

**LEVEL OF PROVISION AND USABILITY OF NON-MOTORIZED
TRANSPORT INFRASTRUCTURE ALONG TOM MBOYA STREET,
NAIROBI CITY COUNTY**

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DECLARATION

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

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DEDICATION

I dedicate this work to my loving and supportive family.

ACKNOWLEDGEMENT

I thank the almighty God for granting me the strength and good health during the period of this study and courage to complete this thesis. I would like to acknowledge my Supervisor Dr. Romanus Opiyo for his dedicated support and guidance at the most opportune occasions throughout the process.

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ABSTRACT

Non Motorised Transport (NMT) is an integral part of the transport system whether in the urban or the rural setting. NMT is typically a part of every trip made. Everyone uses it at some point in their trip for instance, once they get off the bus walking to an office block or to a mall or walking to the bus stop or their car or from or to the train station. The recently prepared NMT policy for Nairobi City County identified various challenges facing NMT in the city as a whole which include; lack of policy implementation, road-based Nairobi transport system, lacking NMT infrastructure, encroachment into NMT spaces and lack of enforcement, unsafe pedestrian environments, inaccessibility and discomfort in usage of pedestrian and cyclist facilities (Nairobi City County, 2015). The main objective of the study was to assess the provision and usability of non-motorized transport infrastructure along Tom Mboya Street in Nairobi City County. This study will be guided by systems approach and New Urbanism theory. Correlational design was used to determine the relationship between NMT provision and NMT usability along Tom Mboya Street in Nairobi because it shows relationships between variables, and if a relationship exists, to determine a regression equation that could be used make predictions to a population. The target population of the study included pedestrians, cyclists, traders/business operators (both formal and informal), private road users, public vehicles operators, the implementing agencies and also the key informants from the Department of City Engineering (Nairobi City County Government), Traffic Police Department, Nairobi City County Government Traffic Management section, KURA and National Transport and Safety Authority. Relevant officials were selected from each of the departments and institutions. The study adopted purposive and quota sampling. The findings were reported both descriptively and graphically using, tables, bar charts, histograms, pie-charts, graphs and spatial maps and 2D and 3D design models. The common NMT modes in along Tom Mboya Street in Nairobi are walking, cycling for personal transport, and human drawn carts for goods and garbage transport, trolleys and wheelchairs. Wheel barrows are also used but to a limited extent. Therefore NMT infrastructure include foot paths, pavements, terminal facilities, zebra crossings, traffic lights, signs and speed bumps to regulate speed at different levels in the urban transport system, for safety of motorized and non – motorized alike. It was established that 59% used walk-matatu-walk modal mix while 35% used walk-bus-walk. It was further established that 6% of the NMT users along Tom Mboya Street walked throughout. Based on the findings, majority of the respondents were dissatisfied with the condition of existing Zebra crossing with 44% of them indicating that it was lacking while 19% indicated that it was in poor condition. Only 29% of the respondents indicated that the condition of Zebra crossing was satisfactory. In terms of traffic lights, 36% of the respondents rated it as good while 25% rated it as being in excellent condition. The study concluded that Tom Mboya Street lacks of pedestrian's lane and cycle tracks and signage, roadways designs, including traffic calming, road diets, and traffic speed controls. The study recommends that Tom Mboya Street needs the provision of sufficient pedestrian walkways wide enough to accommodate the large number of pedestrians using this section of the CBD. This will help sort the problem of pedestrians spilling to the carriage ways thus causing traffic congestion. Also provision of better pedestrian walkways will allow for better movements of pedestrians reducing incidences of human congestion.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADA	Americans with Disabilities Act
APBP	Association of Pedestrian and Bicycle Professionals
ASAL	Arid And Semi-Arid Lands
ASSA	Anglophone Sub-Saharan Africa
BRT	Bus Rapid Transit
CBD	Central Business District
CCTV	Closed Circuit Television
CO ₂	Carbon dioxide
Ft	Feet
GDP	Gross Domestic Product
GIS	Geographic Information System
GoK	Government of Kenya
INTP	Integrated National Transport Policy
ITDP	Institute for Transportation and Development Policy
JICA	Japan International Cooperation Agency
KARA	Kenya Alliance of Resident Associations
KBS	Kenya Bureau of Statistics
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
Km	Kilometre
KNBS	Kenya National Bureau of Statistics
KRC	Kenya Railway Corporation
KURA	Kenya Urban Roads Authority
MDGs	Millennium Development Goals
Mph	Miles Per Hour
MT	Motorized Transport
MTIHUD	Ministry of Transport, Infrastructure, Housing and Urban Development
NaMATA	Nairobi Metropolitan Area Transport Authority
NaMSIP	Nairobi Metropolitan Services Improvement Project

NCC	Nairobi City County
NCCG	Nairobi City County Government
NEPAD	New Partnership for Africa's Development
NIUPLAN	Integrated Urban Development Master Plan for the City of Nairobi
NJ	New Jersey
NMT	Non-motorized Transport
NMIMT	Non - Motorized and Intermediate Means of Transport
NTSA	National Transport and Safety Authority
NY	New York
PIDA	Programme for Infrastructure Development in Africa
PSV	Public Service Vehicles
PT	Public Transport
PWD	Persons With Disability
SDGs	Sustainable Development Goals
SGR	Standard Gauge Railway
SPSS	Statistical Package for Social Sciences
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
VTPI	Victoria Transport Policy Institute

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Non Motorised Transport (NMT) is an integral part of the transport system whether in the urban or the rural setting. NMT is typically a part of every trip made (Zamisile Mkhize et al, 2009). Everyone uses it at some point in their trip for instance, once they get off the bus walking to an office block or to a mall or walking to the bus stop or their car or from or to the train station, (Labuschagne et al, 2014). According to Guitink et al, (1994) NMT comprises of any form of transportation offering either goods or personal mobility by means other than motor combustion.

NMT in Nairobi City can currently be described as; in adequate, poorly designed and poor maintained and inefficiently governed by the responsible institutions. These characteristics have been deduced from the urban transport situational analysis done by JICA in the preparation of NIUPLAN and also a recent study done by Nairobi City County in association with UNEP in preparation of NMT policy for the City County.

A study by Angira (2013) in Nairobi show that cycling and walking are the main modes of transportation in the city catering for the low-income earners who account for the largest segment of the city dwellers. Moreover, NMT also serves the medium and higher income earners since every trip begins with a walk, and most of the short trips are made by walking and cycling to the destination. The most prevalent provided NMT infrastructure in the Central Business District (CBD) is pedestrian walk way the rest are missing conspicuously.

The recently prepared NMT policy for Nairobi City County identified various challenges facing NMT in the city as a whole. These challenges having been hindering the provision and use of NMT, they include; lack of policy implementation, road-based Nairobi transport system, lacking NMT infrastructure, lack of enforcement, encroachment into NMT spaces, unsafe pedestrians environments, inaccessibility and discomfort in utilization of the provided cyclist and pedestrian facilities (Nairobi City County, 2015).

Turning the focus on CBD the difficulties affecting NMT are visible all over. They range from lack of NMT infrastructure, obstruction and encroachment of the pedestrian walkways, on-street bus terminus, dilapidation of the walk ways,

incomplete NMT facilities (missing links), lack of Persons With Disabilities (PWD) compliant, lack of cycling lanes, over speeding vehicles due to lack of traffic calming features. These among other invisible challenges (policy issues, institutional, under funding, political good will, Public Service Vehicles (PSV) owners influence, neglect by road engineers are curtailing NMT as a mode of transportation within the CBD.

In addition, there are numerous benefits associated to sufficient provision of NMT as outlined in different studies. Some are related to physical planning while others are economically and socially inclined. They include environmental benefits; NMT users generate no air pollution or greenhouse gases and have little noise pollution (Hook, 2003): efficient use of space; NMT is urban space conscious: utilizes the minimum road space in the urban areas; ideal for short trips especially in developing cities, the average trip distances are relatively short; improved road safety as there is a robust positive relationship between higher NMT use and road traffic safety (Macmillan, 2007; Mohan, 2002; Litman, 2007); economical; modal share of bicycling and walking could lower the county's dependence on imported oils (Walter Hook, 2003).

NMT has over the years been curtailed by several challenges all over the world. However, some countries and cities have paid enough attention to NMT and resolved the problem despite the challenges and turned the situation around such include Curitiba, New Jersey, Netherlands among others. On the contrary NMT is still faced with numerous challenges especially in most developing countries.

In Kenya, NMT is faced by several challenges such as lack of policy implementation: this is manifested by the failure to provide an integrated transport system inclusive of NMT facilities despite the fact that an integrated national transport policy is in place; Road-based transport system: the transport system in the country is mainly road based and favours the use of private car; Inadequate NMT users infrastructure: over the years the road designers have not paid a lot of attention to NMT facilities provision. This is attributed to the vehicle-oriented engineering and planning for transport systems (Nairobi City County, 2015).

According to Mitullah and Makajuma, (2013), the City County of Nairobi has had unbalanced focus on transport infrastructure investments over the years. This has seen the promotion of the needs of motorized means of transport, thus belittling the importance of non-motorized means (pedestrians and bicyclists). In planning and

provision of transport systems within the capital city-Nairobi, Universal Design principles have never been adequately applied. Consequently, disabled road users, pedestrians and children experience difficulties navigating their way within the city road environment. This problem is illustrated in almost every street where commonly you will find dilapidated, flooded, untidy narrow pedestrian walkways which have no lumps for wheel chairs and the grade differences are uncomfortable.

Mitullah and Opiyo (2012) indicated that provision of physical infrastructure like shoulders and overpasses for NMT users are not catered for in new road construction and upgrading exercises. This phenomenon often leads to a higher NMT– automobile crash rate, longer travel periods and in some cases total eradication of NMT traffic. They further allude that, the dominance of the NMT mode has not cushioned it from the numerous challenges it faces. This, they say could be attributed to the fact that policy makers and bureaucrats give NMT secondary consideration. This is explained by the inexistence of the prerequisite plans and policies with regard to NMT as well as limited NMT infrastructure in the country.

1.2 Statement of the research problem

The world is becoming more global and interconnected today with over half (54 percent) of the world population lives in urban areas. By the year 2050, a projected 2.5 billion people will be added to the urban population as a result of the continuing urbanization and overall growth of the world population. Asia and Africa will contribute nearly 90 per cent of this increase (United Nations, 2014). Kenya has been experiencing rapid urbanization in the recent years. The urban population increased from 5.4 million in 1999 to 12 million people in 2009. Between 1970 and 1980, the urban population grew at an annual average growth rate of over 7.9 percent. The population growth rate was projected to average about 4 percent beyond 2010 all through to 2040 (UNDESA, 2010).

According to World Bank (2017), Kenya is urbanizing at about 4.3 percent and is estimated that about half of the population will be living in the urban areas by 2050. In this regard, the transport system of all the urban centres in the country as well as the related political and planning structures need to address this phenomenon of increasing transport demand associated with increase in population. Integration of all modes of transport is crucial in ensuring efficiency of the systems. Thus,

transportation planning in the urban areas has to consider incorporating NMT facilities as well and how these facilities impact on street economy.

According to the census report of 2009, the population of Nairobi was estimated to be 3,138,000 people. This accounted for about 8.1 percent of the national population. From the 1989 to 1999 census, the average annual growth rate of Nairobi was 4.2 percent while a rate of 4.0 percent was recorded from the 1999 to the 2009 census. The population was projected to stand at 4,247,770 by 2017 (KBS, 2013). This increase in urban population is directly proportional to day-time population which is comprised of workers coming in to work and citizens coming in to seek service or do shopping. More than Forty percent (40 percent) of the trips made every day by the city dwellers are done through walking and about 4 percent are done by two-wheelers (both bicycle and motorcycles), (NIUPLAN, 2014). Some of the key facilities that support NMT are; speed bumps, pedestrian crossing, overpass, dedicated walking paths and street lights. This manifests the rationale for need to provide adequate NMT infrastructure in the city.

The CBD of any city should be the most NMT user friendly part of a city (Khayesi, 2017). The NMT facilities that ought to be provided in a CBD are: sidewalks; comprising of the frontage zone; the pedestrian zone and the planted buffer/furnishing zone, street trees which can either be on open trench or covered soil trenches, street furniture comprising of Well-placed benches and properly distributed and maintained waste bins, cycling lanes and bicycle parking space, street lighting, security cameras, marked pedestrian crossing points, bus shelters and traffic calming features (Jersey, 2017). In addition to provision, both pedestrians and cyclist facilities should have various qualities which are Attractiveness, Safe and secure, comfort, directness and cohesiveness (Mkhize et al, 2009). Unfortunately in Kenya, over the years NMT infrastructure integration into urban development and streetscape is yet to receive the sufficient attention it requires from the Government and implementation agencies.

Tom Mboya Street is a two-way major commercial street running across the Nairobi CBD. The street runs from Haile Selassie Avenue to Murang'a road at Koja bus terminus. The street has got several adjoining streets such as; Ronald Ngala, Luthuli Avenue, Latema road, Lagos road among other lanes. According to Githira, Opiyo and Mwaniki, (2018), the major activities along the street are commercial and

transportation. Commercial activities comprise of formal and informal activities. The formal activities range from retail, wholesalers, supermarkets, eateries and some few office spaces. Street vending, kiosks are some of the informal commercial activities. All these activities draw human traffic into the street since access to the products and services along this street require most of the people to walk.

Along this street there are three (3) designated bus terminus, these are Koja, Odeon and Tea room which extends from Tom Mboya Street to River road. Additionally, there are several on-street PSV termini along the street and some located along the adjoining streets namely; Ronald Ngala, Luthuli Avenue, Accra road and Lagos road. In total there are 9 on street termini spots along the street which accommodate vehicles ferrying passengers from various places such as Civil servant estate, Buru buru, Eastleigh, Pipe line estate, Kasarani, Mwiki, Baba Ndogo, Komarocks, Kikuyu, Kiambu, Langata among other areas in the outskirts of the city centre. The passengers alighting from the designated terminus and on-street PSV termini along the street generate human traffic especially in the morning hours. Similarly these terminus attract human traffic in the evening from the commuters leaving the CBD for their homes consequently the human traffic currently out ways the motorized traffic.

Despite the case presented above, Tom Mboya Street is facing numerous challenges in regard to NMT infrastructure provision and usability. These challenges range from presence of dilapidated narrow uncoherent sidewalks, inadequate street lighting, lack of street furniture, presence of on-street-bus terminus, obstructions from street vendors, kiosks, street lighting poles, poorly planned street trees, lack of ramps for PWD usage, lack of marked pedestrian crossing points, cycling lanes, bicycle parking, insufficient street lighting, lack of bus shelters. In addition to these the street is really dusty and noisy.

Non-Motorized Transport Policy prepared by County Government of Nairobi cited the lack of Non-Motorised Transport provisions along major streets in Nairobi and Tom Mboya is not an exception. NMT users are therefore forced to compete for road space with fast, aggressive and high Motorized Transport (MT) volumes. This competition results to avoidable high traffic accidents. There is also massive encroachment of the few available NMT spaces by hawkers who capitalize on the availability of customers during the peak hours. This encroachment has impacted

negatively on road users especially the vulnerable ones including women, PWDs and children. The high accident rate among pedestrians in Nairobi is also an indication of how unsafe the usage of NMT is. To aggravate the situation, land use planning and development control which are supposed to mitigate against these problems are weak. In addition, the land use planners haven't encouraged compact land use that is supportive of integrated transport provisions. The current segregated land use planning practices promotes increased trip distances thus rendering the use of NMT less attractive.

The challenge facing planners, policy-makers and urban managers today is how to identify and develop appropriate transport policies strategies and systems that are sustainable both economically and environmentally and at the same time provide adequate and viable accessibility and mobility levels to all urban residents. One such strategy with high potential is Non-Motorized Transport (NMT) - encouraging more pedestrian trips and use of bicycles. The NMT strategy to work successfully should be well coordinated and integrated with other motorized modes especially public transport. In view of the above, the purpose of the study was to examine the level of provision and usability of NMT infrastructure along Tom Mboya Street in Nairobi.

1.3 Research questions

The study sought to answer the following questions:

1. What is the state of the available NMT infrastructure along the street?
2. What are the NMT black spots along Tom Mboya Street?
3. What are the factors affecting usability of the NMT facilities along the street?
4. What planning and policy interventions that would enhance provision and usability of the NMT infrastructure?

1.4 Objectives of the Research

The study has main and specific objectives.

1.4.1 Main Objective

The main objective of the study was to assess the level of provision and usability of non-motorized transport infrastructure along Tom Mboya Street in Nairobi City County.

1.4.2 Specific Objectives

The specific objectives of the study were to:

1. Identify the current state of the provided NMT infrastructure along the street.
2. Map NMT black spots along the Tom Mboya Street.
3. Analyze the factors affecting usability of the provided NMT infrastructure
4. Propose planning, design and policy interventions for sufficient provision and optimally usable NMT infrastructure

1.5 Research Hypothesis

The study hypothesis was:

H_{a1}: Provision of sufficient properly designed NMT infrastructure is positively correlated to usability.

1.6 Geographical and theoretical scope

The area of study is located in Nairobi City County geographically positioned at 1⁰ 17'S 36⁰ 49'E. The study will cover Tom Mboya Street which extends from junction with Murang'a Road and connects with Haile Sellassie Avenue. Tom Mboya Street is a very busy street with numerous drop-off and pick up points. In total there are 9 on street termini spots along the street which accommodate vehicles ferrying passengers from various places such as Civil servant estate, Buru buru, Eastleigh, Pipe line estate, Kasarani, Mwiki, Baba Ndogo, Komarocks, Kikuyu, Kiambu, Langata among other areas. Tom Mboya Street feeds other streets such as Ronald Ngala, Accra road and Latema among others. The main focus of this study is to assess the provision and usability of non-motorized transport infrastructure along Tom Mboya Street, Nairobi City County.

1.7 Justification and Significance of the Study

The study was justified by various rationales. There being several transportation studies done in the city, there is still a knowledge gap regarding NMT infrastructure. Land use planning is an integral part of urban development. Article 60(1) of the Constitution gives the guidelines on how land is to be used equitably, efficiently, productively and sustainably. The State is given the authority to regulate the use of land or any interest on or over land as stated in Article 66, for reasons as defense, public safety, public order, land use planning, public morality and public health. This implies that land use planning will be used by the state as a tool for land use

regulation which provides a useful foundation for proper land management. Article 67 establishes the National Land Commission with among other functions, to monitor and have oversight responsibilities over land use planning throughout the Country. The Study will therefore be useful to the National Land Commission, Ministry of Lands and Infrastructure, Kenya Urban Roads Authority and County Government of Nairobi by recommending interventions that would ensure adequate provision and optimal usage of the non-motorized transport infrastructure along Tom Mboya Street and Nairobi in general.

Moreover, the CBD is the core and the heart of the city. There are major functions at the core, these are; administrative and economic functions. The CBD was the very first part of the city to be planned, it has a well laid out road network, it defines the urban form of Nairobi. Major events are done in the city, the core being the phase of the whole county; it should be appealing and well serviced to communicate a positive message to dignitaries and investors.

The focus of the study was on Tom Mboya Street, this is one of the busiest streets in the CBD. Along this street there are 4 off-street termini which accommodate hundreds of PSVs each day and also there are 11 on-street termini and numerous *boda boda* spots, major supermarkets, retail shops, eateries and restaurants. These activities generate a lot of human traffic along the street. The street also acts as a bridge that people uses to Cross over from the extended CBD section (down town) (goods sale oriented) into the initial designated CBD (service oriented). Hundreds of pedestrians from down town moving into the upper CBD and those moving from and into the various PSV termini cross over the street every day.

There has been a rapid urban population increase over the years. According to the census report of 2009, the population of Nairobi was estimated to be 3,138,000 people. This accounted for 8.1 percent of the national population. Between the 1989 to 1999 census, the average annual growth rate of Nairobi was 4.2 percent while a rate of 4.0 percent was recorded from the 1999 to the 2009 census. The population was projected to stand at 4,247,770 by 2017 (KBS, 2013). This increase in urban population is directly proportional to day-time population which is comprised of workers coming in to work and citizens coming in to seek service or do shopping. These city dwellers use NMT in each and every trip they make, typically NMT is part

of every trip thus the need to prioritize the people first in provision of transport systems.

The definite contribution of NMT to the transport sector in Nairobi is not well documented. The studies on NMT in urban settings are also scanty hence the need for current study. The planners should therefore pay more attention to research on NMT provision and usability in Nairobi CBD. Implementation of the recommendations that will result from the study will minimize the economic loss among other benefits. The end product is adequate provision of usable well-designed NMT facilities on the street. Walking and cycling friendly streets shall improve the business along the street, in addition it will reduce the emissions on the road, improve safety of the pedestrians and reduce noise pollution. The study focused on Tom Mboya Street in Nairobi CBD, it is well known that provision of NMT in Kenya cities is lacking. This study on the provision and usability of NMT facilities will therefore provide the findings and interventions to be replicated in other similar cities/towns.

1.8 Scope of the study

The study was conducted on Tom Mboya Street which is enclosed by Haile Selassie Avenue, the main entry of traffic from the Eastern part of the city and Thika super highway (A2), the main entry of traffic from Nyeri, Kiambu, Meru, Garissa among other towns and the estates located along the highway. On the lower side the street is bordered by River Road Street with multiple roads and lanes feeding in and out of the street while on the upper side the street is bordered by Moi Avenue. The area was sufficient to illustrate the use and provision of NMT infrastructure because it has a significant number of motorized and non-motorized traffic since it houses several of businesses inclusive of whole sales, retail shops, eateries, bars, restaurants and super markets.

In addition, many Public Service Vehicles enter and leave the CBD via different points which are located along the street. The street has the highest concentration on PSV termini currently there are four (4) off street (Afya centre-oil Libya petrol station, tea room, odeon and kodjah terminus) and eleven (11) on-street termini (Buru buru, Umoja, Komarocks, East leigh, Mwiki, Kasarani, Kikuyu, Kiambu and also three-wheeler to Jogoo road). These combined with all the businesses along this street generates massive human traffic congestion.

1.9 Definition of Terms

Street:

A Street is a social space and not just a channel for vehicular mobility, (European woonerf concept, collarte, 2012)

NMT:

Non-motorised Transportation also referred to as human powered transportation or active transportation. It includes walking, cycling and other variants like small-wheeled transport which include hand carts, cycle rickshaws, skateboards, skates and push scooters as well as wheel chair travel (VTPI, 2010). These modes provide both transportation and recreational activities and are important especially for short trips of up to 7km which account for majority of trips in urban areas (Witting et al., 2006).

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter reviews literature related to the study. There have been several studies about matters related to non-motorized transport. These studies have unearthed important information which has informed this research. The areas covered include; Status of NMT in Urban Areas, NMT Provision and Usability, NMT Provision and Usability Legal and Policy Framework, Theoretical Framework, Conceptual Framework and Chapter Summary. This chapter thus brings out a conceptual background of NMT across the world and in Kenya as documented by other scholars so as to inform the current study.

2.2 Status of NMT in Urban Areas

Heierli (2013) indicated that in medium-sized cities in in the Netherlands, Germany and Japan, walking and cycling make 40-60 percent of all trips, while this share is as high as 80 percent in equally sized cities in India. The best practices for NMT across the world are manifested by adequate provision of standard user friendly, optimally utilized NMT facilities in major cities. For example the city of New York Department of Transportation, initiated action with a view of making safer streets, reducing pedestrian fatalities, improve aesthetics, comfort and usability as well. In this endeavor, the department has practically illustrated how innovative and smart street design can drastically improve the safety of city streets.

City of New York (2013) explains that making streets safer needs expertise and judgment in traffic engineering though there are some technical issues in nature like traffic signal timing and turning radii. They further explain the simplicity and self-explanatory nature of the key concepts required in designing safer streets. These concepts have been applied in NYC and proven to be the most effective in improving safety among other needs of pedestrians;

- a) **Design easy to use streets:** this is done through the inclusion of desire lines and reducing driving, walking and cycling complexity leading to reduced crash risk through provision of a more simple and direct route to navigate through the area.
- b) **Create safety in numbers:** this ensures that street users i.e. cyclists and pedestrians more visible to motorized users.

- c) **Make the invisible visible:** by placing street users in a more visible location to each other
- d) **Choose quality over quantity:** in such a way that the road reserve/way and intersection geometries fulfill the first principles of design
- e) **See past the (current) problem:** this is done through expansion of the focus area in cases where solutions at the particular location cannot be resolved in isolation

The application of the above strategies is as explicated below;

a) Design easy to use streets

Complexity and difficulty elevates risk on busy city streets whereas simplified, easy to use streets minimize the risks and improve on the aesthetics value.

- **Accommodate desire lines**

Ensuring streets are easier to use begins with a clear comprehension of what the pedestrians intends to do. With this in mind, a street ought to accommodate desired lines with regard to how people intend to move within the space. This is done through provision of a simple clear path with minimal complexity that does push the pedestrians out of their way (City of New York, 2013).

- **Minimize user complexity**

Intricate junctions generate difficulties for users as well as elevate the possibility of crashes. Street design, while appropriately applied complexity and the potential for conflicts can be curtailed. Other applications to reduce complexity of the streets include; signalized intersections, designed merges and transitions, medians, designated cyclist facilities and clear lane assignments (City of New York, 2013).

b) Create safety in numbers

- **Bring users together**

This is one of the easiest strategies to improve safety of users. By increasing their presence on the street, they become more visible to other users and more predictable. The design of the street with adequate facilities plays a major role in increasing volumes (City of New York, 2013).

- **Create platoons of vehicles**

Further, in a view to create safety in numbers, signal timing and phasing in collaboration with street design to improve on safety can be used. Timing creates

platoons that ensure vehicles move in groups and at the same time create “gaps” for cyclists to ride and pedestrians to cross the street. Additionally, phasing could be applied to group turners and specific modes of transport to elucidate movements and give a go ahead (City of New York, 2013).

c) Make the invisible visible

Mutual visibility of pedestrian, driver and cyclist enhance safe passage through intersections where all their paths cross. The design of a street can enhance visibility of all users. This is normally attained through visual cues which gives the users a heads up on the presence of other users. However, this doesn't always work, thus the need to redesign the street to make every user visible through some street treatments (City of New York, 2013).

d) Choosing quality over quantity

The city of New York has got many demands that evolve with time. This requires an update on the city streets to meet the current needs. The absence of this update would lead to unmet needs and chaotic conditions. In executing this update of the street, there is need to distinctively mark the specific parts of the street serving a particular use thus prioritizing the most essential uses which consequently make the streets work better. In addition, substituting two good lanes for three poor lanes would also be considered. This would ensure minimal disruption in the lanes thus ensuring their effectiveness in their function. In most of the studied areas, a road with many undesigned lanes gets congested as a result of either double parking or vehicle turning that occur through lanes. This could be resolved by designating spaces for other road activities and reducing through lanes to improve on functionality (City of New York, 2013).

