FACTORS CONTRIBUTING TO TRAFFIC PROBLEMS ON MAJOR URBAN ROADS: A CASE STUDY OF MOMBASA ROAD

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THIS PLANNING RESEARCH PROJECT IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE AWARD OF BACHELORS OF ARTS DEGREE IN URBAN AND REGIONAL PLANNING AT THE UNIVERSITY OF NAIROBI

FEBRUARY, 2009
DECLARATION

This Planning Research Project is my original work and has never been presented for a degree requirement in any other University. No part of this research project may be produced without the prior permission of the Author or the University of Nairobi.

SIGNED…………………………………… DATE……………………………………

OCHIENG GODWIN, (Candidate)

This planning research project has been submitted for examination with my approval as University Supervisor.

SIGNED…………………………………… DATE……………………………………

DR. SAMUEL V. OBIERO, (Supervisor).
1 DEDICATION

To my best friends I ever met in this world, my mum Pauline and the mentor of my life time Fred, and to all those who were there to see me through all this process, I dedicate to you this as I continuously ask God to continue blessing you.
3 ACKNOWLEDGEMENT

I count this work a success because of untiring support I received continuously from many quotas.

The little but valuable financial support from university of Nairobi through department of Urban and Regional Planning can not go unrecognised for their positive contribution for the success of this project.

Most importantly my sincere thanks goes to Dr. Samuel Obiero for his fatherly, moral and professional guidance that I constantly received from him to enable me succeed in completing this planning research project. I also feel obligated to appreciate the immense contribution of the project coordinators: Prof. Peter Ngau and Mr. Romanus Opiyo for their tireless guidance to make this work a success.

Finally Fred and my entire family, I appreciate every bit of their contribution for being there whenever I needed them, this success belongs to them.

I say God bless!
Acronyms and abbreviations

MT é é é é é é é é é é .... Motorized Transport
CBD é é é é é é é é é é ..é . Central Business District
NGO's. é é é é é é é é é é .. Non-Government Organizations.
CBO's é é é é é é é é ..é é é Community Based Organization
AIDSé é é é é é é é é é é .Acquired Immunodeficiency Syndrome
KM/Hé é é é é é é é é é é ....Kilometer Per Hour
UTPé é é é é é é é .Urban Transport Planning
KRBé é é é é é é é é é é ..Kenya Roads Board
CBSé é é é é é é é é é ..Central Bureau of Statistics
GNPé é é é é é é é .Growth National Product
NTMPé é é é é é é é é é ..Nairobi Transport Master Plan
JICAé é é é é é é é é é ..Japan International Corporation Agency
EUé é é é é é é é é é é .European Union
SSAé é é é é é é ..Sub-saharan Africa
NARCe é é é é é é é ..National Rainbow Coalition
INTPé é é é é é é é ..Intergrated National Transport Policy
NEMAé é é é é é é é ..National Environment Management Authority
MoRe é é é é é é é é é ..Ministry of Roads
5 ABSTRACT

Urban population has increased from less than 30% of the total in 1950 to more than 47% in the year 2000. It is projected that more than 57% of world population will be living in cities by the year 2020. This rate of urbanization raises the need for efficient urban transportation systems (UNCHS Habitat 1999, Howe 1994, UNCHS Habitat 1998).

A recent JICA study and other recent studies show that traffic speeds are increasingly getting slower especially on major arterials like the Mombasa road. Currently, congestion Sections of key arterials in Nairobi City are less than 20 km/h. In the morning peak, most of the major roads are extremely congested with short distances which should take as little as 10 minutes taking as long as 2 hours. The slow movement of vehicular within the city and across it has resulted into loss of economic time, high cost of maintaining cars, air pollution from vehicle exhausts and mostly it has been a big hindrance to economic growth both of the city, the whole country and east Africa region. Although the total number of vehicles in Nairobi is not large relative to the human population, the city, suffers from a high level of ambient air pollution due to vehicular emissions, and is one of the worst environmental problems affecting the city. This is due to poor and inadequate road system, high traffic density, poor traffic system, poor maintenance of private and commercial vehicles, lack of proper monitoring and strategies, policies and enforcement of existing laws, rules, and regulations.

Institutions in the transport sector, in general, have weak and ineffective structures. Lack of capacity and shortage of resources seriously undermines their capability for good corporate governance, sound policymaking and public management. There are also serious deficiencies in the current planning approach adopted by different agencies, with very little or no cognisance of stakeholders views.

It is estimated that 2.2 million residents of Nairobi lack an appropriate and affordable means of public transport to facilitate their movement, especially journey to work, which is the economic prime urban trip worldwide.

To ensure that a steady growth and development is realised, the following measures are worth considering in development of transport system which includes; Bypass system, Major corridors within Nairobi city, Missing links, Light Rail Transit System (LRTS), Re-organisation of bus transport with a higher share by big buses, Improvement of intersections and, A host of other measures

Previous transport planning work that has been undertaken in Nairobi has proceeded on the basis of diagnoses that have focused too narrowly on capacity constraints related to automobile traffic. Therefore there is absolute need to look at Mombasa road in many dimensions given that a part from being the main arterial in Nairobi it is the main High way linking the port of Mombasa and other neighbouring countries hence it plays a critical role in development of the East Africa Region.

The paper analyses the findings and concludes by giving a wide range of proposals, recommendations as well as key implementation points geared towards addressing the problems facing Mombasa road.
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FACTORS CONTRIBUTING TO TRAFFIC PROBLEMS ON MAJOR URBAN ROADS: A CASE STUDY OF MOMBASA ROAD

1.1 INTRODUCTION
1.2 PROBLEM BACKGROUND
This study covers Mombasa road from Jommo Kenyatta International Airport Interchange to Nyayo stadium round about approximately two kilometres. This section of Mombasa road experiences different degrees of traffic jams at different points, otherwise known as known as bottle necks hence thus forms the basis of this study.
Mombasa road is a class A road, which, a part from playing the role of international Trunk road it also acts as urban traffic distributor. Therefore it is one of the most important roads not only in Kenya but also in the entire East Africa. This is because the international heavy traffic goods which are destined to western Kenya, Uganda, Tanzania, Congo, Rwanda e.t.c.passes through this road.
This brings with it a lot of challenges which requires investigation and proper analysis in order to find solutions for rectification. A gain most of the estates that neighbours this road like south B, South C, Industrial buildings and offices exploits this road’s role as urban distributor.

1.3 RESEARCH PROBLEM STATEMENT
Road accidents disproportionately affect the poor, making road safety an economic development imperative. Most of the victims of road accidents are not even in motor vehicles. Pedestrians, cyclists and motorcycle riders are most vulnerable road users and account for majority of traffic deaths in low and middle income countries. A good example is Dhaka city, Bangladesh where by pedestrians alone comprise almost 75 percent of road accidents fatalities and the pattern is not any different from other third world countries like Kenya.
Road accidents are economic burden and pose a major challenge to health care system. The economic cost of road crashes and injuries is estimated at 1-1.5 percent of Gross National Product (GNP) for low and middle income countries. Critical and often scarce health care resources get consumed by road crashes cases. This hurts country’s ability to responds to other health needs. Road traffic injuries also place a heavy burden on household finances of the victims and their families. Many families are driven deeply into poverty by loss of a bread winner and the added burden of disabled members
Mombasa road was design purposely to serve international heavy traffic goods, and it acted as a bypass in the past years but with the high rate of population growth in Nairobi its function has increased more than five folds which have also compromised the objective of its role.
This is one road which experience a lot of high vehicular traffic resulting in unmoving traffic jam. This has resulted out of the fact that most heavy traffic vehicles that use it are moving at a slower pace and when added the usual matatus that applies this route and the private cars, hand carts, cyclists and pedestrian with no distinctive route to follow, there is definite traffic snarl-up.
The mix of traffic modes together with the mix of local and through traffic with no special lanes
normally result in total chaos. Lack of adherence to planning regulations which results in illegal allocation of road reserves to "well-connected" individuals has aggravated the situation.

1.4 RESEARCH GOAL
The main goal of the study is to investigate factors contributing to traffic problems on Mombasa road.

1.5 RESEARCH OBJECTIVES
1. Examine the traffic conditions on Mombasa road.
2. To analyse relevant factors which affect smooth flow of traffic on Mombasa road.
3. To propose appropriate planning interventions to improve transport situation on Mombasa road.

1.6 RESEARCH ASSUMPTIONS
An international Trunk Road in normal circumstances is a class A type road, which is wide and stable enough to withstand the weight of heavy trucks that are destined to international countries that are across the border. In Width it should be about 12m and properly served with special lanes for ambulance, police and other emergencies. Pedestrian paths and cyclist ways are also supposed to be provided to avoid modal conflict which is currently experienced along this road. Proper planning of this international trunk road will not only reduce the number of accidents and traffic snarl-up along this road but will also save people prime economic time, wastage of fuel, pollution and most importantly enables the country to keep pace with other rapidly developing countries across the globe.

Research Hypothesis
A hypothesis is an empirically testable statement about a relationship involving two or more variables. The study is based on the following research hypothesis;
The current Mombasa road do not have the capacity to play its effective role as it supposed to be and this has compromised a lot of other activities.

JUSTIFICATION
Given that majority of transportation in Nairobi, Kenya, and the neighbouring countries are through road therefore there is every need to plan for crucial roads which plays the interlinking role such as Mombasa road in order to ensure that development in the country and the neighbouring countries is sustainable.
There is also the need for an integrated transportation plan, which will ensure co-existence between motorized and non-motorized transport uses and users.

1.7 STUDY AREA

1.8 RESEARCH METHODOLOGY
Methodology of study of Mombasa road would involve conducting qualitative and quantitative of both primary and secondary data. Qualitative data would be inform of statements of views, opinion of respondents and past reports on Mombasa road that have been done by other research.
groups like JICA (Japan International Corporation Agency) and NTRP (Nairobi Toll Road Project) that is currently underway. On the other hand qualitative data would be inform of numbers giving actual figures of measurements for example speed in km/hr, measurement of road in terms of length i.e meters, kilometres

1.8.1 Data Sources and Data Need Matrix

SAMPLING PROCEDURES
Sampling is the technique of selecting a suitable sample, or a representative part of a population for the purpose of determining parameters or characteristics of the whole population. A population is a group of individuals, persons, objects, or items from which samples are taken for the purpose of the study. A sample must be large enough to give a good representation of the population, but small enough to be manageable Mugenda (1999:14)

In this study, the sample size of 65 will be adopted and non-probability sampling techniques consisting of Purposive and Snowball methods will be used to select the sample from the target population. Non-probability samples are often necessary and un-avoidable [Kerlinger 1973:129]. Their weaknesses can to some extent be mitigated by using knowledge expertise and care in selecting the samples.

Purposive sampling
Purposive sampling is a sampling technique that allows a researcher to use cases that have the required information with respect to the objectives of the study Mugenda (1999:50). Therefore, informative subjects or those with required characteristics e.g. cyclists, pedestrians, motorists and other professionals will be hand picked for interviews.

Snowball sampling
The subjects chosen through purposive sampling will help in naming other subjects whom they fill have the relevant information on the research topic until the required sample size is achieved. The sample size is 65 and divided into:
- Drivers of commercial matatu 10, drivers of heavy trucks 10, drivers of private cars 5, policemen 5, pedestrian 10, cyclist 5, cart pullers 10 and owners of encroached structures 10

1.8.2 Data Collection

Primary data collection
The primary data would entail physical observation and recording of the character of the road like the physical appearance of the road, the materials used on the road under study e.t.c.
Oral interviews and filling of the questionnaires by the road users like the drivers, cart pullers, cyclists, traffic police and pedestrians on average time spent on road, speed, alternative routes and other challenges facing them.

There would be physical measurement and recording of the width and the road reserve.

The following features will also be looked at:
- whether the road is dual carriage way or single carriage
- the number of lanes the road has
- various modes of transport operating on this road
- total length and width of the road under study
- frequency of different modes of transport to find out who uses the road most

Secondary data collection

Secondary data would involve literature review of the past studies along the road and other roads of similar nature, examples of such studies include findings of the JICA (Japan International Cooperation Agency) and findings of NTRP (Nairobi Toll Road Project).

1.8.3 Data analysis

Data obtained would be analysed through the following methods:

a) the summery of the data would be done using descriptive statistics techniques, that is, percentages, frequencies and mean scores
b) qualitative descriptions and interpretations
c) tabular and graphical presentations in reporting the trends
d) Pictorial presentation of information on the ground such as jam on Mombasa road, modal type that applies the route e.t.c.

1.9 DATA PRESENTATION

The findings will be presented by use of descriptions, tables to show the modal split and speed, photographs to show peak and off peak hours, graphs to show frequency of use. Charts and drawings by use of Google sketch up.
### 1.10 SUMMARY OF DATA NEED MATRIX

<table>
<thead>
<tr>
<th>Research question</th>
<th>Objective</th>
<th>Type of data</th>
<th>Source of data</th>
<th>Methods of data collection</th>
<th>Methods of data analysis</th>
<th>Method of data presentation</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there transport problems experienced along Mombasa road?</td>
<td>To find out various transport problems along Mombasa road</td>
<td>-opinions on problems of transport - opinions on possible planning interventions</td>
<td>- secondary sources like previous studies by JICA &amp; NTRP -field work -road users -maps and plans</td>
<td>- observation - interviews - photographs - questionnaires - literature review</td>
<td>-use of maps -spatial data analysis</td>
<td>-maps -graphs -charts - photographs</td>
<td>To understand existing transport challenges</td>
</tr>
<tr>
<td>What are the various transportation modes that operate along Mombasa road?</td>
<td>To find out various modes of transport that operate along the route</td>
<td>-data on modes of transport -data on frequency of the modal split</td>
<td>Secondary sources -field work -road users</td>
<td>- observation - photographs - interviews - literature review Questionnaire</td>
<td>Use of photograpgh -correlations</td>
<td>-tables -sketches -reports - photographs</td>
<td>-maps -reports -tables To be able to plan and advice on necessity of special lanes.</td>
</tr>
<tr>
<td>What are the existing structures that borders Mombasa road?</td>
<td>To find out extent of structures’ intrusion on road reserve</td>
<td>-data on type of structures -data on road reserves - data on role of the structures on economy</td>
<td>- secondary sources - observation</td>
<td>- observation - photographs - interviews - questionnaires</td>
<td>Use of photograpgh -sketches -maps reports</td>
<td>-maps -reports -tables</td>
<td>-maps -reports -tables To be able to plan and advice on necessity of special lanes.</td>
</tr>
<tr>
<td>What are the various planning strategies and solutions that can be undertaken to improve efficiency of Mombasa road?</td>
<td>To consider employing planning techniques to improve the existing situation</td>
<td>-views on proper planning interventions -proper planning of road reserve for sustainable economic growth</td>
<td>- secondar y sources -primary sources</td>
<td>- observatio ns - photographs -interviews -literature reviews</td>
<td>Use of maps</td>
<td>-tables -maps -sketches -reports -photographs</td>
<td>An insight into challenges compromisin g efficiency of the road and recommendati ons to amend the situation</td>
</tr>
</tbody>
</table>

1.11 SCOPE AND ORGANIZATION OF THE STUDY
This planning research project has been organised into five chapters, these chapters have been briefly discussed as follows:

1.12 STRUCTURE OF THE REPORT

1.12.1 Chapter one
This chapter consists of the introduction part including the overview which discusses the situation of urban transport in world wide and in developing world with focus on Africa, definitions of key terms and role of Mombasa road in development of Nairobi city, the surrounding regions and the neighbouring countries. The chapter also discusses the statement of the problem and the specifics questions that the research aims to answer and the subsequent objectives, hypothesis, justification and the significance of the study as well as the scope, assumptions and methodology of the study.

