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DEPARTMENT OF URBAN AND REGIONAL PLANNING

SUSTAINABLE CBD DECONGESTION:

Its Application in Eldoret CBD.

By

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DECLARATION

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

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DEDICATION

For my little niece Melissa Aby Were now 1,
Wishing you a coat of many colours, '*idong irom gi bao ma ka neru*'

PROLOGUE

'If any man makes search for truth with all his penetration, and would be led astray by no deceiving paths, let him turn upon himself the light of an inward gaze, let him bend by force the long-drawn wanderings of his thoughts into one circle; let him tell surely to his soul, that he has, thrust away within the treasures of his mind, all that he labours to acquire without…'

Anicius Manlius Severinus Boethius
The Consolation of Philosophy

ACKNOWLEDGEMENTS

That foremost I thank God does not camouflage an exiguous job, but is an expression of gratitude for the sum of all gifts (*of life, health, intelligence, opportunity, family and all that I ever needed)* that propel me through life, without which I am never. No amount of human effort and struggle can yield that, is there? I am not ashamed.

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ABSTRACT

Third world cities are undergoing rapid growth accompanied by rapid development pressures with high demands for housing and infrastructure as a result of high population growth rates. Some of these cities are doubling in population and have more than doubled in area within the last few years. 2008 saw, for the first time in history, over half of the world's population living in urban areas. According to current projections, these will have risen to 70% by 2050. Almost all the growth will take place in developing regions. Rodrigue (2008) asserts that the outcome (of the massive urbanization transition) has been a fundamental change in the socio-economic environment of human activities as urbanization involves new forms of employment, economic activity and lifestyle. More and more people flock into urban centres to meet their livelihood needs. One such town in Kenya whose growth is great and expected to rise further is Eldoret in the Rift Valley Province.

On one hand, the role of Eldoret Central Business District (ECBD) in the local context as a transport centre, commercial centre, administrative centre, business centre, and service centre, among others contributes to a myriad of its woes. Among the problems that have been cited to plague the ECBD in relation to these is traffic congestion. On the other hand, its importance as an international transport centre is made worse by the location of the international trunk road, the class A, A 104 Namanga-Kampala Road, right at the heart of the ECBD. Cargo freight heavy trucks en-route to various international destinations, loaded to capacity with the cargo from the Port of Mombasa, which may not have any business at the ECBD, have to pass through it.

There is a great call to effect a strategy to decongest the ECBD to alleviate its problem and accentuate its progress. But there is a greater need to do it **sustainably**. Sustainable ECBD Decongestion sets the context of mobility and accessibility within the ECBD in relation to the newly developed Strategic Urban Development Plan (SUDP) for Eldoret. Strategies identified range from strengthened urban planning, legislative and institutional frameworks review, as well as in urban design and transportation planning, tailored to respond to the social, economic and environmental challenges that arise from decongestion. Action areas identified include, but not limited to re-designation of the section of A 104 Uganda Road passing through the ECBD to an urban road and creation of by-passes to form part of this road, pedestrianization of the ECBD, promotion of public transport, redesigning of the transport channels, planning for parking provision, that include re-designation of parking facilities, and transportation system-oriented urban design.

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ABBREVIATIONS AND ACRONYMS

AIDS -	*Acquired Immune Deficiency Syndrome*
BTR -	*Bus Transit Route*
CBD -	*Central Business District*
CBS -	*Central Bureau of Statistics*
CCTV -	*Closed Circuit Television*
CEI -	*Central European Initiative (countries)*
CO -	*Carbon monoxide*
CO_2 -	*Carbon dioxide*
EAT -	*East African Time (GMT +3.)*
ECBD -	*Eldoret Central Business District*
ECMT -	*European Conference of Ministers of Transport*
EMCA -	*Environment Management and Coordination Act*
FGD -	*Focused Group Discussions*
GHG -	*Green House Gases*
GIS -	*Geographical Information Systems*
GNP -	*Gross National Product*
GoK -	*Government of Kenya*
GPS -	*Global Positioning Systems*
HIV -	*Human Immuno Virus*
IDS -	*Institute of Development Studies*
IMT -	*Intermediate Means of Transport*
INTP -	*Integrated National Transport Policy*
JICA -	*Japan International Cooperation Agency*
KIPPRA -	*Kenya Institute of Public Policy Research and Analysis*
KURA -	*Kenya Urban Roads Board*
LA -	*Local Authority*
LGA -	*Local Governments Act*
MCE -	*Municipal Council of Eldoret*
MDG -	*Millennium Development Goal*
MEMR -	*Ministry of Environment and Mineral Resources*
MoLG -	*Ministry of Local Government*
MoR -	*Ministry of Roads*
MoT -	*Ministry of Transport, GoK*
MoWI -	*Ministry of Water and Irrigation*
MSS -	*Multi-Stage Sampling*
MTRH -	*Moi Teaching and Referral Hospital*
NEMA -	*National Environment Management Authority*
NMT -	*Non-Motorized Transport*
NO_x -	*Nitrates (including NO_2, No_3 and NO_4)*
O-D -	*Origin-Destination*
OEDC -	*Organization for Economic Co-operation and Development*
PCU -	*Passenger Car Unit*
PPA -	*Physical Planning Act*
PPH -	*Physical Planning Handbook*
RVTTI-	*Rift-Valley Technical Training Institute*

SD -	*Sustainable Development*
SDF -	*Sustainable Decongestion Framework*
SEA -	*Strategic Environmental Appraisal*
SPSS -	*Statistical Package for Social Scientists*
SUDP -	*Strategic Urban Development Plan*
TDM -	*Travel Demand Management*
TSM -	*Transportation System Management*
TLA -	*Transport Licensing Act*
TLB -	*Transport Licensing Board*
UNEP -	*United Nations Environmental Programme*
UNHSP -	*United Nations Human Settlements Programme (HABITAT)*
UNWCED -	*United Nations World Commission on Environment and Development*
WHO -	*World Health Organization*

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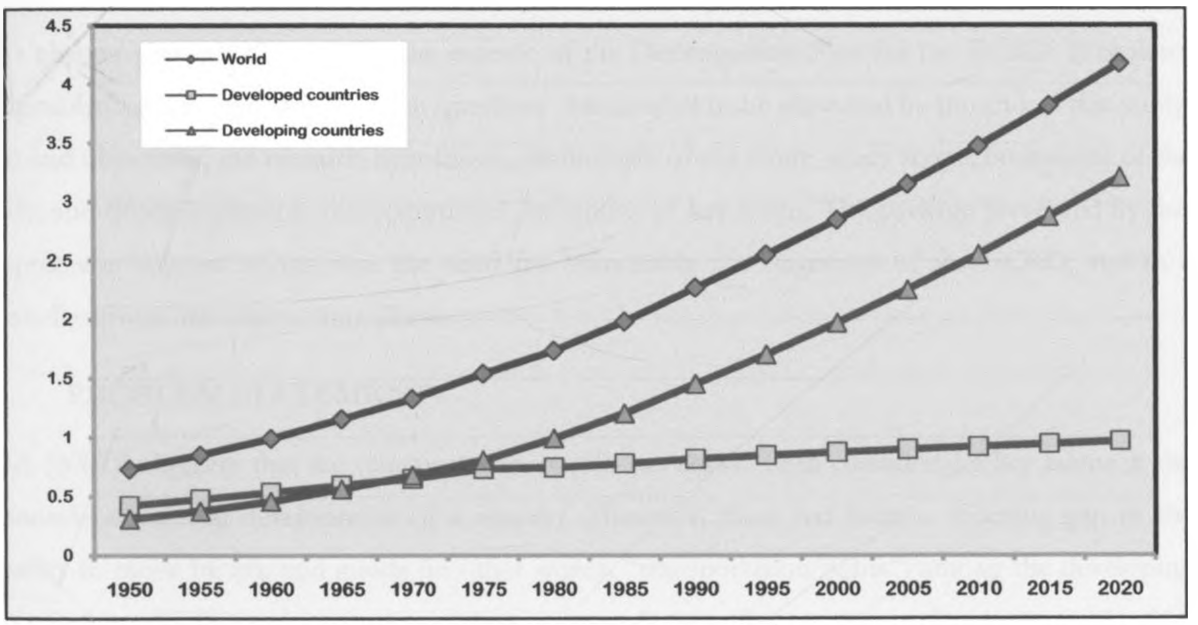
CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

Third world cities are undergoing rapid growth accompanied by rapid development pressures with high demands for housing and infrastructure as a result of high population growth rates. Some of these cities are doubling in population and have more than doubled in area within the last few years. According to the United Nations Human Settlements Programme (UNHSP)-HABITAT (2009)[1], 2008 saw, for the first time in history, over half of the world's population living in urban areas. According to current projections, these will have risen to 70% by 2050. Almost all the growth will take place in developing regions. Between 2007 and 2025, the annual urban population increase in developing regions is expected to be 53 million (or 2.27%), compared to a mere 3 million (or 0.49%) in developed regions.

Figure 1-1: World Urban Population, 1950-2005 with Projections to 2020 (in billions)



Source: Adapted from Rodrigue et al, (2009)[2]

[1] UNHSP, (2009): *Global Report on Human Settlements 2009: Planning Sustainable Cities*. EARTHSCAN, London.

[2] Rodrigue, J-P *et al.* (2009) *The Geography of Transport Systems*, Hofstra University, Department of Global Studies & Geography, http://people.hofstra.edu/geotrans on 6th November, 2009 at 5.00 pm EAT.

Rodrigue (2008) asserts that the outcome (of the massive urbanization transition) has been the fundamental change in socio-economic environment of human activities as urbanization involves new forms of employment, economic activity and lifestyle. More and more people flock into urban centres to meet their livelihood needs. However, while mega-cities of the developed world began to experience the challenge of suburbanization long ago, which has seen major sprawl and decentralization of functions take place to the emerging suburbs, in the growing cities of the developing regions agglomeration of functions at the centre continue unabated, increasing with it newer challenges. Congestion in the Eldoret Central Business District (ECBD) in Kenya highlights the epitome of breakdown in transportation and land use planning in urban cores of such towns.

Cities and traffic have developed hand-in-hand since the earliest large human settlements. The same forces that draw inhabitants to congregate in large urban areas also lead to sometimes intolerable levels of traffic congestion on urban streets and thoroughfares. Effective urban governance requires a careful balancing between the benefits of agglomeration and the dis-benefits of excessive congestion (OECD/ECMT, 2007)[3].

This chapter presents the case for the essence of the Decongestion Plan for the ECBD. It outlines the problems on the ground, research questions that needed to be answered by the end of this study, goal and objectives, the research hypothesis, justification of the study, study scope, limitations of the study, and finally it presents the operational definitions of key terms. The package presented by this chapter was targeted to lay bare the need for Sustainable Decongestion of the ECBD, and in a nutshell capture the spirit of this Thesis.

1.2 PROBLEM STATEMENT

JICA (2007)[4] observes that the transportation system has always been considered a key factor in the economic and social development of a country. However, there has been a widening gap in the capacity to move people and goods (in other words, "transportation rights") among the developing countries. In addition, serious transportation issues such as traffic congestion, deterioration of public transportation services, air pollution, and traffic accidents have been worsening, mainly due to continued urbanization and rapid progress of motorization in developing countries.

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[3] OECD/ECMT, (2007): *Managing Urban Traffic Congestion.* Paris: Transport Research Centre (OECD Publishing).

[4] JICA (2007): *Approaches for Systematic Planning of Development Projects: Transportation.* Tokyo: Research Group, Institute for International Cooperation (IFIC) JICA.

Throughout much of the 20th century, transportation has dictated urban form. Transportation was designed to open vast land resources to development and to provide businesses and households with choices of local public goods and services (Moore, et al., 2007)[5]. But transportation left to its own means has not always been friendly, especially in the context of inadequately planned and poorly managed towns and cities. Transportation and land uses interlock to a very great extent, influencing location and access of other land uses, to a varying degree of detriment. Perry and Farland (2008)[6] have noted that the connection between transportation and land use is even more apparent in the context of pressing quality of life concerns, including: growing and changing populations; increased congestion and vehicle miles traveled; growth in goods movement; financial constraints at all levels of government; rising cost of new infrastructure; and air quality, climate change, and energy concerns.

In Kenya, urban transport is generally characterized by congestion and environmental pollution, inadequate route network and accessibility, poor demand management, poor safety and security, fare policy problems, dilapidated and inadequate transport infrastructure, supply deficit and demand distribution, sector wide managerial and institutional deficiencies, and disregard for quality and user needs (Aligula *et al*, 2005)[7].

Regional transport routes are a function of national and regional development. They link main development generators improving business and trade among the different regions and countries. Eldoret Town is joined at the regional scale with a number of principal Class B roads including Kisumu Road that links Eldoret to Kisumu City through Kapsabet and Nandi Hills, B2 Class B Road linking Eldoret Town to Kitale, and a number of Class C Roads like Iten Road. A 104 Nairobi-Kampala International Trunk Road Class A links Eldoret to Tororo in Uganda, extending all the way from the Kenya-Tanzania Border at Namanga to Kampala, Kigali and Bujumbura. The A 104 is also joined with the A2 International Trunk Road Class A (the Great North Road) which leads to Kapenguria through Kitale passing through Lodwar, and Lokichoggio and further on to Juba in South Sudan. In addition to the road network, Eldoret International Airport, as-well-as the main Mombasa-Kampala Railway line also indicates how important Eldoret is as a national and

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[5] Moore, Terry, Thorsnes, Paul, and Bruce Appleyard (2007). *The Transportation / Land Use Connection.* Chicago, Illinois: American Planning Association Press,

[6] Perry, Bev and McFarland Christiana (2008): *Local Roles in Integrating Transportation and Land Use: A Municipal Action Guide:* Washington DC.: National League of Cities. 2004, downloaded from www.nlc.org, on 15th December 2009 at 3.00 pm EAT.

[7] Aligula, E., Abiero-Gariy, Z., Mutua, G., Owegi, F., Osengo, C. and Olela, R. (2005): *Urban Public Transport Patterns in Kenya: A Case Study of Nairobi City.* Nairobi: KIPPRA. Special Report No. 7 April 2005

international transport centre in the North Rift Region and in Western Kenya as a whole. Figure 1-2 below shows the complex roads pattern of vast importance passing through the ECBD

Considering that the ECBD is the focal point of access of all these transport channels, there emerges considerable pressure, causing congestion of functions. The role of the ECBD as a transport centre, commercial centre, administrative centre, business centre, service centre, among others also contributes to its woes. This causes a lot of traffic congestion at the CBD. On the other hand, it's importance as an international transport centre is made worse by the passage of the A 104 class A Uganda Road right at the heart of the ECBD. Cargo freight heavy commercial trucks en-route to the international destinations, loaded to capacity with the cargo from the Port of Mombasa, that may not have any business at the ECBD, still has to pass through it. Despite having a crew of 2 or 3, which may offer very little in terms of business, for example boarding in hotels, the trucks with usually 4 or more Passenger Car Units (PCUs) continue to increase vehicular traffic in the ECBD, hence causing congestion.

Structure of urban centres has a major influence on issues of accessibilities. This is especially true in the traditional urban structure-urban form analysis where road transport channels, including roads, streets, path, etc were mainly used for accessibility. However, the massive urbanization transitions that have seen a population explosion into towns and cities has shifted this view a great deal, and there emerges need for a new lens to view it. As has been noted by Rodrigue, (2008), the change in socio-economic climate, livelihoods and lifestyles has brought about new mechanisms for survival. Urban areas, previously known for higher wages and better living conditions have become a field of competition, and because the existing jobs in the formal employment pool cannot march the rate of population increase (both from natural increase and rural-urban migration), poor urban folks have innovated new survival mechanisms. One of the emergent survival strategies for the urban poor is informal (unlicensed and unregulated) trade along roads and streets. In the ECBD, this has created thousands of job opportunities. But while it is a good thing for the urban poor, it sure is a nightmare for urban managers. It has led to invasion by the informal traders of the pedestrian walk-ways of the roads and streets, spilling over onto the verandahs and front porches of shops. This creates among others increased congestion, slower human and vehicular traffic movement, reduced businesses for formal shop-owners, among others. This study has chosen to handle the congestion problem, and to tackle it effectively.

Terminal facilities and termini are a highly significant component of the transport system. Flexibility of road transport therefore demands a large number of terminal facilities and parking spaces. Urban land requirements for parking are a major area of concern for urban transport managers the world over. Poorly done, planning for terminal facilities is a major cause of traffic congestion, reduced mobility and accessibility. Parking in the ECBD takes different forms. The main Eldoret Bus, Station located at the centre of the CBD is a major traffic generator and destination in the ECBD. It houses the parking area for buses '*matatus*[8] originating and destined for other regional centres like Nairobi, Kisumu, Kericho, Nakuru, and Kisii and among others regional destinations. The consequence of this is increased vehicular and pedestrian traffic. Kapsabet-bound public transport vehicles also have their own terminal point in the ECBD. The major problem with this facility is that it houses only the 14-seater *matatus* whose capacities call for a number of vehicles. As opposed to the buses with 3 PCUs, these vehicles have 1 PCU but 5 would be required to accommodate passengers in a single bus. On the other hand, parking lots in the ECBD also contribute to congestion. Angular parking that is favoured in the takes a lot of the road space, leaving only the lanes for the vehicles (the carriageway). There is therefore need to solve the pressures on road space caused by parking within the ECBD.

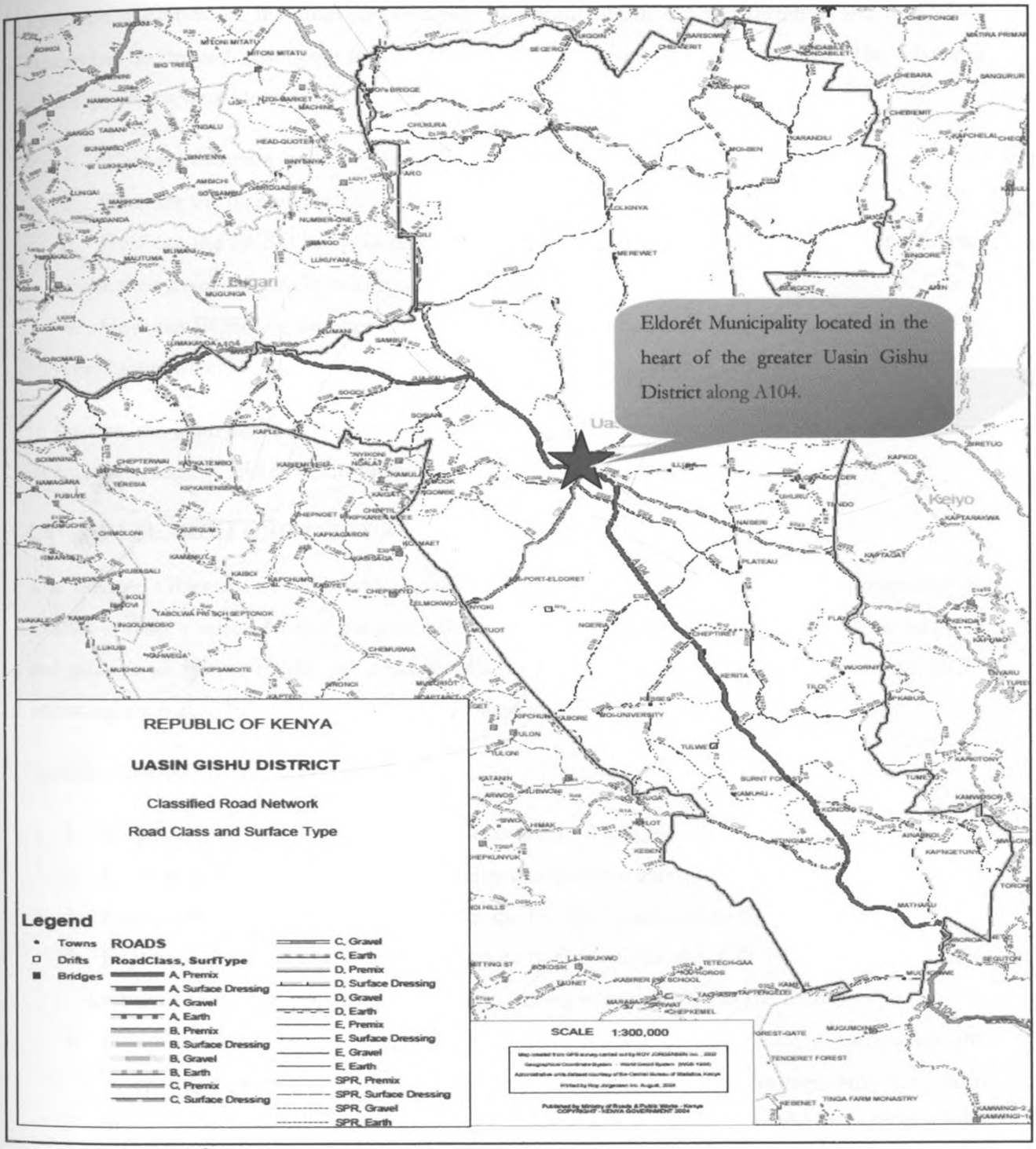
On the whole, there is the question of why congestion as the main problem in the ECBD. SUDP for Eldoret, 2010 has identified congestion as one of the main problems bedevelling urban functions in the ECBD. It is not the opinion of this study that congestion is the greatest problem or challenge of them all, but what does emerge is that several urban problems converge on the issue. To sum it up, congestion has been regarded mostly as a transportation problem. From the literature review and analysis of the problem in the ECBD, this is mainly true, but not the only truth. Foremost, on the economic sense, the slow movement of passengers and goods impact considerably on productivity of the economic activities. This covers speed of goods arrival at the market place and of passengers arriving at their work places. Secondly, the slow movement of vehicular traffic implies increased consumption of petroleum fuels by the vehicles even in their state of non-movement, hence heightened air pollution rates. In addition to these, vibrations, noise and other elements of pollution increase with the amount of time motor vehicles spend at the same spot. This touches on the environmental quality, contributing mainly to pollution and climate change in the short and the long term. Finally, on the social perspective, there is the impact on the lives of the people who live and

[8] *Matatu* is a local term used in Kenya for small-capacity para-transit omni-buses mainly used in public transport in Kenya. Despite its colloquial origin in mid 19th century, the term matatu has been officially accepted in daily language use.

make their livelihoods in the ECBD. As has been observed variously, sustainable development is about people. Lower economic productivity, implies that the people cannot meet their livelihoods comfortably, increasing the amount of psychological stress. Air pollution affects people's health, which involves increasing spending on health-care, and in an environment of low earnings, this kills the will and desire of the people to be stronger and to work harder.

An emerging dilemma is, therefore, how the CBD can be decongested without necessarily breaking down the existing balance. What remains is Sustainable Decongestion of the ECBD. Sustainable decongestion plan is a plan that looks at the economy, the society and the environment of the CBD so that not only is the traffic efficiency in the CBD improved, but that the three elements are not destabilized, but improved.

Figure 1-2: Classified Roads in the Greater Uasin Gishu Region



Source: Kenya, 2009[9].

[9] Kenya, Republic of (2009): *Uasin Gishu District: Classified Roads Network*. Nairobi: Transcom House (Unpublished)

1.3 RESEARCH QUESTIONS

Research questions are the chart and compass of a study meant to offer direction and to point a researcher on the path that needs to be beaten towards attainment of new knowledge. The following direct questions were identified to guide this study:

1. What are the main causes of congestion in the ECBD?
2. What are the planning implications of congestion in the ECBD?
3. How can the ECBD be decongested without destabilizing the livelihoods of the people who make their living out of the existing arrangements?
4. How can ECBD be decongested without touching its importance which is the essence of its very being, which would herald the beginning of another (or other) CBD(s)?

In essence, the main problem is how then the ECBD can be decongested sustainably, without killing its economy, society, and its environment.

1.4 RESEARCH OBJECTIVES

The General Objective of this study, therefore, is *to provide a framework for sustainable decongestion of the ECBD, to create a sustainable road transport system that ensures improved accessibility and mobility for passengers and goods, in an efficient, reliable, safe and affordable manner throughout the town centre, and past the MCE, without negatively disturbing ECBDs economy, its environment and its society.*

Specific objectives of this study include to:

1. Investigate the causes and effects of congestion in the ECBD
2. Investigate ways of improving accessibility and mobility within the ECBD
3. Examine ways through which parking in the ECBD contributes to congestion
4. Explore ways of improving the transport quality within the CBD that will enable fast, efficient and reliable linkages between and among activity spaces in the ECBD
5. Formulate a framework for sustainable decongestion of the ECBD, opening-up the congested shop-fronts that have been encroached upon by the pedestrians who have been moved away from the main carriageway's pedestrian walkways by parking lots and vehicular traffic that suffer congestion on the carriageways

1.5 RESEARCH HYPOTHESIS

This study is founded on the hypothesis that congestion in the ECBD is a result of unresponsive urban planning, and that the solution to the congestion challenges lies in 'sustainable ECBD decongestion plan'.

1.6 JUSTIFICATION AND SIGNIFICANCE OF THE STUDY

A question that begs asking is why would anybody talk about Sustainable Deçongestion of a CBD? Even so, why would it be Eldoret CBD, a fifth city in a third world country? Well to begin with, urbanization statistics in third world cities of the world talk for themselves, and would certainly not need further justification. But congestion in the urban core of major cities of the world is a main cause of decay of the cities' forms and functions in the face of their fast growth and need. As the urban populations of the world continue to increase, and the function of the urban cores continue to be more and more complex, there emerges a need to better manage the congestion to improve the performance of the urban core. OEDC/ECMT (2007) has noted:

> *Transport systems facilitate the rapid and predictable movement of people, vehicles and goods. Congestion, on the other hand, prevents traffic from moving freely, quickly and/or predictably. However, the benefits afforded to us by transport activity stem not from mobility itself, but, rather from what that mobility allows us to accomplish.*

Eldoret, having emerged as an administrative town like most colonial African cities, has been overtaken with a myriad other functions which have complicated their earlier simple function. Trade and commerce, education, industrialization, administration, the service sector, recreation, and tourism functions, among others, have agglomerated in double quick-time and soon there emerges the need of the biggest land use of all, residential, whose role is to house the large numbers of people engaged in the other land uses. Sooner, the need to move these population and their goods become so important, hence a great pool of urban land is set to be used for transport. In the case of the ECBD, its location as the opening of the land-locked Great-lakes Region to the port of Mombasa makes it a huge hub of cargo transit en-route from the rest of the world.

Efficiency and reliability of transport systems have been stressed and may not allow us to accomplish much. The ECBD presents the scenario where mobility bottlenecks lay a very solid foundation for urban decay. Besides the slow movement of people and goods, businesses in the

ECBD are seriously hampered as the shop-fronts are squatted on by the informal traders who by all means should occupy pavements away from the shops, where they should not push pedestrians to carriageway, from where motor vehicles have pushed them away. Their migration from the pavements is a consequence of the pedestrians being moved further in by the vehicular transport. But mobility is not the only problem. City planners have another problem in their hands involving the thousands who make their livelihoods out of the mess. Street traders, newspaper vendors, informal commercial businesses, pedestrians, the service sector (like shoe-polishers, hand-cart pushers) etc.

Solving the inherent problem of decongestion in the ECBD is the key focus of this study. But isn't decongestion good, one may ask? And if it is good, wouldn't it be well if one went ahead to decongest a settlement, a CBD, a city, once and for all to have people move in an open environment free of congestion? It is the opinion of this study to point to the contrary. The decongestion plan to be evolved from the study will lay down the framework through which the ECBD will be freed from the ills of congestion identified. But this will be done **sustainably**. The concept of sustainability is not just the common high-sounding word applied anywhere one finds fit to catch headlines, but certainly with good understanding in this context it is the only possible best call. It aims to decongest without harming the traders and the service providers

Significantly, this study is not aimed to be an end to itself. While this study learns from others, the problem of decongestion is a fact in every corner of the world. It is the wish of this study that its findings may be solid to help in fighting congestion, sustainably, in the ECBD and in all congested cities world-wide, especially in 3rd world cities where the congestion issues adds an economic dimension. This is more important, especially considered in the lens that urbanization continues to increase, and the future of all humanity lies in the urban areas.

1.7 SCOPE OF THE STUDY

Sustainable ECBD Decongestion Framework covers the jurisdictional boundary of the ECBD. Though legally and spatially undefined, this study defines the Eldoret CBD as the area between Tagore and Mitaa Road to the west and north-west, the railway line to the north, Lumumba Avenue to the west and Sosiani River to the south. The definition of the physical scope of the CBD has been based on an analysis of the ECBD Map at scale 1/10,000. The area so delineated has been mainly based on homogeneity of urban structure exhibited by the road network patterns, mainly of grid-

iron conformation in a north-westerly to south-easterly orientation. Another criterion used involves the analysis of the compactness of development as shown by the high density of the roads which signify the need for more coverage of access per a unit area. The density of the ECBD is influenced by high density of the various commercial, government, transportation as well as other land-uses which yield greater performance with agglomeration and economies of scale, which in turn call for a dense road network system.

A Sustainable CBD Decongestion Framework (to be evolved from this study) sets the context of mobility and accessibility in the town in relation to other plans, such as the Strategic Urban Development Plan for Eldoret. Acknowledging the role played by the hinterland and the regional economy, and thus the import of the decongestion framework, the scope includes matters that influence the City's linkages and role with the other regional cities like Kitale, Kisumu, Bungoma, Kakamega, Kapsabet, Nakuru, and even in a more wide and dynamic role of Eldoret as the gateway to the Eastern Africa Region, serving as the link to Uganda, Sudan, Rwanda and Burundi, and joining the port of Mombasa to these land-locked countries.

1.8 ASSUMPTIONS OF THE STUDY

This study is made on the assumption that Eldoret Municipality has never had a comprehensive land use plan, a fact that has led to various problems including congestion.

1.9 LIMITATIONS OF THE STUDY

As most studies, especially thesis researches, would have it, this study suffered from a lack of funds. There were several authentic novel surveys that would have been carried but for a shortage for the funds. In particular, there was difficulty in conducting in-depth and more detailed Origin-Destination (O-D) Surveys, and traffic census along the main points of transport significance in the CBD, and the whole of Eldoret Municipality.

Time factor was another limitation. Rather than the preliminary preparatory works done at own initiative, this thesis officially was commissioned to take one academic semester, covering just under 4 months. Owing to the massive amounts of information required for this study, the time limit provided a limitation, fixing the amount of data that could be gathered.

To minimize this limitations, there was required a high level of ingenuity. Foremost, because the available funds could only accomplish so much, this study dug deeper in borrowing both raw and

analyzed data gathered during the preparation of the Strategic Urban Development Plan (SUDP) for Eldoret, done by *Syagga and Associates,* the consulting firm contracted by the GoK to prepare the plan. The researcher then identified the data gaps that needed refilling, and effectively prepared research instruments to collect them, including questionnaires and interview schedules which were duly administered in the field.

Time as a limit cannot be created. However, the researcher began earlier preparation in terms of data gathering and preliminary consultations with the supervisor, who guided him in understanding the problem at depth. On the other hand, the researcher also had begun to consult with other planners on the ground, in private and government practice, who understand the problem on the ground in the ECBD. These provided the researcher with a firm grip on the issues at hand, and focused his attentions to the real issues that needed urgent interventions, at a smaller scale.

1.10 OPERATIONAL DEFINITIONS

1. Congestion

Most people know what congestion is and likely have their own definition of the phenomenon. However, when pressed, precise definitions of congestion rapidly give way to descriptive terms (e.g. "stopped traffic") and causal explanations (e.g. "too much traffic"). These have resonance with those experiencing congestion but only contribute marginally to understanding the phenomenon. (OECD/ECMT, 2008). In light of the foregoing, this study avoids the fanciful descriptive lingua, but looks at congestion in the context of the problems and challenges experienced in the ECBD. It is therefore taken as an operational definition in this study, that congestion *is the inefficiency of manouvre and movement of persons or vehicles in a place resulting from the high usage of movement space by the persons or vehicles, which considerably reduce movement time per a unit distance of each of the users.* This definition was particularly taken on the justification that:

1. Space for movement is usually constant, is influenced by activities accessed, and the users accessing the spaces are the variables that keep changing,
2. Properly organized activity patterns considerably reduces the stress on the channels of movement,
3. Accessibility and mobility affect one another in a grand scale, especially in densely utilized spaces like those of a CBD,

4. Congestion hurts movement between activities in a location, hence reduces productivity levels of the activities, and hurts the whole society at large.

2. Urban Form.

Rodrigue, (2008)[10] has defined Urban Form as the *spatial imprint* of an urban transport system as well as the adjacent physical infrastructures. Jointly, they confer a level of spatial arrangement to cities.

3. Urban/Spatial Structure

The concept of urban structure refers to the set of relationships arising out of the urban form and its underlying interactions of people, freight and information.

4. **Mobility**

Grava (2004)[11] has defined as the ability of any person to move between points in a community by private or public means of transportation. The usual obstacles to mobility are long distances, bad weather, steep hills (all constituting friction of space), but, above all, the unavailability of services, high fares, and possibly other forms of exclusion while

5. Accessibility refers to the possibility of reaching any activity, establishment, or land use in a community by people (or by conveyances of goods or information) who have a reason to get there. It is a measure of the quality and operational effectiveness of a community. (Grava, 2004)

6. Sustainable Development (SD) is defined by the (WCED, 1987)[12] as development that takes care of the needs of the present generation without jeopardizing the ability of future generations to meet their own needs.

1.11 RESEARCH STRATEGY AND METHODOLOGY

It is necessary for a researcher to design a research methodology for the problem chosen (Rajasekar, *et al,* 2006). Prewitt (1974)[13] has defined Research Methodology as systematic research procedures

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[10] Rodrigue, J-P, (2008): *Transportation and Urban Form.* Downloaded from http://people.hofstra.edu/geotrans/eng/ch6en/conc6en/transpurbaform.html on 6th April, 2010 at 5.00 pm EAT.

[11] Grava, Sigurd (2004): *Urban Transportation Systems: Choices for Communities.* Mc-Graw Hill Architecture. Downloaded from Digital Engineering Library @ McGraw-Hill (www.digitalengineeringlibrary.com) Copyright © 2004 The McGraw-Hill Companies. All rights reserved.

[12] World Commission for Environment and Development (WCED (1987): *Our Common Future*, Oxford: Oxford University Press.

and techniques which help the researcher to avoid 'self-deception'. *'Self-deception'* is stressed in this context based on the assumption that the researcher desires to accurately describe and explain the observed phenomena. To guard against being *'unwittingly inaccurate'* (ibid), this study employs a repertoire of methodologies to establish the required information for its successful conclusion. The study intends to use a wide range of both qualitative and quantitative data to inform sustainable ECBD decongestion. Data to be collected for the purpose of the research are categorized into secondary and primary data.

1.11.1 Sampling Design.

This study comes after the main process for preparation of SUDP for Eldoret. The data collection process for the main SUDP preparation provided the researcher with an opportunity to ground the study on the observable and identified need. During this stage the researcher reconnoitred the study area, units of observation identified, and data collection commenced.

Methodological approaches for preparation of the SUDP involved securing data from both secondary and primary sources. The secondary sources included review of existing literature (government documents, plans, relevant research reports etc.). The primary data included household surveys, focused group discussions, interviews (key informants, roadside), traffic counts, stakeholder consultations, and field observations. Sampling strategy involved dividing Eldoret Municipality into 14 land use blocks which were used as sampling units, for purposes of collecting spatial and base-line data. The planning process followed included profiling, transect survey, formation of planning sectoral teams (for which transportation formed an important sector), advertisement of the notice of intention to plan, stakeholder identification and analysis, baseline and feasibility studies, problem synthesis, stakeholder validation workshop, formulation and evaluation of alternative plan proposals, preparation of draft plan proposal, stakeholder consultative forum, final plan preparation and plan approval, in that order. It is worth to note that the steps were followed without much hiccups, and that the SUDP was achieved on schedule.

For purposes of this study, there was considerable data available on the baseline information relevant in the study. However, the Sampling Design of this study was prepared to ensure that all the

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[13] Prewitt, Kenneth (1974): *Introductory Research Methodology, East African Applications.* Institute of Development Studies (IDS) Occasional Paper Number 10, IDS, University of Nairobi.

units of observation were adequately represented without any anticipated bias (Ochieng, 2004), and done to provide information on the decongestion issues in particular.

1.11.1.1 Multi-Stage Sampling

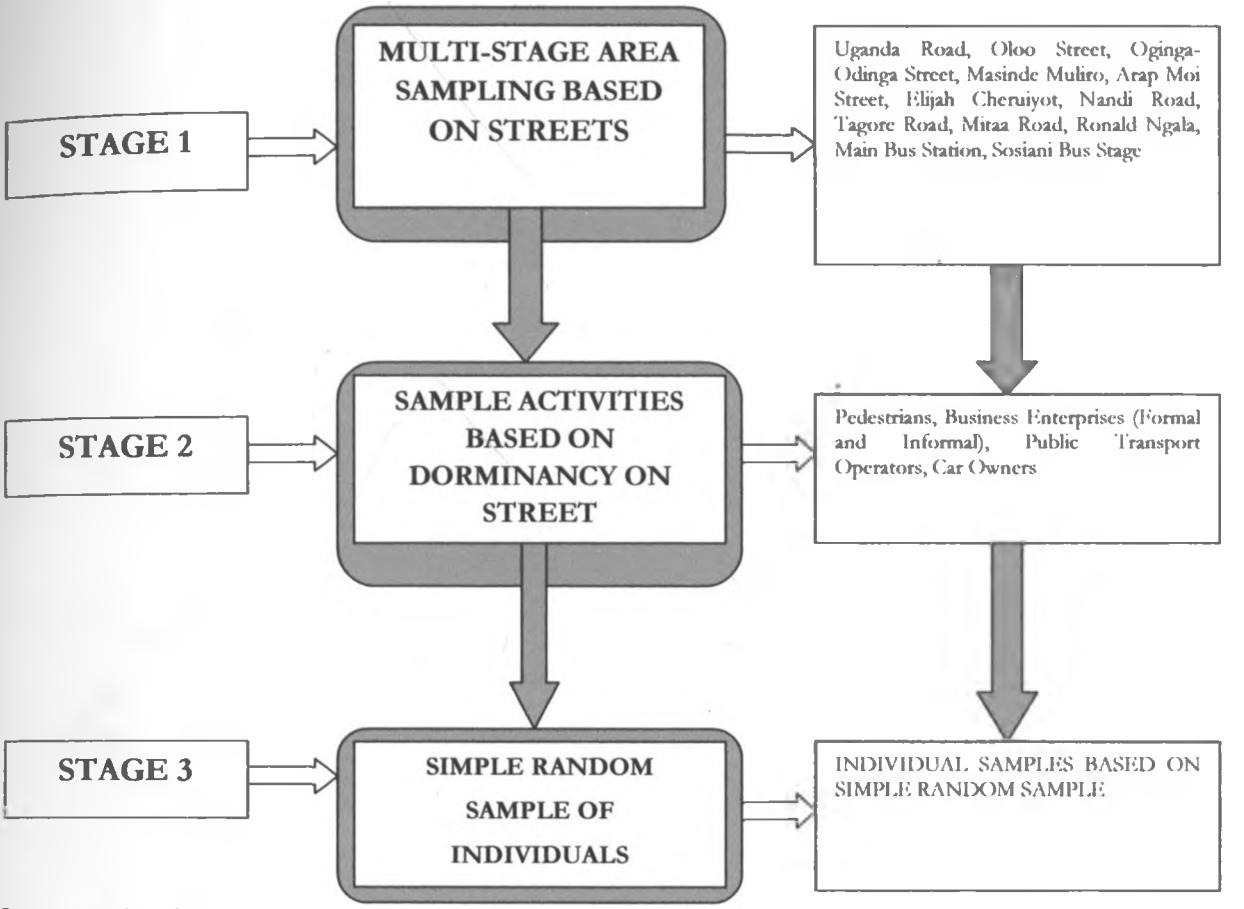
Multi-Stage Sampling (MSS) was used in this study. Prewitt (1974) submits that MSS is just what its name implies, sampling in stages. MSS was selected because of its reliability in an environment of absence of a reliable sampling frame for the whole population of the ECBD. This was however, simplified through listing of all roads and streets through the ECBD. Mugenda (2006)[14] has defined a sampling frame as the list of all individuals in the population from which a researcher would like to draw a sample from, but because of the dynamic nature of this study, involving foot-loose pedestrians, street vendors, and static business-enterprise owners, it would be difficult, if not impossible to compile a sampling frame. The researcher, therefore, decided that availability of the sampling frame would be limited to identification of the ECBD roads and streets. Secondly, the samples for this study had to be selected in stratified layers. First, there were needed sample streets within ECBD to be subjected to the study. Because of financial limitations, it was difficult to study all the streets, and so a few were chosen based on some basic characteristics exhibited by the streets. The second stage included selection of samples to be studied based on the street characteristics to be studied, of pedestrians, business-enterprises owners (formal and informal), and street vendors, and car-owners or whatever dominant characteristic the streets are easily identified with in respect to congestion issues.