In the city, there are numerous complex intersections which more often meet at peculiar angles, more specifically in the peri urban areas where neighborhood grids intersect. This type of road design that promotes intersection can be either reconsidered or completely done away with so as to provide normal right-angle geometry which increases movement duration.

e) Looking beyond the problem

This strategy looks into expanding the focus area for locations where it can be difficult to implement the solution. Extending the project area to encompass the local

street network has a possibility to unlock new options. Further, viewing beyond the intersection or a major transport corridor improves the main project area. The illustration below shows the viability of the strategy where by an intersection challenge can be addressed through corridor redesign that re-evaluates the movements that require accommodation.

2.2.1 Status of NMT in Nairobi City

In most African cities, NMT is the most dominant, healthy and cost effective mode of transport. In Nairobi City for instance, about 60 percent of the residents walk to the various activity spaces, 35 percent use public means of transport mainly *Matatus* and buses, with only 5 per cent having access to private cars. This amplifies the importance of NMT as the most convenient and conventional way of accessing activity spaces especially those located within short distances. However, NMT modes are forced to compete for space with motorized vehicles due to inadequate planning and failure to provide the required NMT infrastructure. This has caused numerous conflicts and compromised on the safety of the users (GoK, 2015). According to the Nairobi Urban Transport Master Plan study which was conducted in 2006, NMT comprising of cyclists and pedestrians accounted for about 47 percent of the city's modal split. In 2004, about 4.8 million trips per day were recorded in the city, whereby, 48 percent were made on foot, 36 percent by public transport vehicles while only 16 percent were made in private cars (Gonzales G. *at al.*, 2009).

The transport system in Nairobi is mostly road-based, with more emphasis put on the use of private car. As documented in the Nairobi City County Government (NCCG NMT policy (2015), the city's transport system is yet to fully take into account the contribution of all transport modes so as to offer practical and affordable choices to the users. The system fails to offer convenient and practical alternatives to the private cars in order to minimize the overreliance of the private car by the city residents. To address this overreliance, the policy proposes an effective and attractive public transport seamlessly integrated with NMT. In addition, the policy deduced that the main transport problem in the city was inefficient public transport and lack of convenient and safe NMT infrastructure but not the residents' hesitation to use public transport, cycle or walk to their various destinations.

In Nairobi Kenya, NMT includes walking, pulling and pushing wheelbarrows and carts, cycling, animal transport in form of donkeys, camels and horses as well as animal-drawn carriages like sledges (GoK, 2012). Use of wheelchairs, strollers and skate boards are also other NMT modes. Walking, cycling both for personal transport and as a public transport mode, animal and human drawn carts for the transportation of goods and garbage are the most prevalent NMT modes. According to various sources, walking and public transport are the main means of transport in the city. The table below illustrates the modal split in Nairobi County;

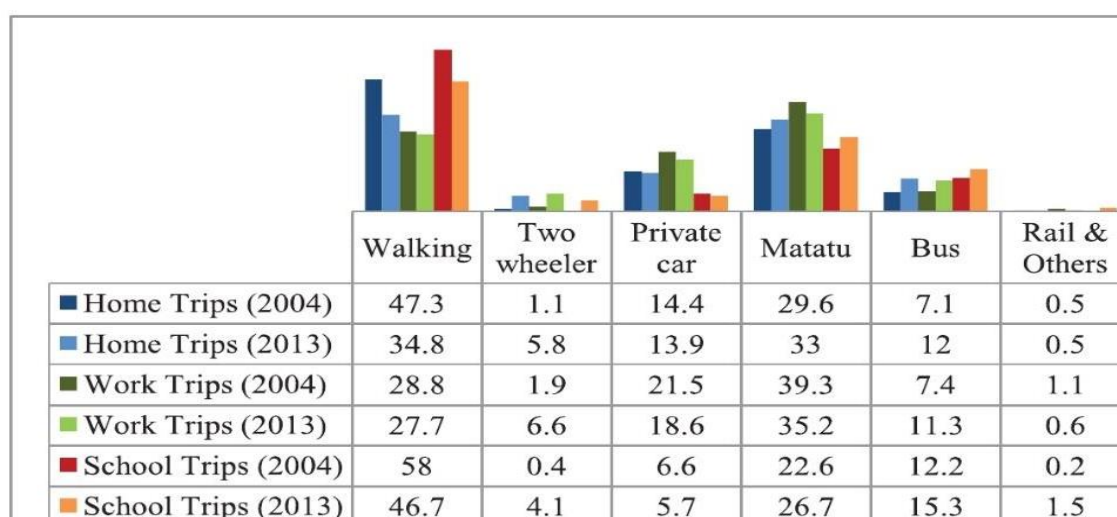
Table 1: Modal split in Nairobi County

Study	Public transport (%)	Walking (%)	Cycling (%)	Private car (%)	Train (%)	Institution bus (%)	Others (%)
Ref. 1 ¹	32.7	47.1	1.2	15.3	0.4	3.1	0.2
Ref. 2 ²	36	47	-	16.5	0.4	-	-
Ref. 3 ³	51.5	41.2	3.0	7.0	-	-	-
Ref. 4 ⁴	42	47	1	7	-	3	-

Source: various studies

As documented in the NIUPLAN (2014), walking is the main transport mode to school and work accounting for over 85 percent of all walking trips in the years 2004 and 2013 as illustrated in the figure below:

Figure 1: Means of transport by purpose in 2004 and 2013



Source: NIUPLAN, 2014

¹ JICA: The Study on Master Plan for Urban Transport in the Nairobi Metropolitan Area (2006)

² NUTRANS, 2005

³ Travel Behavior in Cape Town, Dar es Salaam and Nairobi Cities, July 2011

⁴ Scoping Study, TRL Nairobi Field Surveys, May 2002 (WB)

There is no clear documentation of the actual contribution of NMT to transportation in Nairobi as illustrated above. Nevertheless, all the available data indicate that NMT is the leading mode of transport in the county. It accounts for over 40 percent of the total daily trips. JICA, (2004) discovered that 2.32 million trips were made by walking and cycling out of a total of 4.82 million daily trips. Notably, the increase in the number of motorcycles in the city for public transport has resulted in the rise of two wheelers for all trip purposes. These are relatively faster and more flexible public means in comparison to other motorized transport as they can maneuver their way along the congested Nairobi streets.

2.3 NMT Provision and Usability

Furness (2010) highlights that despite the importance of NMT as a form of mobility; many cities around the world have neglected it. Historically, infrastructure development, urban design as well as dominant cultural norms have always favored motorized transport and specifically the private car. This practice has continued to date. Dutch Cities are great examples of cities with effective NMT functions. In the three largest Dutch cities, NMT accounts for about 67.4 percent of retail trips and about 40 percent of commuting trips. The Netherlands for instance, have had thorough regulation with regard to spatial development since the 1970s and has high levels of cycling and walking. It is thus an important case of exploring urban design and infrastructural factors with regard to the travel behavior of individuals.

As highlighted by Schwanen et. al., (2004) built environment factors play a critical role in influencing individuals travel behavior. They observed that the Netherlands had paid substantial attention concerning how urban form impacted on transport mode choice and travel distance over the past two decades. They further observed that most European cities had emphasized on policies which promoted development of compact urban forms as well as investment in built-up areas through infill developments as opposed to policies allowing individually and less directed urban growth. According to their view, mixed use developments and compact urban forms allow residential, retail and employment opportunities to be located in proximity. In turn, trip lengths are reduced, thus making it convenient for walking and cycling as long as the infrastructure is in place.

In an analysis of Beijing City, Zhao (2013) explored the influence of built environment factors on bicycle commuting in a country which was originally referred to as 'the kingdom of bicycles'. He observed that there was a rapid decline in the use of bicycles over the last two decades. He concluded that other factors like demographic and socio-economic characteristics impact on the prevalence of NMT in cities. Cervero et, al., (2009) explored the influence of built environment factors on the use of NMT in Bogota, Colombia which was well known for NMT development. They observed that Bogota had a sustainable urban transport system with well-developed cycling infrastructure and designated pedestrian spaces. They further observed that the significant growth in the use of NMT was as a result of development of NMT specific infrastructure. The city has designated pedestrian facilities and cycle ways which are located in proximity to trip origins.

The UN Habitat report (2013) on urban mobility indicates that in most of the developed countries, the bicycle mode often serves as a feeder mode to public transport facilities. Thus, building on the interconnection between NMT and public transport, travel times that are competitive with the unsustainable overreliance on the private car can be created (Schwanen *et al*, 2004). Hutabarat (2010) notes that the City of Jakarta in Indonesia is characterized by inequalities with regard to income levels, mobility and infrastructural development. The policies and development levels on mobility and pedestrian infrastructure is a clear reflection of this inequality as there has been an inconsistent provision of pedestrian infrastructure. He further observed that pedestrian infrastructure had been provided in form of exclusive pedestrian plazas and retail precincts which were only accessible to the rich.

With regard to NMT within Anglophone Sub-Saharan African (ASSA) cities, walking is the most preferred mode of transport among the populations. However, despite this preference, walking as a transport mode is highly neglected both at the policy level and at the development of the physical infrastructure. The high rate of walking is due to inefficient and geographically fragmented public transport. Cycling on the other hand is not that widespread within many ASSA cities. As highlighted by Pirie (2013), in many ASSA cities, NMT is not included in transport policy as it is not considered to be in the category of transport. In this regard, NMT users are forced to share the same street space with motorized traffic where their welfare is sacrificed for smooth

motorized traffic flow. In instances where pavements and pedestrian walkways have been provided, pedestrians have to compete for the same space with informal traders (ibid).

Non-Motorized Transport is the most widely used mode of transport in Kenya. For instance, in Nairobi, about 47 percent of the people walk daily to their destinations (JICA, 2006). However, despite this dominance as a mode of transport, NMT is the least catered for during transportation planning and public investments. A great proportion of road infrastructure investments in the country are directed towards the construction of roads that facilitate efficient movement of vehicles rather than moving majority of road users like pedestrians and cyclists. As documented by the World Bank (2002), Nairobi City is quite unique as it has a fairly flat terrain suitable for cycling, a potential that is yet to be utilized. Just like most cities in Africa, transport planning in the city of Nairobi is geared towards meeting motorized traffic needs. This is quite an irony since a small percentage of the population use motorized traffic (de Langen 2005).

Khayesi et, al., (2010) while analyzing transport planning in Nairobi, observed that NMT and informal economy had not been adequately catered for in the city resulting to competition for the use of road and pavements. This has rendered the most vulnerable road users like cyclists, pedestrians and street vendors subjects of harassment, insecurity and neglect by planners and policy makers. They further explain that failure to provide pedestrian infrastructure could be explained by the fact that, as much as walking is an important mode of transport; NMT in general tends to be linked with inefficiency and anti-modernity.

Salon and Aligula (2012) observed that majority of the poor Nairobi residents reside in informal settlements preferably located along the main transport corridors and in proximity to their employment areas for ease of access. They further explain that a significant proportion of the population in Nairobi wasn't in a position to afford any form of public transport thus resulting to NMT, with walking being preferred to cycling. They also observed that within the residential neighborhoods, short walking trips to access various activity spaces was very common. Based on the importance of NMT from their study findings, they recommended sufficient provision of NMT infrastructure which caters for all income groups in order to make NMT an attractive

mode of transport. They further called for the implementation of policies to help reduce traffic congestion like parking taxation particularly close to the CBD.

2.3.1 Factors Affecting Usability of Provided NMT Facilities

Several factors impact on the usability of provided NMT facilities in any city all over the world. Sudhakaran et al. (2017) notes that the choice of using an NMT facility depends among other factors an individual assessment of relative time, cost, convenience, comfort and safety of the existing modes. Some of the factors are as discussed below:

2.3.1.1 Accessibility

The accessibility of an NMT facility is a critical determinant of the degree of its usability. As noted by Phayane et al., (2015) to ensure efficient utilization of pedestrian walkways, they should facilitate ease of crossing within intersections and promote accessible connections to other neighborhoods and public transport facilities. In addition, the networks should provide continuity thus linking the origins to the destinations.

The City of Cape Town (2005) notes that inadequate, inefficient and inaccessible public transport forces people to walk to their destinations. This implies that, the accessibility of walkways as compared to public transport makes it the default mode of transport. However, the authors also observed that for most NMT users, accessing NMT facilities across freeways, railway lines and major arterials was a major challenge. This situation results to unsafe environments for NMT users as they are required to cross the barriers in risky and unsafe areas or trail the long paths to access the designated safe crossing points. In addition, Labuschagne and Ribbens (2014) observes that crossing of freeways, major road junctions and urban arterials was a main challenge to NMT road users as it affects their accessibility hence their usability.

In Nairobi, lack of bicycles and motorcycles parking facilities at the destinations as well as the difficulty experienced in the transfer to motorized transport by NMT users make NMT not ideal mode of transport in some instances. In some cases, the condition of the facilities makes them inaccessible. For instance, the slopes of some footbridges are relatively steep and sometimes hinders for movement continuity (Nairobi City County Government, 2015). For the people with disabilities, the case is even worse as larger dimensions are required to cater for continuous sidewalks,

crutches, wheelchairs as well as way finding possibilities for the visually impaired, facilities that are not available in almost all streets of Nairobi city.

2.3.1.2 Safety and security

There are various dimensions of safety as presented by Nairobi City County Government (2015) which include risk of injury, an aspect that is related to behavioral patterns of other users, road and traffic conditions and failure of enforcement of the existing traffic laws. Rakesh (2015) in a study on non-motorized transport and sustainable urban planning, a case study of Pune Metropolitan Region notes that it is important for NMT users to perceive that the facilities are safe and secure as these impacts on the usability of the facilities. This implies that there should be freedom from conflict with motor vehicles, a minimum threat from personal attack and risk of tripping for NMT facilities to be attractive to users.

To maximize usage of NMT facilities, personal safety of NMT users is of utmost importance (Republic of South Africa, 2014). Thus, concealment of potential criminal areas, enhancement of clear sight and splayed buildings and boundary corners should be observed. In addition, alternative connections should be availed to avoid insecure spots, street lights should be provided, vegetation should be controlled and managed and parking should never be allowed on walkways.

The World Bank (2002) reported that majority of African cities have poorly equipped street environments with respect to NMT storage facilities, lighting, direct sight lines and CCTV. These streets are unsafe for pedestrians and become conducive environment for criminals particularly at night. It is quite interesting that most of the workplaces and bus terminus in the City of Nairobi have no provisions for the storage of NMT facilities like cycles, a situation that is also replicated in majority of the destinations. It goes without say that without secure and monitored storage facilities, cycling as a mode of transport will remain relatively underutilized.

The high speeds associated with motorized transport and absence of protection from motorized transport users make NMT users in Nairobi city very vulnerable. In addition, some security aspects like the fear of being robbed or harassed affect the use of NMT facilities for some people especially women during early morning and late evening hours. Moreover, the vulnerable users like the elderly, People with

Disabilities (PWDs) and children are prone to criminal attacks and anti-social behavior (Nairobi City County Government, 2015).

2.3.1.3 Urban Design

Good urban design is prerequisite to the much-desired attractive urban neighborhoods. As cited in Wu and Chen (2016) some of the key aspects that influence the alleged evaluation of the environment are; population density, transportation facilities, commercial density and the morphology interface. As observed in Shanghai, high population densities challenged the walking and security of environments. In addition, the form of commercial activities also affects the attractiveness of the walking environment since the more the number of commercial interfaces the less attractive the environment is. Moreover, other aspects like sidewalks and penetrable interfaces but in small scale influence the overall walking environment, security and comfort issues of NMT facilities.

The World Bank (2002) notes that well planned, compact developments with mixed land uses which offer equitable streets and public spaces with high-quality cycling and walking infrastructure, increased connectivity and public transit access improves among other things livability thus making them very attractive for NMT users. Phayane et al., (2015) recommends that pedestrian networks need to ensure an interesting and attractive landscape, probably situated next to the public space. These facilities should also cater for people who want to stop, rest, chat and/or window shop in pleasing surroundings if they are to be effectively utilized.

Labuschagne and Ribbens (2014) observe that the inadequate integration of transport modes and more specifically provision of NMT facilities within the proximity of public transport in South African cities affect their usability. Thus, designing of NMT facilities by making them attractive and pleasant and at the same time safe and secure for all users enhances their utilization (Republic of South Africa, 2014). Consequently, these facilities should pass through attractive, shaded and green environments with the entire prerequisite infrastructure for use by the NMT users. In addition, urban design that ensures complete and direct routes makes NMT more attractive to users.

Street connectivity, land use mix, residential density, street landscaping, frequency and variety of buildings, proximity and orientation of homes/buildings watching over

the street, place making, street designs appropriate for people are some of the factors that affect walkability in the streets of South African cities (Labuschagne & Ribbens, 2014).

As noted by NCCG (2015) sometimes when providing NMT facilities alongside motorized transport roads, a good permeability and the most direct route is not offered thus affecting the use of these facilities as most users would prefer the most direct and short route.

2.3.1.4 Integration

The UNDP (2007) outlines five integration areas namely: physical, network, institutional, fare and information. Physical integration calls for integration of NMT, inter-modal terminals, railway and structures tracks for efficient transport system. Lack of an integrated planning approach in the provision of NMT facilities, affects their usability as is the case in the city of Cape Town (City of Cape Town, 2005). In trying to establish ways of achieving integration, UNDP (2007) postulated that, one should understand the needs and wants of the users. Thus, the distance to desired activity spaces should be matched with user willingness to NMT with more emphasis on route directness and connectivity.

2.3.1.5 Quality of the space

Provision of good quality NMT facilities increases their demand hence their usability (Rakesh, 2015). Labuschagne and Ribbens (2014) noted that poor maintenance of NMT infrastructure in most of the South African cities makes it inconvenient for use. Encroachment into NMT spaces is a major challenge in the efficient movement of pedestrians and cyclists. In the streets of Nairobi city, parked vehicles, hawkers, motorcycles and *matatus*, in most instances take over pedestrian walkways thus hindering NMT movement. In several instances, even at signalized crossings, shop verandas or marked zebra crossing, pedestrians do not have a right of way. Lack of a legal framework to penalize these violations further compounds the problem (NCCG, 2015).

In addition, poor maintenance of the NMT facilities makes them very unappealing to the users. For instance, in Nairobi due to poor maintenance, the walkways which had tarmac or cabro surfacing are full of potholes and accumulate storm water during the rainy season. In certain areas, maintenance works contractors leave debris on the

walkways after road works making rendering the sections of those facilities unusable (ibid).

2.3.1.6 Comfort

The importance of the comfortability of the facilities can never be over-emphasized. The NMT facilities provided have to consider people who have special needs with respect to physically challenged persons, people travelling with children or with bulky luggage. In this regard, adequate design standards should be used in terms of quality, grade and width (Phayane et al., 2015). NMT facilities with room for fast and comfortable NMT flow are easier to use. The comfort would imply that there is a large capacity of the infrastructure to avoid congestion of pedestrians and cyclists. It would also mean smooth cycling and walking with no interference caused by elements such as potholes, bumps, stopping at junctions and gradients (Servaas, 2000). As reported by Okoth (2013) there is no much comfort in the use of NMT facilities in Nairobi city, a situation that worsens during extreme weather conditions. Providing attractive NMT routes to public transport interchanges and conducive waiting and resting facilities would greatly help in encouraging use of NMT as a preferred mode of transport.

2.3.1.7 User attitude

The walking behavior of the elderly in Shanghai China is highly influenced by the attitude they have towards walking and the satisfaction they obtain from the surrounding neighborhood. The perceived attributes of the environment like land use mix, residential density and street connectivity are some of the aspects linked with a highly walkable neighborhood (Wu and Chen, 2016).

Labuschagne and Ribbens (2014) notes, that the negative perception of cycling in South African cities affects its use as cycling ranks low in status among majority of the population. In some areas NMT especially walking and cycling are basically associated with recreation activities or indicators of poverty.

2.3.1.8 Awareness

In most of the developing countries, NMT is not recognized as a mode of transport. The situation is demonstrated by the failure of motorists to consider pedestrians and in some instances; pedestrians are lawless and have reckless attitudes (City of Cape Town, 2005).

2.3.1.9 Other factors

Labuschagne and Ribbens (2014) observed that increment in traffic volumes and density makes it difficult for NMT users to cross and share the roads. This phenomenon has resulted to high number of NMT casualties on the roads. This situation was first demonstrated by Appleyard in 1981 as quoted in Labuschagne and Ribbens (2014). Appleyard carried out a comparison of three streets with the same morphology in San Francisco. However, these streets had varying levels of car traffic (2,000, 8,000 and 16,000 vehicles) in day. He established that the residents who lived on the low volume street had thrice more friends as compared to those living on high-volume streets. There is thus a need to view the street not just as a channel for vehicular mobility but as a social space of interaction (Collarte, 2012).

As per the NCCG (2015) the usage of existing NMT facilities in the city is relatively low as only 27.2 percent of the population regularly use pedestrian crossing, 23.5 percent regularly use overpass with only about 13.2 percent regularly using assisted crossing. Some of the identified reasons for not using the provided NMT facilities were; unmarked facilities at 42.6 percent indirect route at 30.1 percent, non-existence of the facility at 19.1 percent and the unsafe status of the facilities accounting for 5.9 percent of the respondents. In addition, human and motorist traffic congestion, air and noise pollution from vehicles, insecurity and obstruction of walkways made walking unpleasant.

2.4 Policy, Legal and Institutional Framework

This section highlights the policy, legal and institutional framework governing NMT infrastructure and users in the country.

2.4.1 Policy framework

Sustainable Development Goals (SDGs)

Published on the 19th day of July 2015, the final report of the Open Working Group (OWG) on SDGs is considered a major breakthrough for the sustainable transport community. Transport plays a critical role in sustainable development hence targets related to transport have been included in eight out of the seventeen SDGs. Goal 3 seeks to guarantee healthy lives and promote well-being for all people of all age groups. It targets to reduce global deaths and injuries associated with road traffic accidents by half by the year 2020. About 92 percent of the 1.24 million people who

die annually from road traffic accidents are from low and middle income countries. In these accidents, the most vulnerable road users like cyclists and pedestrians have the highest fatality risk. This call for the development of integrated and well-planned, transport networks so as to increase road safety. This could be achieved through the construction of pedestrian - oriented development patterns by utilizing people-centered planning.

Non-motorized transport can be used by both the rich and poor thus walking and cycling could be used to enhance equity among the different income groups. As documented by UN HABITAT (2013), cycling and walking offer cheap access to various destinations like work, school among other essential services especially to the poor segment of the population. Majority of the urban population in developing countries, do not own a car and in most instances, public transport is unaffordable thus resulting to NMT. For instance in African cities, walking contribute about 30-35 percent of all trips. Investing in safe and adequate infrastructure and facilities for walking and cycling therefore becomes paramount in achieving the Sustainable Development Goals. Investing in safe infrastructure for non-motorized transport will also contribute to achieving goal 1 of the SDG's. Often, road accidents push families to poverty especially when they suffer death or maiming of a bread winner through road accidents.

Target 3.9 of the Sustainable Development Goals aim to reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. The transport sector has an important role in achieving this target as it contributes 23% of all CO₂ emissions. In contrast, non-motorized transport is air-pollution free as it is powered by human energy. IEA estimates that a shift of 1 percent in distance traveled by car to non-motorized transport modes can help reduce energy consumption and pollution emissions by about 2-4 percent (Litman, 2007) Investment in non-motorized transport infrastructure is important in achieving such a modal shift.

In terms of policy, most countries lack policies and legislation that protects and promotes the needs of the non-motorized transport users. Putting in place policies for non-motorized transport, whether as stand-alone or integrated with wider transport policies, and most importantly implementing them is one sure way of achieving the

SDG target in question. The SDGs, Target 11.2 aim at providing accessible, safe, affordable and sustainable transport systems for all. This is intended to be achieved by road safety improvement through public transport expansion and at the same time pay special attention to the vulnerable group's needs. Safe and adequate cycling and walking infrastructure in cities including walkways, cycle tracks, ramps, crossing, foot bridges will facilitate safe and affordable access to destinations for such vulnerable group.

The New Urban Agenda

The New Urban Agenda was endorsed on the 23rd day of December 2016 by the United Nations General Assembly. It presents a paradigm shift founded on the science of cities. It has laid out principles and standards for planning, development, construction, improvement and management of urban areas. These principles and standards have been formulated along the five main implementation pillars namely: urban legislation and regulations, national urban policies, local economy and municipal finance, urban planning and design as well as local implementation. It recognizes the relationship between development and good urbanization by highlighting the connections between good urbanization and livelihood opportunities, job creation and improved quality of life. The New Urban Agenda further describes its connection with the 2030 Sustainable Development Agenda and more specifically Goal 11 on sustainable cities and communities.

African Agenda 2063

Transport networks and services throughout Africa have been steadily extended and improved over the last two decades. But there is a substantial task ahead to ensure transport contributes to achieving the socio-economic transformation of Africa in the coming 50 years as set out in Agenda 2063. Agenda 2063 is a strategic framework for transforming Africa's economy and meeting society's expectations. It builds on the Programme for Infrastructure Development in Africa (PIDA), Regional and National Infrastructure Plans and the New Partnership for Africa's Development (NEPAD). Agenda 2063 commits to a shared set of seven aspirations, three of which are directly relevant to transport:

- The first aspiration aims at achieving a prosperous Africa based on inclusive growth and sustainable development

- The second aspiration strives to ensure an integrated continent, which is politically united, founded on the Pan Africanism ideals and Africa's Renaissance vision.
- The seventh aspiration aims at realizing a strong, united and resilient Africa who is an influential global player and partner

The other four aspirations cover good governance and the rule of law, peace and security, values and ethics, and people-driven development by Africans. Although not directly linked to transport, these aspirations will enhance the contribution of the transport sector to achieving the Agenda 2063 aspirations.

To fulfil Agenda 2063 aspirations for African integration and political unity, the continent will be interconnected by means of strategic transport corridors. Thus, the policy goal is to maintain and upgrade existing Trans-African Highways and to build the missing links in connecting Africa's regions and countries. Economic prosperity depends on the free movement of goods and people along regional corridors and on national networks throughout Africa and with the rest of the world. Free movement will be achieved by harmonizing transit regulatory frameworks and setting up SMART corridors that operate intelligent systems for road and rail transport. The transport sector can and must create more jobs for men, women and girls, as well as for unemployed youth through, for instance, labour-based approaches mainly for road construction and maintenance, and service provision. Safe urban mobility is vital for access to employment and social amenities and essentially depends on integrating land-use planning and transport service demand. Access to urban amenities requires networks of footpaths for pedestrian and cyclists separated from motorized traffic.

Kenya vision, 2030

The Kenya Vision 2030 is a long-term development blue print for the country. By the year 2030, the vision seeks to change the Country into a newly industrializing and middle income country which provides a high quality of life to every citizen. It is founded on three pillars namely the social, economic and political pillar. The social pillar targets at making the country cohesive and a just society characterized by social equity, secure and clean environment. The economic pillar aims at raising Kenya's GDP to a sustained growth rate of 10 percent per annum. The political pillar seeks to

structure Kenya's political system into one that is democratic with rule of law that protects individuals' rights and freedoms.

