

**INVESTIGATION OF PUBLIC OPEN SPACES IN MACHAKOS TOWN
MUNICIPALITY, MACHAKOS COUNTY, KENYA**

By

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Environmental Planning and Management in the School of Environmental Studies of
Kenyatta University**

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DECLARATION

This research project is my original work and has not been presented for a degree in any other university or for any other award.

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DEDICATION

I dedicate this report to my dear wife Teresia Muthina for her moral and financial support throughout the entire programme. My children Liam and Olivia have been an inspiration to me all through.

ABSTRACT

Public open spaces form an important part of urban life, giving services to people and protect urban environment. In effective regulations and standards for establishment, setting, management and maintenance of public open spaces have always been a stumbling block in ensuring their sustainability, hence the existence of poorly performing, unplanned, and poorly distributed public open spaces. This study sought to establish why the public open spaces in Machakos municipality, Machakos County face sustainability challenges. The study aimed to find out the various types of public open spaces in Machakos Municipality; to examine their usage, find out measures taken by the stakeholders to ensure proper functioning of the public open spaces and ultimately to come up with approaches for successful establishment and management of a sustainable public open spaces system in Machakos Municipality. Primary and secondary data sources were utilized, with Primary data being gathered from in the form of questionnaires, interview schedules, observation and photography. Secondary data on the other hand was gathered through reviewing of existing literature materials and documentations on public open spaces from Government blueprints and policy documents. The report findings form a database for information needed towards a theoretical knowledge to help respective stakeholders in the establishment and management of public open spaces in Machakos town Municipality. This provides improved public open spaces setting that eventually raise the quality of life and value of the residents and property respectively. The findings revealed that there are a number of public open spaces in Machakos Municipality with Machakos People's park as the most popular of these open spaces. These spaces are mainly used for relaxation, sports, recreation, meetings, parking, source of income and physical exercise. These open spaces are highly used during weekends as opposed to all week through. Majority of them are managed by the county government of Machakos. However, the study reveals that the open space users are not satisfied with the management strategies employed by the current regime. They proposed better open spaces management strategies with all stakeholders involved.

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CHAPTER ONE: INTRODUCTION

1.0 Background to the Study

According to Swanwick *et al.*, (2003), there is a general public opinion that public open spaces can aid in creating a solution to social and environmental challenges facing current urban areas and enhance their sustainability. Considering that according to the (UN-Habitat, 2010), an estimated 70% of the world's population will be living in the urban areas by 2050, with figures above 90% being in Northern Europe and Northern America, while 67% will be in under developed areas, the role played by the public open spaces is crucial.

Blanco *et al.*, 2009, asserts that majority of cities worldwide are continually facing challenges associated with congestion and pollution due to increased population. With the current public open spaces consisting of a wide range of ecosystem services, it is apparent that they help in reducing urban pollution and in turn improve health status of the urban area residents (Wilson, 2010).

As urbanization intensifies, there is pressure to establish appealing and healthy urban public open space surroundings which range from large wooded pieces of land to small gardens which offer a variety of ecosystem services (Lovell and Taylor, 2013). According to Huang *et al.* 2010, these spaces are often faced with urbanization challenges, urban population influx and more coverage of undeveloped land surface by infrastructure.

In Africa, (UNFPA, 2007) highlights that the urban population will hit the 742 million mark by 2030, posing a threat to the public open spaces which always become easy targets as (Esbah *et al.*, 2009 and McConnachie *et al.*, 2009 assert.

Some public open spaces in urban areas are created in a way that they are pleasing to the eyes of both residents and investors like in the case of Singapore, Malaysia where foreign investors aided in the rapid economic growth due to a beautification initiative. Haq, 2011 asserts depending on the use and development type, public open spaces and landscaping increase property value and re-turns between 5% and 15%. They have also been found to be useful to public health, human wellbeing and also key in provision of a stable urban ecology system and also support biodiversity according to Marshall and Corkey, 2011; Konijnendik *et al.*, 2013.

Majority of African nations' public open space creation is spontaneous and only directed to solve a certain problem that has been identified with short-term goals being set without considering the future needs and consequences with such scenarios being exhibited capitals of Nigeria, Egypt, and South Africa (Abegunde, 2008; CCG, 2008).

1.1 Statement of the Problem

Significant increase in impermeable surfaces as population grows has led to reduced soft landscape coverage in developing countries according to Shi, 2002 and this has become a dominant component of physical planning as highlighted by Officha and Onwuemesi 2012.

Makworo and Mireri (2011) highlight that urban open spaces play important role in improving urban life as well as safeguarding the well being of the urban surrounding. Poor governance, population increase, invasions and modest methods of public open spaces have all been a stumbling block towards the success and sustainability of the public open spaces. The factors above coupled with unsustainable maintenance levels, challenges due to material choice, ineffective design of landscape components, poor solid waste and deficiency in competent technical personnel have contributed in one way or the other to poorly performing public open spaces (Alabi, 2009). Budgeting towards the management and general running of the public open spaces in such areas is always a factor leading to their ineffectiveness and poor performance.

The County Government of Machakos has made significant efforts to increase and improve the public open spaces within the municipality. This is attributed to the knowledge on the role the public open spaces play in enhancement of recreation, aesthetics, economics, environmental and health aspects as highlighted in the Machakos CIDP 2015. The county government of Machakos takes the sole responsibility for the management of the public open spaces, leaving other stakeholders out of involvement. However, the efforts by the county government has not been investigated, hence this study aims to find out the adequacy, usage and the challenges facing the establishment and maintenance of public open spaces in the municipality.

1.2 Research questions

- 1.Are there various types of public open spaces in Machakos town Municipality?
- 2.How are the public open spaces utilized?
- 3.What measures have been put by the relevant parties to ensure proper functioning of the public open spaces in the Municipality?

1.3 Research objectives

- 1.To establish the various types of public open spaces in Machakos Town Municipality, Machakos County.
- 2.To study the utilization of the public open spaces in Machakos Town Municipality, Machakos County.
- 3.To assess the management strategies in place to ensure proper functioning of the public open spaces in Machakos Town Municipality, Machakos County
- 4.To come up with measures to improve the creation, utilization and management of public open spaces in Machakos Town Municipality, Machakos County.

1.4 Research Premises

- 1.There are various kinds of public open spaces in the Municipality.
- 2.There are different uses of the public open spaces in the Municipality.
- 3.There exists different management approaches in place to guarantee sustainability of the public open spaces in Machakos Town Municipality, Machakos County.

1.5 Significance of the study

Machakos county will benefit from the theoretical knowledge provided by the study, which will in turn help in the planning and management of public open spaces in the municipality by the relevant departments. Through this, the general appearance of the town, value of property and quality of life of the residents will be improved. The study provides information on current state and loopholes regarding the public open green spaces in Machakos County, thereby being a major addition to the body of knowledge. The report also serves as an eye opener to the community in respect to their rights and responsibilities regarding the environment as indicated in Article 42 of the Kenyan constitution (2010).

1.6 Justification

According to Haq, 2011, a sustainable and ecologically sensitive urban landscape can be achieved if there exists a well planned system of public open spaces which include low cost maintenance levels which is achievable native plant material species selection and use of natural plants to form features like screens.

As Harnik *et al.*, 2009; CABE Space, 2009; Kroegeret, 2009 assert, public open spaces present an attractive setting for improved businesses, tourism attraction and in turn lead to creation of jobs to the natives as well as leading to skillful labour demand.

Aesthetics, social wellbeing and recreational needs of an urban neighborhood or town can be attained or enhanced through a well laid down public open spaces which come as a result of a sustainable planning and improvement of the said public open spaces, which in turn the area makes the area an attraction for both living and working. Other benefits include modification of the urban areas.

With the existence of various county governments in Kenya, this study is thus timely and will provide insight on procedures and practices on upon which emerging and existing public open spaces will be created, enhanced and managed to ensure sustainability.

1.7 Theoretical Framework

1.7.1 Political economy theory

Political economy theory is well explained in a perspective relating to Government's involvement in dealing with the needs of the community since they rely on the government for their well being in absence of market and job opportunities. Of importance thus is an effort to ensure effectiveness in dealing with needs of the society as required of the relevant economic, social and political arms of the government as (Cohn, 2008; Keiser, 2006) asserts. Weaver (1996) asserts that political economy scenario occurs when there is inequitable sharing or entitlement to resources as a result of a burden created by social and political customs.

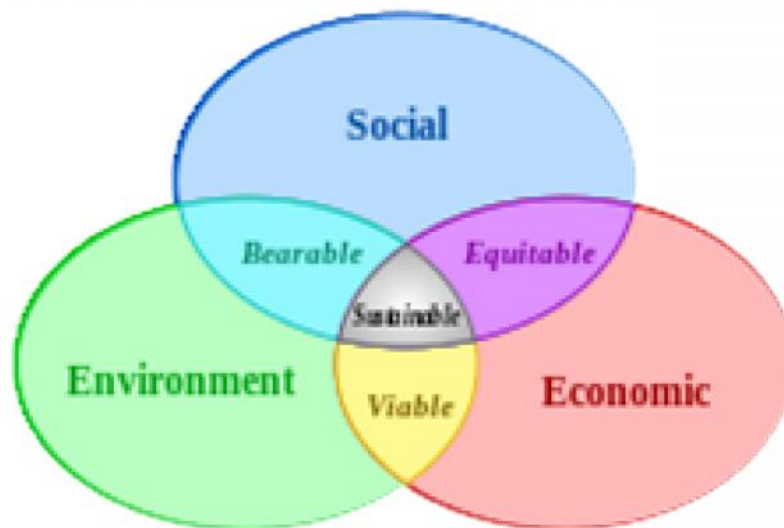
Dimitris and Ben, (2009) assert that the increase of unplanned dwellings in Africa is as a result of poorly managed urban environment resulting from poor funding by the relevant governmental institutions. They further indicate that to get to the root of this failure is pivotal in explaining the slum situation in Africa.

According to (Caporaso and Levine, 1992), slow pace and poor urban development in many Africa countries can be attributed to influential individuals' political and economic interests which has been fueled by the coincidental emergence of anti-urbanization preference exhibited by foreign entities and organizations when most of these African countries were experiencing rapid urban growth. Locally, the emergence and management of public open spaces in Kenya can as well be as a result of political and social greed by the elite who view these spaces as prime spots for financial gains as the government remains silent about the occurrences. This can further be supported by the fact that majority the counties today solely develop policy and legislate how the public open spaces are created and managed. This situation has led to inequitable distribution and deterioration of public open spaces through poor maintenance. Important thing to note is also the lack of goodwill and capacity by the county governments to put in place measures required for creation, implementation and maintenance of the public open spaces. For this to be achieved, then there needs to have a relationship between the county governments and other stakeholders.

1.7.2 Sustainable development theory

The study takes a sustainable development approach that advocates for economic development with an aim of ensuring that it fulfills present needs without affecting the capacity of future generations to meet their own. The common aspect about this theory as depicted in different definitions is the challenges that man faces, earth and its natural environments' carrying capacity. It exists in broad and distinct categories of environmental, economic and social aspect considerations of the any development at hand.

A well laid down public open space management framework encompassing bearable, equitable and viability considerations is thus key to ensuring their sustainability.



Source: WCED, 1987

Figure 1.1: Sustainable development theory

1.8 Conceptual framework

The conceptual framework outlined here is in line with political economy approach and sustainable development theory. Walker (2006), states that Political ecology has an enormous amount to offer- to help create a more just and sustainable world, but this potential is underutilized. Under the ecology theory which is a sub discipline under the political economy theory, it explains the status and physical aspects of public open spaces thereby touching on the different types, sizes and management conditions of the public open spaces in Machakos municipality. The management success is in this case based on the efforts put together by an organized multi-stakeholder team working towards a common goal(s), therefore highlighting on the benefits of public open spaces. Management of public open spaces entails interrogations that encompass the right pointers, types and means through which public open spaces are created and maintained, though this is not always easy to achieve, hence highlighting the different challenges facing the public open spaces.