1.11.1.2 Simple Random Sampling

The third stage of sample, that would identified simple random sample, would be to identify the sample within the universe of the second stage (whether pedestrians, business-enterprises owners (formal and informal), and street vendors, and car-owners). Figure 1-3 shows the framework for sampling units identified by Table 1-1.

[14] Mugenda A. G. (2008): *Social Science Research.* Nairobi: Applied Research and Training Services (ARTS).

Figure 1-3: Framework for Sampling



Source: Author, 2010.

Table 1-1: Sample Size and Sampling Units.

CBD ROADS AND BUS STATIONS	Variables Considered	Sample Activities	Samples Taken	Justification	Population	Sample Size (Number of Individuals)
Uganda Road, Oloo Street, Oginga-Odinga Street, Muliro Street, Arap Moi Street, Elijah Cheruiyot, Nandi Road, Tagore Road, Mitaa Road, Ronald Ngala, Main Bus Station, Sosiani Bus Stage Prestige Shuttle Stage(on Uganda Road) Mololine Shuttle Stage, North Rift Stage, etc	• Diversity of Activities • Pedestrian concentration • Importance of street • Congestion levels • Amount of roadside parking	Primacy of Road Pedestrians, Business Enterprises (Formal and Informal), Public Transport Crews, Car Owners	Uganda Road	Primacy of Road. Sample Activities:		
				Formal Traders	-	5
				Informal Traders	-	5
				Pedestrians	Varied	5
			Elijah Cheruiyot	Pedestrian concentration	Varied	5
				Formal Shop-Owners	-	5
			Oginga Odinga,	Formal trade, Car Owners.	-	5 5
			Tagore Road	Informal Trade, Pedestrians	-	5 5
			Main Bus Station	Public Transport Crews	-	5
			Prestige/ North Rift/Shuttles etc	Public Transport Crews, Pedestrians	-	5 5

Source: Author, 2010

1.11.1.3 Sample Size and Sampling Units

A total sample size of 60 for this study (Table 2-1) has been arrived at using the designed sampling framework. The sampling size bears in mind the various categories of space-user activities. To arrive at this, the various activities inherent in the various sampled streets were considered, which would give the clear picture of congestion situation in the ECBD.

1.11.2 Data Collection Methods

Owing to human agency to congestion, Transportation Planning is at best a human behavioural science which makes the study of different aspects of man paramount. Hart (2005)[15] notes that the complexity of human behavior is not something easily overlooked, and because of this, numerous attempts have been made to capture this complexity by developed highly sophisticated methodological positions and measuring instruments. At the broadest level information sources that are available can be classified as primary or secondary (Bharati, *et al* (eds), (2004)[16].

1.11.2.1 Secondary Data

Secondary data is important in the theoretical understanding of the study area and also in generating the conceptual framework with which to work on the primary data. The sources of such data will include written sources like books, journal articles, magazines, government reports, newspapers, seminar papers, maps and other relevant documents on Transportation and land use planning.

1.11.2.2 Primary Data

Primary data refers to the novel, first hand information/records obtained from the participants and the observers that have been passed down to posterity. There are different techniques for primary data collection which include observation, questionnaire administration, interviews, focused group discussions (FGDs), etc.

Observation as a technique for primary data collection was widely used. Among the features critically assessed include the most congested streets and roads, the causes of congestion, survival mechanisms of people in the face of congestion, among other critical areas.

Structured questionnaires were administered to respondents to give more give more information on the issue under study. The main target will be enterprises within the ECBD, the road users,

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[15] Hart, Chris (2005): *Doing Your Masters Dissertation.* New Delhi.: Sage Publications.

[16] Bharati K. P., Muir-Leresche, K., Richard Coe, and S.D. Hainsworth (2004 eds.). *The Green Book: A Guide to Effective Graduate Research in African Agriculture, Environment, and Rural Development.* Kampala: The African Crop Science Society.

(including drivers of public transport, cargo freight and private vehicles, pedestrians, *boda boda* operators, etc). Special questionnaires will be prepared for different target groups, incorporating specialized information that will help for the fulfillment of the objectives of this study. Prewitt (1974) highlights that a structured questionnaire standardizes the stimulus presented to the respondent as much as possible. This was especially important because it made data analysis by SPSS easier.

Interviews were key in mining data from key informants. Different categories on the policy-making as well as decision-makers on transportation and land use planning of ECBD were interviewed. Key informants interviewed included relevant officers like the Municipal Physical Planning Officer (MCE), the District Physical Planning Officer, the District Roads Engineer, the Municipal Engineer, and the Traffic Police Department. The data needs are summarized in Table 1-2 below.

Collected data was recorded in various media including maps, sketches, photographs, and through narratives/ written descriptive texts. Photography was made possible using a hand-held digital camera. The advantage of using various data recording media over single media usage includes, but not limited to ease in data analysis, expanded scope of interpretation as well as dynamism in the variety of presentation.

1.11.3 Data Analysis and Presentation.

Analysis of data was done using various analogue and digital techniques depending on the availability, applying qualitative and quantitative methods. Computer application soft-wares for statistical and spatial analysis used include Statistical Package for Social Scientists (SPSS) and Geographical Information Systems (GIS). Data was presented using various media including text narratives, charts, models, maps and photographs.

Table 1-2: Data Needs Matrix

TYPE OF DATA	DATA SOURCE	DATA COLLECTION METHOD	DATA ANALYSIS METHOD	EXPECTED OUTPUT
1. Location and size 2. Climatic conditions 3. Physiographic characteristics 4. Historical development	• Books, • Theses, • Journals, • Maps and plans. • Internet sources	• Literature Review, • direct observation	• Qualitative analysis • GIS	• Growth of MCE • Evolution of MCE • Emergence of problems in ECBD • Causes of the problems
1. Population characteristics – Size, Structure, density and distribution – Urbanization trends – Migration trends – projections 2. Demographic characteristic – Fertility rates – Growth rates – Morbidity rates – Life expectancy	• Books, • Theses, • Maps and plans. • Internet sources • KNBS population data • Personal projections	• Literature Review • Statistical methods	• Statistical methods • Comparative analysis	• Urbanization Trends • Problems caused by urbanization shift • Future projections and consequences • Emerging solutions
1. Transportation and land use 2. Transportation and land use conflicts 3. Sustainable Development 4. Sustainable Transport 5. Major causes of congestion 6. Tackling decongestion	• Books • Journals • Unpublished Theses	• Literature Review • Case studies	• Qualitative analysis	• Comparative information • Theoretical foundations • Emerging concepts • Applicable standards • Design elements
1. Urban structure/ form of ECBD. 2. Traffic problem Areas in the ECBD. 3. Causes of the problems 4. Coping mechanisms of the people 5. Contribution of urban form to congestion in ECBD. 6. Emerging solutions	• Primary Data • books, journals, etc. • theses, MCE and other GoK reports	• key informant interviews • questionnaire administration • FGDs • Literature review	• Qualitative Analysis • SPSS • Excel Spreadsheets • GIS	• Congestion issues in ECBD • Causes of congestion in ECBD • Coping mechanisms in place • Solutions to the emerging problems
1. Importance of Uganda Road 2. Contribution of Uganda Road to congestion in ECBD 3. Essence of Proposed By-Passes	• Primary data • Books, • Journals, etc.	• Direct observations • Literature Review • Questionnaires • Key informant Interviews	• Qualitative Analysis • SPSS • Excel Spreadsheets • GIS	• Establishment of the problem • Evolution of solutions

Source: Author, 2010.

1.12 ORGANIZATION OF THE REPORT/CHAPTER SYNOPSES.

This Thesis is organized into seven chapters. Chapter 1 introduces the Decongestion of the ECBD. It states the problem, research questions, goal and objectives, justification of the study, the scope of the study, the study hypotheses and the limitations of the study. It further states the operational definition of key terms and highlights the chapter synopsis. This chapter also presents the study methodology. Being the systematic way to solve a problem (Rajasekar, *et al*, 2006)[17], the section on Research Methodology presents the sampling procedures, data needs, data collection and presentation techniques.

Chapter 2 presents the Study Area. Physiographic characteristics, demographic attributes location, size and shape of the ECBD, and its historical background are highlighted. It emphasizes the impacts of Physiography and the other attributes to transport within ECBD.

Literature Review and Conceptual Framework is presented in Chapter 3. Various works have been done on congestion and decongestion issues in myriad areas throughout the world. If the lessons of have to be learnt, a review has to be done of the literature on all the previous works.

Chapter 4 focuses on the legislative, policy and institutional frameworks within which land use in the ECBD are based.

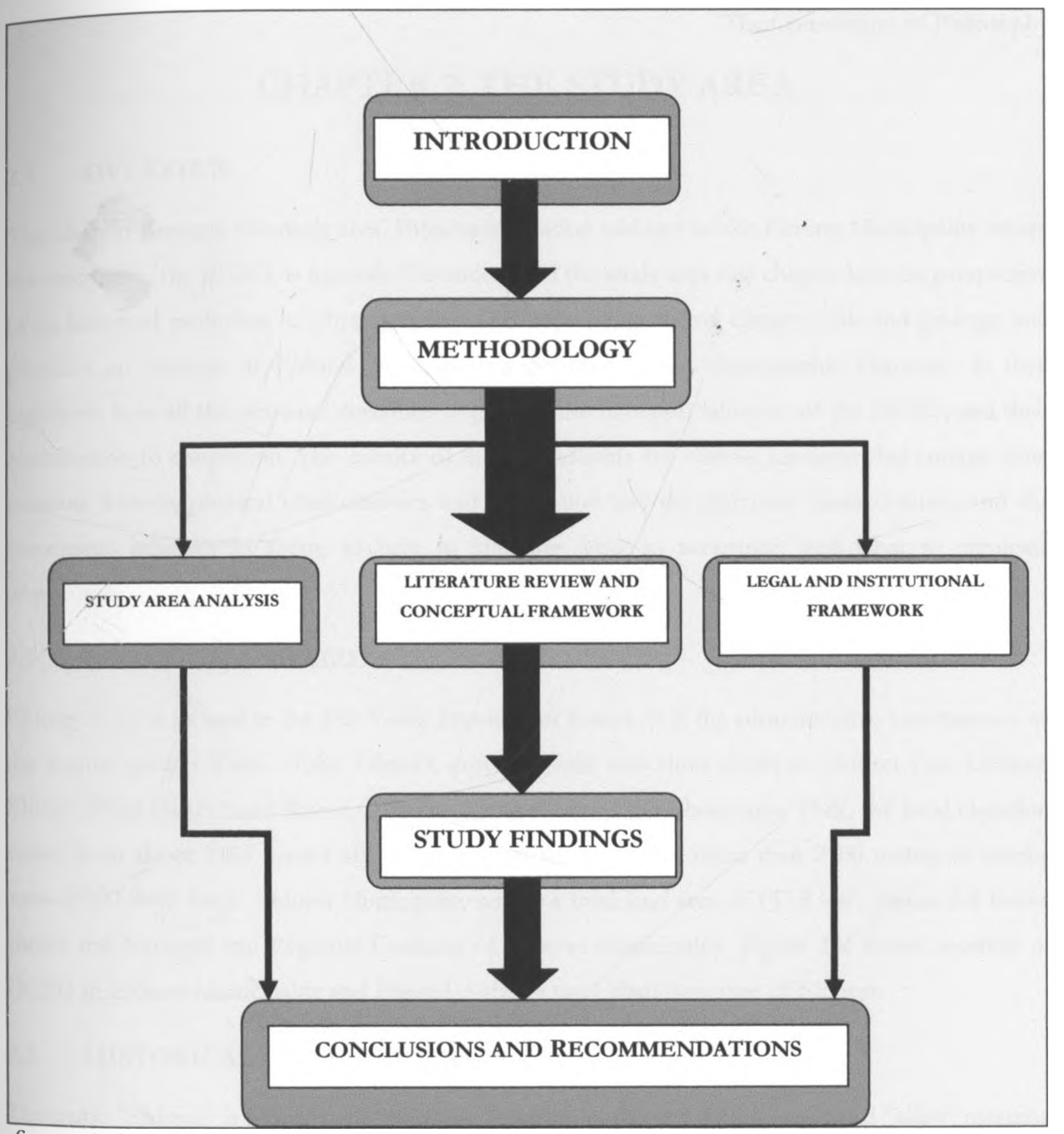
This study is characterized by both aspects of reactive and non-reactive research. Chapter 5 presents study findings based on primary data collected from the field. As stated, the various elements of primary data collected through interview schedules, questionnaires, observations, are presented, etc.

It is the purpose of this study to evolve a framework for the decongestion of the ECBD. Chapter 6 is the culmination of this study. It concludes the study and provides the planning recommendations based on the fore-going arguments, and discussions on the previous chapters.

The study has been organized as provided in Figure 1-4 below.

[17] Rajasekar, S. and Philominathan P. (2006): *Research Methodology*. Published on the web as arXiv:physics/0601009 v2 25 Jan 2006, downloaded from http.www.scribd.com on 14th December, 2009.

Figure 1-4: Organization of the Document



Source: Author, 2010.

'...Such a fixed order of nature could not continue its course, could not develop motions taking such various directions in place, time, operation, space, and attributes, unless there were One who, being immutable, had the disposal of these various changes. And this cause of their remaining fixed and their moving, I call God, according to the name familiar to all.'

Anicius Manlius Severinus Boethius
The Consolation of Philosophy

CHAPTER 2: THE STUDY AREA

2.1 OVERVIEW

This chapter presents the study area. It features location and size of the Eldoret Municipality where the study area, the ECBD, is located. To understand the study area this chapter lays the perspective of its historical evolution, its physiographic characteristics, including climate, soils and geology, and provides an analysis of Eldoret Municipality's population and demographic character. It then highlights how all the elements described impact on the transport situation of the ECBD, and their contribution to congestion. The essence of this is to identify the various strengths that emerge from location, history, physical characteristics and population and demographic characteristics, and the constraints inherent in them, to help in knowing what to accentuate and what to eliminate respectively.

2.2 LOCATION AND SIZE

Eldoret town is located in the Rift Valley Province of Kenya. It is the administrative headquarters of the former greater Uasin Gishu District, currently split into three districts: Eldoret East District, Eldoret West District and Wareng District. Lying south of the Cherangany Hills, the local elevation varies from about 2100 metres above sea level at the airport to more than 2700 metres in nearby areas (7000-9000 feet). Eldoret Municipality covers a total land area of 147.8 km^2. Figure 2-1 below shows the National and Regional Contexts of Eldoret Municipality. Figure 2-2 shows location of ECBD in Eldoret Municipality and Figure3-3 shows the Urban Structure of Eldoret.

2.3 HISTORICAL DEVELOPMENT

The name "Eldoret" is based on the Maa (the language spoken by the Maasai) word "*eldare*" meaning stony river because the bed of the nearby Sosiani River is characterized by a stony and bouldery surface. White settlers called it Eldoret for easier pronunciation. At the start of the colonial era, the area was occupied by the Nandi, before that by the Maasai and before that the Sirikwa. It is now a

cosmopolitan region that has an ethnic mosaic of the various clans of the Kalenjin (Nandi, Tugen, Keiyo, Marakwet, among others), Kikuyu, Luhya, Luo, Asians, Somalis among others.

The town of Eldoret emerged in 1907 when the then post-office General Master Mr. Gosling identified farm 64 not taken up for development as a central place for a district post office. It was known as 'farm 64' to the settlers and *'sisibo'* to the local Kalenjin community because at that time the town was 64 miles from the newly built Uganda Railway railhead at Kibigori. Willy van Aardt owned the farm which was later sold to the government. In 1908 Corbett, the then District Commissioner gave Van Aardt a contract to build the districts commissioner's house, offices, a store, a clerk's house and police station (UGDAR, 1912 and 1913). Thereafter the centre became known as 64 until 14th November 1912 when it was declared a township and renamed Eldoret.

Figure 2-1: Eld

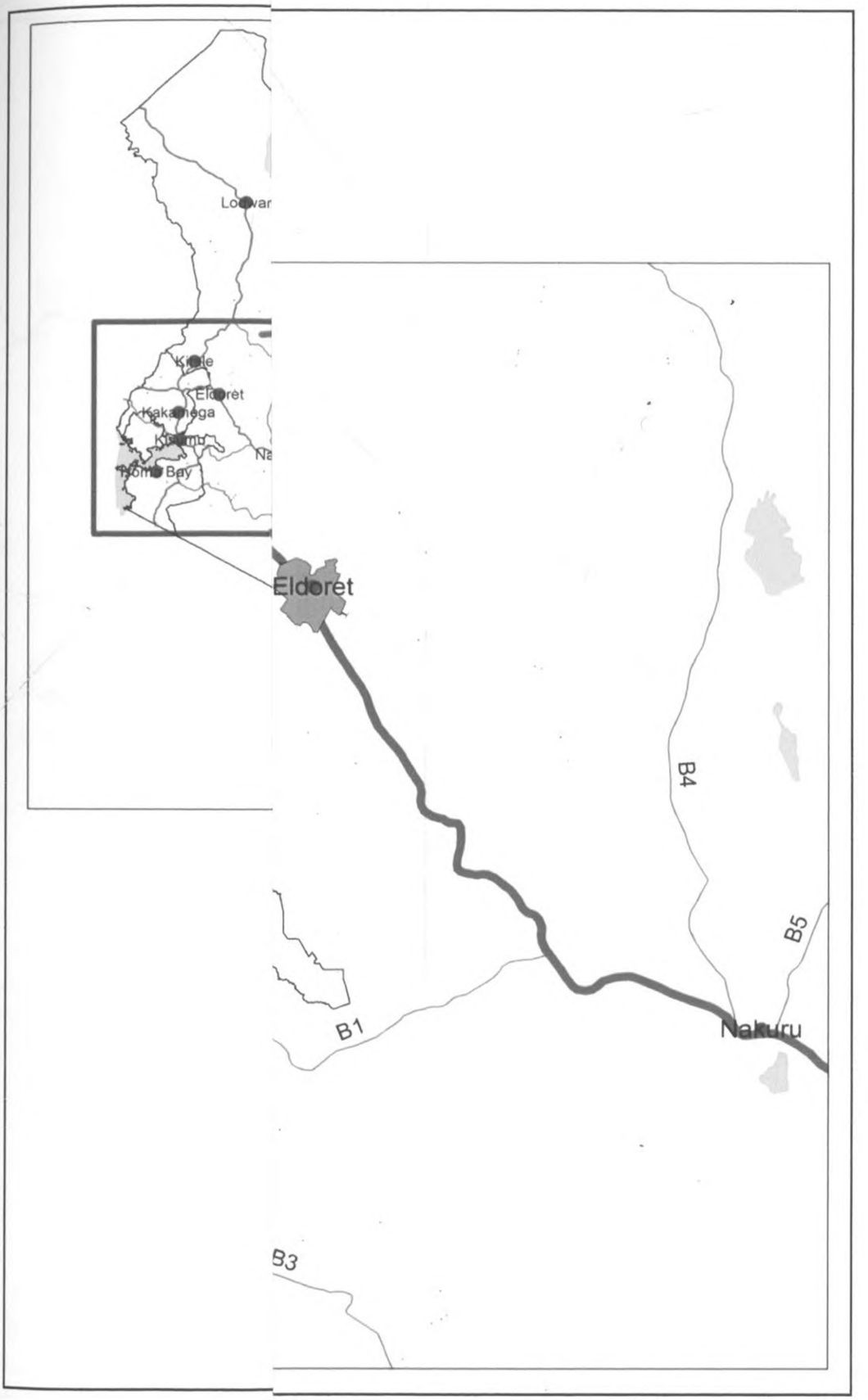
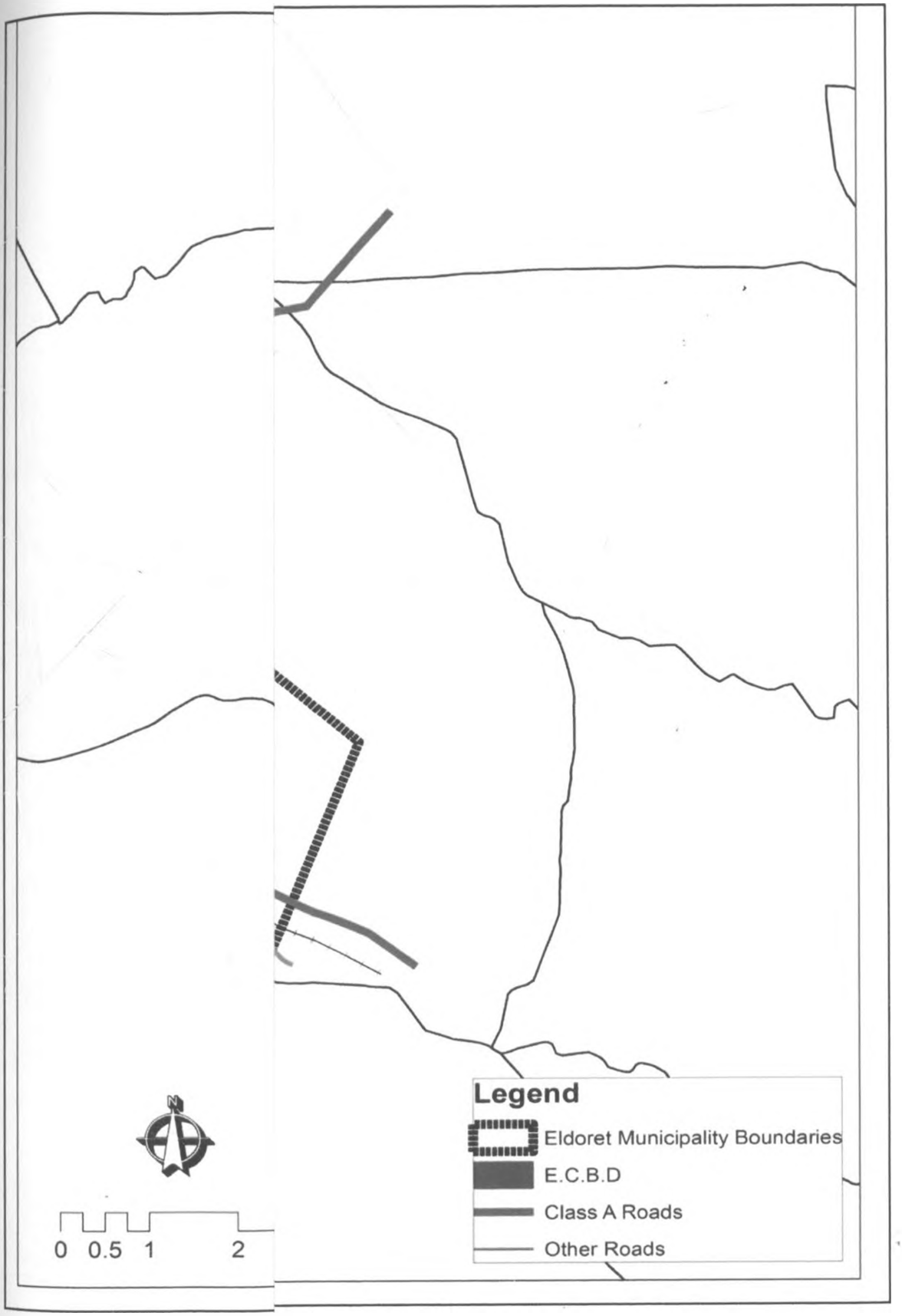
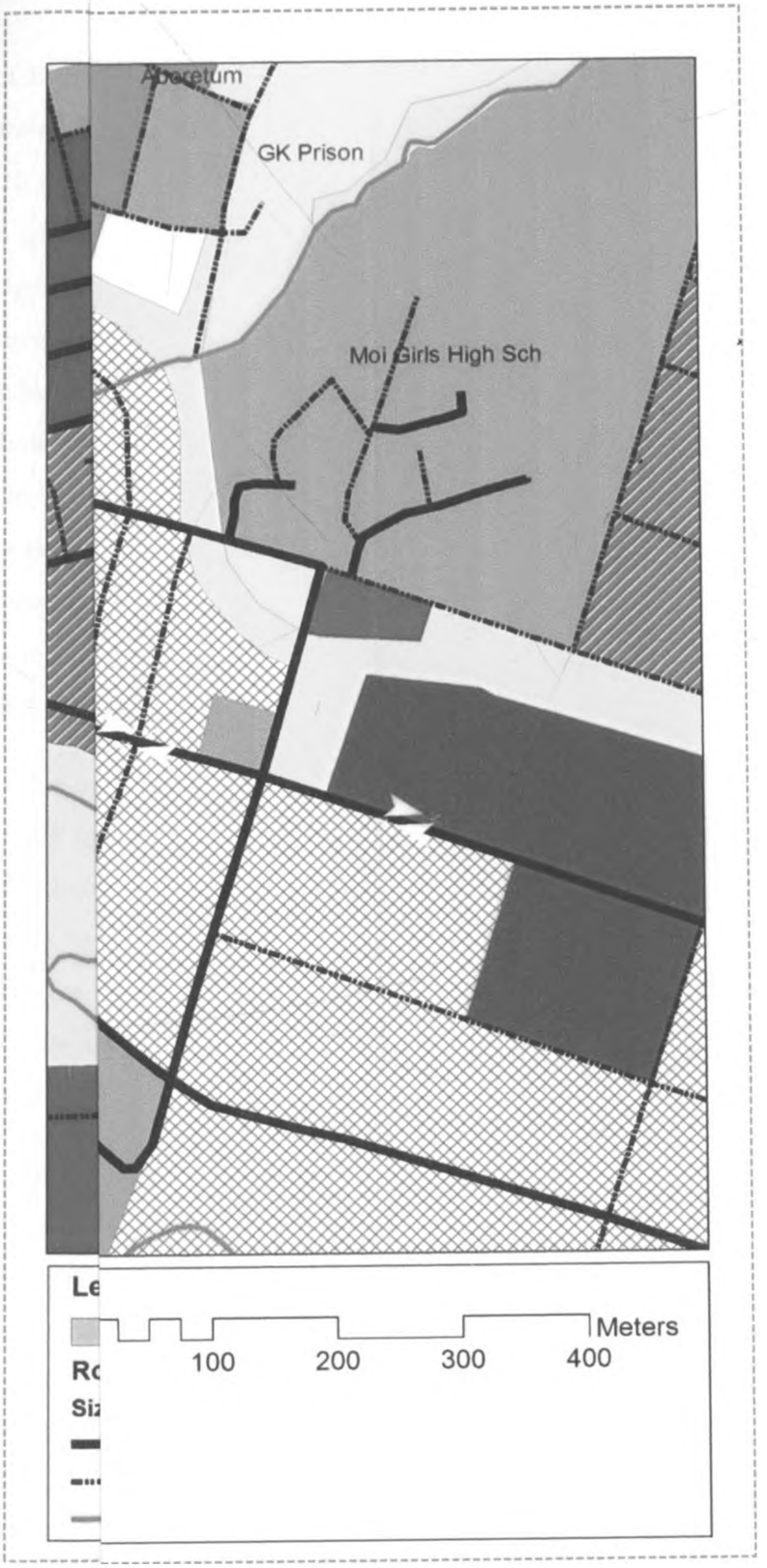


Figure 2-2: ECBD Location



Source: Author's Consu

Figure 2-3: ECBD, Lo



Source: Adapted from Kenya

[18] Kenya, Government of (20

The elevation of Eldoret to the status of Township in 1912 led to other major developments in the town. It necessitated the construction of some sections of the road linking Eldoret and Londiani, the railhead. By 1916 there were a total of thirteen shops in Eldoret. White traders like Wreford Smith, Mcnab Mundell and the Standard Bank owned four of these buildings .There were also a branch of the shop of Sergoit farm. A.A. Ortlepp owned the pioneer Hotel in Ortlepille where Afrikaaners also ran carpentry and blacksmith's shop. As the town's population increased, constructions of service facilities became absolutely necessary. In 1920 Barclays bank was opened, in 1962 the two river dam was built by the railway company, in 1933 Kenya Power and Lighting Company Limited brought electricity supply and power to light the streets of the town. The town hall was built in 1956 and Eldoret was elevated to municipality status in January 1958 (Municipality of Eldoret, 1994). The first mayor of the town was J.Wolson Beard who was elected in November 1959. The second mayor, Aziz Pieera, an Indian was elected in 1961. The first African mayor was councilor A.N. Oloo elected in 1965.

2.3.1 Governance of the MCE.

Eldoret is governed by a Municipal Council, the MCE. The municipality is divided into thirteen wards. Six of them (Market, Huruma, Kamukunji, Kapyemit, Kidiwa/Kapsuswa, and Stadium/Industrial) are in Eldoret North Constituency, Three (Hospital, Kapsoya and Kimumu/Sergoit) are in Eldoret East Constituency, and the remaining four (Kipkenyo, Langas, Pioneer/Elgon View and Race Course) are part of Eldoret South Constituency. All of these three constituencies have more wards within local authorities other than Eldoret municipality.

When the town was gazetted as a township in 1912 it occupied an area of about 11.2 sq. km. In 1983 further extension was undertaken which brought into the municipality, large privately owned tracts of agricultural land. The latest boundary extension took place in 1988 and the municipality now covers 147 sq. km. Eldoret once a white settler stronghold is now the fifth fastest growing town in Kenya after Nairobi, Mombasa, Nakuru and Kisumu. The town has many industries and a vibrant market for goods and services. It is known for its manufacturing industries like Ken-Knit, Raiply, Rupa (formerly Raymonds), dairy, agricultural and textile industries. There are open markets for foodstuffs and other necessities like clothes. Furthermore, the town offers hospitality services. Within the municipality are found a number of hotels like Hotel Sirikwa, Poa Place, Wagon Wheel, White Castle, Asis, Highlands Inn, Marriot, Eldoret and Rift Valley Sports Clubs.

The town is a major educational centre. Moi University a public institution has over 13 schools and Moi Teaching and Referral Hospital (MTRH) the second largest referral hospital in the country and its AMPATH (Academic Model for the Prevention and Treatment of HIV) being the largest HIV/AIDS research centre in the region. Other private and public health facilities include; Eldoret Hospital,Medheal, and Elgon View Government of Kenya (GoK) District and Sub District Hospitals, and municipal health facilities. Private institutions ; are Catholic University of Eastern Africa (CUEA), Eldoret and Baraton. Baraton impacts on the town though it's not found in the municipality or its environs. Eldoret Polytechnic the third largest in Kenya and the Rift Valley Technical Institute, Moi Girls School (formerly Highland Girls) and other schools are located within the municipality.

Eldoret is also surrounded by a high potential agricultural hinterland, and for this reason is home to many farmers, some of whom carry a lot of political and economic clout.. Eldoret is also home to a number of nationally recognized manufacturing industries like Raiply Woods, Ken-Knit and Lochab Brothers. All these industries were set up and developed by some of the oldest Indian origin families in the rift valley region namely The Rai's, The Shah's, The Lochab's and The Patel's.

Eldoret has a number of estates. Almost each estate has it identity. Some of the estates include; Elgon View, Langas, Huruma, Kapsoya, Kahoya, West Indies, West, Kipkaren, Kimumu, Jerusalem, Pioneer among many others There is a growing professional crowd emerging in Eldoret now, whose presence is being felt in the town. Due to the Moi Referral and Teaching Hospital and Eldoret Hospital, which also has specialized radiology services and Doctors Plaza, there is a host of experienced doctors.

Eldoret is also home to the International Association of Athletics Federation's (IAAF)'s High Altitude Training Center for Kenyan and international athletes.

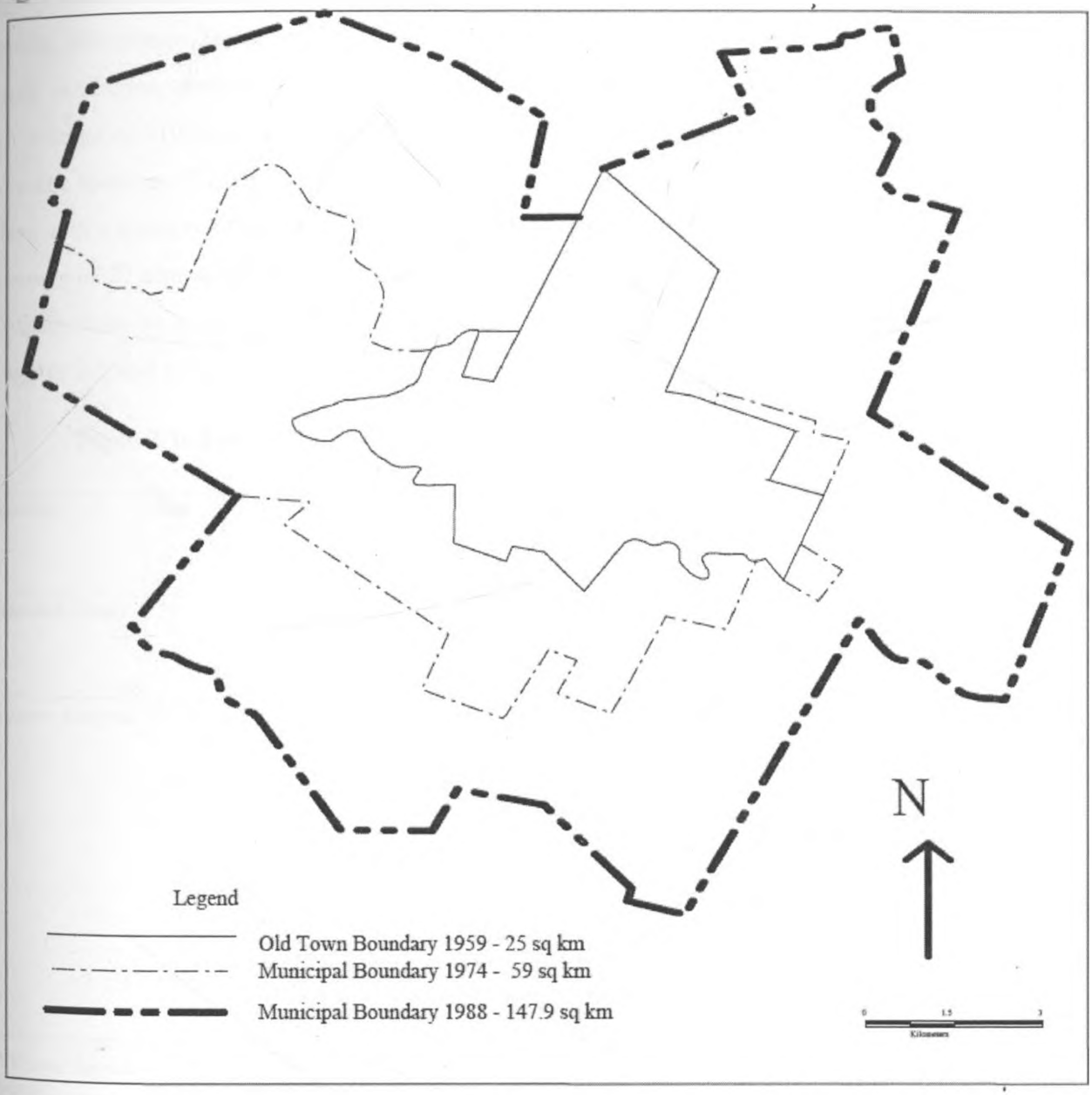
2.3.2 Boundary Changes

On being declared a township in 1912, Eldoret had an area of 11km^2. The elevation of the town to a municipality status in 1929 led to an extension of its boundary to 25 km^2. In 1974, the municipality's boundary was again extended to cover 59 km^2. Finally in 1988, its boundary was further extended to enclose the current massive area of 147.7 km^2. (Figure 2-4) (Ochieng, 2004)[19]. In all the boundary

[19] Ochieng, W.O. (2004): *Planning for Domestic and Commercial Solid Waste Management in the Informal Settlements: A Case Study of Langas in Eldoret Municipality.* University of Nairobi.: Unpublished Thesis.

changes, one long-lasting common denominator is the ECBD. Indeed as noted earlier, what remains of the van Aardt legacy, it being the very genesis of Eldoret as we know it today, is the ruins in the central lawn of the MCE, showing that its location has not shifted a bit. What has changed however, are its challenges and woes.

Figure 2-4: Eldoret Boundary Changes



Source: Musyoka, 2004[20].

[20] Musyoka, Rose (2004): *Informal Land Delivery in Eldoret, Kenya: Summary of Findings and Policy Implications.* Birmingham: International Development Department, The University of Birmingham.

2.4 PHYSIOGRAPHIC CHARACTERISTICS

Physiography not only influences the general locational attributes of a land use, but also how the operations of the sites are managed.

2.4.1 Climatic Conditions

Kenya (1980)[21] states that Eldoret exhibits a modified tropical climate. Rainfall patterns exhibit a bi-modal distribution, featuring rainfall throughout the year with the first peak in April and the second peak in August. According to http://www.climatetemp.info/kenya/eldoret.html[22] Eldoret receives an average of 1103 mm (43.4 in) of rainfall per year, an average of 92 mm (3.6 in) per month. On average there are 137 days per year with more than 0.1 mm (0.004 in) of rainfall (precipitation) or 11 days with a quantity of rain, per month. The month of January presents the driest weather when an average of 29 mm of rainfall (precipitation) occurs across 5 days. However, the wettest weather is in August when an average of 196 mm of rainfall (precipitation) occurs across 21 days (Table 2-1 and Figures 2-5 and 2-7).

Table 2-1: Annual Rainfall Distribution

Month	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	29	40	57	150	124	104	172	196	87	48	50	46

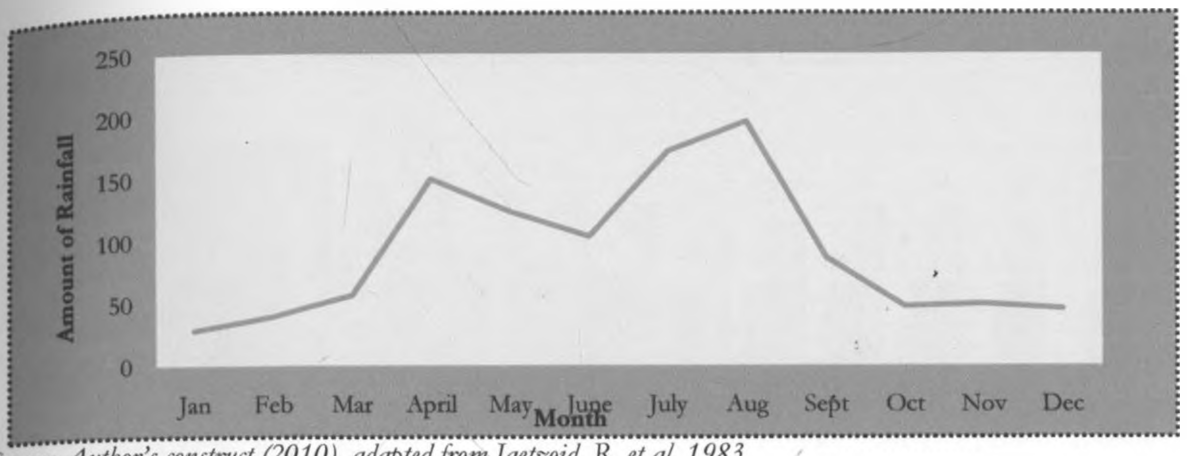
Source: Jaetzoid, R. et al, 1983[23]

[21] Kenya, Republic of (1980): *Eldoret Physical Development Plan, 1980-1985.* Ministry of Lands and Settlement. Nairobi. Unpublished Report.