The strategy gives priority to investment in infrastructure through establishing a firmly interconnected system of roads, airports, railways, ports, water, sanitation and telecommunication. It seeks to promote environmental conservation to support economic developments as key to and achievement of the SDGs which replaced the Millennium Development Goals (MDGs). The strategy recognizes that 50 percent of Kenyan population will be urbanized by 2030 and thus the need to plan for sustainable urban livelihoods.

Integrated National Transport Policy (INTP)

This policy paper is anchored on the maxim '*Moving a Working Nation*'. It recognizes the problems besetting the sector of transport in Kenya as a whole. The city of Nairobi has a number of transportation challenges. However, since the policy's vision is to achieve an integrated transport system, the study seeks to open up the transportation sector in a way of achieving an efficient integrated transport system. The importance of Non - Motorized and Intermediate Means of Transport (NMIMT) have been recognized in the formulation of policy proposals so as a way of addressing the needs of the poor in the society and promotion of a health population.

The policy recommends integration of NMIMT during the design development and operation of the transport sector. It also recommends promoting development and use NMIMT vehicles, providing the prerequisite road infrastructure and furniture like walkways, pedestrian crossing and footbridges so as to enhance the role of NMIMT in urban areas. The sessional paper notes that the development and maintenance of infrastructure for NMT will be supported by county governments and other road agencies such as Kenya Urban Roads Authority (KURA) among others. County Government of Nairobi is mandated to ensure adequate provision of sidewalks and pavements for pedestrians, parking bays, separate lanes, footpaths and bridges for NMIMT as well as ramps for the physically challenged.

Physical Planning Hand Book, 2007 (Subsidiary Legislation of the Physical Planning Act Cap 286)

This handbook provides clear and user-friendly guidelines with regard to the minimum acceptable standards on the practice of physical planning in the country.

The objectives of handbook are:

- To operationalize Physical Planning Act Cap 286 of the Laws of Kenya and subsequent legislations
- To develop a comprehensive land use planning standards and guidelines for emerging opportunities and challenges
- To integrate physical planning standards and guidelines with other relevant pieces of legislations, standards, guidelines and regulations.

Nairobi City County Non-Motorized Transport Policy, 2015

As highlighted in the NCCG (2015), NCCG in the first county in the country to develop an NMT policy. The aim of the policy is developing and maintaining a fully NMT integrated transport system within the city. The policy explores ways of creating a cohesive, safe and comfortable system of cycling lanes, footpaths, tracks, and green areas among other support amenities. It also puts in place laws and regulations of preventing encroachment on NMT facilities by MT modes and other street users.

The policy has got objectives and strategies that will lead to the improvement of the environment and culture of NMT in the city. The objectives of the policy are to increase: mobility and accessibility; transport safety; NMT amenities and; recognition and image of NMT in Nairobi County as well as ensuring adequate funding/investment for NMT infrastructure.

According to the policy, the city county of Nairobi intends to apply the following strategies in achieving the above stated objectives:

- Leadership and priorities
- Adequate funding
- Integrated Planning
- Street design and maintenance
- Incorporating a modern design for parking of motor vehicles and introduction of restrictions
- Application of traffic relaxation strategies
- Design and provision of cycling facilities
- Integrations of NMT with public transport, private car and street business
- Promotion of education and awareness on NMT in the city

- Formulation of regulations and enforcement
- Constant monitoring and evaluation

The policy cites that inefficient public transport, traffic congestion, radial network system, inefficient traffic management, lack of non-motorized transport provisions, weak land use planning and development control as the conspicuous characteristics of transport in the city.

Specifically, the policy findings culminated to definition of the key challenges facing NMT in the city, these are;

- **Lack of policy implementation:**

This is manifested by the lack of provision of balanced transport system inclusive of NMT facilities in spite of the existence of an integrated national transport policy (INTP) that was approved in December, 2012. The policy recognizes that there has been little focus on NMT over the years with transport professionals focusing on roads for motorized transport, resulting to no funding for NMT provision. The policy stipulates that development and management of infrastructure for NMT shall be supported by local authorities and road agencies. The guidelines are well laid in the policy but unfortunately there lacks champions at the National or County level to implementation. This is quite a common occurrence in the country in many sectors not only transportation, thus the need to relook at the institutions are establish where the disconnected exists.

- **Road-based Nairobi transport system**

The system is for the most part road based and more so private car use. The system has not taken to account the needs of other modes evident with lack of affordable practical choices for other users. The system has not provided for practical and convenient alternatives to the private car. This leaves these city residents with minimal modes of travel which are still problematic to use.

- **Lacking NMT users' infrastructure**

Over the years the road designers have not paid a lot of attention to NM facilities provision. This is attributed to the vehicle-oriented engineering and planning for transport systems. Currently the facilities are lacking and where available they are in deplorable conditions. Ideally NMT facilities ought to be incorporated with the MT modes and they should to meet the minimal requirements of directness, safety,

coherency, and comfort. Unfortunately, this is not the case within the large part of the city.

- **Lack of enforcement and encroachment into NMT spaces:**

This is manifested by presence of parked vehicles, hawkers, motorcycles and matatus on the footways obstructing movement of pedestrians. Unfortunately, the existing legislations are silent of this and thus it goes unpunished thus propelling its occurrence.

- **Pedestrians Safety:**

This could unfold in several dimensions such as injury related to road and traffic conditions, behavior of users and also lack of enforcement of traffic laws. NMT users are constantly vulnerable to high speed MT and lack of protection from these users.

- **Accessibility problems**

This problem is mostly experienced by cyclists who require parking facilities at their destinations which are lacking. Further the gradients of the foot bridges are too steep thus curtailing movement of cyclists.

- **Discomfort in usage of pedestrian and cyclist facilities:**

While developing the policy the NMT users consulted sited that the walk ways are in poor conditions and are rarely maintained. Further the ones which are tarmacked had potholes and ponding water during the rainy season. Another unpleasant observation was that the maintenance -works contractors usually leave debris and mounds of earth piled on the walkways and cycle lanes after the road works thus inhibiting movement.

2.4.2 Legislative framework

The Constitution of Kenya, 2010

Article 53 of the Kenyan Constitution stipulates that all the citizens inclusive of the people with disability have the right to adequate access to all places, information and public transport. This provision is applicable to the study since the study aims at understanding the state of provision and usability of NMT facilities. Thus, strategies to address the constraints hindering this provision need to be put in place. Section four makes freedom of movement and association a fundamental human right. To help in the actualization of this human right, the NCCG policy on NMT has proposed the

integration and inclusivity of Nairobi's transport system through the provision of the required space and facilities.

The Physical Planning Act (CAP 286)

The Act stipulates that preparation of regional physical development plans should be undertaken for land improvement by providing the suitable physical development for the land. The development plans among other things, secure ideal areas for provision of residential, industrial, recreational areas, public purposes, commercial, utilities and services as well as transportation land uses.

Traffic Act Amended, 2012

In order to prevent the commission of traffic offences thus minimize the loss of Kenyan lives through road accidents, this Act seeks among other things, to increase the penalties for various traffic offences. Most traffic offences are associated with cyclists, pedestrians and speeding vehicles. Thus, punishing the offenders in such respects would enhance cyclists and pedestrians safety as well as ensure that NMT as a transport mode is recognized in the city. The protection of NMT facilities is highlighted in Section 45a of the Act which states that "no person shall, in order to avoid a buildup of traffic on a road, drive a motor vehicle on, or through, a pavement, cycling lane or a pedestrian walkway."

Urban Areas and Cities Act, 2011

This Act provides for urban areas classification, management and governance. It also sets out the standard for the creation of urban areas, the governance principles and upholds residents' participation. To ensure efficient provision of social services to city residents, the Act creates boards of cities and municipalities to perform the function. This Act's provisions are essential in running the City of Nairobi in regards to service provision, and public involvement in the processes of planning and provision of infrastructural facilities.

Environmental Management and Coordination Act, Amended, 2015

In the second schedule, this Act recognizes several projects which require undertaking an Environmental Impact Assessment (EIA) before their implementation. In the transportation category, some of the projects that require an EIA include the construction of major roads, railway lines, airports and water transport. In addition,

the act requires constant monitoring of emission from the motorized traffic since the emitted gases are hazardous to the health of the population.

Kenya Roads Act, 2007

This Act gives provisions for the creation of Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA) and Kenya Rural Roads Authority (KeRRA) and outlines the functions and powers bestowed on the authorities with the aim of providing better road networks in the Country.

National Transport and Safety Authority (NTSA) Act (2012)

This Act of Parliament was created to provide for the powers and functions of NTSA. Some of the functions of the authority as stipulated in the Act include; Advising and making recommendations to the Cabinet Secretary on road transport and safety matters, Implementing road transport and safety policies, Planning, regulating and managing the road transport system and, Ensuring that safe, efficient and reliable road transport services are provided. The authority is also responsible for the harmonization of key road transport departments operations, helping in the effective management of the road transport sector as well as reduction of road traffic associated deaths as outlined in subsection (1).

2.4.3 Institutional framework

Kenya Urban Roads Authority (KURA)

KURA has the mandate of managing, rehabilitating, developing, and maintaining all public roads in the cities and municipalities in the country with the exception of national roads.

Kenya Roads Board (KRB)

Kenya Roads Board has the mandate to offer oversight on the Kenya's road network. The board coordinates the development, management and rehabilitation of all public roads in the country.

Traffic Police Department

The department of traffic police in the country assists in traffic flow management and ensures observance of traffic rules and good conduct on the roads for all road users.

Matatus welfare association and Matatus owners' association

These play a crucial role in lobbying for the well-being of the vehicle owners and operators in the Country. They influence the transportation policies since they are part of the transport sector and therefore they ensure that the policies are in favor of their interests.

Ministry of Transport, Infrastructure, Housing and Urban Development

The Ministry is responsible for all investments in the transport sector in the country. The department of transport is mandated to manage the national roads development policy and the transport policy. The department is also required to oversee roads development, maintenance and standardization as well as safeguarding of road reserves from encroachment.

City County Government of Nairobi

The County Government has the mandate to manage and maintain the urban transport systems which are mainly roads and supporting infrastructure. It is also charged with provision of other pedestrian related facilities such as walk ways, cycling lanes, street furniture, litter bins, street lighting among others. The County Government recently committed to provision of NMT facilities in the city by preparing the very first NMT policy, 2015.

Nairobi Metropolitan Services Improvement Project (NaMSIP)

NaMSIP is one of the four donor-funded projects under the State Department of Housing and Urban Development. NaMSIP is a World Bank supported project that became effective on 17th December 2012 with a five year project design but a two year extension was granted to the project pushing the end date to May 2019. The total project cost is USD330 million (USD 300 million and GoK USD30 million). Nairobi Metropolitan Region includes five counties namely: Nairobi, Kiambu, Kajiado, Machakos and Murang'a. The objective of the project was to support provision of urban services and infrastructure in the region including NMT infrastructure. The project pays great attention to NMT and has hence constructed pedestrian walkways and bicycle paths.

Nairobi Metropolitan Area Transport Authority (NaMATA)

This authority was created in February 2017 through a presidential order. It was meant to have oversight duties on the development of an integrated, efficient and

sustainable public transport within the metropolitan region which comprises of Nairobi, Kiambu, Murang'a, Machakos and Kajiado Counties. To solve the transport problem in the Nairobi metropolitan area, deliberate efforts have been done, among them, the formulation of the *Integrated National Transport Policy, 2012* which recommended the establishment of NaMATA.

In collaboration with NaMATA, ITDP has updated the BRT design framework and provided common set of guidelines for implementation of BRT projects in the city so as to ensure planning of new corridors adapts an integrated approach. The proposed design framework integrates a robust corridor, intersection designs, station, and quality access to pedestrians and cyclists. In addition, ITDP in collaboration with MTIHUD and public works are working to develop design standards for urban streets in the country so as to ensure high quality NMT facilities.

2.5 Theoretical Framework

As highlighted by Friedmann (1979), theory is critical in the practice of planning profession. It offers explanations for decisions, gives guidance on likelihoods, and enables ethical behavior as it describes, explains and predicts phenomenon based on extracted rules. This study is based on the systems approach to planning and new urbanism theories as discussed below.

2.5.1 Systems approach to Planning

Systems theory was first propounded by von Bertalanffy (1968). It is an interdisciplinary theory concerning all systems in society, nature and scientific domains and provides a framework for holistic investigation of phenomena (Capra, 1997). Systems approach emanated from the change in focus from the part to the whole where observed phenomena was seen as integrated and interrelating and the individual aspects of the single parts got indistinct (Jackson, 2003). This planning approach highlights that a phenomenon can't be fully understood by breaking it into small parts then reconstructing it but rather the broad vision needs to be used to determine its functionality.

Transportation systems consist of the travel ways, vehicular traffic and terminal facilities which interact with other elements in the urban environment such as land use, population, and transport management systems (Demitriou, 2011). The level of

interaction of these elements determines the efficiency of the urban transport system. The operation of these components is controlled by transportation regulations. Transportation systems in urban areas need planning to operate efficiently despite the growth of the city. Demetriou (2011) considered the Urban Transportation Planning (UTP) approach as one of transportation planning approaches undertaken in the urban areas. It uses the system approach as one of the new approaches to transportation planning. Improvement of travel ways is likely to attract a lot of vehicular traffic especially where there are no controls for access by traffic control department.

The systems approach represents a distinct perspective with regard to the design and management of complex objects that could be of great help in solving problems of this kind. As much as the approach is not, able to solve all urban transportation problems, it can help improve the structure and methods of designing urban transport system. The approach uses the concept of “the system” in exploring complex phenomenon by categorizing it into objects, properties and relationships hence its effectiveness (Uempv, 1963). The approach enables transportation planners to describe the transport network of a city within a given framework as well as undertake structural analysis in the design process. These structure examinations form a vital component of systems analysis and leads to an evaluation of the connection between the elements and the subsystems.

NMT is a sub system of the urban transport system hence the need for combination. The objective definition of NMT integration is to put together or combine with the motorized mode in the urban transportation system. NMT integration into the urban transport system means streamlining it in the larger transport system and this system integration occurs at three levels. The first is at the institutional level, the operational level and the physical level (Sharma, 2002). Though in most places, NMT users are the majority, they are always left out during the design and upgrading of transport infrastructure. For instance, construction of new roads or road upgrading doesn't have provisions for NMT infrastructure like shoulders and overpass for already existing NMT users. In most cases, this leads to high NMT-automobile accident rates, total elimination of NMT traffic and longer travels times for NMT users. This neglect breeds a transportation system that has zero regard for NMT users and only factors

motorized transport. As a sub-system of the transportation system, NMT needs to be considered during the infrastructure design (Guitink et al, 2004).

Some of the objectives of urban transport planning are: promotion of efficiency and equity, integrating transportation and land use and provision of the required facilities for pedestrian and Non-motorized vehicles. The application of the systems theory in developing countries such as Kenya should put into consideration the culture, economic and social characteristics of the population (Demitriou, 2011). The World Bank (2002) studies found that the paratransit mode of transport is the dominant and development of other systems should consider integration of this system. Therefore, urban transportation planning in Nairobi city cannot be accomplished without considering the NMT infrastructure.

2.5.2 New Urbanism theory

The design of New Urbanism community supports the public space over the private space. Katz (1994) highlighted that the principle was reflected in so many aspects like; the interrelationship between the design of the buildings and the public space, coordination of the land use scale and regional road network and community building types and functional arrangement. The concept of new urbanism development focusses on the community design as well as the linkage from the regional scale to small urban scale designs. The development strategies utilized in this concept are; promotion of the community's diversity, population scale, public space and structure in the entire area and; applying similar development principles in the design and planning of the area (Peter and William, 2001).

According to this theory, the urban center is viewed as a multi-functional mixed use public activity center and a vital public space. The design of the center is done to enable adaptation to walking and use of public transport. The urban core, urban center, neighborhood center and rural center comprise of the four categories of centers that constitute the urban public space system. These levels of centers have different sizes, service radius and offer the residents with various levels of life choices. In this regard, the community needs to prioritize public space.

New urbanism theory advocates that most places should be within a 10-minute walk from home or work. Thus, pedestrian-friendly street designs are vital and these streets

should be car free. Some of the designs that would be considered are interconnected street grid network as it separates traffic and eases walking. In addition, provision of a hierarchical network of narrow streets, boulevards and alleys with quality pedestrian walkways would make walking pleasant. The theory further recommends pedestrian-friendly designs that encourage a greater use of bicycles, rollerblades and walking as daily transportation.

The new urbanism presents a different way of thinking with regard to urban form and development. It borrows lessons from some of the most beautiful and successful cities, thus promoting mixed use, compact, walkable and fairly self-contained communities. The approach advocates for traditional architecture and building patterns that promote walking and creation of strong urban identities as opposed to car-oriented development practices. NMT can be characterized as resource-efficient travel modes since they impose little costs on the users and the environment and utilize negligible road and parking space.

NMT modes help in the creation of more liveable communities and cities since they offer healthy exercise and enjoyment. Creating conducive walking environments make them conducive to people. Walking forms a vital component of the transport system. It offers the linkage between homes and public transport as well as parking lots and destinations. Despite the key role played by NMT modes in the daily lives of the population, these modes are always not given the necessary attention. Conventional transport planning operates on the assumption that driving for 5 mins to run an errand is better off than walking or cycling for 10 or more minutes. This planning approach puts consideration only on vehicle operating costs but ignores external impacts like congestion and parking costs. The health and enjoyment benefits associated with NMT usage are also not valued. With such assumptions, most planning decisions tend to favour MT at the expense of NMT.

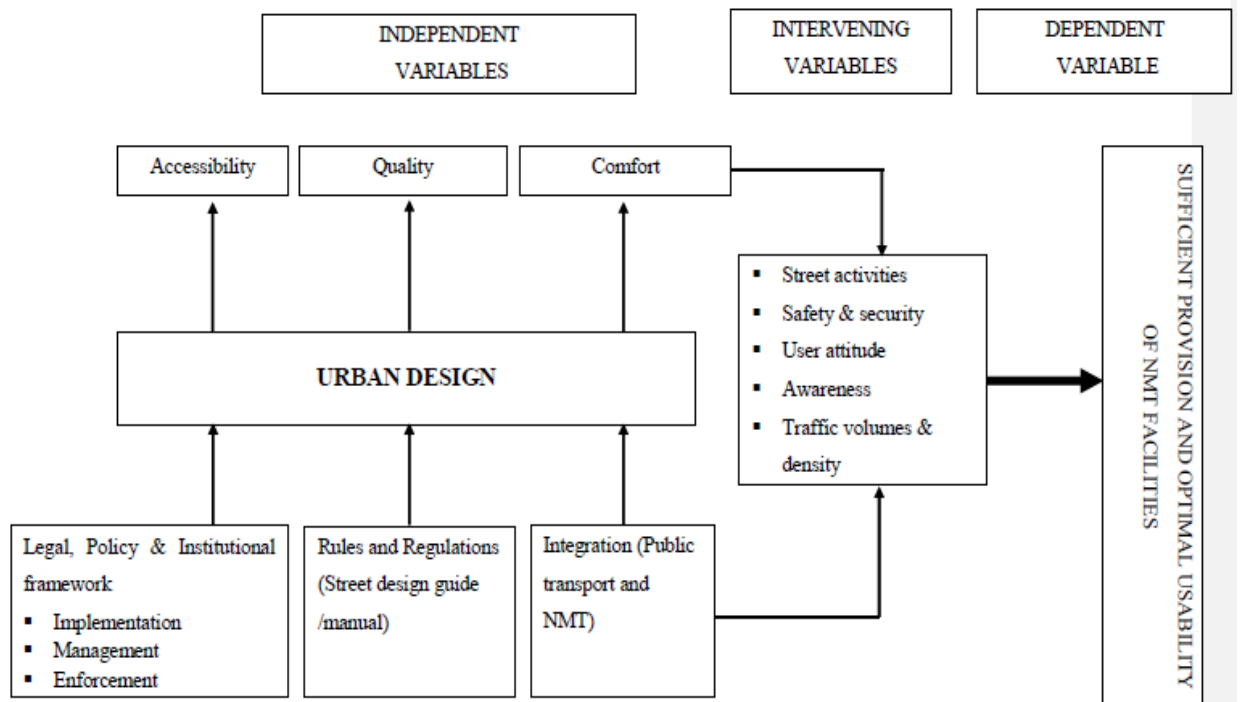
In a city with proper urban transport planning, the presence of NMT infrastructure gives the working population travel options to choose from. This reduces the increased use of car travel and strengthens the efficiency of public transport. In addition, promotion of NMT usage will enhance the creativeness of architects and planners who will create innovative designs that attract people in the city. These areas would become vibrant public spaces where people would meet and interact thus

reducing the necessity of the car. As said by Gehl (2007) "The city is for the people and not for cars".

2.6 Conceptual Framework

The conceptual framework derived from literature review outlines the independent, intervening and the dependent variables of the study as shown below;

Figure 2: Conceptual framework



2.7 Chapter Summary

The chapter reviewed literature related to provision and usability of non-motorized transport infrastructure. The review is done on a three pronged approach, global, regional and local context. The key areas covered in the chapter include; Status of NMT in Urban Areas, NMT Provision and Usability, NMT Provision and Usability Legal and Policy Framework, Theoretical Framework, Conceptual Framework and Chapter Summary.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

The chapter outlines the complete research design, highlighting the data needed and the action to be taken to acquire the required data. The strategy of the research provides a framework for formulating a chronological study that will adequately respond to the study questions/research objectives with an aim of filling up the existing knowledge gap on NMT facilities on the street.

3.2 Research Design

A research design is a description of the explicit strategy that the researcher anticipates to use in undertaking his/her study in the best suitable way of achieving the research objective (Burns and Grove, 2003). The study involved three stages which include conceptual, narrative and interpretation stage. The conceptual segment involves development of the research problem, questions and the objective. This was done through thorough literature reviews during which the researcher familiarized himself with the policies, concepts and theories related to the subject under study.

The narrative segment involved the procedure for planning the study. The researcher demarcated the area of focus and the extent on which the field surveys and observations were to be done. In addition, the data required, research methods and the techniques employed in collecting, analyzing and presenting the data were designed.

The interpretive stage of the research commenced upon completion of data collection, cleaning, analysis and synthesis. At this juncture, the researcher engaged in rational interpretation of the data making sense of it and responding to the research questions. An essential part of this stage was testing of the study hypothesis, in this, the researcher it determined whether or not there was a relationship between NMT infrastructure provision and usability.

The study further sought to explore the relationship between NMT infrastructure provision and usability. The study was correlational in nature hence adopted correlational design. Correlational studies indicate the associations among variables by use of correlation or cross-tabulation techniques. Correlational design is also referred to as *ex post facto* design which simply implies *from after the fact*. Correlation study basically helps to determine the existence of relationship between

variables. In cases where a relationship exists, it helps determine a regression equation that could help make inferences to the population. Correlational design was used to determine the relationship between NMT provision and NMT usability along Tom Mboya Street in Nairobi.

The study adopted mixed research approaches; both qualitative and quantitative methods were used to assess the nature of relationship between NMT provision and NMT usability along Tom Mboya Street. Qualitative research emphasizes on the manner in which people interpret their experience and their environment (Holloway & Wheeler, 2002). This approach was acceptable in this study by the need to understand and describe the acuties that the NMT infrastructure providers and the users have on the affiliation between NMT infrastructure provision and usability.

In a view to apply exploratory approach, the researcher conducted review of previous literature that was done regarding the subject of the study. This was done with an aim to relate the study results to the germane theories that have been hypothesized by various researchers. This aided in understanding the phenomena that had been studied in relation to the subject matter and to authenticate the validity of the findings in this study.

3.3 Target Population

The study's target population included pedestrians, cyclists, traders/business operators (both formal and informal)⁵, private road users, public vehicles operators, the implementing agencies and also the key informants from the NCCG departments of City Engineering and Traffic Police, Traffic Management section, KURA and National Transport and Safety Authority. Relevant officials were selected from each of the departments and institutions.

⁵ Formal business operators encompass of the traders within the commercial premises and are issued with a business permit by the City County Government authorizing them to do business in the city. Informal businesses operators are the traders who are temporarily located on the pedestrian walkways and are issued with a temporary business permit to operate. These include; newspaper vendors, books & magazine vendors, shoe shiners, PWD business operators. Hawkers fall under this category but have no permit to conduct business.

3.4 Sampling Plan

a) Road use sample size

The road users included pedestrians, cyclists, traders/business operators, private road users and public vehicles operators. Among other things the road users were expected to outline the level of provision of NMT infrastructure and of their experiences in use of the facilities and also the relation between the NMT users and the motorized road users. These groups of respondents were interviewed at different spots along the street. The study sample size was 138. This was calculated using the following formula:

$$N = \frac{T^2 \times P(1-P)}{M^2}$$

Where:

N = Sample size

T = Confidence level, 95% confidence level, whose standard score is 1.96

M = Tolerable margin error

P = Estimated prevalence to the NMT provision and usability (90% of the total population)

$$N = \frac{1.96^2 \times 0.8(1-0.8)}{0.05^2} = 138$$

$$0.05^2$$

b) Institutional sample size

The respondents sampled under this category included informants from NCCG departments of City Engineering and Traffic Police, Traffic Management section, KURA and NTSA. One official from each institution was interviewed.

3.4.1 Methods of sampling

The study employed the following non-probability sampling techniques:

i. Purposive Sampling

As documented by Richie, et, al., (2003) this type of sampling is used to select specific individuals of concern to the topic under study. Purposive sampling was used in selecting the key informants for the study.

ii. Quota sampling

This sampling method ensures that the sample group selected has specific features of the population chosen by the researcher. The population was divided into the following groups: pedestrians, cyclists, traders/business operators, private car users and public vehicles operators. The final sample of 138 was arrived at after the pilot study was conducted which was benchmarked with various other studies conducted in Nairobi's Central Business District such as NIUPLAN. Then the proportion of subgroups in the population was determined to arrive at the sample size. The respondents were selected from the various subgroups while taking into consideration the population proportions to arrive at 138 as follows;

Table 2: Population Proportion

Respondents	Number
Pedestrians	76
Cyclists	5
Traders/business operators	35
Private vehicle road users and public vehicles operators	22
Total	138

3.5 Data Needs Matrix

3.5.1 Data Types

The data required for this study falls under two categories: primary and secondary data. Primary data entails the data which was acquired directly from the field while secondary data was obtained from review of literature from journals, periodical reports-economic surveys, statistic abstracts, census reports, working papers, published and unpublished books, physical development plans, County Integrated Development Plan.

