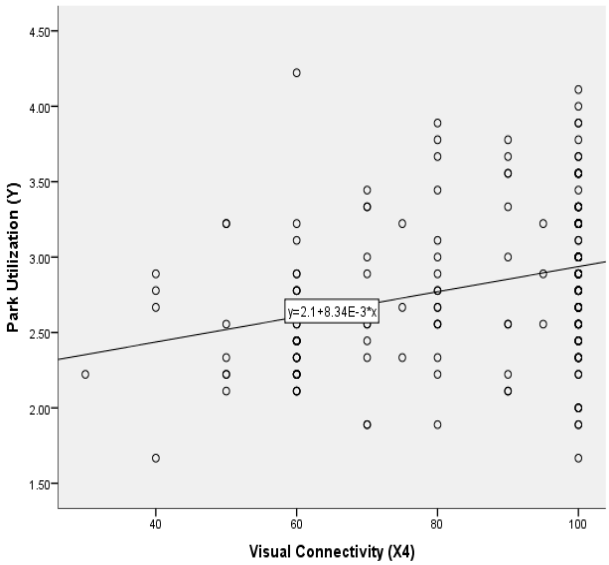
This assumption is met if the scores are randomly distributed and did not form a curved Shape or megaphone shape (Monotone Spread).

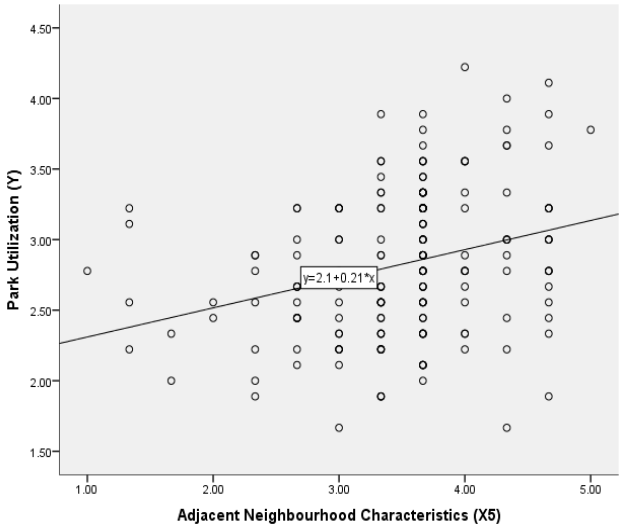
The interaction of the dependent variable, Park Utilization and the Independent variables was demonstrated using scatter plots. This was presented in the Figures below.

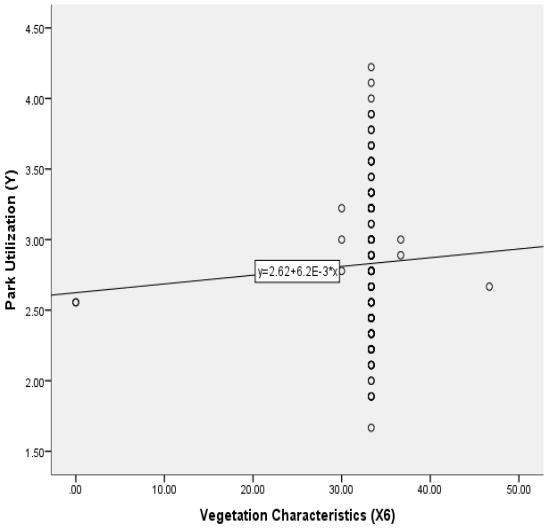

Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.9+-1.36E-5*x
.00
20000.00
40000.00
60000.00
80000.00
100000.00
120000.00
Size of Space (X1)

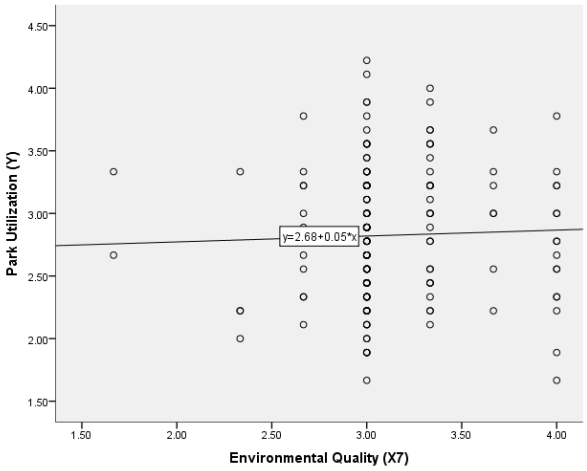

R2 Linear = 0.010
Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.77+-0.05*x
1.00
2.00
3.00
4.00
5.00
Surface Material (X2)

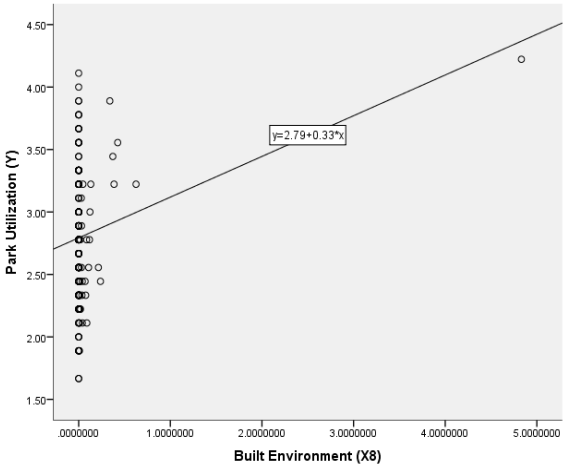

Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.79+0.01*x
.00
10.00
20.00
30.00
40.00
50.00
Accessibility to the Space (X3)