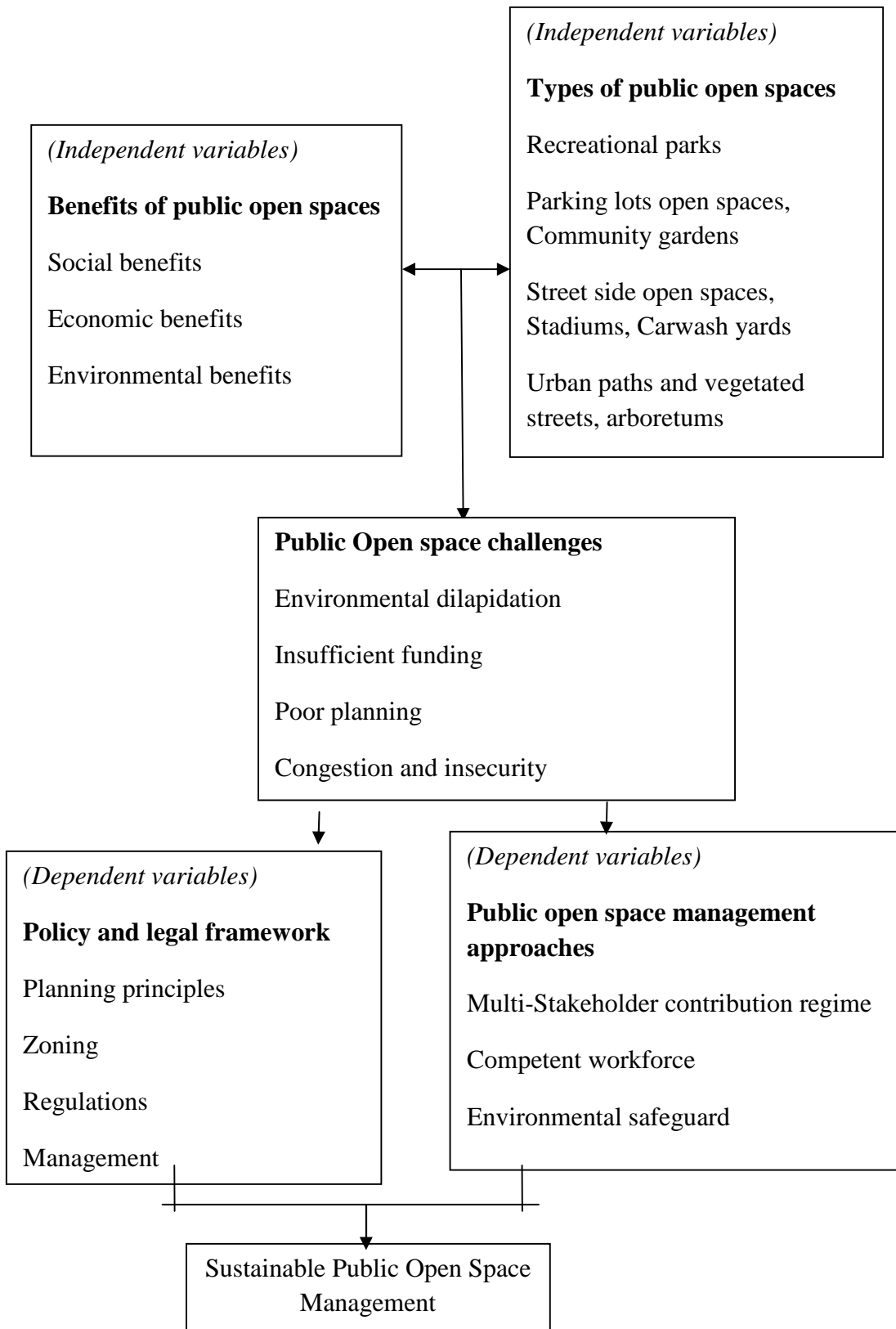


Figure: 1.2 Conceptual Framework

Source: Researcher, 2016

CHAPTER TWO: LITERATURE REVIEW

2.1 The history of Public open spaces

Public open spaces have been fundamental setting for cultural, political, and economic way of life for quite a long time with the correspondence amongst early Greek urban spaces and democratic practice regularly representing the starting point, with the Greek agora becoming a mark of the public sphere in modern literature (Crouch, 1981; Carr *et al.*, 1992; Madanipour, 2003; Carmona *et al.*, 2008). According to (Ward-Perkins, 1974; Wycherley, 1976; Owens, 1991), Roman-planned forums and religious plazas are also stated to belong in this category of ancient spaces. During the feudal Europe, plazas were commonly found alongside Christian churches, and held a broad range of socio-economic and recreational purposes (Zucker, 1959; Carr *et al.*, 1992; Carmona *et al.*, 2008). Thereafter as renaissance and enlightenment rose and continued, emphasis was on secular and private values, which was reflected within the urban open spaces. As (Carr *et al.*, 1992; Carmona *et al.*, 2008) assert, Urban squares planned solely for neighboring residential usage occurred in specific parts, like the Place des Vosges in Paris, the Bloomsbury squares in London, and downtown parts of Philadelphia and Savannah according to (Carr *et al.*, 1992; Carmona *et al.*, 2008). Specialized urban parks, first flourished in the 19th century according (Crouch, 1981; Cranz, 1982; Carr *et al.*, 1992).

Recently, focus has been on public open space themes and functions. In the USA, Portland and Vienna, Stadtplanung Wien, (1996), notes that protection and enhancement of natural resources that relate well with the recreational spaces in the urban areas has been a common practice. Focus has also been put towards ensuring the street as a public space has evolved to make it more appealing and usable by the community at large, (Gehl, 1987).

2.2 Types of public open spaces

As Francis (1987) states, public open spaces are built for people and people related undertakings in built-up areas. Kitha and Lyth, (2011) further assert that they exist as pieces of land that are

either developed or undeveloped and are in various measures; varying from walkways and private yard gardens to more broad urban landscapes like green parklands, woodlands, unused vegetated allotments and neglected fields.

Other categories include forest covers, streetscapes, parks and other smaller spaces such as parking lots. Kitha and Lyth, (2011) further state that they can also occur in the form of green infrastructure, which comprises of an interrelated system of green spaces that offer natural ecosystem values and services consisting of trees, parks, green roofs.

According to Byrne and Sipe, (2010), public open spaces can also be categorized in terms of the size, usage pattern, location and its intended function.

2.3 The creation and enhancement of public open spaces

According to Kong *et al.* (2010) public open space systems include the creation of fresh spatial forms, safeguarding of present ecological volumes, renewal and maintenance of connectivity within varied ecosystems in urban areas. To achieve this, environmental planners choose the most ideal ecosystem and possible corridors by considering distances and other challenges posed by the land use to ensure user satisfaction. Easy access, quality, quantity and uniform distribution aspects of the public open spaces are important considerations in place when creating and planning for the public open spaces according to Haq, (2011).

Public open spaces are essential in residential areas, recreation and in commercial settings as Baycan-Levent, (2002) state and therefore they should be considered even during water and power network infrastructure installation as suggested by Schaffler and Swilling, (2012).

2.4 Utilization of public open spaces

According to Byrne, 2012; Byrne and Wolch, (2009), there are various reasons behind uneven distribution and usage of public open spaces and these comprise of state oppression, the ancient approach to park creation, history of land usage, land morals and growing concepts about public open spaces as part of recreation.

Pigram and Jenkins, (2006) asserts that public open spaces often occur as left over spaces as a result of installation of health, transport, education and security infrastructure, causing them to perform ineffectively.

2.5 Benefits of public open spaces

2.5.1 Environmental benefits

Urban vegetation in public open spaces are essential in curbing soil erosion and modifying unfriendly urban climate through cooling the air, checking wind speed and providing shade (Tyrvainen, 2005). They also help in air purification by absorbing air pollutants, which occur in various forms as gases and other solid impurities. They serve as the lungs of the urban areas and also as important elements in land reclamation.

2.5.2 Social Benefits

Dines and Cattell *et al.*, (2006) state that the social value of public open space is broad is measured by the degree at which it enhances the 'people's attachment to their neighborhood and opportunities for socializing with one another, and in people's memory of places'. They present to people the much needed interaction, social mixing and social inclusion, and can enhance the advance of community ties.

At their best, public open spaces serve as self-organizing community service; just like hospitals and schools offer a common resource to enhance quality of life. They also form a common spatial resource from which unique experiences are made (Mean *et al.*, 2005).

'People are drawn to, and tend to stay for more in more public open spaces that are rich in user preferred aspects and motivation without compromising on comfort as research proves that public open space users like and long for unique events and activities, both in rural and urban settings according to Holland *et al.*, (2007).

2.5.3 Economic Benefits

The value of open space increases (More *et al.*, 1988) and affects rent values around large urban parks (Hammer *et al.*, 2007). In addition, amenity values are higher in urban forests than in rural areas (Cho *et al.*, 2008).

2.5.4 Health Benefits

Urban green parks in cities enhance quality of life and create positive emotions (Chiesura, 2004). They contribute to reducing illnesses caused by stressful living (Grahn & Stigsdotter, 2003). Furthermore, having open green space in neighborhoods increases their walkability and positive interactions among residents and park users. Neighborhoods that encourage walking and physical activity help to lower obesity rates and improve air quality (Frank *et al.*, 2006).

Thus, people who live near green spaces have a tendency to be healthier than others, and urban areas close to green spaces tend to have a stronger focus on healthy living (Maas *et al.*, 2006). According to Tzoulas *et al.*, (2007), an integration of public open spaces with green infrastructure can lead to improved user health and a good coexistence with the ecosystem found within.

As (de Vries, 2003; Maas, 2006), state, good health can be associated with frequent contact with vegetated zones like parks and playgrounds, while stress levels can be lowered significantly (Grahn, 2003; Nielsen, 2007), reduction in gloominess (Morita, 2007) and foot mobility (Li, 2005; Giles-Corti, 2005). To add on this, frequent walking enhances physical and mental health (Manson, 2002), as it has been proven that lack of physical activity is a public health risk according to the World Health Organization (2002).

According to (WHO, 2003), mental health is a major source of lots of diseases and enhanced physical health and the building of stronger families and societies. It also aids in reducing health-care expenses, costs of social intervention and contributes to reduction in crime and social dysfunction (WA Department of Sport and Recreation, 2009).

2.6 Public Open Spaces Management Approaches and Regimes

There exists two main public open space management approaches, aimed at ensuring sustainability of the projects at hand. The commonly adopted one is where the respective local authority solely carries out the running of the public open space. This implies that the public open space running approaches and procedures are done within the local authority and due to challenges resulting from limited resources to non adherence to existing statutory requirements may lead to deterioration and ineffectiveness in performance of the public open spaces.

According to (Jim, 2004), the local authorities should ensure that the relevant statutory requirements are in place and followed for quality enhancement through a number of ways, including creation of a database of both existing and possible future public open space establishments.

The second management approach is Multi-Stakeholder Involvement (MSI) and involves both the internal (local authority) and external interest groups like the public, private and Non Governmental institutions. In this scenario, the government doesn't get involved solely in management, instead it acts as a facilitator for development as stated in (UNDP, 2004). According to Erickson (2006: 280), it is not advisable for the public open space client to be the sole implementer. (Baycant-Levent *et al.* (2004: 10) also asserts that there is need to have a collaboration among all the stakeholders to better the quality of the public open spaces in what is called a Multi-Stakeholder Involvement (MSI). As Smith (2009) asserts, the partnership can either be formal or informal, intra or inter-organizational, vertical or horizontal.

2.7 Challenges facing management of public open spaces

One of the challenges facing the public open space management success is its location. As Van Herzele and Wiedemann (2003) states, of essence to consider is the distance one has to cover through walking from the town center to access their intended public open space(s). A shorter distance is found to increase the frequency of the public open space user visit. Past findings indicate that positioning, distance as well as allocation of public open spaces in the town affects people's involvement in those areas. In Helsinki, Finland, it has been proven that a large number of public open spaces that are situated near the city center are more frequented than those located further, (Neuvonen, 2007). Public open spaces that are

Public open spaces are not viewed as a priority as it is when it towards infrastructure creation, poverty eradication and employment creation (Constanza, 1997; Wallace, 2007 and Ward, 2010). This leads to underfunding and neglect leading to deterioration in quality and general performance of the public open spaces. This coupled with poor management practices, lack of maintenance scheme, shortage of skilled management personnel, poor planning, design and poor choice of landscape materials have made it difficult for the respective authorities and stakeholders to have a successful and sustainable network of public open spaces. High cost of maintenance also fits in the category of challenges mentioned above.

2.8 Policy, Legal and Institutional framework

2.8.1 The Constitution of Kenya (2010)

Chapter 5, Section 42 (a) on Environment, the Constitution states that every person has the right to a clean and healthy Environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures. Chapter 4, Section 5(b) on Bills of Rights, it states that "In allocating resources, the State shall give priority to ensuring the widest possible enjoyment of the right or fundamental freedom having

regard to prevailing circumstances, including the vulnerability of particular groups or individuals”. Sections 69 and 70 of Chapter 5 detail environmental and land issues that are safeguarded therein. The main components of the chapter include the different types of land and safeguarding the environment for future generations. The chapter also lists: warranting sustainable utilization, management and preservation of the environment and natural resources, and ensuring the equitable distribution of the accruing benefits; working to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya.

It also mentions protecting and enhancing intellectual property and indigenous knowledge of biodiversity and the genetic resources of the communities. The other facet mentioned is the safeguard of genetic resources and biological diversity, the formation of systems of environmental impact assessment, environmental audit and monitoring of the environment. These citations could be read together with other sections that allude to the general health of the citizens of Kenya (The Constitution of Kenya, 2010). These selected sections are in direct relevance to the issue of recreational spaces, which fall under the category of public open spaces.

2.8.2. The Physical Planning Act (2010)

Cap 287 allows the Director of Physical Planning to prepare a physical development plan for all areas whereas Cap 286 makes provision for the preparation of a physical development plan.