1.12.2 Chapter two
This chapter focuses on the literature review with due considerations to transport systems world over in relation to the local situation on Mombasa road. This is done trough analysis of various reports on Mombasa road and their subsequent analysis and recommendations on the way forward. These data will be critical in understanding the topic under study and The literature review will be very important in developing conceptual frameworks which will ensure that a more effective and sustainable transport systems or modes are achieved for the study area to ensure that Mombasa road effectively serves it purpose.

1.12.3 Chapter three
This chapter keenly focuses on the background to the study area including the location of the study area and its historical development with special emphasis on socio-cultural and economic, environmental and physical characteristics of the place and how they affect the transportation
systems.

1.12.4 Chapter four
This chapter focuses on findings from the field through primary and secondary data collection analysis in comparison to the objective of the study. It also discusses the situational analysis of the study area with clear identification of the problematic areas along Mombasa road.

1.12.5 Chapter five
This chapter gives alternative planning proposals and recommendations based on analysis of the data collected from the field. The conclusion of the study is also given in this chapter

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION
The aim of this chapter is to obtain detailed knowledge of the topic being studied (Mugenda and Mugenda, 1999). Mugenda and Mugenda notes that review of literature involves the systematic identification, location and analysis of documents containing information related to the research problem being investigated.

2.2 TRANSPORT SYSTEM IN NAIROBI
The transport system of Nairobi is essentially road based and occasional railways and air transport that is sometimes used in aid developing Nairobi which is the seat of government, the biggest commercial, financial and industrial centre of not only Kenya but also the neighbouring countries.

2.3 URBAN POPULATION GROWTH
The latter half of the 20th century has seen the continuous transformation of the world's population into urban dwellers. Urban population has increased from less than 30% of the total in 1950 to more than 47% in the year 2000. It is projected that more than 57% of world population will be living in cities by the year 2020. This rate of urbanization raises the need for efficient urban transportation systems (UNCHS Habitat 1999, Howe 1994, UNCHS Habitat 1998, Kasuku 1995).

The Population of Nairobi alone has increased from a mere 100,000 inhabitants in 1948 to some 3.5 Million and 4.7 Million people for night and day population respectively. Statistics show that Nairobi's night population will be 6.7 Million by the year 2020. This calls for an elaborate urban transport services to serve mobility needs of the population.

From observations made by the JICA(Japan International Corporation Agency) studies and the NTRP(Nairobi Toll Road Project), Mombasa road is one the major roads within the city that experience a lot of challenges as far as traffic congestion is concerned hence requires investigation and proper mitigation measures.
2.4 TRANSPORTATION AND ACCESSIBILITY IN THE CITY OF NAIROBI
The latter half of the 20th century has seen the continuous transformation of the world's population into urban dwellers. Urban population has increased from less than 30% of the total in 1950 to more than 47% in the year 2000. It is projected that more than 57% of world population will be living in cities by the year 2020. This rate of urbanization raises the need for efficient urban transportation systems (UNCHS Habitat 1999, Howe 1994, UNCHS Habitat 1998).

Recent studies of hourly traffic volume to/from Nairobi shows that about 20,000 passenger cars are composing the traffic volume, which is reaching about 60,000 vehicles in each direction. Studies have also shown that most of the access mode to/from bus stop/matatu is walking. The maximum walking time to/ from bus stop/matatu is 30min. The average walking time is 1 1.7 min. Studies also shows that there are increasing levels of road accidents in Nairobi city. The major reason for traffic accidents are bad driving behaviour and poor physical conditions of roads.

2.5 ROLE OF MOMBASA ROAD IN NATIONAL CONTEXT
Nairobi is the seat of government, the biggest commercial, financial and industrial centre of the country contributing slightly above 50 per cent to the Gross Domestic Product (GDP) and accounts for the largest proportion of wage employment in the country at 44.3 per cent (CBS 2003). Nairobi is also Kenya's primate city accounting for 20.1 per cent of national urban population and 5.2 per cent of national population (CBS, 1999) and therefore sets pace for other parts of the country and Mombasa road plays a key role in ensuring sustainability of these.

2.6 ROLE OF MOMBASA ROAD IN NAIROBI METROPOLITAN REGION
A STRATEGIC ANALYSIS OF THE NAIROBI METROPOLITAN REGION
Cities all over the world are at the centre of two powerful forces; urbanization and globalization. It is widely acknowledged that more than 50 per cent of the world's population is now living in urban areas. Of the world's 2.3 billion urban population, 61 per cent reside in the metropolitan areas of developing countries (UNCHS: 1 996, 2000).
This urban population tends to concentrate in cities where economies of scale are most favourable and where the greatest opportunities exist. Because the contribution of cities to Gross National Product (GNP) is often greater than their share of national population, they have long since been recognized as "engines of economic growth and development".

Figure 2.1 Nairobi Metropolitan Region Population Growth Patterns
Core Nairobi's population has grown significantly from 350,000 in 1963 to 828,000, 1,325,000 and 2,137000 in 1979, 1989 and 1999 respectively. Its night time population by 2007 is estimated at 3.05 million and is growing at a rate higher than even the national population growth (4.8 per cent as compared to 3.4 per cent: (CBS, 1999). The current population of Nairobi Metropolis is projected at 4.73 million. Notably important is that Nairobi's population represents about 21 per cent of Kenya's urban population. A feature not to be ignored also is Nairobi's primacy; Mombasa the second largest city has a population of 660,000 representing approximately % of Nairobi's population. Projections indicate that this population is expected to hit the 8 million mark by the year 2030. Therefore it means that proper infrastructural facilities like Mombasa road, railways and air transport must be improved because they are necessary for the development to sustainable.

2.7 NAIROBI CITY TRAFFIC CHARACTERISTICS

The transport system of Nairobi is essentially road based. The Nairobi city road network extends over 1165.2km (includes 202.7km of MRPW and 962.5km actual city roads). Traffic on the roads is intense with high congestion and long delays. The mobility rate of car owning households is high. A large percentage of trips (47%) are by walk. Public transport share is 42%. Traffic volumes are high and level of service low tending to be D to F on many links. The directional peak hour share is highly skewed ranging between 7% and 18.2%. Public Transport Modes include buses and matatus with the matatus accounting for a high share of 97% in number of public transport vehicles and 82% by passengers. Table 1.3 presents some salient of travel characteristics of Nairobi City.
Travel Characteristics of Nairobi City

Table 2.1

<table>
<thead>
<tr>
<th>Person Trips</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Person trips per day</td>
<td>4,815,457</td>
</tr>
<tr>
<td>Trips per person</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Trip Purpose</strong></td>
<td></td>
</tr>
<tr>
<td>To home trips</td>
<td>47%</td>
</tr>
<tr>
<td>To work trips</td>
<td>25%</td>
</tr>
<tr>
<td>To school trips</td>
<td>10%</td>
</tr>
<tr>
<td>Other purpose trips</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Modal Share</strong></td>
<td></td>
</tr>
<tr>
<td>Walk Trips</td>
<td>47%</td>
</tr>
<tr>
<td>Private Car Trips</td>
<td>15%</td>
</tr>
<tr>
<td>Public Transport (Matatu)</td>
<td>29%</td>
</tr>
<tr>
<td>Public Transport (Bus)</td>
<td>4%</td>
</tr>
<tr>
<td>Main trip flow into central area is from west area</td>
<td></td>
</tr>
<tr>
<td>and east area</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traffic Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Car</td>
<td>36%</td>
</tr>
<tr>
<td>pick-up/4WD</td>
<td>23%</td>
</tr>
<tr>
<td>Matatu</td>
<td>27%</td>
</tr>
<tr>
<td>Bus</td>
<td>3%</td>
</tr>
<tr>
<td>Traffic Originate and arrive at Nairobi</td>
<td>93%</td>
</tr>
<tr>
<td>Through traffic</td>
<td>7%</td>
</tr>
<tr>
<td>Average Speeds (Kmph)</td>
<td>15 to 81</td>
</tr>
<tr>
<td>Directional Peak Hour Traffic</td>
<td>7% to</td>
</tr>
<tr>
<td></td>
<td>18%</td>
</tr>
</tbody>
</table>

Source: JICA Study

2.8 TRAFFIC PROBLEMS ALONG MOMBASA ROAD

A recent JICA study and other recent studies show that traffic speeds are increasingly getting slower especially on major arterials like the Mombasa road. Currently, congestion Sections of key arterials in Nairobi City are less than 20 km/h. In the morning peak, most of the major roads are extremely congested with short distances which should take as little as 10 minutes taking as long as 2 hours. The slow movement of vehicular within the city and across it has resulted into loss of economic time, high cost of maintaining cars, air pollution from vehicle exhausts and mostly it has been a big hindrance to economic growth both of the city, the whole country and east Africa region. Although the total number of vehicles in Nairobi is not large relative to the human population, the city, suffers from a high level of ambient air pollution due to vehicular emissions, and is one of the worst environmental
problems affecting the city. This is due to poor and inadequate road system, high traffic density, poor traffic system, poor maintenance of private and commercial vehicles, lack of proper monitoring and strategies, policies and enforcement of existing laws, rules, and regulations. Other costs on environmental include noise pollution and poor transport infrastructure construction and maintenance practices amongst others.

Institutions in the transport sector, in general, have weak and ineffective structures. Lack of capacity and shortage of resources seriously undermines their capability for good corporate governance, sound policymaking and public management. There are also serious deficiencies in the current planning approach adopted by different agencies, with very little or no cognisance of stakeholders views.

Studies indicate that over 50% of Nairobi city residents live below poverty line, earning less than a dollar a day. Considering the various competing needs of life, expenditures on transport are usually considered non-essential in favour of life supporting items like food, water and shelter. Recent surveys show that some 60% of residents of Nairobi meet their mobility needs on foot especially for the journey to work which the critical urban trip is accounting for over 75% of all daily urban trips.

It is estimated that 2.2 million residents of Nairobi lack an appropriate and affordable means of public transport to facilitate their movement, especially journey to work, which is the economic prime urban trip worldwide.

To ensure that a steady growth and development is realised, the following measures are worth considering in development of transport system which includes:

- Bypass system
- Major corridors within Nairobi city
- Missing links
- Light Rail Transit System (LRTS)
- Re-organisation of bus transport with a higher share by big buses
- Improvement of intersections and
- A host of other measures

Previous transport planning work that has been undertaken in Nairobi has proceeded on the basis of diagnoses that have focused too narrowly on capacity constraints related to automobile traffic. Therefore there is absolute need to look at Mombasa road in many dimensions given that a part from being the main arterial in Nairobi it is the main High way linking the port of Mombasa and other neighbouring countries hence it plays a critical role in development of the East Africa Region.

2.9 NAIROBI TRANSPORT MASTER PLAN-DECONGESTING MOMBASA ROAD

A Nairobi Transport Master Plan (NTMP) has been prepared in the year 2004, by JICA. It presents a detailed analysis of the traffic, road network and public transport system
characteristics of Nairobi. The Transport Plan has estimated the travel demand, by modes, in the year 2004 up to 2025 as under

2.9.1 Travel Demand, by Mode (Person Trips)

Table 2.2

<table>
<thead>
<tr>
<th>Year</th>
<th>Walk</th>
<th>Private</th>
<th>Public</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2,326,021</td>
<td>723,614</td>
<td>1,704,392</td>
<td>4,754,027</td>
</tr>
<tr>
<td></td>
<td>49%</td>
<td>15%</td>
<td>36%</td>
<td>100%</td>
</tr>
<tr>
<td>2010</td>
<td>2,818,637</td>
<td>1,048,843</td>
<td>2,062,050</td>
<td>5,929,530</td>
</tr>
<tr>
<td></td>
<td>48%</td>
<td>18%</td>
<td>35%</td>
<td>100%</td>
</tr>
<tr>
<td>2015</td>
<td>3,014,587</td>
<td>1,386,154</td>
<td>2,246,295</td>
<td>6,647,036</td>
</tr>
<tr>
<td></td>
<td>45%</td>
<td>21%</td>
<td>34%</td>
<td>100%</td>
</tr>
<tr>
<td>2025</td>
<td>3,613,754</td>
<td>2,156,583</td>
<td>2,505,633</td>
<td>8,275,970</td>
</tr>
<tr>
<td></td>
<td>44%</td>
<td>26%</td>
<td>30%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: JICA Study

The Transport Plan has forecast some of the city characteristics and traffic demand as under

2.9.2 City Characteristics and Traffic Demand

Table 2.3

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2010</th>
<th>2015</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRDP per HH (at 2004 Constant Pricing: Ksh)</td>
<td>32600</td>
<td>37805</td>
<td>43815</td>
<td>58882</td>
</tr>
<tr>
<td>No. of HH</td>
<td>882317</td>
<td>1028675</td>
<td>1131492</td>
<td>1391838</td>
</tr>
<tr>
<td>Car ownership Rate per HH</td>
<td>23.30%</td>
<td>31.10%</td>
<td>41.30%</td>
<td>49.20%</td>
</tr>
<tr>
<td>No. of Private Cars (Nairobi)</td>
<td>207339</td>
<td>319428</td>
<td>467740</td>
<td>684833</td>
</tr>
<tr>
<td>Population (5 years and above)</td>
<td>2143254</td>
<td>2540716</td>
<td>2834539</td>
<td>3507666</td>
</tr>
</tbody>
</table>

Source: JICA Study

To enable mobility at the desired level of service the NTMP has recommended development of transport system which includes: Bypass system, Major corridors within Nairobi city, Missing links, Light Rail Transit System (LRTS), Re-organisation of bus transport with a higher share by big buses, Improvement of intersections and A host of other measures
2.9.3 Table below presents the salient features of the Transport Plan

<table>
<thead>
<tr>
<th>Sector</th>
<th>S No.</th>
<th>Project</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Network</td>
<td>1</td>
<td>Bypass Roads</td>
<td>Southern Bypass, Northern Bypass, Eastern Bypass</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Link Roads</td>
<td>Western Bypass Link Road, Eastern Bypass Link Road/Outer Ring Road</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Missing Links</td>
<td>Missing Links No 1 to 16</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Planned Radial Roads</td>
<td>Ngong Road/Haile Selassie Road, Uhuru Highway, Limuru Road, Muranga Road</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Circumferential Roads</td>
<td>Upgrading Uhuru Highway, Construction of circumferential route(C-2 line) &amp; Construction of radial routes with C-3, Construction of circumferential route(C-3 line) &amp; Extension of radial routes</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Secondary Arterial</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Intersection Improvement</td>
<td>Upgrading and improvement of major intersections</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Non Motorized Transport</td>
<td>Pedestrian way and bicycle path</td>
</tr>
<tr>
<td>Public Transport</td>
<td>1</td>
<td>Bus Incentive Policy</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Bus Priority Policy</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Existing Rail</td>
<td>Improvement of Existing Railway, Introduction of Light Rail System</td>
</tr>
<tr>
<td>Traffic Management</td>
<td>1</td>
<td>Traffic Circulation in City Centre</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>On Street Parking</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Traffic Enforcement</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Public Education</td>
<td>--</td>
</tr>
<tr>
<td>Traffic Institution</td>
<td>1</td>
<td>Human Resource Capacity Building</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Institutional Development</td>
<td>--</td>
</tr>
</tbody>
</table>

*Source: JICA Study*
2.10 FACTORS JUSTIFYING THE NEED FOR IMPROVEMENT OF MOMBASA ROAD

2.10.1 Urban Population Growth

The latter half of the 20th century has seen the continuous transformation of the world's population into urban dwellers. Urban population has increased from less than 30% of the total in 1950 to more than 47% in the year 2000. It is projected that more than 57% of world population will be living in cities by the year 2020. This rate of urbanization raises the need for efficient urban transportation systems (UNCHS Habitat 1999, Howe 1994, UNCHS Habitat 1998, Kasuku 1995).