[22] Climatemp info (2010): What is the Climate, Average Temperature/ Weather in Eldoret? Downloaded from http://www.climatetemp.info/kenya/eldoret.html on 18th July, 2010 at 3:59 EAT.

[23] Jaetzoid, R. and Schmidt, H. (1983): *Farm Management Handbook of Kenya: National Conditions and Farm Management Information, Part B – Central Kenya (Rift Valley and Central Provinces).* Rosdorf: Ministry of Agriculture and GTZ.

Figure 2-5: Eldoret's Annual Rainfall Distribution.



Source: Author's construct (2010), adapted from Jaetzoid, R. et al, 1983

The average temperature in Eldoret, Kenya is 16.6 °C with an average diurnal temperature range of about 3 °C. The highest monthly average high temperature experienced in Eldoret is 26 °C in February & March while the lowest monthly average low temperature is 9 °C in January, February, April, June, July, August, September & December. (Table 2-2, Figures 2-6 and 2-7)

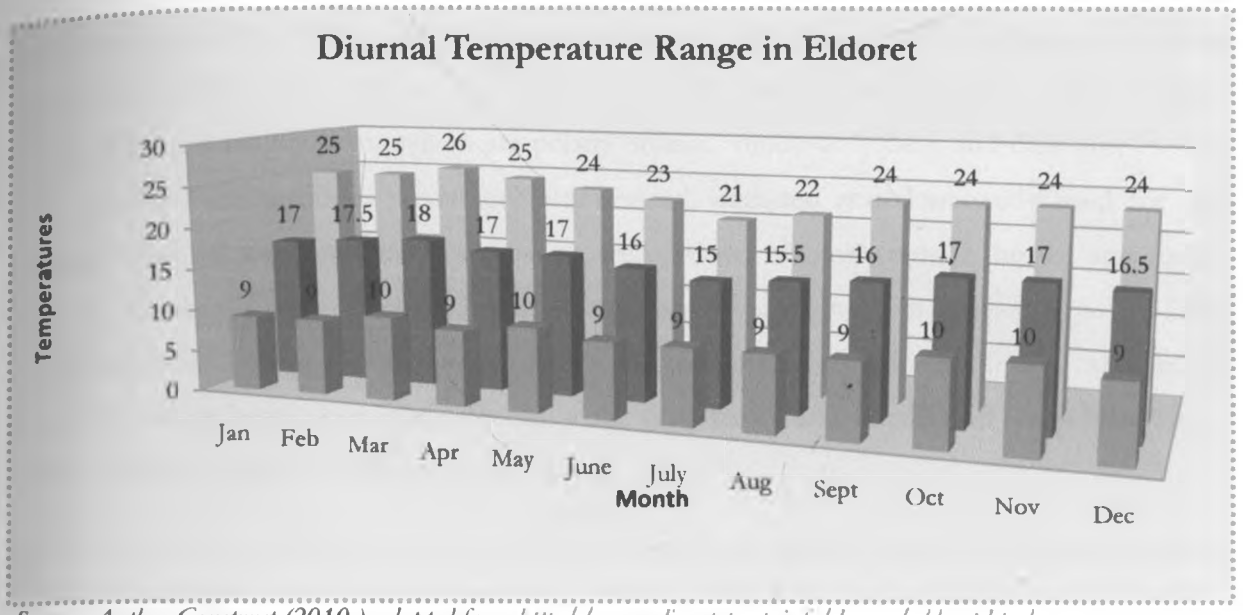
Table 2-2: Average Diurnal Temperature Variation in Eldoret

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average Minimum (° C)	9	9	10	9	10	9	9	9	9	10	10	9
Average Temperature	17	17.5	18	17	17	16	15	15.5	16	17	17	16.5
Average Maximum	25	25	26	25	24	23	21	22	24	24	24	24

Source: http://www.climatetemp.info/kenya/eldoret.html

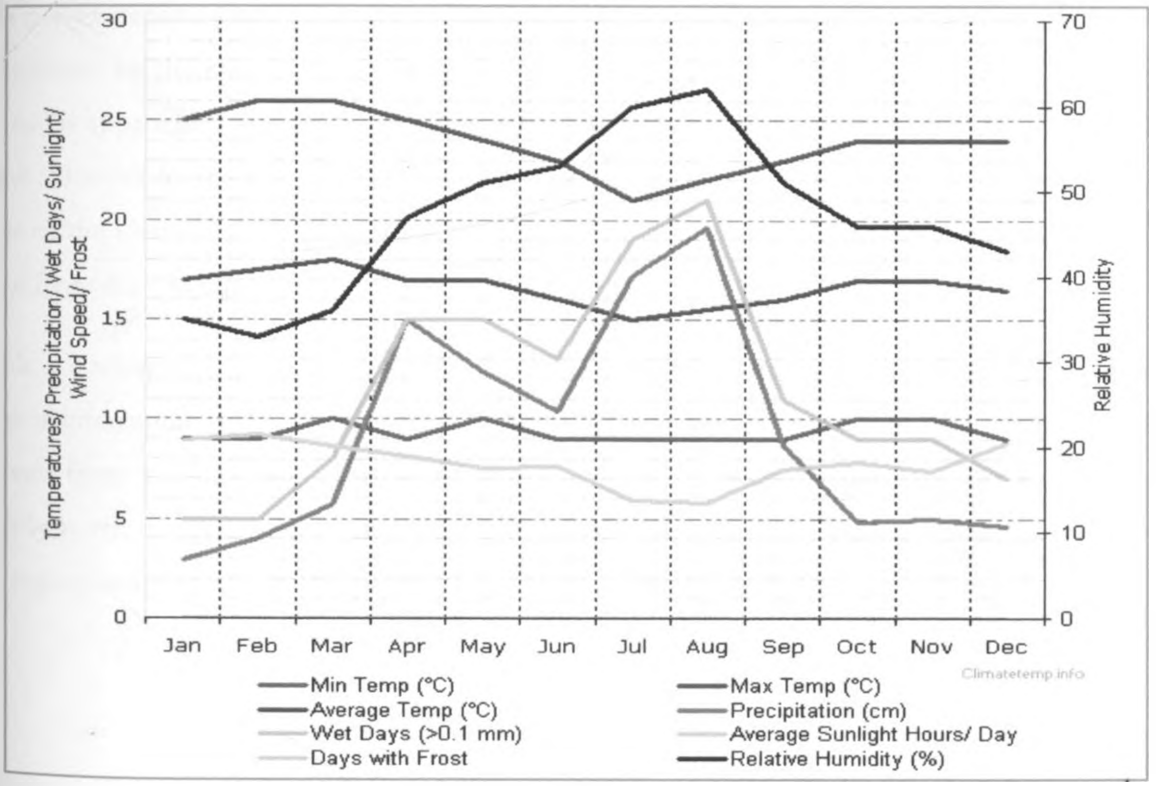
The average annual relative humidity in Eldoret is 46.9% and average monthly relative humidity ranges from 33% in February to 62% in August. Average sunlight hours in Eldoret range between 5.8 hours per day in August and 9.2 hours per day in February. An average of 2832 hours of sunlight per year with an average of 7.8 hours of sunlight per day is experienced in Eldoret (Figure 2-7).

Figure 2-6: Diurnal Temperature Range for Eldoret



Source: Author Construct (2010,) adapted from http://www.climatetemp.info/kenya/eldoret.html

Figure 2-7: Eldoret Climate Summary Map



Source: http://www.climatetemp.info/kenya/eldoret.html

2.4.2 Geology and Soils

According to Kenya (1970) soils of Eldoret Municipality are categorized into 4 groups, depending on their localities. The soils on bottom lands, mainly in the south-eastern parts of Eldoret Municipality, are mainly vertic which are poorly drained, moderately deep and dark grey in colour. The plateaus have ferralsols which are well-drained, dark-red and dominantly used for mixed farming. Soils on hills and minor scarps are well-drained, shallow, reddish brown and variously known as cambisols, regosols and lithosols. These soils cover the western and south-eastern Eldoret Municipality. Soils on upper midlands found to the east of Eldoret form the fourth category. They are developed on basic older igneous rocks, particularly basic tuffs, basalts and phonolites. They are friable, extremely deep-reddish and well drained.

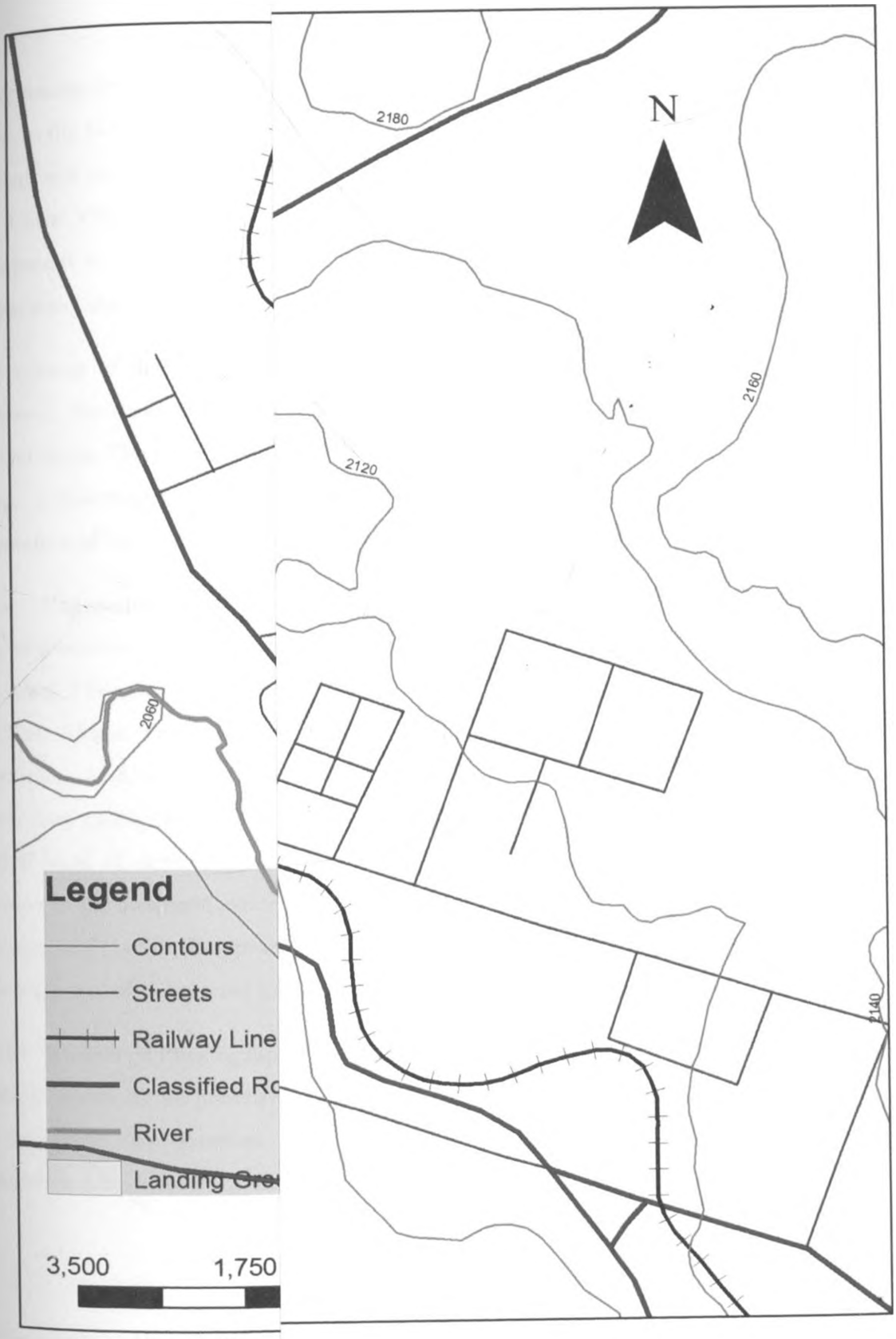
Eldoret CBD has the red well-drained ferralsols, which are stable, fertile and support vegetation growth.

2.4.3 Slope Analysis and Drainage

The most extensive single physiographical unit in the area is the Uasin Gishu Plateau, which is solely determined by the present limit of the Uasin Gishu phonolite lavas. In the vicinity of Eldoret, the plateau is approximately 7200 ft above sea level, rising aggressively towards the Rift Valley at Elgeyo, some 20 miles to the east of Eldoret. Most parts of the municipality are located on the southern parts of the Uasin Gishu Plateau, which is largely below the 3134 m edge of the common southward ridge from the Cherangany Hills (Figure 2-8).

While a considerable portion lies on the lower part of the western slope of the ridge, the northern ridge is interrupted by the local north-west to south-east-tending scarp. The rivers running over the Plateau form a sub-parallel consequent drainage system incised on the lava surface, their course slightly north of west, indicating the general dip of the flow. The gentle undulating topography of the region around Eldoret Municipality has facilitated mechanization of agriculture.

Figure 2-8: ECBD: I



Source: Survey of Kenya

The primary drainage system includes the Sosiani and Kipkaren rivers to the south-west and Sergoit River to the North. River Sosiani which divides Eldoret into two parts rises near the crest of Elgeyo Escarpment and flows westwards through the town to Selby Falls where it plunges from the edge of the Uasin Gishu phonolite onto metamorphic rocks and then follows the tract of the lava escarpment to Turbo, eventually joining the Kipkaren River ultimately joining River Nzoia, which drains into Lake Victoria. (Kenya 1970[24], Ochieng 2004.)

The context of the ECBD (Figure 2-8) is characterized by the general pattern described above. However, the drainage is characterized by land rising uniformly northwards. To the south is the Sosiani River. The topography rises gently northwards, and beyond Uganda Road, the rise becomes steep, culminating into very steep gradient of the escarpment that runs almost parallel to the orientation of the town, the river, Uganda Road and the railway line.

2.4.4 Vegetation

The vegetation cover in Eldoret town has been limited by the increasing scarcity of open spaces in the town. The sale by Lonrho multi-national company of its wattle tree farms popularly known as the East African Tanning Extract (EATEC) led to the clearance of large plantation of wattle trees, subsequent land sub division and settlement. Currently there is little forest cover around Eldoret town. The nearby wetland is located around Chepkoilel and the dominant vegetation here is a central band of dense papyrus. The changing pattern of land use and the introduction of flower farming in the area have exerted enormous pressure on the land and water resources. Due to these activities and the fast disappearing natural vegetation cover in the catchment, a considerable amount of surface runoff is expected to take place during rainy seasons (GoK, 2010).

2.4.5 Impact of Physiography on Transport

Various situations are presented by the different elements of the physical environment that impact on land uses. Transportation, the land use that cuts across hectares of landscapes is impacted in various ways by the physical environment as summarized by Table 2-3 below.

[24] Kenya, Republic of (1970): *Eldoret Physical Development Plan.* Nairobi: Town Planning Department, Ministry of lands and Settlement. Unpublished Report.

Table 2-3: Effects of Physiography on Transport in Eldoret

Attribute	Negative Implications	Positive Implications
Climate	1. Highest rainfall (in March and April) wears roads off faster	1. Annual temperature variations do not badly affect roads through extreme contraction and expansion differentials. 2. Temperatures do not badly affect mass transport in public modes.
Geology and Soils	1. Sticky red volcanic soils, especially unpaved 2. Bare soils allow increased surface run-off which destroys roads	1. Stable rock structure that favours road construction 2. High water infiltration capacity of the soils hence low water-logging.
Slope and Drainage	1. Determines location of the CBD, almost equi-distant to the escarpment from Sosiani River to the South 2. Orientation of roads highly influenced by slope in original town design 3.	1. Properly drained roads and pavements 2. The slope of CBD is not steep to affect road construction 3. The River limits growth= of the CBD to the south. 4. The escarpment limits the growth of the CBD to the North
Vegetation	1. Clearance of vegetation in the catchment area creates the risk of increased surface run-off, which when compounded over long periods of time contributes to destruction of roads.	2. Fast growth an opportunity for green streets and beautiful landscape.

Source: Author's Construct, 2010

2.5 POPULATION AND DEMOGRAPHIC CHARACTERISTICS

2.5.1 Population Size and Structure

Like the rest of the country, Eldoret had her first population census in 1948. Other censuses have taken place in 1962, and after every decade since 1969: 1979, 1989, 1999 (Table 2-4) and 2009. The figures for the 2009 census are not yet released by the government, and so this study will still rely on projections based on the 1999 population and the inter-censal growth rate of 4.9% for the subsequent years.

The high population growth rate in the town is attributed to various factors. Firstly, natural increase (birth and deaths); secondly, immigration of people to the town in such of employment, better facilities and settlement and thirdly, industrial and institutional growth of the town which has attracted many people in search of jobs both in the formal and informal sectors. These factors have continuously led to an increase in the town's population (GoK, 2010). Eldoret's population increased from 8,000 in 1948 to 197,000 in 1999 (Table 2-4). The rates of growth the population have registered mixed fortunes over time, sometimes rising, in other cases falling. The population

increased between 1948 and 1962 by 6.2% but fell to -1.07% in 1969. It later rose to 10% in 1979, fell again to 8% in 1989 and further fell to 4.9% in 1999. The decline in the 1960s might be explained by the flight of European and Asian settlers in the run-up to Kenya's independence (Ochieng, 2004). The growth of population size between 1969 and 1979, and between 1979 and 1989 is not only attributed to natural increase, which does not explain the sudden increase, but the expansion of the boundaries between the inter-censal periods to 59 km^2 and 148 km^2 respectively. In the 1979 period, the growth rate (10.2%) was second only to Nakuru (16.7%) in the whole country. Despite the fall of growth rates in 1999, the rate is still almost double the national average, attributed to natural increase and in-migration.

The municipality has shown a consistent pattern of a higher male population than female over a long period of years. The difference may be attributed to high number of male immigrants to the town in search for jobs others preferring to leave there families at their rural homes. Eldoret continues to have a multi-racial and multi-ethnic population a reflection of its settler past and present migrations, and inter-ethnic relations (Kenya, 2010).

2 5.2 Population Distribution

Population of the municipality of Eldoret is distributed among 5 locations. According to the 1999 population census, the population of Eldoret was distributed as shown in the Table 2-4 and Figure 2-10 below.

Table 2-4: Population Distribution in Eldoret Municipality per ward.

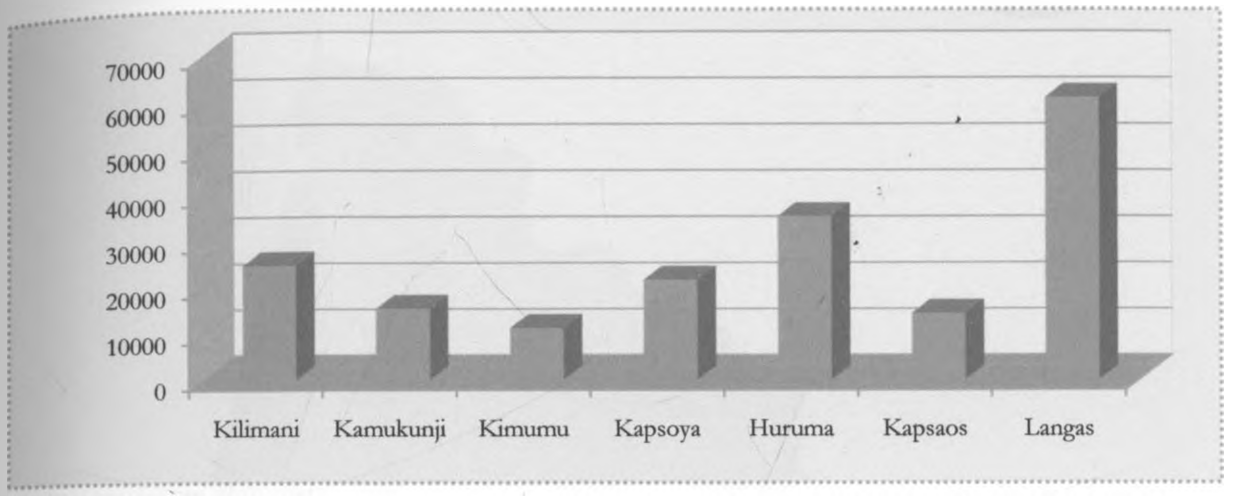
Location	Sub-Location	Population (sub-location)	Population Density	Population (location)
Kibulng'eny	Kilimani	24,777	2,406	40,153
	Kamukunji	15,376	910	
Chepkoilel	Kimumu	11,140	557	19651
	Sergoit	8,511	2076	
Kapsoya	Kapsoya	21,545	490	
Pioneer	Langas	66,973	1358	
Kapyemit	Lapsaos	1,454	990	

Source: CBS (1999)[25]

[25] Central Bureau of Statistics (CBS) 1999: Kenya Population and Housing Census, Vol. 1. Nairobi: Government Printers

Administratively, Eldoret Municipality has five locations namely: Kibulng'eny, Chepkoilel, Kapsoya, Pioneer and Kapyemit (Table 2-4). The population is distributed in the municipality in a number of various low, mid and high density residential estates, including the following 7 major settlements:

Figure 2-9: Population Distribution in 7 Major Settlements in Eldoret



Source: CBS, 1999.

The informal settlements have the greatest population concentrations in Eldoret (Table 2-4 and Figure 2-9). Langas informal settlement has the highest population concentration of more than 60,000 people.

2.5.3 Population Projection and Growth

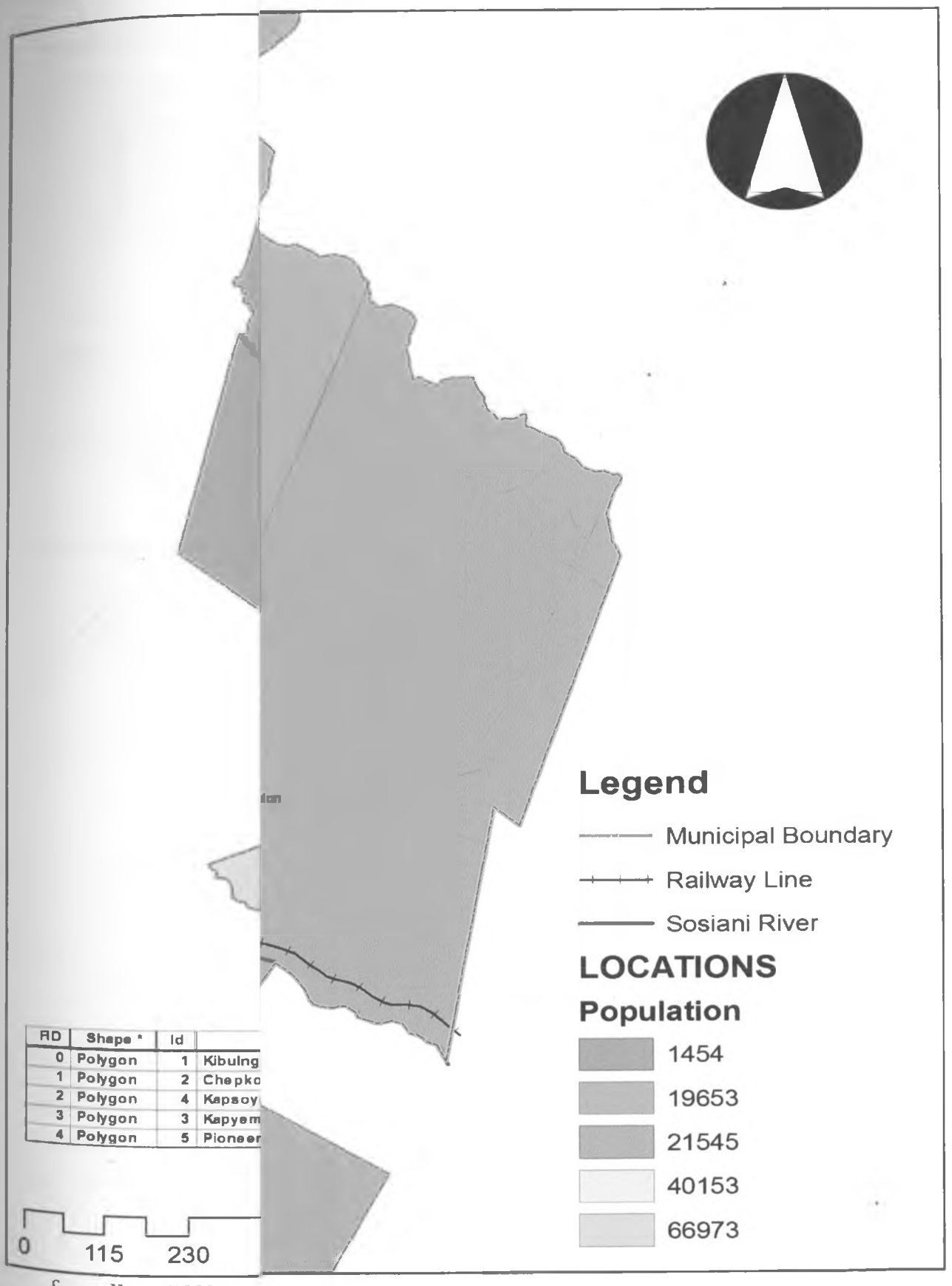
According to 1999, the population of Eldoret Municipality stood at aloes to 200,000 people. The population is expected to grow based on the current inter-censal growth rate is 4.9%. (Table 2-5)

Table 2-5: Population of Eldoret, 1948-2010

Year	Population	Area (km^2.)	Density	Average Inter-censal growth rate (% p.a.)
1948	8,193	25	327	-
1962	19,605	25	784	6.2
1969	18,196	25	727	-1.07
1979	50,500	59	874	10.2
1989	111,882	147.9	756	8
1999	197,449	147.9	1335	4.9

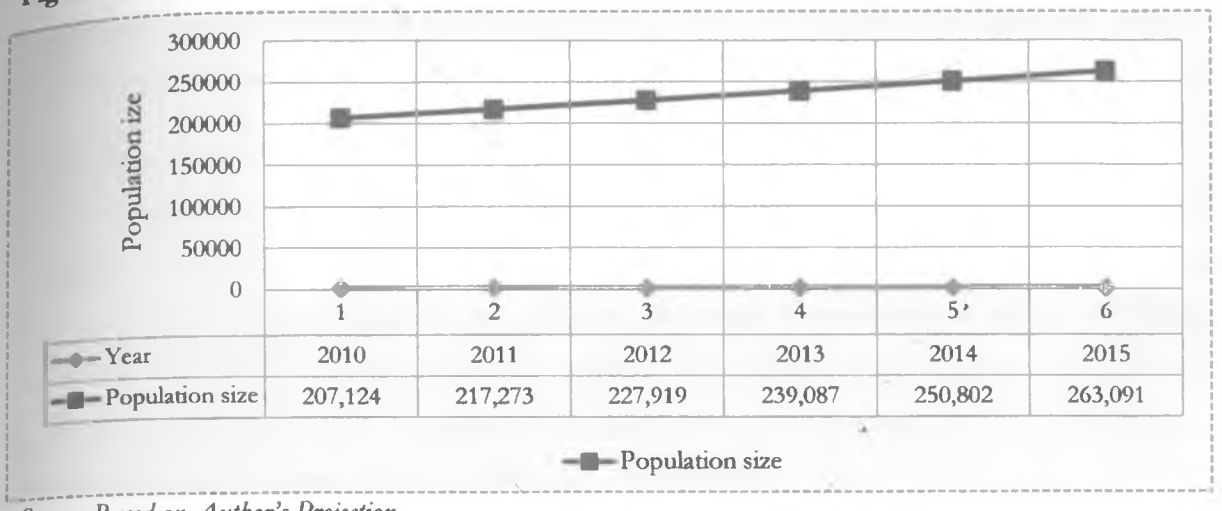
Source: CBS Population Census Reports for 1948, 1962, 1969, 1979, 1989 and 1999 (in Musyoka (2004))

Figure 2-10: Eldoret M



Source: Kenya (1999)

Figure 2-11: Population Projection, Short-Term



Source: Based on Author's Projection

Assumption: Rate of Population projection is the inter-censal growth rate of 4.9%

Table 2-7: Projected Population Growth 2015-2040 (Long Term)

Year	Population size
2015	263,091
2020	350,557
2025	445283
2030	565,560
2035	718,382
2040	912,500

Source: Based Author's Projection.

Assumption: Rate of Population projection is the inter-censal growth rate of 4.9%

Figure 2-11 and Table 2-6 show the population projections for Eldoret Municipality. The short-term projections (Figure 2-11) indicates that by the year 2015 the population will have passed the quarter a million mark, and by 2040 the population will be about 1 million, making Eldoret a mega city by then. The implications of the growth are that there will be increased demand of services, including

more roads. As the populations continue to grow, car ownership will grow, increased congestion, etc. this suggests by extension that to prevent a crisis, better planning should be done in advance.

2.5.3 Migration Trends

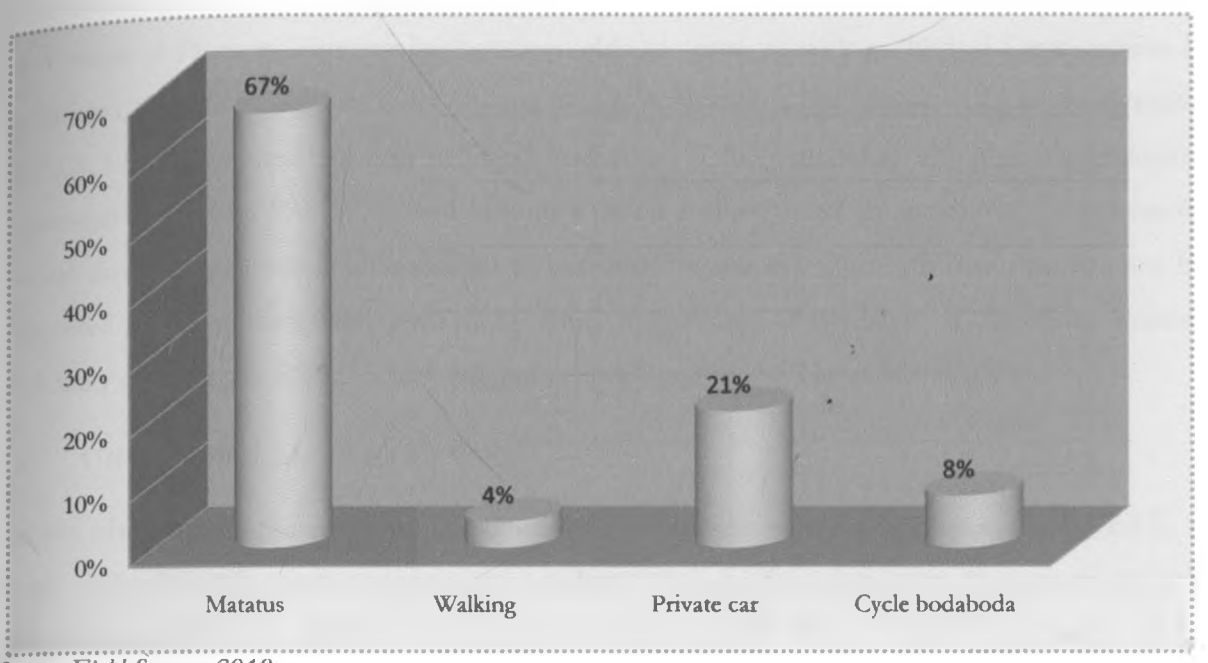
Eldoret Municipality has mainly registered a net immigration quotient contributing to population increase in the CBD. The strategic location of Eldoret in the heartland of the vast agricultural hinterland has mainly an agglomerating effect for industrial, commercial and white and blue-collar jobs interests. No data directly points to migration in particular contributing to the growth of population of Eldoret, but the expansion of the informal sector, including the informal settlements and the informal economic trade, industry and service sectors.

2.5.4 Impact of Population on Transport

Transportation demand is a factor of population. As the population increases, there is need for settlements to emerge further from the activity sites. In the Eldoret Municipality, the boundary changes testify to the lateral expansion of the municipality, signifying the spread of human settlements and differentiation of activity spaces. As populations increase, more settlements in the initially peripheral areas like Langas, Huruma, Kamukunji, Kimumu, Illulla, Hawaii, Sugunanga and Annexe emerge, creating a need for transportation to the work centres located in the ECBD and its environs an increased demand for more transportation services.

Population characteristics mainly reflect in the services they choose to use in their day-to-day lives. Because the incomes of the populations are mainly low, their modes of travel mainly revolve around public transport, with the use of matatus the highest for longer distance travels into the ECBD (Figure 2-12). There are other modes in use, including walking for shorter journeys, and the use of bicycle and motor-cycle taxis (*boda-boda*). But as incomes of the populations increase, there is a higher attraction to private car-ownership, a general reflection of success in this society. The consequence points to increased congestion at the convergence points of the population, i.e. the ECBD.

Figure 2-12: Mode of Travel to the CBD



Source: Field Survey, 2010.

2.6 FUNCTIONS AND ECONOMY

Eldoret, once a white settler stronghold, is now the fifth fastest growing town in Kenya after Nairobi, Mombasa, Nakuru and Kisumu. The town has many industries and a vibrant market for goods and services. It is known for its manufacturing industries like Ken-Knit, Raiply, Rupa (former Raymonds Industries), dairy, agricultural and textile industries. There are open markets for foodstuffs and other necessities like clothes. Furthermore, the town offers hospitality services. Within the municipality are found a number of hotels like Hotel Sirikwa, Poa Place, Wagon Wheel, White Castle, Asis, Highlands Inn, Marriot, Eldoret and Rift Valley Sports Clubs.

2.7 PLANNING AND DEVELOPMENT

Planning in Kenya is done in the public domain. Legislative and institutional framework guiding planning in Kenya places planning in the Department of Physical Planning, under the Ministry of Lands, the department being headed by an all-powerful director whose discretion not only allows undue control and, but almost always, since the enactment of the Physical Planning Act (PPA) Cap 286) in 1996, impedes progress of planning in Kenya.

From the foregoing overview of institutional framework, it is therefore fair to state that the office of the director of Physical Planning has not been able to come up with a Physical Development Plan for Eldoret to meet its legal and institutional mandate. However, the Ministry of Local Government (MoLG), being the parent ministry of Local Authorities (LAs) concerned with plan implementation, in pursuance of the PPA (1996) and has since taken it upon itself to spearhead the plan-making process through contracting a consultant to perform the process. Currently, the Plan has just been completed by the contracted consulting firm, Syagga and Associates. It therefore points to availability of a current SUDP which will guide development in Eldoret Municipality.

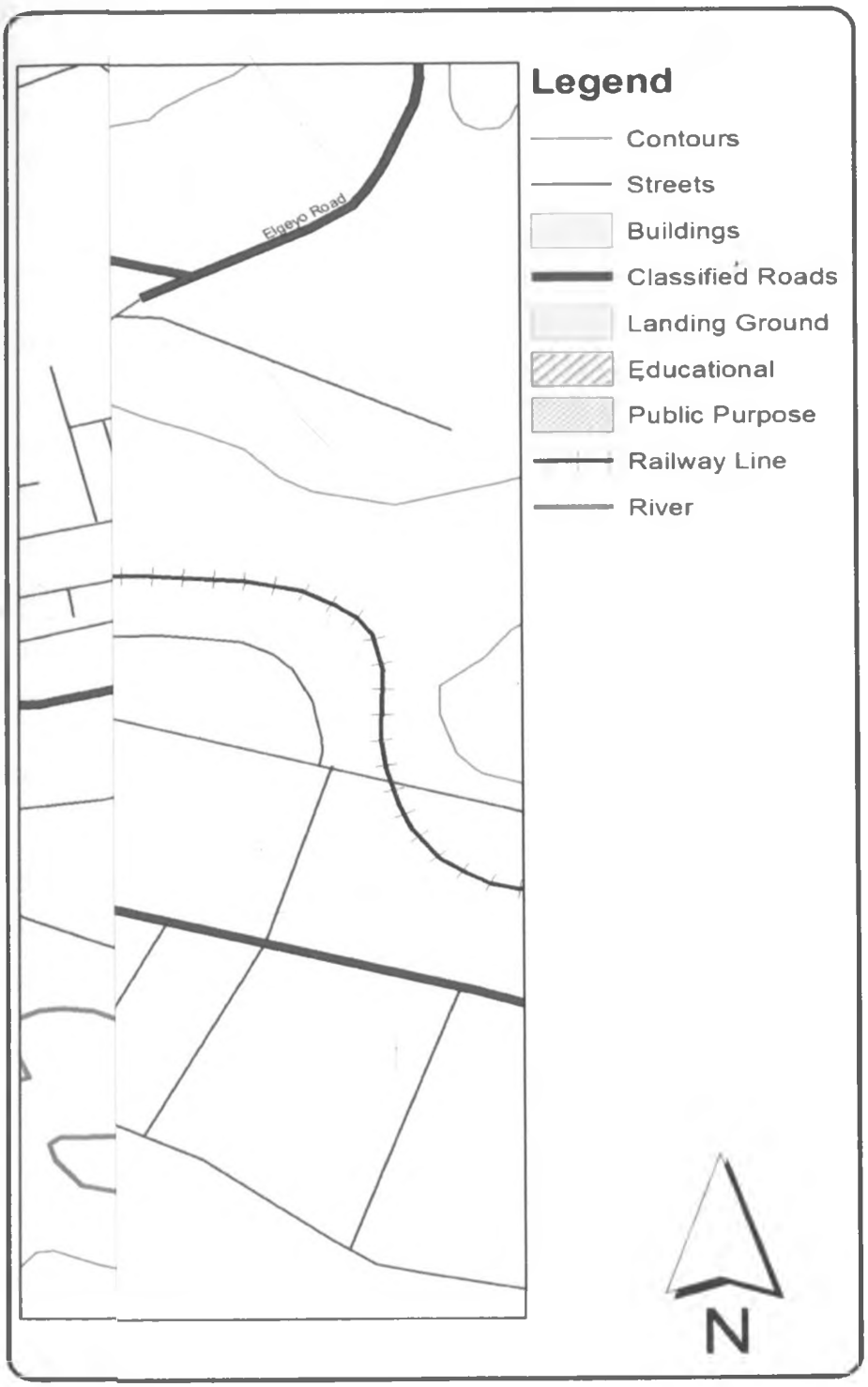
2.8 URBAN FORM OF ELDORET

Eldoret Municipality presents an interesting urban structure where at a glance (Figure 2-13), at a macro scale, different urban structures are exhibited. At a higher perspective, the general growth of Eldoret Municipality is influenced by the International trunk Road A104 Uganda Road and the Nairobi-Kampala Railway line that gives Eldoret's line of growth a dominant linear spatial structure. This is interesting given the view that development of these transport routes are influenced by the general slope of the land as shown by the relief and drainage map (Figure 2-8). From the linear model various roads join the Uganda Road in a kind of fish-bone structure, featuring roads like Oginga Odinga Road, Oloo Street, Muliro Street, Lumumba Avenue, among others. Other more micro linear patterns and fish-bone structures emerge on the Class B Kisumu Road, featuring roads like First Street, Second Street, Third Street, among others in Pioneer to the south of the ECBD. These roads are the most important linkages between the town and the important population centres, industries, university campuses, the international airport, and agricultural areas as well as major towns of Nairobi, Kisumu, and the Uganda border, and international destinations beyond the borders in Uganda, Rwanda and Southern Sudan. These roads have clearly become the backbone of the town's spatial development as well as the main contributors to some of the challenges facing the town.