2.8.3. Environmental Management and Coordination Act (EMCA), 1999

Part 5, Sections 44-47, 51-52,54 on Protection and Conservation of the Environment, EMCA details aspects that encompass the safeguard of conventional benefits, guarding of hill tops, hill sides, mountain areas and forests, re-forestation and a forestation of hill tops, hill slopes and mountainous areas, protection of forests, conservation of energy and planting of trees or woodlots, conservation of biological diversity, biological resources *in situ/ ex situ*. It presents a practical structure for enforcing the protection of the environment. It therefore encourages a reactive approach to some issues, one such occasion being the allocation of public open spaces.

2.8.4. County Government Act, 2012

Section 102, Part 14 on County Planning, the act gives the county government of Machakos powers to develop the Machakos County spatial plan. The spatial plan, which shall be spatial development framework for the county, shall indicate the areas designated to conservation and recreation. It is also mandated to undertake development works related to public open spaces within the town. The Department of Physical Planning in the county is the one involved with the production of physical development plans. As outlined in the Machakos County Integrated Development Plan of 2015, page 97, plans are underway to construct more people's parks in eight sub-counties to add on the already established Machakos people's park.

2.8.5 National Land Policy, 2009

This act gives the government the mandate to enable the development of national and regional physical development plans as a foundation for investment and sustainable exploitation of natural resources, taking local land use practices into account. It also acknowledges that land usage planning is essential for efficiency and sustainable utilization and management of land and land based resources. Public open spaces are thus contained under the physical plans and aim to protect natural resources.

2.8.6. National Environmental Action Plan (NEAP)

Kenya has a strategy for sustainable development through the NEAP in 1993, which would offer a framework for integrating environmental considerations into the country's 5-year development plans. The NEAP identified key environmental challenges and laid out a general approach to deal with the challenges and include a specific plan for government as well as the private sector and NGOs to act on.

CHAPTER THREE: STUDY AREA AND METHODOLOGY

3.1 Study Area

The study was carried out in Machakos municipality, Machakos County. It further narrowed down to public open spaces within the planned part of the Machakos town. The municipality coordinates are as follows: latitude $1^{\circ} 29' 59''$ South, longitudes $39^{\circ} 14' 60''$ East with the altitude at 1138m above sea level. The size is 925.3Km^2 with a population density of 215 persons every square kilometer (KNBS, 2013).

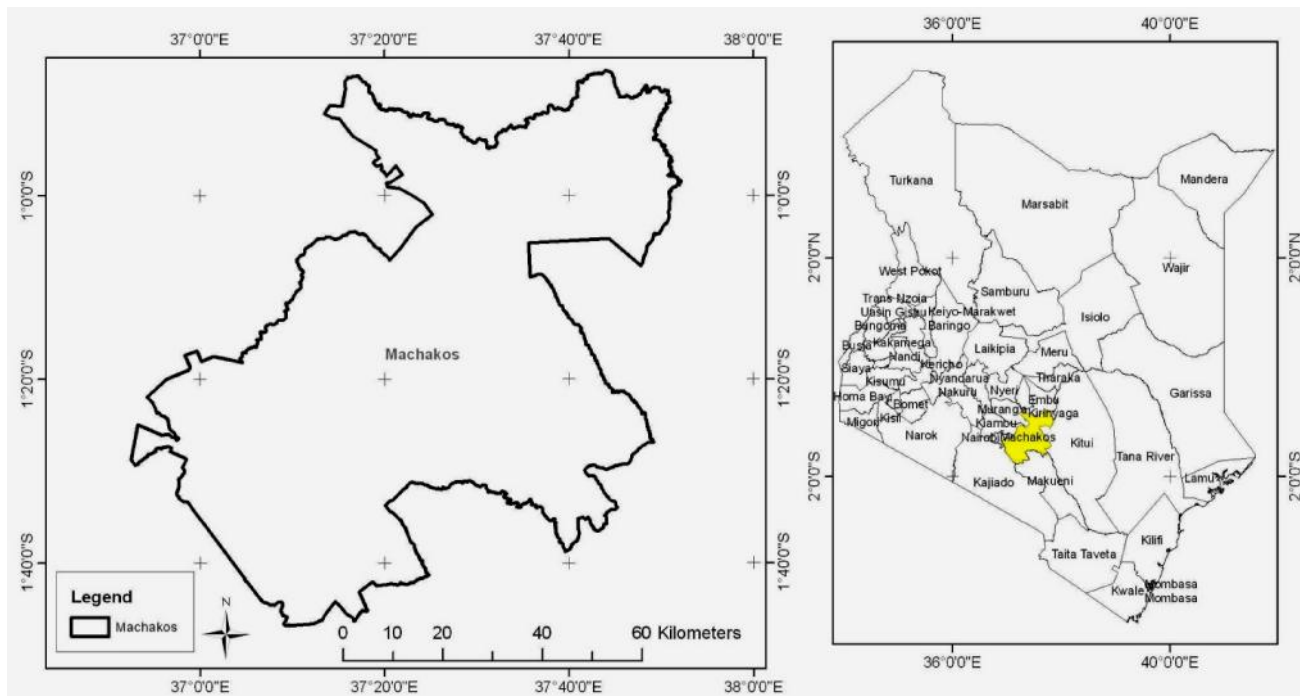


Figure 3.1: Machakos County in Kenya

Source: ArcGIS, 2016

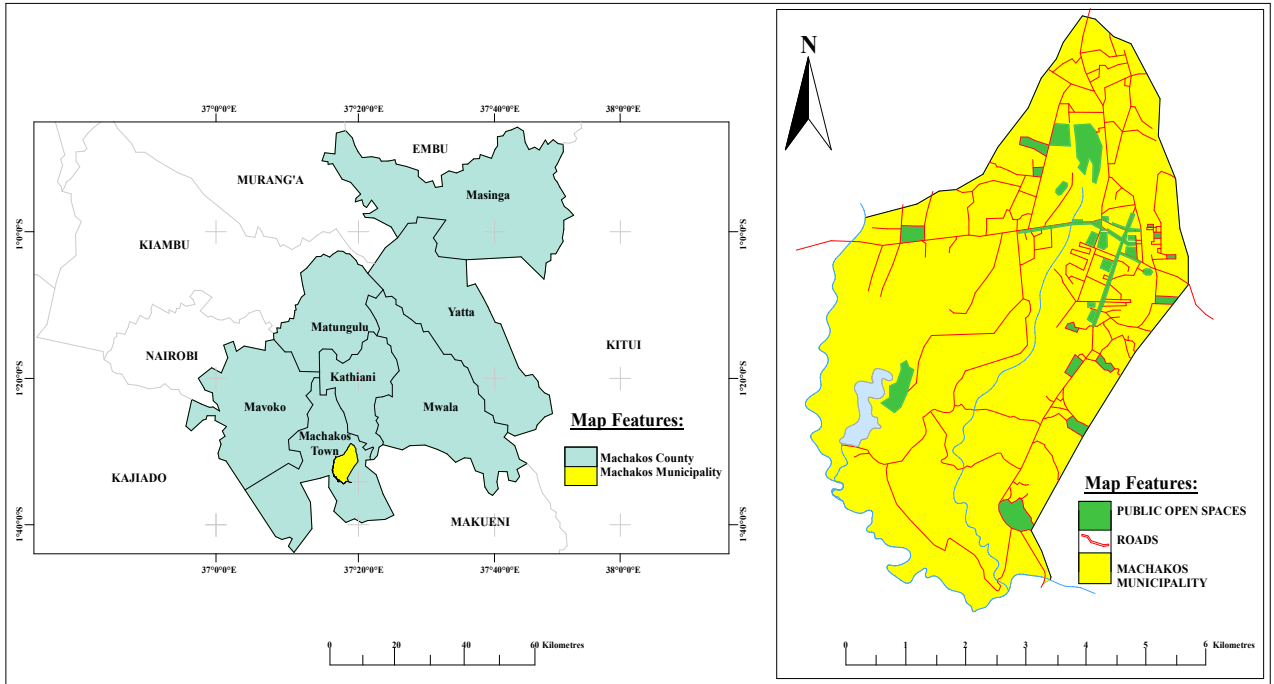


Figure 3.2: Public open spaces in Machakos municipality

Source: ArcGIS, 2016, ArchiCAD 16, 2017

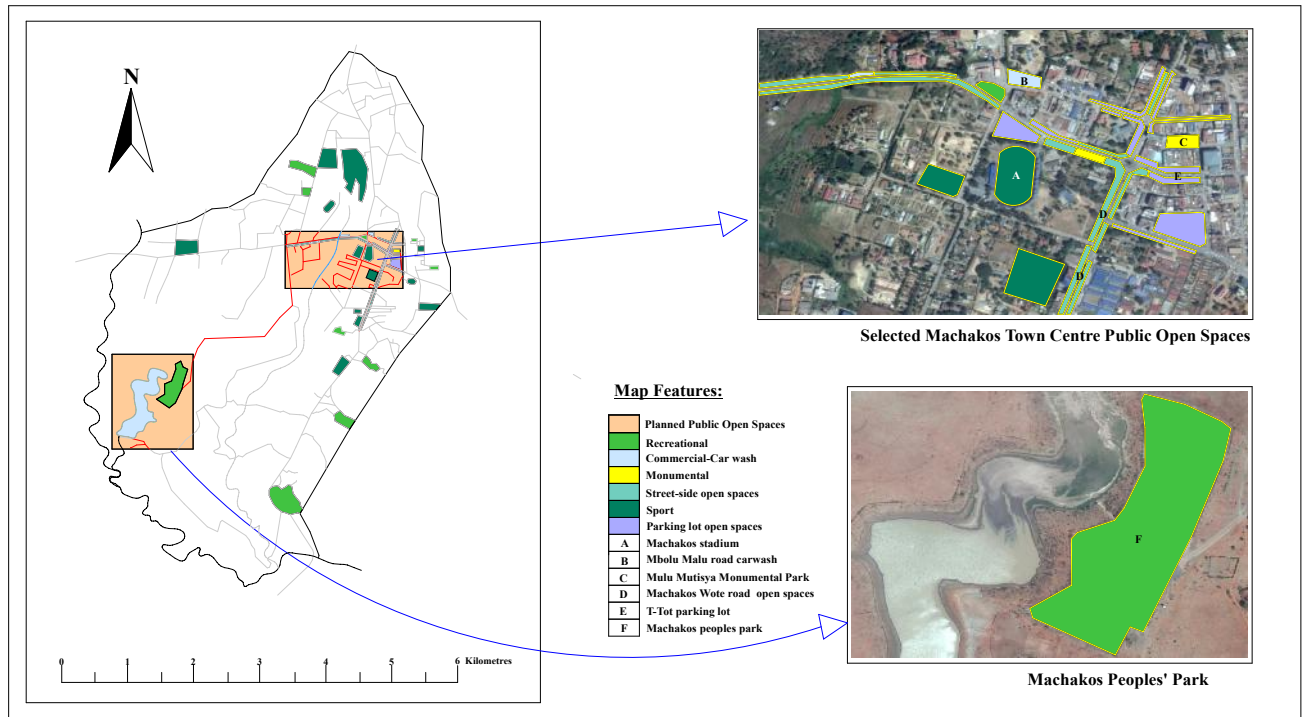


Figure 3.3: Selected Public open spaces in Machakos municipality planned area

Source: Source: ArcGIS, 2016, ArchiCAD 16, 2017

3.2 Climatic Conditions

3.2.1 Rainfall and Temperature

The climatic conditions of the study area are semi-arid, with monthly temperature ranging from 12.2°C between the coldest month of July and August to 25.1°C between the hottest month of October and March and a total annual rainfall ranging between 400 mm and 800 mm. Depending on altitude and aspect, mean rainfall and temperature vary widely. The average rainfall is between 500 mm and 1300 mm, with short rains falling in October and December while the long rains fall in March to May. Temperature-wise, July is the coldest month with October and March being the warmest. Since the Municipality does not experience rain throughout the year it then

means that there are months that experience dry spells. These months are mainly February to March and August to September. This means that there is need for installation of water points or irrigation network for watering plant materials in the public open spaces. Shading is also necessary when the sun is hot.

3.2.2 Vegetation

Vegetation in the area is mainly drought resistant, consisting of mainly semi-arid acacia and thorn bushes. The vegetation mainly consists of Acacia's and other thorn bushes such as Terminalia combretum (Borst & Haas, 2006). The settled and agricultural active areas have exotic trees such as blue gum and gravella. Forestland covers less than 18ha, serving mainly as water catchment areas within the area and this has been affected by urban development (mainly housing) Most of the hills that used to be forested have been cleared for agriculture purpose and charcoal burning which has resulted in large areas of bare land, which are more vulnerable to erosion. The plant materials for the public open spaces should be selected carefully to ensure sustainability and low cost of maintenance. They should be adaptive to the climate.