3.5.2 Data Needs and Sources

The research objectives guided in determining the data needed for the study:

- a) **Determine the current state of the provided NMT facilities along the street**

The data required on this objective include: the current provided NMT infrastructure along the street; the state/conditions of the infrastructure; the users of the facilities, the

street design and the relationship between provision and usage of the facilities. This data detailed out the situational analysis of the NMT infrastructure on the street. The data was acquired through observation, spatial mapping and physical counting.

b) Determine activities affecting NMT facilities along the street

To address this objective, the required data were the activities along the street. Depending on these activities a land use map was generated illustrating the spatial distribution of activities along the street. An analysis was done to determine the effects that the major land use activities on the street have on the provision and usability of NMT infrastructure. The data was sourced from aerial photography, observations, interviews, photography and literature reviews.

c) Establish the factors affecting usability of the provided NMT facilities

The data required to address this objective included; existing policies, theories and concepts on NMT provision and usability: factors affecting provision of these facilities, factors influencing usability of facilities and the actors behind the management and provision of NMT infrastructure. The data was sourced from literature reviews, observations and interviews.

d) Recommend interventions for adequate provision and optimal usability of NMT facilities

The data required for this objective included: Urban Mobility Plan for pedestrians, bicycles and other forms of non-motorized transport, Sustainable and practical NMT policy, Attainable and Suitable street design, required modifications to motorized transport infrastructure to accommodate the needs of NMT, Interventions to improve the supply of non-motorized transport and operational and practical Legal and institutional framework. The synthesis of the above outlined data aided the formulation of practical planning interventions (physical and institutional) for pedestrian friendly streets. The table below summarizes the data needs with respect to the study objectives:

Table 3: Data Needs Matrix

Research objectives	Data needs	Data sources	Data collection methods	Data analysis methods	Data presentation methods	Expected output
Identify the current state of the provided NMT infrastructure along the street	Current NMT facilities provided Conditions of the provided facilities Users of the NMT facilities The adequacy of the provided NMT facilities Street designs	Secondary sources Field survey	<ul style="list-style-type: none"> ○ Literature review ○ Observation ○ Photography ○ Traffic count ○ Statistical correlations 	<ul style="list-style-type: none"> ○ Spatial analysis ○ Descriptive analysis ○ Statistical tests and correlations 	Maps Photographs Descriptive texts Report	A report on the current NMT facilities, their conditions and adequacy along the street
Map NMT black spots along the Tom Mboya street	Existing activities along the street Traffic generated by the activities The impacts the activities have on NMT facilities Land use map Satellite imagery	Secondary sources Field survey Google earth World wide web	<ul style="list-style-type: none"> ○ Literature review ○ Observation ○ Interviews ○ Photography 	Descriptive analysis Statistical tests and correlations	Maps Descriptive texts Report Photographs Graphs	A report on land use activities along the street and their effects of NMT usability
Analyze the factors affecting usability of the provided NMT infrastructure	existing policies, theories, concepts on NMT facilities Factors influencing the usability of NMT facilities Actors affecting provision,	Traders Street vendors Pedestrians Motorized road users	<ul style="list-style-type: none"> ○ Literature review ○ Observations ○ Interviews 	Descriptive analysis	Descriptive texts Graphs/Charts	A detailed report explaining on the factors/actors that are affecting NMT facilities

	usability and management of NMT facilities	Boda boda operators Field survey			Report	use along the street
Propose planning, design and policy interventions for sufficient provision and optimally usable NMT infrastructure	Urban Mobility Plan for pedestrians, bicycles and other forms of non-motorized transport Sustainable and practical NMT policy Attainable and Suitable street design Required modifications to motorized transport infrastructure to accommodate the needs of NMT. Interventions to improve the supply of non-motorized transport. Operational and practical Legal and institutional framework	Study results	Synthesis of findings	Descriptive analysis Spatial analysis	Report Maps Design drawings	Appropriate street design for sustainable urban mobility along the street

3.6 Data Collection Methods

Both quantitative and qualitative data were collected from multiple sources, using multiple methods by multiple investigators. This was to allow for triangulation hence improve validity of the findings. The sources of data were primary and secondary while the methods included document examination, case study reviews, individual and group interviews, round table discussions, observation, oral history and instrument administration.

a) Interviews

This entailed one on one interviews with the road users (pedestrians, PSV operators and private cars owners, *boda boda* operators, business operators (both informal and formal) and the key informants from NCCG Department of City Engineering, Traffic Police Department, NCCG Traffic Management section, NTSA and KURA.

b) Instrument administration

Actual measurements of the pedestrian lanes were done using appropriate methods. If good quality pedestrian facilities are provided, then demand will tend to increase. This was done to illustrate the existing situation in comparison to the ideal street scape as stipulated in the international street design standards. For the establishment of minimum space standards, pedestrian facility designers utilize body depth and shoulder breadth. For a single pedestrian, a simplified body ellipse of 0.50 m * 0.60 m, with total area of 0.30 m² is used.

c) Document reviews

This entailed reviews of relevant documents to the study. These documents were inclusive of population census reports, NMT policies, transportation policies, books, past research reports, research and periodical journals, print media publications and the internet. Case studies from other parts of the world that have experienced the same problem and developed a solution for were also reviewed to gather information on how the interventions were integrated and the processes of efficient operations.

d) Observation and photography

An observation checklist was formulated to ensure that all the data that needed to be gathered through observation was captured. This consisted of key and relevant features in the study areas such as NMT infrastructure, activities, type of houses street

scape and materials used for house construction, structures etc. Photography was also used to amplify evidence of study phenomena.

e) Sketching

This was used to draft various features while in the site for the purpose of illustration which included street cross sections, elevations, street design/environment, and activities along the street among other features.

f) Digital mapping

A recent satellite image was digitized to produce the base map for the study area. The maps indicated the spatial layout of the street, the land uses the street and its infrastructure, the neighboring urban form and the traffic flow, points of conflicts, movement of pedestrians among other analytical features.

3.7 Data Analysis Methods

Various methods were used to analyze the collected data. They include use of SPSS to generate frequency distributions and measures of central tendency. Statistical tests such as Correlations and regressions were conducted on quantitative data in measuring the relationship between provision and usability of NMT infrastructure. Document analysis and analysis of maps and photographs were also undertaken. Qualitative data was analyzed using both case analysis and cross-case especially on data collected through interviews.

3.8 Data Presentation Plan

The findings was reported both descriptively and graphically using, tables, bar charts, histograms, pie-charts, graphs and spatial maps and 2D and 3D design models.

3.9 Ethical Considerations

The researcher ensured the respondents confidentiality of the collected data. The research finding was solely for the purpose of the study and any publications will adhere to consent regulations that guide research world over. The research was based on objectivity, honesty, social responsibility, confidentiality, non-discrimination and respect for intellectual property.

CHAPTER FOUR

STUDY AREA

4.1 Overview

This chapter presents location, demographic characteristics, physiographical features, socio-economic status, social and physical infrastructure, land and land use as well as the history of physical planning with reference to Tom Mboya Street in Nairobi Central Business District.

4.2 Geographical Location

Kenya is located on the East Coast of Africa. It shares borders with the Republics of Ethiopia, Somalia and South Sudan to the North, Republic of Tanzania to the South, Republic of Uganda to the West and the Indian Ocean in the East. The country has an approximate area of 610,000Km² comprising of 590,000Km² land and 20,000km² water surfaces. The main inland water surfaces are comprised of a section of Lake Victoria and Lake Turkana. About 510,000Km² of the total land areas accounting for more than 85 percent is categorized as arid and semi-arid lands (ASAL) leaving less than 15 percent of land as arable land (JICA, 2014).

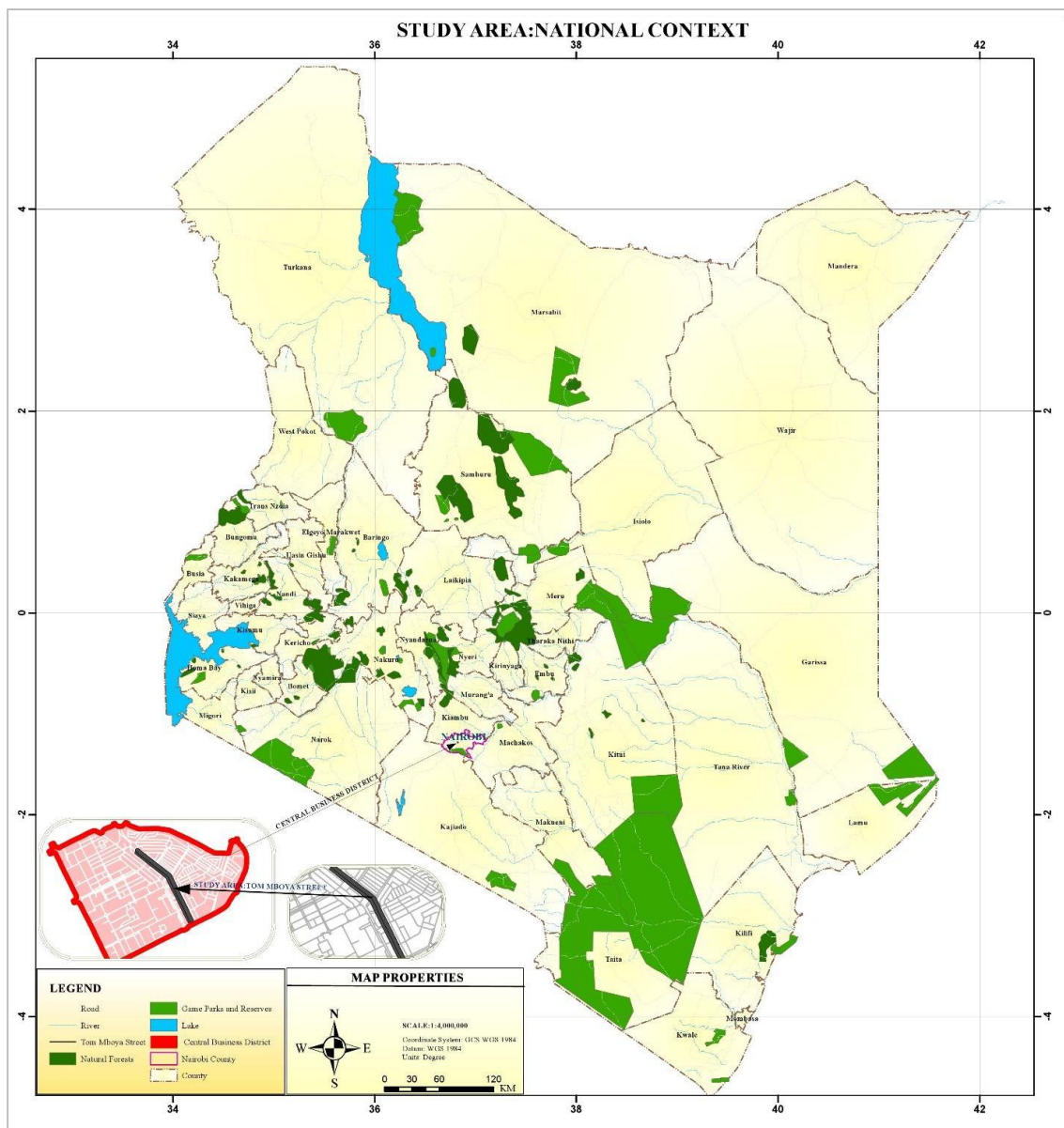
Nairobi City is the country's capital and a center of politics, economy, administration, and culture for Kenyan people. The name emanates from the Maasai phrase "*Enkare Nyrobi*" which means "cool water", as they referred to River Nairobi that flows through the city. The spatial coverage of the city is an approximate area of 700Km². To the North, the city is bordered by Kiambu County and Kajiado County to the South and South West, to the East and South East; it is bordered by Machakos County. The study area is located within the Nairobi Central Business District (CBD) which is within City square sub location Ngara location, Nairobi Central ward, Starehe Constituency/Sub County in Nairobi City County (Wiesmann et al., 2014).

Tom Mboya Street forms the study area. It extends from junction with Murang'a Road and connects with Haile Sellassie Avenue. It is situated at the southern edge of the inner and outer CBD. The street is multi-user with tall buildings which consist of shops, small stalls, offices, fast food stores, nightclubs, hotels and lodgings as well as major supermarkets. It is also a main transport street with numerous matatu terminal facilities along the street which is popular for congestion from people, hawkers and vehicles. The street was originally named Victoria Street, after the queen and was

later named after a prominent political disposition in the history of Kenya, Tom Mboya. The renaming of the street to Tom Mboya was done as an honour and in commemoration of the assassinated politician. Tom Mboya founded Nairobi People’s Congress Party, which was critical in the Kenya African National Union (KANU) formation. At the time of his death in 1969, he was the Minister of Economic Planning and Development (Khayesi et al., 2010).

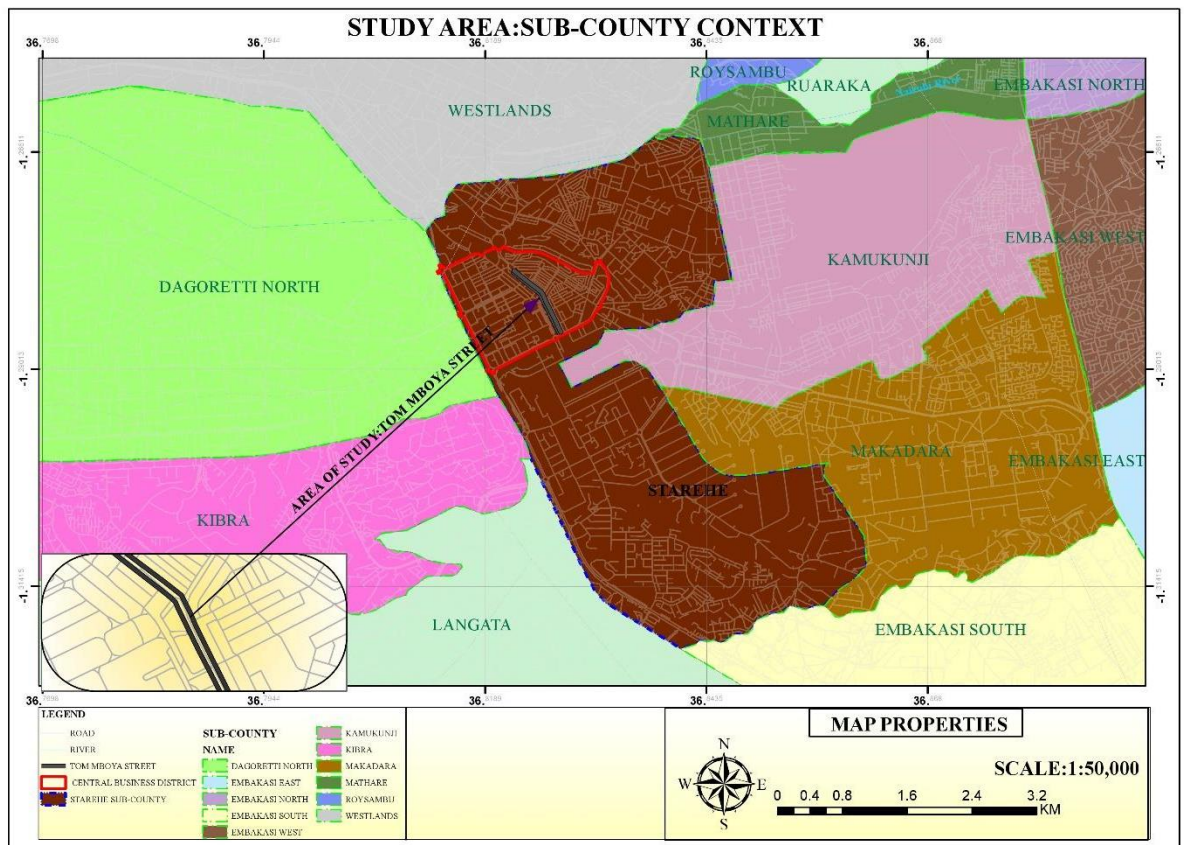
Map 1-4 below shows the location of the study area in the National, Sub-county, Ward and Sub-location context:

Map 1: Study Area in the National Context



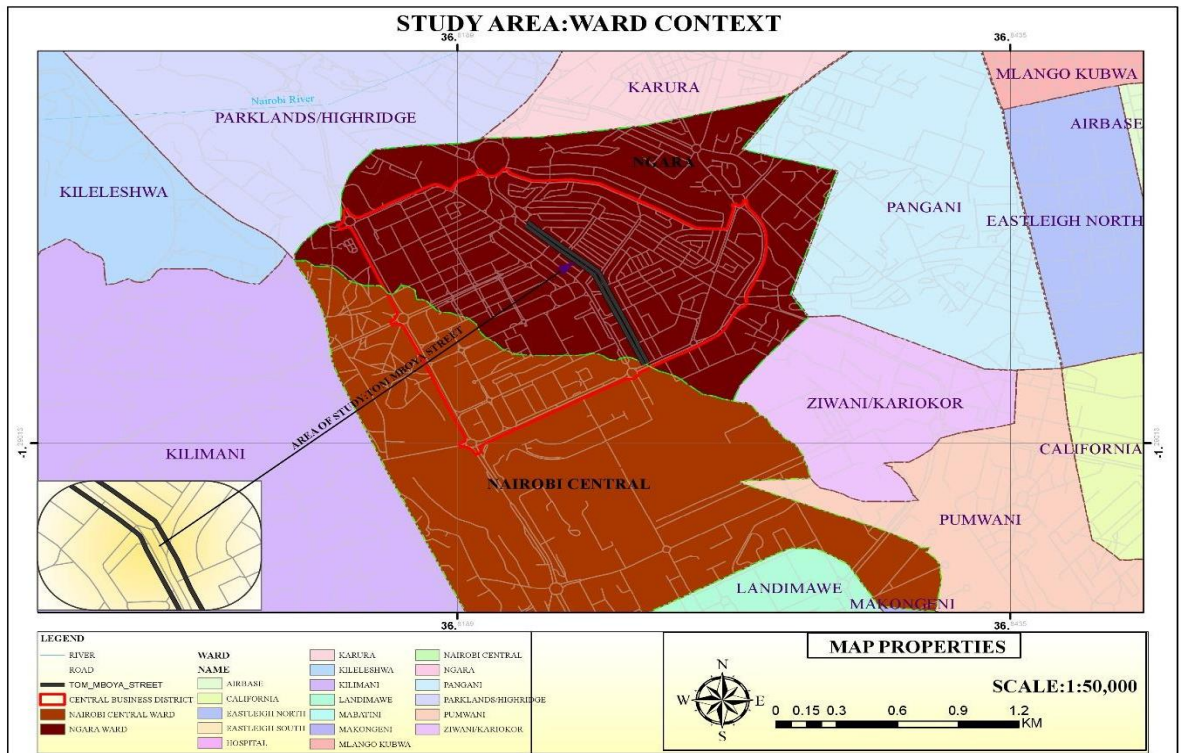
Source: Kenya GIS data

Map 2: Location of the Study Area in the Sub-county Context



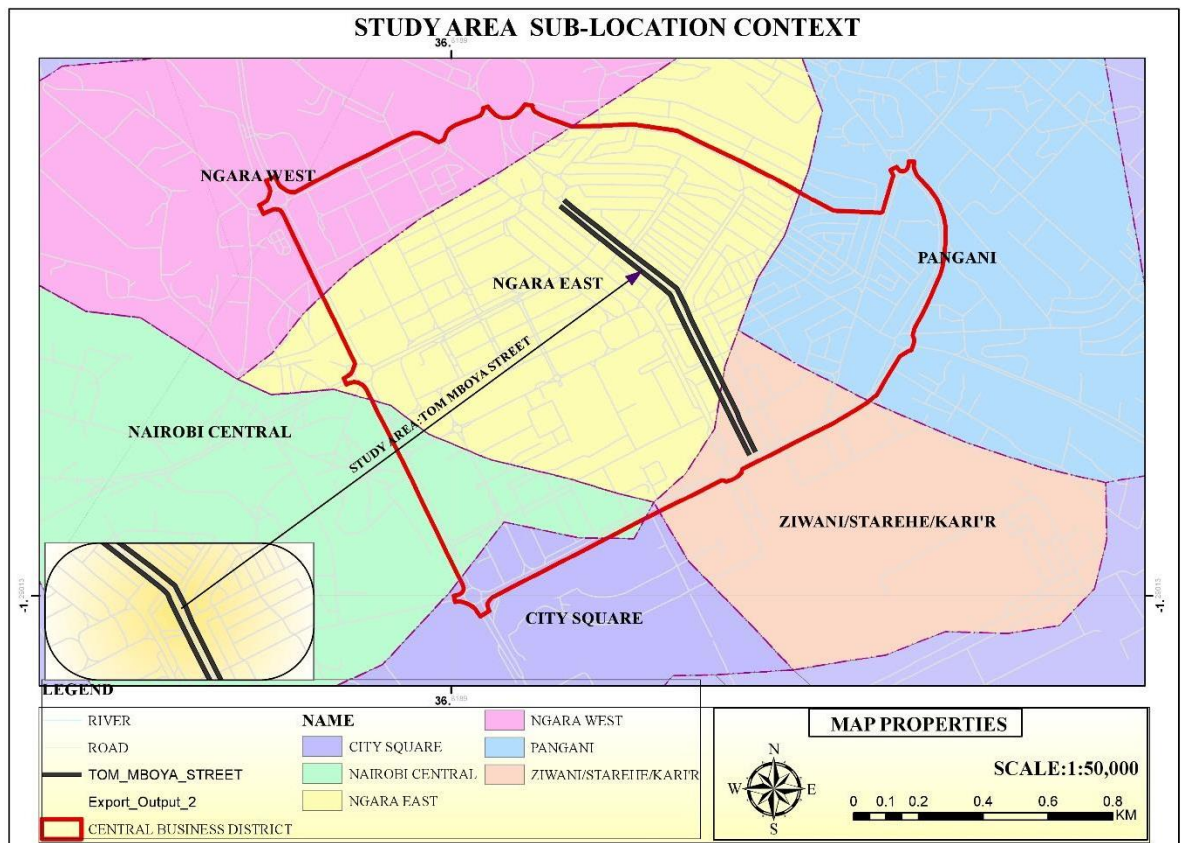
Source: Kenya GIS data

Map 3: Location of the Study Area in the Ward Context



Source: Kenya GIS data

Map 4: Location of the Study Area in the Sub-location Context



Source: Kenya GIS data

4.3 Demographic dynamics

These are inclusive of the population size, the population density, population composition and also projection.

4.3.1 Population Size

According to the Kenya Housing and Population Census, Kenya had a total population of about 38,610,000 people. The city of Nairobi on the other hand had a population size of about 3,138,000 people translating to 8.1 percent of the country population (KNBS, 2009). The population of the city has been growing steadily since the last census conducted. The city's rate of population growth has been relatively more than for the rest of the country. The average growth rate of the greater Nairobi was about 4.2 percent and 4.0 percent between 1989 - 1999 and 1999 – 2009 censuses respectively while the national growth rate stood at 3.0 percent within these two (2) decades.

The city population was projected to be about 3,517,334 and 4,253,334 people by the years 2012 and 2017 respectively. The high growth in population is attributed to the evident rural – urban migration as people from other counties come into the city in search of employment opportunities and to access high order goods and services. This consequently has put pressure on physical amenities and infrastructure such as roads, storm water drainage and waste management among others.

4.3.2 Population Density

According to the Population Census Report of 2009, the average population density in the city county was approximately 5,429 persons per sq. km. Nairobi Central and Kamukunji divisions which are at the core of the city county have the highest population density running up to an excess of 20,000 persons per sq. km. These statistics are outlined in table 4 below;

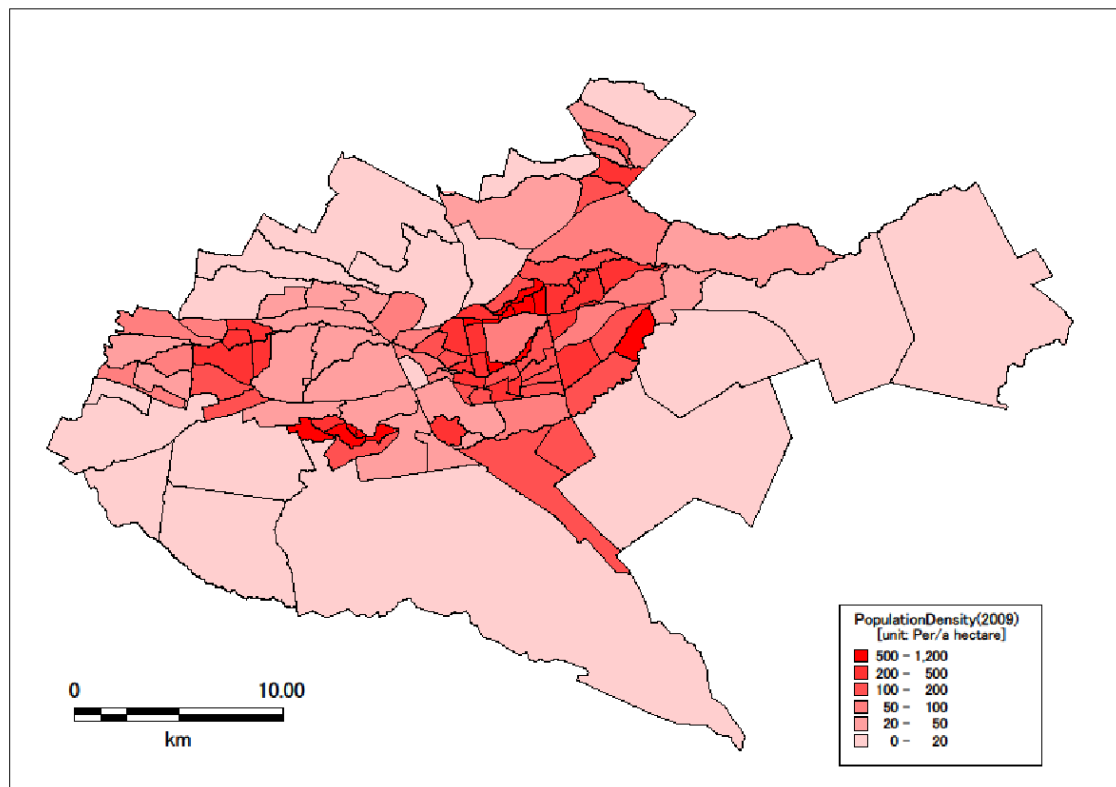
Table 4: Nairobi city population density

Division	Population	Area (Km²)	Density (persons per Km²)
Nairobi city	3,138,369	578	5,429
West lands	274,102	97	2,538
Langata/Kibera	355,188	106	3,346
Embakasi	925,775	201	4,546
Kasarani	525,624	86	6,081
Dagoretti	329,577	39	8,532
Makadara	218,641	23	9,481
Kamukunji/Pumwani	261,855	12	21,623
Central/Starehe	274,607	11	25,640

Source: Population Census Report, 2009

The spatial illustration of the population density in the city is as shown on the map below;

Map 5: Nairobi City County Population Density - 2009



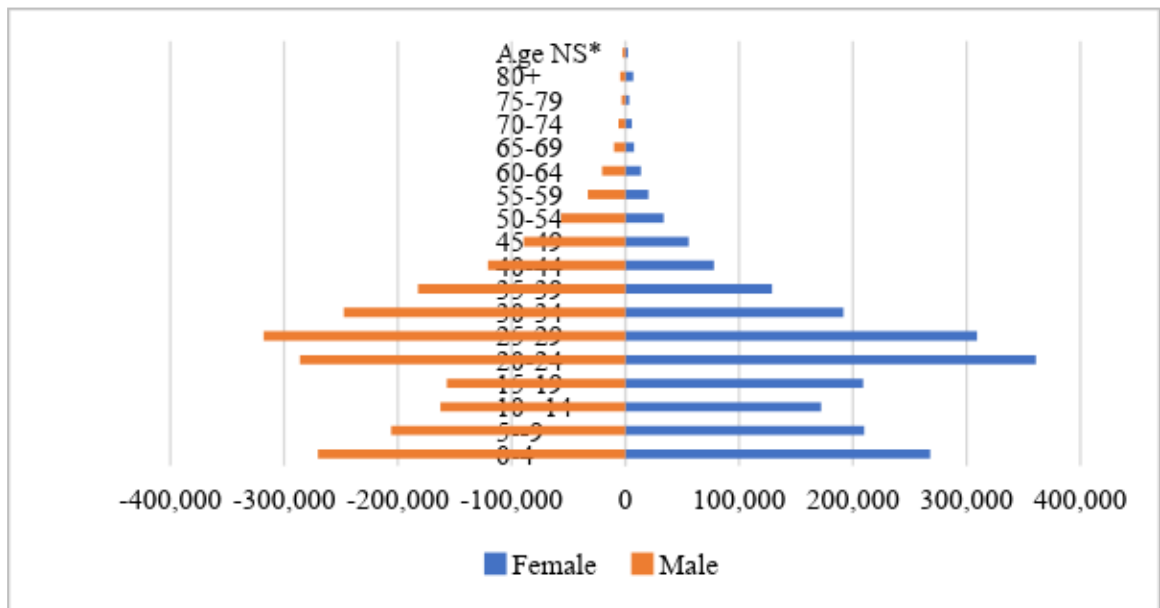
Source: KNBS, 2009

4.3.3 Population distribution per age groups

The total population of the city in 2009 comprised of 1,605,230 males and 1,533,139 females. This shows that the males accounted for 51.15 percent while the females accounted for 48.85 percent of the total city population. Projecting the population, the female population for the age groups between 5 and 24 years is relatively higher than for the males. However, for the 0-5 age group, the population of boys is more than that of girls. For the age cohorts between 25 and 69 years, the male population becomes more than that of females. The situation however changes from the 70 to over 80 years of age as females become slightly more than males.