Another emergent structure is the radial pattern. The radial structure is influenced by mainly the classified roads, radiating from the ECBD in generally west-east and north-south orientations. The arterial system of the network is highly dominated by Uganda road traversing the town from south-east to north-west, and the Kisumu and Iten roads traversing from the south to the north. The three roads intersect in the CBD, where Oginga Odinga Road, which links Iten Road and Kisumu Road joins Uganda Road at nearly right angles.

The general structure of the road network within the CBD is the grid-iron pattern. It includes a series of streets joining Uganda Road and roads running parallel to it like Arap Moi Street, Nandi Road, Elijah Cheruiyot Road and Sosiani Street at right angles with roads like Oginga Odinga Street, Kenyatta Street, Oloo Street, Ronald Ngala Street, Muliro Road and Tagore Streets. Such a configuration of streets poses a major traffic management challenge as street functions and use are not observed.

Figu


Legend
Contours
Streets
Buildings
Classified Roads
Landing Ground
Educational
Public Purpose
Railway Line
River
Elgeyo Road
N

Source

2.9 ROAD TRANSPORT INFRASTRUCTURE FACILITIES

Roads in Eldoret Municipality are generally categorized into classified Roads and urban roads. Classified Roads are roads managed by the GoK through the Ministry of Roads (MoR). The MoR has structures for the management of roads through regions and access roads in areas of jurisdictions of County Councils. Urban Roads are mainly roads within towns and urban centres under management and maintenance by Municipal and City Councils.

Of the classified Roads in Eldoret, Uganda Road is a very important element of road transport. Because of its central location at the heart of ECBD, Uganda Road now acts both as a primary distributor of traffic within town for local traffic and the main entry and exit for international transit traffic from Mombasa through Nairobi to Uganda. This dual function is served with the consequences of high congestion and conflicts for most of the day. The design of the road is therefore difficult as it is being used also for filtering of traffic (a secondary distributor) and as an access road. Furthermore, businesses have direct access to the road, with provisions for on-street parking, unrestricted pedestrian crossings, public transport lay-bys, and street trading.

Roads within the CBD have characteristic functions. For example, Kenyatta Street connects Uganda Road to Nandi Street and is popular with banking services. Banking institutions located along it include; Barclays Bank, Standard Bank, Family Bank and Kenya Commercial Bank of Kenya. It suffers from congestion because of its cocktail of uses, as well as the unrestricted parking throughout the day.

Oloo Street traverses the CBD in a north-south orientation, starting from Somali Road, meeting at a T-junction with Uganda road. It connects government offices around the Railway station and the industrial area to the commercial part of the CBD. The junction with Uganda Road is one of the accident black spots in the CBD.

Oginga Odinga road is a classified road connecting Iten Road and Kisumu Road. It joins the Uganda Road at right angles, and is a 24-hour street with most major commercial enterprises located along it like Nakumatt Supermarket, Ukwala Supermarket, several bars and restaurants, and retail and wholesale shops. The main challenge is parking as vehicles park at the side, taking a large part of its cross-section.

Tagore road is another busy road linked to much activity that attracts a lot of traffic. The road is generally narrow and attracts high volumes of pedestrians, *boda-boda* cyclists, motor cycle taxis, as well as motorized traffic. Matatus, light goods vehicles, and private cars are the most predominant modes along this road. It is an exit route from the main bus terminus within the CBD to the western part of the town. The road is characterised by small and medium scale commercial activities such as sale of khat *(miraa),* fish, tyres, and other retail businesses. Tagore Street marks the boundary of the CBD with the residential areas to the West, like West-Indies Estate.

Mitaa Road links Uganda Road and the Municipal housing Estates like West, Macharia and other areas of 64/Industrial Ward. There are high volumes of pedestrians and other Non-Motorised Traffic (NMT) volumes on the road as the road connects low/medium level income residential areas and a large market to the CBD. It intersects with the Uganda road at Paul's bakery, which has been identified as an accident black spot for NMT users. There is high use of human drawn carts on market days (Fridays) to haul goods which reduce traffic flow causing high level of congestion.

Nandi Road is an important road that according to its location offers an alternative to the use of Uganda Road on entry or exit for vehicles and pedestrians from the eastern sides of the Eldoret Municipality entering the ECBD. Nandi Road runs parallel to Uganda Road from the CBD, linking with the Uganda Road near Poa Place at the eastern end of the town. It is also important as it is the road linking the rest of the municipality to Eldoret District Hospital and the Moi Teaching and Reaching and Referral Hospital (MTRH)

Ronald Ngala Street joins Nandi Road to Uganda Road in a North-South orientation. Also important in Eldoret spatial structure is Elijah Cheruiyot Street that joins Tagore Street with Ronald Ngala Street. It is an important street with high pedestrian volumes through the CBD.

Arap Moi Street is a back-street running parallel to Uganda Road, connecting Main-Stage (Central Bus Station) to Tagore Street.

2.10 TERMINI AND PARKING FACILITIES IN ELDORET

There are 2 planned terminal facilities in Eldoret Municipality, all of them located in the CBD. Main Bus Stage is located centrally in the ECBD for parking of both regional and local urban transport. Regionally, it offers parking for public transport buses and matatus transporting passengers to Nakuru, Kisii, Kisumu, Kericho, Bungoma, and many other regional destinations. The facility's

finishing is of bituminous paving, of unmarked parking lots, and currently is congested and in bad state of repair, making it fail considerably in meeting its high need for parking and a thriving informal economy, as well as revenue for the MCE.

Sosiani bus station is also located in the CBD. It is also of bituminous paving and unmarked parking lots. It is in fair condition.

Other parking lots created out of demand include the Kimumu and Kapsoya ones out of the town, and within CBD road-side and petrol station parking of Nairobi and Nakuru Shuttle Service Vehicles like those of North-Rift and Rift-Valley Shuttles.

Photo 2-1 and 2-2: Urban Functions-Transport Infrastructure Interactions, ECBD.

Source: Eldoret Photos, 2008 2010.

- *Plate 2-1: Informal commercial 'jua kali' activities on road pavements. Evident also is parking of these lorries on the same pavements.*
- *Plate 2-2: Perspective Photo of interaction among urban land use (White Castle Hotel Building, Industrial (signified by the Caltex Petrol Station, and informal road-side parking)) on Uganda Road.*
- *Plate 2-3 shows the north-surface view of the Main Stage Eldoret I the foreground.*

Photo 2-3: Main Eldoret Bus Park.

Source: Field Survey, 2010.

2.11 CHAPTER SUMMARY

Background information to the town points to the fact that the physical, historical and demographic growth has given rise to a number of issues that call of immediate attention. Eldoret history indicate that the town developed from an isolated post serving a small European farming community and overtime has evolved into a major economic, regional administrative, commercial, educative and industrial hub in the region.

Eldoret is strategically located at the centre of a large high potential agricultural area, which has contributed to its growth as an important storage, processing and distribution centre for agricultural produce from its hinterland. Its position has made it an ideal centre for wholesale and retail, servicing of farm tools and machinery, provision of administrative services and entertainment.

The most significant feature of the town's growth is the increase in the industrial enterprise, which has taken place in the recent years. Its favourable location with respect to markets in Western Kenya, Uganda and Sudan, its position as a railway town, its rich agricultural hinterland as well as the availability of the necessary infrastructural services and facilities are some of the key factors that have contributed to its present growth. The town's physical setting and climate is its greatest resources, set on a high plateau means it has a healthy, cool and brazing climate, with fresh and moderate humidity throughout the year thus making it a more habitable zone.

Despite the town having favourable agro-ecological zones it has a number of physical constraints due to its topography and drainage pattern. The escarpment forms the edge of the Uasin Gishu plateau and marks the northeastern limit of the possible built up area. Expansion northwards is limited by the airfield on the top of the escarpment and steep slopes. Sosiani river valley, which traverse the town, although well situated for recreational purposes, is liable to flooding and can be difficult to provide with infrastructure service. These constraints have caused the towns' growth in an east-west axis direction almost parallel to the Sosiani River. Furthermore, these constraints have impacted on the sewerage system in the town.

The multi-faceted nature of local governance jurisdictions impact greatly on the town's planning and development. Services provided by the municipal council cuts across sections of three constituencies, districts and thirteen civic wards. This calls for concert efforts from the diverse governing bodies to reduce potential areas of conflicts (Kenya, 2010.).

'Every man is a borrower and a mimic ... and literature a quotation.'

Ralph Waldo Emerson (1860)
Society and Solitude

CHAPTER 3: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK.

3.1 OVERVIEW

This chapter is a review of the literature related to previous studies based on congestion,, sustainability issues and sustainable transport, land use planning, transportation planning, sustainable transportation planning. It then presents the conceptual framework for sustainable decongestion, featuring the various dimensions of sustainable development and sustainable transportation like the environment, society and economic considerations.

3.2 TRANSPORT LAND-USE DEBATES

OECD (2000) captures the transportation land use dilemma quite aptly, that to be strictly accurate, land is not "used" by transport, but withdrawn from other uses. It is divided and polluted by noise. The soil is compressed, contaminated (e.g. by heavy metals) and sealed. The use of land therefore does not only refer to the transport infrastructure itself, but also to the areas impaired by their use for transport facilities and by the actual transportation using the facilities. Thus, even if the direct land use of a four-lane motorway requires approximately 2.5 ha/km, the average overall land use amounts up to 8ha/km. This includes space for noise protection and embankments, interchanges, motorway junctions and service areas. In addition to this, an affected area (impact zones of noise and pollution or required compensation and substitution areas) of 50 to 80 m along both sides of the road can make land use up to 20 ha/km necessary.

Gakenheimer (2008)[26] asserts that because of current concerns for local pollution, congestion and global warming, strong efforts are made to plan land use in such a manner as to reduce kilometers travelled. There is effort in cities everywhere to plan land use cluster trip origins and destinations, to densify urban development, to invoke transit orientated development, smart growth, neo-traditional

[26] Gakenheimer, Ralph (2008): *Land Use and Environment in Transportation Planning As an Option among Others in Rapidly Growing and Motorizing Cities.* International Transport Forum: Transport and Energy: The Challenge of Climate Change International Conference in Leipzig, May 2008

planning. This has been going on now for a number of years. In most countries it has been only very modestly effective. The exceptions are a very few countries with remarkably strong land use controls or which have significant possibilities for government entry into the land development process. Yet we continue to bear the banner of land use planning as a potentially strong form of improvement of transportation caused problems.

The basic argument is that:

a) Thoughtful land use planning has many virtues to improve urban life, but one of them is NOT congestion mitigation and air quality improvement, at least in developed cities.
b) The more forceful pursuit of these objectives requires firm attention to traffic management, including such actions as vehicle use restraints, congestion pricing, and parking pricing—which in turn will have positive effects on land development.
c) Direct land development initiatives, particularly where government has some sort of possibilities for significant intervention, may be more feasible in the global south than in the global north.

Gakenheimer (2008)'s arguments leave a case for influencing solution to urban transportation-induced problems using land use planning. In all cases urban transportation management presents the best framework of managing transportation-induced problems. It says that these can be achieved through vehicle use restraints, congestion-pricing and parking pricing, all strategies that are affected by policy framework rather than by land use planning. Both direct and indirect land requirements for the transport system must be taken into account. Therefore it is very important to incorporate the principles of ***sustainable development*** also into land use plans and transport infrastructure as well as to take account of the policy needs for public transport, walking and cycling within regional and local development and zoning plans.

Within the urban system each activity occupies a suitable, but not necessarily optimal location, from which it derives rent. Transportation and land use interactions mostly consider the retroactive relationships between activities, which are land use related, and accessibility, which is transportation related. These relationships often have been described as a "chicken-and-egg" problem since it is difficult to identify the triggering cause of change; do transportation changes precede land use changes or vice-versa?

Urban transportation aims at supporting transport demands generated by the **diversity of urban activities** in a diversity of urban contexts. A key for understanding urban entities thus lies in the analysis of patterns and processes of the transport / land use system. This system is highly complex and involves several relationships between the transport system, spatial interactions and land use:

- **Transport system**. Considers the set of transport infrastructures and modes that are supporting urban movements of passengers and freight. It generally expresses the level of accessibility.

- **Spatial interactions**. Consider the nature, extent, origins and destinations of the urban movements of passengers and freight. They take into consideration the attributes of the transport system as well as the land use factors that are generating and attracting movements.

- **Land use**. Considers the level of spatial accumulation of activities and their associated levels of mobility requirements. Land use is commonly linked with demographic and economic attributes (Rodrigue J-P et al, 2009).

3.3 THE SPATIAL IMPRINT OF URBAN TRANSPORTATION

Primarily a *way of thinking* about social and economic problems, planning is oriented predominantly toward the future, is deeply concerned with the relation of goals to collective decisions, and strives for comprehensiveness in policy and program. Wherever these modes of thought are applied, there is a presumption that planning is being done. This formulation is helpful insofar as it points to certain elements of action which underlie planning (Friedmann, 1962[27], Friedmann, 1963)[28].

According to Friedmann, (1963), it is now possible to assert a few simple, empirical generalizations whose validity has been established reasonably well. Although these generalizations do not constitute a systematic body of theoretical propositions, they strongly suggest that there is a certain regularity and order in the structure of space as it is shaped by human activities. The following may serve for illustration:

1) The structure of human settlements can be defined as a system of nodes and functional linkages.

[27] Friedmann, John (1962): "Urbanismo como Vocacao", *Binario* No. 47; Lisbon
[28] Friedmann, John (1963): "Regional Planning as a Field of Study", *Journal of the American Institute of Planners* Vol. 29.

2) Nodes are arranged into a loose hierarchical structure which is internally differentiated by function

3) Surrounding each node is a "density field" of functional interaction, the densities declining with decreasing distance from the centre.

4) The cost of overcoming distance exerts a pervasive influence on the distribution of activities in space as well as on the level of activity at any given location.

The mere fact that it has become possible to assert some general propositions concerning spatial structure indicates that activity distributions cannot be wholly arbitrary but must, in some sense, be considered 'lawful'.

Rodrigue, (2008) posits that the amount of urban land allocated to transportation is often correlated with the level of mobility. In the pre-automobile era, about 10% of the urban land was devoted to transportation which were simply roads for a traffic that was dominantly pedestrian. As the mobility of people and freight increased, a growing share of urban areas is allocated to transport and the infrastructures supporting it. Large variations in the spatial imprint of urban transportation are observed between different cities as well as between different parts of a city, such as between central and peripheral areas. The major components of the spatial imprint of urban transportation are:

- **Pedestrian areas**. Refer to the amount of space devoted to walking. This space is often shared with roads as sidewalks may use between 10% and 20% of a road's right of way. In central areas, pedestrian areas tend to use a greater share of the right of way and in some instances, whole areas are reserved for pedestrians. However, in a motorized context, most of pedestrian areas are for servicing people's access to transport modes such as parked automobiles.

- **Roads and parking areas**. Refer to the amount of space devoted to road transportation, which has two states of activity; moving or parked. In a motorized city, on average 30% of the surface is devoted to roads while another 20% is required for off-street parking. This implies for each car about 2 off-street and 2 on-street parking spaces. In North American cities, roads and parking lots account between 30 to 60% of the total surface.

- **Cycling areas**. In a disorganized form, cycling simply shares access to pedestrian and road space. However, many attempts have been made to create spaces specifically for bicycles in urban areas, with reserved lanes and parking facilities.

- **Transit systems**. Many transit systems, such as buses and tramways, share road space with automobiles, which often impairs their respective efficiency. Attempts to mitigate congestion have resulted in the creation of road lanes reserved to buses either on a permanent or temporary (during rush hour) basis. Other transport systems such as subways and rail have their own infrastructures and, consequently, their own rights of way.

- **Transport terminals**. Refer to the amount of space devoted to terminal facilities such as ports, airports, transit stations, railyards and distribution centers. Globalization has increased the mobility of people and freight, both in relative and absolute terms, and consequently the amount of urban space required to support those activities. Many major terminals are located in the peripheral areas of cities, which are the only locations where sufficient amounts of land are available.

The spatial importance of each transport mode varies according to a number of factors, density being the most important. If density is considered as a gradient, rings of mobility represent variations in the spatial importance of each mode at providing urban mobility. Further, each transport mode has unique performance and space consumption characteristics. The most relevant example is the automobile. It requires space to move around (roads) but it also spends 98% of its existence stationary in a parking space. Consequently, a significant amount of urban space must be allocated to accommodate the automobile, especially when it does not move and is thus economically and socially useless. At an aggregate level, measures reveal a significant spatial imprint of road transportation among developed. In Western Europe, roads account for between 15% and 20% of the urban surface while for developing countries, this figure is about 10% (6% on average for Chinese cities). In Kenya, roads account for between 25% and 30% of all urban land use. (Kenya, 2002)[29]

[29] Kenya, (2008): *Draft Physical Planning Handbook*. Ministry of Lands, Ardhi House. Unpublished.

3.4 URBAN LAND USE PATTERN, CONCEPT OF THE CBD AND TRANSPORTATION.

Cities are the focal points in the occupation and utilization of the earth by man. Both a product of, and an influence on the surrounding regions, they develop in definite patterns in response to economic and social needs (Ullman and Harris, 1945)[30]..A number of theories have been posited to explain the concept of the pattern of urban land uses based on economic characteristics (von Thuenen, Ricardo, Alonso and Wingo), culture (Firey), among others. But generally speaking, the similarity of land use patterns in different urban areas supports the assertion that there are certain general principles which govern urban layouts. Guiding motives for firms, i.e. profit-maximization, and households, satisfaction-maximization, have been mentioned, and these hold true under all forms of competition, although only under the assumptive conditions of perfect competition are they compatible with the maximum efficiency in the use of resources from the community's point of view (Goodall, 1979)[31]

3.4.1 Central Place Theory and the Concentric Rings.

The first attempt to explain spatial patterns in the rent-based context of concentric zones stems from Von Thuenen (The Isolated State, 1826[32] and Chapin 1972[33]). He imagines a large town, surrounded by a large plain of uniform fertility. The town supplies its rural hinterland with manufactured goods and services and provides a market for agricultural surpluses produced in the rural area. In his view, transportation costs are crucial as heavy and bulky goods are produced in the vicinity of the town while lighter less bulky goods can incur relatively higher transportation costs and will therefore be produced in more remote places. Thus a system of concentric rings emerge (Figure 3-1 below). In principle von Thuenen's isolated state has only one large town, at least in principle in its original version.

According to Chapin (1972), despite von Thuenen Theory's obvious deficiencies as a framework for spatial policy, it inspired many other geographers and economists to study the theme of human settlement organization and its hierarchical structure. Three names are worth mentioning here, because their publications became classics in the field: Chrystaller, Losch and Galpin.

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[30] Ullman, Edward and Chauncy Harris (1945): The Nature of Cities, in the Annals of the American Academy of Political and Social Sciences (1945)

[31] Goodall, Brian, (1979): *The Economics of Urban Areas.* Oxford: Pergamin Press.

[32] Thuenen, J.H. Von (1826): *Der Isolierte Staat in Beziehung auf Landwirtshaft und Nationaleconomie.* Berlin.

[33] Chapin, Stuart Francis Jnr (1972): *Urban Land Use Planning* (Second Edition). Chicago: University of Illinois Press.

Chrystaller's ideas on hierarchical settlement systems are largely based on market and traffic principles. The most important factor influencing the distribution of centres is the need for central places to be as near as possible to the customers they serve. Losch, not concerned with hierarchies, concerned with explaining the existing complex patterns of market areas, describes his 'economic landscape' more in terms of different market areas. Galpin analyzed the central places from the rural point of view, and from there, derived functional hierarchies empirically. From data collected in interviews maps were drawn, showing the spatial range of various goods and services provided by specific localities. As it turned out, these 'trading zones' did not coincide as some were much larger than others. Because of the empirical approach, it also became apparent that topographic factors greatly influenced the actual shape of the trading zones.

It would not be conclusive to speak of the concentric rings without mentioning the solid works of Earnest Burgess who also pointed that the typical processes of the expansion of the city can best be described by a series of concentric circles, which may be numbered to designate both the successive zones of urban extension and the types of the areas differentiated in the process of expansion, representing an ideal construction of the tendencies of any town or city to expand radially, in transitional fashion, from its CBD, what he called the 'Loop'.

Ullman and Harris (1945) have observed that all cities are dependent on transportation in order to utilize the surplus of the land for their support. This dependence on transportation destroys the symmetry of the central-place arrangement, inasmuch as cities develop at foci or breaks of transportation, and transport routes are distributed unevenly over the land because of relief or other limitations. City organizations recognize the importance of efficient transportation, as witness their constant concern with freight-rate regulation and with the construction of new highways, port facilities, airfields and the like.

In view of the arguments of the agglomeration of activities in the central places, ECBD presents a picture of a dominant central place, albeit asymmetrical as observed by Ullman and Harris, created out of the interplay among the various factors of markets, transportation and administration. However, as transport has been singled as an important factor, the single most important key in unlocking the congestion problem in the ECBD will be transport planning. There is need to do this without breaking unfairly the market functions.

3.4.2 Sector and Multiple-Nuclei Theories

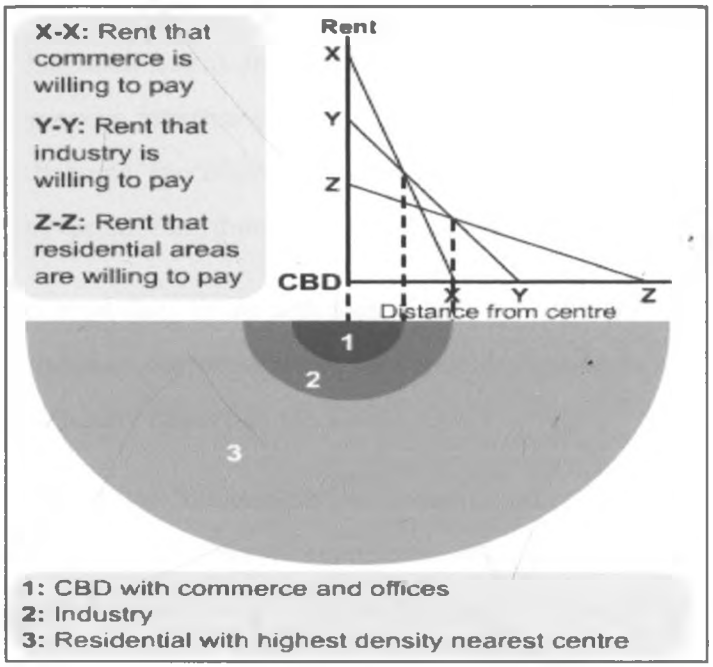
Sector Model was developed in 1939 by land economist Homer Hoyt. According to this model, the city develops in a series of sectors, not rings. Chapin (1979) observes that this theory holds that the different income group classes of a city tend to be found in distinct areas describable in terms of sectors of a circle centred on the CBD. Certain areas are more attractive for different activities. In the center is the Central Business District. As the city grows, activities expand in a wedge, or sector, from the center. Once a district with "high-class" housing is established, the most expensive houses is built on the outer edge of that district further from the center.

A study of residential areas (Hoyt 1939, Rodrigue, *et al*, 2009) in the North American context concluded that the land use pattern was not a random distribution, nor sharply defined rectangular areas or concentric circles, but rather sectors (Figure 3-2). Thus, the effect of direction and time was added to the effect of distance. Transport corridors, such as rail lines and major roads, are mainly responsible for the creation of sectors, thus transport has directional effect on land uses. Cities would thus grow along major axis. The sector representation also includes concentric transitional processes observed by Burgess, which is occurring along a specific direction.

Viewed on the context of change, the theory holds that similar types of use originating near the centre of the city tend to migrate within the same sector and away from the centre. High rent-areas (and high-price areas) are conceived as having a dominant influence on the direction of residential area growth. It is noted that where "a certain sector develops originally as a low-rent or low-price area, the balance of that sector is likely to be occupied by low-rent or low-price residences as expansion proceeds outward. The same tendency is typical of intermediate-rent or price sectors." The sector theory thus provides a more detailed explanation of residential patterns of land use than that set forth in the concentric zone formulation, particularly in the more discriminating way in which it deals with the dynamics of growth processes. It has received criticisms, but Chapin's and the stream and the stream of commentary that followed the publication of Hoyt's study clearly indicate the profound effect the sector theory has had in stimulating awareness of the need for a theory of urban of urban land use to which all fields can subscribe (Firey, 1947[34], Chapin, 1972).

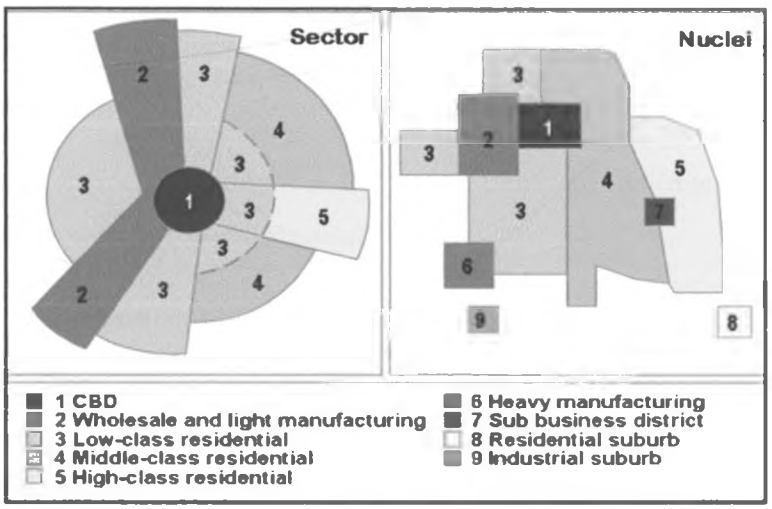
[34] Firey, Walter (1947). *Land Use in Central Boston.* Cambridge: Harvard University Press.

Figure 3-1: Concentric Ring Theory and Bid-Rent Curve



Source: http://www.s-cool.co.uk/assets/learn_its/alevel/geography/urban-profiles/central-place-and-bidrent-theories/2007-10-15_160719.gif[35]

Figure 3-2: Sector and Multiple Nuclei Models



Source: http://www.people.hofstra.edu/geotrans/eng/ch6en/conc6en/img/sectornuclei.gif

[35] http://www.scool.co.uk/assets/learn_its/alevel/geography/urban-profiles/central-place-and-bidrent-theories/2007-10-15_160719.gif, accessed on 16th April, 2010.

Following Hoyt's development of a sectoral city, geographers C.D. Harris and Edward Ullman (1945) introduced a more effective generalization of urban land uses: the Multiple Nuclei Theory. It was brought forward that many towns and nearly all large cities do not grow around one CBD, but are formed by the progressive integration of a number of separate nuclei (Figure 3-2) in the urban pattern. These nodes become specialized and differentiated in the growth process and are not located in relation to any distance attribute, but are bound by a number of attributes:

- **Differential accessibility**. Some activities require specialized facilities such as port and rail terminals. For instance, the retailing sector demands maximum accessibility, which is often different from centrality offered in the CBD.

- **Land use compatibility**. Similar activities group together since proximity implies improved interactions through the process of economies of agglomeration. Service activities such as banks, insurance companies, shops and institutions are strongly interacting with each other. This can be defined as centripetal forces between activities.

- **Land use incompatibility**. Some activities are repelling each-other such as high quality residential and heavy industrial. This may be defined as centrifugal forces.

- **Location suitability**. Some activities cannot afford the rent of the optimal site for their location. They are thus locating at cheaper places, which are not optimal, but suitable for these activities.

Harris and Ullman's poly-nuclear model was the first to represent the fragmentation of urban areas, specialized functions as well as suburbanization (ibid).

3.4.3 Evolution of the Concept of CBD

Shore (2005)[36] has briefly traced the evolution of CBDs. It has observed that until about the end of World War II (1945), all human settlements followed the same pattern: activities people did together were in the center and homes circled around them. Picture a steel magnet as the activity center and iron filings as homes. Close to the magnet, the iron filings cluster densely; they taper off to lower and lower density as distance from the magnet increases—to a scattered few homes and, finally, no homes at all where the magnetism ends. That was the historic human settlement pattern—centers

[36] Shore, W.B. (2005): Land-use, transportation and sustainability in *Technology in Society* XX (2005) 1–17. Elsevier.

with communities forming around the centers. Some people chose to give up space in and around their home to be near the jobs and services in the center—living in high apartments and close-packed lower buildings. Some were willing to travel long distances to those activities in exchange for more space. Many chose a compromise between space and access, e.g. small homes close enough together to support convenient bus service.

The larger the center of activities (the magnet), the higher the density around it and the farther the homes extended out. This pattern was created when walking was the only way to travel. It remained when animals were introduced to carry goods and people and when steam and electric propulsion moved people on trains. According to OECD (2000)[37], transport - and in particular access for people to communication, services and goods - has been one of the principal factors in this century's economic and social development. However, transport is also recognized as a problem sector for the numerous impacts it has on health and the environment. Present mobility patterns in passenger and freight transport do not correspond with the objectives of sustainable development. Shore (2000) proceeds with the line of thinking that the automobile shattered the pattern of the agglomeration of activities. When people could travel by car, individually and fast over great distances, many simply moved farther from the center and away from bus and train routes, though they continued to work downtown. But city centers were not made to handle two tons of machinery for every worker and every store customer. Cars freed people from having to use public transit, bicycles or their feet, but not from gathering all in the traditional place. City centers became increasingly clogged with cars—distressing the far greater number of pedestrians (Shore 2005).

3.4.4 The Central Business District

Among the different explanations posited to explore emergence of the Central Business District, transportation has been seen as critical (Haig, 1926; Goodall 1979). It suggests that if all activities and consumers were in the same place, no resources or efforts need to be devoted to overcoming physical distance. Alternatively, if transportation were instantaneous and costless, urban activities could spread themselves over all usable space. According to Goodall, the CBD develops around the focus of intra-urban transportation facilities and is, therefore the position of the greatest accessibility to the whole urban area. Located there are high-order activities characterized by unique accessibility requirements to the maximum number of people, i.e. activities able to make the greatest net gain

[37] OECD *et al* (2000): *Environmentally Sustainable Transport in the Central European Initiative (CEI) Countries in Transition.* Paris: OECD Publications.

from the accessibility advantages. Competition for the very restricted supply of sites is great, giving rise to peak land values and fully built-on site. Use intensity is also reflected in the tallest multi-storied buildings in the urban area, for the sky-scraper is an economic way of providing access in the urban centre for activities not requiring street-display space. All activities seem to assemble people especially for work consequently day-time population far exceeds resident population. An intricate web of complimentary linkages has developed, for activities use each others' products or services, or together extend the range of goods and services offered, or need close communication to function efficiently.

3.3.5 Appraisal of Land Use Patterns

According to Ullman and Harris (1945), most cities exhibit not only a combination of the three patterns of urban support, but also aspects the three generalizations of the land-use pattern, namely the concentric zones, sector and the multiple nuclei theories. As a general picture subject to modification because of topography, transportation, and previous land use, the concentric –zone aspect has merit. It is not a rigid pattern, inasmuch growth or arrangement often reflects expansion within sectors or development around separate nuclei.

The sector aspect has been applied particularly to the outward movement of residential districts. Both the concentric zones and the sector aspect, as applied primarily to residential patterns assume (although not explicitly) that there is but a single urban core around which land use is arranged symmetrically in either symmetrical or radial patterns. In broad theoretical terms such an assumption may be valid, inasmuch as the handicap of distance alone would favour as much as a small central core. Because of the actual physical impossibility of such concentration and the existence of separating factors, however, the separate nuclei arise. The specific separating factors are not only high rents in the core (Figure 4-1), which can be afforded by a few activities to extra –urban transport, space or other facilities, and the advantages of the separation of unlike activities and the concentration of like functions.

The foregoing assumptions apply to a wide extent in a generic sense, and indeed fitting the bill in the context of Eldoret. The existence of the CBD, influence of transportation, and separated functions, limitations of the physical development including topography as well as scarcity of land at the core, hence higher rents, apply.

3.5 EVOLUTION OF TRANSPORTATION AND URBAN FORM

The evolution of transportation has generally led to changes in urban form. The more radical the changes in transport technology, the more the urban form has been altered. Among the most fundamental changes in the urban form is the emergence of new clusters expressing new urban activities and new relationships between elements of the urban system. In many cities, the CBD, once the primary destination of commuters and serviced by public transportation, has been changed by new manufacturing, retailing and management practices. Whereas traditional manufacturing depended on centralized workplaces and transportation, technological and transportation developments rendered modern industry more flexible. In many cases, manufacturing relocated in a suburban setting, if not altogether to entirely new low costs locations. Retail and office activities are also suburbanizing, producing changes in the urban form. Concomitantly, many important transport terminals, namely port facilities and railyards, have emerged in suburban areas following new requirements in modern freight distribution brought in part by containerization. The urban spatial structure shifted from a nodal to a multi-nodal character. (Rodrigue, *et al,* 2009)

The foregoing establishes the case of the urban functional transition in many highly developed cities of the world. Though the change in the developing countries (with special emphasis on Sub-Sahara Africa, and Kenya in particular), is undeniable, if not happening at a higher rate than in the Global North, the reliance on the CBD as the focal point for commerce, administration, interaction, transport and several other complex functional interrelationships is still very high. Agglomeration of important activities at the centre still suffers people the focus to the centre, creating a high demand of spaces at the centre for investments and survival, which consequently increase the levels of competition for access to the spaces.

Table 3-1: Urban Form-Transportation Interaction; Expression in Eldoret

Author	Spatial Structure/ Urban Form	Description	City Where Applicable
Arturo Soria y Mata, (1882)	Linear City	• Idea was to provide easy access to open-spaces and infrastructure facilities • 48km stretch and width of 400m • Main axis with public transport and road infrastructure around which residential buildings are situated at a breadth of 200m on each side of the axis • Built up areas to be separated from agricultural lands by parks and woodlands • Problematic with regard to provision of higher	• Madrid – Spain • Brasilia – Brazil Eldoret is based on a linear model influenced mainly by Uganda Road.

		order central facilities	
Ebenezer Howard (1898)	Garden City Surrounded by Satellite Towns Radial in Form	• Reconcile rural and urban areas by combining the qualities of both • Conceived of a satellite system consisting of a central city with 58,000 people and six surrounding towns with 32,000 people • Ideal distance of the satellite towns to the central city was defined by travel time • Inter municipal railway lines to connect the satellite towns to each other and the central city • Density of 220 people per acre • Central city was divided into several land use rings by parks and avenues • However, this could not allow for growing metropolitan area	Letchworth Garden City in Britain More pressure can be released off the ECBD by allowing for decentralization of some retail functions by the West Campus Market, and in the estates.
Le Corbusier (1929)	Functional City Grid Iron in Form and Compact	• Functional separation of land uses • Proposed the decongestion of city centers by increasing density vertically • Increase circulation and amount of open space • Middle income and low income workers to live in high rise on a small percent of the total ground area with 48% left open, and high income in apartments with 85% left open • Overall layout was grid iron • Encouraged high density land use pattern • Proposed a less dense urban settlement as opposed to the above in a plan called *'Broad acre city'*	ECBD is functionally crafted after the Grid-iron. The structure, mainly influenced by Uganda Road as the main spine, joined nearly at right angles by roads like Oloo Road, Oginga Odinga Road, etc, which also link with others running parallel to Uganda Road like Aap Moi, Elijah Cheruiyot, Nandi Road, etc.
Frank Lloyd Wright (1950)	Grid Iron and Dispersed	• Comprised grid system of streets • Required widespread motorization and adequate road infrastructure • Large highway corridors to ensure convenient long distance commuting	
Fritz Schumacher	Axial/Radial Structure	• Central area of the city to accommodate high order urban functions • Urban development to be located on the axes forming a star shaped radial structure • Open spaces to be maintained between the axis	• Copenhagen, Stockholm, Hamburg, Cologne In Eldoret, the Radial pattern is exhibited by major classified roads radiating outwards from the CBD like Kisumu Road, Iten Road, Uganda Road in both directions, as well as other distributors like Mitaa and Sergoit Road, etc.
Burgess and Others	Compact Monocentric Urban Form	• Intensive land use patterns and a strong central area (CBD) • Uses strategies that reduce the expansion of urban area • Promotes urban regeneration • High densities per area occupied • Prioritize improvements in urban public transport • High density and high accessibility promotes use of non-car modes • In terms of energy efficiency, the compact city is likely to be the most efficient land use transport	This can easily be manipulated to take other forms like star shape, when decentralization of CBD occurs along the axis, e.g. Curitiba Spider Shape. In Eldoret, the case for a monocentric form is supported by the agglomeration of functions in the ECBD where densities are highest and activities centred.

Harris and Ulman	Polycentric Form or multi nuclei	• Less dominant city center but with core urban functions • Decentralization of less core activities and residential developments to the satellite commercial/industrial centers • The satellites linked to each other by public transport and to the main center as well • Encourages even use of public transport • Low to medium density developments	Suitable for even spread of residential and employment densities and for the organization of a system of cities around a large city Not yet highly recommended for Eldoret, to decongest functions from the ECBD.

Source: Adapted from Aligula, et al, (2005)

The theories and models were mainly postulated in the pre and earlier-automobile advent periods in history. But since they came, they have revolutionized transportation, and indeed urbanization. However, Rodrigue *et al* (2009) asserts that the advent of the automobile has clearly influenced contemporary spatial organization but other socioeconomic factors have also shaped urban development such as gentrification and the increase in land values. The diffusion of the automobile has lead to an urban explosion. The car has favored the mobility of individuals thus permitting a disorderly growth and an allocation of space between often conflicting urban functions (residential, industrial, commercial). Transport thus contributes to the local spatial organization, however, it must also adapt to urban morphologies. Transport networks and urban centers complement and condition each other.

3.6 TRANSPORT: A SYSTEMS VIEW

Lynch and Rodwin view the city as being made up of what they call "adapted space" for the accommodation of human activities and "flow systems" for handling flows of people and goods (Lynch and Rodwin, 1958, Chapin 1972). The flow systems in this case presents the transportation system. The term transportation system is used to describe several different aspects of transportation, including the different transportation options used to move people, levels of jurisdictional authority and the facilities that a user might access to begin, change or switch, and end a trip. According to WisDOT (2001)[38] identifies that a transport system consists of roads, transit services, rail services, bicycle lanes, paths, tracks, and accommodations, pedestrian accommodations and habours. Each transportation system is complex, and this complexity derives from the pluralism of its hardware (infrastructure and vehicles) and of the people and organizations involved. The complexity is multiplied by the existence and roles of different modes, regulatory and legislative

[38] Wisconsin Department of Transportation (2001): *Transportation Planning Resource Guide: A Guide to Preparing the Transportation Element of a Local Comprehensive Plan*. Wisconsin: WisDOT.

bodies, service providers, builders, financing systems, technologies, land-use patterns, and, most importantly, human behavior (Richardson, 2005)[39]. However, for purposes of CBD decongestion, it would be best to integrate the multiplicity of modes and components into one whole unit called the CBD transport systems, and the factors that influence, impact of interact in any way with each other as to contribute to congestion. The consequences of transportation use are both positive and negative and are addressed in considering the sustainability of the transportation system. Among these consequences are safety, congestion, fuel consumption, vehicle emissions, and access (Richardson, 2005).