3.2.3 Geology and soils

The soils are well drained with black cotton soils covering particularly the Municipality system in the town and the Municipality as a whole consists of intensely folded Basement Rocks of gneiss and schist which include limestone, amphibolites and quartzites as well as the predominating biotite granitoid gneisses (Howard Humphreys, 2009). The eastern part of the municipality has sand, murrum and lateritic soils which overlay the folded basement rocks while the Western part of the Municipality has phonolite rocks consisting of lava of Miocene and most part of this area is covered with black cotton soil. Due to the presence of black cotton soils, there is need for careful selection of plant materials that do well under this, and also make sure that there is enough manure to enrich the soil. In worst situation, red soil should be imported to support healthy vegetation. For the foundation of public open space structures foundation and bases, the black cotton soils have to be excavated and this brings the cost of implementation high.

3.3 The Public open spaces in Machakos municipality

The study focused on different categories of public open spaces within the municipality namely recreational, sport, monumental, transport corridors, commercial and parking lots and then narrowed down to selected public open spaces in the categories above which lie within the planned area of the town. Public open spaces selected here are the Mulu Mutisya Park, the Machakos People's Park, the Machakos stadium, the main Nairobi-Kitui, Mua and Makueni Street side public open spaces, main parking lot public spaces and car wash yards. The above public open spaces are described below;

3.3.1 Recreational, The Machakos people's park

This is located five kilometers from the town center and occupies approximately 40 acres. It is popular for gatherings, active and passive recreation and boasts a variety of landscape features which include but not limited to: good lawns, amphitheater, colorful flower beds, sufficient parking lot, restaurant, canteens, public toilets and good views to the Maruba Dam.

It is open to the public on Thursdays, Fridays, Saturdays, Sundays and public holidays. Mondays, Tuesdays and Wednesdays are left for maintenance. This park is maintained by the county Government of Machakos through routine sweeping, mowing, watering and repairs where and when necessary. Challenges faced in the park include; water shortages for watering the lawns, drying up of plants and grass, soil erosion, underutilization, poor choice of plant materials and insufficient trees for shade. Moreover, its location, 2kilometres from the town center makes it difficult for visitors to walk there, resulting in use of motorized transport. This however discourages some who would have wished to walk short distance to access it. The road to the park has no pedestrian walkway, making it unsafe to walk through.

3.3.2 Monumental and historical

They are spaces with historical and monumental values. In the town centre, they include the Mulu Mutisya Park and the Muindi Mbingu corner garden. The Mulu Mutisya Garden was

selected for this category. This pocket park is located within the town center, bordered on all sides by commercial buildings and measures approximately two acres. It is popular for political and religious gatherings. Visitors also use it for passive recreation. It consists of benches, lawn, trees and shrubs. It is easily accessible due to its location within the town center. It is open to the public all the time. This park is maintained by the county Government of Machakos and faces some challenges, which include; poorly kept lawn, littering, lack of parking and congestion when hosting large crowds.

3.3.3 Transport corridor, Machakos –Wote road side public open spaces

These entail the public open spaces along the main roads and streets. They comprise of walkways, street furniture, street lighting, drainage, kiosks, litterbins, trees, shrubs flowers and signage. They average six to twelve meters in width. They are maintained by the County Government of Machakos and face the following challenges; littering, encroachment by hawkers and retailers' shops, poor drainage, illegal parking, poor beautification practices and vandalism. The Machakos- Wote road was selected for this category.

3.3.4 Parking lot public open spaces

These are areas designated for parking of vehicles and are common within the town Centre. They comprise of street furniture, lighting, litterbins, trees for shade and signage. Their sizes vary depending on the available space. They are maintained and run by the County Government of Machakos and face the following challenges; littering, poor drainage, shortage of street furniture, poor lighting and congestion. The T-Tot parking lot was selected for this category.

3.3.5 Sport

They comprise of playing fields for sporting activities. The Machakos stadium was selected for this category. It is located within the town center and neighbored by county administrative

offices and commercial buildings. It hosts a number of sports which include soccer, rugby and athletics. It is famous for the Masaku Sevens Rugby tournament, which generates high revenues to the county government. It has a capacity of 5,000 and consists of both standing and sitting spectator areas. It is maintained by the county government of Machakos and faces challenges related to lawn maintenance, vandalism and its proximity to town and business premises leading to looting and destruction of property whenever chaos caused by the fans occur.

3.3.6 Commercial, Car wash yards

These are informal yards for car washes that are at random locations determined by the availability of space and customers. They are characterized by muddy surfaces, poor drainage and poor litter management. They are controlled by youths who run the businesses and have no connection to tap water. They use water supplied by cart movers and also storm water when it rains. Some have garden benches and trees for shade. The Mbolu Malu road carwash yard was selected for this category.

3.4 Research Design

Orodho (2002) asserts that this is an outline used to put forward answers to research questions aimed at solving the problems being investigated. A survey study design was employed to help collect data and explain types, use and the management of public open spaces in Machakos town was employed. The research design has been outlined as follows:

3.5 Sources of data

Primary and secondary data sources were used as follows:

3.5.1 Primary data

The primary data was derived from the opinions issued by the three main public open space participants which include the users, management and the regulatory organs (Zube, 1986). They included various public open space visitors like residents, institutional and key informants within

Machakos County physical planning, lands and the tourism and parks management department. Both Qualitative data and quantitative information was gathered through structured questionnaires, interview schedule and direct observations. The above data was in line with the objectives of the study and entailed the different types of open spaces in Machakos town, the usage of the spaces in terms of suitability, frequency, the difficulties encountered during the space running, policies and legal framework governing the running of open spaces, the responsibility of various stakeholders in public open space management, adequacy in landscape features, and also their opinion on general state of public open space management.

3.5.2 Secondary Data

Relevant documentations from Machakos County's Department of Physical planning and lands on different types of open spaces and available maps and plans were the main sources of secondary data. The Machakos county integrated development plan of 2015 was very useful in this situation. To add on the above, further information was gathered from journals, policy papers, technical reports and strategic plans from relevant departments like Machakos town administration, NEMA and Ministry of Lands and Urban Development. A map was obtained showing the physical layout of the Machakos town and contained the public open space lots under study. These include the Mulu Mutisya Park; the streets open spaces, the Machakos stadium, and the parking lot open spaces.

3.6. Sampling procedure

Orodho & Kombo (2002) outlines that this is a procedure used to choose a number of persons or items from a population to have a scenario whereby the chosen group entails features characteristic of the whole group.

3.6.1 Sample frame

The study sample frame entailed park users, park management and regulatory arms of the county government of Machakos. It also involved the Public open spaces themselves. The park users were further subjected to simple random sampling as outlined in 3.6.3 below, the park management and regulatory arms to Purposive Sampling as outlined in 3.6.5, while the public open spaces were further subjected to Stratified Random Sampling as outlined in 3.6.4 below

3.6.2 Sample Size

Mulusa (1990), asserts that 10-30% of the total population is sufficient sample. However, to determine the sample size, the formula below as applauded by Nassiuma (2000).

$$n = \frac{NC_v^2}{(C_v^2 + (N-1)e^2)}$$

Where n= Sample size

N= Population

Cv = Coefficient of variation (take 0.5)

e= Tolerance of desired level of confidence, take 0.05% at 95% confidence level

Since Machakos municipality has a population of 199,211 as per 2009 national housing and population census, the formula was applied as follows:

$$n = \frac{199,211 (0.5)^2}{0.5^2 + (199,211) \times 0.05^2}$$

= 100 respondents.

3.6.3 Simple Random Sampling procedure on the public open space users

Within the different categories of public open spaces, users were randomly selected and Questionnaires administered. However, the number of questionnaires administered at each public open space, depended on its size (Table 3.1).

Table 3.1. Number of respective Public Open Space Users Interviewed.

No.	Name of Public Open Space	Size in Acreage	Number of Users Interviewed
1.	Machakos peoples' park	40	30
2.	Machakos stadium	4.45	15
3.	Mulu Mutisya park	0.99	10
4.	Machakos-Wote road open spaces	5.09	20
5.	Mbolu Malu road Car wash yards	2.4	13
6.	T-Tot hotel parking lot	1.79	12
Total			100

3.6.4 Stratified Random Sampling

A stratified random sampling technique was used to arrive at the different public open space categories namely; recreational, sport, monumental/historical, transport corridor spaces and commercial ones. Once stratified, then one from each category was selected through a Simple Random Sampling technique. The selected public open spaces for study are shown in table 3.1 below:

Table 3.2: Sampled public open spaces in Machakos Town Municipality

Category of the public open space	Names of the public open spaces	Name or the public open space selected
Recreational	Machakos peoples' park Machakos golf course Club.	Machakos peoples' park
Sport	Machakos stadium. Machakos university playground. Machakos boys playground. Machakos Muslim school playground. Machakos teachers training playground. St marys boys school playground. Machakos primary playground	Machakos stadium
Monumental/ historical	Mulu Mutisya park Muindi Mbingu monument garden	Mulu Mutisya park
Transport corridor	Machakos-kangundo road Machakos-Kitui road Machakos-Wote road	Machakos-Wote road open spaces

	Machakos Nairobi road	
Commercial	Mbolu Malu road Car wash yards Machakos-Wote road Car wash yards Machakos- Nairobi road Car wash yards	Mbolu Malu road Car wash yards
Parking lots	Mwatu wa ngoma street parking lot. T-Tot hotel parking lot Mbolu Malu road parking lot Machakos bus terminus parking lot	T-Tot hotel parking lot

3.6.5 Purposive sampling on the public open space Management and Regulatory participants

Purposive sampling technique was then used to collect data from two categories of the public open space participants namely; Management and Regulatory. County officials in selected for interviews were the Director of Physical Planning, Director of Tourism, Sports, Culture and two Parks Management representatives. They were picked purposely by the researcher due to prior knowledge on the role they play as far as the public open spaces are concerned.

3.7. Methods and Instruments of Data Collection

3.7.1 Questionnaires

Open and closed questionnaires were used to obtain information needed in fulfilling the purpose of the study. The questionnaires were administered to the three main public open space participants, which included the users, management personnel and the regulatory organs. Data collected was on the various kinds of public open spaces in Machakos town, the usage of the spaces in terms of suitability, frequency, the difficulties facing the running of public open spaces,

guidelines and legal framework for managing of the spaces, the responsibility of different stakeholders the open space management, adequacy in landscape features, and also their opinion on general state of public open space management. The questions in each category were similar to ensure uniformity.

3.7.2 Observation

Observation was used to study the physical aspects of the public open spaces that are relevant to the study and entailed the capturing information on the visual aesthetics, landscape features like trees, monuments, water cascades and usage patterns like overcrowding, vandalism, lighting, erosion, littering among others. To accomplish this, photography and quick sketches were done on site to help in recording and storage of the aspects being observed. The information collected through observation was applied to counter-check data provided by various respondents.

3.7.3 Interviews

Kothari, 1990 states that interviews are ideal for collecting first hand information from respondents in both official and unofficial situations. He further states that they are cost effective. In this study, they were used to gather information from the Machakos people's parks management personnel, Director of Physical Planning and Director Tourism, Sports and Culture In the form of interview schedules. Information captured was on management strategies, challenges faced and future plans for sustainable public open spaces.

3.8. Reliability of Research Instruments

Mugenda and Mugenda, 1999 asserts that if a researcher gets the same results as he/she had got from the same test done earlier, then that is what reliability is in research. It aims to ensure trustworthiness or steadiness of a test as stated by Nachmias and Nachmias, 1996. The study measured the dependability of the questionnaire to establish its accuracy in putting to test what was being investigated. The test re-test technique was used to evaluate the dependability of the tools.

3.9 Data Analysis

Quantitative data analysis technique was applied for data analysis by coding it as presented by the questionnaires wide-ranging thematic extents, subsequently analysing it with Statistical Package for Social Scientists (SPSS). The statistical results were then employed to find out and survey the following features: types and use, the status of the current public open spaces, their maintenance, challenges and strategies in place to ensure their sustainability. These were then presented through, graphs and pie charts.

CHAPTER FOUR: DATA ANALYSIS, DISCUSSION AND PRESENTATION

4.0 Introduction

This chapter comprises of the study findings and analysis of the outcomes according to the information gathered from the field. The findings are further presented according to the study objectives. The first part gives an overview of the different selected public open spaces in Machakos Municipality, the different existing types or categories, their extents and location. Section two discusses the public utilization patterns of the open spaces, preferred landscape aspects as well as benefits attributed to them. The last section discusses the management strategies in place for sustainable public open spaces as well as challenges facing the management of public open spaces in Machakos municipality.

4.1 Knowledge of respondents on types of Public Open Spaces in Machakos Municipality

Respondents were asked to mention the various categories of public open spaces that exist in Machakos Town Municipality. The study found out that there are different types of public open spaces in Machakos Town Municipality. They are in the categories of recreation, monumental, sport, commercial and transport corridor and are represented by the Machakos People's park, The Mulu Mutisya garden, the Machakos stadium, the Mbolu Malu road carwash yard, the Nairobi-Wote road side public open spaces and the T-Tot parking lot open spaces respectively, (Table 4.1). Further below are detailed discussions on the individual public open spaces.