Urbanisation in Kenya has been growing rapidly since independence. During the two intercensal periods (1969 - 1989 - 1999) the rates of growth of urban population has increased from 8 % in 1980s to over 34% in 2003 and is projected to reach over 50% by 2020. The Population of Nairobi alone has increased from a mere 100,000 inhabitants in 1948 to some 3.5 Million and 4.7 Million people for night and day population respectively. Statistics show that Nairobi’s night population will be 6.7 Million by the year 2020. This calls for an elaborate urban transport services to serve mobility needs of the population.

Increasing personal trip rates

Trip rates in Nairobi City especially along Mombasa road have been increasing steadily and currently stand at 2.27 trips per person per day. This is due to casual labourer that walk to and from industrial area every day in the morning and the evening. The trip rate of male is higher than that of female being 2.44 trips against 2.04 trips respectively. The total number of person trips per day is 4,815,457 and the internal trips within the Nairobi City are 4,754,027.

<table>
<thead>
<tr>
<th>Table 2.5</th>
<th>Total Number of Person Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Study Area</td>
</tr>
<tr>
<td>Study Area</td>
<td>4,754,027</td>
</tr>
<tr>
<td>Outside City Boundary</td>
<td>29,331</td>
</tr>
<tr>
<td>Total</td>
<td>4,783,358</td>
</tr>
</tbody>
</table>

Source: JICA Report 2005
Based on the Cross-Classification trip rate table and the total future framework, the total trips production in Nairobi City is forecasted to expand to 8.28 million tips per day in 2025, swelling from 4.82 million trips in 2004 as shown in Table 2 below.

Table 2.6 Future Total Trip Production by Trip Purpose

<table>
<thead>
<tr>
<th>Target year</th>
<th>HOME</th>
<th>WORK</th>
<th>SCHOOL</th>
<th>OTHERS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2,240,692</td>
<td>1,204,926</td>
<td>471,665</td>
<td>898,174</td>
<td>4,815,457</td>
</tr>
<tr>
<td>2010</td>
<td>2,754,523</td>
<td>1,561,561</td>
<td>555,149</td>
<td>1,058,297</td>
<td>5,929,530</td>
</tr>
<tr>
<td>2015</td>
<td>3,087,894</td>
<td>1,751,447</td>
<td>631,203</td>
<td>1,176,492</td>
<td>6,647,036</td>
</tr>
<tr>
<td>2025</td>
<td>3,843,578</td>
<td>2,196,167</td>
<td>783,155</td>
<td>1,453,069</td>
<td>8,275,969</td>
</tr>
</tbody>
</table>

Source: JICA Report 2005

Increasing Trip Generation and Attraction

Recent studies of Hourly Traffic Volume to/from Nairobi show that about 20,000 passenger cars are composing the traffic volume, which is reaching about 60,000 vehicles in each direction. Studies have also shown that most of the access mode to/from bus stop/matu is walking. The maximum walking time to/from bus stop/matu is 30min. The average walking time is 11.7min.

Traffic Safety

Studies show that there are increasing levels of road accidents in Nairobi city. The major reason for traffic accidents are bad driving behaviour and poor physical conditions of roads, junction and design of round abouts.

Problematic transportation system

There are three fundamental problems with the current transport system, and these are traffic congestion, poor transport infrastructure quality in that the road is narrow, and lack of mobility for the overwhelming majority of persons who do not have access to private automobiles.

Decreasing travel speed

A recent JICA study and other recent studies show that traffic speeds are increasingly getting slower. Currently, congestion Sections of key arterials in Nairobi City are less than 20 km/h. In the morning peak, most of the major roads especially Mombasa road is extremely congested with short distances which should take as little as 10 minutes taking as along as 2 hours.
Poor Quality of Transport Services

The transport sector in Kenya is characterised by weak public and private institutions, and low levels of investment. It operates in a physical environment of high levels of risk and socio-political context of extreme poverty. Overcrowded and inefficient public transport, with poor safety and security records, and unreliable service operations are quite common in Kenya. In freight transport, high cost, long transit times, insecurity of cargo, etc. are some of the common problems. If this trend continues, the transport sector development would become unsustainable from economic, social and environmental points of view.

Inappropriate Modal Split

Due to its comparative advantage in terms of speed, flexibility, and accessibility, road transport has emerged as the most popular mode of transport in Kenya. Reflecting this popularity and increased realization of the significance of road transport for rural development and poverty alleviation, road development has continued to receive major attention of the successive governments since 1963. As a result, road transport has become the principal mode for both passenger and freight traffic. There is no 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 Mombasa road for along time due to traffic snarl up. This is because it is the same route that connects the airport to the city and Mombasa port to the city and the rest of the neighbouring countries.

Urban Environmental Pollution

Although the total number of vehicles in Nairobi is not large relative to the human population, the city, suffers from a high level of ambient air pollution due to vehicular emissions, and is one of the worst environmental problems affecting the city. This is due to poor and inadequate road system, high traffic density, poor traffic system, poor maintenance of private and commercial vehicles, lack of proper monitoring and strategies, policies and enforcement of existing laws, rules, and regulations. Other environmental issues include noise pollution and poor transport infrastructure construction and maintenance practices amongst others.

Institutional problem

Institutions in the transport sector, in general, have weak and ineffective structures. Lack of capacity and shortage of resources seriously undermines their capability for good corporate governance, sound policymaking and public management. There are also serious deficiencies in the current planning approach adopted by different agencies, with very little or no cognisance of stakeholders views.
The Urban Modal Captive Challenge

Studies have shown that road development has focused attention mainly on roads for motorized transport although this has not been matched by increased access to motorized transport mode. In Nairobi, for instance, 60% of the residents meet their daily travel needs by walking while 35% travel by public transport (mostly matatus and buses) and only 5% use private cars.

Recommendations contained in the 2004 Integrated National Transport Policy stated that Planning for public transport services in Nairobi City should be based on origin-destination surveys to enhance appropriate planning and development of passenger transport networks. Provision of tramways, bus lanes, commuter rail and metros should be planned to ultimately meet urban passenger mobility needs. Bus corridors should be planned and developed for major urban areas to ultimately give way for future networks for Metro ways. The policy document underscores the need to integrate road and rail transport services by providing tramway services, commuter rail services and metro/light rail passenger transport services to meet urban mobility needs.

Public Transport Issues

Public transport services in Nairobi City are characterised by un-coordinated operations, poor service quality, unsafe and insecure services, congested vehicles and travelways and unaffordable public transport service. This has resulted to majority of the urban dwellers being captive in the Non-motorised transport (NMT) modes like walking which prove to be inefficient for journey to work spanning long distances ranging from 1 to 12km. Despite its role in the economy some zones like the industrial area are increasingly becoming public transport islands due to lack of appropriate public transport services.

Studies indicate that over 50% of Nairobi city residents live below poverty line, earning less than a dollar a day. Considering the various competing needs of life, expenditures on transport are usually considered non-essential in favour of life supporting items like food, water and shelter. Recent surveys show that some 60% of Nairobians meet their mobility needs on foot especially for the journey to work which the critical urban trip is accounting for over 75% of all daily urban trips.

An analysis of current census statistics shows that Nairobis population is now at 3.6 million night inhabitants and some 4.7 million people by day. It is therefore apparent that an estimated 2.2 million Nairobians lack an appropriate and affordable means of public transport to facilitate their movement, especially journey to work, which is the economic prime urban trip worldwide.
Experienced problems in transportation system

There are three fundamental problems with the current transport system, and these are traffic congestion, poor transport infrastructure quality, and lack of mobility for the overwhelming majority of persons who do not have access to private automobiles. Previous transport planning work that has been undertaken in Nairobi has proceeded on the basis of diagnoses that have focused too narrowly on capacity constraints related to automobile traffic. This summary is shown in Table below

Poor Transport Infrastructure Condition

The World Bank urban transport sector study stated that lack of maintenance and investment in capacity is the main cause of the poor state of Nairobi's roads. While lack of maintenance is an important contributing cause, it is not a sole cause, and lack of investment in new capacity is not a major cause. The implementation of only maintenance and more road investment would not have the desired effect on road condition unless the issue of design and construction quality is addressed.

While the lack of routine maintenance of roads in Nairobi is a major concern, simply correcting the lack of maintenance and building more roads will not solve the problem. A properly designed road should last for many years before it requires rehabilitation and should not require reconstruction unless there is a quantum change in traffic loads. There is no universal agreement on the proper design life of a pavement. Some EU countries now design high strength pavements to last well beyond 12-15 years, while North American practice is for 7-10 years for high traffic roads, and much longer periods for lower volume secondary and roads. By contrast, the useful life of roads in Nairobi can be measured in much shorter time-frames.

Table 2:7 Summary of Problems Diagnosis

<table>
<thead>
<tr>
<th>Symptom</th>
<th>MSI-diagnosis</th>
<th>Proper Diagnosis</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestion</td>
<td>Narrow roads</td>
<td>Badly designed traffic operations strategy</td>
<td>Network simplification, conversion to interrupted flow</td>
</tr>
<tr>
<td>Poor road condition</td>
<td>Insufficient investment, lack of maintenance</td>
<td>Poor design and construction quality control, lack of routine maintenance</td>
<td>Concentration on Priority Road Network, and reallocation of emphasis from investment to maintenance</td>
</tr>
<tr>
<td>Lack of mobility</td>
<td>Lack of road capacity for automobiles</td>
<td>Lack of facilities for the &quot;mass&quot; modes: Public transport and NMT</td>
<td>Reallocation of resources to PT/NMT</td>
</tr>
</tbody>
</table>

Source: Nairobi Long Term Transport Study
The absence of maintenance is but one contributing factor related to such rapid deterioration of pavement condition. An underlying contributor to the problem is that the roads in Nairobi like Mombasa road, at some junctions like Kampala road towards Nairobi water and Sewerage Company, are not properly designed, and there are insufficient quality controls on the construction process. As result, roads are designed with inadequate provision for drainage, using substandard materials with inadequate compaction.

Some existing roads will require reconstruction before they can be maintained. Continuing to invest in rehabilitation, reconstruction and construction of new roads following the present practices for road design and construction management would be wasteful because the resulting facilities would likewise have very short useful lives. New practices and procedures must be put in place to improve these deficiencies. In the future, road design must properly address the problem of drainage, pavement structures must be designed to support the axle loads that are reasonably to be expected to use the road, and there must be a system in place to ensure that the design specifications for construction materials and procedures are technically adequate from an engineering perspective, and are adhered to during construction.

The survival of a pavement requires that its impermeability to water not be compromised, and this involves continuous vigilance and treatment under a well organized maintenance program for the treatment of drainage structures, pavements and for shoulders. Unpaved roads require regarding on a cycle that varies with traffic and rainfall but should rarely be less than at least once annually. In order to solve the lack of maintenance it will be necessary to develop and fund a sustainable program of routine and periodic road maintenance.

The solution to the problem of poor design and construction procedures will require strong leadership and investment in institutional strengthening, but is mainly a matter of having the will to undertake to solve the problem. The solution to the lack road maintenance, however, will be more difficult because of the scale of the financial resources that would be required.

**Lack of Mobility**

The problems associated with public transport are described in depth elsewhere in this report. With respect to the road system, the main problems for public transport users are the slow in-vehicle travel times caused by the general high level of traffic congestion. The mobility problem for NMT users has several components and causes.

1. Excessive trip length because of the low density settlement pattern and continued sprawl of new development on the urban fringe;
2. Excessive NMT travel time because of the marginalization of bicycle use; and
iii Excessive number of NMT accidents due to the lack of separation of NMT and MV road users - no sidewalks or footpaths and no gaps in traffic for crossings.

The solution to the settlement pattern goes beyond the scope of this study. It would require that the prevailing development type be changed and programs put in place to restrict further sprawl of the urban area beyond the metropolitan area, and at the same time to implement a complementary program to bring about increased densification of the existing urban area. This would shorten trip distances or at least keep them from growing as long as they would if the existing trends are allowed to continue.

The solution to the NMT travel time problem would be to develop a network of NMT infrastructure that would make it possible for more people who walk to use bicycles. Also, providing better walking surfaces in the form of constructed footpaths and sidewalks would improve pedestrian travel speeds.

NMT accidents could be reduced by providing spatial separation in the form of maintained paths. These should be planned a continuous, integrated network that serves the major generators and attractors of trips. Of equal or greater importance would be to provide a systematic way for pedestrians to cross the road. There are basically two ways to do this - footbridges or traffic signals. It is generally recommended that traffic lights be used in most places and footbridges where it is not possible to use signals, or where topography makes this a feasible solution.

2.13 TYPES OF URBAN MOVEMENTS

Movements are linked to specific urban activities and their land use. Each type of land use involves the generation and attraction of a particular array of movements. This relationship is complex, but is linked to factors such as recurrence, income, urban form, spatial accumulation, level of development and technology. Urban movements are either obligatory, when they are linked to scheduled activities (such as home-to-work movements), or voluntary, when those generating it are free to decide of their scheduling (such as leisure). The most common types of urban movements are:

- **Pendular movements.** These are obligatory movements involving commuting between locations of residence and work. They are highly cyclical since they are predictable and recurring on a regular basis, most of the time a daily occurrence, thus the term pendulum.
- **Professional movements.** These are movements linked to professional, work-based, activities such as meetings and customer services, dominantly taking place during work hours.
- **Personal movements.** These are voluntary movements linked to the location of commercial activities, which includes shopping and recreation.

- **Touristic movements.** Important for cities having historical and recreational features they involve interactions between landmarks and amenities such as hotels and restaurants. They tend to be seasonal in nature or occurring at specific moments. Major sport events such as the World Cup or the Olympics are important generators of urban movements during their occurrence.

- **Distribution movements.** These are concerned with the distribution of freight to satisfy consumption and manufacturing requirements. They are linked to distribution centers and retail outlets.

The consideration of urban movements involves their generation, the modes and routes used and their destination:

- **Trip generation.** On average, an urban resident undertakes between 3 and 4 trips per day. Moving in an urban area is usually done to satisfy a purpose such as employment, leisure or access to goods and services. Each time a purpose is satisfied, a trip is generated. Important temporal variations of the number of trips by purpose are observed.

- **Modal split.** Implies which transportation mode is used for urban trips and is the outcome of a modal choice. **Modal choice** depends on a number of factors such as technology, availability, preference, travel time and income.

- **Trip assignment.** Involves which routes will be used for journeys within the city. For instance, a commuter driving a car has most of the time a fixed route. This route may be modified if there is congestion or if another activity (such as shopping) is linked with that trip; often known as **trip chaining.** Several factors influence trip assignment, the two most important being transport costs and availability.

- **Trip destination.** Changes in the spatial distribution of economic activities in urban areas have caused important modifications to the destination of movements, notably those related to work. The **central city** used to be a major destination for movements, but its share has substantially declined in most areas and **suburbs** now account for the bulk of urban movements.

The share of the automobile in urban trips varies in relation to location, social status, income, quality of public transit and parking availability. Mass transit is often affordable, but several social groups, such as students, the elderly and the poor are a **captive market.** There are important variations in mobility according to age, income, gender and disability. The so-called gender gap in mobility is the outcome of socio-economic differences as access to individual transportation is dominantly a matter of income. Consequently, in some instances modal choice is more a **modal constraint linked to economic opportunities.**

In central locations, there are generally few transport availability problems because private and public transport facilities are present. However, in locations outside the central core that are accessible only by the automobile, a significant share of the population is isolated if they do not
own an automobile. Limited public transit and high automobile ownership costs have created a class of spatially constrained (mobility deprived) people. They do not have access to the services in the suburb, but more importantly to the jobs that are increasingly concentrated in those areas.