3.7 URBAN STRUCTURE, URBAN FORM AND CONGESTION

Chapin (1972), Rodrigue (2008) and a host of other planners, geographers and sociologists have asserted that theoretical work in urban spatial structure is the type of theory which has special relevance for urban land use planning. The pattern of urban development strongly affects sustainability (Shore, 2005). Small metropolitan areas, as indeed single market and town centres, can efficiently grow around a single business center that offers metropolitan-wide, or market or town-wide activities, with neighborhood centers offering day-to-day services like groceries and hardware. But very large metropolitan areas need a variation. The common denominator in all cases is the understanding of the factors that urban spatial structure presents to the operation of the urban system, and the potential it presents to urban spatial planning.

3.8 SUSTAINABLE TRANSPORT

The concept of *sustainable development* has now been widely adopted as a legitimate planning goal (Barron, B. *et al,* 2002)[40]. The term sustainable development was introduced in 1980, popularized in the 1987 report of the World Commission on Environment and Development (the Brundtland Commission), and given the status of a global mission by the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 (Barron, B. *et al,* 2002). The concept of sustainability places great emphasis on environmental conservation, social preservation and economic development.

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[39] Richardson, Barbara C. (2005): **Sustainable transport: analysis frameworks** in *Journal of Transport Geography* 13 (2005) 29–39: Elsevier. Available online at www. Sciencedirect.com

[40] Barron, B. *et al,* (2002): *Sustainable Transport in Hong Kong: Directions and Opportunities.* Hong Kong. MTR Corporation

Since the Rio Summit in 1992, a series of international conventions and agreements have been created to build a framework to promote sustainable development internationally. The most significant of these agreements is *Agenda 21*, which outlines an action plan to help nations become more sustainable, thereby introducing the concept of sustainable development as part of the international political agenda.

Agenda 21 identifies transport as a key aspect of sustainable development and offers a new approach to evaluating transport systems and policies. It reframes transport development by acknowledging that while transport promotes economic and social development, rapid motorization and poor transport/traffic planning and management cause a number of problems - including accidents and injury, poor air quality, noise, and congestion - that impact negatively on economic productivity and overall quality of life. Thus, all countries are encouraged to promote efficient and environmentally sound transport systems as well as develop cost-effective policies to control harmful environmental impacts (Secretary of State for the Environment UK, *et al.* (1994)[41])

OECD (2000) has defined environmental sustainable transport system as one where generally accepted objectives for environmental quality (e.g. such as those set forward by the World Health Organization concerning air pollutants) are met, where ecosystem integrity is not significantly threatened and where potentially adverse global phenomena such as climate change and stratospheric ozone depletion are not aggravated. What is worth noting is the stress on the environmental concern of sustainable over the social and economic concerns. This study however views sustainable transport in view of the all the concerns of sustainability together. There is need to look at sustainable transportation in a wholistic manner. Richardson (2005) suggests that by modifying the Brundtland Commission's definition of sustainability for the planet (WCED, 1987), we can derive a definition of sustainable transportation as the ability to meet today's transportation needs without compromising the ability of future generations to meet their transportation needs (based on Black, 1996)[42]. Irrespective of the specific definition of sustainable transportation, there is frequently reference to the "triple bottom line" of economic, environmental, and social equity sustainability. (e.g., World Bank, 1996; Loo, 2002[43]; Schipper, 2003[44]).

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[41] Secretary of State for the Environment UK, et al. (1994), *Sustainable Development: The UK Strategy.* Cm2426, London: HMSO), cited in Barron, B. *et al,* (2002)

[42] Black, W.R., (1996): **Sustainable transportation: a US perspective.** *Journal of Transport Geography* 4, 151–159.

[43] Loo, B.P.Y., (2002): **Role of stated preference methods in planning for sustainable urban transportation: state of practice and future prospects.** *Journal of the Urban Planning and Development* 128 (4), 210–224.

3.8.1 Social Dimension

Grava (2004) has identified the concept of community in the choice for transportation choice. More specifically, the adequacy of operations of transport systems can be looked at from three perspectives, which eventually leads to the selection of a proper response or transportation mode:

- The point of view of the *individual,* which will stress personal attitudes and emphasize usually humanly selfish considerations
- The policy of the *community,* which has to stress the common good and long-range capabilities
- The concerns related to *national* efficiency and well-being

3.8.2 Environmental Concerns

The environmental concerns of transportation issues related to pollution are an important component of sustainable CBD decongestion framework. Table 3-2 is a summary of environmental damage of air pollution, which forms only a single dimension of environmental pollution from CBD decongestion.

Table 3-2: Impacts of Air Pollution to Different Recipients

Pollutant	Source/Course	Impact on			
		Humans	*Vegetation*	*Global Climate*	*Materials*
Carbon monoxide (CO)	incomplete combustion	inadequate oxygen supply; heart, circulatory, nervous system		indirect effect through ozone formation	
Carbon dioxide (CO2)	combustion			major greenhouse gas	
Hydrocarbons (HC–VOC+ methane, isopentane, etc.)	incomplete combustion, carburetion, evaporation	some are carcinogenic; ozone precursor	accumulation in soil, feed, food crops	methane has high greenhouse potential, leads to ozone formation	
Nitrogen oxides (NOx)	oxidation of N2- and N-compounds in	respiratory irritation and other	acidification of soil and water,	NO2 has high greenhouse potential, leads to	weathering, erosion

[4] Schipper, L., 2003. **Sustainable urban transport in the 21st century: a new agenda.** In: Proceedings of Conference: *Transportation, Energy, and Environmental Policy: Managing Transitions*, held in Monterey, CA, 9/11/2001–9/12/01. Transportation Research Board, Washington, DC.

	fuels	problems	over-fertilizing	ozone formation	
Particulates, diesel soot	incomplete combustion, road dust	respiratory damage, various toxic con-tent; may be carcinogenic	reduced assimilation		dirt
Ozone (formed by interaction of other pollutants)	photochemical oxidation with NOx and HC	respiratory irritation, ageing of lungs	risk of leaf and root damage, lower crop yields	high greenhouse potential	decomposition of polymers

Source: OECD (2006) Cited in OECD (2000)

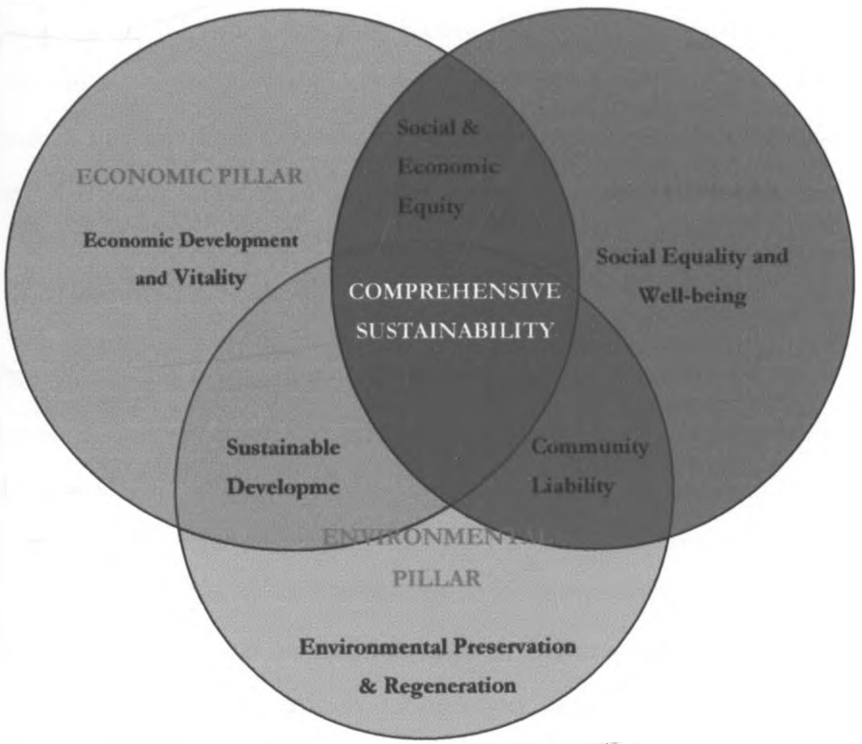
Table 3-2 above shows that the impacts of air pollution are varied on different recipients. OECD (2000) asserts that transport is a substantial and growing contributor to emissions of a variety of greenhouse gases, particularly carbon dioxide (CO_2). This concern has given rise to important international conventions on the reduction of Green-House-Gas (GHG) emissions. According to the most recent Protocol, adopted by the Third Conference of the Parties of the United Nations Framework Convention on Climate Change at Kyoto, Japan, in December 1997, the signatories will seek to realize "the stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interferences with the climate system. A follow-up of the Kyoto Protocol in 2010 failed to *'meet the deal'* because western countries could not yield to demands for them to be more accountable in their GHG production In addition to these, there are different ways through which fossil fuels pollute ground water resources and polymers and rubber products increasing greatly in solid-waste pollution. And the nightmare does not end here.

OECD (2000) further notes that the health and environmental impacts of transport can also be expressed in monetary terms. Basically, the cost estimation is done by calculating direct monetary costs (medical costs or costs of restoring destroyed vegetation), indirect monetary costs (e.g. loss of output due to illness or fatalities), avoidance costs (e.g. costs for catalytic converters or investments in road safety) or "willingness to pay" (e.g. payments to avoid nuisance or a specific type of damage). Most of these costs are not paid by the transport user, i.e. by the motorist paying for petrol or the rail traveller paying a fare. Instead, they are paid by the general taxpayer regardless of his' or her utilization of transport. This situation gives rise to what is often called the "free rider" phenomenon; that is, subsidies from the general public are offered to the transport consumer.

3.8.3 Economic Concerns

Human beings meet their day-to-day needs in the market-place where there is exchange of goods and services. The common characteristic of the market place is that the goods and services have costs attached to them, which are real values (other goods or services in the case of barter) or currency (money). These present the economic dimension that human beings have to deal with, since no individual person, community or even country has the ability to produce all its goods and services. It is a fact, indeed that the economic front, the means for satisfying the various needs and wants, is the centre of conflict between individuals, communities and countries and it also has a temporal dimension. This concern has placed the economy as one of the facets of sustainability. Figure 3-3 below presents the interplay among the social, environmental and economic factors that lead to comprehensive sustainability.

Figure 3-3: Multi-Faceted Nature of Sustainability.



Source: Adapted from Draft ITP for the City of Cape-Town (2006-2011)[15]

[15]City of Cape Town, (2009): *Draft ITP for the City of Cape-Town from 2006-2011* PDF. Unpublished.

3.9 EFFECTS OF TRAFFIC CONGESTION

In addition to the poor functioning of urban transport network, congestion has implications on the efficiency of the private sector to produce and create jobs. A further danger of the malfunctioning urban transport network is the "marginalization" of vulnerable segments of society. In an era of limited resources, it is critical that investment in urban transport be focused at achieving optimal functionality of the urban areas and ensuring supportive dynamic linkages with their hinterlands, while at the same time taking critical account of the urban poor (Aligula, *et al*, 2005).

3.10 POLITICAL ECONOMY OF TRANSPORT IN KENYA

To arrive at a sustainable solution for all transport-related issues in Kenya, it is important to understand the interplay between politics and economics of transport at the macro and micro levels. Foremost, the widely hailed transport sector contributes greatly into the national economy, directly and indirectly. Top of the lot is the fact that Kenya does produce fossil fuels and motor vehicles. Consumption of these high-consumption high cost products and the basic nature of this consumption pitting imports and the ever-elusive foreign exchange and the low GDP levels of Kenya. The most obvious reaction in the attempt to restore order in this sector is that there is every need to cut on the consumption of these highly expensive products that cost the country in terms of billions of dollars.

3.10.1 Road Decongestion Strategies and their Implications

The main response to transportation congestion issues in Kenya, and indeed many third-world countries is usually addition of lanes on the transportation channels. Addition of lanes is itself a knee-jerk quick-fix-populist reaction prescribed by policy-makers. One fact that evades most is the fact that roads expansion in Kenya, and indeed most of these developing countries, is spearheaded by donor funds and resources, and the main donors in this case are the same countries that export the motor-vehicles and the petroleum fuels. Congestion, and indeed its surrogates in the transport sector are fuelled by these intended solutions, thereby aggravating their effects. This cycle on use of the foreign exchange on the ever-increasing demand of these goods need to be brought to a balance

3.10.2 Automobile Ownership

There is continued increase in Kenya of the use and density of automobiles (more vehicles with fewer people in them travelling greater distances over proportionally shorter roads) in relation to transportation sustainability and quality of life. The social dilemma perspective views this trend as

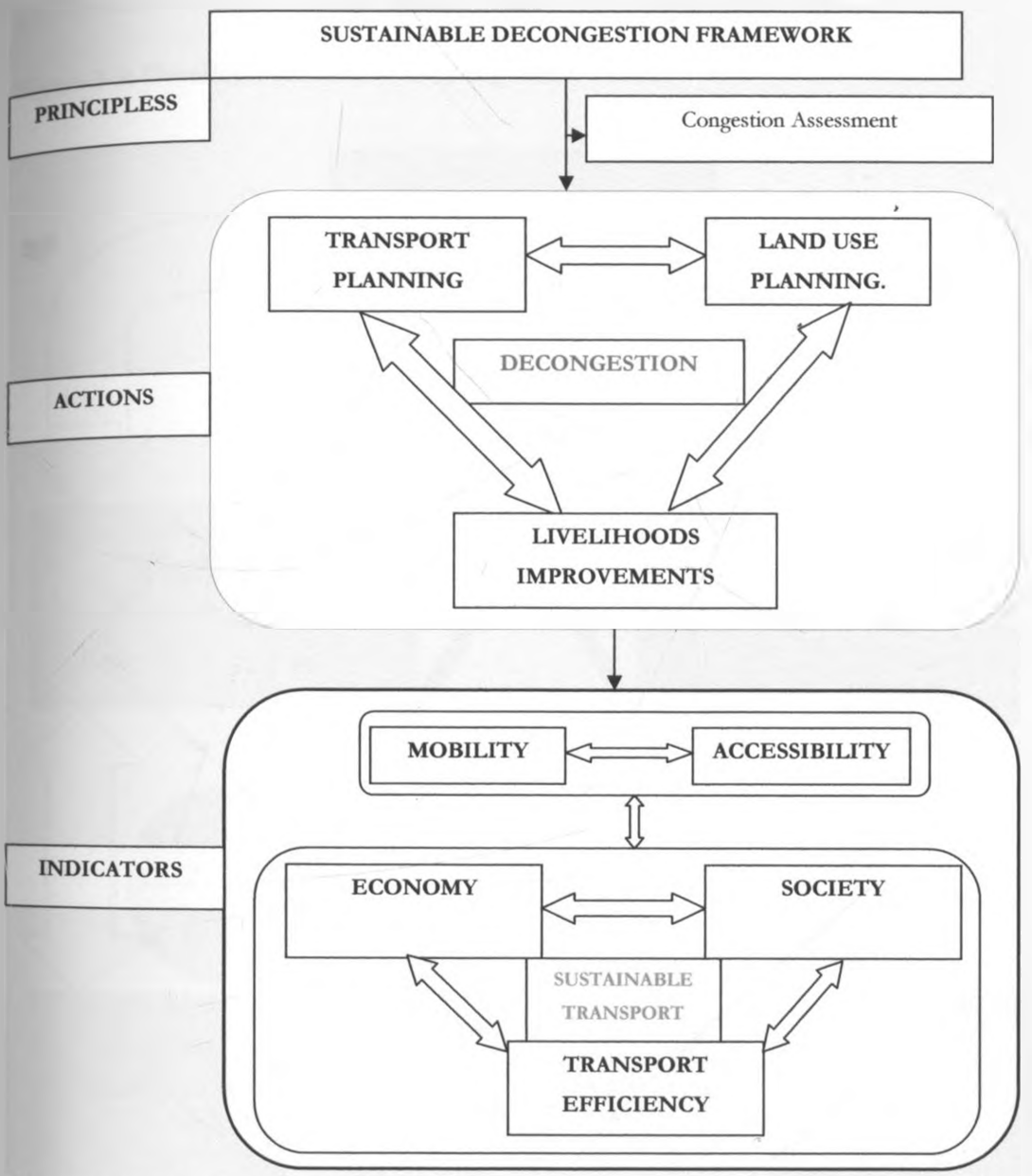
the outcome of an unfortunate preference for short-term gains by car users at the cost of long-term losses to society (Steg and Gifford, 2005)[46] In Kenya this is a fact that automobile ownership is a symbol of progress in society. It therefore emerges as a general thumb rule that as incomes grow and families move into middle and high classes, their automobile ownership must befit their new acquired status. This could be viewed more broadly that they buy themselves into personal luxury and comfort, but the society into congestion with its attendant consequences.

3.11 CONCEPTUAL FRAMEWORK

Ever since the *Brundtland Commission* (WCED, 1987) crystallized the concept of SD, sustainability has remained a password to mega studies in Planning, Engineering, Social Sciences, and in many fields, and rightfully so. The earth has seen in the wake of the 21st century catastrophes of varying proportions emanating from unsustainable use of resources by the ever increasing numbers of human beings and their many needs. This has called to the shift in human thinking in terms of what constitutes development. Planning has henceforth been viewed as a practice which must be sustainable in its thinking, lest planners plan for the existing populations to exhaust available resources. The same has also applied in stream-lining the contents of plans to take care of the three pillars of sustainability as identified by UNCED (1987), being environment, society and economy. Sustainable Decongestion of ECBD is based on a Sustainable Decongestion Framework (SDF) (Figure 3-4). SDF is a framework that looks at transport sector from the lens of SD. It looks at the various elements that define activity patterns of ECBD, and applies the elements of SD in their analysis.

[46] Steg, Linda and Robert Gifford, (2005): **Sustainable transportation and quality of life** in *Journal of Transport Geography 13 (2005) 59–69:* Elsevier.

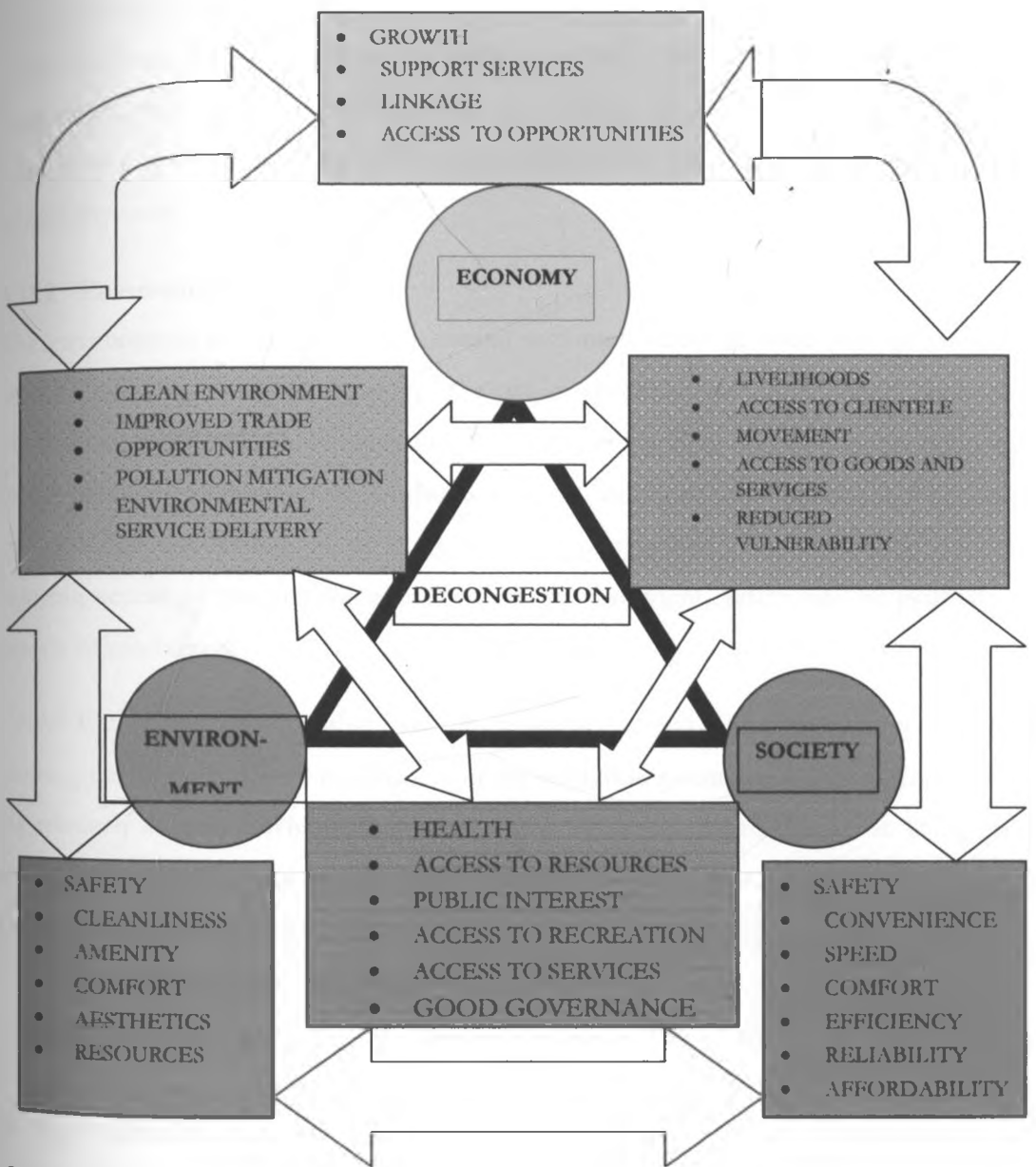
Figure 3-4: Conceptual Model



Source: Author's Construct, 2010

SDF is a 3 tiered framework that looks at analysis of decongestion based on the principles of SD, the availability of different courses of action that will attend to the identified issues, weighed against the expected outcomes/outputs. Figure 3-5 provides a detailed SDF model.

Figure 3-5: Detailed Sustainable Decongestion Model



Source: Author's Construct, 2010

3.11.1 Society

Space use in any context of urbanization is influenced by human activities. The interaction of people with space defines the life of the people. In the ECBD, the aim of decongestion is not to break the social arrangements of the people who interact with the ECBD, including residents of Eldoret Municipality, tourists, passengers and goods in transit, and the whole hinterland that depends on Eldoret Town, but to improve the gains from the interaction. Considering all the causes of congestion, the mitigation of decongestion should in reality reflect on the people's safety, convenience, speed of mobility, efficiency, reliability and affordability of goods and services, as well as mobility costs.

3.11.2 Environment

The environment is the sum of all natural and man-made features that surrounds an individual object (including man) comprising the wide spectrum of both biotic and abiotic factors. Man/society obtains its necessities for day-to-day living from the environment. In this regard, for the environment to produce its goods and services well, man must protect it. As human populations approach the environmental carrying capacity[47] congestion arises, and there is strain related to enjoying access to the environmental goods. Environment, safety and accessibility are three key aspects of road travel.

UNWCED (1987) observe that environmental stress has often been seen as the result of the growing demand on scarce resources and the pollution generated by the rising living standards of the relatively affluent. Where economic growth has led to improvements in living standards, it has sometimes been achieved in ways that are globally damaging in the longer term. Much of the improvement in the past has been based on the use of increasing amounts of raw materials, energy, chemicals, and synthetics and on the creation of pollution that is not adequately accounted for in figuring the costs of production processes. These trends have had unforeseen effects on the environment. Thus today's environmental challenges arise both from the lack of development and from the unintended consequences of some forms of economic growth. According to UNEP *et al*,

[47] Carrying capacity (CP) here is viewed as the number that a unit area of environment that it can comfortably support without there-arising a crisis. Its application here bears in mind the fact that land use planning and other human interventions as architecture and engineering can influence the environmental carrying capacity of towns and human settlements.

(2010)[48] the transport sector is both an engine of economic growth and a major source of CO_2 and non-CO2 emissions: Road transport accounts for 17% of global CO_2 emissions (73% of total transport-related emissions) and 70-90% of air pollution in urban areas. This calls for the environmental CP to be adjusted upwards or for the density of activities to be reduced, which would both translate to decongestion. Decongestion of the ECBD here is viewed as attempts focusing on an environment that is safe, clean, healthy, and beautiful, rejuvenating and one that provides its resources without pressure.

3.11.3 Economy

To meet their day-to-day needs, human beings engage in different activities that enable them achieve the means. In the most rudimentary sense, these activities involve manipulation of the various natural environmental provisions like land to produce food, shelter, clothing, etc. In the case of urbanization, it involves interaction among different human beings in trade (commerce), manufacturing, service provision (including transportation, banking, administration, etc.) But when the quest to achieve economic development of the people becomes hampered by such factors as unemployment, exacerbated by population pressure, environmental degradation, among others, human beings innovate novel ways to meet their daily needs. This takes place, especially in the unregulated informal sector. In the ECBD, the informal sector has encroached open pavements, pedestrian walkways, and shop-fronts. A decongestion of this should not disturb these peoples' livelihoods. SDF aims at improvements of the livelihoods, access to business areas, clientele/customers, improved mobility, access to goods and services, among others.

SDF presents a detailed tool for analysis of environmental, social and economic elements of human activities in the ECBD. To push the set agenda to completion, the traditional Transportation Planning Methodology is employed. The solution to the various problems leads to the anticipated strong-points.

3.12 OVERVIEW OF TRANSPORTATION PLANNING PROCESS

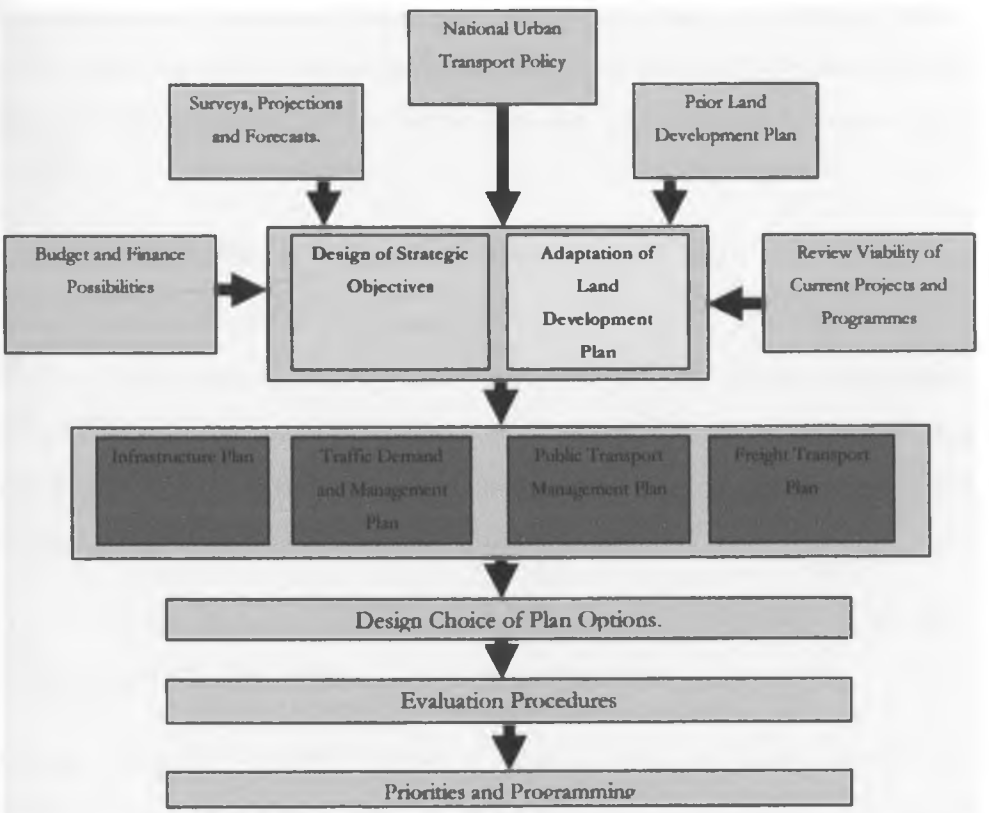
Of the second tier (ACTION) inputs, the urban transportation planning process (Figure 3-6) is taken as the vehicle for achievement of objectives. To analyze the sufficiency of existing transportation networks involves investigation of persons and goods movement on one hand, and

[48] United Nations Environmental Programme and FIA Foundation (2010): *Share the Road: Minimum of 10% Finance for Safety, Environment and Accessibility.* Nairobi: UNEP

the transportation facilities (Chapin. 1972). These two present the facts and parameters necessary for transportation planning.

The transportation planning process ties with the decongestion methodology. It integrates the various profiling data collection methods, physiographic analyses, literature review of various development plans, integrated urban transport policy, surveys and projections and other analyses like institutional and legal framework. The outcome of the analyses gauged against the reality of demands leads to preparation of infrastructure plan, traffic demand and management plans, public transport management and freight management. But in the framework of SDF, the other elements of ACTION tier like livelihoods strategy and land use planning in general. However, in light of the Decongestion of ECBD, this study focuses on the transportation planning element, and in the place of land use planning and livelihoods improvement, applies urban design on transportation planning. This then leads to evolution of various design options and finally the action plans.

Figure 3-6: Process Framework for Urban Transportation Planning



Source: Gakenheimer, 2008.

Law is order, and good law is good order.
Aristotle (384 BC - 322 BC)
Politics

CHAPTER 4: LEGAL, POLICY AND INSTITUTIONAL FRAMEWORKS

4.0 OVERVIEW

Planning in Kenya takes place within a wide policy, legal and institutional framework. Legal frameworks are spelt out in the Constitution of Kenya and in a myriad Acts of Parliament. Government Policies are spelt out through sessional papers, national, regional and local development or strategic plans, and other policy documents and laws. Institutions play a crucial role as agents of development (Ngau and Mwangi, 2003 eds.)[49]. This chapter highlights the various legal, policy and institutional framework, at the national and regional scales, affecting land use planning in Eldoret, and transportation planning issues in particular. In so doing, this chapter seeks to lay bare the strengths that planning, and transportation planning have that emanate from the laws, and the weaknesses presented by the laws, and to define how the strengths can be accentuated while the weaknesses ameliorated.

4.1 LEGAL FRAMEWORK (OVERARCHING STATUTES)

4.1.1 The Local Government Act (Chapter 265)[50]

The key role of local government is to implement approved physical development plans. *Section 166* of the Local Government Act states that every city Municipal, county, town or urban Council subject to any written law relating there to, prohibits and controls development and use of land and building in the interest of proper and orderly development of its area.

Section 162 (9) of this act empowers the local authority to control or prohibit sub division or cutting of land or sub division of existing building plots into smaller areas.

Section 166 provides that every Municipal Council, County Council or Town Council may, subject to any other written law relating thereto, prohibit and control the development and use of land and buildings in the interest of the proper and orderly development of its area.

[49] Ngau P.M. and Mwangi I.K. (2003 eds): *Nyandarua District Regional Development Plan, 2001-2030: An Integrated Plan for Regional Development.* Nairobi: UNCRD Africa Office.
[50] Kenya, Government of (1948). *Local Government Act (Chapter 265).* Nairobi: Government Printers

Also, the act empowers the local authorities to make by laws desirable for maintenance of a safe and healthy environment for human habitation in their areas of jurisdiction; provision of other forms of infrastructure is also placed in the domains of the local authority e.g. Provision of roads, electricity etc, and to promote housing development. Municipal Council of Homa Bay will undertake these as appropriate

4.1.2 The Physical Planning Act (Chapter 286)[51]

This act makes provision for the preparation of a physical development plan. The act empowers the director of physical planning under *Section 24 (1)* to prepare in reference to any government trust or private lands within any area of jurisdiction of a city, municipal, town or urban council, or with reference to any trading or market centre a local physical development plan.

Section 29 of the act states that subject to the provisions of this Act, each local authority shall have power:

1. to prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area
2. to consider and approve all development applications and grant all development permissions.

Section 30(1) directs that no person shall carry out development within the area of a local authority without a development permission granted by the local authority under *Section 33.*

Section 31(a) indicates that for purposes of development control, and to ensure compliance to the various regulations as there may be in a respective local authority, a person requiring development permission shall make an application in the form prescribed in the Fourth Schedule (PPA1), to the Clerk of the local authority responsible for the area in which the land concerned is situated.

Section 33 (1) grants the local authority powers to grant permission for development, or refuse to grant permission to an application under Section 31,depending on whether the application of the development satisfies the regulations set for developments or not.

[51] Kenya, Government of (1996). *Physical Planning Act.* Nairobi: Government Printers.

4.1.3 Environment Management and Coordination Act (EMCA) of 1999

EMCA (1999)[52] is an act of parliament that concerns itself with matters of preservation and conservation of the environment. The act was promulgated in 1999 but became operational in 2000. *Part 2* of the EMCA provides general principles which include the entitlement of every person to a clean and healthy environment. Such entitlements include access to segments of the environment for recreational, educational, health, spiritual and cultural purposes. *Part 4* of the Act provides for preservation and conservation of the environmentally significant areas, protection of coastal zones, and protection of the ozone layer.

Provisions for environmental quality standards are given under *section 8*. In addition to air pollution control standards, provisions touching on air pollution are outlined. Any person contravening the provisions of this act shall be guilty of an offense and liable for a term not exceeding two years or a fine not exceeding one million shillings or both. A person found guilty shall in addition to the sentence imposed, pay costs for removal of the pollutants, including costs for restoration of the damaged environment as well as third party compensation as may be determined by the court in favour of those applying. *Sub-section 93* of *section 8* prohibits discharge of substances, chemicals and materials or oil into the environment and makes the polluter liable for such offenses.

4.1.4 Transport Licencing Act (TLA) Cap 404[53]

The TLA is an act of parliament to provide for the coordination and control of means of and facilitates for transport. *Section 3 (a)* provides for the establishment of a Transport Licencing Board (TLB) for the enforcement of this Act. For Road Transport, *Section 4* provides for the conditions of licences for the operation of motor vehicles on the roads in Kenya. In *Section 5*, the TLA stipulates for the types of licences that vehicles in Kenya, they being passenger vehicles and goods vehicles and attracting different conditions for their operations.

Section 7 provides that the Licensing Authority (TLB) shall have full power in its discretion either to grant or to refuse any application for any licence, or to grant a licence subject to such conditions as it may see fit to impose, and, in exercising its discretion, the Licensing Authority shall have regard primarily to the public interest, including the interest or interests of persons requiring, as well as those of person providing facilities for transport, and to such other matters as may be prescribed:

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[52] Kenya, Government of (1999). *Environmental Management and Coordination Act.* Nairobi: Government Printers.
[53] Kenya, Government of (1955). *Transport Licencing Act.* Nairobi: Government Printers.

Provided that the Licensing Authority shall, before granting any road service licence in respect of any vehicle or vehicles for the carriage of passengers from, through or into, the area of jurisdiction of any county council or municipal council, consult and have regard to the wishes of such council respecting the place or places in the area of such council at which the vehicle may stop or start and the route to be taken by such vehicle.

Under the provisions of this act, the MCE therefore has a window to be allowed by the TLB to make special recommendations based on the requirements of the classes of vehicles they would allow to enter the ECBD.

4.1.5 Traffic Act Cap 403[54]

The Traffic Act is an Act of Parliament to consolidate the law relating to traffic on the road. *Section 3* of this Act stipulates the procedures for appointment the Motor Vehicles Registrar who would be responsible for registration and licensing of motor vehicles and trailers and for the licensing of drivers, and for the keeping of such records in relation thereto as are required by this Act. *Section 5* provides that:

1. The Registrar shall keep records of all motor vehicles and trailers registered in Kenya, and shall cause every licensing officer to keep records of all vehicles registered by him.
2. Vehicle records maintained by the Registrar or a licensing officer shall be open for inspection by any police officer, any collector of customs and the chairman of the TLB, who shall be entitled to copy any entry in such records free of charge.
3. Any person who satisfies the Registrar that he has reasonable cause therefore shall be entitled on payment of the prescribed fee to a copy of any entry in such vehicle records.

Other provisions of the Traffic Act pertains to licensing of motor vehicles, issuance of driving licences, and highlights offences relating to the use of vehicles on the roads which includes regulations for speeds of motor vehicles o the road, driving under influence, reckless driving, use of proper fuels, obeying signals and signs, offences of vehicles relating to parking, etc. *Part VI* relates to the Regulation of traffic vested in the police including the Highway Codes, power to relate traffic, traffic signs, etc. *Part VI A* provides for designation of parking facilities, including powers of Las to formulate by-laws related to parking, duties and responsibilities of local authorities for provision and charging of levies for the use parking facilities as well as powers to lay by-laws for parking elsewhere

[54] Kenya, Government of (1954). Traffic *Act*. Nairobi: Government Printers.

other than in towns and to lay penalties for parking in areas not designated by the LAs. Part VII stipulates regulates governing accidents, including power to stop and report accidents, inspection of vehicles involved in accidents, and penalties related to this. Part VIII relates to suspension, cancellation and endorsement of driving licences. Part XI relates to offences by drivers of vehicles other than motor vehicles and other road users, etc.

The Traffic Act Cap 403 is a very comprehensive piece of legislation that carries the whole road transport sector. It brings on board different actors including Motor Vehicle Registrar, the Kenya Police, the Las, among others. It provides the MCE with a powerful legal tool to regulate issues of traffic within its jurisdictional areas, recognizing its role for the provision of parking facilities, etc. However, a major short-coming is that till now the MCE hasn't taken it upon itself to prepare a set of its own parking-by-laws and have them gazetted as subsidiary legislation which would make them more powerful on issues of regulation.

4.1.6 Kenya Roads Act Cap 2 of 2007

The Kenya Roads Act is an act of parliament to provide for the establishment, powers and functions of the Kenya Roads and for connected purposes. Section 9 of this act establishes the Kenya Uran Roads Authority (KURA) which will be responsible for all matters connected with public roads in urban areas.

4.2 POLICY CONTEXT

To be effective, a transport policy must satisfy three main requirements: i) creating incentives for efficient response to needs, ii) promoting more livable settlements and reducing adverse external effects, and iii) reducing poverty (Wasike 1995a, Wasike, 2001)[55]. To achieve this, the policy must fulfill three requirements. First it must ensure that a continuing capability exists to support an improved standard of living. This corresponds to the concept of economic and financial sustainability. Second, it must generate the greatest possible improvement in the general quality of life, and not merely an increase in traded goods. This relates to the concept of environmental and ecological sustainability. Third, the benefits that the transport service produces must be equitably shared by all sections of the community. This is often termed social sustainability (Wasike, 2001).

[55] Wasike, WS.K. (2001): *Road Infrastructure Policies in Kenya: Historical Trends and Current Challenges.* KIPPRA: Working Paper Number 1.