Table 4.1: The various selected planned public open spaces in Machakos municipality

Source: Field Survey, 2016.

Public Open Space	Frequency	Percentage
Machakos peoples' park	95	95
Machakos stadium	79	79
Mulu Mutisya park	85	85
Machakos-Wote road open spaces	54	54
Mbolu Malu road Car wash yards	25	25
T-Tot hotel parking lot	70	70

4.1.1 The Machakos People's Park

Majority of the respondents, 85%, mentioned this park as one of the public open spaces found in Machakos town Municipality. This high percentage is due to the presence of a wider number of landscape features, its big size and better management than all other public open spaces available. It was further rated very good in terms of general status by 26% of the respondents, good by 64% and only poor by 10%. The 10% poor rating is associated with the few challenges it faces which include its far location from the town centre,

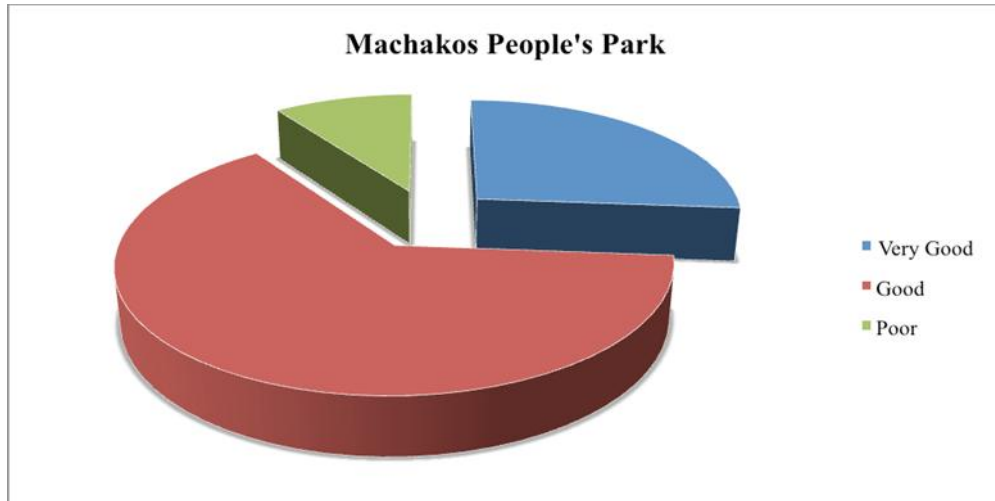


Figure 4.1: Machakos people’s park general status user ratings

Source: Field Survey, 2016



Plate 4.1: Access road to Machakos People’s Park

Source: Field Survey, 2016.

The park is used for both active and passive recreation and boasts a number of landscape features which include good expansive lawns, trees and flowers, water fountains, children’s play area,

miniature golf, restaurants, and solar exhibition stand and conference facilities. The park is also used to stage political and religious rallies/gatherings and entertainment.



Plate 4.2: A section of the children playing area within the park
Source: Field Survey, 2016.

The presence of a designated children's area acts an attraction for families to the park. The park has adequate seating arranged in an amphitheater design as shown in plate 4.3. This seat arrangement guarantees the audience maximum view of the stage without blocking one another. Cladded Terraces have been used in the amphitheater for aesthetics as well as a mitigation measure against soil erosion.



Plate 4.3: An amphitheater within the park

Source: Field Survey, 2016

4.1.2 Machakos Stadium

79% of the respondents mentioned this as one of the public open spaces that exist in Machakos Town Municipality. Its popularity is due to its proximity to the town centre, its large capacity and aesthetics brought about by the well-manicured turf for sports. Famous matches and events hosted here are also a reason for its popularity. It is mainly used for sports such as soccer, rugby and athletics. It is also popular for political, religious and other rallies. However, since it is located near some residential areas and a school, the stadium is a source of noise when in use. An entry fee is payable to the authorities before one accesses the stadium and this hinders some open space users from easily utilizing it.



Plate 4.4: A bird's eye-view of Machakos Stadium

Source: Field Survey, 2016

4.1.3 Mulu Mutisya Gardens

85% of the respondents mentioned this as one of the public open spaces that exist in Machakos Town Municipality and its strategic position within the town centre makes it easily accessible, hence its popularity. It is characterized by garden seats, trees for shade and for relaxation. It is busier during the weekends and popular for staging political and religious rallies.

However, the garden is faced by a number of challenges. There is poor lighting especially at night; poor litter management; no parking allocation; and it gets muddy during the rainy season due to poor lawn cover. It was further rated good by 38% of the park users, very good by 31%, while 31% rated it poor. The close trend in rating percentages could be due to few merits accompanied by demerits like limited landscape features, poor maintenance and its small size.

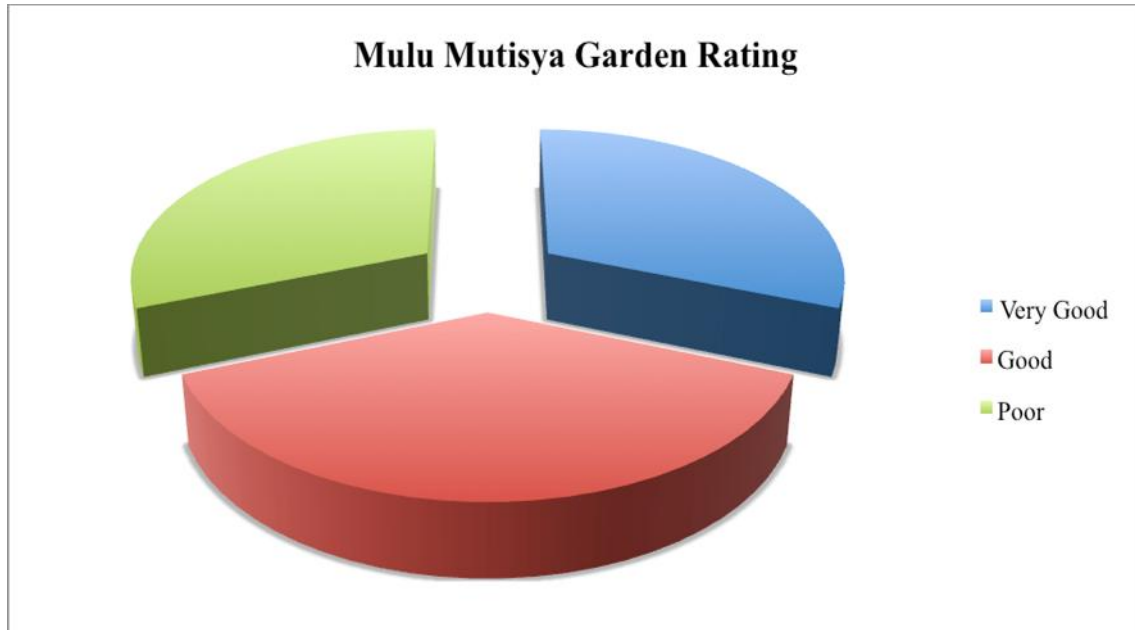


Figure 4.2: Mulu Mutisya park general status user ratings

Source: Field Data, 2016



Plate 4.5: A section of the Mulu Mutisya garden in Machakos Town

Source: Field Survey, 2016

4.1.4 The Machakos-Wote roadside public open spaces

54% of the respondents mentioned this as one of the public open spaces that exist in Machakos Town Municipality. The relatively low percentage in respondent mention is attributed to its location off the main Kitui -Machakos road which is used by majority of the town visitors. Another reason is the fact that many users don't really consider the roadside spaces as public open spaces but as mere transport corridors. They comprise of walkways, street furniture, street lighting, drainage, kiosks, litterbins, trees, shrubs flowers and signage. They average six to twelve meters in width and are maintained by the County Government of Machakos. They however face the following challenges; littering, encroachment by hawkers and retailers' shops, poor drainage, undesignated parking, poor beautification practices and vandalism.



Plate 4.6: Public open spaces along the Machakos –Wote Road

Source: Field Survey, 2016

4.1.5 The T-Tot parking lot

70% of the respondents mentioned it as one of the public open spaces that exist in Machakos Town Municipality. It is popular because of its location in the heart of the town and its large size. It is used as parkin area for cars and is maintained and managed by the county government of machakos. It is the main parking in the town and faces challenges including poor litter disposal,insufficient landscape seats and poor lighting. Trees for shade are also insufficient for the benefit of both the pedestrians, drivers and the cars. The few seats found here are dusty and not appealing to the eye.



Plate 4.7: T-Tot parking lot in Machakos Town

Source: Field Survey, 2016

4.1.6 Mbolu Malu Car wash yard

25% of the respondents mentioned this as one of the public open spaces that exist in Machakos Town Municipality. The low percentage is due to its poor state, disorganization and location off the main road axis. It is however one the main and busiest carwash yards in the town though characterized by overcrowding and disorganization. They are a source of income to many youths and are managed by the private operators, from whom the County Government of Machakos collects operation fees. They have trees within and also have informal seats for clients. Some kiosks for selling beverages are found around and within them. The yards are however faced with the challenge of muddy surfaces and wastewater disposal. Most of the wastewater is directed to open drains, which in turn drain to the streams causing water contamination.



Plate 4.8: Mbolu Malu road car wash yard

Source: Field Survey, 2016

4.2. Utilization of Public Open spaces in Machakos Town

Respondents were required to state how they utilize the public open spaces. The utilization of public open spaces is dependent on various aspects and includes the location, the availability of types of landscape elements, the intended use or benefits, their sufficiency, preferred aspect and frequency of visits. In summary, a variety of attractive landscape elements and having sufficient public open spaces within walking distance were highly preferred.

4.2.1 Attracting Landscape elements

A well-designed public open space offers set of an environment good for public interaction due to their dynamism and popularity, bringing about contact with nature. Landscape features and elements there within on the other hand form an integral part in attracting park users and include but not limited to public arts and natural features such as rocks, water fountains and waterfalls. In this study, 84%, 74% and 61% of the respondents stated that the existence of plants, walkways, and seats respectively in public open spaces as the highly rated attracting features. This is due to their important use in shade, movement and relaxation. Others mentioned were monuments, streetlights rock gardens and others (fig. 4.4)

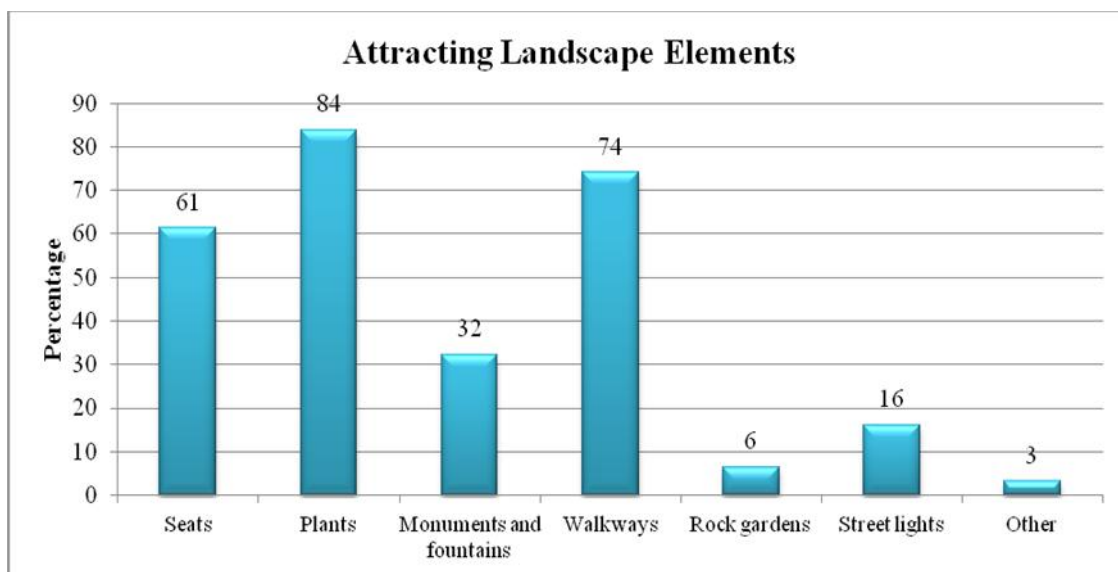


Figure 4.3: Attracting Elements in public Open Spaces

Source: Field Data, 2016



Plate 4.9: Water fountain at the Machakos people's park

Source: Field Survey, 2016

4.2.2 Location of public open spaces

Location of public open spaces in relation with areas of residence and work place is very crucial although it depends on the nature of the space and also the nature of job being undertaken by the park user. 45% and 32% of the respondents felt that the public open spaces were fairly convenient and convenient respectively in terms of their location. This was attributed to the fact that most of them are within the town center where many other activities like shopping, meetings, work and transport take place. However, a combined 16%, of them felt that the public open spaces were not conveniently located. This was attributed to the fact that the main recreational park, the Machakos Peoples Park is located approximately five kilometers from the

town center. This means that a park user has to drive, use public means or walk all the way to the park.