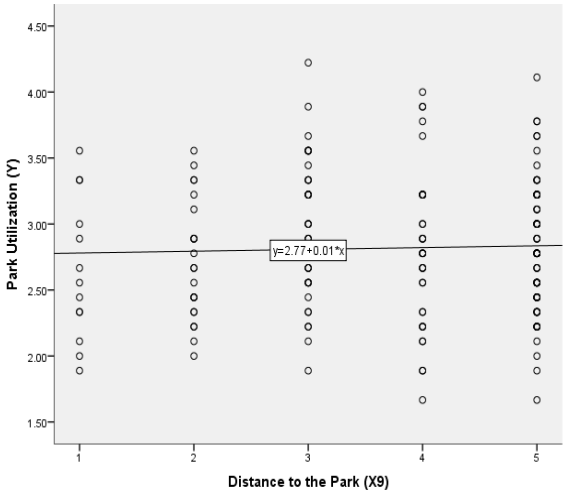

Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.1+8.34E-3*x
40
60
80
100
Visual Connectivity (X4)

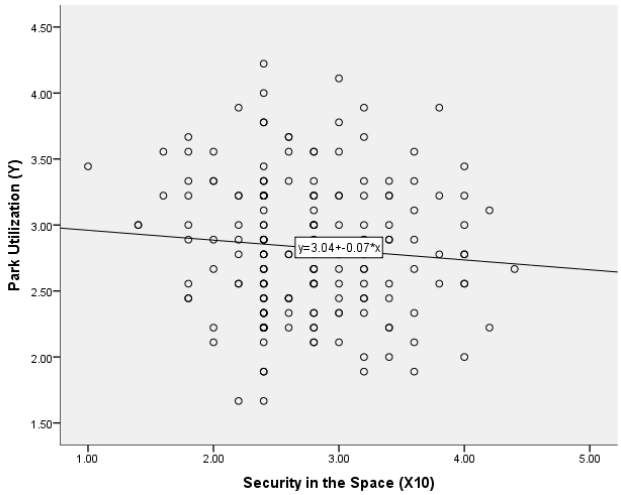

Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.1+0.21*x
1.00
2.00
3.00
4.00
5.00
Adjacent Neighbourhood Characteristics (X5)

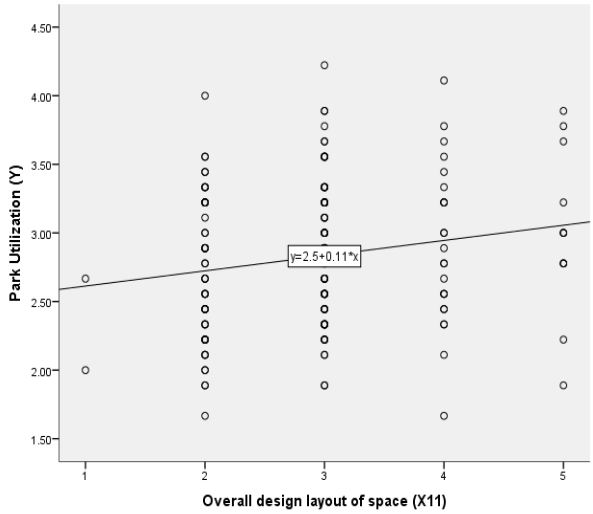

Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.62+6.2E-3*x
.00
10.00
20.00
30.00
40.00
50.00
Vegetation Characteristics (X6)

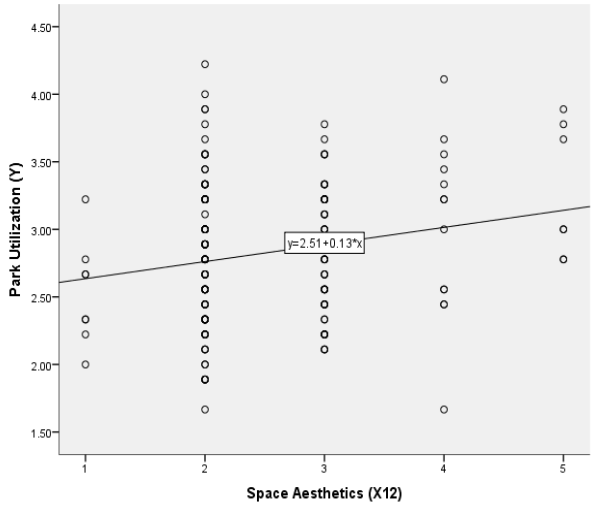

Park Utilization (Y)
y=2.68+0.05*x
Environmental Quality (X7)


Park Utilization (Y)
y=2.79+0.33*x
Built Environment (X8)


Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=2.77+0.01*x
1
2
3
4
5
Distance to the Park (X9)


Park Utilization (Y)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
y=3.04+-0.07*x
1.00
2.00
3.00
4.00
5.00
Security in the Space (X10)





(c) Multicollinearity

Multicollinearity refers to the high correlation among the independent variables. In linear regression analysis, independent variables are assumed not to be highly correlated with each other. In this study, Variance Inflation Factor (VIF) and Tolerance tests were used to test for multicollinearity.

Table (ii): Multicollinearity test

Variable	Tolerance	VIF
Accessibility to the Space	.248	4.748
Visual Connectivity	.478	2.093
Adjacent Neighborhood Characteristics	.298	3.354
Vegetation Characteristics	.310	3.227
Built Environment	.329	3.039
Distance to the Park	.810	1.235
Security in the Space	.397	2.522
Overall design layout of space	.295	4.122

The results in Table (ii) revealed that multicollinearity did not exist among the variables as tolerance values were all above 0.2 and also the VIF values were greater than 5. Therefore, this affirms that there was no violation of the no-multicollinearity assumption.