The growth of African cities has been too rapid, compared to the capacity of the local governments to manage, absorb and finance the required urban transport infrastructure. In Sub-Saharan Africa [SSA], the youngest segment of the population accounts for more than 50 percent of the total urban population and this has created a heavy demand for transport services in such areas.

Travel conditions in African cities are very difficult because of traffic safety issues, the quality of and accessibility to services, and air pollution caused by motorized transport. Currently more than half of all urban travel is by walk.

Although the actual situations vary, urban transport systems in SSA have a number of common features:

a) The majority of urban trips are still made by walk.
b) There is little or no coordination amongst the different modes of transport. [MT and NMT]
c) The regulatory system governing public transport is inadequate and ineffective in meeting the demand.
d) Traffic accident rates are quite high.
e) Roads are in poor condition.
f) The skill levels of planning and regulatory personnel are inadequate or nonexistent.
g) Low/poor enforcement of traffic laws due to corruption and inadequate human and financial resources.

These common characteristics of urban transport in SSA are compounded by factors arising from the general environment in which urban transport is evolving:

i. The rapidly growing urban population,
ii. Continuing high incidence of poverty among the urban population,
iii. The impact of the city as the centre of economic productivity,
iv. The evolution of the role of government,
v. The low density of cities,
vi. The process of decentralization, and
   Poor land use planning and ineffective development controls together with the lack of any linkage to urban transport planning.

2.14 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A policy is an intention to achieve certain goals with some outlined stipulated time. Normally the government sets a policy that help in development of different sectors within a country. This chapter sets out the key safeguard policies that provide the policy context to any development partner that may be wiling to help in terms of development especially in road construction.
Policy Frameworks

Kenya Vision 2030

Vision 2030 is the current policy framework pursued by the Kenyan government to guide socio-economic development in the country. The Vision 2030 was launched in mid 2008 to succeed the Economic Recovery Strategy that was formulated by the NARC government to spearhead structural reforms in the country between 2003 and 2007. The Vision 2030 aims at putting Kenya in a middle income economy by the year 2030.

The Vision 2030 is based on 3 key pillars; Economic Pillar, Social Pillar, and Political Pillar. The economic, social and political pillars of Kenya Vision 2030 are anchored on the following foundations: macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science, technology and innovation (STI); land reform; human resources development; security and public sector reforms.

Infrastructure: The 2030 Vision aspires for a country firmly interconnected through a network of roads, railways, ports, airports, waterways, and telecommunications, and a country where water and modern sanitation facilities are available to all. To ensure that the main projects under the economic pillar are implemented, investment in the nation's infrastructure will be given the highest priority.

Energy: Development projects recommended under Vision 2030 and overall economic growth will increase demand on Kenya's energy supply. Currently, Kenya's energy costs are higher than those of her competitors. Kenya must, therefore, generate more energy and increase efficiency in energy consumption. The Government is committed to continued institutional reforms in the energy sector, including a strong regulatory framework, encouraging private generators of power, and separating generation from distribution. New sources of energy will be found through exploitation of geothermal power, coal, renewable energy sources, and connecting Kenya to energy-surplus countries in the region.

Science, Technology and Innovation (STI): Vision 2030 proposes intensified application of science, technology and innovation to raise productivity and efficiency levels across the three pillars. It recognizes the critical role played by research and development (R&D) in accelerating economic development in all the newly industrialising countries of the world. The Government will create the STI policy framework to support Vision 2030. More resources will be devoted to scientific research, technical capabilities of the workforce, and in raising the quality of teaching mathematics, science and technology in schools, polytechnics and universities.
**Land Reform:** Land is a critical resource for the socio-economic and political developments spelt out in Vision 2030. Respect for property rights to land, whether owned by communities, individuals or companies, is an important driver of rapid economic transformation everywhere. The transformation expected under Vision 2030 is dependent on a national land use policy, which, therefore, must be completed as a matter of urgency. The policy will facilitate the process of land administration, the computerization of land registries, the establishment of national spatial data infrastructure in order to track land use patterns, and the introduction of an enhanced legal framework for faster resolution of land disputes.

**Human Resource Development:** Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrialising economy. This will be done through life-long training and education. As a priority, a human resource database will be established to facilitate better planning of human resources requirements in the country. Furthermore, steps will be taken to raise labour productivity to international levels. Other steps will include the establishment of new technical training institutions, as well as the enhancement of closer collaboration between industry and training institutions.

**Public Service:** An efficient, motivated and well-trained public service will be one of the major foundations of the Vision. Kenya will build a public service that is citizen-focused and results-oriented, a process whose achievements so far have received international recognition and awards. The Government proposes to intensify efforts to bring about an attitudinal change in public service that values transparency and accountability to the citizens of Kenya. Results-based management and performance contracting will be pegged to the implementation of the Vision's goals, making it easier to reward public servants on merit and performance. Reforms in the public service will further enhance strategic planning in government, continuous improvement, and stakeholder engagement. A Kenya School of Government will be established to provide research and training for transformative leadership to the highest international standards.

**Transport Sector Policy**

The Integrated National Transport Policy (INTP) drafted by the Ministry of Transport between 2003 and 2004 based on a theme of "Moving a Working Nation". The policy recognises that an effective and efficient transport system is an important prerequisite in facilitating national and regional integration, promoting trade, economic growth, poverty reduction and wealth creation. The policy outlines that the transport sector in Kenya consists of the following modes, namely:

i. Road transport;
ii. Rail transport;
iii. Maritime and Inland Waterways transport;
iv. Pipeline transport;
v. Air transport; and

The policy covers issues related to transport infrastructure planning, development and management, legal, institutional and regulatory frameworks, safety and security, funding, gender mainstreaming, utilisation of Information and Communication Technologies (ICTs), and environmental considerations, among others. Its aim is to create an enabling framework to nurture development of a safe, efficient and affordable transport system, whilst keeping at the leading edge of technological advancement in a rapidly changing and globalised environment.

**Vision**

The Vision of the Integrated National Transport Policy is to develop a world-class transport system that is integrated and responsive to the needs of people and industry in Kenya.

**The Mission**

The mission of the INTP is to develop, operate and maintain an efficient, cost effective, reliable, safe, secure and integrated transport system and link transport policy with other sectoral policies, in order to achieve national and regional development aspirations in a socially, economically and environmentally sustainable manner.

**Strategic objectives**

The strategic objectives of the Integrated National Transport Policy are to:

i. integrate transport with national and regional socio-economic demands;

ii. establish appropriate institutional systems for transport sector management, coordination and regulation;

iii. develop and maintain an integrated and coordinated transport infrastructure for efficient movement of passengers, freight and mail and support disaster management efforts;

iv. develop appropriate transport sector funding/financing mechanisms;

v. integrate transport in land use planning and management systems;

vi. deliver efficient and effective sector operations to enhance national productivity;

vii. enhance investments in the transport sector;

viii. apply ICTs in transport planning, operations and management to enhance sector efficiency;

ix. facilitate regional integration and trade;
x. incorporate environmental protection and resource conservation issues in transport sector activities;

xi. ensure enforcement and compliance with sector laws and regulations;

xii. develop a national transport information database for effective transport planning and management;

xiii. enhance public awareness through use of appropriate information to inculcate positive attitude change;

xiv. improve safety and security in the transport industry;

xv. develop and promote appropriate human resource capacities in the sector; and

xvi. Facilitate public private partnerships.

**Highlights of the policy principles**

The INTP highlights key policy principles that require to be observed in the course of its implementation as follows:

i. Clarification of the roles of the central and local governments, statutory bodies, non-governmental bodies, and the private sector in the delivery and management of transport infrastructure and services

ii. User pays and polluter pays principles to facilitate economic efficiency, generation of sufficient revenues to support development, operation and maintenance of transport infrastructure and services, eliminate distortions user choice of transport modes, eliminate to the extent possible externalities in production and consumption e.g. pollution and congestion

iii. Stakeholder consultation in setting of tariffs and other prices

iv. Financing of economic infrastructure through user charging or cost recovery from direct users

v. Financing of social and strategic infrastructure through subsidisation on a declining basis over time

vi. Institutionalisation of Regulatory Impact Analysis to enable assessment of regulatory proposals

vii. Establishment of Industry Codes of Conduct and Client Service Charters to enhance service delivery in the transport sector
2.15 CHALLENGES BESETTING THE TRANSPORT SECTOR

The policy identifies key challenges facing the transport sector as;

i. Poor Quality of Transport Services
ii. Inappropriate Modal Split
iii. Unexploited Regional Role of the Transport System
iv. Transport System Not Fully Integrated
v. Urban Environmental Pollution
vi. Lack of an Urban Transport Policy
vii. Institutional Deficiencies
viii. Lack of a Vision for the Transport Sector

Roads Sub Sector Policy

A Roads Sub sector development is currently guided by the Policy passed by parliament and published by the Ministry of Roads; SESSIONAL PAPER No. 1 OF 2006 ON THE DEVELOPMENT AND MANAGEMENT OF THE ROADS SUB-SECTOR FOR SUSTAINABLE ECONOMIC GROWTH

In the roads policy, Economic recovery and sustained growth is acknowledged as the mechanism by which the lives of Kenyans will be improved and the indicators identified in the Millennium Development Goals achieved.

A functioning transport sector is a key pillar of economic growth. In Kenya, road transport sector is the predominant mode of transport. The road network is currently not in the condition that is required if it is to play its role of promoting economic growth.

The prevailing poor state of our roads is a result of many years of inadequate financing and maintenance. Various studies indicate that the financial and administrative needs of the road network, which have increased steadily over the years, have outgrown the framework in which the sector is currently managed.

The key objective of this policy paper is to bring about adequate and consistent maintenance and development of roads by creating a conducive environment for all players to contribute effectively. This in turn will ensure that road transport fulfils its role in the attainment of sustainable economic growth.

The policies are aimed to address the needs of all stakeholders including road users, investors and financiers and recognise that the roads sub-sector requires wide-ranging reform that can best be put into practice through the adoption of a more business-like approach to management.
The Government, having reviewed the various options over recent years is now implementing a complete and immediate restructuring of the roads subsector. Three news road authorities have been established to implement roadwork on highways and in urban and rural areas.

2.16 NATIONAL ROADS POLICY FRAMEWORK

The Economic Recovery Strategy for Wealth and Employment Creation for 2003-2007 (ERS 2003-2007) and Vision 2030 sets out the broad principles through which the economy of Kenya is being set on the path to fulfilling its economic potential. The ERS and Vision 2030 projects that annual GDP growth will be raised from the 1.1% observed in 2002 to 7% in 2006.

The ERS acknowledges that the need for a functional transport sector as the third pillar of the economic recovery effort which is expected to tackle such challenges as reduction of poverty by half by the year 2015 and the achievement of newly industrialized country status by 2020.

With regard to financing of roads infrastructure the ERS states that increased investment through public and private sector involvement, such as concessioning, is necessary. In relation to rural roads, the ERS highlights the use of local resources including labour through the Roads 2000 maintenance strategy.

Transport is achieved through various modes. The transport sector in Kenya comprises roads, rail, air, maritime and inland waterways and pipeline transport modes. Road transport accounts for around 90% of land freight and passenger traffic in the country, the balance being carried by the railways.

The Integrated National Transport Policy that looks at all transport modes and how these can be synergized has been developed by the Ministry of Transport.

The Roads Sessional Paper defines the policies that have been developed by the Government through the Ministry of Roads for the roads sub-sector in line with the ERS.

Policy Objectives

The goal of the policies outlined in the Sessional Paper is to attain an efficient Road Sector that supports and promotes economic growth through the cost-effective provision and maintenance of infrastructure that is necessary for safe and reliable road transport.
The key objectives of the policies are:

i. To reduce transport costs and travel time by improving the condition of roads, including reducing congestion on urban roads by increasing capacity.

ii. To increase accessibility.

iii. To optimise use of available resources.

iv. To increase the resources available for investment in the road sector.

v. To enhance preservation of existing road assets.

vi. To create a conducive environment for increased private-public partnership.

vii. To enhance road safety and cater adequately to the needs of non-motorised traffic (NMT).

viii. To enhance ownership through stakeholders participation in the road sector.

To achieve an optimal institutional framework for effective implementation

Rationale for policy

Enhance economic growth
From independence up to the mid 1980s, the condition of the road network was not considered a major impediment to economic growth. However, cutbacks in current funding for road maintenance which began in 1975 took their toll by the 1980s. The present condition of road network is characterised by widespread existence of sections whose economic life has been exhausted and which are imposing high transport costs and longer travel times on road users both within the country and the Great Lakes region.

The Government through the ERS has put into place an ambitious programme for economic growth and sustainable development in all sectors with a special focus on agriculture, industry, tourism and regional trade. These plans will not be realised without an effective road network to achieve the following among others:

i. Lower the transport costs by reducing vehicle maintenance costs and fuel costs

ii. Increased ease of access to road transport by Kenyans

There is therefore a need to put in place road sub-sector policies to form the basis for implementation of the ERS.

Streamline management of the roads sub-sector
As the size of Kenya’s population and economy has increased, the Government has adapted and reshaped the mechanisms for the exercise of its functions in various sectors.
In the roads sector, maintenance and development of road has hitherto been implemented by the Roads Department of MOR&PW and Local Authorities using either force-account or by contract. The above organizations also have policy, fund allocation and monitoring responsibilities.

From studies carried out by Road Management Initiatives (RMI) of the World Bank in Sub-Saharan African Countries (SSA), it has been established that for a country’s road subsector institutional arrangement to be functional and sustainable, certain basic principles must be satisfied. These are termed the Four Basic Building Blocks – necessary requirements for effective road management.

They are:-

i. **Ownership** – involving road users in the management of roads and thereby winning their active support.

ii. **Clarified Responsibility** – a clear mandate and legal identity for each organization involved with the road sector.

iii. **Stable Financing** – Secure, adequate and stable flow of funds to the road sector.

iv. **Commercialised Management** – Providing an effective and businesslike approach to road management.

The establishment of the RMLF in the 1993 to provide stable financing and KRB (along with DRCs) to provide ownership were a step towards fulfilling two of the basic building blocks. However, this process requires to be carried to its conclusion by establishing autonomous road authorities to implement roadworks in order to clarify responsibilities and manage roads in a businesslike manner.

Create a conducive environment for increased investment

In the past, road sector investment has been limited to internal government funding supplemented by external funding in the form of soft loans or grants. Both sources have been inadequate and subject to fluctuations caused by both external and internal factors.

In 1993 the Government addressed the issue of diminishing recurrent funds for road maintenance by establishing the Road Maintenance Levy Fund. Although this has increased the available funds for road maintenance the fund only covers 60% of the maintenance requirements if the road
network was in good maintainable state. The Fund is therefore not sufficient to cater for both the maintenance of roads that require reconstruction.

Recent studies show that the backlog maintenance requires Kshs. 150 Billion and subsequent annual maintenance requires Kshs. 15 billion per year. These figures do not include required investments for the urgent need to expand the road network in urban areas and other high potential areas as well as regional roads to enhance the economic growth of Kenya.

In order to close the financing gap, increased investment from the Government should be secured. In addition, new financing mechanisms such as the use of public private partnerships need to be applied to finance, develop and manage road infrastructure.

One of the aims of this Sessional paper is to provide a framework to facilitate private sector participation in development and management of road infrastructure services through private/public partnerships.