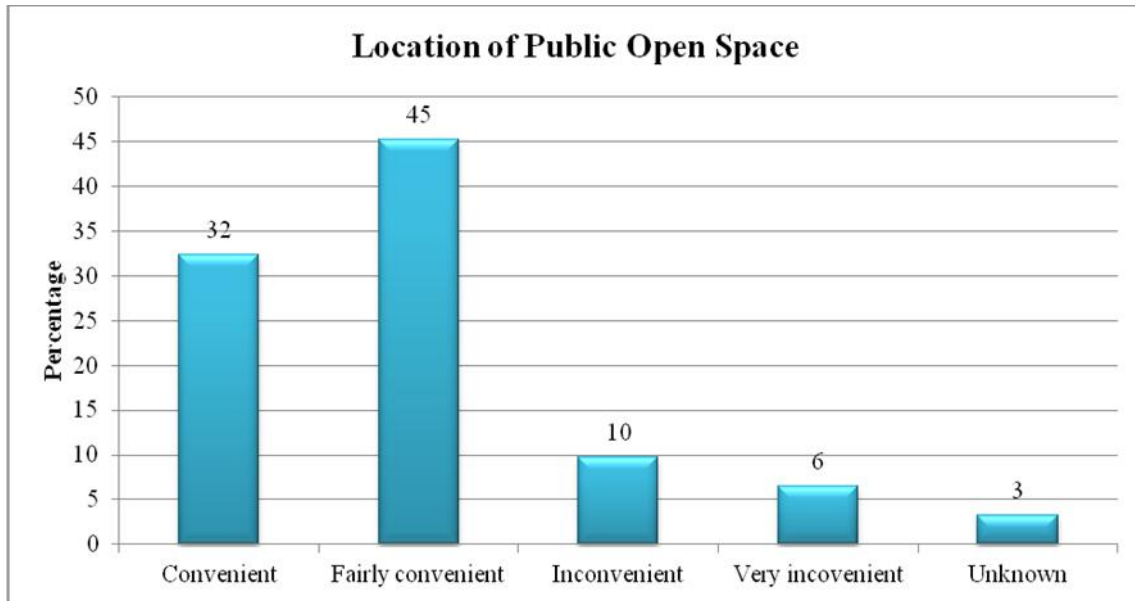


Figure 4.4: Convenience of location of open spaces

Source: Field Data, 2016

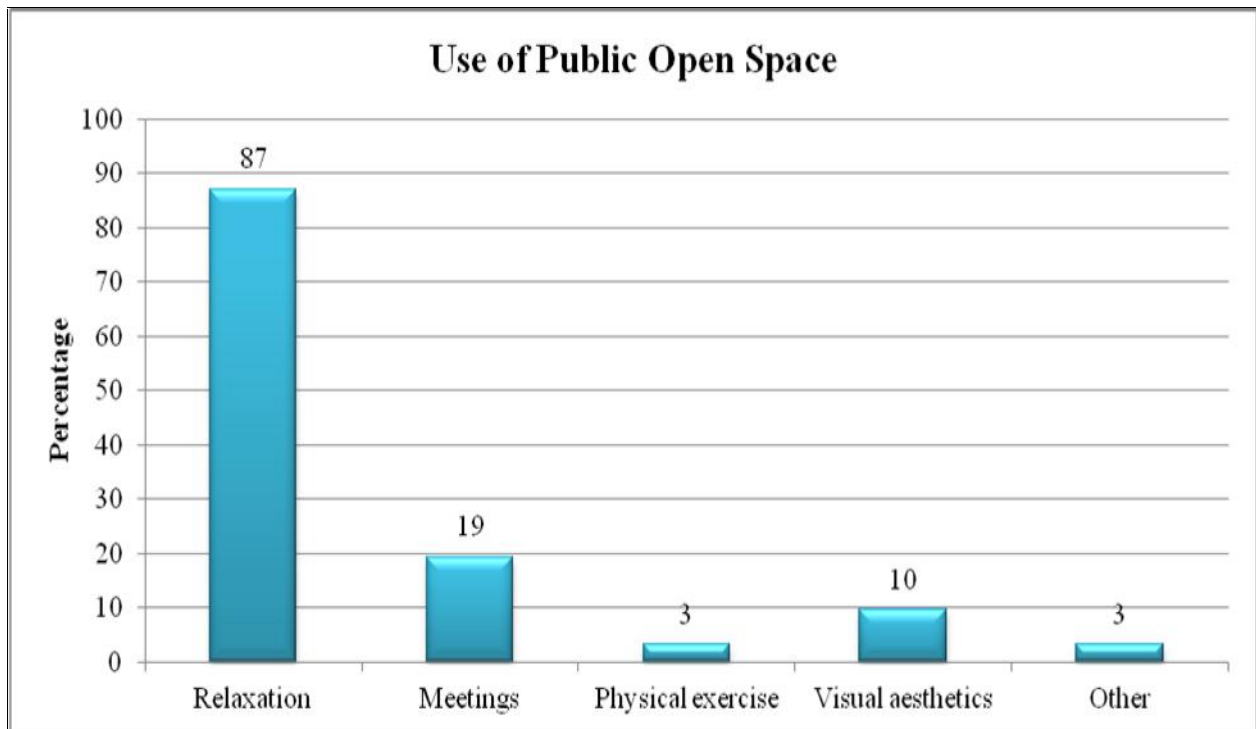


Plate 4.10: Road leading to Machakos People’s Park

Source: Field Survey, 2016

4.2.3 Uses of public open spaces in Machakos Municipality

Regarding actual usage of the public open spaces by visitors, the study found out that they are mainly used for relaxation (at 87%). Other uses include meetings (19%), visual aesthetics (10%), and for physical exercise (3%). The higher percentage in relaxation is attributed to the conducive environment the public open spaces offer to users away from their hectic day to day activities as well as the county government on machakos effort to provide more garden and street seats for relaxation. Ikawa (2015) found out that on the uses of recreational spaces in Nairobi, different spaces show slight variations in activity compared with one another. However, relaxing and enjoyment are the key activities. Others include spiritual, walking, meetings, learning, economic and waiting for other people. This presents a wider range of uses as compared to public open spaces in Machakos, which could be attributed to the fact that Machakos has fewer and smaller public open spaces, hence need increase them.



Source: Field Data, 2016

Figure 4.5: Uses of open spaces in Machakos Town



Plate 4.11: Active Recreation at the Machakos people's park

Source: Field Survey, 2016



Plate 4.12: A crusade event at the Mulu Mutisya park

Source: Field Survey, 2016

4.2.4 Frequency of user visits to the public open spaces

Respondents were requested to state the days or periods they visit the public open spaces. The study found out that 67%, frequently visit them over the weekends, with only 3% using them over public holidays. This may be attributed to the busy work related schedules for many people during the week days and that Sunday is generally a day-off work for many. However holidays are not frequented because they do not occur often. Others at 13% represent scenarios where the users are on holiday, on leave and the fact that the other public open spaces are used daily, for example the parking lot, walkways and car wash yards.

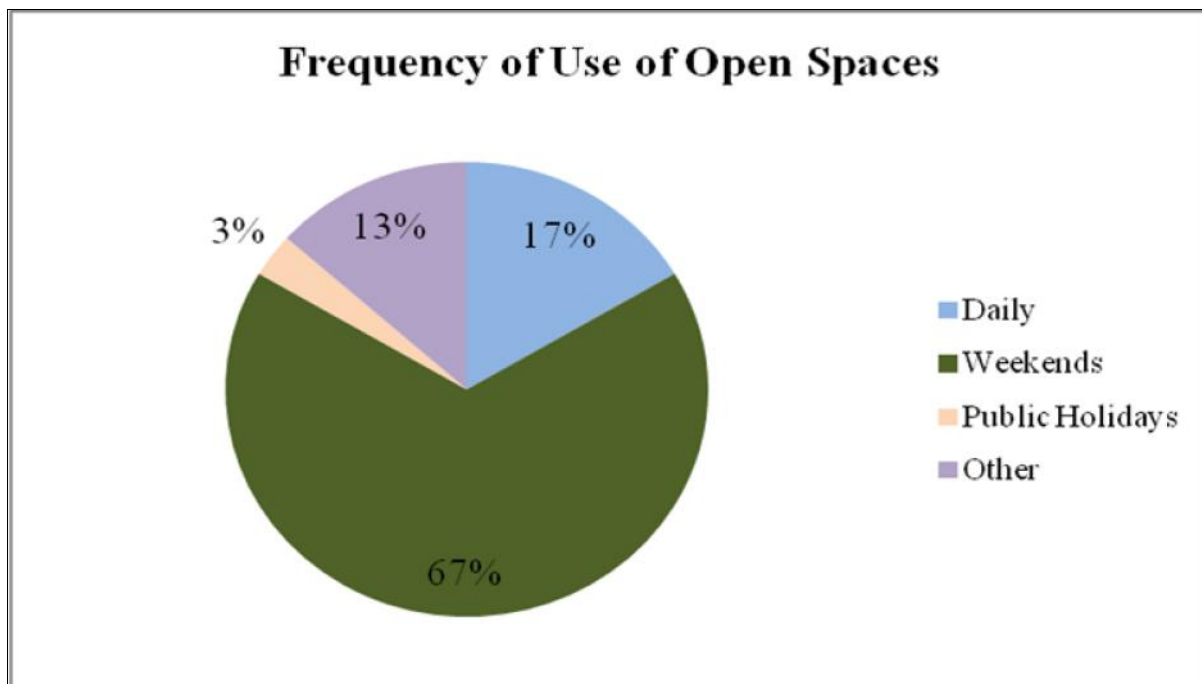


Figure 4.6: Frequency of use of open spaces in Machakos Town

Source: Field Data, 2016.

4.2.5 Benefits of public open spaces in Machakos municipality

Public open spaces offer varied benefits in the growth and development of urban areas. These benefits vary from social liveliness to environmental health (Fuwape and Onyekwelu, 2011). Notable of these benefits include the provision of recreational facilities, enhancing of micro-climate, development of physical and psychological health of the urban areas residents (Fam *et al.*, 2008, Zhao *et al.*, 2013, Chiesura, 2004, Hanik and Welle, 2010).

In this study, beauty(81%) and improved shading by vegetation(45%), revenue generation(42%) were the notable high benefits of public open spaces. Other benefits that were cited include pollution control, and biodiversity, health, wind speed reduction, among others

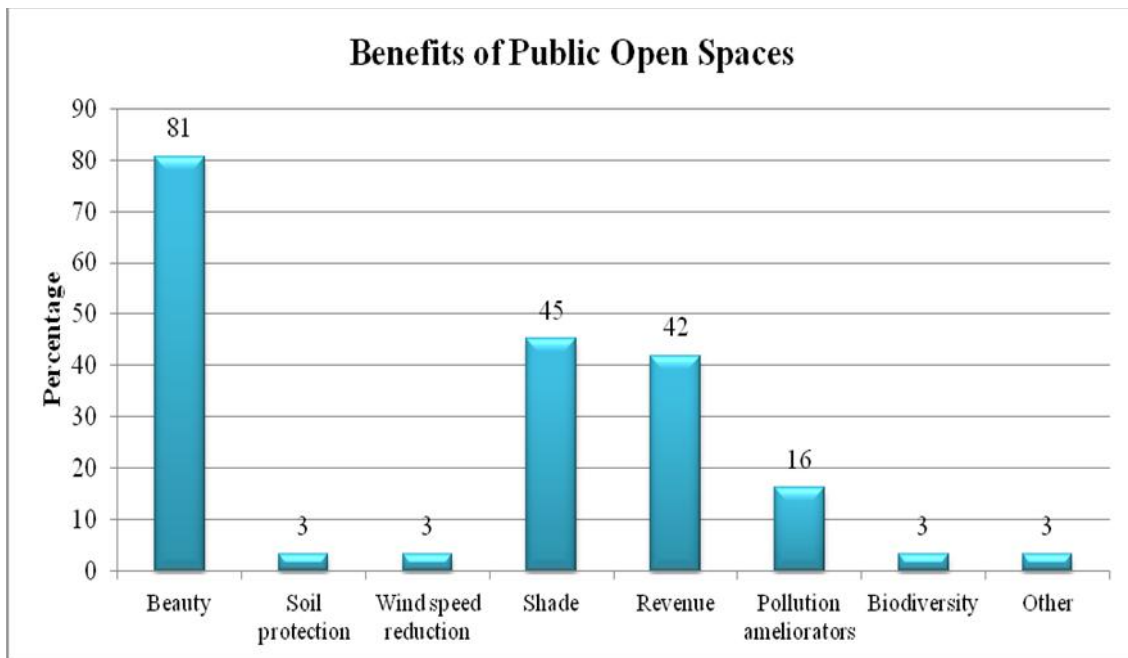


Figure 4.7: Benefits of the public open spaces

Source: Field data, 2016



Plate 4.13: Beauty at the Machakos people's park

Source: Field Survey, 2016.