The composition of the population presents a low heavy based pyramid. The number of people with less than 15 years accounts for about 30.3 percent of the population. The youth population, those aged between 15 and 29 years account for approximately 38.5 percent of the population and presents about 56.3 percent of the labour force. Above 50 years of age, both male and female population continues to decrease with progression in age as illustrated in the population pyramid below:

Figure 3: Population Pyramid



Source: Kenya Bureau of Statistics, 2013

The study recognizes rapid increase in urban population combined with high urban poverty levels, inadequate urban services, impractical transport planning and poor urban management has resulted to the failure to fully address the needs of the urban population. This phenomenon explains the non-provision of critical NMT facilities in the urban areas.

4.4 Physiographical Features

4.4.1 Physical and Topographic Features

Topography

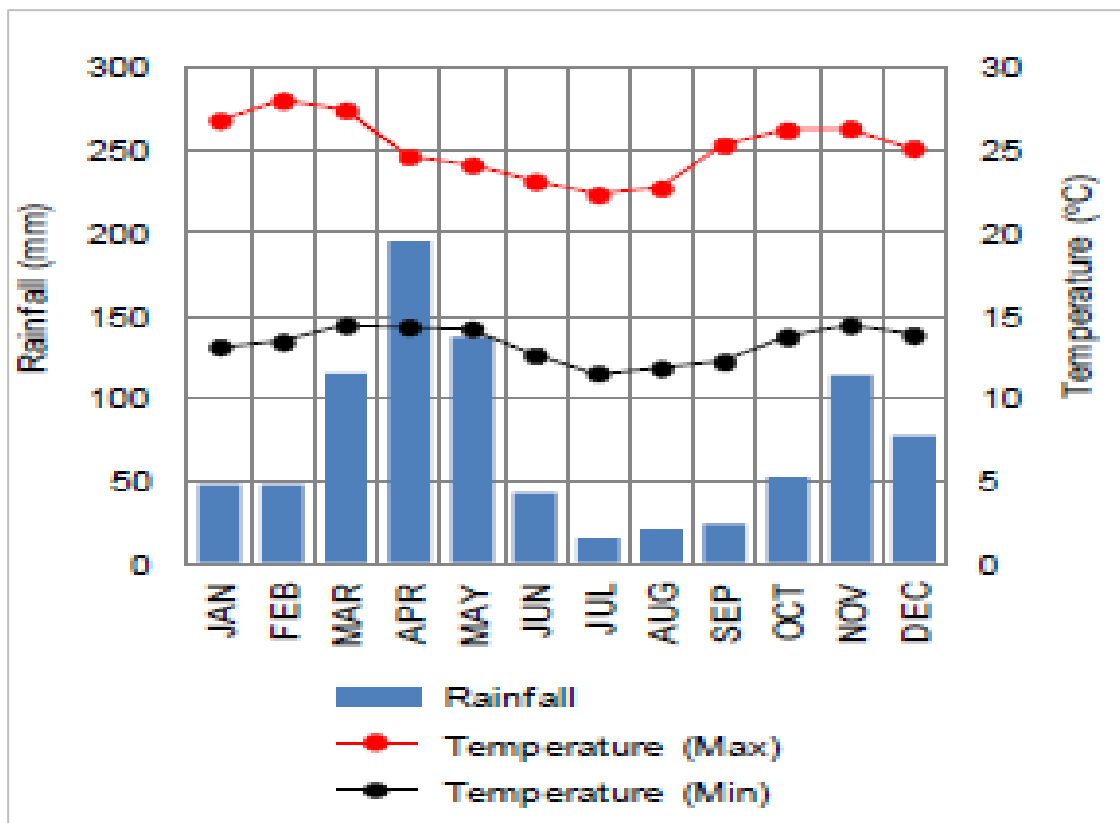
The topography of the country is composed of numerous topographical varieties. It ranges from deserts to glaciated mountains. The elevation ranges from 0m at the Indian Ocean to about 5,199 m above sea level at the Batian Peak of Mount Kenya. The City of Nairobi is characterized by a hilly topography. The elevation varies from 1,460 m to 1,920 m above sea level with Athi River having the lowest elevation while the highest is at the western edge of the city (Herrero et al., 2010).

4.4.2 Climatic Conditions

Nairobi City has a dry and cool climate between the months of July and August and a hot and dry climate in January and February. The city has an average annual rainfall of approximately 900mm with rainfall peaks being experienced in April and November. The mean daily maximum and minimum temperatures varies from 28°C to

22⁰C and 14⁰C to 12⁰C respectively as illustrated in the figure below. The design of the roads must therefore take into account the needs of the pedestrians given the high temperatures of the city. A Street needs to be comfortable and comfort involves adequate shading from hot sun and extreme temperature. The brief rainfall at certain periods should be kept in mind with regard to drainage problems and their return periods known to guide planning and design of non motorable transport facilities (Egondi et al., 2010).

Figure 4: Rainfall and temperature in Nairobi City



Source: Kenya Meteorological Department

4.5 Physical Infrastructure

This includes transportation, water and sanitation, energy and telecommunication facilities.

4.5.1 Transportation

The city of Nairobi is served by three modes of transport namely; road, railway and air as discussed below.

4.5.1.1 Road Transport

According to Kenya road classification manual, 2009 that was prepared by then the ministry of roads, there are two major categories of roads; rural roads and urban roads. Further these two are classified in relation to function and road classes. As indicated in the table below, urban roads comprises of arterial, collectors and local roads. Major arterials are meant for through traffic for relatively long-distance travels between extensively separated parts of the urban area. Minor Arterials on the other hand offers the main means of travel between different zones of the urban area. The linkage between arterials and local streets is provided by major collectors. Minor collectors serve a similar purpose as the major collectors but are limited within lower traffic levels. Local roads dispense traffic within the neighborhoods. Major local roads serve main shopping areas in residential neighborhoods, business streets in the CBD or suburbs of big urban areas. Minor local roads on the other hand provide direct access to one or more properties (Salon & Aligula, 2012).

The main modes of road transport in the city include; public transport, private car and NMT inform of walking or cycling. As documented by Mitullah and Opiyo (2012) about 60 percent of trips are non-motorized with 51 percent being pedestrians. Public transport accounts for only 14 percent of road transport share. However, despite the importance of NMT as a mode of transport, deliberate efforts to provide NMT facilities within the city are yet to be put in place.

The table below describes the classification of roads as per the former Ministry of Roads.

Table 5: Kenya roads classification

Category	Functional class	Road class	Functional class	Alternative classification	Description	Indicative design standards	
						Carriage-way width in meters	Design speed (kph)
Rural road	Arterial or Trunk	S	Super Highway	Auto route, Motorway, Expressway	These are highways which link two or more cities. Their design enables them to safely carry large motorized traffic volumes at high speeds	Dual carriageway of min 2 lanes	90-120
		A	Major arterial	Trunk road	These are roads that create strategic routes and corridors. They link international boundaries and terminals.	7-14	70-110
		B	Minor arterial	Trunk road	These roads form key national routes. They connect Province headquarters and/or other key centres to; Class A roads, the capital and to each other.	7-(14)	70-110
	Collector	C	Major collector	District	These roads connect district headquarters and other main selected towns to the higher-level network and/or to each other.	6.5	60-110
Urban road	Arterial	H	Major arterial	Highway	They are meant for through traffic for relatively long-distance travels between	3.5m per lane, 4-6 lanes	70-90

					extensively separated parts of the urban area of the town or city.		
		J	Minor arterial	Principal arterial	These roads offer means of travel between the various zones of an urban area.	3.5m per lane, 2-4 lanes	50-60
	Collector	K	Major collector	Primary distributor	These roads connect arterials and local roads and dispense traffic in defined zones like residential neighborhoods.	7	30-50
		L	Minor collector	District distributor	These roads serve the same purpose as main collector but have a smaller service area with lower levels of traffic.	7	30-50
	Local	M	Major minor	Shopping/local street	These roads serve the main shopping areas, business sections of the CBD and residential suburbs of larger towns and cities.	5-7	30-50
		N	Minor local	Non-residential access	They offer direct access to one or more properties, in areas apart from residential areas.	5	30-50
		P	Local access	Residential access	They offer direct access to a number of residential properties.	3-5	30-50

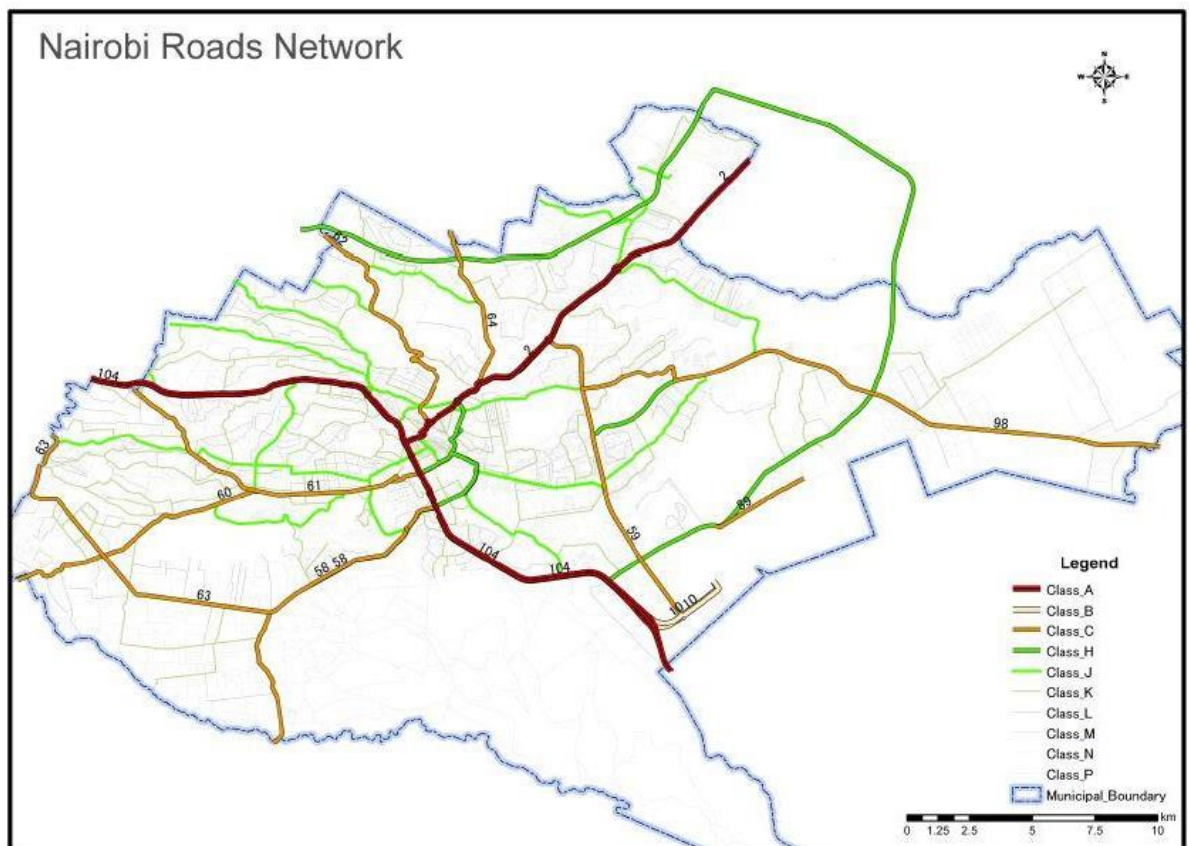
Source: "Kenya Roads Classification Manual" July, 2009, Ministry of Roads

Road classification in Nairobi City County

Kenya Urban Roads Authority (KURA) is the institution in charge urban roads, thus the roads within the city are within the jurisdiction of KURA. However, there are two international roads in the city which fall within the jurisdiction of KeNHA. These two comprise of the arterial roads in the city. They include; the Northern corridor (A109/104) which comprises of a section of Mombasa road, Uhuru highway, Waiyaki Way and Nairobi – Nakuru Highway. Class A104 stretches from the centre of the City to the South through Kajiado and Namanga towns connecting the capital city to the Republic of Tanzania. Road Class A109 outspreads to the East linking the capital to the second largest city in the country, Mombasa City. To the West it stretches to the Ugandan border and forms a rational axis for the inland neighboring countries.

A2 is the other Class A Road running through the city. It connects the capital to Ethiopia with the first 50km of the road being referred to as Thika Superhighway. The map below shows the main road networks in the city.

Map 6: Road Networks in Nairobi



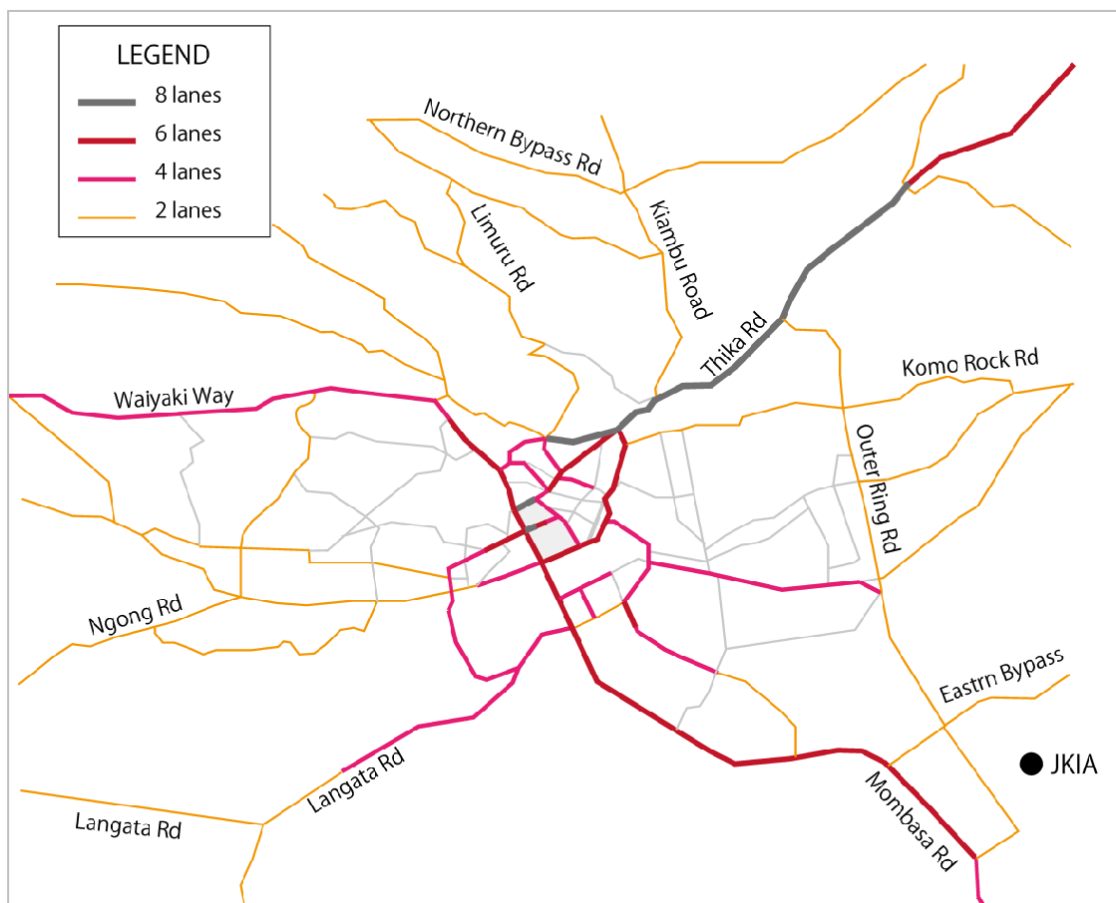
Source: NIUPLAN, 2014

Number of lanes

Within the city, classification of the road network is undertaken based on the number of lanes. The trunk roads mainly have more than 4 lanes as seen in the map below. On the South – North direction, majority of the roads have 2 lanes, forcing traffic to concentrate on the A104 road. Based on the traffic analysis done in 2014 by JICA, in the future, traffic on the East - West direction will increase, thus the need for strengthening.

Majority of the roads in Nairobi do not have designate lane for different modes of transport especially emergency lanes that dignitaries, police and ambulances can use; this inadequacy has led to a lot of traffic problems along the major roads within the city. Within the CBD of Nairobi, most roads were designed in preference of MT with very little consideration for NMT. Failure to provide NMT facilities has resulted to modal conflicts and accidents within the city roads Private cars contribute the highest proportion of vehicles in the city with over 70 percent carrying one passenger.

Map 7: Number of lanes



Source: NIUPLAN, 2014

4.5.1.2 Railway Transport

As documented by the City County Government of Nairobi (2014), the main railway line in the city is the line from Mombasa to the Republic of Uganda through Nairobi which is managed by the Kenya Railway Corporation (KRC). There are four commuter train services within the city namely Nairobi – Syokimau, Nairobi – Dandora – Ruiru, Nairobi – Kibera and Nairobi – Embakasi (City County of Nairobi, 2014). The commuter services are available every week day during the morning and evening hours with convenient stop overs for picking and dropping passengers along the designated routes.

In addition to the old railway line, the Standard Gauge Railway (SGR) was constructed as an upgrade of the colonial line and links Mombasa to Naivasha through Nairobi. Though not a direct mode of transport within the CBD, the SGR has enhanced the connectivity of the city with the hinterland and the region through the terminal facilities provided along the route.

With average passenger traffic of 19,000 people daily, the existing railway system within Nairobi is extremely underutilized factoring that 75 percent of commuters employed in the CBD relies on public transport. The Government estimates that around 1.5 million people access the CBD daily via public transport creating nightmare traffic congestion as people do not just waste productive man hours but pollution (noise and air) rises. The commuters coming to the city alight at the railway station and then walk on foot to Nairobi CBD. They first cross Haile Selassie Avenue through Tom Mboya Street to the CBD. Therefore, the prerequisite NMT infrastructure needs to be provided so as to cater for the pedestrians and cyclists in the CBD.

4.3.1.3 Air Transport

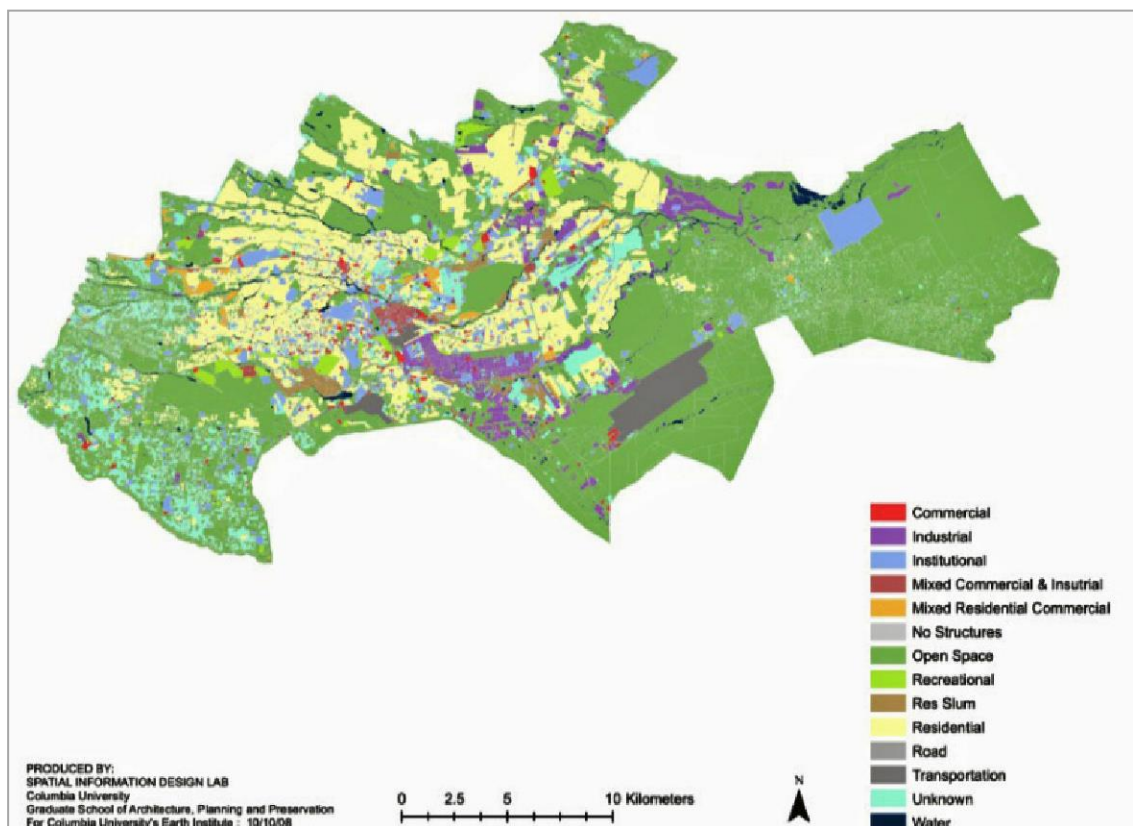
The city of Nairobi is a host to three airports namely; Jomo Kenyatta International Airport, Wilson Airport and Eastleigh Air base. Jomo Kenyatta International Airport (JKIA) is the biggest Airport in East and Central Africa, and a key focal point for major aviation activity in the region. JKIA is situated about 18 km to the East of the City centre. The Airport has a runway which measures about 4,117m long and 45m wide and sits on a 4,472.2 ha of land.

Wilson Airport is the second airport in the County. It has two runways of 1,463m long and 24m wide and 1,558m by 24m respectively. The airport is mainly used for local flights. Eastleigh Air base on the other hand is a military installation and isn't available for the general public.

4.4 Land and land use

In the years 2005 and 2010, the Centre of Sustainable Urban Development (CSUD) of the University of Columbia in association with the University of Nairobi conducted a land use survey for the entire Nairobi city. From the survey, open spaces occupied the highest percentage (47.8 percent) of the city land while transportation land use occupied 2.2 percent. Superimposing the analysis from the satellite image on the ground survey, a land use map was prepared as illustrated below.

Map 8: Nairobi City County land use



Source: NIUPLAN, 2014

The actual area of focus, Tom Mboya Street, is fully a transportation land use including non-motorized transport facilities. The surroundings of study area are however comprised of various land uses namely; recreational, public purpose, commercial and public utility.

Notably commercial land use takes the highest percentage this is attributed to the location of the area which is the Central Business District where the major activity is commerce. Transportation land use (comprising of road reserves, bus termini and parking spaces) take the second largest area. This is an indication that the area has got quite enough road connectivity for motorized transport.

4.5 History of planning of Nairobi City County

Planning of Nairobi has been propelled by various planning efforts since the 1800's, these are explicated below;

a) First Nairobi Plan of 1898

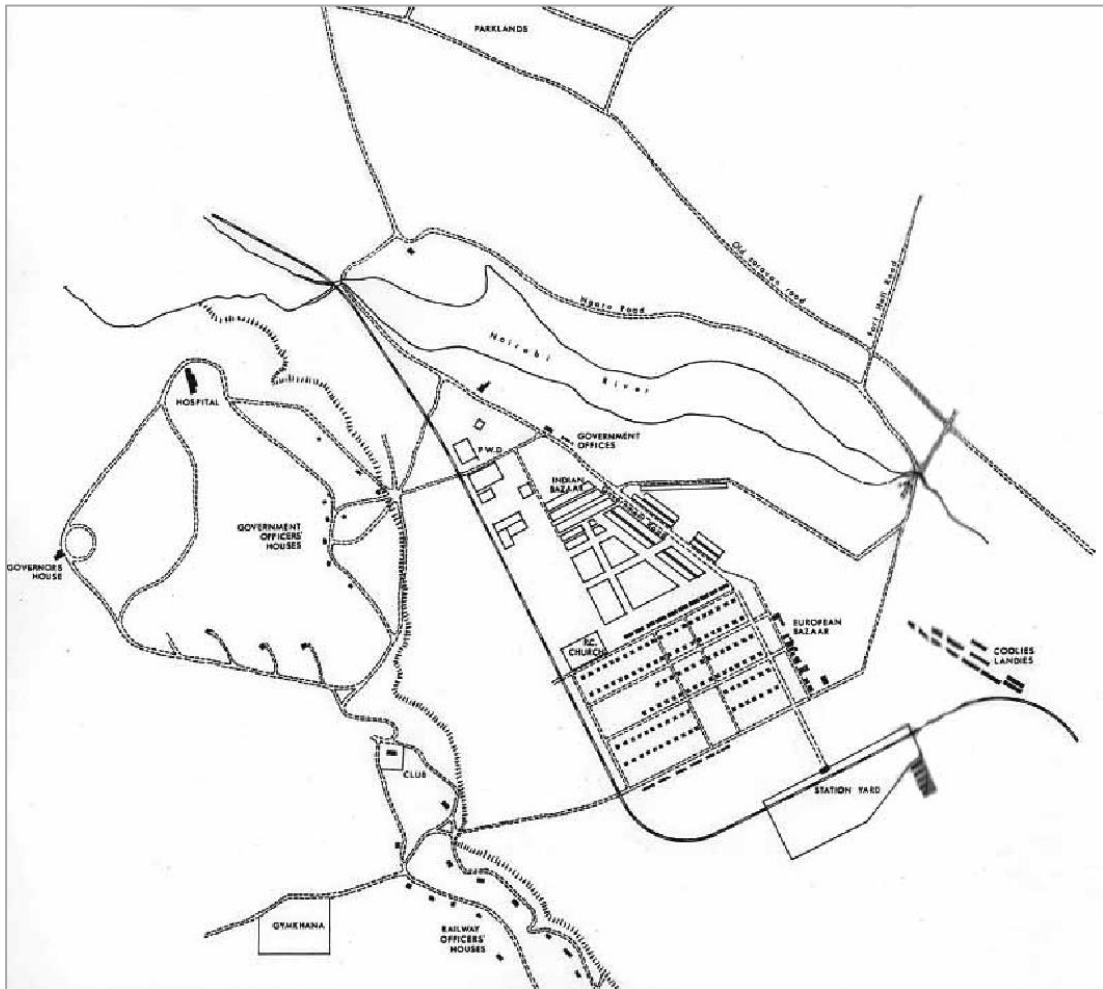
This plan was drafted by a young assistant railway engineer known as Arthur Frederick church in 1898. Arthur had been dispatched to Nairobi to offer assistance to Engineer George Whitehouse. He was tasked with the preparation of town layout for the railway depot in the City (Myers, 2015).