Economic, social and environmental sustainability are often mutually reinforcing Road or public transport systems that fall into disrepair because they are economically unsustainable fail to serve the needs of the poor and often have environmental consequences. Hence, there is need for policy instruments that serve all dimensions of sustainability in a synergistic way, generating 'win-win' solutions. (Munasinghe, 1993, Wasike, 2001). Broadly speaking, Rodrigue (2009) buttresses this argument by defining public Policy as the means by which governments attempt to reconcile the social, political, economic and environmental goals and aspirations of society with reality. These goals and aspirations change as the society evolves, and thus a feature of policy is its changing form and character. Policy has to be dynamic and evolutionary. Transport policies arise because of the extreme importance of transport in virtually every aspect of national life. Transport is taken by governments of all types, from those that are interventionist to the most liberal, as a vital factor in economic development. Transport is seen as a key mechanism in promoting, developing and shaping the national economy. This section highlights the public and transport policy issues that affect road transport in Kenya. According to Wasike (2001), generally, commitment to a strategic and broad-based approach to transport planning is often gauged by examining the extent to which a country's roads policies are based on the following fundamental criteria:

- Integration—ensuring that all roads decisions are taken in the context of a coherent, integrated transport policy covering all modes
- Accessibility—making it easy to reach the places we wish to get to
- Safety—making travel safer
- Economy—getting good value for money and supporting sustainable economic activity in appropriate locations
- Environmental impact—both positive and negative, on both the built and the natural environments, and at the global, regional and local levels
- Tackling road congestion

In Kenya, there are various legislative and policy instruments in place to deal with the above issues. To these objectives, Wasike (2001) adds that dealing with road congestion is another important aspect of roads policies. A strategy has to be developed on both economic and environmental grounds to deal with increasing congestion. Measures to reduce the need to travel and to attract demand to other modes of transport have to be considered in the wider approach to an integrated

transport policy. Three potential options exist for responding to the predicted increase in congestion on trunk roads:

- Making better use of existing road infrastructure
- Managing demand for travel by road
- Creating new infrastructure

The options are not mutually exclusive. They could be mixed, and different mixes may be suitable to different locations. All options need to be weighed against the implications of doing nothing and allowing the increasing congestion to influence road users' decisions on when, how and whether to travel. Some of the policies and broad strategies that impact on the road transport sector include:

4.2.1 The Kenya Vision 2030

Kenya Vision 2030 (Kenya, 2008)[56] is a GoK national development blue print covering the period 2008-2030. It aims at making Kenya a newly industrialized middle income country by the year 2030 providing high quality of life to its citizens by the year 2030. The Vision is anchored on three pillars;

(a) The **Economic Pillar** which aims at improving the prosperity of all Kenyans through a transformation programme covering all regions of Kenya, with an average (Gross National Product) GNP growth of 10% per annum,

(b) The **Social Pillar** which seeks to build a just and cohesive society with a social equity in a clean and secure environment, and

(c) The **Political Pillar** which aims at realizing a democratic political system that nurtures issue-based politics respects the rule of law and protects all the rights and freedoms of individuals

With respect to the transport sector, there emerge several areas of interaction with the Kenya Vision 2010. On the economic front, the transport sector is not only a mover in its literal sense, but also a prime mover of the economy, contributing significantly to the GDP. Socially, transport systems link or separate societies with each other, besides affecting (negative or positive) the lives of the people. And the political pillar highlights essence of a robust legal and institutional framework to govern the transport sector, pushing towards protection of all the stakeholders in the transport sector including the users, operators and the managers. On the whole, the environmental dimension manifests itself

[56] Kenya, Republic of, (2008): *Kenya Vision 2030*. Nairobi: Government Printers

across all the 3 pillars. A sustainable environment plays a great role for economic growth, social development and political stability, in ways direct and indirect.

4.2.2 The Physical Planning Handbook (2008)

The Physical Planning Handbook, 2002, provides guidelines for the preparation and implementation of physical development plans. It is meant for use by physical planners, land administrators, local authorities and other relevant personnel and institutions responsible for guiding and controlling the use and development of land in Kenya.

The objectives of this handbook include provision of understanding and uniformity in the following planning, development control and development co-ordination tasks:

- Preparation of physical development plans for both rural and urban areas, (chapter one);
- Provision of equitable levels of socio-economic facilities and services, (chapter two);
- Consideration of development applications, (chapter three); and
- Development co-ordination (chapter four).

The handbook is largely as a reference for the preparation of local and regional physical development plans; guidance of the use and development of land; and administration procedures involved thereto. This is due to Kenya's dynamic environment, diverse physical and socio-economic conditions and political changes.

4.2.3 Strategic Urban Development Plan for Eldoret

The SUDP for Eldoret was prepared by the GoK through the work of planning consultants Syagga and Associates, contracted to perform the task. The SUDP is meant to respond to the need by the municipality to improve the environmental amenity, housing and settlements in the municipality, commercial areas and trade, transportation as well as improve its investment climate. SUDP for Eldoret is a document whose time is long over-due, and its mandate is tailored to respond to the needs and improve its strengths.

4.2.4 The Integrated National Transport Policy (2010)[57]

The Draft Integrated National Transport Policy on urban transport recognizes the following, among others, as the major challenges in Urban Transport in Kenya:

[57] Kenya, Republic of (2010): *White Paper on the Integrated National Transport Policy.* Nairobi: Transcom House. Unpublished.

i). Inappropriate policy integration and coordination of transport planning and land use planning;

ii). Poor institutional frameworks for urban land use policy and traffic management;

iii). Lack of adequate human resource capacity and capital resource deficits within local authorities;

iv). Increased journey times, often due to transport system deficiencies and urban sprawl;

v). An inadequate information base for planning action due to low investment in urban transport research;

vi). Poor state of transport infrastructure increasing cost of transport operations;

vii). There is increasing health problems associated with traffic related pollution in the urban environment.

Other challenges include unsupportive legal or regulatory framework to address emerging transport issues; lack of recognition of problems and commitment to solving problems at the political level; and difficulty in providing for individual attitude, behaviour and choice in both users and decision makers.

The draft policy recommends, among others, the following policy intervention areas for Urban Transport:

i). Optimal Planning and Provision of Transport Services to include both MT and NMT modes; dedicated bus lanes; options for mass transit; off-street parking and restriction on private car ownership and use; transport control and management.

ii). Enhancing Transport Safety and Security: vehicle standards; inspection; street lighting; interventions accident prevention and black-spot improvement programmes; .

iii). Competition and Complementarities between different transport modes: give priority to mass transit; development of facilities for all modes; appropriate pricing regime for urban transport.

iv). Institutional Capacity building: Create staff and equip Transportation Units within the Engineering Departments in Municipalities.

v). Mitigating Environmental effects of transport: storm water drainage; planting of trees; paving of roads; and reducing congestion through use of PT and traffic management.

vi). Legal, Institutional, and Regulatory Framework for Transport: By-laws to regulate transport operations.

vii). Mobilization of private sector funding for infrastructure; prioritise transport infrastructure funding from budgets.

4.2.5 Sessional Paper Number 6 of 2006[58]

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 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.

4.3 INSTITUTIONAL FRAMEWORK

The concept of institution can be viewed from the internal patterns of behavior and ways of working, as well as the collective values, knowledge, and relationship that exist within any organization in society. Institutions signify rules, norms and codes of conduct structuring interaction

[58] Kenya, Republic of (2006): *Sessional Paper Number 6 of 2006.*

among individuals, firms and organizations (actors) at one or several scales, providing opportunities, constraints for interaction outcome (Rader Olsson 2008)[59].

4.3.1 Kenya Urban Roads Authority (KURA)

Kenya Urban Roads Authority (KURA) as established by the Kenya Roads Act, 2007 is mandated with the responsibility to manage, develop, rehabilitate and maintain all public roads in cities and municipalities in Kenya. *Section 9* of the Kenya Roads Act of 2007 provides that the KURA shall:

1. Have the responsibility for the management, development, rehabilitation and maintenance of all public roads in the cities and municipalities in Kenya except where those roads are national roads.
2. For the purposes of discharging its responsibility under *sub-section (1)* the Authority shall have the following powers and duties –
    a. constructing, upgrading, rehabilitating and maintaining roads under its control;
    b. controlling urban road reserves and access to roadside developments;
    c. implementing roads policies in relation to urban roads;
    d. ensuring adherence by motorists to the rules and guidelines on axle load control prescribed under the Traffic Act and under any regulations under this Act;
    e. ensuring that the quality of road works is in accordance with such standards as may be defined by the Minister;
    f. in collaboration with the Ministry responsible for transport and the Police Department, overseeing the management of traffic and road safety on urban roads;
    g. monitoring and evaluating the use of urban roads;
    h. planning the development and maintenance of urban roads;
    i. collecting and collating all such data related to the use of urban roads as may be necessary for efficient forward planning under this Act;
    j. preparing the road works programmes for all urban roads;
    k. liaising and coordinating with other road authorities in planning and on operations in respect of roads;
    l. advising the Minister on all issues relating to urban roads; and

[59] Rader Olsson, A. (2008): *Planning Metropolitan Regions: Institutional Perspectives and the Case for Space:* Doctoral Thesis. Stockholm: Royal Institute of Technology.

m. performing such other functions related to the implementation of this Act as may be directed by the Minister.

The establishment of KURA would be seen as a step towards taking the burden of provision, maintenance and management of roads infrastructure from the shoulders of LAs.

4.3.2 Municipal Council of Eldoret (MCE)

The MCE was established through Legal Notice No. 515 of 1958. Its mandate is given in the Local Government Act Cap 265.

As has been identified previously, CAP 265 of the laws of Kenya mandates local authorities to provide numerous services to residents under their areas of jurisdiction. The law allows councils to provide services that are mainly unique to particular socio-economic activities of an area. The council therefore , as established , maintains and controls markets, bus park, fire brigades, streetlights, cemeteries, social rental houses, access roads, nursery and primary schools, public conveniences, sports stadia, recreational parks and trees, health agency to undertake services with the Ministers approval.

The MCE has the main mandate of providing services to the Municipality, including service provision and planning of the areas within its 147 square kilometers.

4.3.3 Other Institutions Created by the Array of Acts and Policies.

Enforcement of certain acts of parliament require establishment of key institutions by the acts of parliament. Various acts have within them key institutions which it would be difficult to talk about and ignore, and while they should be identified singly as institutions, their mandates expressly come out in the highlight of the legislations. The institutions within transportation environment identified in the acts include:

- NEMA, created by EMCA (1999)
- Office of the Director of Physical Planning, otherwise referred to as Department of Physical Planning, created by the PPA (1996)
- TLB, established by TLA (Cap 404)
- Ministry of National Planning and Vision 2030, responsible for implementing the landmark Vision 2010, among others.

CHAPTER 5: STUDY FINDINGS.

5.0 OVERVIEW

This chapter presents the study findings of the field survey held in the Eldoret Municipality between April 2009 and May 2010. It is about the characteristics of the Eldoret Municipality that would impact on congestion or decongestion of the ECBD, comprising an analysis on transportation situation in the ECBD, commercial activities and parking situation, as well as an overview of felt environmental issues, the importance of which helped in understanding the dimensions of the congestion problems which when pitted against literature review subsequently aided in formulating Sustainable CBD Decongestion.

5.1 BASELINE INFORMATION

5.1.1 Respondents' Bio-Data

Field survey findings indicate that the majority of those engaged in eking out their living in the ECBD are in the informal commercial sector. According to the survey, 52% of the respondents are engaged in informal trade that occupies spaces in sites not designated for their operations. According to Figure 5-1, 50% of the respondents are youths between 18 and 30 years, and a whopping 92% below the age of 50. This means that mainly the people engaged in trade and other activities are youths. 42% of the respondents interviewed are females implying that the employment sector in the ECBD caters for both males and females in nearly equal measure (Figure 5-2). Urban activities have been dominated by males in the past, but more and more women are coming in.

Figure 5-1: Age of Respondents

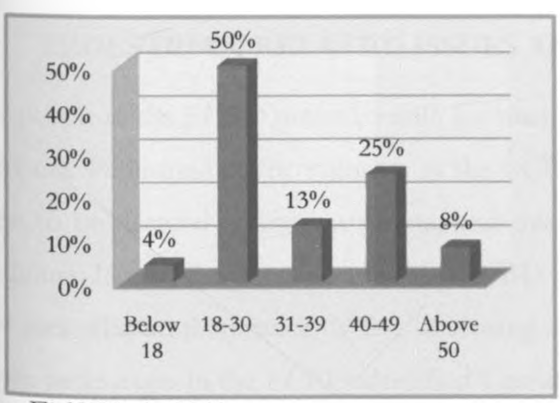
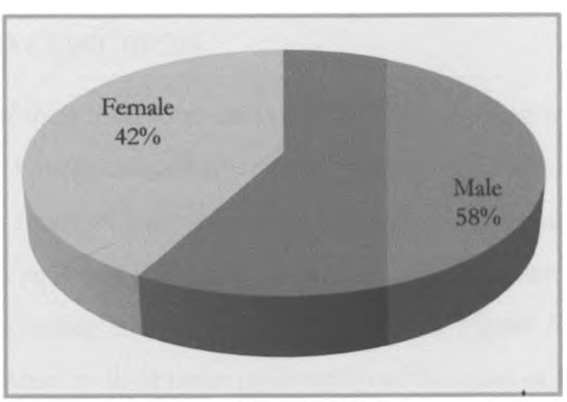


Figure 5-2: Gender Distribution

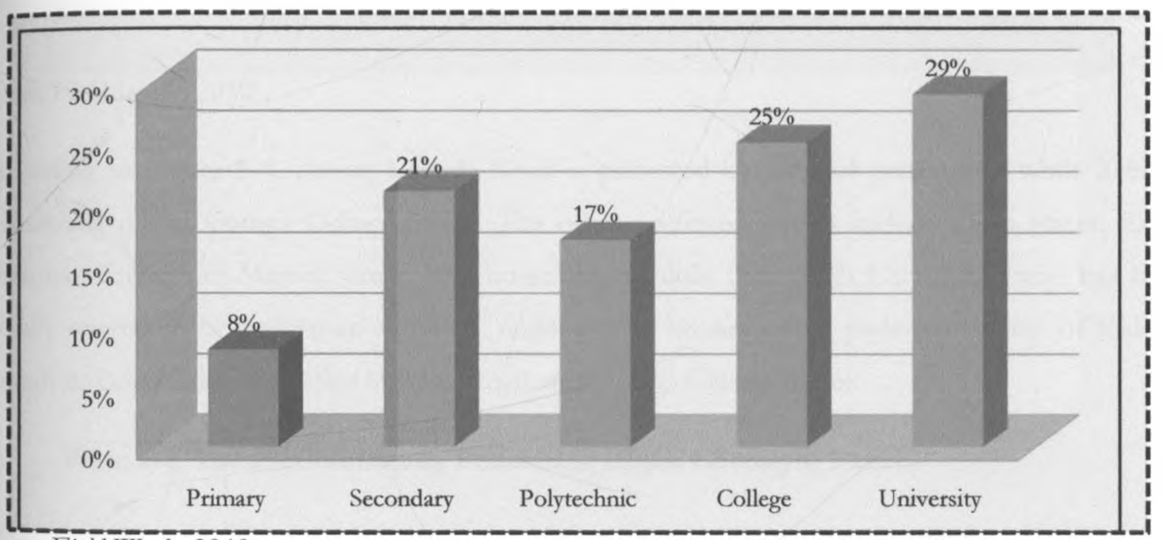


Source: Field Work, 2010.

5.1.2 Levels of Education

The levels of education of owners of enterprises interviewed in the ECBD indicate that the people who eke their living in the ECBD are mainly a literate lot. According to the findings, 29% have university education and 25% have college education (Figure 5-3). Only 8% have primary education and below. It is in light of the fact that Eldoret is also viewed as an educational town, being home to several institutions of higher learning. This is in concord with the view that the educated are more apt to adapt to urban life, and despite owning land elsewhere, they are still attracted to urban life. The hope is to be engaged in white and blue-collar jobs, but in the absence of formal employment, they engage in trade. And because doing formal business may be prohibitive because of the high costs, most find themselves locked in the informal sector of business.

Figure 5-3: Respondents' Levels of Education



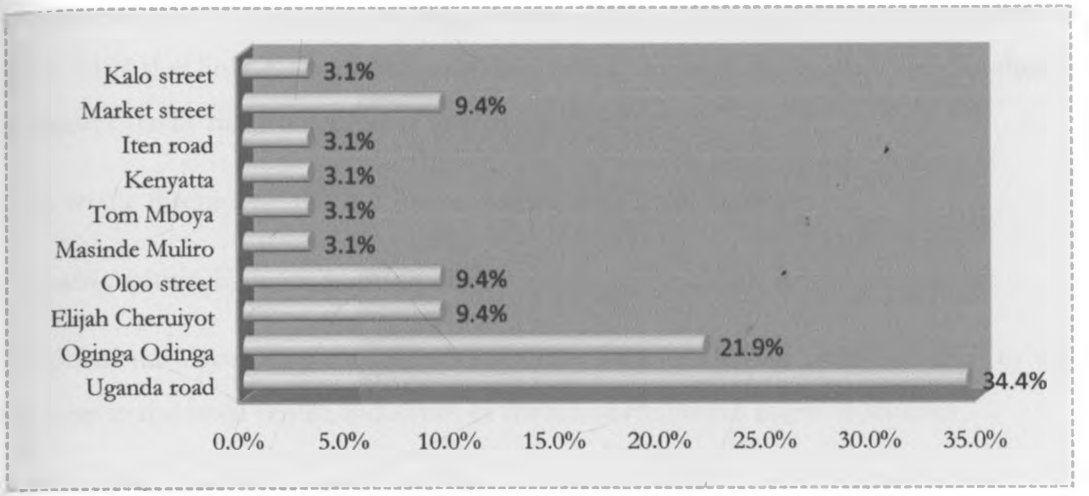
Source: Field Work, 2010.

5.2 PEDESTRIAN RELATED ISSUES AND CONCERNS

Most people in the ECBD prefer to walk for many of their local journeys, i.e. to work, shopping and for leisure. Pedestrian traffic volumes in the ECBD have increased over time, making some urban streets to be deemed pedestrian streets, and this is mainly observed in the morning and evening rush-hours. Indeed the importance of the ECBD has emerged as a strong node, giving it dominancy in an area where urbanization is fast increasing. According to the survey (as shown in Figure 5-3 below), pedestrians in the ECBD identified Uganda Road as their most preferred road because of its linkage to most destinations, followed by the Oginga Odinga Road in the opposite direction. It is

important to note that though they pass through the ECBD, these two roads are classified roads, not urban roads.

Figure 5-4: Dominance of Pedestrian Streets



Source: Field Survey, 2010.

According to Figure 5-4, above, Uganda Road is preferred by 34% of pedestrians while 21% of pedestrians prefer Oginga Odinga Street. The other preferred streets include Oloo Street, Elijah Cheruiyot Street and Market Street. It is interesting to note that Elijah Cheruiyot Street has been literally overtaken by pedestrian activities, making it an unannounced pedestrian street of Eldoret though its dominance rank after Uganda Road and Oginga Odinga Street.

Plate 5-1: The Predominantly Pedestrian Elijah Cheruiyot Street.

Source: Field Work, 2010

5.3 TRANSPORT SITUATION IN THE ECBD.

5.3.1 Trip Generation

ECBD is the unquestioned headquarters of the North Rift. Its importance at the centre of a rich agricultural hinterland, its hierarchy among centres and its strategic location on the international trunk road A104 that links Kenya to Uganda, and further to Rwanda, Burundi and Southern Sudan, attracts massive traffic numbers to the centre of the town.

In general, traffic through ECBD can be categorized into 3 main groups:

a) Traffic within Eldoret Municipality

This comprises the day-to-day transportation in the municipality that integrates trips to work and business areas in the town centre, industries or from one residential estate to another

b) Traffic from the hinterland of Eldoret

Eldoret being an important centre in the agricultural corn-belt of North Rift, as well as other resources of national importance like tourism, education, transportation, etc., attracts the peripheral populations to its centre for a reason or two. These include purchase of farm implements, sale of agricultural inputs, recreation, among others.

c) Traffic to and from other main owns,

The relationship of Eldoret as a centre of national importance need not be overemphasized. The existence of forces of attraction between Eldoret and Nairobi, Kisumu, Nakuru, Kitale, among others makes the transport routes between Eldoret and these towns and cities very busy.

Plate 5-2: Intermodal Conflict long Kisumu Road

Source: Field Survey, 2009.

Plate 5-2 above shows the Eldoret-Kisumu class B Road, a regional road that carries different modes of transport, but serving as an urban area in the context above, carrying pedestrians, matatus, oil tankers, heavy commercial vehicles. The pedestrian sidewalks are enhanced by different by such facilities as the rubbish bin for waste-management within the transportation system.

d) Through Traffic

This is mainly traffic that passes through Eldoret to other destinations of national and international importance like Webuye, Kitale, Kampala and beyond. This type of traffic mainly comprises long distance travel buses and trucks for transit goods. Because Eldoret is on the way of such traffic, motorists are tempted to make a major stop-over for various services including repairs, rest and restocking of supplies.

5.3.2 Trip Distribution

Trips in Eldoret are distributed among various routes, with most traffic headed into or out of ECBD. Table 5-1 below explores the use of various roads to in the fulfillment of a trip.

Table 5-1: Trip Distribution on Various Roads in Eldoret Municipality.

Road	Frequency
Nandi Road	11
Ziwa Juction Road	2
Iten Eldoret road	26
Kapsoya SOS Route	8
Munyaka Hawaii	2
Uganda Road	25
Kaptagat Route	4
Mitaa Road	5
Eldoret-Kapsabet Road	9
SDA Road.Mti Mmoja	1
Eldoret-Kuinet Road	1
Kisumu Road	6
Elgeyo Road	7
Baharini Turbo Highway	2

Malel	1
Outspan MCC	3
Nakuru Eldoret Road	13
Annex Kcc mtrh	6
Langas Road	6
Kipkareen-Town Rd	1
Kamkunji Road	6
Market Street	1
Mwanzo Road	2
Main Stage shop	1
Kipkenyo Sewege Road	3
Nairobi Road	2
Kiplombe-Main stage -Hawaii	1
Chepkoilel-Ziwa road	3
Kimumu Kiplombe Road	1
Kiplombe -Eldoret road	1
KCC Town-Uganda road	1
Pioneer-MTRH Road	1
Town-Celia Road	1
Kahoya Route	1
Senior Route	1
Mti Mmoja route	2
Bucon Road	1
Eastern avenue	1

Source: Field Study, 2009

From the table 5-1 above, an interesting pattern emerges where most estate access roads link the estates to the town via the main transport corridor which is Uganda Road. With respect to this, Uganda Road takes huge volumes of traffic that is filtered from the periphery. The routes that join Uganda Road include KCC Town-Uganda Road, Munyaka, Hawaii, Uganda Road, Outspan, KCC, Nakuru Eldoret Road, Annex KCC, Mwanzo Road, Market Street, Kamukunji Road, Nairobi Road, Mti Mmoja Route, Town-celia Road, Kahoya Route, Bucon Road, Senior Route, Nandi Road. A critical observation therefore reveals the following:

Further, the distribution of traffic Eldoret can be summarized by the Table 5-2 as follows:

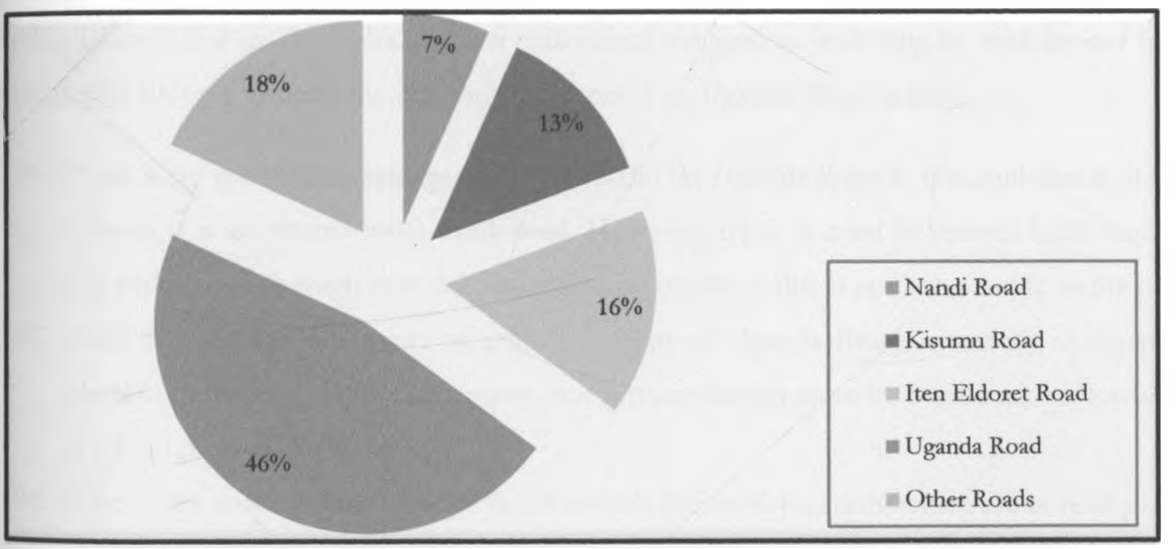
Table 5-2: Distribution of Traffic on Major Roads

Road	Frequency
Nandi Road	11
Kisumu Road	21
Iten Eldoret Road	26
Uganda Road	77
Other Roads	30

Source: Field Work, 2009

This information is illustrated as shown in Figure 5-5 below:

Figure 5-5: Trip Distribution on Major Roads in ECBD.



Source: Field Work, 2009

Table 5-2 and Figure 5-5 above strongly show the dominance of Uganda Road for all types of transportation modes. Nearly all traffic getting in and out of ECBD move on Uganda Road at some point. This is actually shown by the fact that these other roads: Kisumu Road, Iten Road, Nandi Road and other major routes actually join Uganda Road at some point. What is revealed is that even though the ECBD remains dominant and attracts traffic from the periphery in a radial pattern, the

relationship of the other roads vis-a-vis Uganda Road is an intricate system of linear pattern converging on Uganda road in the ECBD. The result is that despite the grid-iron configuration of the streets in the ECBD which characteristically would disperse the traffic, it remains perpetually congested.

Uganda Road is the primary distributor of Eldoret Town: in addition to being a classified Class A International Trunk Road. It carries all traffic passing through to Kitale and Uganda, and distributes the traffic coming into the town from the other roads. In addition to its use being altered to include filtering of traffic (the role of a secondary distributor) and access (the role of access roads), the main section of the road passes through the town, creating traffic snarl-ups and generally congesting the town.

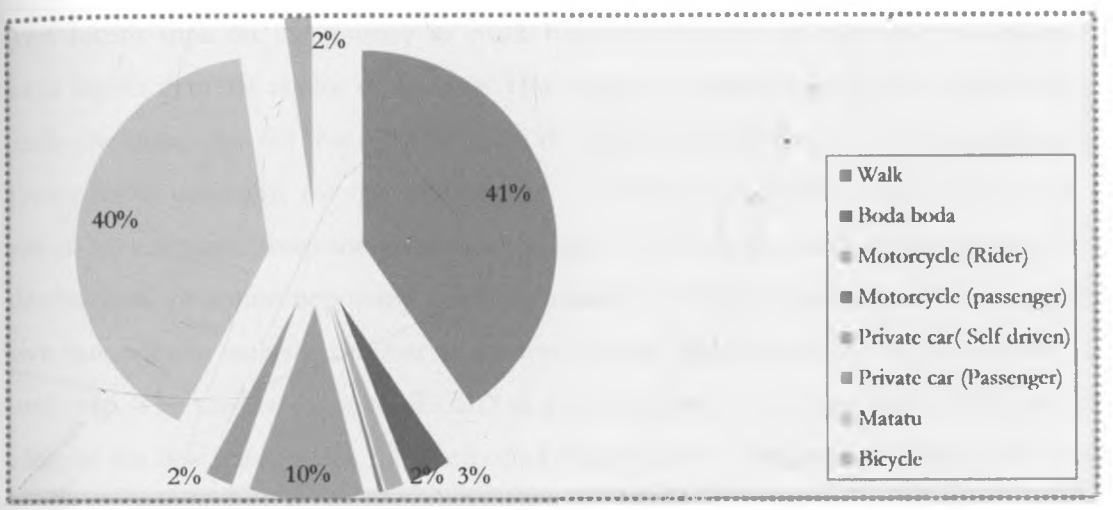
There is a lot of conflict of road-use on Uganda Road, as part of the General Nairobi-Kampala Highway. While the road is of such vast importance to Eldoret, it should not be the result of the ills plaguing Eldoret like traffic, (vehicular and pedestrian) congestion, including by vehicles not bound in any way to Eldoret. Among the challenges expressed on Uganda Road is that:

- There is no speed-limit signage in town. Traffic on Uganda Road is fast, and this is justified because it is an international trunk-road. However, there is need to protect both motorists and pedestrians through very deliberate signage meant to direct and calm traffic in the town.
- There is need for expansion of a good section of Uganda Road, especially at the points where it becomes a single carriageway, not serving though as an international trunk road but as a local primary distributor.
- Most of the roads joining Uganda Road actually join at T-Junction, which are in reality black-spots and causes of traffic snarl-ups.
- Intersection conflicts are not only exacerbated by the lack of traffic lights, but also by the intermittent disregard to simple traffic rules on the part of the motorists and pedestrians alike, made worse by the configuration of the ECBD. It goes without saying that despite the obvious attempt to disperse traffic using the grid-iron pattern, Uganda Road and Oginga Odinga Road have been given high influence, subjecting the ECBD to the weaknesses of radial street patterns.

5.3.3 Modal Split

Human beings everywhere will choose transport modes depending on their incomes and availability of transport modes. The most predominant means of transport in Eldoret is by road, despite the availability of railway and air transport.

Figure 5-6: Preference of Travel Modes on the Trip to Work/Business



Source: Field Survey, 2009

According to the household survey, walking as a mode of travel emerged as the most preferred by the residents of Eldoret (Figure 5-6). 41% of the respondents walk on the trip to their work places while 40% use matatus. However, for the various trips that would complete a journey to a given destination, Table 5-3 below provides a breakdown on the preference of modes, based on distance, convenience and costs.

Table 5-3: Modal Choice for the up-to 4 Trips

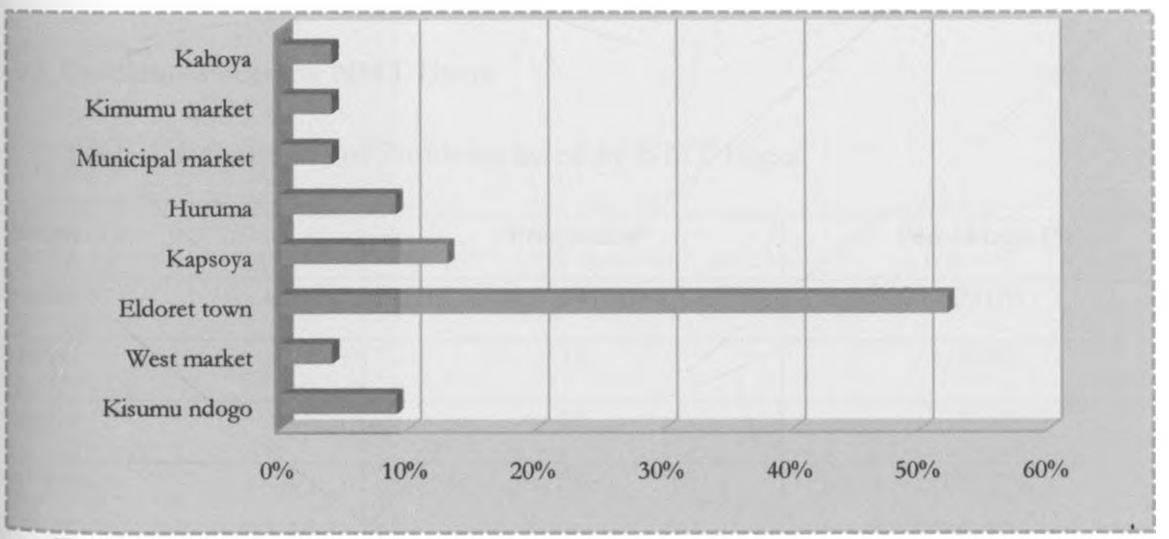
Modal Choice	Trip 1 Frequency	Trip 2 Frequency	Trip 3 Frequency	Trip 4 Frequency
Walk	134	56	36	23
Boda boda	3	5	6	1
Motorcycle (Rider)	2	2	5	1
Motorcycle (passenger)	1	1	3	3
Private car – Self Drive	16	9	6	3

Private car (Passenger)	5	2	2	2
Matatu	47	67	24	15
Bus		1	2	1
Bicycle	6	6	2	2

Source: Field Work, 2009

According to Table 5-3, walking accounts for the majority of trips in Eldoret, especially for the first, third and fourth trips on the journey to work/business. For the second trip, the choice of the matatus is higher than the choice of walking. This could be explained by the fact that the first trips are usually the main trips for most people from their places of residence to the bus stations where they access public transport for the second trip. The third trips generally refer to the trip where commuters have alighted from the public transport modes (mainly matatus) and opting to walk to their destinations, or connecting using public transport to the final destination. The use of private self-drive cars reduces with the number of the level of trip, falling from 16 for the first trip to 3 in the fourth trip. The preference of the ECBD as a shopping destination is itself a case for concern. According to the field survey data, there are other markets more proximate to Eldoret residents, but a majority (in excess of 50%) prefers the ECBD (Figure 5-7). Incidentally, the second most preferred markets are in Kapsoya and Huruma, respectively, both generally aligned in locations accessible through the Uganda Road.

Figure 5-7: Preference of the ECBD as a Shopping Destination



Source: Field Survey, 2010.

5.3.4 Non-Motorized Transport (NMT)

On main roads, pedestrian walkways are designed at the sides. Along Uganda Road, there is ample space for pedestrian movement on the shoulders of the road, and on the sections where it is a dual carriageway, on the median. However, there is a lot of conflict arising from traders who have encroached on the pedestrian walkways to trade, the use of carts, and on some sections as parking for shuttles, like on the section of Uganda Road fronted by white Castle Hotel and Mahindi Hotels.

Security for pedestrians and cyclists is very poor as street lighting is inadequate and/or not provided at all in many routes. A footpath and/or a cycle lane of at least 1.5m wide should be provided along the road. to meet their walking space needs, most pedestrian have been pushed to verandah space fronting business premises, which by all accounts are business spaces that should be left clear for free movement of pedestrians interested in buying. Space meant for pedestrian movements have been encroached on by informal sector activities.

The Sosiani River footbridge which links estates beyond the river like Pioneer Estate to the CBD is a very busy facility, especially in the evening as people move home from work. It is narrow compared to the pedestrian volumes. According to the traffic counts, the volume of pedestrians on the bridge is especially highest in the morning between 7.00 am and 8.00 am, and in the evening between 5.00 and 7.00 pm. It needs expansion to accommodate more people without congestion. However, there is insecurity posed by the street boys who have colonized around the crossing point.

5.3.4.1 Problems Faced by NMT Users

Table 5-4: Summary of Problems faced by NMT Users

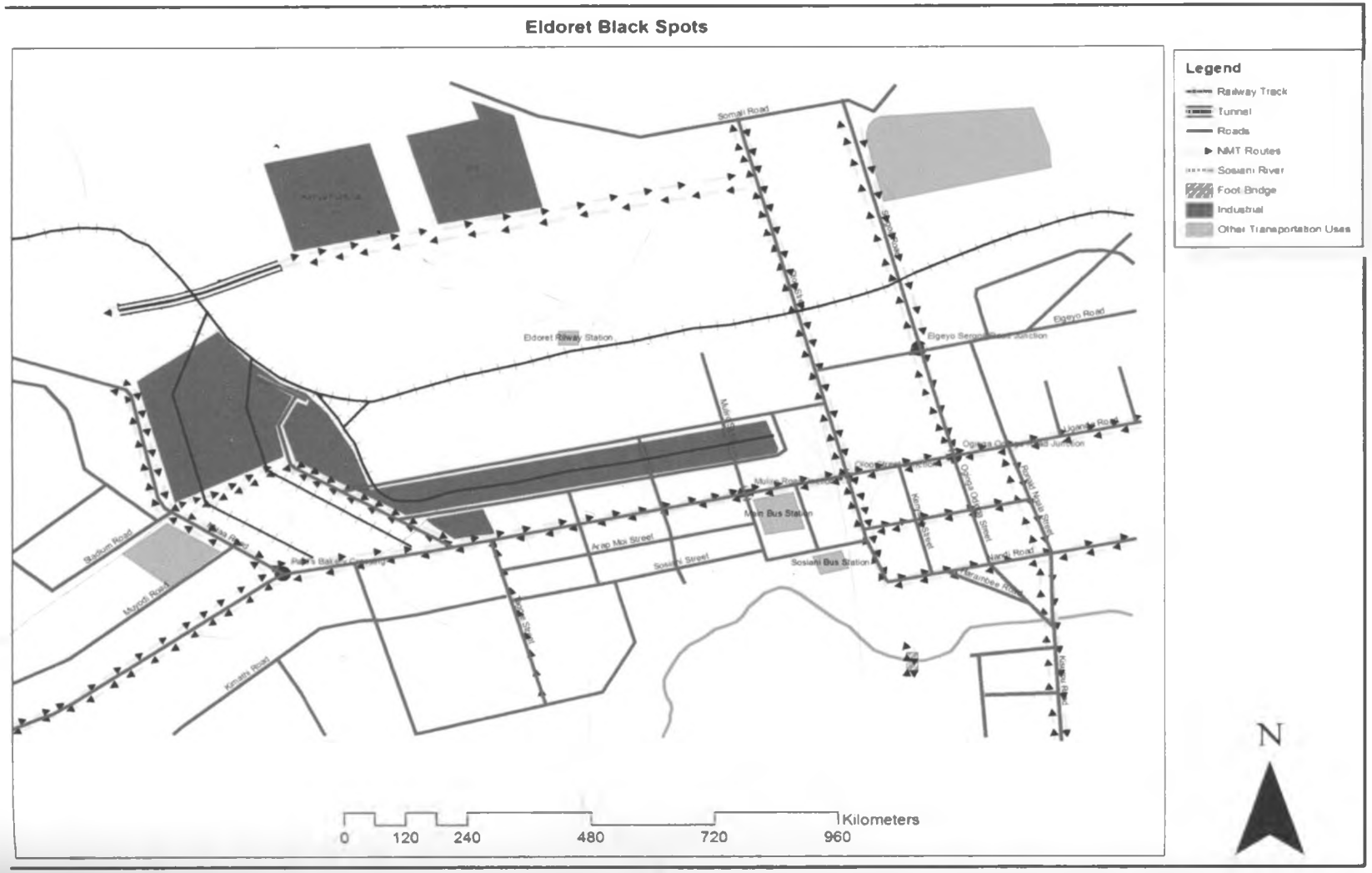
Problems	Frequency	Percentage (%)
Insecurity	44	24.6%
Pollution	16	8.9%
Accidents	32	17.9%
Time- wasting	51	28.5%
Tiresome	5	2.8%
Scarcity	2	1.1%

Traffic- jam/congestion	6	3.4%
Narrow walkways	6	3.4%
Careless driving by motorists	2	1.1%
Harassment by motorists	3	1.7%
Uncomfortable travel	3	1.7%
Poor roads conditions	4	2.2%
Totals	166	100

Source: Field Work, 2010

Walking as a mode of travel is mainly chosen because of inability by most to use other faster and therefore more expensive modes. Most people, 20% of respondents, view walking as time saving, 24% fear it because of insecurity while 18% fear it because it has a high chances to lead to accidents from careless motorists, and while crossing roads, Others believe that the fact that they take long on the roads, they are often, for long periods subjected to pollution from exhaust fumes from motor vehicles.

Figure 5-8: Accident Black Spots and Main NMT Routes in the ECBD.