**Attain increased stakeholders participation**
Experience gained in other sectors as well as the District Roads Committees indicates that stakeholders involvement and feedback is an important input into optimal decision making.

There is a need to incorporate stakeholders more directly into decision making in the roads sub-sector by having stakeholders represented on the Boards of institutions managing roads infrastructure and the Road Fund.

**Prioritise road investment**
In the recent past both internally and externally funded road investments have been planned and justified on a project to project basis not taking into account the overall road network priorities.

The MOR&PW Roads Department Strategy prepared in 1997 included an overall prioritisation plan of road maintenance works based on a cost benefit analysis. Unfortunately, this plan was generally not implemented.

There is a growing acknowledgement that in order to receive best value for money the entire road network, including upgrading and expansion has to be based on sound asset management concepts which includes looking at the life cycle costs and providing maintenance at the opportune time.
Development partners are moving away from the project to project approach to sector wide and budget support. A prerequisite for such support is a comprehensive road investment plan that covers maintenance, upgrading and expansion. Such a plan can be used to secure additional external as well as internal funding.

There is thus an urgent need to develop and maintain a road investment plan for both urban and rural roads.

**Provision and maintenance of roads**

**Providing an appropriate road network**
Road development shall be in accordance with the economic and social objectives determined by the Government as published in policy documents. In particular, road development will be focused on improving accessibility, increasing the variety and quality of affordable urban and rural transport and improving accessibility for the development of key economic sectors.

Current roads policy states that road development is guided by the following principles in order of priority:

1. Bitumenise all international (Class A) roads.
2. Bitumenise economically viable major urban arterial roads.
3. Bitumenise all economically and socially viable Class B and C roads.
4. Bitumenise all roads connecting district administrative centres, major urban centres and important tourist facilities.
5. Bitumenise economically viable urban arterial roads, especially where these serve low income neighbourhoods.
6. In support of the Millennium Development Goals, to work towards eventually providing all season road access within 2 kms for Kenyans.

**Road Maintenance**
Having made a substantial investment in roads, the Government through the Ministry responsible for roads is determined to ensure that all roads in maintainable condition receive timely and routine and periodic maintenance before any deterioration of service levels. Those roads that are not in maintainable conditions and which satisfy appropriate economic and social criteria shall be restored to the standards for which they were intended and properly maintained condition, backlog periodic maintenance and rehabilitation shall be carried out. This backlog rehabilitation shall have priority over new developments.
Road Safety
The Government will put in place procedures to ensure that road safety issues are fully incorporated in road infrastructure planning, design, development and maintenance. Safety auditing of highways shall be mandatory including, as one of its aims, the reduction of conflicts with NMT. Road infrastructure shall be maintained in order to ensure safety standards are compiled with. Special attention shall be given to identified accident prone road sections.

Roads and Land-Use Planning
The Government shall ensure compliance with land use and development plans in accordance with existing laws and ensure that all land previously inappropriately allocated shall revert to its intended road use in order to optimise road and parking space provision. In addition, the Government shall reduce encroachment within the highway boundary of unauthorised business and obstructions and finally ensure that land identified for future road infrastructure is secured from any other development.

Axle Load Compliance
The Government is determined to strictly enforce axle load regulations in order to protect the roads from damage and premature failure. Administrative and other operational weaknesses in axle load control shall be identified and eliminated. Increased private sector participation will be adopted with a view to improving axle load management. In addition, the Government will harmonise vehicle specifications and axle load limits in Kenya with those of other countries within the region.

The Minister responsible for roads shall assume overall control of GVW and axle load enforcement, ensuring that fines are in proportion to the damaging effect of overloading. Weigh-In-Motion equipment shall be introduced and the existing static weighbridges modernised. The public will be sensitised on the need to adhere to axle load limits.

Legal Framework
The Government is aware that the various items of legislation relating to roads need clarifying and harmonising, particularly with respect to the statutory responsibility for roads. All roads are owned by the State, and the Minister responsible for roads can assign statutory powers to other bodies. The various statutory instruments, especially legislative Acts on roads and road transport, will be revised as a result of this land and other policy changes. The Ministry responsible for roads will ensure that all public roads are gazetted and will resolve any conflicts relating to statutory responsibility. The various statutory instruments relating to roads will be revised and ambiguities removed.
**Environment**

Environmental issues have in the past not been fully incorporated in the design and implementation of road works. Environmental legislation exists but is not being enforced rigorously.

The potential negative impacts of road works shall be minimised through incorporation of environmental mitigation measures in the design and implementation of all works projects in accordance with environmental legislation and as prescribed by the National Environmental Management Authority (NEMA).

**HIV/AIDS**

The HIV/AIDS endemic has been declared a national disaster by the Government. It is recognised that both the construction and the use of roads has contributed to the spread of HIV and that sufficient counter measures were not carried out.

The Government commits in the policy that it will mainstream the fight against HIV/AIDS in all sectors including the roads sub sector. HIV/AIDS counter measures shall be included in all road works contract and programmes. In addition, the Government’s HIV/AIDS policies relating to prevention and treatment shall be pro-actively applied to all public sector employees within the roads sub sector.

**Gender**

In the past, few women have taken the opportunity to seek a professional or managerial career in the roads sub sector. Applications from female students for enrolment in training institutions leading to careers in the roads sector are low, despite the female students possessing equal qualifications to male counterparts. In addition, statistics relating to unskilled jobs have been notable for the extremely low participation of women.

Both genders have an equal right to fully participate in the roads sub-sector. The Government shall mainstream gender issues throughout the roads sub sector to ensure and actively promote equal opportunities to achieve gender parity.

**Special interest groups**

The design standards for road infrastructure do not currently adequately address the needs of special interest groups including vulnerable groups such as the physically challenged.

The Government will update road design standards to incorporate the needs of the special interest groups and ensure that implementation when rehabilitating, upgrading or developing road infrastructure caters for special interest groups.
Governance, Ethics, Transparency and Accountability
The Government will promote and uphold ethics, transparency, fiduciary duty, social responsibility, accountability and overall good governance in the provision of roads and will rigorously implement a policy of zero tolerance to corruption. All organizations within the roads sub sector shall endeavour to improve their efficiency and effectiveness and shall account in accordance with internationally accepted accounting rules.

Private/Public Sector Participation
Private sector finance has not been used in Kenya for road investment in the past. Currently, the government is encouraging the tapping of private financing and is implementing the Nairobi urban toll road concessioning project.

The Government shall encourage public/private partnerships (PPP). To this end, an appropriate legal framework shall be established to support PPP for roads infrastructure financing and development. The Government shall facilitate private sector participation in road sector asset financing and management.

2.17 ROAD NETWORK IN KENYA
When Kenya attained independence in 1963, the country had approximately 45,000 km of roads of which a mere 2,000 km were paved and the rest were earth and gravel roads which were subject to closure during the rainy season.

The network had insufficient geographical reach for the attainment of the development objectives of the people of independent Kenya and had a focus on the transport interests of the settler community.

In the 1960s, emphasis was laid on upgrading of the principal highway arteries in the trunk road system. This was followed by the improvement of the primary road network through selective bituminisation of heavily trafficked segments. At the same time feeder roads were constructed within the former settler areas.

In the 1970s, as outlined in the 1974-78 National Development Plan, emphasis shifted towards the construction of feeder and minor roads. In line with this, the Government of Kenya with the support of development partners successfully implemented the labour based Rural Access Roads Programme (RARP) and the equipment based Gravelling Bridging and Culverting (GBC) programme which improved the rural roads network.
In the 1980s the Government continued to implement the rural-oriented road development programmes through the successful Minor Roads Programme. During this time it was observed that the primary and secondary roads had started to deteriorate due to lack of maintenance.

In the 1990s despite and initial effort to raise funds through tolls followed by the introduction of the RMLF in 1993, the aging main roads continued to deteriorate. The available resources were used to rehabilitate, upgrade and gravel mainly rural roads, neglecting periodic and routine maintenance on a network basis. This situation was further worsened by waning external support.

The Local Government Reform program, an initiative launched in the early 1990s aimed at addressing issues hindering effective delivery of services by local authorities identified the poor state of urban roads as one such hindrance. The Kenya Urban Transport Infrastructure Project, a road rehabilitation and maintenance plan targeting 26 municipalities which had GOK and development partner support, was carried out in an attempt to deal with the problem.

In summary, the following has been achieved through the various Government efforts since independence:

The paved road network has been expanded from 2000 km in 1963 to 11,600 km in 2006. All provincial headquarters are now connected to Nairobi by bitumen roads. Kenya is connected to Uganda and Tanzania by bitumen roads at multiple border points. The Kenya – Sudan Road is bituminized up to a point 26 km from the border.

Table 2.9 Current road network details are summarised below.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MAIN A, B, C</th>
<th>RURAL (D, E, OTHER)</th>
<th>RURAL</th>
<th>URBAN</th>
<th>TOTAL [KM]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paved</td>
<td>7,100</td>
<td>2,000</td>
<td>0</td>
<td>2,500</td>
<td>11,600</td>
</tr>
<tr>
<td>Unpaved</td>
<td>7,200</td>
<td>47,00</td>
<td>100,000*</td>
<td>12,000</td>
<td>166,200</td>
</tr>
<tr>
<td>Total</td>
<td>14,300</td>
<td>49,00</td>
<td>100,000*</td>
<td>14,500</td>
<td>177,800</td>
</tr>
</tbody>
</table>

* Estimate, detailed Inventory under way

Despite these tangible achievements, Kenya’s road network is characterised by poor pavement surfaces of all types, with consequent advance effects on service levels and operating costs. Only 40% paved roads are in good condition, the balance being fair, poor, or very poor. For unpaved roads the situation is worse with only 14% in good condition.
Changes in road management

The Public Works Department (PWD) was established by the colonial Government in 1896. The Roads branch of PWD was charged with the responsibility of developing and managing national roads, while Local Authorities were responsible for urban and rural roads under their jurisdiction.

Reform attempts undertaken in the roads sub sector began in 1950 when the colonial government published ordinance number 64, which provided for the establishment of a road authority and Roads Fund. The Authority and Road Fund were however never established. In 1956 the PWD became a fully-fledged Ministry of Works and at independence it was renamed the Ministry of Works, Communications and Power.

In 1966, the Roads branch was elevated to a full Department of Ministry of Works, Communications and Power. In 1970 about 10,000 km of rural roads were transferred from County Councils to the Roads Department. The urban roads and unclassified rural roads continued to be managed by Local Authorities.

Between 1979 and 1988, the Department was renamed Roads and Aerodromes Department and placed under the Ministry of Transport and Communications. In 1988 the Road Sector Departments were moved back to the Ministry of Works. The MOTC retained the overall transport sector policy management role while the latter (MOW) took charge of development, maintenance and rehabilitation of all classified roads in Kenya. In 1993, the Roads Maintenance Levy Fund (RMLF) Act was enacted to provide for sustainable funds for road maintenance. This Act initially excluded local authorities and thus unclassified roads, from RMLF funding.

The GOK undertook a road sector institutional reform study in 1995 as a result of which Kenya Roads Board was established in 1999 through an Act of Parliament. The main objective of KRB is to manage the Roads Maintenance Levy Fund (RMLF) for maintenance, repairs and rehabilitation. The KRB Act designated certain large towns and the UDD as sub-agencies eligible to receive RMLF funds hence making the fund available for the maintenance of unclassified roads that are managed by these organizations. Around the same time, a strategic plan for the road sector was developed and published in 1997.

Despite these initiatives the condition of the road network continued to deteriorate due to inadequate maintenance arising from insufficient funds and inappropriate institutional framework for sector management. National development was hampered by the dilapidated road network.

From studies carried out by Road Management Initiative (RMI) of the World Bank in Sub-Saharan African Countries (SSA), it has been established that for a country’s road sector...
institutional arrangement to be functional and sustainable, certain basic principles must be satisfied. These are the so-called Four Basic Building Blocks — necessary requirements for effective road management.

They are-

1. **Ownership** - involving road users in the management of roads and thereby win their active support.
2. **Clarified responsibility** — a clear mandate and legal identity for each organization involved with the road sector.
3. **Stable financing** - Secure, adequate and stable flow of funds to the road sector.
4. **Commercialized management** - Providing effective and appropriate technical and commercialized management capability for each agency.

Reforming the sector was necessary to ensure that the proposals satisfied the above RMI principles. The recommendations for assigning roles and responsibilities to the various organizations in the road sub-sector in Kenya are currently based on the report “Harmonizing ongoing Road Sub-sector Reform Documents.” Fig 3.1 is a diagrammatic representation of the recommended arrangements. It shows that road maintenance funds from KRB flow to all road agencies while development funds and sector jurisdictional instructions flow from MoR to the agencies.

A major departure of the reformed arrangements made by the just concluded reform process from the current one is that, sector responsibility for roads would be solely exercised by MoR. The implication is that all other Ministries which implement projects with road related components would consult with and seek the inputs of MoR or its road agencies.

The main features of the policy are:

1. MoR is overall in charge of the provision and maintenance of all roads in Kenya.
2. KRB to coordinate and fund all road maintenance in Kenya.
3. Three new road authorities to improve efficiency of implementations as follows:
   a. **KeNHA**: Kenya National Highways Authority is responsible for implementations of road programmes for class A, B, and C roads.
   b. **KeRRA**: Kenya Rural Roads Authority is responsible for rural and small town roads as well as special purpose roads and would operate as an umbrella organization for DRCs.
   c. **KURA**: Kenya Urban Roads Authority is responsible for urban roads in the 46 cities and municipalities.
4. Further commercialization of the roads related support Departments of MoR namely; Materials, Mechanical, and KIHBT is ongoing.
5. A comprehensive road investment plan for the roads sub-sector has been carried out and currently being implemented.
vi.
2.18 ROAD MANAGEMENT INSTITUTIONS

Below described is the new Institutional arrangements and responsibilities for managing road asset in Kenya.

**Ministry of Roads (MoR)**

MoR now exercise sectoral responsibility over the entire network of roads in the country including rural, municipal and city roads currently under MoLG. It shall be the lead Ministry in the roads sub-sector and shall formulate and coordinate all Policy and Strategy matters as well as investment plans for the sector.

The Ministry on the advice of a standing committee on road standards, ensure that design standards for all roads including rural and urban roads are regularly reviewed and updated to take into account new technologies, changes in traffic characteristics and changes in the needs of road users and communities. Steps are taken to ensure that design standards for international routes will be harmonized with those used elsewhere in the region.

Other functions of the Ministry include:

i. Formulation and harmonization of policies and strategies relating to development, rehabilitation, and maintenance of the entire road network.

ii. Formulation of policies on resource allocation to the executing agencies

iii. Approval and funding of road development programmes of all agencies.

iv. Monitoring and evaluation of the use of development funds through performance audits to ensure value for money.

v. Operating as the supervisor in chief of all road related agencies and organizations including KRB.

**Kenya Roads Board (KRB)**

The name of the Board is retained in the reform process. KRB fund, coordinate, and monitor maintenance activities of all road agencies. Only in special cases can development funds be channeled through KRB. It is intended that the Kenya Roads
Board Act 1999, would be amended to remove any functions that fall outside the scope of road maintenance.

Although there are proposed modifications in the functions of KRB, it is recommended that its present organizational structure shown be retained since it has been fine-tuned and optimized over the past four years. A Transport Economist would however, be added to the senior management team.

The Board is under MoR and report to the Minister responsible for roads.