Some of the features included in the plan were;

- Nairobi railway station which was positioned at the exact place it is today while the railway line was stationed at the current Uhuru Highway
- A main street (station road) was laid down from the railway station to the North, with a design which was wide enough to fit three-axled oxcart wagons and enable them turn with ease
- An addition street that was parallel to station road was laid down, the street was named Victoria Street. Later it was renamed to Government Street in 1901 then to today's Tom Mboya Street. The street had a similar width as station road. Thirteen commercial plots which were named as European Bazaar were located along this street.
- Other ten streets were located off the Victoria Street where railway workers residents were built
- Six sites for upper grade houses meant for senior men in the railway were located in the relatively flat area, the current railway golf course
- Blockage of Nairobi River to create an impounding pond

The map below gives the spatial distribution of the features.

Map 9: First Nairobi City Plan by A.F Church 1898



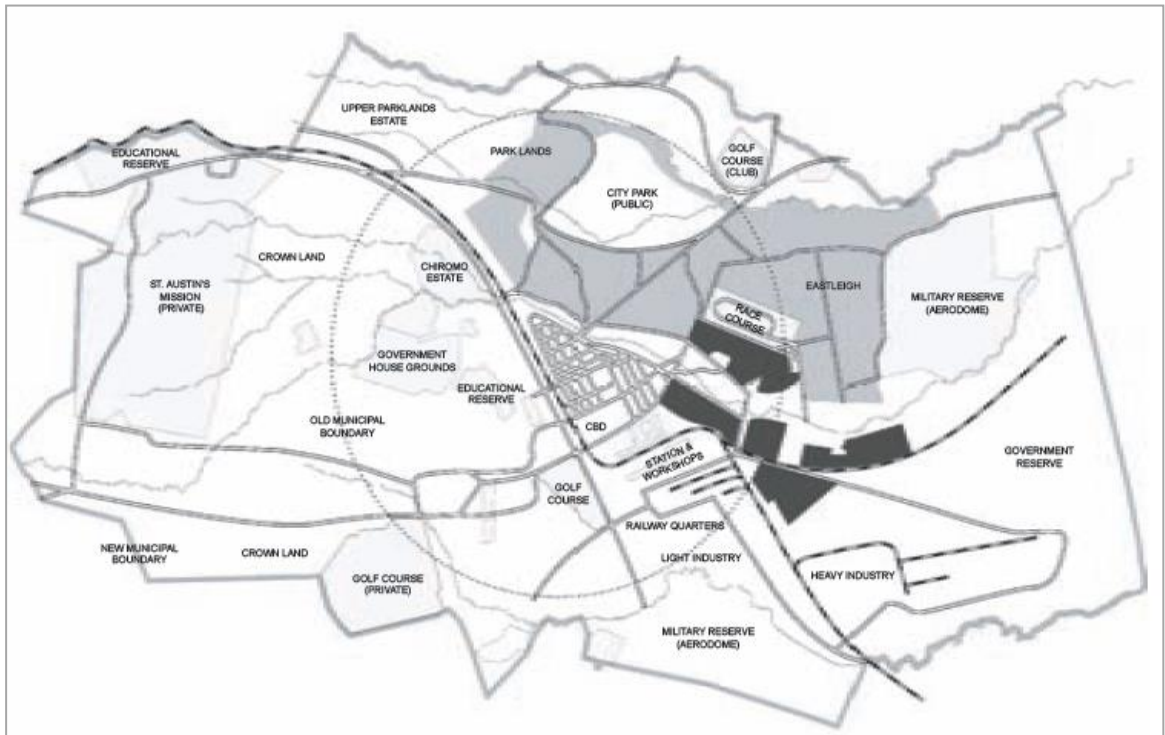
Source: S. Mills. *Railway to Nowhere-the building of the lunatic line, Nairobi 2012 in NIUPLAN, 2014*

This plan was approved on the 30th November, 1898 by Chief Engineer Whitehouse. However, he changed the spelling of the town from *Nyrobi* to Nairobi before approving it. As illustrated on the map above, the plan patently resembled the current layout of the CBD of Nairobi.

b) Plan for a Settler Capital - 1927

This plan was drafted by F. Walton James and planned by Eric Dutton under the British African rule. To accommodate the growing city population, the boundary was extended to cover an approximate area of 77Km². The plan emphasized on the enhancement of drainage systems, dissipation of swamps and regulating construction of buildings and density. Traffic regulations also formed part of the plan proposals. These regulations covered up to the extended areas of residence. The spatial layout of the plan was as shown on map 10 below;

Map 10: Settlers' Capital Plan of 1927



Source: *ETH Studio Basel, History of urban planning in Nairobi, 2008 in NIUPLAN, 2014*

c) 1948 Master Plan for a Colonial Capital

The master plan was prepared as a trial in town planning for the colonial city of Nairobi. The plan presented a zoning scheme with various zones for residential, industrial, commercial, official buildings, railway functions, forest reserve, open space and parks. Establishment of neighborhood units and transformation of Nairobi to a more attractive area for industrial investments were some of the main goals of the plan. These residential neighborhoods were meant for the working class and were provided on a segregation basis.

Notably the railway way leave was redesigned to the current area along the western section of the CBD. The redesigning of the way leave presented an opportunity for the widening of Uhuru highway to its current dimensions. In addition, an extensive industrial area was placed at the south part of the railway station. This master plan has been revised over the years. The latest review was done by the City County of Nairobi in collaboration with JICA in 2014 when they prepared an integrated urban development master plan for the city of Nairobi. The layout of the plan was spatially illustrated as shown below;

Map 11: Colonial Capital Master Plan of 1948



Key:

	MAIN ROAD		RAILWAY
	REGIONAL ROAD		BICYCLE PATH

KENYA CENTER	BUSINESS & COMMERCE	RESERVE FOR BUSIN. & INDUSTRY	RAILWAY	LIGHT INDUSTRY	HEAVY INDUSTRY
OFFICIAL BUILDING	OFFICIAL HOUSING	RESERVE FOR OFFICIAL HOUSING	RESIDENTIAL	OPEN SPACES	NOXIOUS INDUSTRY

Source: ETH Studio Basel, History of urban planning in Nairobi, 2008 in NIUPLAN, 2014

d) Nairobi Metropolitan Growth Strategy, 1973

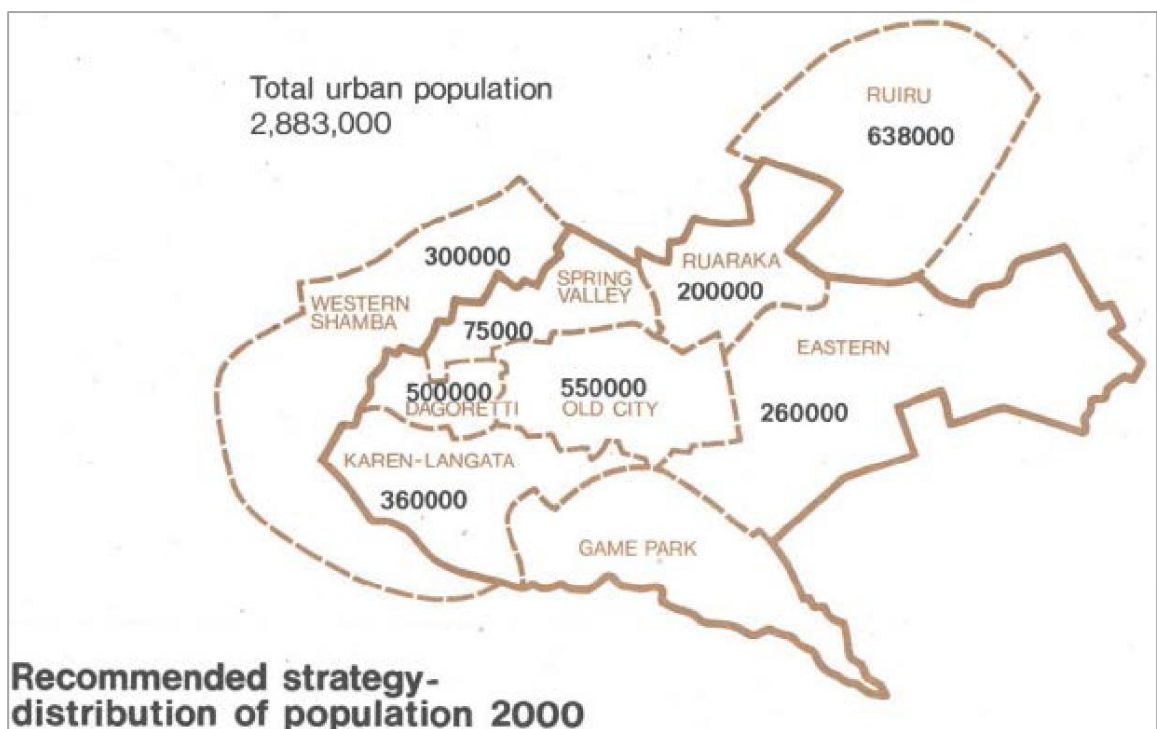
In 1971, urban planners in the former City Council of Nairobi in association with experts from UN and urban planning consultants, (Nairobi Urban Study Group), developed the metropolitan growth strategy. The study was completed and published two years later under the leadership of Charu Gupta (1971-72) and Donald Monson (1972-73).

The strategy was based on long term projections up to the year 2020 but had medium term targets to be achieved by the year 1985. In the year 1971, the city population was approximately 590,000 people. As per the strategy's projections, the population was to be 2.88 million people in the year 2000 comprising of 1.94 million people for

Nairobi City County while the rest was for the surrounding areas outside the City County including Ruiru and Western *Shamba*. However, in 2000, NCC had a population of about 2.20 million people, a little higher than the projected one.

Some of the parts recommended by the strategy included; regional and city strategies, narration of the strategy by area, incorporation of phased development, development of a transport policy and identification of the resources required for implementation. With regard to phased development, the projected city population in year 2000 was distributed as illustrated on the map below;

Map 12: Recommended strategy-distribution population-2000



Source: Nairobi City County

Among other factors and conditions, the following were required to make the 1973 development plan proposals a success;

- ❖ The plan was a long-term structure planning policy recommendation which gave general long-term policy directions, possibilities, guidelines and strategies for Nairobi City's development. It was thus broken down to short-term comprehensive implementable development projects and programmes which were ideal for the specific zones.

- ❖ Skilled personnel from the City County and National Government as well as adequate funding were required to help in the detailing of the proposals and for their implementation.
- ❖ Lots of capacity building and reorganization of the decision-making institutions, enforcement system as well as the tools for effective plan implementation.

Apparently, it is observed that the above outline requirements were merely met in the implementation phase of the 1973 development plan. Consequently, the following features characterize the area;

- ❖ There haven't been detailed local plans to guide development as envisioned in the plan.
- ❖ Land speculators and private developers whose main aim is to maximize profit control the development process in the city; the mandated authorities have very little guidance or control.
- ❖ Development has increasingly over the time overtaken the prior provided infrastructural, transport and utility facilities, putting pressure on them and highly ineffective in their intended functions
- ❖ The existing housing shortage in the whole city has fueled the speculative uncontrolled development trend

The 1973 Strategy, had various proposals in relation to the urban planning of Nairobi, among them were the following;

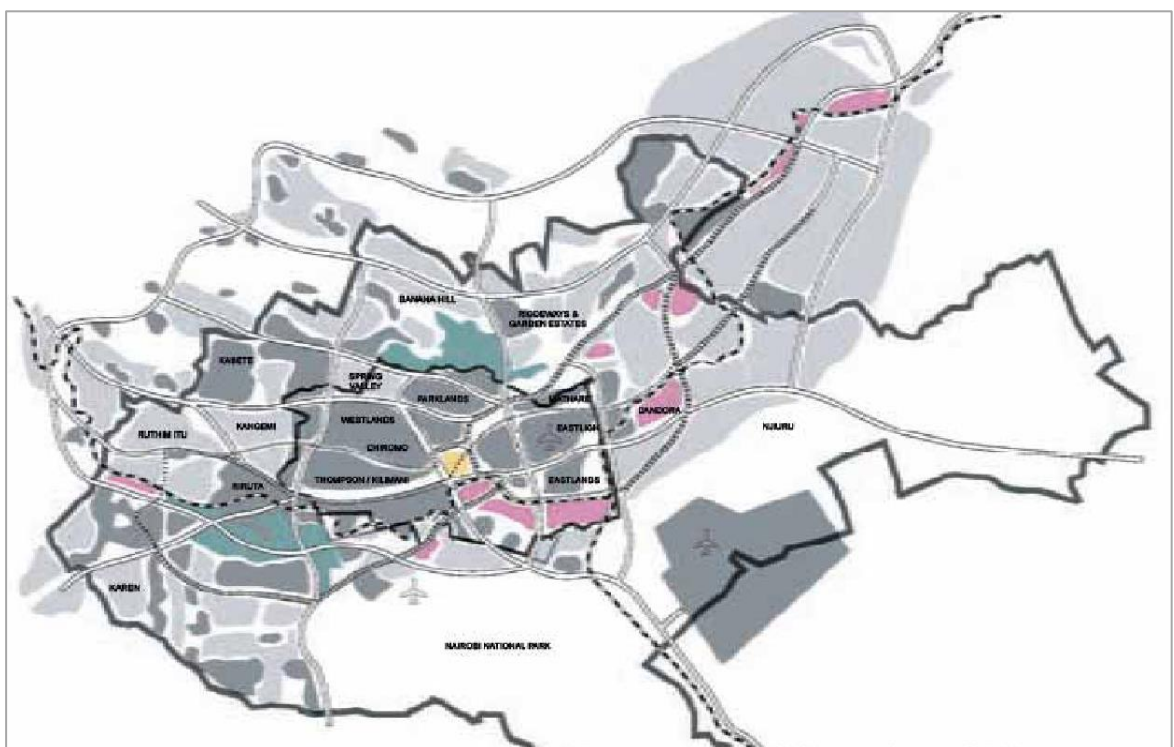
- ❖ In order to decongest the CBD, it was proposed that some suburban sub centers should supplement some of the functions of the core so as to minimize excessive congestion. This was to be achieved through provision of wide roads connecting the areas both residential and industrial areas located in the periphery to the CBD. The roads provided for bus ways and the use of private was to be prohibited in favor of public transport.
- ❖ Even though the industrial area near the CBD offered high number of job opportunities, it was also congested. The strategy sought to avoid if not eliminate this scenario. Therefore, where need be for expansions the limitation was to capital-incentive, urban industry kind with minimal employees. On the

other enlargement of the existing industries was only recommended in the suburban areas.

- ❖ The eastern section of the city was retained for the low to middle income segment of the population with the exception of some few high-end residential estates. The people living in the eastern part were largely commuters and therefore alighted in bus terminus along Tom Mboya. They would then connect on foot to their final destination.

The growth strategy is shown on map 13 below;

Map 13: Nairobi Metropolitan Growth Strategy of 1973



Source: ETH Studio Basel, History of urban planning in Nairobi, 2008 in NIUPLAN, 2014

4.5.1 History of Tom Mboya Street

An early plan was prepared by Church Fredrick Arthur, an assistant railway engineer in 1898. He made provisions for two streets which were wide enough to allow three-axled ox-cart to turn. These streets were; Victoria Street, presently Tom Mboya Street, and Station road, the current Moi Avenue (Mills, 2006). Arthur marked 13 commercial plots and named them European Bazaar along Victoria Street.

The street was originally named Victoria Street, after the queen and was later named after a prominent political disposition in the history of Kenya, Tom Mboya. The renaming of the street to Tom Mboya was done as an honour and in commemoration of the assassinated politician. Tom Mboya founded Nairobi People's Congress Party, which was critical in the Kenya African National Union (KANU) formation. At the time of his death in 1969, he was the Minister of Economic Planning and Development. In honor of Tom Mboya, a monument was erected on Moi Avenue in 2011, just 50 metres from the spot where he was gunned down. Notable places along the street that have been in existence from the 1950s are; the Victoria Bar, a popular area for the British Army as well as the Chez Joseph restaurant, currently known as Express Bar (Wangechi Kanyeki, 2014).

Tom Mboya Street is one of the busiest streets in the CBD hence the need for NMT infrastructure. Along this street there are four off-street termini which accommodate hundreds of PSVs each day. There are also eleven on-street termini and numerous *boda boda* spots, major supermarkets, retail shops, eateries and restaurants. These activities generate a lot of human traffic along the street. The street also acts as a bridge that people uses to Cross over from the extended CBD section (down town - goods sale oriented) into the initial designated CBD (service oriented). Hundreds of pedestrians from down town moving into the upper CBD and those moving from and into the various PSV termini cross over the street every day.

CHAPTER FIVE

RESEARCH FINDINGS

5.1 Introduction

The main study sought to assess provision and usability of non-motorized transport infrastructure along Tom Mboya Street in Nairobi City County. The analysis is based on the objectives of the study. The study specifically sought to: identify the current state of the provided NMT infrastructure along the street, map NMT black spots along the Tom Mboya street, analyze the factors affecting usability of the provided NMT infrastructure and to propose planning, design and policy interventions for sufficient provision and optimally usable NMT infrastructure. To achieve these objectives, interviews were conducted with the road users (pedestrians, PSV operators and private cars owners, *boda boda* operators, business operators (both informal and formal) and the key informants (informants from NCCG Department of City Engineering, Traffic Police Department, NCCG Traffic Management section, NTSA and KURA).

5.2 Response Rate

A total of 138 road users including pedestrians, cyclists, traders/business operators, private road users and public vehicles operators were interviewed. In addition 5 key informants were also interviewed drawn from the NCCG Department of City Engineering, Traffic Police Department, NCCG Traffic Management section, NTSA and KURA. Therefore a total of 143 respondents participated in the study as shown in table 6. The response rate was therefore 100% which was considered very good for survey research as recommended by Punch (2003) who proposes a score of 70-85% as good response rate, whereas Mugenda and Mugenda (2003) suggest a 50% response rate is adequate, 60% good and above 70% very good.

Table 6: Respondents

Respondents	Number
Pedestrians	76
Cyclists	5
Traders/business operators	35
Private road users and public vehicles operators	22
Department of City Engineering	1

Nairobi City County Government Traffic Management section	1
Traffic Police Department	1
KURA	1
NTSA	1
Total	143

Source: Field Survey, 2019

5.3 Respondent's Demographics and General Profiles

This section will look at the demographics and general profiles of the respondents which included; name of the organization, position, age, gender and level of education. The findings are discussed in the following sub-section.

5.3.1 Age of the Respondents

Age of respondents is always an important factor while evaluating urban mobility and travel patterns since it more often informs the travel purpose and modes of travel. It was established that majority 15.28 percent were between 25 and 29 years. It was further established that 14.69 percent were between 30-34 years old while 13.44 percent of the respondents were between 20 and 24 years. The findings also indicated that 13.29 percent were between the age of 40 and 44 years. It was also noted that only 13 (9.09 percent) of the respondents were above 50 years old. Table 7 shows the other findings of the study.

Table 7: Age

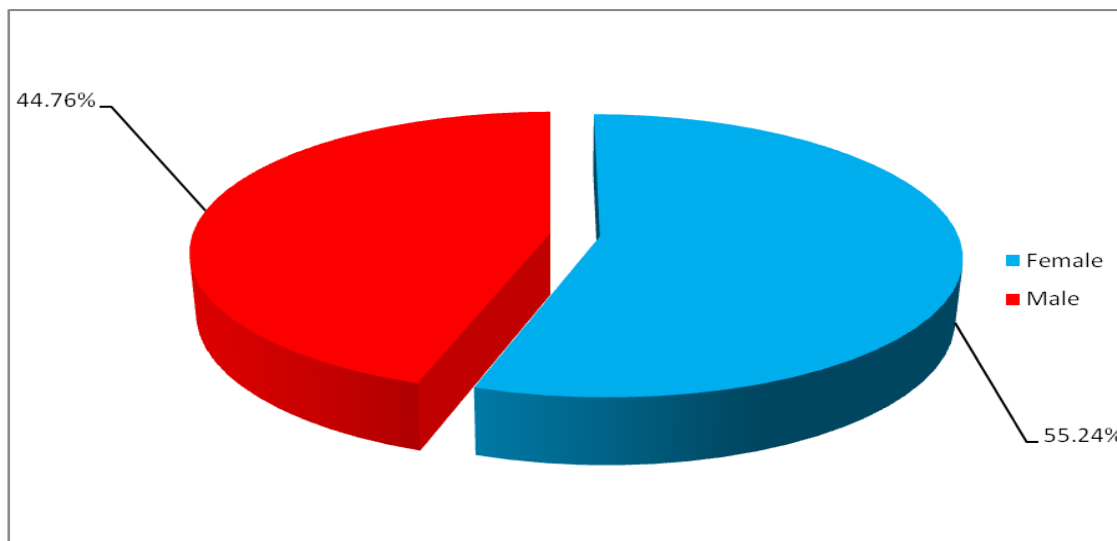
Age (Years)	Frequency	Percentage	Cumulative %age
Below 20	16	11.19	11.19
20-24	20	13.99	25.18
25-29	22	15.38	40.56
30-34	21	14.69	55.25
35-39	17	11.89	67.14
40-44	19	13.29	80.43
45-49	15	10.48	90.91
Above 50	13	9.09	100
Total	143	100	

Source: Field Survey, 2019

5.3.2 Gender

In terms of gender, the findings shown in table 3 indicate that 55.24 percent were female while 44.76 percent were male as shown in figure 5. The findings of the study therefore represent the views of both genders hence gender inclusive.

Figure 5: Gender



Source: Field Survey, 2019

5.3.3 Level of Education

The level of education, employment and income of respondents is vital when analyzing NMT provision and usability since they have direct relations to other factors such a travel time, mode, purpose and frequency. The respondents' level of education was established as follows; majority 27.97 percent had attained secondary education while 26.57 percent had attained college/university education. Further findings indicated that 23.08 percent had primary level of education while only 22.38 percent had postgraduate qualification as shown in table 8 below.

Table 8: Level of Education

Level of Education	Frequency	Percentage	Cumulative %age
Primary	33	23.08	23.08
Secondary	40	27.97	51.08
College/university	38	26.57	77.62
Postgraduate	32	22.38	100
Total	143	100.0	

Source: Field Survey, 2019

5.4 Provision and Usability of NMT Infrastructure

5.4.1 Provision of NMT along Tom Mboya Street

The common NMT modes along Tom Mboya Street in Nairobi are walking, cycling for personal transport, and human drawn carts for the transportation of goods and garbage, trolleys, wheelchairs wheel barrows but to a small extent. The NMT infrastructure include foot paths, pavements, terminal facilities, zebra crossings, traffic lights, signs and speed bumps to regulate speed at different levels in the urban transport system, for safety of motorized and non – motorized alike. Given the dominance of walking as a mode of transport, one would expect that the coverage of NMT infrastructure to be extensive. Further, the condition of the infrastructure also points to the discrepancy in non-motorised maintenance and state.

According to the City County Engineer, several facilities need to be given priority so as to enhance the walkability of various routes. Some of the facilities recommended for prioritization included; erection of speed bumps as recommended by 29 percent of the respondents, marking of pedestrian crossing areas (21.7 percent), construction of overpass (18.3 percent), provision of dedicated walking paths (12.4 percent) and provision of street lights (12.1percent). About 57.9 percent of the respondents highlighted that prioritization of these key facilities would lower motorized transport speeds. Other reasons postulated include; avoiding encroachment of pedestrian areas (12 percent), reducing the number of accidents (9.9 percent) and enhancement of security and visibility (7.9 percent).

Approximately 96.3 percent of the respondents indicated that they used NMT to their regular destinations. Majority of the NMT users walked to their destinations as represented by 96.9 percent of the respondents with only a few cycling or using wheelchairs. NMT as a means to transport goods is also common within the street as represented by 35 percent of the respondents. Bicycles, wheelbarrows, handcarts and human transport are the types of NMT used in the transportation of goods.

Pedestrians face a number of challenges as they access the various activity spaces. For instance, majority of the roads have been designed with only motorized transport in mind. As a result, provisions for pedestrians' sidewalks are non- existent. There is also a lot of obstruction of the available pedestrian walkways by parked vehicles, heaps of garbage and informal businesses (hawkers). This renders walking

inconvenient and unsafe. The situation becomes more challenging during the rainy season when pools of water fill the walkways making walking impossible and the residents are forced to use public transport. Cycling as a mode of transport is very limited as majority of the roads are perceived to be too dangerous for cyclists. The exact contribution of NMT to transport in Nairobi is not well acknowledged though it remains the main mode of transport in the city contributing over 40 percent of the total daily trips (CCN, 2015).

Due to the challenges facing NMT users, in 2015, the NCCG developed an NMT policy to ensure the development and maintenance of a transport system that completely assimilates NMT within the transport system of the city. To enhance NMT usage, the policy proposes the creation of cohesive, safe and comfortable network of cycling lanes, footpaths, green areas, among other support amenities. It also has laws and regulation of preventing encroachment of NMT facilities by MT. The plate below shows the state of pedestrian walkways along the street.

Plate 1: Pedestrians Walking along Tom Mboya Street



Source: Field Survey, 2019

5.4.1.1 Current state of the provided NMT infrastructure along Tom Mboya Street

The study established that NMT is a dominant transport mode in Nairobi which concurs with the findings of NIUPLAN (2014). However, NMT infrastructure provision along Tom Mboya Street is wanting. The infrastructure is scarce and the few available cannot meet the demands of the pedestrians and other NMT users such as cyclists.