Plate 4.14: Public open space for commercial advertisement

Source: Field Survey, 2016

4.2.6 Sufficiency of the public open spaces

Despite presence of the above-discussed public open spaces, a combined 48% of the respondents felt that the public open spaces were insufficient and very insufficient in terms of numbers. This calls for creation of more public open spaces to satisfy the growing population and demand in Machakos municipality.

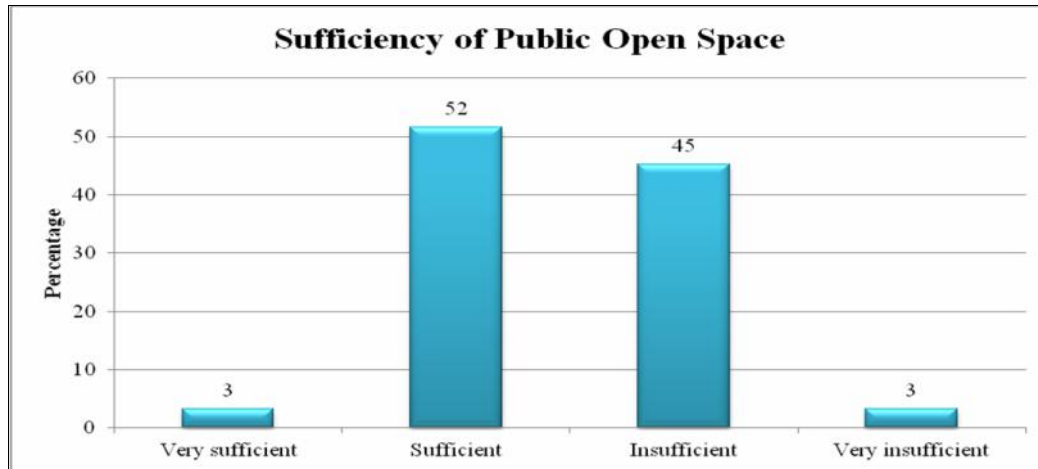


Figure 4:8: Level of satisfaction of open spaces in Machakos Town

Source: Field data, 2016



Plate 4.15: Overcrowding at the Mulu Mutisya Park during a rally.

Source: <http://www.nation.co.ke/image/view-/2729514>

4.2.7. Preferred Aspect of the public open space

Majority of the respondents (52%) preferred the public open space size and location aspects, security (48%), landscape elements (45%) and general maintenance (13%), while 3% stated others as their preferences. The size and location are associated with comfort and easy accessibility respectively. The above situation then makes this preference sub heading a major consideration for stakeholders to have in mind when creating, enhancing and managing public open spaces.

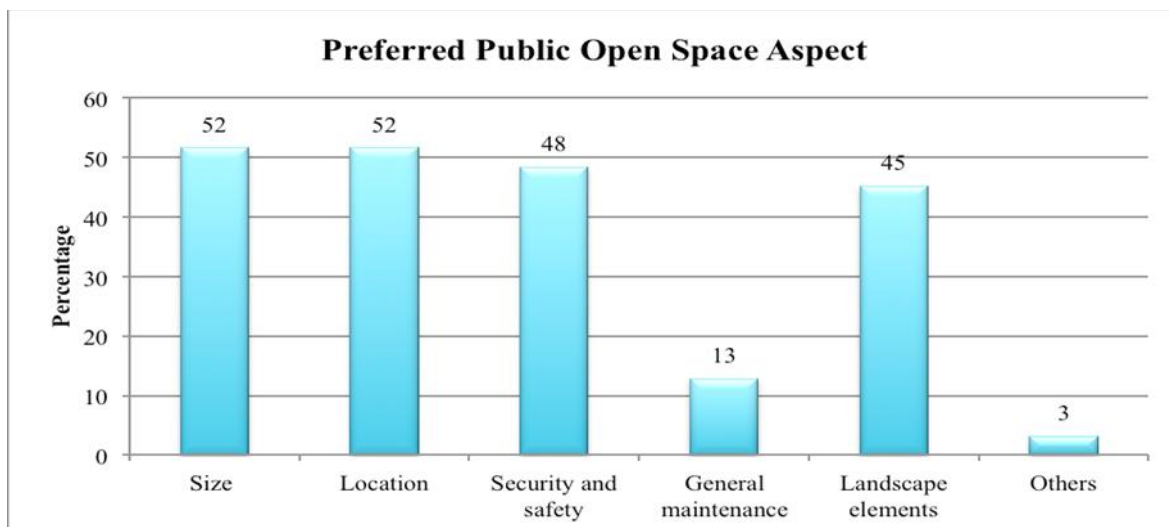


Figure 4:9: Preferred public open space aspect

Source: Field Data, 2016

4.3 Management strategies for the public open spaces in Machakos Town Municipality

Although public open spaces are important in urban areas, they are often least prioritized by planning authorities in most developing countries (Owino *et al.*, 2014). This has resulted in their loss or encroachment by unintended activities like avenues for waste disposal (Ondiege, 1999).

The public open spaces in most urban areas are faced by maintenance and management challenges due to a number of reasons. These include: poor planning and inadequate guidelines formulated to govern provision and distribution of public open spaces (Iordache and Cebuc, 2009); lack of proper design in ensuring the spaces are accessible and safe to encourage utilization (Leinberger and Berens, 1997); and deficiency in public involvement in the planning and running of the spaces leading to lack of public association and sense of belongingness (Shuib *et al.*, 2014).

Mismanagement of public open spaces leads to their degradation causing some negative effects such as waste dumping and illegal construction (Akerlund *et al.*, 2006, Honu *et al.*, 2009, Williams *et al.*, 2009). When properly managed, these public open spaces provide spaces for people to relax and socialise (Gobster, 2001). However, the quality of public open spaces is dependent on the long-term political commitment to the city. Therefore, failure to prioritise development and management of public open spaces is detrimental to the city due to increasing risks of crowding, insecurity and environmental dilapidation (Makworo and Mireri, 2011).

The study found out that the Public Open spaces in Machakos municipality are mainly managed by the County government of Machakos, with 74% of the respondents stating this. Only 26% stated otherwise. However, the county government's maintenance entails basic cleaning, garbage collection and disposal, pruning of plants, repainting of structures and replacement of fixtures. There is no schedule for maintenance except for the Machakos people's park, which closes on Monday, Tuesday and Wednesdays for maintenance and the rest open to the public.

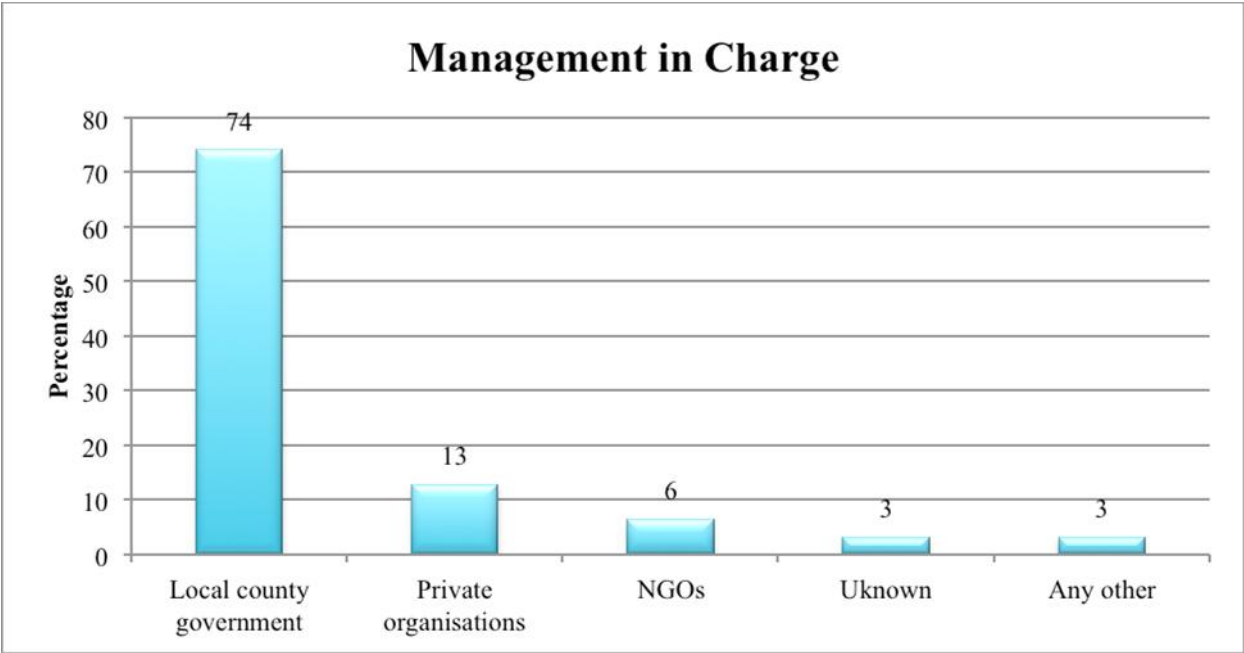


Figure 4:10: Management in charge.

Source: Field Data, 2016

Public open spaces have been rated poor by 77 % of the respondents, with only 13% rating it good. This is attributed to the general appearance and rate of deterioration witnessed by the park users. The respondents however expect better management strategies in place and also management of the public be put in place by the county government and other stakeholders.

Rating Management

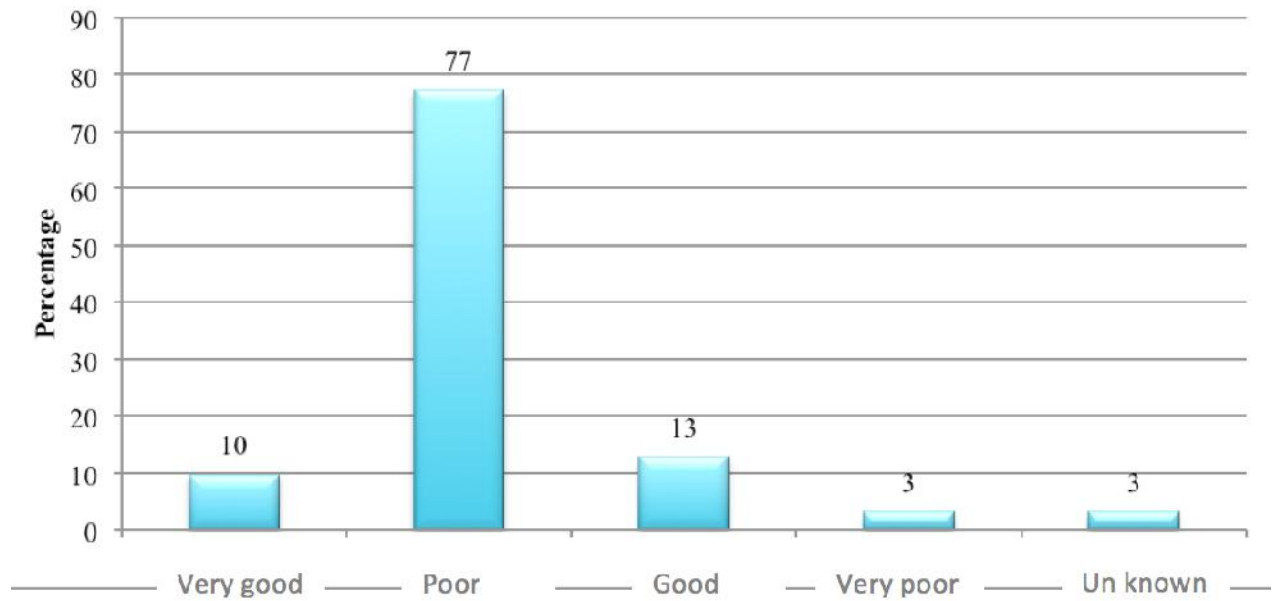


Figure 4:11: Management rating.

Source: Field Data, 2016.

It is important to note that there is a challenge in the county government's strategy to solely maintain the public open spaces, hence need for other stakeholders to be involved. This is evident in the status of the public open spaces. Ikawa (2015), found that the recreational spaces in Nairobi, which have diverse sources of income, largely through private-public partnerships, perform better on various parameters as indicated by the different users. Ofafa (2016), established that there is a relationship between park maintenance and the number of people visiting the park because parks with more facilities and activities attracted more users.

4.3.1 Challenges facing the Public open spaces in Machakos town municipality.

A number of challenges were noted to be affecting the public open spaces in Machakos Town municipality. Top among them is ineffective and poor management strategies (42%). This is attributed to limited revenue allocated for public open spaces management, insufficient maintenance staff, poor maintenance practice and lack of a stratified management routine. Other challenges include poor public open space distribution (26%), poor accessibility(19%), poor planning(26%) and others(3%) which are attributed to a poor inception, implementation and maintenance process of public open space.