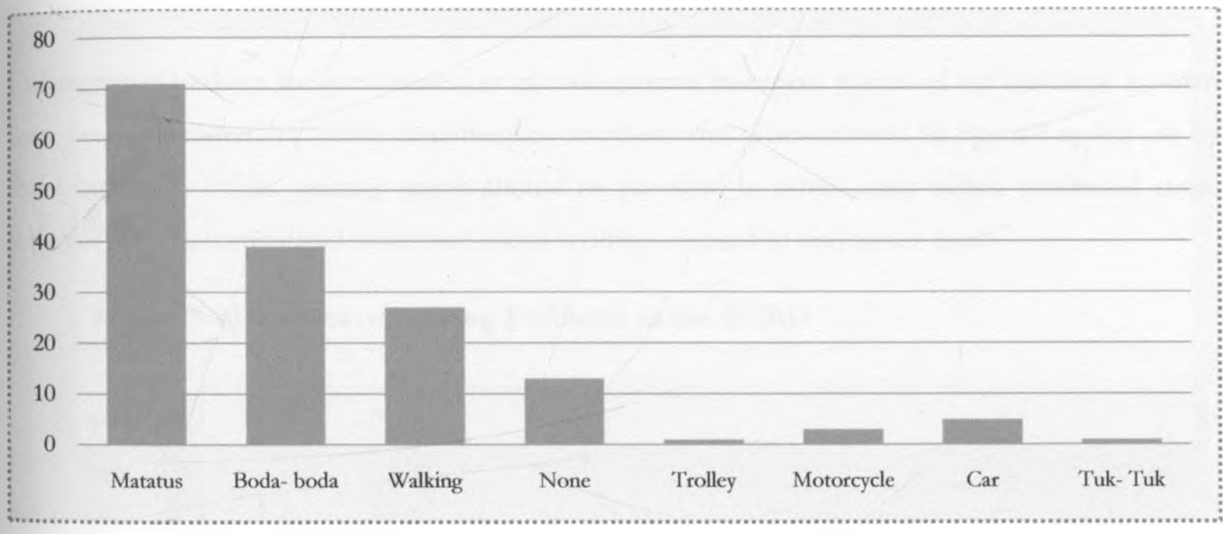


Source: Field Survey, 2010

5.3.4.2 Available Alternative Modes for NMT Users

Though walking still remains a favourite mode for most people in Eldoret because of one reason or another, people still view it as a fact that public transport is their best preferred alternative mode. More than 40 % (as shown by Figure 5-9 below) rank the use of matatus as the most preferred mode, with *boda-boda* coming second with around 30%. Public transport sector therefore needs to be supported and developed further to be more efficient and reliable, as well as affordable. The use of motor-cycle taxis is slowly being accepted, but their higher fares over short distances make them a not so close alternative, where despite their availability, a marginal 4% would use them as a preferred alternative

Figure 5-9: Alternative Modes of Travel Preferred by NMT Users



Source: Field Survey, 2010.

5.3.5 Parking Situation

The Main Bus Stage located centrally within the ECBD is an activity hub for buses and matatus bound for other major towns. It is also a stage for local urban transport vehicles to the western side of the ECBD. It is overcrowded and in poor condition of disrepair and operate as often there are cases when traffic simply cannot move because of congestion.

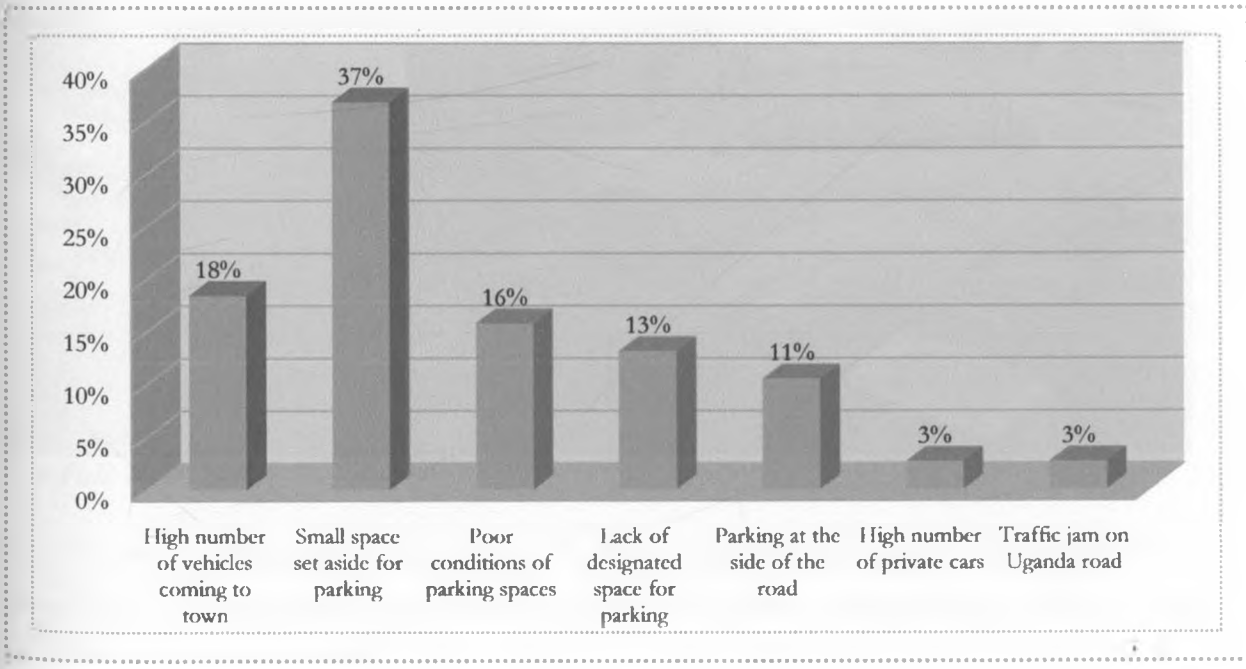
Sosiani Bus Stage is the second largest stage and accommodates both up-country and town-service vehicles especially to Eastern and southern parts of the town like Kapsoya, Islamic Centre and Sugunanga.

There is a serious case for the use of petrol stations as parking areas for Nairobi-bound shuttles. North Rift Shuttles plying the Nakuru Nairobi routes operate in the Total Petrol station. Rift Valley shuttles operate along the road reserves of Uganda Road, obstructing pedestrians, who later move on the verandahs of shops affecting business operations of these businesses.

Private vehicles mainly park on parking slots along main CBD roads. Angular parking consumes a lot of space of the roads. Taxi ranks also do not have proper designation and are not marked properly. Motor-cycle/*boda-boda* parking areas are also not properly demarcated, yet the preference for the use of these modes is on the increase.

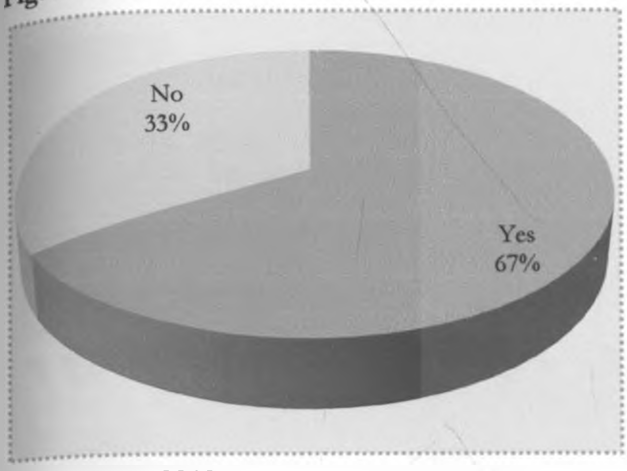
Underground parking facilities located in the sub-ground basement spaces of tall buildings in town have been converted into either discotheques or cyber cafes. These should be opened up for use by these buildings. Public parking spaces should be provided in urban areas within residential areas, industrial zones, commercial zones and social facilities, recreation and sports areas.

Figure 5-10: Causes of Parking Problems in the ECBD



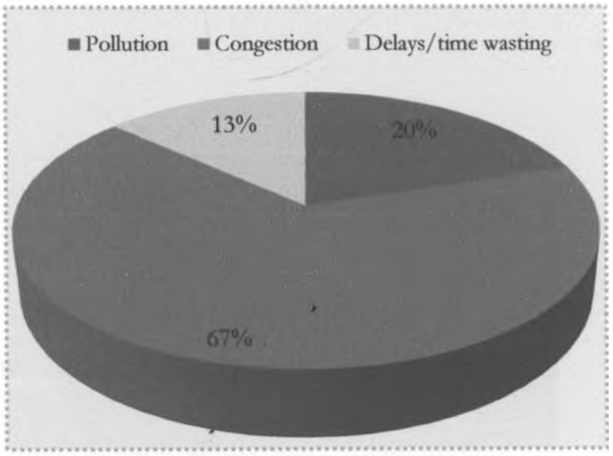
Source: Field Survey, 2010.

Fig. 5-11: Contribution of Parking to Congestion



Source: Survey, 2010,

Fig. 5-12: Problems Related to Parking



Source: Field Survey, 2010

Plate 5-3: Parking along Uganda Road.

Source: Field Work, 2010.

Plate 5-3 above is an illustration of the various factors contributing to congestion on this section of Uganda Road. In the picture are the informal commercial activities, angle-parking of PDC on the side of the road, advertisement boards, all competing with utilities like electric power poles and pedestrians against the narrow space.

Plate 5-4: Bicycle Park along Tagore Street

Source: Field Survey, 2010.

5.3.1 Growth in Travel Demand

Population increase has been identified as a major contribution to the need to disperse urban functions over wide areas. While it only comes with the expansion of urban areas over larger areas, it also increases the number of people seeking to connect between activity sites, hence creating a net increase in travel demand. The consequences of the increase translate into increased vehicles to carry people across the wide expanse, and further, an increase in the need for more spaces to accommodate the increased people and the vehicles. Trends in the ECBD point to this phenomenon, and that it is bound to increase over time.

5.3.2 Public Transport

The world's light-duty motor vehicle fleet is set to triple by 2050, at which time two-thirds of the global fleet will be found in non-OECD countries. CO^2 emissions from developing countries will increase from 30% in 2006 to 45% of the global total by 2030 (IEA, 2008 in UNEP *et al* 2010). In the ECBD, 21% of the residents were noted to own private cars, translating to approximately 43,500

cars currently. Projected over time, car ownership trends is expected to increase as shown in Table 5-5 below.

Table 5-5: Car Ownership Trends in Eldoret Municipality (2010 to 2040)

Year	Population size	Car Ownership
2010	207,127	43,500
2015	263,091	55,200
2020	350,557	75,130
2025	445283	93,500
2030	565,560	118,780
2035	718,382	150,860
2040	912,500	191,630

Source: Author's Construct, 2010.
Assumption: that there is a single car ownership per an individual
That the average car ownership remains at 21% of the total population, over the years.

The projections clearly indicate that indeed the motor car ownership rates in Eldoret match the global average projections, as it shows that by the year 2030, the number of motor cars will have tripled. However, by the 2040, the number will have quadrupled. This, in view that land continues ever to be scarcer, the problem will be much more aggravated than it is now, calling for urgent measures to ensure sustainable accessibility and mobility needs of the future generations, as well as a friendly environment and an economically productive city.

5.3.4 Traffic Management

Traffic management is almost entirely left for the Kenya Police as traffic lights and roads signage are not properly integrated in traffic management. As the traffic builds up due to one or a possible combination of the myriad causes of traffic snarl-ups, including grid-locks, high volumes, etc, the only way out of cases lies with the response of the police.

5.3.5 Accidents

According to the WHO (cited in UNEP et al (2009), over 90% of the global toll in road fatalities occurs in low-income and middle-income countries, which have only 48% of the world's vehicles.

Adding Highway lanes is like loosening your belt to deal with obesity
Lewis Mumford
Cultural historian and City Planner
Quoted by UNEP (2010)

CHAPTER 6: SUSTAIBANLE ECBD DECONGESTION PLAN: STRATEGIES AND ACTIONS

6.0 OVERVIEW

OECD/EMCT (2008) concedes that dynamic, affordable, livable and attractive urban regions *will never be free of congestion.* Road transport policies, however, should seek to *manage congestion* on a cost-effective basis with the aim of reducing the burden that excessive congestion imposes upon travellers and urban dwellers throughout the urban road network. On the other hand, sustainable livelihoods are ensured through decongestion, opening up accessibility and mobility channels without impacting negatively on the lives of the population in the target area.

Success in transportation and transportation planning is about making the connections, whether it's connecting from bike to bus or truck to rail relating the travel choices we make with environmental consequences, ensuring that land-use and transportation planning go hand in hand, or more equitably linking our transportation financing mechanisms to those who benefit directly from use of the system (SCAG, 2008) This chapter identifies the various ways to sustainable CBD decongestion, incorporating social, economic and environmental concerns. It synthesizes the findings of the study, and provides conclusions based on the findings, and ultimately proposes various strategies and actions to address the congestion issues and challenges.

6.1 SYNTHESIS OF FINDINGS

This study sums the problems in the ECBD as mainly caused by unresponsive urban planning of Eldoret. This way, it confirms the hypothesis of the study, but further highlights general areas in which the lack of proper planning have contributed to congestion. These areas include:

1. The location of Uganda (Nairobi-Kampala) Road through the heart of ECBD is the cause of traffic congestion in the town.
2. Urban structure determines the efficiency of accessibility and mobility in a town. Therefore, the grid-iron pattern of road networks in the ECBD is contributes to the constant grid-locks that cause traffic congestion in ECBD.

3. Parking challenges in the CBD contribute to congestion in the ECBD
4. Location of business enterprises, especially the informal sector businesses, while it is a positive component of the urban environment, assisting both the traders and pedestrians meet their various needs, also contributes to congestion levels in the ECBD.

Planners like Chapin (1965) have variously cited problem identification as a key component of urban planning in general and transportation planning in general. Indeed the identification of the problems have not just been identified as meeting the general want, but also laying down of potentials that may be deemed productive in the long-run. But after the problem has been identified, there is need to provide the solutions to the problems. The best way to move to, from the identification of the problems is setting of responsive objectives that need to be met, measured against the gains that are targeted to be met.

6.2 OBJECTIVES FOR SUSTAINABLE CBD DECONGETION PLAN

Broadly, land use objectives are guides to the way in which land development should proceed to fulfillment of basic needs and wants of residents, firms, and institutions (Chapin 1965). A Sustainable ECBD Decongestion Plan in this context provides solutions to the congestion problems in the ECBD. The objectives of a sustainable ECBD decongestion plan therefore are aimed towards evolution of a system that provides:

- A safe, secure, reliable, and equitable public transportation (PT) system
- A well coordinated public transportation system that provides efficient access to work areas, informal and formal shopping, recreation, education, health care and other urban activities in the CBD
- Increased access to parking areas in close proximity to the various interlinked road transport modes, including suitable interface between walking, cycle and motor-cycle *boda-boda,* matatus and public transport buses, and/or even private transport means including personal cars, bicycles and motor-cycles.
- A framework for the inclusion of carts *'the forgotten modes'* in urban transportation planning, that includes short-distance freight services performed by hand-cart pullers, trolley users and even animal-hauled carts; modes that contribute considerably in congestion within the CBD, but almost always evade the sight of the modern CBD transport planners concerned with mobility *'just-for- the-heck- of- it!'*
- A variety of modal choices and modal split in addition to private and public transportation, such as improved access to non-motorized transportation, including

walking, cycle and motor-cycle *boda-boda,* as well as other possible future modal inclusions like the regional light-rail system or the more futuristic electric trains.

- ✂ Improved environmental quality in the CBD, including air quality as well as storm-water drainage and solid waste management within the road transport system.
- ✂ Productivity in the economy supported by an efficient goods-movement system in both the formal and informal sectors
- ✂ Development of robust legal, policy and institutional frameworks responsible for the planning, implementation, management, monitoring and evaluation of the sustainable CBD decongestion framework, which ensures a water-tight system that allows for uninterrupted mobility that does not affect lives and livelihoods of the people negatively.

The objectives encapsulated above buttress the core pillars of a sustainable transportation system for the CBD. At a glance, the objectives of the sustainable transportation system are highly applicable in a sustainable CBD decongestion programme. As has been identified the, sustainable CBD decongestion plan will respond to the various expected outputs that will meet the objectives of this study. Table 6-1 below shows the relationships among the goals of the plan and the expected outputs.

Table 6-1: Sustainable ECBD Decongestion Objectives and Expected Outcomes

CBD Decongestion Goals	Mobility	Accessibility	Reliability	Economic Productivity	Safety	Environmental Justice	Social Equity
A safe, secure, reliable, and equitable public transportation system	*	*	*	*	*	*	*
A well coordinated public transportation system that provides efficient access to work areas, informal and formal shopping, recreation, education, health care and other urban activities in the ECBD	*	*	*	*	*	*	*
Increased access to parking areas in close proximity to the various interlinked road transport modes	*	*	*	*	*	*	*
A variety of modal choices in addition to private and public transportation, such as improved access to non-motorized transportation, including walking, cycle and motor-cycle *boda-boda,* as well as other possible future modal inclusions.	*	*	*	*	*	*	*

Improved environmental quality in the ECBD, including air quality as well as storm-water drainage and solid waste management within the road transport system.			*	*	*	*	
Productivity in the economy supported by an efficient goods-movement system in both the formal and informal sectors	*	*	*	*	*	*	*

Source: Adapted from SCAG (2008)[60]

The analytical table 6-1 on relationship between goals of a sustainable transport plan and the expected output presents a strong case for the study.

6.3 STRATEGIC URBAN DEVELOPMENT PLAN FOR ELDORET (SUDPE)

Effective land use planning and appropriate levels of public transport service are essential for delivering high quality access in congested urban areas. Integrated land use and transport planning and coordinated transport development involving all transport modes - including appropriate levels of public transport – are fundamentally important to the high quality access needed in large urban areas.

The SUDP of Eldoret (Figure 6-1) has adopted transport planning as part of the general planning methodology. In the transport plan, various transportation planning issues have been postulated to cater for the host of problems presented in this thesis.

6.3.1 Construction of By-Passes

The passage of Uganda Road through the heart of the ECBD has long been considered the chief cause of congestion. Both the SUDP and this study recognize the truth of this claim. Based on this, the construction of 2 number by-passes to shift the long-distance traffic headed for Uganda and other international destinations from passing through the ECBD, to pass via the by-passes in the fringe areas is provided. The proposed by-passes include:

1. The southern by-pass forming part of the main A104 International Trunk Road, passing through Annexe, through Kipkaren, and joining the current road at Bahari
2. The northern by-pass passing through Kapsoya, linking through the Old-Uganda Road, and joining the main current road via Maili Nne.

The importance of these two by-passes is that while they will ease traffic on the Uganda Road through the ECBD, especially for the long-distance traffic, they will also create options for local traffic as they will operate more-or less as ring-roads. Secondly, the staggered levels of connection to the existing road at the two sites at Bahari and Maili Nne respectively, provides

[60] Southern California Association of Governments (SCAG) (2008): *2008 Regional Transportation Plan*. SCAG.

vast potential for development of these nodes. Theory points to the assertion that convergence of two or more major roads as factors that contribute to stimulating emergence and growth of centres. The idea for staggering of the sites is to control agglomeration of functions at one particular site to create a major centre, but to have smaller satellite nodes for services and trade.

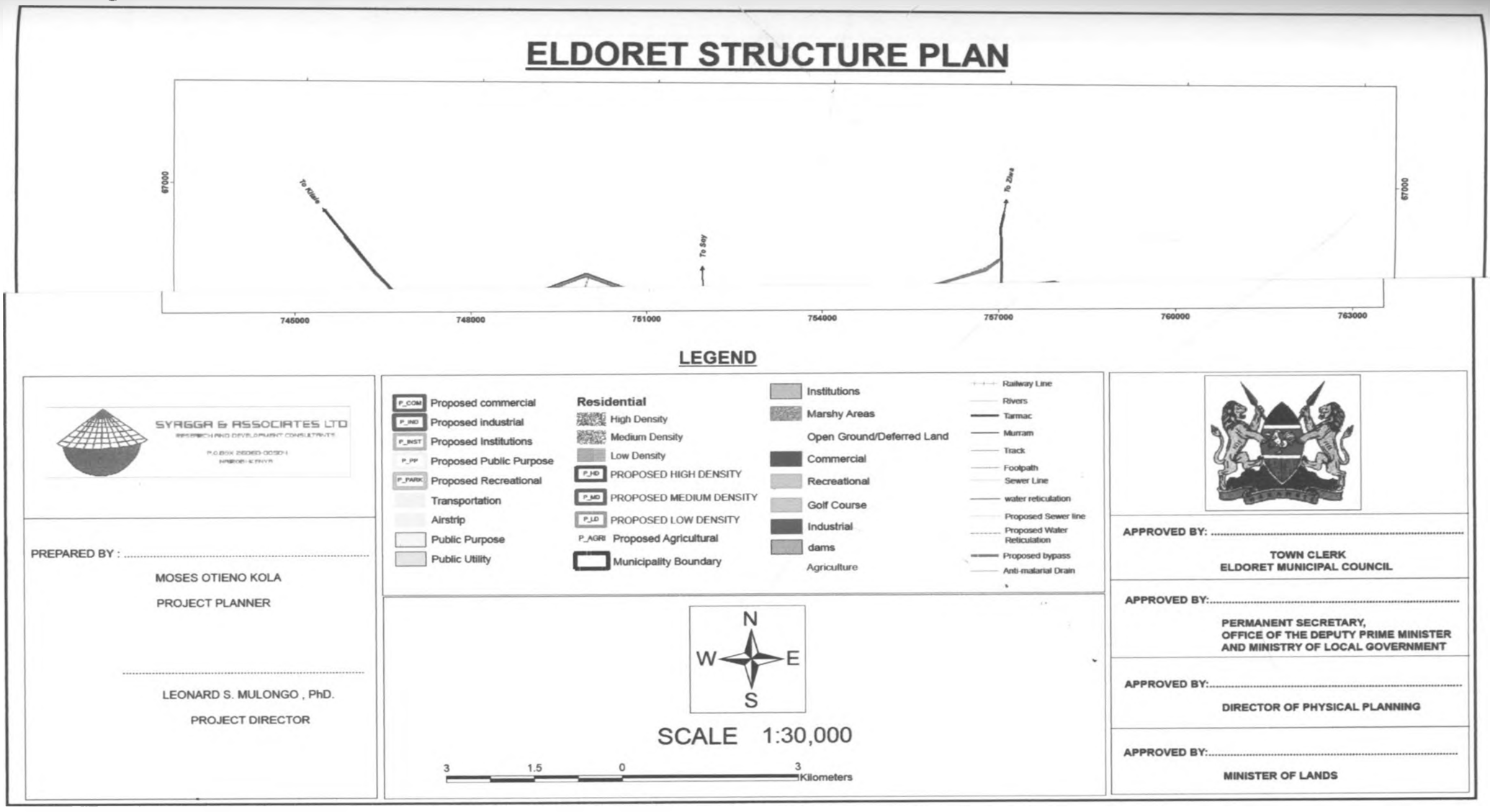
6.3.2 Planning for Commercial Centres

Kenya, (2010) has identified in the SUDP for Eldoret the necessity for detailed planning of all commercial nodes within the municipality as shown by Figure 6-2 below. Well planned commercial and shopping areas have the advantage of integrating the locational aspects of the shopping structural components with respect to improved accessibility and mobility means.

6.3.3 Planning of Informal Sector Activities

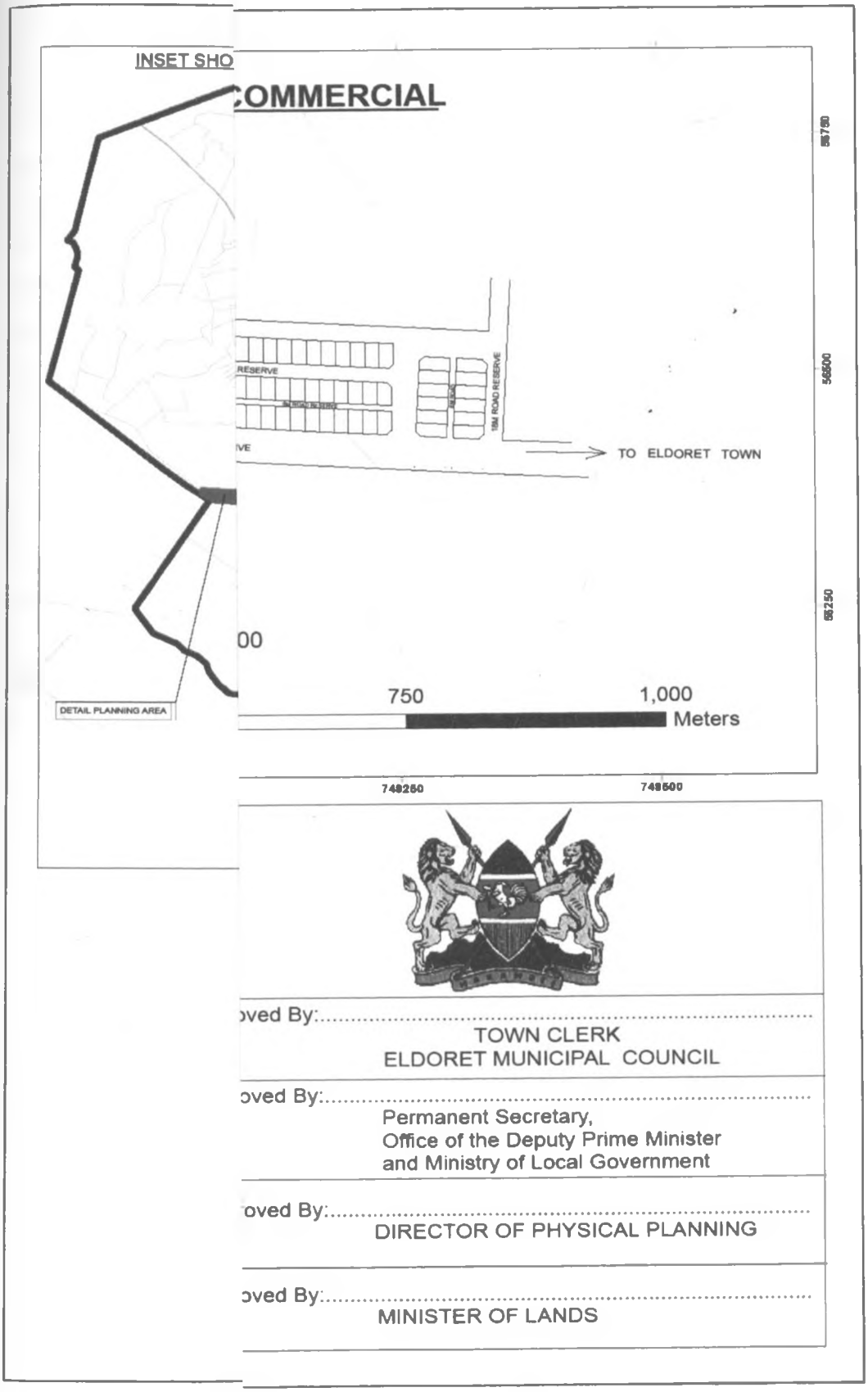
The informal commercial sector is a key employer in the economy of Kenya. While every effort is made to ensure the formal sector of the economy is planned for, the informal sector must be fully integrated into urban planning so as to provide adequate spaces for their operations. However, as their location on sites not designated for their operations affect the functionality of those sites

Figure 6-1: Eldoret Structure Plan.



Source: Kenya (2010)

Figure 6-2: I



Source: Kenya, 2010.

6.4 INTERMODAL DEVELOPMENT FOR ELDORET MUNICIPALITY

Rochat (2000)[61] has identified that intermodality is a key element in any modern transport system. It underpins international trade and economic growth, while satisfying the requirements for sustainable development at local and regional levels. Indeed, the intermodal approach has been identified as a major tool for reconciling the economic, social, and environmental dimensions of sustainability. In other words, safety, accessibility, speed, efficiency, employment, flexibility, proper land use, and pollution control form the main benefits of intermodality. Success in this regard requires an overall vision and a balanced approach, as any integrated transport system has to be based on a rational and thorough cost-benefit analysis and a fair and equal treatment of complementary modes of transport.

To this end therefore, findings of this study also point towards a robust intermodal mix in the ECBD. The wide array of modes for intermodal development in the ECBD comprise mainly road transport modes like walking, cycling and motor-cycling (both private and public), private motor-car transport and public transport. Rochat (2000) counsels that though ground transportation services may compete with each other and with air services, but intermodality calls for cooperation with the view to:

- Satisfying customers' expectations through the selection of best practices.
- Promoting the most cost-effective use of the means of transportation.
- Reducing congestion, air traffic control delays, and environmental impacts.

It is therefore the key aim of this study to lay the importance of the intermodal development of Eldoret at the regional and local levels, laying a foundation for expanded intermodality at the national and intermodal development. Various strategies point that towards this overall strategy.

6.5 IMPROVEMENT OF ECBD ROADS INFRASTRUCTURE

According to Kenya (2010), urban road reserves require more generous space provision because of additional street furniture and infrastructural facilities that have to be provided. In most instances, the road has to accommodate multiple functions that have to be independently provided in design. Wayleaves for trunk services such as water and sewerage, underground telephone cables and high voltage power lines, when provided along road reserves require additional provision.

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[61] Rochat, Philippe (2000): **Intermodal Transportation Fosters International Trade and Sustainable Development** *in International Transportation: Moving the Global Economy Forward:* Economic Perspectives • An Electronic Journal of the U.S. Department of State • Vol. 5, No. 3, October 2000

Further, the role of the informal sector in job creation in urban areas has now been recognized. Most of the informal activities are footloose and heavily dependent o passing trade. They therefore require specific provision when located within road reserves.

Because of the above reasons, the following urban road reserve widths have been recommended (Table 6-2)

Table 6-2: Recommended Urban Roads Hierarchy in Kenya.

Level	Hierarchy	Recommended Size
Primary Distributors	• Major communication routes • Important through – routes	60m. 30-36m.
District Distributors	• Spine roads and roads in commercial or industrial areas • Bus routes • Local distributor roads with no direct vehicular access to Individual plots.	25m 18m.. 18m
Local Distributors	• Major access road exceeding 150m in length • Access road not exceeding 150m in length (normal residential street)	15m. 12m
Access Roads	• Cul-de-Sac or short connecting road not exceeding 60m. • Service lanes • Cyclist lanes • Footpaths	9m 6m. 3m 2m.

Source: Kenya (2008).

Plates 6-1, 6-2 and 6-3: Space Requirements for Different Modes.

Source: City of Cape Town, 2009.

As is shown by Plates 6-1 to 6-3, different modes obviously present different strengths and opportunities and weaknesses and threats. This study comes out strongly to recommend for a strong public transport (Plate 6-3), as well as pedestrianization (Plate6-2), while works strongly towards reducing private self-drive cars (Plate 6-1) which is more susceptible to cause congestion than the rest, though projections indicate it is a likely trend to continue in the future. In the event that the influx of the private self-drive cars, the plan moves in to disperse its negative effects through improved and responsive roads designs that will promote efficiency and functionality, as well as improve its structural effectiveness.

6.6 NON-MOTORIZED TRANSPORT (NMT) DEVELOPMENT.

NMT integration in the urban spatial structure is one of the objectives of the Integrated National Transport Policy (INTPC). The Policy states that considering the critical role the NMT, what it calls the Intermediate Means of Transport (IMT), plays in the development of rural and urban transport in Kenya, there is need to revisit the mode and provide guidelines for promoting it in collaboration with other modes with a view to ensuring the realization of its potential (Kenya, 2010).

6.6.1 Pedestrianization of the ECBD.

We are all pedestrians; any trip by any means includes at least a small distance covered on foot at the beginning and end of each journey. Walking is the basic urban transportation mode that has allowed settlements and cities to operate for thousands of years. It is still very much with us, but its role has been eroded with the introduction of mechanical means of transportation (Grava, 2004). According to UNEP *et al* (2010), Concerted and long-term efforts to preserve and promote more fuel-efficient, low-carbon transport modes like NMT are needed in both developed and developing countries. Investments for both improving existing roads (e.g. maintenance) and for constructing new roads should allocate resources specifically for safety, inclusive of NMT infrastructure. The justification of this is that NMT can have a significant impact on decongestion. For instance, cyclists need less than a third of the road space that is used by a private motor vehicle, and a pedestrian needs only a sixth of that space. Providing safe NMT infrastructure can increase the flow of traffic for all types of vehicles.

6.6.1.1 Green Streets.

Grava, (2004) has observed that the presumably ubiquitous pedestrian system in any community consists of only a few rather simple physical elements, but—given the importance of this network—a closer examination of each is warranted. This is in view of the contribution of the

system to the general urban fabric, how it affects the lives of the people, and livelihoods of the individuals and communities.

6.6.1.2 Pedestrian Walkways

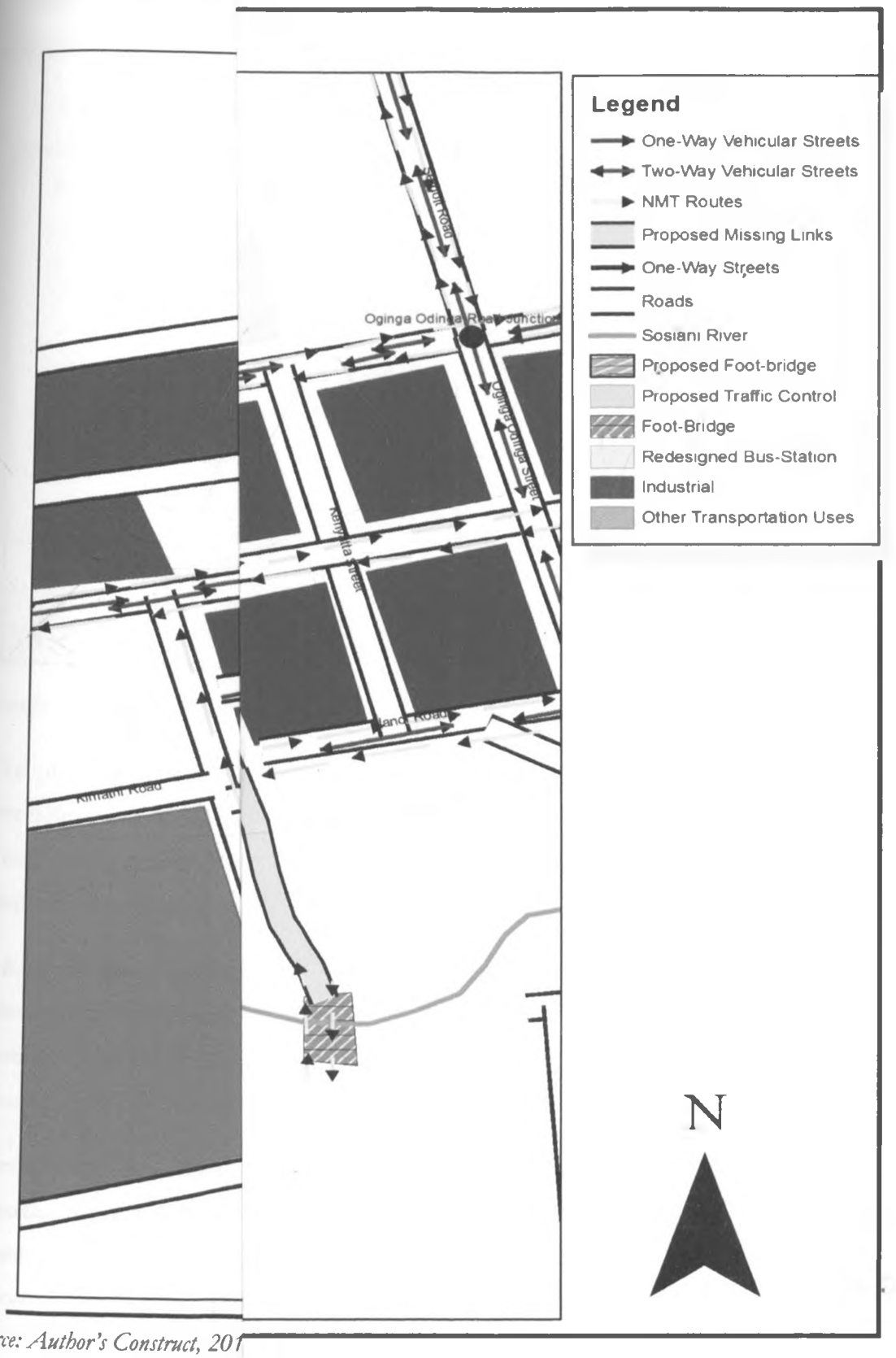
According to Grava, 2004, Sidewalks are normally placed within the public right-of-way on either or both sides of the central vehicular channel, within the marginal reserved strips, which will usually be at least 2 m wide (with a 15-m right-of-way and a11-m pavement). The sidewalk itself should be **at least 1.5 m** wide, where the governing consideration is not the size of persons, but rather the ability of two baby carriages (or mail carts or wheelchairs) to pass each other. In higher-intensity areas, the sidewalks are frequently 2.4 m wide; in commercial districts of large cities, they may be 4.6 m wide or more.

Sidewalks may be placed directly adjacent to the curb, thereby allowing some savings in construction costs, but with the drawback that pedestrians will be in very close proximity to moving vehicles, and the opening of doors from parked cars may create obstructions to pedestrians. A preferred approach is to place side- walks directly or almost adjacent to the outside right-of-way line, which creates a buffer strip between the sidewalk and the curb.

This strip provides a safety zone that can be landscaped. It is advisable to place utility lines under the unpaved strips, thereby making repair and excavation less costly. The utility of sidewalks is frequently impaired by various obstructions—sign- and lampposts, hydrants, mailboxes, bus shelters, newspaper vending machines, parking meters, trees, and benches, not to mention protruding outdoor cafes, produce stands, and staircases. All this may be useful and necessary, but the effective sidewalk width will be thereby reduced. (Grava, 2004)

The design elements for improvement of side-walks and pedestrian walkways as provided by Grava need to be localized to suit the case of ECBD. As has been identified, earlier, pedestrianization of the ECBD has the potential to improve the reducing the vehicular traffic, as well as provide for safe, walkable streets that not only are good to the amenity and functionality of the town, but also for the health of the people. Pedestrianization of the ECBD will focus on all roads. Special consideration is given to Uganda Road, Old Uganda Road, Arap Moi Street, Nandi Road, in view of effectively sharing out pedestrian traffic among the roads to ease more pedestrian traffic from Uganda Road. The plan also gives special consideration to the roads that run perpendicular to Uganda Road and parallel to Kisumu Road, including Oginga Odinga Road, Ronald Ngala Road, Kenyatta Street, Oloo Street and Muliro Street that carry traffic mainly destined to and from the ECBD from residential estates and settlements.

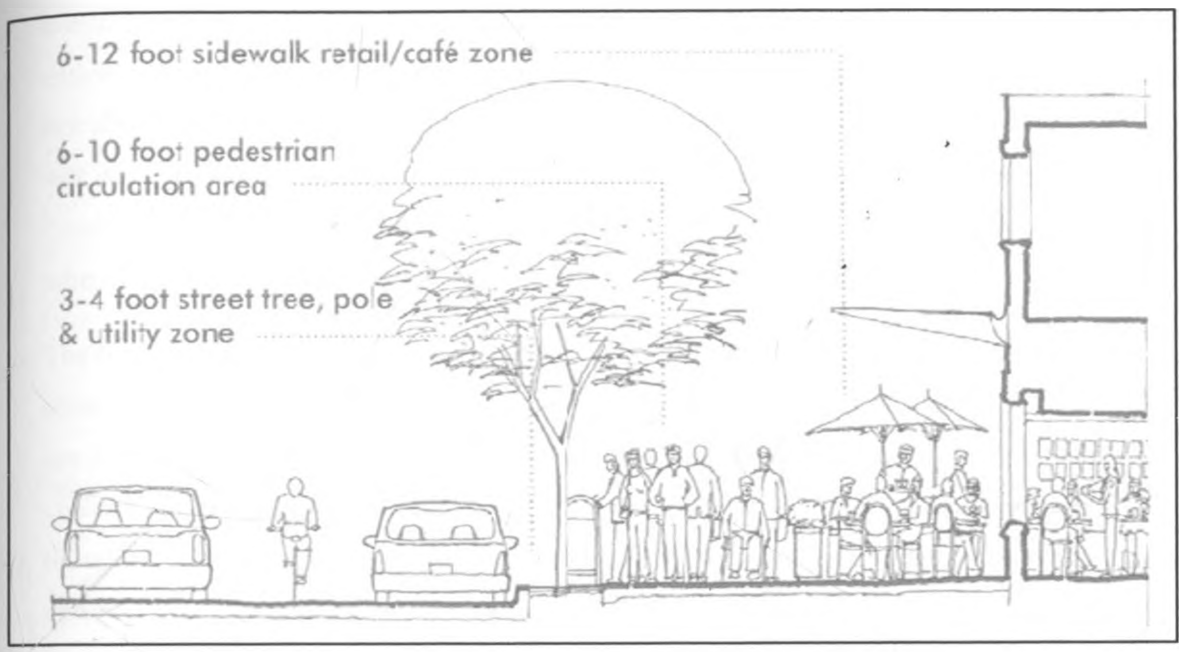
Figure 6-3: Proposed N



Source: Author's Construct, 201

The highly advocated for pedestrianization of the ECBD integrates several design, functional and structural elements that will promote the pedestrian movement within the ECBD. Pedestrian schemes include footbridges on Sosiani River, pedestrian walkways, cycle lanes, parking spaces, business areas, services in the transport sector, etc.