NMT survey findings in NIUPLAN, (2014) indicated that NMT usage is relatively low as only about 27.2 percent regularly utilized pedestrian crossing, 23.5 percent regularly used an overpass and only about 13.2 people utilized assisted crossing. The main reasons for the insignificance use of NMT facilities included; unmarked (42.6 percent), indirect route (30.1 percent), non-existence of the facility (19.1 percent) and the unsafe status of the facilities (5.9 percent). Some of the challenges presented by operators of handcarts included; impeded mobility due to traffic congestion (29.2 percent), prone to accidents (24.7 percent), noise pollution by PSV motorist through hooting (9 percent) and insecurity (5.6 percent). Other challenges like poor road condition (potholes), high number of pedestrians and lack of respect towards handcarts accounted for 3.4 percent each. Poor road maintenance, abuse from motorists accounted for 2.2 percent of the respondents each while health complications associated with chest pains as a result of pushing and pulling of heavy loads, lack of NMT provision and work seasonality each accounted for 1.1 percent.

Generally, Nairobi city have poor quality NMT infrastructure for NMT. Designated NMT corridors have hardly been provided, and in areas where they exist, they are usually occupied by informal traders or used for expansion of motorized carriage ways. Within Tom Mboya Street; absence of footpaths, poor lighting of the street and overcrowding renders walking unsafe. There is also inadequate speed limit enforcement in the street thus the high MT speeds are not deterred. For the cyclists, the safety concerns of the speeding vehicles and the absence of segregated NMT infrastructure makes them use alternative transport modes hence the low cycling rates. Failure to provide and maintain the required NMT facilities along Tom Mboya Street is primarily a problem of financing.

5.4.2 Usability of NMT Infrastructure along Tom Mboya Street

5.4.2.1 Condition of each of the NMT infrastructure along Tom Mboya Street

The study sought to establish the condition of NMT infrastructure along Tom Mboya Street. The respondents were therefore presented with a list of NMT infrastructure in order to rate their condition. From the study findings, majority of the respondents were dissatisfied with the condition of existing Zebra crossing with 44 percent indicating that it was lacking while 19 percent indicated that it was in poor condition. Only 29 percent of the respondents indicated that the condition of Zebra crossing was satisfactory while 8 percent indicated that it was good. In terms of traffic lights, 36 percent of the respondents rated it as good while 25 percent rated it as being in excellent condition. Further findings indicate that respondents were dissatisfied with the condition of existing sheds with 39 percent indicating that it was in poor condition while 33 percent indicated that it was lacking. The only existing sheds is found around Koja bus station near the intersection of Tom Mboya Street and River road. Some of the sheds have also been invaded by traders who have converted them into *Kiosks* and shoe shine booths. Through observation, it was established that the sheds are dilapidated and needs renovation.

The respondents indicated that the cycling facilities were completely lacking along Tom Mboya Street, a fact which was confirmed by the researcher through observation. There is only one designated bicycle parking bay located at the General Post Office (G.P.O) in the entire Nairobi CBD. The bay has a capacity of 16 bicycles with hooks onto which the bicycles are locked as the only special provision. It was also established that the street benches were lacking as indicated by 42 percent of the respondents. In terms of footpaths, majority (72 percent) of the respondents indicated that the existing facilities were in poor condition with 22 percent indicating that footpaths were lacking along Tom Mboya Street.

As established from the field survey, the condition of the existing NMT infrastructure is wanting, though in most cases, the infrastructure doesn't exist. The table below summarizes the condition of NMT infrastructure.

Table 9: Condition of existing NMT infrastructure

Facility	Excellent	Good	Satisfactory	Poor	Lacking
Zebra Crossing	0%	8%	29%	19%	44%
Traffic lights	25%	36%	21%	18%	0%
Sheds	8%	8%	12%	39%	33%
Cycling facilities	0%	0%	0%	0%	100%
Street benches	8%	8%	10%	32%	42%
Footpaths	0%	0%	6%	72%	22%

Source: Field Survey, 2019

Most of the pedestrian walk ways are in poor condition as part of the tarmac has being eroded making them unsafe to use especially without proper lighting. In addition, these holes are filled with water during the rainy season making the pavements inconvenient for use. The plate below exemplifies the state of the walkways.

Plate 2: Poor Condition of the Pavements



Source: Field Survey, 2019

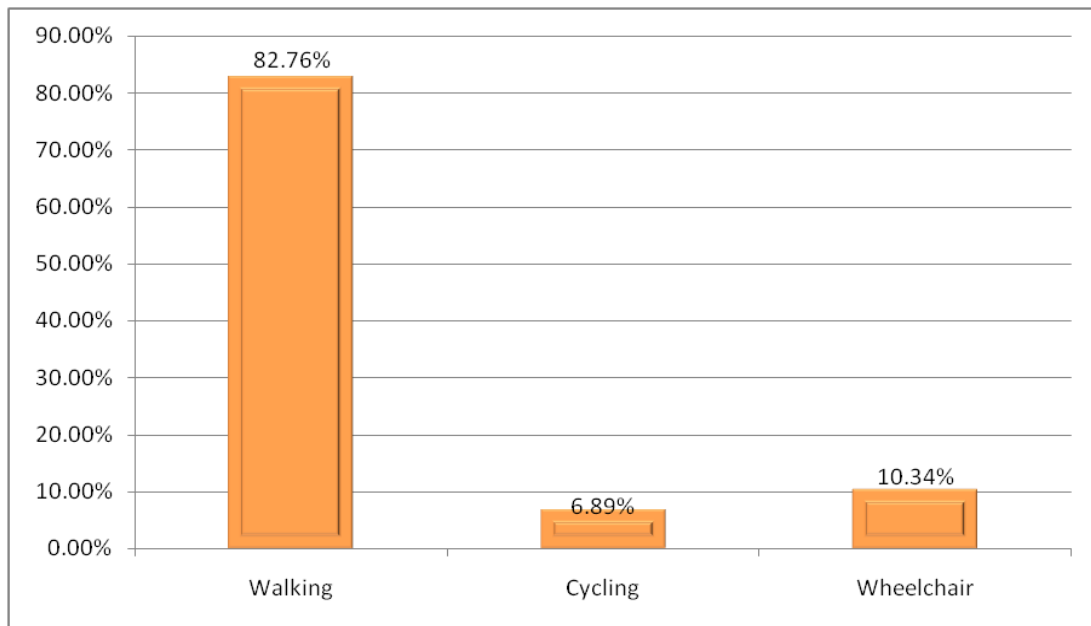
Along Tom Mboya Street, the pedestrian walkways such as pavements are shrinking since they have been taken over by hawkers, handcart pushers, boda bodas and matatus. As documented by UN-Habitat (2017) the space meant for streets and pavements in the central part of Nairobi is only about 12 percent of the total land area. This percentage is less than half of the recommended space of 30 percent to support a properly functioning traffic system in a modern capital. The street lacks suitable pedestrian lanes and cycle tracks have not been provided. In addition, the existing street and pavement conditions are in a poor condition and the drainages are always blocked by dirt and debris due to poor design and maintenance. These problems explain the low satisfaction with the time taken to reach various destinations. To address these challenges, bicycle lanes need to be incorporated along the main roads like the arterials and collector streets.

According to the City County of Nairobi officials interviewed, the county government came up with NMT policy. The policy gives the objective of the county with respect to increasing NMT's role as a mode of transport by; integrating NMT as a key component of public transport, allocating sustainable and adequate funding for the promotion and development of NMT as well as provision of safe NMT infrastructure. In this regard, about 20 percent of the City Engineering Department's budget is meant for the provision of NMT infrastructure.

5.4.2.2 Preferred Mode of Transport along Tom Mboya Street

The researcher sought to establish the mode of transport used by NMT users (pedestrians, cyclists, traders/business operators). The modes of transport included walking, cycling and wheelchair. According to the findings shown in figure 6, majority (82.76 percent) of NMT users preferred walking along Tom Mboya Street while 10.34 percent were on wheel chairs. It was observed that only 6.89 percent of NMT users preferred using bicycles.

Figure 6: NMT users preferred mode of transport along Tom Mboya Street



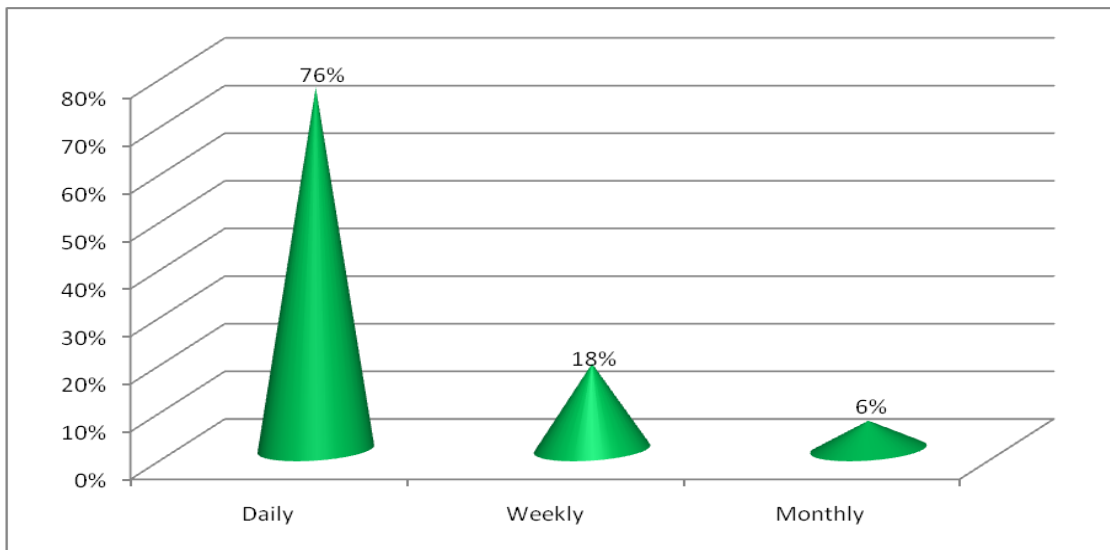
Source: Field Survey, 2019

The findings shown in figure above are supported by the findings of NIUPLAN (2014) which indicated the dominance of walking as a mode of transport in Nairobi as it contributed over 40 percent of the total daily trips. JICA (2004) established that about 2.32 million daily trips out of a total of 4.82 million trips were made by cyclists and pedestrians. In addition, Kasuku (2001) noted that over 64 percent of the residents whose trips started at Eastern Nairobi along Jogoo Road to the industrial area and CBD walked while 0.8 percent cycled.

5.4.2.3 Frequency of Trips

In terms of frequency of trips, majority (76 percent) of the respondents indicated that they make the trips either going to work, school or just running other errands in Nairobi CBD. It was also established that 18 percent made the trips weekly while only 6 percent made the trips monthly. Figure 7 shows the summary of the findings.

Figure 7: Frequency of Trips

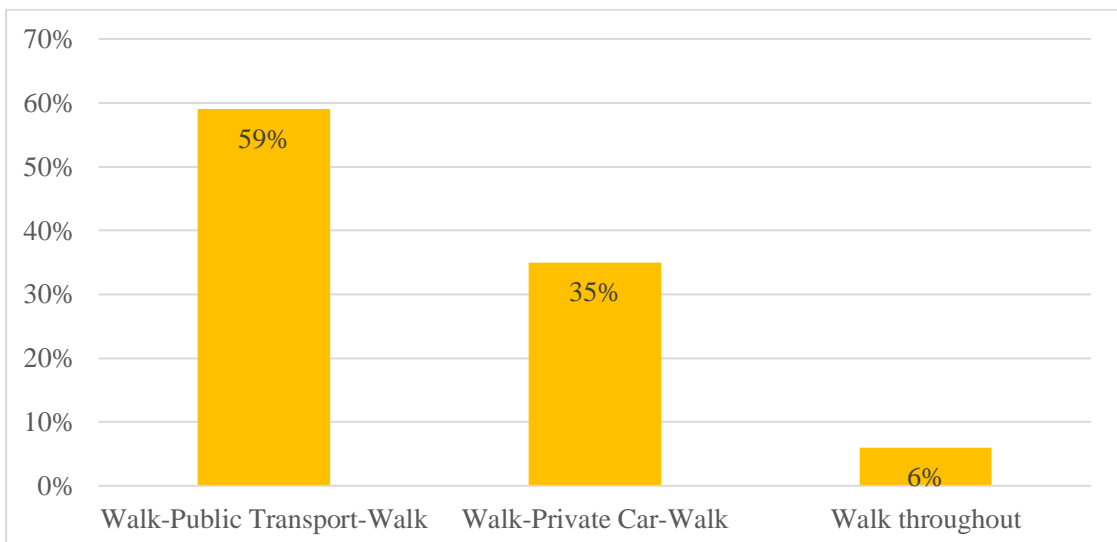


Source: Field Survey, 2019

5.4.2.4 Modal Mix

The respondents were asked to indicate their modal mix where it was established that 59% used walk-public transport-walk modal mix while 35% used walk-private car-walk. It was further established that 6% of the NMT users along Tom Mboya were unimodal and therefore walked throughout. The NMT users walking throughout were the ones living close to town hence covering short distances.

Figure 8: Modal Mix



Source: Field Survey, 2019

The above findings imply that walking stands out to be the most used option. This adds to the realization that integration of NMT into the urban transport is important

and more so public transport. The intermodal mix will add to efficiency in the system and safety for NMT users. This calls for the recognition, funding, development and technical support from all the responsible government bodies.

5.5 NMT black spots along Tom Mboya Street

5.5.1 Occurrence of bicycle and pedestrian accidents

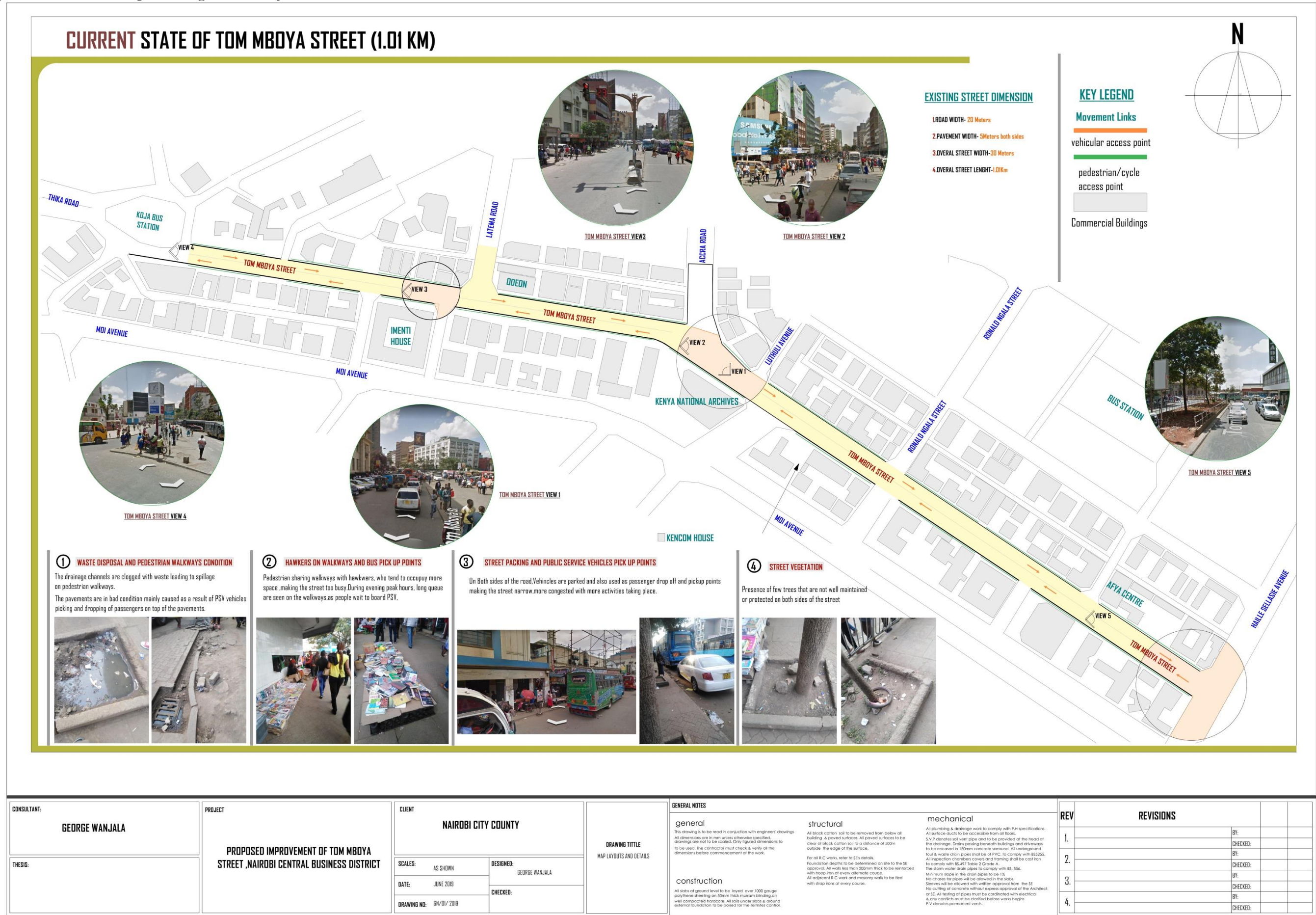
According to the traffic department, occurrence of bicycle and pedestrian accidents along Tom Mboya Street was low in the last three years which contradicts National Transport and Safety Authority's latest statistics on road accidents, pedestrians have remained the most vulnerable road users in Nairobi County. It was established that pedestrian accidents were minimal in Nairobi CBD as compared to other parts of the county because vehicles move in relatively low speed and the traffic laws are enforced by city county traffic marshals. It was further established that the accidents was spread across all gender and age groups from below 16 years and above 50 year of age.

5.5.2 Accidents Prone Spots

The major black spots along Tom Mboya Street according to NTSA are Koja roundabout, Odeon cinema at the intersection between Riveroad and Tom Mboya Street and finally the intersection between Luthuli Avenue and Tom Mboya Street. These are very busy and out dated traffic confluences, which promotes traffic congestions, especially because the traffic congestion on the points don't work at all. Traffic congestion on Tom Mboya Street is greatly experienced in the morning and the evening peak hours. This is because many huge buildings housing several banks, shops, and supermarkets and restaurants front Tom Mboya Street, but unfortunately, being one of the oldest avenues in the CBD of Nairobi, Tom Mboya Street does not have the capacity to accommodate all the vehicles coming for services on its frontage.

Most of the business outlets along Tom Mboya Street do not have any parking space for the traffic they attract. The little parking space can only be found on the street, and this leads to double and triple parking which dangerously blocks the carriage way. Unsafe crossings, failure to observe traffic rules and scarce footbridges are to blame for the increase of pedestrian deaths on Tom Mboya Street Nairobi. Figure 9 shows the black spots along Tom Mboya Street numbered 1, 2 and 3.

Figure 9: NMT Black Spots along Tom Mboya Street



Source: Adapted from Google

NMT users are exposed to speedy, hostile and high volumes of MT which results to high number of traffic accidents. According to NTSA, pedestrian accidents were very high in 2018 as shown in table 10.

Table 10: NTSA summary of Fatalities in 2018 in Nairobi County

Category	2018
Pedestrians	445
Drivers	119
Passengers	241
Pillion Passengers	97
Pedal Cyclists	20
Motor Cyclists	224
TOTAL	1,146

Source: NTSA, 2018

5.6 Factors affecting usability of the provided NMT infrastructure

Some of the factors affecting the usability of the provided NMT infrastructure include; accessibility, safety and comfort, road design, wrong/undesigned parking, quality of NMT facility and presence of informal traders along the facilities as discussed below:

- **Accessibility**

The street has several functions which range from commercial to transport. There are several terminal facilities located just off the carriageway thus hindering the smooth flow of pedestrian traffic. In addition, the undesignated parking of vehicles along the road results to congestion which hampers both pedestrians and other motorized vehicular movements. The encroachment of the pedestrian facilities by commercial facilities compounds the accessibility problem.

- **Safety and comfort**

The entire stretch of Tom Mboya Street is characterized by informal traders along the building pavements that serve as pedestrian walkways. The encroachment of the NMT facilities by informal traders causes congestion of the space making it unsafe and uncomfortable especially during the rush hours when buyers flock the street on their way home from work

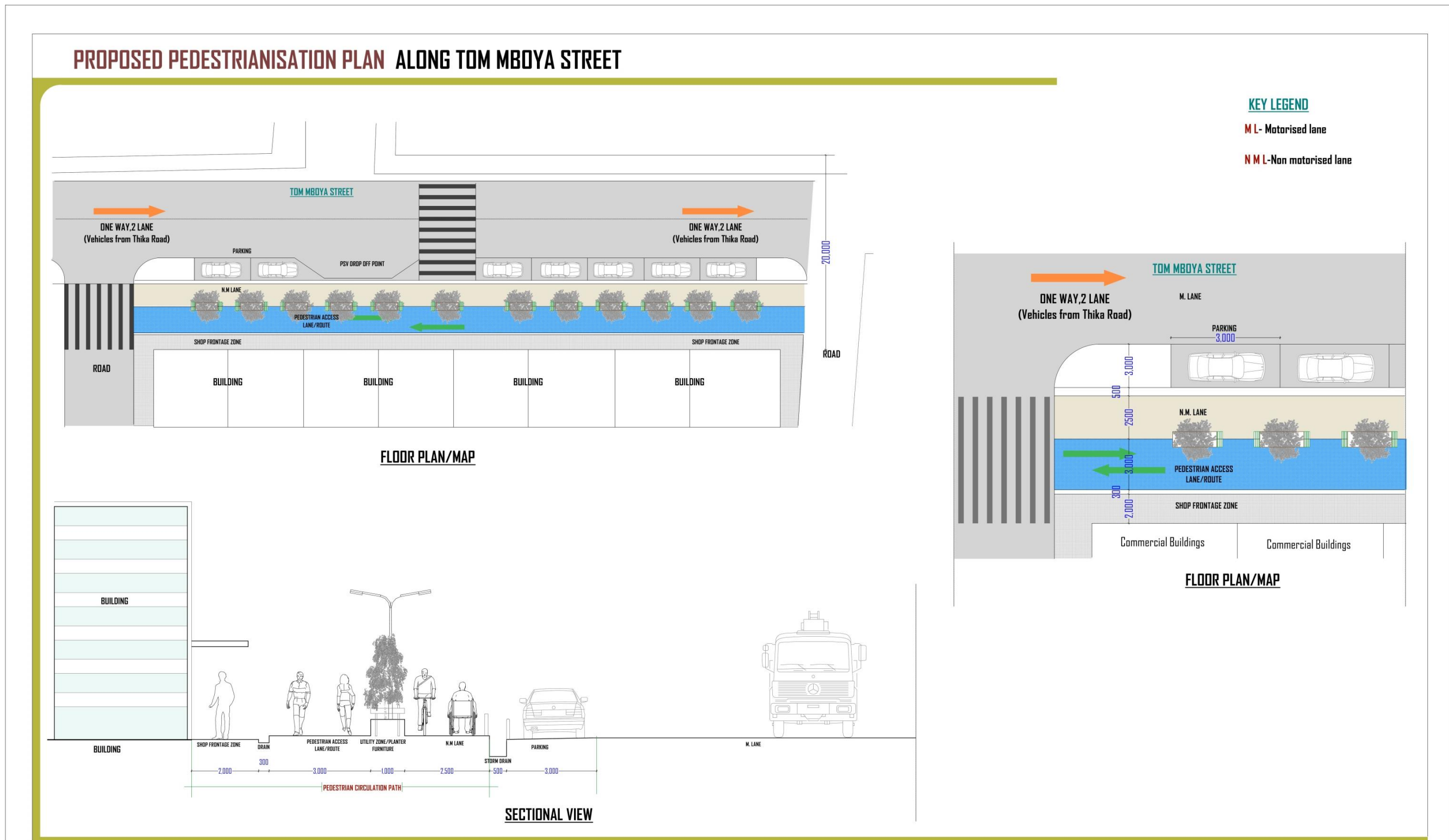
- **Road design**

One of the factors affecting usability of the provided NMT infrastructure is the road design. The road design of the road along Tom Mboya Street is contributory to the road traffic accidents (RTAs) between motorists and between pedestrians and motorists. The traffic pile up on the highway can also be linked to the road design, which is not compatible to the land use activity. The road has terminal facilities located just off the carriageway without service lanes. As a result, the public transport operators drop and pick passengers while still on the carriageway. This behaviour is also contributory to traffic pile up, obstruction and even Road traffic accidents (RTAs) where the pedestrians have to alight on the carriage way and cross the road without looking out for oncoming vehicles.

Figure 10 shows Tom Mboya Street existing situation showing disorder in terms of the street use between motor vehicles and pedestrians. The Narrow Sidewalk cannot support the pedestrian function fully as pedestrians do not experience comfort while walking. There is no pedestrian infrastructure along the street that is important to encourage socialization among pedestrians as well as signage to direct pedestrians. The street does not have any form of aesthetics or public art display for purposes of enhancing pedestrian infrastructure. The planting pots are a threat to pedestrian safety due to sharp edges. Lack of enough space to incorporate other street land uses e.g. sidewalk cafes.

Figure 11 is a representation of the ideal road design fully integrated for use of NMT means (walking and cycling) in transport. The design is a representation of what should be done on Tom Mboya Street as it is the most frequently used and links the CBD through intersections with other roads.

Figure 10: Proposed Pedestrianization Plan along Tom Mboya Street



CONSULTANT: GEORGE WANJALA	PROJECT: PROPOSED IMPROVEMENT OF TOM MBOYA STREET, NAIROBI CENTRAL BUSINESS DISTRICT	CLIENT: NAIROBI CITY COUNTY	DRAWING TITLE: MAP LAYOUTS AND DETAILS	GENERAL NOTES: general This drawing is to be read in conjunction with engineers' drawings. All dimensions are in mm unless otherwise specified. Drawings are not to be scaled. Only figures dimensions to be used. The contractor must check & verify all the dimensions before commencement of the work. structural All black cotton soil to be removed from below all building & paved surfaces. All paved surfaces to be clear of black cotton soil to a distance of 500m outside the edge of the surface. For all R.C. work, refer to SE details. Foundation depths to be determined on site to the SE approval. All walls less than 200mm thick to be reinforced with hoop iron at every alternate course. All adjacent R.C. work and masonry walls to be tied with strap iron at every course. mechanical All plumbing & drainage work to comply with P.H.T specifications. All surface ducts to be accessible from all floors. S.V.P. denotes soil vent pipe and to be provided at the head of the drainage. Drains passing beneath buildings and driveways to be encased in 150mm concrete surround. All underground foul & waste drain pipes shall be of PVC, to comply with BS5255. All inspection chambers covers and framing shall be cast iron to comply with BS 497 Type 2 Grade A. The storm water drain pipes to comply with BS 556. Minimum slope in the drain pipes to be 1%. No chases for pipes will be allowed in the slabs. Sleeves will be allowed with written approval from the SE. No cutting of concrete without express approval of the Architect or SE. All testing of pipes must be coordinated with electrical & any conflicts must be clarified before works begin. P.V denotes permanent vents.	<table border="1"> <thead> <tr> <th>REV</th> <th>REVISIONS</th> <th>BY:</th> <th>CHECKED:</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4.</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	REV	REVISIONS	BY:	CHECKED:	1.				2.				3.				4.			
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Figure 11: Proposed Conceptual Master Plan for Pedestrianisation Tom Mboya Street



The study also established that use of wheelchairs was hampered as their mobility was affected throughout their trip period. The limitation of the use of wheelchair is mainly brought about by among other factors; structural design of the roads and terminal facilities, inefficient operation of public service vehicles and the attitude of the public to wheelchair users.