Except for a few changes, the functions of KRB substantially remain as before. They include the following:

i. To arrange for the collection of monies assigned to the road maintenance levy fund (RMLF).

ii. To identify other sources for funds to be applied to road maintenance.

iii. To account for and administer the funds derived from RMLF and any other funds that may accrue to it.

iv. Determine revenue forecasts for each year and make them available to the road agencies.

v. Organize and approve budget hearings with the road agencies to ensure that both the content and coverage of the budget confirm to the objectives of the fund.

vi. Implement the allocation of financial resources from the fund using formulae as provided in the enabling Act.

vii. Monitor the operations of road agencies in the rehabilitation and maintenance of roads and evaluate by means of technical, financial and performance audit, and performance contracts the delivery of works.

viii. Prepare and publish procedures for the disbursement of the fund.

ix. Ensure that all procurement for the rehabilitation and maintenance of roads and other associated works financed out of the fund or other funds
are conducted in accordance with guidelines and criteria set out by the Board.

Kenya National Highways Authority (KeNHA)

KeNHA is one of the three new Authorities to take over the management of roads in Kenya. It is responsible for the control maintenance and development of class A, B and C roads. It shall create and operate in six regional branches.

KeNHA shall develop the annual maintenance programme in accordance with guidelines provided by KRB. The programme shall be submitted to KRB for processing, approval and funding. Similarly the Authority shall develop the annual development programme in accordance with guideline provided by MoRPW, and submit it to the Minister for processing, approval and funding

KeNHA shall:

i. have responsibility for the management, control, development, and maintenance of all roads under its jurisdiction.

ii. advise the Minister in defining the National Road Network and classifying it into its sub-divisions based on considerations of national interest and a functional classification scheme determined by the Authority.

Kenya Rural Roads Authority (KeRRA)

A new Roads Authority to be known as KeRRA has been created to be responsible for the management of all rural roads of class D and below, including Special Purpose Roads, Game Reserve Roads, Coffee roads and unclassified roads (currently under county and town councils). District Road Committees (DRCs) would remain as prioritization and monitoring bodies for the annual road maintenance programmes for their respective districts. The District Head of KeRRA would be a Member/Secretary of the DRCs to create the necessary institutional link between KeRRA and the DRCs.

The country will be divided into 25 Road Regions of KeRRA for a strategic management of roads. A Road Region would be made up of two or more administrative districts. The aim of this approach is to consolidate a sizable network of roads that can be managed by a team of two or more KeRRA Engineers and other professionals at a lower level. The creation of Road Regions will reduce the excessive administrative and operational units which lead to thin spreading of resources.
Recommended geographical locations of the KeRRA Regional headquarters and their component administrative district. The two administrative districts contiguous with Nairobi City Council and Mombassa Municipal Council respectively would not be part of KeRRA’s operations but that of KURA.

KeRRA shall develop the annual maintenance programme in accordance with guidelines provided by KRB. The programme shall be submitted to KRB for processing, approval and funding. Similarly, the Authority shall develop the annual development programme in accordance with guideline provided by MoRPW, and submit it to the Minister for processing, approval and funding.

Considering the importance of coffee, tea and sugar to the economy of Kenya, it is recommended that Coffee, Tea and Sugar Roads be considered as one KeRRA Roads Division, a Special Purpose Roads Committee with membership from KTDA, Coffee Board, Kenya Sugar Board, Farmers’ Representatives and other Tea, Coffee and sugar Stakeholders be formed and granted the status of a Designated Road Agency of KRB. It is believed that with this arrangement in place, Tea, Coffee and Sugar Roads would receive the requisite attention.

KeRRA shall develop the annual Maintenance Programme for all DRC’s, County Councils, Coffee and Tea Roads. KeRRA’s role in the sector would include;

i) To operate as an umbrella body for the DRC’s and provide a focal point for coordinating Policy, Planning and Technical Standards for all rural roads of class D and below and small town roads.

ii) To provide technical guidance to the DRC’s in their process of prioritizing and determining annual developments and maintenance programs.

**Kenya Urban Roads Authority (KURA)**

KURA is the third new Authorities established as part of the reform process. It would take over the road related functions of UDD and those of City and Municipal Engineers and be responsible for managing all urban roads in the cities and municipalities. KURA would create Road Districts as follows: The City and Municipal Council areas would be grouped into eighteen KURA Districts for effective management of urban roads. A KURA District would be made up of two or more Municipal Council areas. The aim is to consolidate a number of urban networks taking into consideration their geographical spread to form a District. The District would then be managed by a team with optimum staff strength to achieve economic savings in operational costs.
KURA would however have and office in each Municipality to be run by a small force account unit.

Although the respective Local Authorities would not have any road workforce on their payroll they would continue to have ownership of the urban roads and be the lead player in prioritizing road works for implementation by KURA.

Section 182 (1) of the Local Government Act, Cap 265 empowers the Municipal and Town Councils with the control and care of all public streets situated within its area and vests ownership of the streets to the municipalities and townships. Meanwhile, Section 194 provides that a municipal council may if so requested by any Road Authority and shall, if so directed by the Minister of Local Government, transfer to such road authority all or any road management functions of the council.

In view of these two provisions of the Local Government Act, it is recommended that the Minister of MoRPW may formally make a request to the Minister of Local Government to effect such a transfer. The councils would on commencement of KURA, still hold ownership of the urban roads but delegate its management functions to KURA.

The Authority will;

i Take charge of the management, development, and maintenance of urban roads in all cities, municipalities, and major towns. They would provide the central point for coordinating policy, planning, and technical standardization for all urban roads.

ii Provide technical guidance to city and municipal authorities in developing their inputs to the prioritization and determination of the annual development and maintenance programs.

Kenya Wildlife Service (KWS)
KWS is to remain a Designated Road Agency of KRB responsible for roads within National Parks and access roads delegated to it by MoRPW.

i Based on policy and strategic guidelines provided by the minister, KWS shall prepare its annual road development programme for submission to the minister for processing and approval and funding.
Based on guidelines provided by KRB, KWS shall prepare its annual road maintenance programme for submission to KRB for processing approval and funding.

**County Council Reserves.**

It was observed that important game reserves such as Maasai Mara and Samburu do not fall under the jurisdiction of KWS but under the relevant County Councils. It is recommended that management of roads in such reserves should fall under the jurisdiction of KeRRA. It is further recommended that unclassified roads such as are in the Reserves be brought under the relevant DRCâ€ for them to effectively benefit from KeRRAâ€ operations.

**Special Purpose Roads**

As mentioned earlier most Special Purpose Roads have not received the requisite attention that their importance to the national economy would demand. It is therefore recommended that Coffee, Tea and Sugar Roads be granted collective Designated Road Agency status by KRB, in order to provide funding for the KeRRA to effectively maintain their roads.

**Mechanical and Transport Department (MTD)**

MTD has commercialized and become a Semi-Autonomous Government Agency (SAGA), in order to be properly positioned to provide road construction equipment to all Road Agencies as well as to the private sector.

**Materials Testing and Research Department.**

Materials Department will commercialize in order to be able to efficiently provide services to all Road Agencies and to the private sector. The possibility for KRB funding Research and Development from the Road Fund would be explored. The Material Department would be encouraged to carry out more Research and Technology Development.

**KIHBT**

Further KIHBT is a SAGA as soon as possible in order to be the preferred road sector training provider for all road agencies and the private sector would be encouraged. The possibility of KRB funding training at KIHBT from the Road Fund would be further explored.

**2.19 Environmental Policy of the Kenya Government**

The policy of the Kenya Government guarantees every citizen a clean and health environment and towards this aspiration, the GOK pursues a policy strategy of
integrating environmental aspects into national development plans. The broad objectives of the national environmental policy as expounded in Sessional Paper No 6 of 1996 include:

i  Optimal use of natural land and water resources in improving the quality of human environment;

ii  Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;

iii  Integration of environmental conservation and economic activities into the process of sustainable development;

iv  Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

6  2.20 LEGISLATION PERTAINING TO LAND TENURE

Currently, there are numerous statutes that specifically deal with rights of ownership and control of land. These include:- The Government Lands Act (Cap. 280); Registration of Titles Act (Cap. 281), Land Titles Act, (Cap. 282), Land Consolidation Act (Cap. 283), Land Adjudication Act (Cap. 284), Land (Perpetual Succession) Act (Cap. 286), Land (Group Representatives) Act (Cap. 287), Trust Land Act (Cap. 288), Mazrui Lands Trust Act (Cap. 289), Trusts Lands Act (Cap. 290), Land Acquisition Act (Cap. 295), Registered Land Act (Cap. 300) Land Control Act (Cap. 302) and the Land Planning Act (Cap. 303).

These statutes make provisions for the conferring and vesting of interests in land under three tenure categories namely:-

•   Government land

•   Trust Land

•   Private land

Government land includes both alienated and un-alienated land. Alienated land is land that has been set aside for a specific purpose. Un-alienated land is legally owned by the government but has not been set aside for a specific purpose.

i)   The Constitution of Kenya: This supreme document offers protection from compulsory acquisition, under section 75, but also lists numerous exceptions to this
principle. The issue of protection from deprivation of property is central to investors and will be discussed later.

ii) **Government Lands Act, Cap. 280 (revised 1984):** This Act deals with government land which includes forest reserves, other government reserves, townships, alienated and un-alienated government land and national parks. In this Act, Section 3 gives the President powers, subject to any other written law, to "make grants or dispositions of any estates, interests or rights in or over alienated Government land." The powers of the President over government land also extend to forest reserves, because these are administered under the government land tenure.

iii) **Trust Lands Act Cap. 288 of 1962 (revised 1970):** At independence, all land that was not in private or government ownership became Trust Land, under the control of County Councils to be used for the benefit of the residents of the area. Currently, approximately 78.5% of the total land area in Kenya is Trust Land.

iv) **Land Planning Act, Cap. 303:** The Land Planning Act and the Physical Planning Act are intended to ensure coordinated economic land-use for development projects. These Acts provide a broad framework for accommodating competing land-use demands. The powers vested by these Acts in the relevant agencies are wide enough to cover land-use planning and zoning for the whole country. However, in practice they are primarily concerned with planning of urban centres and the development of physical facilities such as roads, buildings and factory location. **The Physical Planning Act (Cap 286)** provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of government mainly the District Level. The Act provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in the specific plan. The intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential for economic and social development.

**The Land Acquisition Act Cap 295/288:** Construction and operation of the NTRP will require massive expropriation of land towards development of the Southern Bypass, Interchanges and Toll Plazas which under Kenyan law, is provided for in the Constitution under section 75 for private land and sections 117 and 118 for unregistered Trust Land. The detailed procedures for managing such land acquisition are elaborated under Caps 295 for private land and Cap 288 for unregistered Trust Lands.
### Table 2.10 Land Classification

<table>
<thead>
<tr>
<th>Land Classification</th>
<th>Area in km²</th>
<th>Approx. % of Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust Land</td>
<td>457,449km²</td>
<td>78.5%</td>
</tr>
<tr>
<td>Government Land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Forest Reserves</td>
<td>9,116km²</td>
<td></td>
</tr>
<tr>
<td>-Other GoK reserves</td>
<td>1,970km²</td>
<td></td>
</tr>
<tr>
<td>-Township</td>
<td>2,831km²</td>
<td></td>
</tr>
<tr>
<td>-Alienated</td>
<td>38,546km²</td>
<td></td>
</tr>
<tr>
<td>-Unalienated</td>
<td>28,598km²</td>
<td></td>
</tr>
<tr>
<td>-National parks</td>
<td>24,067km²</td>
<td></td>
</tr>
<tr>
<td>-Open water</td>
<td>10,960km²</td>
<td></td>
</tr>
<tr>
<td>Total Government Land</td>
<td>116,088km²</td>
<td>20.0%</td>
</tr>
<tr>
<td>Private Land</td>
<td>8,731 km²</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>Total area</strong></td>
<td><strong>582,646 km²</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

*Source: Central Bureau of Statistics, 1996*
CHAPTER THREE: BACKGROUND TO THE STUDY AREA

3.1 INTRODUCTION

3.2 LOCATION BACKGROUND
Mombasa road runs right across the city of Nairobi therefore to understand its locational context it is in order that its geographical context is well understood.

Nairobi is the capital and largest city of Kenya. The city and its surrounding area also forms the Nairobi province. The name "Nairobi" comes from the Maasai phrase *Enkare Nyirobi*, which translates to "the place of cool waters". However, it is popularly known as the "Green City in the Sun"

Founded in 1899 as a simple rail depot on the railway linking Mombasa to Uganda, the town quickly grew to become the capital of British East Africa in 1907 and eventually the capital of a free Kenyan republic in 1963. During Kenya's colonial period, the city became a center for the colony's coffee, tea and sisal industry. Nairobi is also the capital of the Nairobi province and of the Nairobi District. The city lies on the Nairobi River, in the south of the nation, and has an elevation of 1661 m (5450 ft) above

Nairobi is the most populous city in East Africa, with an estimated urban population of between 3 and 4 million. According to the 1999 Census, in the administrative area of Nairobi, 2,143,254 inhabitants lived within 684 km² (264 sq mi). Nairobi is currently the 4th largest city in Africa

Nairobi is now one of the most prominent cities in Africa politically and financially. Home to many companies and organizations, including the United Nation Environmental Program and the UN Office in Africa, Nairobi is established as a hub for business and culture. The Nairobi stock exchange (NSE) is one of the largest in Africa, ranked fourth in terms of trading volume and capable of making 10 million trades a day. The Globalization and World Cities Study Group and Network (GaWC) defines Nairobi as a prominent social centre.
3.2.1 Location and size of Nairobi

The city is located at $1°17'36^\circ49''\text{N} / 1.283^\circ\text{S} 36.817^\circ\text{E}$ and occupies 684 square kilometres (260 sq mi). It is situated 1661 metres (5450 ft) above sea level.

Nairobi is situated between the cities of Kampala and Mombasa. As Nairobi is adjacent to the eastern edge of the Rift Valley, minor earthquakes and tremors occasionally occur. The Ngong hills, located to the west of the city, are the most prominent geographical feature of the Nairobi
Mount Kenya is situated north of Nairobi and Mount Kilimanjaro is towards the south-east. Both mountains are visible from Nairobi on a clear day.

The Nairobi River and its tributaries traverse through the Nairobi Province. Nobel Peace Prize laureate Wangari Maathai has fought fiercely to save the indigenous Karura Forest in northern Nairobi which was under threat of being replaced by housing and other infrastructure.

Nairobi's western suburbs stretch all the way from the Kenyatta National Hospital in the south to the UN headquarters and Gigiri in the north, a distance of about 20 kilometres (12 mi).

The city is centred on the City Square, which is located in the Central Business District. The Kenyan Parliament buildings, the Holy Family Cathedral, Nairobi City Hall, Nairobi Law Courts and the Kenyatta Conference Centre all surround the square.

Nairobi is situated at the south-eastern end of the agricultural heartland of Kenya and most of its energy and food requirements can be obtained within a short distance of the city. The immediate environment of Nairobi consists of the productive highland area extending northwards and westwards to embrace the rich farming lands of the Rift Valley. Within a radius of about 10 km from the central business district (CBD), vegetables, fruit, herbs, flowers, and fuelwood are produced. Beyond this zone and in the suburbs, commercial ranching is carried out for the production of milk and meat, to be consumed by Nairobi residents. In addition to the upland agriculture, there is also active, although illegal, cultivation within the city limits (Freeman, 1991; Lado, 1990).