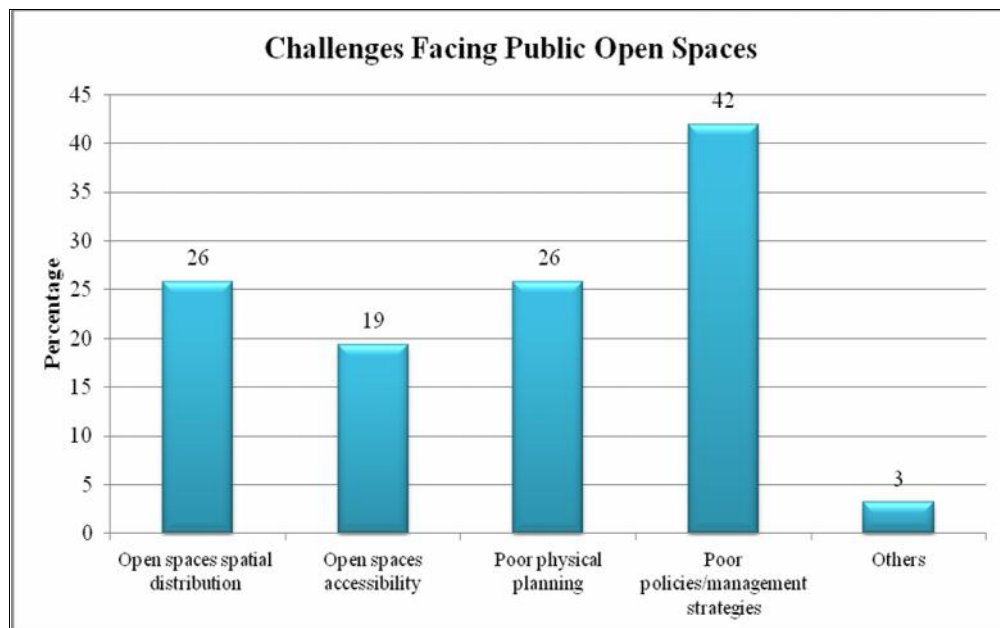


Figure 4.12: Challenges facing public open spaces in Machakos Town

Source: Field Data, 2016.

The Machakos people's park lawn is sometimes at risk of drying up due to insufficient water for irrigation during dry season. The dam, Maruba dam that supplies the park with water is receding due to overdrawn of water. This situation is worsened by the poor choice of plants in the park that require frequent watering leading to high maintenance costs. The park is also characterized

by deep unsecured ditches that raise safety issues to the users as well as compromising on the aesthetics.



Plate 4.16: Unsecured ditch in the park

Source: Field survey, 2016.



Plate 4.17: A section of the receded dam level due to overdrawing of water

Source: Field Survey, 2016.

The water shortage situation is further exacerbated by the poor choice of plants materials like *duranta ssp*, and *kikuyu grass* that require frequent watering, which is at times not possible due to the receded dam water levels.



Plate 4.18: Poor plant choice.

Source: Field Survey, 2016.



Plate 4.19: Solid waste disposal challenge at Mulu Mutisya garden

Source: Field Survey, 2016

CHAPTER FIVE: SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0: Chapter Overview

This chapter comprises of three sections, section one entails the summary of the study findings in relation to the study objectives. Section two comprises of the conclusion on the study findings while the last section provides recommendations that can be taken to enable sustainable establishment, location and maintenance of public open spaces in Machakos town.

5.1 Summary of the Findings

The findings revealed that there are various categories of public open spaces in Machakos municipality. They are in the categories of recreation, sport, monumental, commercial and transport corridor and popularly include Mulu Mutisya garden, Machakos People's park, streets side open spaces, carwash yards, parking lot open spaces, abandoned fields and unused vegetation settlements among other pockets of open spaces. Machakos People's park is the most popular of these due to its big size, variety of landscape features and better maintenance. These public open spaces are mainly used for relaxation, meetings, physical exercise and for aesthetics purposes in the municipality. They are commonly used during weekends as opposed to all week through. Their management is solely by the county government of Machakos. The study shows that the open space users are not satisfied with the sufficiency, status, location and management strategies employed by the current management regime, which is solely by the County government of Machakos. They proposed better park maintenance and management. They mentioned provision of better lighting, more plants, better waste collection and disposal, creation of more public open spaces as what the management should prioritise in the course of carrying out their mandate.

5.2 Conclusion

Public open spaces are important not only for leisure and recreation, but also for economic and political functions. They are key areas for social interaction and community development. Machakos town is endowed with a number of these public open spaces. However, the management of these public open spaces has failed to ensure effective management and sustainability. Only the Machakos People's Park has demonstrated signs of active management with maintenance schedule of every Monday, Tuesday and Wednesday. The other open spaces lack a schedule for maintenance.

5.3 Recommendations Based on Findings

Based on study findings and in line with the study objectives, the following recommendations are made. They include both short term and long term.

5.3.1 Types of public open spaces objective

The study found out that there exist a number of public open spaces in Machakos municipality in the categories of recreation, sport, commercial, transport corridor and parking. However, it was noted that there is a challenge posed by their inadequacy in terms of numbers and sizes, hence the following recommendations are made:

1. Creation of a well articulated landscape master plan by the county planning department that shows the existing and proposed public open spaces easy monitoring and development.
2. Audit and documentation of all public open spaces in the town by the county government of Machakos for monitoring and management fund allocation.
3. Creation of a well planned and linked system of public open spaces that entails walkways, street ways, parking lot landscapes, play fields, urban plant nursery lots, pocket parks and main parks.

4. Redevelopment and reorganization of public open space features and spaces to accommodate more activities and also to suit all age groups and people with disabilities.
5. The county government of Machakos to acquire more land for creation of more and sufficient public open spaces.
6. Creation of a variety of public open spaces within the town to cater for more people, activities and features.

5.3.2 Utilization of public open spaces objective

The study found out that the utilization of the public open spaces is in various aspects and are affected by location, their uses, attracting elements, frequency of visits, benefits attached, sufficiency and preferred aspects, hence the following recommendations are made:

1. Involvement of qualified landscape architects in the selection, planning and installation of public open space landscape materials that suit the environment well to ensure user comfort and sustainability.
2. Sensitization of the public on the importance of usage of public open spaces through advertisements, hosting of public recreational events like walks, games, dancing completions and comedy shows.
3. Proper, strategic and clear signage for general information to the public. The information could be on the usage, safety, dos and don'ts, security, size, distances and general status of the public open spaces.
4. Installation of proper, sufficient and appealing lighting fixtures for night lighting. The lights should be well anchored and protected to curb vandalism.
5. Introduction of more revenue generating activities within the public open spaces to ensure sustainable maintenance through the money generated.
6. Annual appraisal of the public open spaces' performance in an effort to ensure value addition, which could involve addition of landscape features, expansions, advertisements and public sensitization.

- 7.Ensure that all stakeholders are involved during the creation, implementation and maintenance of public open space in the town. In this case, public participation should be emphasized.
- 8.Restructuring of existing public open spaces to make them more usable and efficient. This could include pedestrianization of existing and congested streets, conversion of parking lots into pocket parks and utilization of vertical space for parking.

5.3.3 Management strategies objective

The study found out that the County Government of Machakos solely undertakes the management of the public open spaces hence the following recommendations are made.

- 1.Creation and strict adherence to a sustainable maintenance schedule which should include but not limited to; watering of lawns, mowing of lawns, sweeping, litter collection and disposal, pruning and watering of plants, repairs and repainting of worn out landscape features and structures.
- 2.Create an integrated management strategy by stakeholders to ensure sustainable landscaping and maintenance practices like recycling of water for watering plants, use of mulching, solar for lighting, use of local materials for installation of walkways, seats among others.
- 3.Formation of a well-organized maintenance and security team to patrol the open public spaces to ensure order, security and curb vandalism and theft of landscape features and fixtures.
- 4.Proper training of the maintenance team on matters to do with plant care, safety of parks, etiquette, security and aesthetics.
- 5.Establishment of county government owned plant nurseries to ensure availability of cheap plant materials for replacement and addition in the public open spaces
- 6.Policy wise, there should be multi-stakeholder partnership in the creation, implementation and maintenance of the public open spaces. This can be in form of a trust mandated to ensure that the objectives of the partnership are adhered to and curb any political interference.

5.4 Areas for Further Studies

- 1.Safety and security as factors for consideration in creation and running of a sustainable public open space network in Machakos town.
- 2.Research should be carried out to assess the impacts of public open spaces in Machakos town to the value of property surrounding them.
- 3.Research should be done to establish the process undertaken in the creation of public open spaces in Machakos town. This entails inception, stakeholder involvement, community participation, design process, tendering, implementation and maintenance.

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APPENDICES

Appendix 1: Work plan

Work Plan

ACTIVITY	Oct 2015	Apr 2016	July 2016	Aug 2016	Sep 2016	Oct 2016	Oct 2016	Nov 2016	Jan 2017
Proposal writing and Presentation									
Field work and Piloting									
Correction of instruments									
Data collection									
Report writing									
Presentation of final draft									

Appendix 2: Budget of the Study

Budget of the Study

ITEM	Cost (Ksh.)
Stationery	30,000
Typing and Printing	45,000
Binding cost	8,000
Photocopying	12,000
Traveling costs	22,000
Total	117,000

KENYATTA UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL PLANNING & MANAGEMENT

Park User Questionnaire

My name is Mathias Loki Mutisya, A Masters student undertaking master of environmental planning and management at Kenyatta University, I am conducting a research on INVESTIGATION OF PUBLIC OPEN SPACES IN MACHAKOS TOWN MUNICIPALITY, MACHAKOS COUNTY, KENYA. I am kindly requesting you to assist fill the questionnaire and it is purely for academic purposes. Any information given will be handled with a high level of confidentiality. Thanks in advance.

Date of Survey.....

Name of the respondent (optional).....

Tick in the appropriate box for the questions below:

I. TYPES OF PUBLIC OPEN SPACES

a.Which public open spaces exist Machakos Town Municipality?

.....
.....

b.What is the general status of the open spaces chosen?

- Very good
- Good
- Poor
- Very poor

II. UTILISATION/USE OF PUBLIC OPEN SPACES

a.How do you frequently visit these public open spaces?

- Daily
- weekends
- public holidays
- never
- Other(specify)

.....
.....

b.What do you use the public open spaces above for?

- Relaxation
- Meetings
- Physical exercise
- Visual aesthetics
- Commercial
- Other(s) specify

.....
.....

c.Of what benefit(s) are the public open spaces to the Machakos Municipality?

- Improved drainage
- Soil protection
- Wind speed reduction
- Shade
- Pollution ameliorators
- Wildlife corridors eg. Birds, animals
- Any other (specify)

.....
.....
.....

III. MANAGEMENT OF PUBLIC OPEN SPACES

a. Who is in charge of management of the public open spaces in Machakos Town municipality?

- County government of Machakos
- Private organizations
- NGOs
- Unknown
- Any other (specify)

.....
.....
.....

b. How do you rate the management status of the public open spaces?

- Very good
- Good
- Poor
- Very poor
- Unknown

c. What is the status of existing recreational infrastructure available in the parks within Machakos County?

- Very good
- Good
- Poor
- Very poor
- Unknown

d. What are the challenges facing urban space in Machakos town?

- Spatial distribution of urban open spaces
- Accessibility of open spaces
- Poor physical planning of the open spaces
- Poor policies/management strategies of the open spaces.
- Any other (specify)

.....

.....

.....

e. Which management practices would you recommend for the open spaces in Machakos Town Municipality?

.....

.....

.....

KENYATTA UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL PLANNING & MANAGEMENT

Institutional Questionnaire

Dear Sir/Madam,

My name is Mathias Loki Mutisya a student undertaking master of environmental planning and management at Kenyatta University; I am conducting a research on INVESTIGATION OF PUBLIC OPEN SPACES IN MACHAKOS TOWN MUNICIPALITY, MACHAKOS COUNTY, KENYA. I am kindly requesting you to assist fill the questionnaire and it is purely for academic purposes. Any information given will be handled with a high level of confidentiality. Thanks in advance.

Name of the institution	
Name of the officer	
Designation	
Duration of stay in the institution	

1. What type of public open spaces exist in Machakos town Municipality?

.....
.....
.....

2. Is your institution involved in the creation of public open spaces in Machakos town Municipality?

.....
If YES, state how?.....
.....

3.What role do public open spaces play in Machakos town municipality?

.....
.....
.....

4.Are there other institutions or stakeholders involved in management of public open spaces?

.....
.....
.....

5.What are the problems facing the creation and management of public open spaces in Machakos town Municipality?

.....
.....
.....

6.Suggest measures that can be put in place to ensure sustainable creation, management and usage of public open spaces in the town.

.....
.....

Observation schedule

1. Note the different types of public open spaces
2. Examine the physical status of in the public open spaces.
3. Take note of different landscape features in the public open spaces.
4. Observe public open space utilization patterns.
5. Observe different activities taking place in the public open spaces.
6. Document visible damage on the landscape features found in the public open spaces.