- **Wrong (undesignated) parking**

Wrong parking is also one of the factors affecting usability of the provided NMT infrastructure. Undesignated parking of vehicles along the road is the cause of congestion in the road. This hampers both pedestrians and other motorized vehicular movements and accessibility in general. Parking at road junction breaks the continuity of the pedestrian movements along this road making them use the carriage way and this too limits the free flow of vehicles (Van Houten, 2000). This increases the time taken when using this road and also waste of resources when held up in traffic jam.

- **Quality of the NMT Facility**

From the observations, it was noted that the existing footpaths are either poorly designed or poorly maintained to such a level that they are not usable. Where the footpaths exist, they are also inaccessible with most of them being used as parking for taxi and motorcycles. Barriers should be installed to protect the pedestrians from accidental risks posed by motorized traffic.

- **Commercial Activities**

The encroachment of commercial activities for instance on-street sellers and commercial goods arranged or displayed along the shops fronts' narrows down the space the pedestrians use. The hawkers convert pedestrian walkways along Tom Mboya Street into open air market in the evening where they display their wares for sale. The impacts of these are seen when pedestrians use the limited space hence congestion and also spill over to the carriage way. Others avoid using the road section which causes them use more time walking to their desired destination. In addition, these commercial activities are not provide with loading and unloading zones hence when undertaking this activity, the vehicles are parked on the road which prevents smooth vehicular flow while the goods on the other side blocks the pedestrian movements slowing down other activities along the road.

Plate 3: Informal Traders along the Pavements



Source: Field Survey, 2019

5.7 Correlation Analysis on Provision and Usability of NMT Infrastructure

As presented in table 5.6 below, the correlation matrix shows that usability of NMT infrastructure was highly correlated (0.81) with zebra crossing but moderately correlated to traffic lights (.56), sheds (.53) and cycling (.50). Further findings indicated that there is a statistically significant positive relationship between usability of NMT infrastructure and street benches (.77) and footpaths (.85). The correlation matrix reaffirms the findings in the descriptive analysis that if the NMT facilities (zebra crossing, traffic lights, sheds, cycling, street benches and footpaths) are provided, the NMT users will be willing to use if they are in good condition.

Table 11: Correlation Analysis on Provision and Usability of NMT Infrastructure

		Zebra Crossing	Traffic lights	Sheds	Cycling facilities	Street benches	Footpaths	Usability of NMT
Zebra Crossing	Pearson Correlation	1						
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	138	138	138	138	138	138	138
Traffic lights	Pearson Correlation	0.75	1					
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000

	N	138	138	138	138	138	138	138
Sheds	Pearson Correlation	0.55	0.41	1				
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	138	138	138	138	138	138	138
Cycling facilities	Pearson Correlation	0.45	0.44	0.42	1			
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	138	138	138	138	138	138	138
Street benches	Pearson Correlation	0.56	0.58	0.74	0.61	1		
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	138	138	138	138	138	138	138
Footpaths	Pearson Correlation	0.80	0.76	0.73	0.56	0.78	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	138	138	138	138	138	138	138
Usability of NMT	Pearson Correlation	0.81	0.56	0.53	0.50	0.77	0.85	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	138	138	138	138	138	138	138

*. Correlation is significant at the 0.05 level (1-tailed).

Choosing the significance level for one to reject H_0 is subjective. Conventionally the 5 percent (less than 1 in 20 chance of being wrong), 1 percent and 0.1 percent ($P < 0.05$, 0.01 and 0.001) levels are used. The analysis in table 5.7 shows that footpath had the strongest positive (Pearson correlation coefficient =0.85; P value 0.000) influence on usability of NMT infrastructure. The findings concur with Mbara (2014) who indicated that in an integrated transport system, walking is a vital mode. For instance, in Nairobi and Dar es Salaam about half of the trips are made entirely on foot, with the rest being a combination of public transport and walking.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter covers the summary of the findings as per the objectives of the study. Based on the research findings, policy recommendations and conclusions have been drawn. The possible areas for further study have also been highlighted in this study.

6.2 Summary

6.2.1 Provision and Usability of NMT Infrastructure along Tom Mboya Street

The common NMT modes along Tom Mboya Street in Nairobi are walking, cycling for personal transport, and human drawn carts for the transportation of goods and garbage, trolleys, wheelchairs wheel barrows but to a small extent. The NMT infrastructure include foot paths, pavements, terminal facilities, zebra crossings, traffic lights, signs and speed bumps to regulate speed at different levels in the urban transport system, for safety of motorized and non – motorized alike.

Pedestrians face a number of challenges as they access the various activity spaces. For instance, majority of the roads have been designed with only motorized transport in mind. As a result, provisions for pedestrians' sidewalks are non- existent. There is also a lot of obstruction of the available pedestrian walkways by parked vehicles, heaps of garbage and informal businesses (hawkers). This renders walking inconvenient and unsafe. The situation becomes more challenging during the rainy season when pools of water fill the walkways making walking impossible and the residents are forced to use public transport. Cycling as a mode of transport is very limited as majority of the roads are perceived to be too dangerous for cyclists. The exact contribution of NMT to transport in Nairobi is not well acknowledged though it remains the main mode of transport in the city contributing over 40 percent of the total daily trips (CCN, 2015).

Due to the challenges facing NMT users, in 2015, the NCCG developed an NMT policy to ensure the development and maintenance of a transport system that completely assimilates NMT within the transport system of the city. To enhance NMT usage, the policy proposes the creation of cohesive, safe and comfortable network of cycling lanes, footpaths, green areas, among other support amenities. It also has laws and regulation of preventing encroachment of NMT facilities by MT.

The study established that NMT is dominant transport mode in Nairobi which concurs with the findings of NIUPLAN, 2014. However NMT infrastructure provision along Tom Mboya Street is wanting. The infrastructure is scarce and the few available cannot meet the demands of the pedestrians and other NMT users such as cyclists. The respondents were asked to indicate their modal mix where it was established that 59 percent used walk-matatu-walk modal mix while 35 percent used walk-bus-walk. It was further established that 6 percent of the NMT users along Tom Mboya Street walked throughout their travel period.

The study sought to establish the condition of NMT infrastructure along Tom Mboya Street. The respondents were therefore presented with a list of NMT infrastructure in order to rate their condition. From the study findings, majority of the respondents were dissatisfied with the condition of existing Zebra crossing with 44 percent indicating that it was lacking while 19 percent indicated that it was in poor condition. Only 29 percent of the respondents indicated that the condition of Zebra crossing was satisfactory while 8 percent indicated that it was good. In terms of traffic lights, 36 percent of the respondents rated it as good while 25 percent rated it as being in excellent condition. Further findings indicate that respondents were dissatisfied with the condition of existing sheds with 39 percent indicating that it was in poor condition while 33 percent indicated that it was lacking. The only existing sheds is found around Koja bus station near the intersection of Tom Mboya Street and River road. Some of the sheds have also been invaded by traders who have converted them into *Kiosks* and shoe shine booths. Through observation, it was established that the sheds are dilapidated and needs renovation.

The respondents indicated that the cycling facilities were completely lacking along Tom Mboya Street, a fact which was confirmed by the researcher through observation. There is only one designated bicycle parking bay located at the General Post Office (G.P.O) in the entire Nairobi CBD. The bay has a capacity of 16 bicycles with hooks onto which the bicycles are locked as the only special provision. It was also established that the street benches were lacking as indicated by 42 percent of the respondents. In terms of footpaths, majority (72 percent) of the respondents indicated that the existing facilities were in poor condition with 22 percent indicating that footpaths were lacking along Tom Mboya Street.

6.2.2 NMT black spots along Tom Mboya Street

The major black spots along Tom Mboya Street according to NTSA are Koja roundabout, Odeon cinema at the intersection between Riveroad and Tom Mboya Street and finally the intersection between Luthuli Avenue and Tom Mboya Street. These are very busy and out dated traffic confluences, which promotes traffic congestions, especially because the traffic congestion on the points don't work at all. Traffic congestion on Tom Mboya Street is greatly experienced in the morning and the evening peak hours. This is because many huge buildings housing several banks, shops, and supermarkets and restaurants front Tom Mboya Street, but unfortunately, being one of the oldest avenues in the CBD of Nairobi, Tom Mboya Street does not have the capacity to accommodate all the vehicles coming for services on its frontage.

Most of the business outlets along Tom Mboya Street do not have any parking space for the traffic they attract. The little parking space can only be found on the street, and this leads to double and triple parking which dangerously blocks the carriage way. Unsafe crossings, failure to observe traffic rules and scarce footbridges are to blame for the increase of pedestrian deaths on Tom Mboya Street Nairobi.

6.2.3 Factors affecting usability of the provided NMT infrastructure

One of the factors affecting usability of the provided NMT infrastructure is the road design. The road design of the road along Tom Mboya Street is contributory to the road traffic accidents between motorists and between pedestrians and motorists. The traffic pile up on the highway can also be linked to the road design, which is not compatible to the land use activity. The road has terminal facilities located just off the carriageway without service lanes. As a result, the public transport operators drop and pick passengers while still on the carriageway. Wrong parking is also one of the factors affecting usability of the provided NMT infrastructure. Undesignated parking of vehicles along the road is the cause of congestion in the road. This hampers both pedestrians and other motorized vehicular movements and accessibility in general.

From the observations, it was noted that the existing footpaths are either poorly designed or poorly maintained to such a level that they are not usable. Where the footpaths exist, they are also inaccessible with most of them being used as parking for taxi and motorcycles. Barriers should be installed to protect the pedestrians from accidental risks posed by motorized traffic.

6.3 Conclusions

6.3.1 Provision and Usability of NMT

The dominant NMT users within the study area are pedestrians, cyclists and handcarts. The handcarts are used to ferry goods and luggage for the people on transit or transacting businesses within the area. The study established an increasing demand for bicycles and handcarts which are expected to rise in the future. Despite the great contribution of NMT as a mode of transport, most policy documents have not explicitly recognized it and programs aimed at promoting NMT receive very little thought.

The study concluded that NMT infrastructure on Tom Mboya Street is inadequate, largely in a poor state and not appealing to current and potential users. Some infrastructure such as parking for hand carts and bicycles is completely unavailable on the street. Bicycles could be seen placed against the trees, building walls and on the walkways thus obstructing the pedestrians.

The inadequacy of NMT infrastructure on the street is a clear demonstration of the neglect of NMT as a viable transport option. It reinforces the view that road infrastructure developments have an engineering bias which only caters for the needs of motorists at the expense of the majority of road users. It also implies that NMT is not considered as an important transport option on the street thus compounding the transport challenges on the road. Continued neglect of NMT issues would mean continued disservice to the majority of road users and forfeiture of all the benefits that result from the use of NMT.

In addition, development planning conveys significant failure to consider NMT. It is evident that NMT receives very minimal attention when designing buildings and undertaking traffic impact assessments. Failure to integrate institutions, effectively coordinate projects and non-alignment of budgets have negatively affected the quality of NMT environments as well as the implementation of NMT projects.

6.3.2 NMT Black Spots

The study concludes that the major black spots along Tom Mboya Street are Koja roundabout, Odeon cinema at the intersection between River Road and Tom Mboya Street and finally the intersection between Luthuli Avenue and Tom Mboya Street. The black spot areas observed in this study have no speed limit signs, no speed

control road bumps, lack of convenient pedestrian road crossing facilities, obstructed road views for motorists and passengers, illegal PSV bus stops, road side activities encroachment of motor roads and pedestrian walk ways and where motorists do not give way to other motorists and pedestrians even when they have a right of way.

It was established that pedestrians frequently do not use designated pedestrian sidewalks, traffic ways and safe road crossing points. These are the main causes of the high pedestrian motor road accidents. Therefore, there is a significant relationship between pedestrian accidents and the lack of pedestrian road sidewalks/pathways. Since there are no sufficient road crossing points and pedestrian facilities on the roads, pedestrians are tempted to take a gamble and cross the roads at any vantage points on the roads despite the risks. If this is accompanied road view obstructions to the pedestrians and motorists, there is a high probability of accidents occurring on such road sections.

Meeting mobility and accessibility needs of people through the provision of safe and environmentally friendly modes of transport is what comprise of a sustainable transport system. Within Nairobi CBD, this would be a difficult and complex challenge since the needs of various income are different and in some cases conflict. It is evident that failure to provide the required NMT infrastructure and encroachment of the available ones by hawkers and motor vehicles has forced cyclists and pedestrians to compete for space in a dangerous mixed traffic. To encourage NMT usage, safety levels, both actual and perceived need to be increased. In this regard, the impact of NMT facilities on safety improvement should be considered as well as positive effects of these facilities on increased usage of NMT.

6.3.3 Factors Affecting Usability of the NMT Infrastructure

The study concluded that Tom Mboya Street doesn't have the required connectivity for the promotion of NMT in the urban centre. It is evident that better linked paths and roadways enhance a more direct travel between destinations. Thus, cycling and walking short routes would be an effective way to encourage the shift from MT to NMT. For cyclists, road intersections pose a great challenge as these areas are characterized by striping, confused signals and bad automobile behaviour. This explains why most of the bicycle-vehicle accidents happen at intersections. As much

as experienced cyclists are at ease competing with automobile traffic, most of the users are not comfortable moving through intersections.

According to the findings, cyclists were the third largest cause of road crashes in Kenya after drivers and pedestrians respectively on similar reasons as for pedestrians but they were observed also to be victims of poor road infrastructure designs which ignores their presence on the road and they have to struggle with motor vehicle drivers for road space because there are no cyclist lanes or parking bays.

Considerable efforts have been made to modify the transport system which was not originally designed with NMT in mind. Some of these efforts include traffic calming which helps to reduce speed differentials between MT and NMT. However, a lot more needs to be done to ensure a proper integration of NMT into the transport system. This starts with the recognition that NMT is a sub-system of the urban transportation system. As a sub – system NMT has to have its own network and attention to be paid at intersection points with the motorized system in the urban transport system.

A sustainable transport system is indeed one that meets mobility and accessibility needs of all people by providing safe and environmentally friendly modes of transportation. This is not the case for Tom Mboya Street as it lacks the required connectivity needed for the promotion of NMT within urban centres. The street lacks designated cycle and pedestrian lanes, signage include traffic calming measures and traffic speed controls. As noted earlier, road side activity interference with motor vehicle flow, lack of pedestrian crossing facilities on highways and lack of pedestrian fences to channel pedestrians to safe crossing points on urban roads increases the risk of road traffic accidents. Thus, the research findings indicate a significant relationship between pedestrian accidents and lack of NMT facilities.

6.4 Recommendations

Based on the findings, the study makes the following recommendations;

- i. Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHUD) to encourage, participate in, initiate marketing, promotion and education of NMT
- ii. MTIHUD to coordinate all NMT activities under a single advocacy group

- iii. MTHUD to promote NMT interests during the preparation of integrated land use and transportation plans.
- iv. NCCG to enhance the attractiveness of NMT environment within the CBD area
- v. NCCG to design and implement appropriate infrastructure for NMT while improving and maintaining the existing facilities
- vi. NTSA to align NMT road safety interventions with the road to safe strategy

6.5 Recommendations for further research

- i. One of the factors affecting the pedestrian movement being the on-street sellers and commercial goods being displayed blocking the pedestrian walkways, a study should be undertaken on planning implication for urban informal traders within Nairobi City County who are currently operating on walkways.
- ii. A study should also be carried out on disability mainstreaming within the CBD and the built environment to ensure provision of friendly NMT facilities for this group

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APPENDICES

Appendix 1: Interview Guide– Traffic Police, Nairobi Headquarters

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

General Information

1. Name of Organization
2. Position of the respondent
3. Age of the respondent
4. Gender of the respondent
5. Level of Education of the respondent

I. Traffic Police, Nairobi Headquarters

1. According to police records how many cases of traffic accidents occur along Tom Mboya Street involving:

Types	2016	2017	2018
Cyclists			
Pedestrians			
Hand carts			
Private vehicles			

2. In the last three years how do you rate the occurrence of bicycle and pedestrian accidents along Tom Mboya Street?

Low High Very High

3. Is there a particular age group with high prevalence?

9. Years and below 16-20 21-30 31-40 41-50

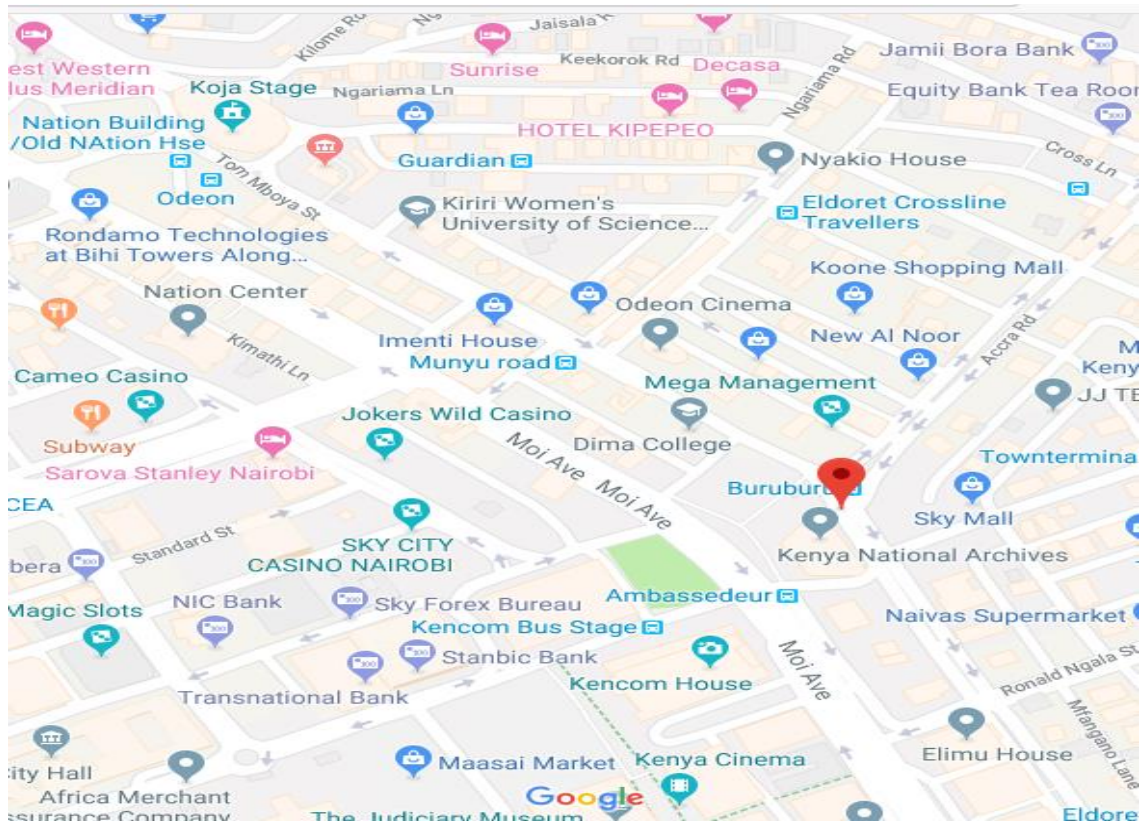
Above 50

4. Which gender is the accidents most prevalent?

Male Female None

5. What time and day of the week are the accidents most prevalent?

6. a). Are there particular spots where the accidents are most prevalent?



b) What causes the accidents?

c) Why the spots? Explain

7. What do you think can be done to reduce accidents involving NMT?

Appendix 2: Interview Guide–Kenya Urban Roads Authority (KURA)

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

I. General Information

1. Name of Organization
2. Position of the respondent
3. Age of the respondent
4. Gender of the respondent
5. Level of Education of the respondent

II. Kenya Urban Roads Authority (KURA)

1. What is the length of KURA road in Nairobi?
2. How many roads have NMT facilities in Nairobi?
3. What is the length of pedestrian paths and cycling lanes in Nairobi CBD?
4. Who is in charge of providing NMT infrastructure along Tom Mboya Street?
5. Are there any plans to provide NMT in Tom Mboya Street? If yes, which type of NMT is to be provided?
6. What is the standard width for pedestrian paths and cycling lanes in Nairobi?

Appendix 3: Interview Guide– National Transport & Safety Authority

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

I. General Information

1. Name of Organization
2. Position of the respondent
3. Age of the respondent
4. Gender of the respondent
5. Level of Education of the respondent

III. National Transport & Safety Authority

1. What is the mandate of NTSA?
2. What are you doing as an organization to fulfill your mandate?
3. What policies have you put in place regarding NMT infrastructure to reduce accidents?
4. What interventions have you put in place to ensure provision of NMT facilities along Tom Mboya Street?
5. Does Nairobi have a functional County Transport & Safety Committee?
6. What is the composition of County Transport & Safety Committee?
7. How frequent does the committee discuss NMT issues in committee deliberations?
8. What changes has it brought in addressing the mobility and safety of NMT in the Nairobi CBD?
9. What challenges does NTSA face when implementing its mandate?
10. How do you rate the efforts towards NMT infrastructure provision along Tom Mboya Street?
 - a. Low High Very High
11. In relation to the standards provided regarding the width of pedestrian walkways and cycling lanes, can Tom Mboya Street accommodate NMT infrastructure? (Explain)
12. If so, how and what do you propose to be done on the existing roads?
13. What measures in your opinion should be put in place to support NMT infrastructure development?
14. Any other comment on NMT provision and usability along Tom Mboya Street?

Appendix 4: Interview Guide– City Engineering and Planning Department

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

I. General Information

1. Name of Organization
2. Position of the respondent
3. Age of the respondent
4. Gender of the respondent
5. Level of Education of the respondent

II. City Engineering and Planning Department

1. Which is the guiding policy of the City on NMT infrastructure?
2. Has the policy been approved?
3. Has budget been allocated for NMT policy implementation in the CBD?
4. Do you have road design manual guiding NMT?
5. Do you use any manual for NMT provision in the CBD?
6. Provide details of status of NMT in the CBD in terms of:
 - a) Types
 - b) Numbers
 - c) Location
7. What are your plans on NMT provision in CBD and Tom Mboya specifically?
8. What challenges do NMT users face along Tom Mboya Street?
9. What activities affect NMT infrastructure?
10. What measures in your opinion should be put in place to support NMT infrastructure development?
11. Any other comment on NMT provision and usability along Tom Mboya Street?

Appendix 5: Interview Guide–NMT Users

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

General Information

1. Age
2. Gender
2. Place of Residence
3. Destination.....

Use of NMT

4. What are your reasons for travelling?
5. Mode of transport used (Walking/cycling, wheelchair) others specify:
.....
6. What are your reasons for the choice of this mode?
7. How long does it take you to reach your destination?
8. How regularly do you make this trip? Daily/Weekly/Monthly
9. What is your mode mix / interchange?
Walk- Public Transport - Walk
Walk - Private Car - Walk
Walk throughout
10. How would you describe the condition of each of the NMT infrastructure along Tom Mboya Street?

	Excellent	Good	Satisfactory	Poor	Lacking
Zebra Crossing					
Traffic lights					
Sheds					
Cycling facilities					
Street benches					
Footpaths					

11. Are there kiosks and hawkers along footpaths and Pavements?

12. If yes how is the presence of kiosks and hawkers affect usability of NMT infrastructure?
13. Do the motorists strictly observe the traffic rules such as traffic lights and pedestrian crossing?
14. How is observance of traffic rules by motorists affect you as an NMT user? Explain.....
15. What problems do you face as;
 - a) Pedestrian
 - b) Cyclist
 - c) PWD (using wheelchair)
16. As a pedestrian, what factors affect your use of provided NMT infrastructure?
17. As Cyclist what factors affect your use of provided NMT infrastructure?
18. What improvements would you like to see carried out on the present NMT infrastructure?
19. Suggest likely NMT infrastructure you would like to see added within specific locations of Tom Mboya Street?

Appendix 6: Questionnaire for Traders

You are kindly requested to answer all the questions in the interview guide. The information provided shall be treated with strict confidentiality and only used for academic purpose.

1. Name of business
2. Position of the respondent.....
3. Age of the respondent
4. Gender of the respondent
5. Level of Education of the respondent
6. Physical location (street).....
7. Type of business/ activity.....
8. When did you establish your business?
9. Is your business full time? Yes...../ No.....
10. Do you own the business? Yes...../ No.....
11. Why did you choose to operate from this location?
 12. Where do you get the goods / raw material you sell?
13. How are your goods/ material transported to the business site?.....
14. Which other place (street) have you operated in before locating here?
 15. If operated elsewhere, what factors did you consider to prefer your present location?
16. Given a choice, would you change your location? Yes.....No.....
17. What would be the reasons of moving to a difference location?
18. What should a good / ideal business site have or provide for your satisfactory operation.
 - (a) Existence of other informal activities..... (b) Proximity to residence....
 - (c) Availability of open space... (d) Formal activities (shopping Activities).
 - (e) Open space..... (f) Pedestrian movement areas.....
 - (g) Others factors (specify).....
19. Which other general problems do you experience in your daily operations?
20. Which are the best possible solutions to these problems?

Appendix 7: Observation Guide

1. Footpath
2. Walk ways
3. Cycle ways
4. Surface of NMT infrastructure (Paved, unpaved, Others (specify))
5. Street furniture such as benches
6. Factors affecting usability of the provided NMT infrastructure
 - Plant outgrowths
 - Hoardings
 - Encroachment by hawkers and traders
 - Cleanliness
 - Utility boxes
 - Poles
 - Service infrastructure blocking NMT such as ditch, water leakage
 - Others (specify)
7. Connectivity
8. Protection from weather agents
9. Safety of NMT users
 - Street lighting
 - Façade of adjoining wall fences
 - Distance from ROW
 - Others (specify)
10. Parking space
 - Bicycle Rack
 - Designated parking space for hand carts and wheelbarrows
 - Others

Appendix 8: Data Collection Work Plan

Target Respondent/Activity Year 2019	Feb 1- Feb 8	Feb 11- Feb 17	Feb 18 - Feb 24	Feb 25- 1 st March	Mar 4 - Mar 8	Mar 11 - Mar 15	Mar 18 - Mar 20	Mar 21 - Mar 22	Mar 25 - Mar 29
Pilot study									
Photography/Observation and Traffic count									
Pedestrians & cyclists									
Traders/business operators									
Private road users and public vehicles operators									
Department of City Engineering and Nairobi City County Government Traffic Management section									
Traffic Police Department									
KURA									
NTSA									