The settlement's administrative boundaries were extended as its population increased from 8,000 in 1901 to 118,579 by 1948 (figs. 9.1 and 9.2). At the time of independence in 1963 the population had grown to an estimated 350,000, although much of the growth was due to the major boundary extension, which increased the urban administrative area to 690 (km²) The city's 1994 population was estimated to be 1.5 million and its current growth rate to be about 5 per cent per annum (Republic of Kenya, 1994), with a population of between 2.8 and 4.0 million persons expected by the year 2010. Nairobi is likely to continue leading in terms of absolute population size, although its rate of increase is below the average urban population growth rate, which is estimated to be 7.7 per cent per annum for Kenya as a whole. Continued growth of the city has been taking place in the face of renewed strategies towards decentralized planning, which focus on the promotion of small and intermediate urban centres (Obudho, 1992).
3.2.2 Location of Mombasa road

Mombasa road

Nyayo stadium

City cabanas
National and Regional context of Mombasa road

Map 3.4

Figure 1 Kenya map

Figure 2 Map of Mombasa road
3.3 HISTORICAL BACKGROUND OF NAIROBI

The site of Nairobi was chosen by the Kenya Uganda Railway (KUR) authorities because it offered a suitable stopping place between Mombasa and Kisumu; adequate water supply from the nearby Nairobi and Mbagathi rivers; ample level land for railway tracks and sidings; elevated cooler ground to the west suitable for residential purposes; and apparently deserted land offering freedom for land appropriation. Another primary consideration for the selection of the site was that the place was free from tropical diseases, especially malaria. The new settlement was named after the Maasai name *Enkare Nairobi*, which means "a place of cold waters," although there was no permanent African settlement since the place was grazing land and a livestock watering point. In 1896, a small transport depot was established at the site to keep provisions for oxen and mules (White et al., 1948, p. 10). The railhead reached the site in June 1899 and by July it had become the KUR headquarters (Boedecker, 1936; White et al., 1948; Foran, 1950, p. 220; Hallman, 1967, pp. 1428; Hake, 1977, p. 20; Obudho and Aduwo, 1992). By the end of 1899 the Government of Kenya (GOK) had selected a site on the high ground on the northern side of the Nairobi River and away from the railway station to be the administrative headquarters (Morgan, 1968; see fig. 9.3). In 1900, the Nairobi Municipal Community (NMC) regulations were published by the GOK and these defined the urban centre as "the area within a radius of one and a half miles from the offices of the sub-commissioner of the Ukambani Province" (Morgan, 1976, p. 100; see fig. 9.1). A small number of settlers had begun settling in the urban centre by then and, with the construction of the KUR on the move, it became essential to designate a midway site where a well-equipped maintenance depot could be built. The then Engineer stated that:

Nairobi has with great judgement, been selected as the site for the principal workshops. It is about 5,500 m above the sea level, which ensures a comparatively salubrious climate; there is ample space of level ground for all sorts of requirements, and excellent sites for the quarters of officers and subordinates. On the higher ground there is a fairly good supply of water but reservoirs and tanks will have to be constructed. (Walmsey, 1957, p. 18)

Once the KUR authorities had made the decision to locate a depot in Nairobi, spatial patterns around it and the railway station emerged. Europeans established their homes on the hill to the west, away from Asians and Africans (fig. 9.3), soon leading to exclusive European residential settlements. Meanwhile, Asian employees who had been discharged from KUR employment established shops not far from the railway station, an area that came to be known as the Indian
Bazaar. The Asian buildings were used both for business and as living quarters by a few Africans who worked for the KUR, while others lived in employee housing and shanty villages to the east (White et al., 1948). By 1906 the original KUR depot and camp had grown into an urban centre of over 10,000 people and definite land-use zones had appeared, though these had not been planned, with the Europeans mainly occupying the cooler westlands, the Indians in the north, and the African workers mainly concentrated on the periphery (fig. 9.4). With the completion of the KUR and the influx of more non-African settlers, the settlement expanded rapidly. By 1909 much of its internal structure, especially the road network in the CBD, was already established.

In 1919, the Nairobi Municipal Community was replaced by Nairobi City Council (NCC). At the same time the boundary was extended to include peri-urban settlements (Croix, 1950, pp. 23-24). The boundary was again extended in 1927 to cover 30 square miles (White et al., 1948; see fig. 9.1). From 1928 to the time of independence of Kenya in 1963, this boundary remained the same, with only minor additions and excisions taking place. By 1950, permanent residential zones had already been demarcated, very much along the lines first established in the early years of the century. In 1963, the boundary of Nairobi was further extended and remains the same today (fig. 9.1). Expansion was expected to take place within this area, mainly on the 20 square miles of black cotton soil and ranching land to the east of the early settlement (Ferraro, 1978).

Urbanization in Kenya has a long history in the coastal region but a short history in the interior parts of the country (Obudho, 1982, 1983, 1992, and 1994). The pattern that exists today predominantly reflects the development of British colonization rather than traditional African settlement patterns. The proportion of the population living in urban areas has increased from 8 per cent at independence in 1963 to 20 per cent in 1995. In 1948, there were 17 urban centres with an aggregate population of 176,000, of which 83 per cent was concentrated in Nairobi and Mombasa. By the 1962 population census, the number of urban centres had doubled to 34 and their population had increased to 671,000. In 1979, the overall proportion living in urban areas had risen to 9.9 per cent, with Nairobi accounting for 36 per cent of the total. The 1979 census indicated 90 urban centres with a total urban population of 2.3 million, which increased to 3.7 million in 1989. The 1989 population results indicate that 18 per cent of the population resided in urban areas. A total of 139 urban centres were reported, of which Nairobi was still the largest, with a similar proportion of the total (36 per cent) as in 1979. The current profile of the city of Nairobi has, in turn, been shaped by geographical, historical, and contemporary forces.¹

I shall first describe Nairobi's location, historical development, and population growth. The system of land tenure and administration, which has influenced the pattern of urban development, will then be outlined, followed by aspects of the city's economy and socio-political structure. Next, the provision of urban services will be analysed, with particular reference to housing, water, solid waste disposal, transportation, and recreation. Following a discussion of environmental and health problems, the final section will suggest appropriate strategies for the future development of the city.
Site and situation

Nairobi is situated at the south-eastern end of the agricultural heartland of Kenya and most of its energy and food requirements can be obtained within a short distance of the city. The immediate environment of Nairobi consists of the productive highland area extending northwards and westwards to embrace the rich farming lands of the Rift Valley. Within a radius of about 10 km from the central business district (CBD), vegetables, fruit, herbs, flowers, and fuelwood are produced. Beyond this zone and in the suburbs, commercial ranching is carried out for the production of milk and meat, to be consumed by Nairobi residents. In addition to the upland agriculture, there is also active, although illegal, cultivation within the city limits (Freeman, 1991; Lado, 1990).

The settlement's administrative boundaries were extended as its population increased from 8,000 in 1901 to 118,579 by 1948 (figs. 9.1 and 9.2). At the time of independence in 1963 the population had grown to an estimated 350,000, although much of the growth was due to the major boundary extension, which increased the urban administrative area to 690 (km²) The city's 1994 population was estimated to be 1.5 million and its current growth rate to be about 5 per cent per annum (Republic of Kenya, 1994), with a population of between 2.8 and 4.0 million persons expected by the year 2010. Nairobi is likely to continue leading in terms of absolute population size, although its rate of increase is below the average urban population growth rate, which is estimated to be 7.7 per cent per annum for Kenya as a whole. Continued growth of the city has been taking place in the face of renewed strategies towards decentralized planning, which focus on the promotion of small and intermediate urban centres (Obudho, 1992).

3.3.1 Population growth and dynamics

The population of Nairobi grew from 10,512 in 1906 to 118,976 in 1948 (table 9.1). By 1962, it had a population of 266,795 people. Between the 1948 and 1962 censuses, the population grew at an average rate of 5.9 per cent per annum, compared with 7.6 per cent in the previous 12-year period. The African and Asian population grew hand in hand with the total population until 1960, with the former making up just under 60 per cent and the latter one-third of the total (table 9.2) (Obudho and Muganzi, 1991). A decline in the number of Europeans and Asians resulted from emigration following independence (Tiwari, 1972 and 1979) and these groups formed only 4 per cent and 14 per cent, respectively, of the city's population in 1969, falling to 1 per cent and 4 per cent, respectively, in 1989.
A feature of the post-independence period has been the movement of people from the rural areas to Nairobi. The main sources of short-distance migrants are the districts of Central Province, while long-distance migrants come from the Eastern, Western, and Nyanza Provinces. The 1989 census put the city's population at 1.3 million, 80 per cent of whom are accommodated on 20 per cent of the land. Population is heavily concentrated in a number of inner-city wards, in some of which, such as Pumwani and Maringo, densities are extremely high (over 26,000 people per km²) see fig. 9.5). Alternative projections to 2010 range from 2.8 to 4 million (Mazingira Institute, 1993; Obudho and Aduwo, 1992, p.57) and it is estimated that 550,000 families will need to be sheltered by the year 2000 (Republic of Kenya, 1993). This increase has and will continue to exert a lot of demands on the environment unless adequate measures are taken. The population of Nairobi is predominantly male. In 1962, there were over twice as many adult males as females, so that the sex ratio (including children) was 250 males to 100 females but with striking differences among racial groups. Although the numbers of women and men have become somewhat more even since then (table 9.3), the continued predominance of men in Nairobi can be attributed to the fact that the majority of rural-urban migrants are men.

Table 3.1 Nairobi: Population for selected years, 1906-1994

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (ha)</th>
<th>Population</th>
<th>% increase p.a.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>1,813</td>
<td>10,512</td>
<td>4.4</td>
</tr>
<tr>
<td>1928</td>
<td>2,537</td>
<td>29,864</td>
<td>17.1</td>
</tr>
<tr>
<td>1931</td>
<td>2,537</td>
<td>47,944</td>
<td></td>
</tr>
</tbody>
</table>

Nairobi has experienced some of the highest growth rates of any city in Africa. Since its foundation in 1899, Nairobi has grown to become the largest city in East Africa, despite being the youngest large city in the region. The growth rate of Nairobi is currently 6.9%. It is estimated that Nairobi's population will reach 5 million in 2015.
### 3.4 PHYSICAL ENVIRONMENT OF NAIROBI CITY

The physical environment of the city has been considerably altered through a variety of human activities over the years since 1890 when the first Town Village was established. The activities include construction of buildings, roads, bridges, and pavements. Dredging and canalization of flowing water have drastically altered the hydrology of Nairobi. Mining of building stones, especially in the southern and eastern parts of the city and the use of the stones for building in different parts of the city has greatly reduced the natural aesthetic value of the city’s landscape.

### 3.4.1 Climate

**Altitude**

At 1,661 meters (5,449 ft) above sea level, Nairobi enjoys a fairly moderate climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day.
**Temperature**

The mean maximum temperature for Nairobi is 24 °C (75 °F).

**Rainfall**

There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. As Nairobi is situated close to the equator, the differences between the seasons are minimal. The seasons are referred to as the wet season and dry season. The timing of sunrise and sunset does not vary tremendously throughout the year, due to Nairobi's close proximity to the equator.

**Vegetation**

The study area has simple vegetative characteristics including a number of tree types, grasses and other perennial shrubs as shown in the figures below;

Figure 3.2

The green indigenous and exotic shrubs shows the vegetation type that characterized Mombasa road

**3.4.2 Drainage**

**Catchment attributes and characteristics**

**Landscape level changes**

Nairobi lies at an average altitude of 1650m (range 1500-1800M). The city lies at the edge of Athi Kapiti plain and the lower slopes of the Kikuyu and Aberdare escarpment. Land elevation increases from east to west and in fact several streams, including Gatharaini; Mathare,
Nairobi, Motoine Ngong and Mbagathi drain the escarpments as they flow eastwards into Athi River.

Ecosystem level changes

Nairobi city and its suburbs enclose an area of 658km of which 117 km comprise forested parks and grasslands. The city lies in the catchments area of River Athi, Athi-Kapiti plains and the forested slopes of the Aberdare Mountain Range. Nairobi City Parks have natural areas of open grassland and deciduous forests at the forest at Karura, arboretum, City Park, Dagoretti and Ngong Forests. The city suburbs of Karen, Langata and Kisser have well-wooded residential plots. Table 1 gives an arbitrary classification of the current status of the NRBP ecosystem. The city has lost most of its wetlands to human settlements. Formerly extensive wetlands along Nairobi River and Gatharaini River for instance, have been drained to create space for buildings, roads, car parks and recreational facilities. Similarly, wetlands that occurred along the upper parts of Mathare and lower parts of River Motoine have been reclaimed for agriculture, pasture and human settlements.

However, there are a variety of natural wetlands fragments that still persist in the basins of Rivers Mathare, Nairobi and Motoine. The most extensive of those swamps remain occur in, Ondiri Swamp in Kikuyu and Kuna Estate. There are also constructed wetlands such as Nairobi Dam along River Motoine, large sewage treatments works at Dandora, and waste water treatment Ponds.

Among the major changes at ecosystem level has been the reduction in natural habitats, specially forests, rank grasslands, and wetlands. Water has also been transferred from Thika river basins into Nairobi so as to meet socio-economic demands for clean water. The waters of Nairobi Motoine and Mathare Rivers have also been heavily polluted, thereby rendering it unfit not only for domestic, commercial and industrial use but also not suitable to support diverse aquatic life. The rivers currently support limited biological diversity and mainly serve as open sewers to carry away waste from human settlements upstream and the CBD.

3.4.3 Habitat and Community level changes

Because of its unique position between savannah grasslands of southern Kenya and the forested slopes of the Aberdare range, Nairobi R.B. has had an abundance of both grassland and forest communities of both plants and animals. It has also supported transient migratory communities, associated with transitional habitats, such as seasonal wetlands. Among the transitional habitats
are riverine reservoirs and seasonal rock pools and marshes in Embakasi, and Kayole west plains and Dandora. These wetlands support substantial numbers of resident and of migratory birds

3.5 ECOLOGICAL SETTING AND HUMAN ACTIVITY
Upper Forested Catchments
Intensive agriculture and animal husbandry, Sparse Human settlements, Coffee estates, Small urban centres, Vegetable farms along the river banks
Upper Agricultural Reaches
Many well development subsistence agricultural farms and residential plots interconnected with murrum roads and footpaths
Peril-Urban Mid Reaches
Residential areas, Road networks and associated infrastructure, Small holder plots for growing Napier grass, Sugarcane, Kales, Tomatoes, Arrow roots, Bananas, Tree nurseries, Backyard lawns, Garages and vehicle repair sheds, Car wash, Solid waste dump sites, Sewer treatment works
Central Business District
High rise commercial office buildings and other urban developments, Industries, Residential areas, Road networks and associated infrastructure, Small holder plots for growing Napier grass, Sugarcane, Kales, Tomatoes, Arrow roots, Bananas, Tree nurseries, Backyard lawns, Garages and vehicle repair sheds, Car wash, Solid waste dump sites, Sewer treatment works
Lower East lands and Industrial Area
Major Industries and similar enterprises in this area are:
Urban developments, Industries, Residential areas, Road networks and associated infrastructure
Lower Eastern Peril-urban and Savannah Reaches
Residential areas, urban centres, Slaughter houses, Quarries, Sewer irrigated vegetable farms, Animal husbandry, and Sewer treatment works
3.6 DIVISIONS OF NAIROBI

Nairobi is divided into eight divisions and fifty locations, mostly named after residential estates. Kibera Division, for example, includes Kibera (Kenya’s largest slum) as well as affluent estates of Karen and Langata.

<table>
<thead>
<tr>
<th>Table 3.2</th>
<th>Division</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Huruma · Kariokor · Mathare · Ngara · Starehe</td>
<td></td>
</tr>
<tr>
<td>Dagoretti</td>
<td>Kawangware · Kenyatta/Golf Club · Mutuini · Riruta · Uthiru/Ruthmitu · Waithaka</td>
<td></td>
</tr>
<tr>
<td>Embakasi</td>
<td>Dandora · Embakasi · Kariobangi South · Kayole · Mukuru Kwa Njenga · Njiru · Ruai · Umoja</td>
<td></td>
</tr>
<tr>
<td>Kasarani</td>
<td>Githurai · Kahawa · Kariobangi North · Kasarani · Korogocho · Roysambu · Ruaraka</td>
<td></td>
</tr>
<tr>
<td>Kibera</td>
<td>Karen · Kibera · Laini Saba · Langata · Mugumoini · Nairobi West · Sera Ngombe</td>
<td></td>
</tr>
<tr>
<td>Makadara</td>
<td>Makadara · Makongeni · Maringo · Mukuru Nyayo · Viwandani</td>
<td></td>
</tr>
<tr>
<td>Pumwani</td>
<td>Bahati · Eastleigh North · Eastleigh South · Kamukunji · Pumwani</td>
<td></td>
</tr>
<tr>
<td>Westlands</td>
<td>Highridge · Kangemi · Kilimani · Kitisuru · Lavington · Parklands</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER FOUR: ANALYSIS OF FINDINGS

4.1. INTRODUCTION

The chapter discusses the respondent’s information like gender, place of origin, destination, employment status, how long they have been operating along Mombasa road, reasons for using Mombasa road, their opinions on challenges and solutions facing Mombasa road among others. The chapter also discusses analyses and presents the major findings evident from the data collected, both through secondary and primary means. It also analyses and describes the road transport situation in the study area including the road conditions, use, traffic and modal split. It also clarifies road conditions during peak and off peak hours. It also discusses the characteristics and significance of other modes of transport apart from vehicular and pedestrian and other NMT modes as well as their impacts on the environment.

The chapter also looks into the various types of NMT traffic and support infrastructure that have been provided along Mombasa road as well as the problems and challenges facing NMT provision and usage along this road. This will be geared towards achieving the main objectives of this research.

4.2 INFORMATION FROM THE RESPONDENTS

Information from respondents were obtained by conducting questionnaire to the following informants as follows:

The sample size is sixty five (65) and divided into:

- Drivers of commercial matatu 10, drivers of heavy trucks 10, drivers of private cars 5, policemen 5, pedestrian 10, cyclist 5, cart pullers 10 and owners of encroached structures 10
4.2.1 Information from commercial matatu drivers

4.2.2 Gender composition

Figure 4.1

The chart above clearly indicate that most commercial matatu drivers are males 96% while just a small percentage are females 4%. The data collected and the responded found were mostly males who believes that the job of driving belongs to men not females.

4.2.3 Location of interview

Figure 4.2

Most of the drivers were interviewed at some designated points mostly during peak hours when there was a big traffic snarl up at least they have the time to answer the questionnaires this
4.2.4 Causes of traffic problems

Figure 4.3

The ever heavy traffic jam that is experienced along Mombasa road is mainly experienced the round about, junctions and around zebra crossing.

---

4.2.5 Points of major traffic problems

Figure 4.4
Road accidents are economic burden and pose a major challenge to health care system. The economic cost of road crashes and injuries is estimated at 1-1.5 percent of Gross National Product (GNP) for low and middle income countries. Critical and often scarce health care resources get consumed by road crashes cases. This hurts country’s ability to respond to other health needs. Road traffic injuries also place a heavy burden on household finances of the victims and their families. Many families are driven deeply into poverty by loss of a bread winner and the added burden of disabled members
4.2.6 Situational analysis of traffic problems

Map 4.1
figure 4.5

- Lack of zebra crossing
- Lack of NMT lane
- Road construction going on
- Conflict of traffic
- Illegal stage next to city cabanas
Traffic jam
The study found out that despite the critical role that Mombasa road is playing as regard the economic development in the region, its current capacity is highly compromised. This is because the road is narrow and it is the only route that large trucks from Mombasa follow, vehicles from airport, commercial vehicles like matatu, private cars of those that stay along Mombasa follow, cart pullers together with all non motorised transport. What worsen the situation is the failure to provide special lanes for the ambulances, police and the dignitaries therefore it means that whenever the above named category would want to use the road all other vehicles must give way, this creates a big traffic snarl up that takes too long to wind up. Given that large trucks as well move with slow speed as compared to other vehicles worsen the situation. Private cars are also too many on the road leading to the city centre. Pollution problem is majorly experienced during peak hours (6:30am-10:00am and 4:30pm-9:00am).
The following are the presentations of the findings as regards traffic problem along Mombasa road.

**Figure 4.7**

Traffic problems along Mombasa road

**Figure 4.9**

Proposed Solution to traffic jam
Pectoral representations of traffic jam during peak hours
Figure 4.10

The pictures above shows traffic situation on Mombasa road during pick hours. Picture (b) shows lack of provision for other modes of transport like the cyclists therefore creating a modal conflict

Situation during off peak hours

Figure 4.11
4.2.7 Summary of Findings on Mombasa Road

Mombasa road plays a critical role in development of the economy of not only the city of Nairobi but other parts of the country as well as the neighbouring countries. Therefore its maintenance and improvement to cope with the rapid changes of pace of development should be prioritised.

A lot of factors are found to be causing traffic problems along Mombasa road; and these include:

a) Narrow road that can not support the large volume of vehicular transport as well as other non-motorised transport

b) The road does not have designate lanes for emergency therefore this causes a lot of traffic snarl up whenever these cases arises because other vehicles must give way for the emergency vehicles
c) There is no by passes for the vehicles that does not have business coming into the city
d) Most working class people who have their own means of transport prefer using them to/from work this increases traffic volume on this road
e) There is inadequate zebra crossing there this causes a lot road accidents on this road
f) There are structure within the road reserve therefore road expansion is not easy
g) Traffic lights are not very efficient therefore motorist disregard them unless there is police officer on sight
h) Large trucks move at very slow pace causing a lot of traffic jam
i) Non- motorise transport lane is not provided causing modal conflicts and accidents
CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSION

4. 5.1 INTRODUCTION
This chapter mainly seeks to advice on possible solutions to the problems highlighted in the previous chapters. These proposals would be inconsideration of what has been done in other places across the world and most importantly what is feasible to the Kenyan authorities.
On areas for further research a proposal would be done on limitation so that further studies are done to ensure there is continuity of generation of knowledge to tackle future challenges on Mombasa road.

5.2 PROPOSAL AND RECOMMENDATIONS

RECOMMENDATIONS

Nil Intervention

When nil intervention approach is adopted then nothing is done to improve the situation. Normally other non-official of adopting nil intervention is when the analysis is done and the proposals then they are just kept without being implemented. This alternative emphasizes a case where a situation takes care of itself without external interference.

The picutures below shows the current condition of the road, and the situation will remain unchanged when nil intervention approach is adopted

<table>
<thead>
<tr>
<th>The situation on Mombasa road during off peak hours</th>
<th>A situation of heavy traffic jams during peak hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>It shows few cars when the road is less congested</td>
<td>The road is narrow and congested</td>
</tr>
</tbody>
</table>
Removing structure within the road reserve

Many of the structures within the road reserve should be relocated because already the capacity of Mombasa road is compromised, the road is narrow and there is limited space for road expansion. These structures have taken place of public utility to the extent that there is no continuous foot path all the way. This has led to modal conflicts that has resulted in a lot of accidents.

Development of bypasses/ring roads

One big factor why Mombasa road has traffic problem is the fact that it is the only through way for large trucks and other vehicles that are destined to other places and have got no business passing through the city. The proposed southern bypass and the northern bypass is taking too long to be effective, therefore there is every need to develop it. These trucks are heavy and tend to move at a very slow pace.

Demarcation of lanes

This would help in controlling overlaps that is a common occurrence in todays roads. The emergency vehicles that normally cause a lot of traffic would have their own lanes, again this would help in reducing road accidents.

Development of bus stops

Numerous bus stops along Mombasa road is a major cause of traffic problems, lack of official bus stops gives room for commercial vehicles like matatu to stop anywhere along the road as they pick and drop passengers. If these are properly provided then a lot of traffic problems shall have been reduced.

Proper design of junctions/round about

A lot of accidents occur due to poor design of junctions and round about, lack of visibility either due to structures within he road reserve or tee-junction are the main cause of this. If these junctions like the Imara daima one is properly designed there would be big reduction in traffic problems.

Developing proper signage

Proper signage and signal and signal is inadequate along Mombasa road, therefore their development a long the highway would enhance order and reduce a lot of traffic problem along this highway.

Abolish private cars into the city
A bout 60 per cent of vehicles causing traffic jam are privately owned cars whose owners are reluctant to use public vehicles to/from work. These cars are supposed to be left some distance from the city so that they do not cause a lot of traffic problems.

**Plant trees along the Mombasa road**
Planting of trees along Mombasa road would help in reducing a lot of pollution caused by commercial vehicles and large trucks that moves along that road, in addition it would help in reducing desertification and providing shade along pedestrian foot paths

Areas for further research
- Possibility of providing a viaduct to be used by express vehicles that have got no business in the city
- Possibility of other transport modes like the railway being incorporated into urban transport system e.g from airport into the city
- Provision of cycle path to avoid modal conflict
- Provision of efficient pedestrian path

### 5.3 PROPOSED MODELS

#### 5.3.1 Dual carriage sketch up model
5.3.2 Pictorial Representation of Proposed Design of By-passes

Two way system

Ring road

Deceleration and Acceleration

Main Highway

Greenery in the middle of the road
5.3.3 One way model

Well maintained Highway

Middle of the road is boldly marked with a yellow line

Zebra crossing
Path
5.3.4 Preferred model for Mombasa road

POTENTIAL FUTURE ROAD DESIGN OF MOMBASA ROAD
Here is a vision for Mombasa road that takes a congested and unattractive road and transforms it into a functional and attractive highway.
This design adds pedestrian paths, crosswalks, tree-lined streets and a bike lane.

3:  Design model of Mombasa Road

5.3 CONCLUSION
The study on factors that are contributing to traffic problems in urban roads with special emphasis on Mombasa road has been necessitated by the fact that this road has been playing and it continues to play a critical role in development of Kenya as a country and act as a linkage of other neighbouring countries with the Mombasa port. Most countries within the region of east Africa would not function effectively if this road fails to play the linking role that it currently play, but surprisingly enough this road continuous to be incapacitated and little is done to
improve the situation. Owing to these factors I have mentioned above there is every need to improve condition of this road in order to keep pace with development world over.
5.3 REFERENCES


7. Nairobi, City Council of [1979], Nairobi Urban Transport Project, Nairobi City Council-Engineers Department Draft Report


15. Sub-Saharan Africa Transport Policy Program S.S.A.T.P Working


17. The politics of urban transport planning (1946) by G. Kraft

6.1 APPENDICES

Appendix 1- Field survey Instruments
6.1.1 Interview schedule for city council of Nairobi

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT – ALONG MOMBASA ROAD

Factors contributing to traffic problems on major urban roads: A case study of Mombasa road

Declaration: this information is confidential and will be used for academic purposes only

INTERVIEW SCHEDULE FOR CITY COUNCIL OF NAIROBI TRANSPORT DEPARTMENT

1. When and how did Mombasa road come about?

2. What is the main role of Mombasa road

3. Does Mombasa road compare to other roads in Nairobi and which ones are these?

4. What are the strengths and weaknesses (challenges) Mombasa road is facing?

<table>
<thead>
<tr>
<th>Strengths (Role)</th>
<th>Challenges/constrains</th>
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5. What are the recommended road reserve for a road like Mombasa one?
6. Are there some structures within the road reserve along this road? (a) Yes (b) No

7. If yes which ones are these?

8. What are the future plans of the council as regard the Mombasa road?
6.1.2 Pedestrian questionnaire

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT – ALONG MOMBASA ROAD

Factors contributing to traffic problems on major urban roads: A case study of Mombasa road

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INTERVIEW-PEDESTRIAN
Location/junction name: __________________ Direction: From__________ to ___________
Date______________ Time_________ Questionnaire No.___________________

1. How long have you been walking along Mombasa road?

2. Is there an alternative route a part from Mombasa road that you can use?

3. Which one do you prefer? Give reason

4. Where do you walk i.e. on main road or pedestrian path?

5. Any reason for the answer above?

6. How does it take you to reach your destination? (In hrs)

7. You view on hours you take on the road?
8. What are the peak and off peak hours along this road?

9. Are there transport problems that are experienced along Mombasa road? (a) yes (b) no

If yes fill the table below

<table>
<thead>
<tr>
<th>No.</th>
<th>Problem</th>
<th>Place experienced</th>
<th>cause</th>
<th>solution</th>
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</table>
6.1.3 Policeman questionnaire

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT – ALONG MOMBASA ROAD

Factors contributing to traffic problems on major urban roads: A case study of Mombasa road

Declaration: this information is confidential and will be used for academic purposes only

INTERVIEW-POLICEMAN

Location/junction name: __________________ Direction: From__________ to ___________
Date____________________ Time_______ Questionnaire No.________

1. How long have you been working along Mombasa?

2. Do you prefer working along Mombasa road? (a) yes (no) .Give reason for your answer

3. What are the peak and off peak hours along this road?

4. Are there transport problems that are experienced along Mombasa road? (a) yes (b) no

If yes fill the table below

<table>
<thead>
<tr>
<th>No.</th>
<th>Problem</th>
<th>Place experienced</th>
<th>cause</th>
<th>solution</th>
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</tbody>
</table>
6.1.4 Drivers questionnaire

UNIVERSITY OF NAIROBI
DEPARTMENT OF URBAN AND REGIONAL PLANNING
RESEARCH PROJECT – ALONG MOMBASA ROAD
QUESTIONNAIRE-INTERVIEW for Cars, matatu, heavy trucks e.t.c.

Factors contributing to traffic problems on major urban roads: A case study of Mombasa road

Declaration: this information is confidential and will be used for academic purposes only.

Name of Interviewer____________________ Date____________________
Name of interviewee__________________ status (occupation) _______________________
Location/road junction: _________________ Questionnaire No.________________________

1. How long have you been driving along Mombasa?

2. Do you prefer using Mombasa road? (a) yes (no) .Give reason for your answer

3. How many trips do you make per day?

4. Average speed of movement

<table>
<thead>
<tr>
<th>Time</th>
<th>Speed in km/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak hours</td>
<td></td>
</tr>
<tr>
<td>Off peak hours</td>
<td></td>
</tr>
</tbody>
</table>

5. Are there transport problems that are experienced along Mombasa road? (a) yes (b) no

If yes fill the table below

<table>
<thead>
<tr>
<th>No.</th>
<th>Problem</th>
<th>Place experienced</th>
<th>cause</th>
<th>solution</th>
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<tbody>
<tr>
<td>1</td>
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</tbody>
</table>
### 6.1.5 Traffic survey data sheet

**UNIVERSITY OF NAIROBI**
**DEPARTMENT OF URBAN AND REGIONAL PLANNING**
**RESEARCH PROJECT – ALONG MOMBASA ROAD**

**QUESTIONNAIRE- TRAFFIC SURVEY**

Factors contributing to traffic problems on major urban roads: A case study of Mombasa road

**Declaration**: this information is confidential and will be used for academic purposes only

Traffic frequency Data

<table>
<thead>
<tr>
<th>Location/Junction name</th>
<th>Direction: From</th>
<th>Questionnaire No.</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Road name</th>
<th>Direction: To</th>
<th>Questionnaire No.</th>
<th>Date:</th>
</tr>
</thead>
</table>

Day/night

<table>
<thead>
<tr>
<th>Time</th>
<th>Heavy Trucks</th>
<th>Matatu/minibus</th>
<th>Private cars</th>
<th>motorcycle</th>
<th>carts</th>
<th>pedestrians</th>
</tr>
</thead>
</table>

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