Figure 6-4: Activity Street with Intensive Sidewalk Use



Source: Grava, (2004).

The plan proposes the intensified sidewalk to be provided for some of the streets that attract intensified pedestrian concentrations. Such a street is Nandi Road Mitaa Road and Tagore Street which currently attract a great number of informal and formal commercial activities that are not planned for, as well as streets used by commuters to and from the ECBD.

6.6.1.3 Walkway Surfaces

The type of material used for sidewalks, and the resulting surface finishes have at least three areas of concern: ease of walking, permanence, and visual attractiveness. All these are responsive to functional, structural and visual appropriateness, all concerns for design, engineering and use.

Grava (2004) provides a comprehensive catalogue of walkway surface finishes. According to this source, the most common type of construction is poured concrete with wire mesh reinforcement, commonly known as concrete slabs. It is easy to build, since not much sub-surface preparation is necessary (no heavy loads will have to be carried); the surface is nonslip and watertight, and the pavement is durable. Some shortcomings are that the surface is not particularly interesting, the

repair effort is rather extensive when the slabs crack or break, and the surface is hard on the feet (in every possible sense).

Bituminous blacktop pavement is favoured and recommended mainly because it is cheaper yet, and construction is very easy. It has a great advantage in that the material is somewhat resilient, thus offering very good walking quality. However, this softness (the surface may even melt under very hot sun) makes blacktop unsuitable for real urban application— sharp heels and small hard wheels will destroy the surface rather quickly. While repairs are easy, the patched patterns and the overall "common" appearance of blacktop walkways make them suitable only for long recreational paths, where most users will wear shoes with soft soles.

The most attractive surfaces in general use are provided by special paving blocks and brick. Various sizes and shapes are available, and interesting geometric designs can be achieved—pleasing to the eye as well as to the feet. These materials are more expensive, and great care has to be taken in construction to maintain the integrity and evenness of the surface. Individual elements may become dislodged, and such surfaces become uncomfortable to walk on because the ankles are continuously twisted. A protrusion of even half an inch may trip some people.

At the top of the line are stone slabs and polished terrazzo. Undoubtedly, they give the best impression due to the rich quality of the material, and they are quite durable. The problems are high cost and the slippery conditions that are quite likely to occur with any moisture (Grava, 2004).

This study leaves room for choice to designers, engineers and civil works contractors charged with the responsibility of fixing the pedestrian walkways and sidewalks on particular roads. Various sites present different challenges and structural advantages and disadvantages that will favour some particular finish over another. Under critical scrutiny of all variables including costs, length, and general site characteristics, the engineers will advise as appropriate. However, for sites that attract a high level of attention like side-walks leading to the town hall, State-House Walk, there is need to provide the highest affordable finish, presumably the stone slabs (as impressed by Grava, 2004). For longer stretches like on Nandi Road and Mitaa Road, the finish can be done during the process of road construction and maintenance, based on the finish of the road. Nevertheless, the use of concrete blocks gain prominence as suggested by the advantages identified elsewhere in Kenya.

6.6.1.4 Drainage and Street-Lighting

Full and uninterrupted utilization of pedestrian facilities depends to a significant extent on overcoming natural constraints, which in this case are too much water and darkness. The need for drainage systems is rather obvious and unavoidable, not only to maintain clear paths at all times, but

also to ensure that no structural damage is done to the infrastructure through gradual erosion or sudden wash-outs (Grava, 2004).

6.6.1.5 Traffic Control Devices and Accessibility Concerns

There should be no constraints on the movement of pedestrians, and people should be able to proceed with no unwanted stops, even if they have some handicaps to walking. This may hold for ideal situations only; in real life, adjustments need to be made.

First, there are the many crossings with vehicular traffic that will be present in any pedestrian network. The needs and choices are quite well understood and worked out by this time, and various levels of controls are available—including simple stop signs for vehicles, regular traffic signals, and controls with special phases for pedestrians.

However, in Kenyan communities reminders are needed that walking is a legitimate transportation mode that should be encouraged and that its participants need some protection. Their presence should be recognized in the timing and deployment of signals and traffic controls, which routinely tend to take into account the speed of cars, not of pedestrians.

It is now the law of the land that people with physical or mental impairments should receive every consideration when systems are designed and built so that they are not excluded from participation (as much as is reasonably possible). This certainly applies to walking, and includes the requirements that public walkways must not encompass steep grades (no slopes along the path in excess of 1:12), and that there must be no steps or curb faces along the way. The latter requirement results in curb cuts at intersections in all the directions that people may travel. Curb cuts not only allow wheelchairs to move without great difficulty, they also assist all others who find climbing up and down somewhat of a chore. Another set of desirable improvements address the needs of people who have impaired vision. These improvements include tactile surface treatments that can be sensed along edges and at points where care has to be exercised (at intersections, for example), traffic signals accompanied by audible sounds indicating Walk or Don't Walk conditions, and the clearance of obstructions that may be difficult to see or sense otherwise.

This is recommended on all roads within the ECBD as a short-term measure to ensure that pedestrians begin to appreciate their rights as rightful owners of the roads, of course without infringing on the main vehicular carriageways.

6.6.1.6 Landscaping and Amenities

Pedestrians appreciate visually attractive environments; indeed, it cannot be expected that paths and spaces will be popular if significant attention is not devoted to such features. Also, walkers need

resting places from time to time. Landscaping, coordinated graphics, and attractive street furniture are all a part of the design challenge. These include benches, water fountains, telephone booths, signs, information kiosks, public toilets, litter baskets, and possibly quite a bit more. Sidewalk cafes, vendors, pushcarts, musicians, and entertainers may also be present— adding lively activity, color, and possible obstructions to walkers in a hurry.

6.6.1.7 Roofs and Shade

The issue of providing weather protection on an open pedestrian network has been touched on already. In extreme climates, it is almost a must if reasonable volumes of walkers are to be attracted, and in temperate zones there are obvious advantages as well. There is no need for a continuous canopy, but occasional shelters are most welcome. Frequently, advantage can be taken of nearby buildings to provide awnings and other devices against rainfall, sleet, snow, wind, and extreme sun conditions. Whenever they are uncomfortable, people will seek protection indoors.

6.6.1.9 Pedestrianization of ECBD

Pedestrian movements have been noted for the vast advantages they present to the urban environment in general, and to the urban dwellers. The ECBD has a big potential for integration of walking, currently a great mode on the part of the residents, but not so much prioritized by the infrastructure providers, the GoK and the MCE. To achieve this in the ECBD, there is a need to:

- Develop Elijah Cheruiyot Road for peak-hour pedestrian traffic only. There is need for closure of the road for vehicular traffic especially between 6.00-8.00 am in the morning and 4.00 pm till the following day, leaving it open for pedestrian movement who rely on the informal sector trade along the road.
- Cut all conflict on the use of designated of road user spaces using sound urban design provisions like raised kerbs, bollards and guard rails where necessary. For example, on some sections of Uganda Road, pedestrian walkways are separated from the cycle tracks and the main motor-vehicle carriage-ways. The pedestrian paths are blocked with cross-kerbs at some points to cut-off cyclists. Cyclists are however reluctant to leave the main carriageways, which add to the conflict of the use of these roads that have fast-moving traffic.
- Provide street furniture at key points where services are provided. A case of good practice is on Uganda Road frontage to the Town Hall where shoe-shine boys are located.
- Provide for new NMT foot-bridges along Sosiani River at an interval of 200m to cater for the walking commuters from the southern areas of the municipality like Pioneer and Langas areas.

- ✂ Bring the country-side to the city by planting trees on shoulders of some main arteries like Uganda Road to create a boulevard that can also provide shade for pedestrians from the sun, as well as a tool for landscaping to improve environmental aesthetics. This can be done on different roads, varying the tree variety and density of plantings per unit distance, depending on the space availability and the functionality of spaces.

6.6.2 Promotion of Cycling (*Boda-Boda* Operations)

Bicycle taxis are fast gaining recognition as a preferred travel mode. There is need to integrate cycle tracks in the design of every road so as to reduce conflict arising from competition of the main carriageway with the motorized traffic.

Bicycle taxis and motor vehicle taxis should have designated base of operation that is well designed complete with sheds they can shelter in during rainy periods, pedestrian resting, as well as places of convenience. These cycle stages should be located not far from the main bus stations and satellite bus station to allow pedestrians easy access to them as they change modes.

6.6.2.1 Shared Lanes

One program that almost every bike system proponent supports is the designation and creation of lanes that are shared by both cyclists and motorists—at least in those instances where the flow volumes of either mode are not too high. Such facilities are also frequently rather difficult to implement because these lanes have to be wider than a regular traffic lane, and this additional width is difficult to find, short of rebuilding the roadway.

The concept of shared lanes supports mixed traffic operations, except that faster motor vehicles would overtake bicycles within the same lane, not intruding laterally into other lanes. Since cyclists would largely stay on the right side of the roadway, but a few feet away from parked cars (doors may be opening)21 or high curbs (pedals may catch), there must be sufficient width for both bike and automobile to move side-by-side as the car passes. This adds up to a width of at least 4.3 m or more with substantial traffic volumes.

While wide shared lanes are a favored concept, it remains still mostly in the realm of theory because there has been very little if any implementation in American communities. Thus, they are not proven in practice, and there may be a potential problem: 4.5 m is wide enough for two cars to stand side by side (a standard automobile is 1.6 m wide) or even move together, which can easily happen with 6impatient motorists on badly congested streets (Grava, 2004).

6.6.2.2 Allocation of Boda-Boda Parks

Boda-boda parks are proposed in this proposition to help in providing special areas for parking of both bicycle *boda-boda*. This plan provides that the parks be provided close to every major transport node and main channels.

6.6.3 Motor-Cycle Taxis

The emergence of motor-cycle taxis on the Kenyan transport landscape has been welcomed with mixed reactions. Indeed their importance cannot be overestimated as they come with a large share of problems including social, environmental, economic, etc. Grava (2004) actually concedes that those who wish to face a significant risk of accidents, weather conditions as they appear, and the ire of automobile drivers find the fluid ability to weave forward through clogged traffic a considerable advantage and even a thrill.

6.6.4 Motor Cars

The invention of the automobiles has revolutionized the way urban areas operate. It has indeed influenced urban life to a very great extent, making mobility easier and faster. But while it has been good, it brings with it challenges that also impact as relates greatly to health, space use, the environment, etc. more specifically, motor vehicles contribute to congestion, environmental pollution, accidents, high consumption of space, noise, among a host of other particular challenges.

6.6.4.1 Road Use

Motor cars occupy more road space than pedestrian movement. But on the whole, different types of motor cars consume different road spaces depending on their capacity. A private car has one PCU while a 60-seater bus has 3 PCUs. But while three full capacity private cars may carry 15 passengers, the bus will carry 60 passengers, 4 times more than the full capacity cars which more often than not only carry single passengers. Likewise, while a bus may consume more fuel than a private car, the cumulative fuel consumed by private cars which would transport the 60 passengers is more, and by extension more pollution. The mathematics of PCUs obviously gives the buses a clear edge over the private cars.

In this regard, there is need to advance the use of public transport over private self-drive cars, regardless of convenience, prestige and comfort of the individual user. But public transport vehicles in Eldoret also have different capacities a there are 14-seaters, 29-seater mini-buses and 60-seater buses. The 60-seater buses need to be encouraged over the others because of the advantage they present. However, this will call for a restructuring of legislative provisions at the national level on the manufacture and furnishing of the buses, as well as their state of maintenance. For this reason,

Eldoret will have less, but obviously larger vehicles to deal with. The road management will have to be set to be in tandem to increased wheeling spaces and fewer vehicles.

6.6.4.2 Parking

Parking spaces in the ECBD is a great and real challenge. From the argument on the PCUs and space requirements, private self-drive cars require a lot more parking spaces compared to public transport vehicles. For this reason, this study bears into consideration strategies capable of increasing availability of parking of both private and public vehicles, as well as bicycle and and motor-cycle *boda-boda*

6.6.4.3 Intersections

Conflicts emerging at the intersections in the ECBD arise from the roads design that features grid-iron pattern. As has been identified earlier, the black-spots are mainly points of intersections of main roads of the ECBD. Intersections on Uganda Road form the bulk of black-spots with intersections of Ronald Ngala, Oginga Odinga and Oloo Streets, which are mainly T-junctions, as well as the Mitaa-Uganda Road Junction which is a Y-junction, being the most notable ones.

There is need to properly design road intersections in the ECBD to improve their functionality and reduce the risk levels they present especially to pedestrians, but also to from motorists against motorists. Two methods for managing intersections include through use of grade separation and the use of roundabouts. However, the need for so much land to establish a grade interchange facility makes it a disadvantage for its application in the ECBD which does not have sufficient land. The best alternative facility for management of intersections is the roundabouts, which, while they require considerably more land for their establishment, can be accommodated through some spatial adjustments. Conversion of the stretch between Annexe and Bahari into urban distributor and opening of the section of the A 104 to by-pass the ECBD allows for this room for manouvre.

This proposal calls for establishment of 2 number roundabouts at Oginga-Odinga and Kenyatta Street Junctions.

6.6.5 Planning for the *'The Forgotten Mode'* - Carts

The *forgotten mode*, but one whose importance cannot be ignored and need to be improved as one of the employment sectors of the growing economies, carts, needs to be planned for in the urban spatial framework. They are a favourite for traders because they carry a lot of goods and charge affordable fees as opposed to the cars or pick-up trucks which would be hired more expensively. The spaces left for pedestrians have been left to be a minimum of 1.5 m wide, not to cater for

walking pedestrians, but to contain persons pulling/pushing hand-carts or baby-carriages passing each other in different directions.

6.7 PRIORITIZATION OF PUBLIC TRANSPORT (PT)

One of the basic challenges in urban transport is to ensure a sustainable balance between public and private modes of travel. This can be achieved by adopting two general categories of measures, that is, public transport incentives and automobile disincentives. Since it will be too sensitive to adopt any automobile disincentive measure given the low level of auto ownership, the focus for ensuring a balanced development of urban transport should concentrate on providing public transport incentives and priorities.

In order to reduce congestion, fuel use and to improve air quality, many modern cities around the globe therefore adopted public transport priority measures.

In order to optimize the use precious road space, fuel use and pollution control, it would be preferable to introduce higher capacity public transport mode for Eldoret Municipality.

Free competition in combination with high unemployment appears to have lead to situations with very large numbers of small, low-cost vehicles (matatus and motor-cycles). In its extreme form, the free competition concept can lead to a quite inefficient use of road network.

It is proposed that the Council should reform and restructure its public transport sector by adopting a controlled competition model with clear division of responsibilities between the public and private sectors. The public sector should maintain the coordinated network approach to public transport and service structure. The new roles of the Council, through the creation of a new Transportation Unit, should be responsible for overall planning, including:

- ✂ Planning the route network in the best interests of the town and passengers;
- ✂ Providing the necessary infrastructure such as bus stops, bus ways, and terminals;
- ✂ Negotiating with and sub-contracting operators for routes or route packages in a competitive bidding process, and;
- ✂ Monitoring and controlling (quality) the performance of such operators.

This model has the strongest merit as it presents a combination of transport authority planning and control of public transport services on the one hand and competition between independent operators for the operation of public transport services on the other.

The development, management, and maintenance of terminals and stages should be privatised, through competitive bidding, and awarded under clear Terms of Reference. Security at the terminals and stages should be part of the responsibility of the investor.

PT must be part of an overall set of policies which also includes urban planning, traffic restraint and measures to improve conditions for pedestrians and cyclists.

The critical issue with PT is flexibility – and key to passengers is simplicity and predictability. Paradoxically, to be flexible, PT must also be rigidly predictable.

Competing with one another or competing for the routes

- An integrated route structure which maximises opportunities for interchange and reduces duplication and overlap.
- Reorganize and coordinate public transport routes to improve circulation. Numbering of routes and ensuring that all public service vehicles must have the route number written on them to avoid confusion on parking. There is need to enact by-laws to stress that the routes by these vehicles are strictly be adhered to, and parking done per the scheduled route number.
- Regulate the public transport sector to instill discipline and create harmony between commuters and operators. The by-laws need to be enacted to ensure that the public transport crews do not treat the commuters badly.
- Link all major residential estates, airport and railway station with a well ordered public transport system.
- The small-scale operators should be encouraged to form associations in order to pull together resources to purchase standard vehicles, with capacities of between 30 and 60 passengers.
- There is an urgent need to develop and deliver capacity building programmes on the management of public transport services.
- Public transport routes need to be competitively tendered and awarded to 2 to 3 large operators to regulate competition and ensure that operators compete for routes, and not on the routes. They should use standard vehicles and maintain minimum standards of operation.
- **Congestion Billing:** To control the use of motor private self-drive vehicle usage in towns and cities so as to control congestion, for example to reduce demand for parking spaces and the incentive to use public transport, congestion-billing is used, and recommended as a tool for ensuring that congestion control. The concept of

congestion-billing can be effected through placing hefty parking fees, increasing proportionately with the reduction in distance from the CBD. The second reason would be through per time billing where vehicles are charged per unit time, thereby contributing to reduction of the number of vehicles in the CBD per a given time.

- **Use of Emergent technologies in (CCTV, GIS,):** Emergent technologies have revolutionized the concept of responsible action on the side of actors, citizens and policy-makers. To bring sanity on areas where individual behavior can be easily monitored is a forward-thinking platform that can nip issues of impunity in the transport sector right in the bud. Among the revolutionary methods that can be used in this area is the concept of Closed Circuit Television (CCTV) technology. Through the use of CCTV technologies, the causes of congestion can be identified and punished immediately through arrests and the CCTV footage allowable by law to be used as evidential material in courts of law. This study recommends that CCTV cameras be installed on all roads and junctions to identify motor-vehicles, and even pedestrians that break the traffic rules.
- Another emergent technology will involve the use of Geographical Information Systems in conjunction with Geographical Positioning Systems (GPS) and other remote-sensing technologies. The use of these technologies will allow the

6.8 IMPROVEMENT OF THE PARKING SITUATION IN THE ECBD.

The PPH has provided parking provision standards to guide parking in various urban uses as shown in Table 6-3 below:

Table 6-3: Recommended Parking Standards

Usage	One Car space for every usage
Housing	2 houses or lodgings
Specialized market place	50 to 60sq. m of covered area
Market	30 to 50 sq. of covered area
Office and Administration	50 to 60 sq. m of covered area
Hotel	5 to 8 beds
School	(a) 0.5 classroom/secondary school and above (b) 1.0 classroom/ below secondary school level
Restaurant, Cinema and Theatre	12 seats

Mosque / churches	10 to 12 prayer space
Hospital	5 to 10 beds
Sports field	10 to 20 seats of spectators
Industrial establishment and workshops	6 to 10 workers

Source: Kenya, 2008.

As has been variously mentioned earlier, the ECBD is a melting pot of several urban functions and need different parking spaces based on the recommended parking spaces in Figure 6-2 above, and others not clearly stipulated. These activities include:

- hotels and restaurants, for example White Castle Hotel, Mahindi Hotel, etc
- markets, like the informal markets located in the bus stations and along Tagore
- various restaurants
- government offices and institutions located in the CBD like the office of the District Physical Planner located along Oginga Odinga Street on the KCB Building
- an array of banks and financial institutions like Barclays, KCB, and National Banks, and
- Supermarkets and high customer demand retail chains like Ukwala and Nakumatt, some like Nakumatt of which operate 24 hours.

These land uses and activities all do not satisfy the demands of Parking. Indeed some of the institutions have not provided any parking at all with their customers and guests forced to seek alternative parking. It is worth noting that in an environment where private car ownership is still a very attractive status symbol, these standards may not be very applicable in the long run depending on different foreseen and unforeseen reasons like economic boom, industrialization, among others, which will be expected to increase the motor car population

To improve the parking situation in the ECBD, there is need to:

- Provide adequate parking facilities in the ECBD by constructing additional parking bays. Roadside parking should mainly be flash parking other than angular parking. The MCE should then charge parking fees, based on the use, a charge manageable enough for motorists, but high enough to reduce any unreasonable parking in the ECBD

- For internal traffic, there should be satellite bus stations constructed to cater for the needs of public transport from different estates. Terminal facilities for local traffic from different areas within the Municipality should be as follows:

- ✂ On the area around **Paul's bakery** for traffic coming from the western side of the Municipality
- ✂ On the area around the **Railway Station** for the traffic from the northern and northwestern parts of the municipality
- ✂ For the southern parts of the Municipality, there should be a bus station in Pioneer, **shortly before the Sosiani Bridge**.

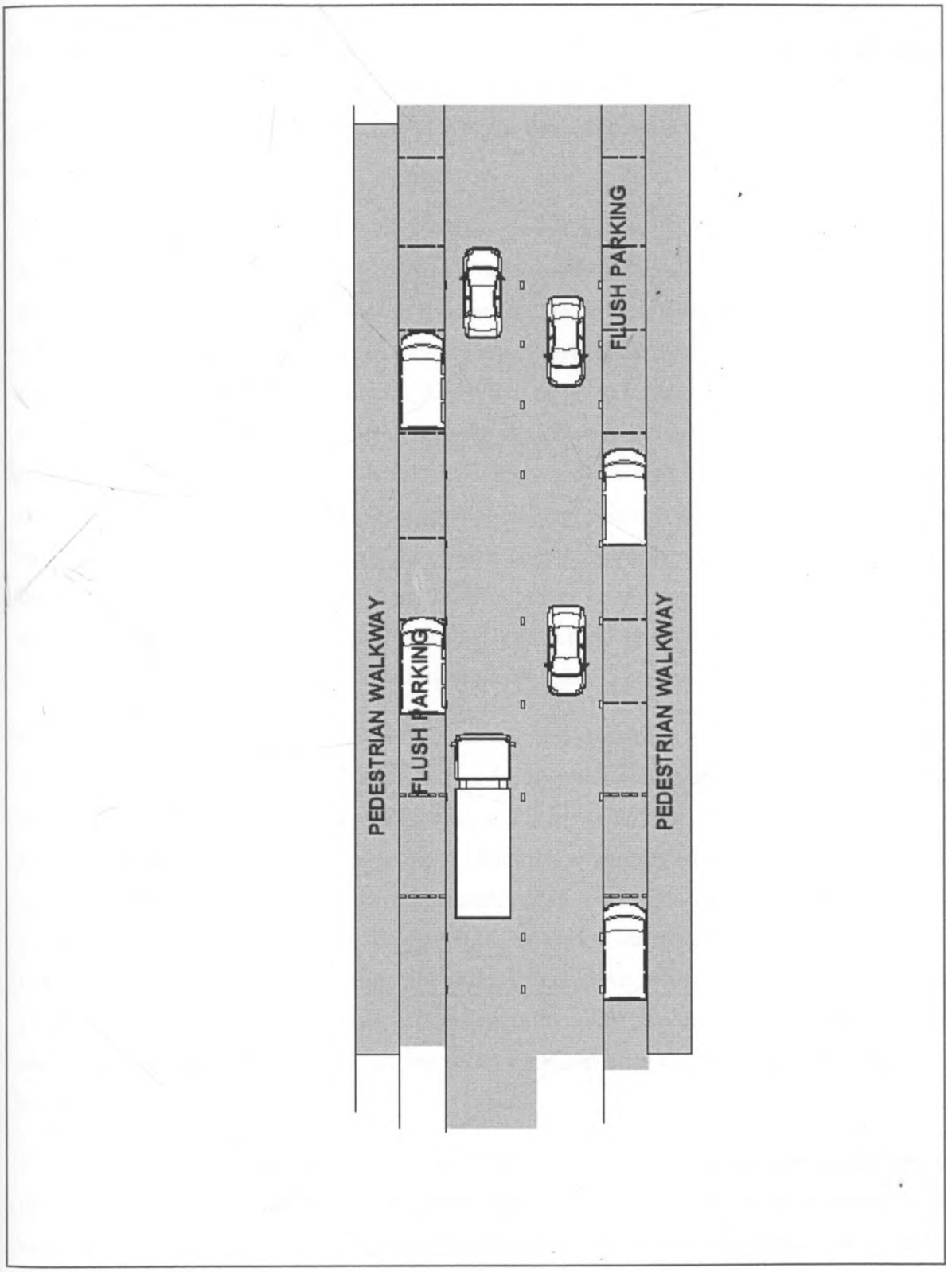
6.8.1 Re-designation of the ECBD Terminals.

The parking in the ECBD has under-performed based on the constrained parking facility. To improve the performance, this thesis proposes conversion of the main bus station for regional public transport needs, only 60-seater buses, below some age-limit, and not producing any lower limit of emission of exhaust fumes. In addition to such limiting regulations, which would need to be crystallized into by-laws, the design should provide for public convenience amenities such as passenger waiting sheds, storage facilities, fast-food kiosks and toilets. This mainly would serve transit traffic for other main towns and regional destinations. The parking should be properly designed and paved to improve drainage, preferably with a finish of concrete blocks.

6.8.2 Public Transport Intermodal Terminals

Transport modes have to act together, frequently supporting each other, to enable residents, workers, and visitors to operate within their own urban environments. The concept of the intermodal terminal thus becomes a convenient instrument to emphasize the need for system integration and to explore how this desirable state of coordination can best be achieved. The structure and all its associated access facilities will become a very visible service complex because of its centrality and role as the prime node of the entire metropolitan transportation system. (Grava, 2004).

Figure 6-5: Flush Parking on Urban Streets.



Source: Author's Construct.

6.9 EVOLUTION OF A ROBUST LEGAL AND POLICY ENVIRONMENT.

No fundamental change may be achieved in any sector in society, at the national and supra-local landscape, in the absence of a strong legislative and policy framework. At the national level there is need to evolve a robust sustainable transport policy which will address the short-coming of the current legislative regimes which do not address the problems associated with transportation and urban congestion.

As has been identified in Chapter 4, the legislative framework that governs the transport sector in Kenya leaves a lot to be desired. Indeed there is need to consolidate all issues in a transport policy. But the transport policy scarcely considers congestion of inner town areas as being the symptoms of the inefficiency of the transport sector. Indeed strong legislative frameworks have as their strengths the capacity to create stronger institutions. The World Bank has identified sustainability as the basis for a more rigorous transport policy and suggests that effective transport policy must satisfy three main requirements: First, it must ensure that a continuing capability exists to support an improved material standard of living. This corresponds to the concept of economic and financial sustainability. Second, it must generate the greatest possible improvement in the general quality of life, not merely an increase in traded goods. This relates to the concept of environmental and ecological sustainability. Third, the benefits that transport produces must be shared equitably by all sections of the community. This is termed social sustainability (The World Bank, 1996)[62]

One overarching statute that has the potential for restoring cross-cutting order in the transport sub-sector is the EMCA (1999). A very powerful tool for environmental management, EMCA (1999) is an act of parliament whose time has long come, and needs to be reviewed to address other salient issues affecting the concerns of congestion. It effectively empowers the GoK, through its various agencies like NEMA to conduct environmental management and coordination. However, for purposes of holding accountability all perpetrators of environmental pollution practices, the Act does not provide for ways of measuring the damage caused. Air pollution, emission of GHG and global warming, water pollution, noise, compaction of long stretches of land, solid-waste pollution and all damages caused by the road transport sector cannot be compounded to hold the polluters to pay in the polluter-pays provisions.

To maintain this, it is imperative for the GoK, at the macro level, to formulate laws and policies to uphold an environmentally viable transportation sector. Consumption ways of the transport sector must be stringently regulated to help come with legislative frameworks to buttress EMCA (1999) regulations which will:

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[62] The World Bank (1996), *Sustainable Transport: Priorities for Policy Reform.* Washington, DC.

- ✂ Reduce consumption of motor vehicles, which would limit purchase of private cars, low capacity public transport vehicles like the 14-seater *matatus,* introduction of high-speed light rail transport systems,
- ✂ Reduce consumption of petroleum fuel products like petrol, diesel, etc, through reduction of vehicles, research into clean energy like electric and hybrid cars, etc.
- ✂ Reduce the harmful content of petroleum fuels like elimination of lead and sulphur compounds in petroleum-fuels,
- ✂ Compel government agencies like NEMA, and MCE to test the amount environmental pollution like amount of pollution in a car, a feat which will lead to banning all vehicles deemed to pollute the environment more
- ✂ Minimise the age of motor-vehicles being imported into the country through methods like increasing taxation levels per a car by how old the vehicle is. This is because it is a scientific fact that older vehicles have less fuel-combustion efficiency, hence are higher polluters
- ✂ Increase environmentally sustainable transport through encouraging land use planning, transportation planning, clean travel means like cycling and walking, planning for cycle tracks and green pedestrianized side-walks planning for buffer zones between high pollution concentration areas like CBDs
- ✂ Set the stage for an environmental fund among cumulative polluters, whose cost of damage cannot be easily quantified, for cleaning the environmental mess caused by their cumulative action. Such a move will entail setting an amount for different vehicles based on size (passenger or goods capacity), age (where the older the vehicle is the more it would have to pay), and condition.
- ✂ Limit corruption among environmental protection agencies like NEMA and MCE, to make environmental management regulations more water-tight, to eliminate the possibility of perpetrators of environmental pollution from illegally paying less to corrupt individuals rather than paying substantially for environmental sustainability.

Such legislative inclusions have the potential to strengthen and sharpen the cutting edge of EMCA (1999). The challenge is to consolidate the coordination of environmental conservation and preservation mechanisms since aspects of pollution cover land, air and water resources, and the institutional competitions among various sectoral ministries of the GoK, like the Ministry of Lands (MoL), MoT, Ministry of Water and Irrigation (MoWI), Ministry of Environment and Mineral Resources (MEMR) and MoT. Other institutions would include Local Authorities, in this case MCE, NEMA, and others. However, NEMA is on the whole created by EMCA (1999) to reduce all the institutional conflicts. All the institutions would therefore have to undertake to comply with the

coordinative role of NEMA, without remaining lax to their own internal environmental management responsibilities.

6.10 STRENGTHENING INSTITUTIONAL COORDINATION AND CAPACITY.

A lot of actions are required at the national level to structure how the transportation sector operates and performs. As it is, there is a great disconnect on the efforts of the national government and the EMC in Eldoret. On this, generally, Kanyama and Cars (2009)[63] have observed that most local authorities are unable to implement crucial schemes to tackle problems of public transportation because central governments control sources of revenue generation. This hinders local authorities' ability to initiate public transportation schemes and for organizing mechanisms for institutional coordination. To actualize this at the MCE level, there is need to:

6.10.1 Stronger Political Goodwill

Politics touch on every facet of life in all democracies and free-market economies. To ensure a strengthened roads transport sector, and decongestion in the ECBD, Kenya's transportation policy must respond to the needs of the 'new economy' (which, according to Wasike (2001), is global, rapidly changing, and customer focused), the desire for greater environmental sustainability, a demand for a good quality of life, the public's expectations for greater involvement in decision-making on transportation, and the need for technologies and expertise not traditionally associated with highway engineers. Meeting all these expectations requires a systems approach that includes sensitivity and responsiveness to the context (social, economic, environmental, and technological) in which transportation takes place.

Stronger political will and consistent action will overcome some of the barriers to improved roads infrastructure for improved transportation efficiency, economic growth and poverty alleviation in Kenya.

6.10.2 Engagement of Physical Planners in Road Development Programmes

Indeed the PPH (2008) has identified the necessity of engagement among road engineers and planners in road infrastructure projects. It identifies that t he department of Physical Planning liaises with the Chief Engineer (Roads) in:

a. preliminary project analysis and assessment;
b. project planning and engineering design;
c. construction; and

[63] Kanyama Ahmad and Cars, G. (2009): *In Search of a Framework for Institutional Coordination in the Planning for Public Transportation in Sub-Saharan African Cities: An Analysis Based on Experiences from Dar-es-Salaam and Nairobi.* Stockholm: Royal Institute of Technology.

d. Maintenance.

In this connection, the Chief Engineer appoints an officer – responsible for township roads – to liaise with the physical planner in respective areas of the country.

6.10.3 Creation of a Transportation Planning Unit in the Physical Planning Departments.

Transportation dynamics call for experts with the capability to critically assess and diagnose the challenges and threats, in order to identify the solutions to them. Institutional capacity-building in the transportation sector in the MCE is required to ensure issues in the transportation sector are properly handled.

6.10.4 Integration of Urban Design as Methodological Component.

Urban design is the process of analysis that helps in identifying urban problems and in identifying ways of improving the urban environment, as-well-as improving the aesthetics and amenity of urban spaces. Urban design is a process that employs futuristic creativity in order to handle issues that would enable the MCE and indeed any other jurisdiction where it may be applied, in order to ensure sustainable decongestion.

6.11 ELDORET MUNICIPALITY DETAILED ROADS DESIGN

6.11.1 Roads Designs.

According to UNEP *et al* (2010), safety and sustainability can be designed into roads by simply rethinking the balance between motorized and MNT users. The design of safe road infrastructure involves managing the speed of motor vehicles and protecting NMT users. Pedestrians and cyclists are relatively safe only when motor vehicles are travelling at less than 30km/h. for proper protection, they should be separated from the motor vehicles, with their own foot-paths (Figure 6-6) and cycle paths or lanes (Figure 6-7).

Further, safe design will depend on the specific traffic flow and characteristics of the road. Nevertheless, it is clear that pedestrian footpaths, crosswalks, on-road cycling lanes or separated cycling paths, and bicycle and (motor-cycle) parking are the basic features. All should be as continuous as possible, with a smooth surface, and have proper street-lighting and signage to maximize visibility and security.

When road design reallocates the total space available for roads more proportionately between motorists and non-motorists, a segment of road users will be encouraged to shift from using vehicles to walking or cycling, especially for shorter trips. Simply increasing road space for motor vehicles propels the traffic induction cycle. On the other hand, a modal shift in favour of NMT tends to result in less congestion, smoother traffic flow, and therefore better accessibility for all. By

addressing the paramount concern of safety, roads designed with NMT facilities promote more eco-friendly, accessible travel, which are objectives that need to be achieved in any decongestion plan.

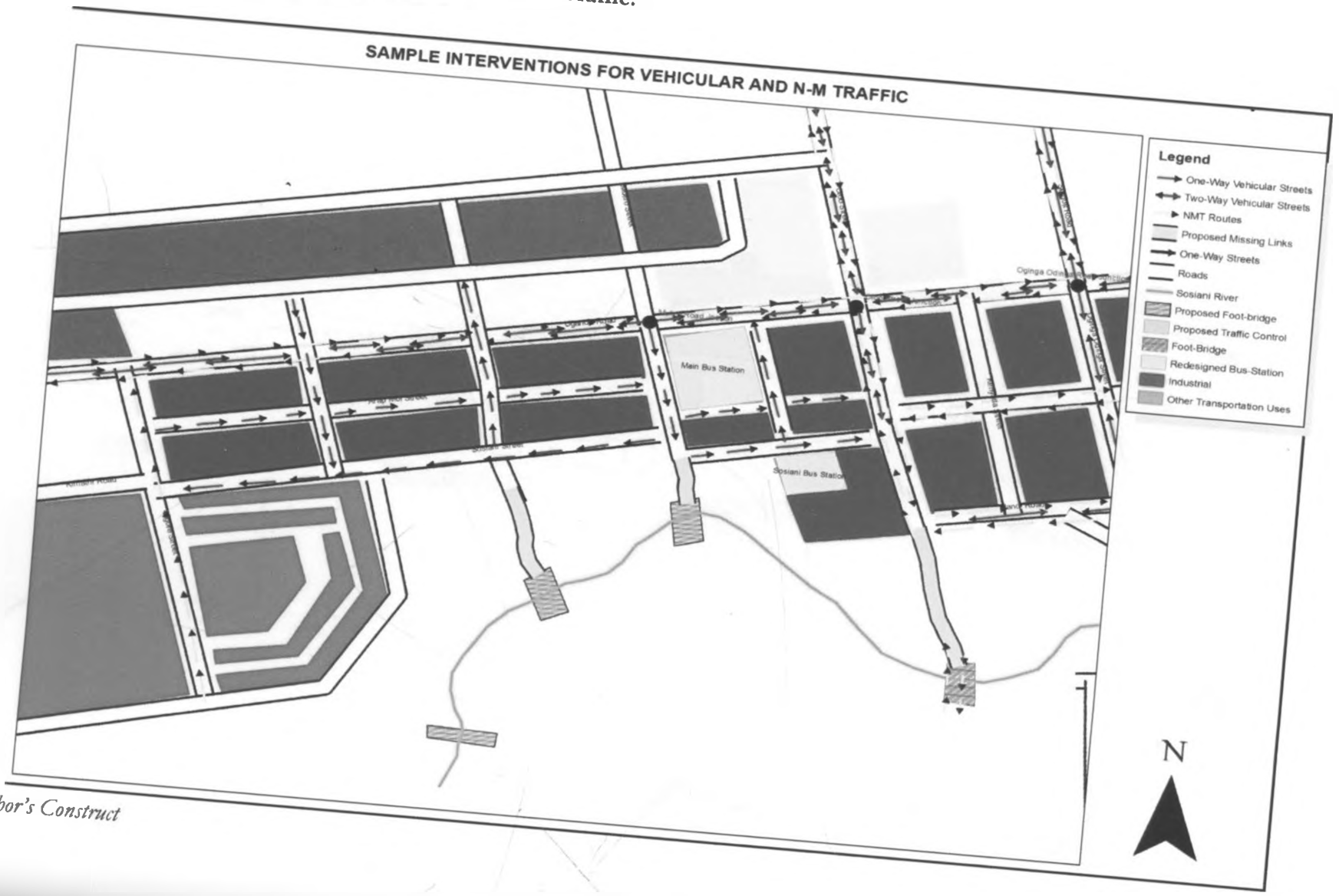
6.11.2 Intersections Management Plan

Intersections are critical elements of any urban road network. They accommodate merging and turning movements, but are also where most delays occur, accidents tend to happen, and pedestrians battle for crossing space. The extent of traffic control devices and physical structuring of any intersection should be a function of the volume, type, and prevailing speed of traffic approaching and going through the node. The basic requirement is good visibility so that each motorist can see any other movements in front or on either side that may affect his or her actions. This means unobstructed views at eye level across all corners from which crossing vehicles or people may emerge.

The first step in providing specific controls are stop signs, either holding back the secondary movement or requiring that all approaching vehicles stop and look at the scene before proceeding across. Next are traffic signals, which can range from a single device at an intersection to an elaborate system of many elements that control specifically and separately each straight or turning movement. (Grava, 2004)

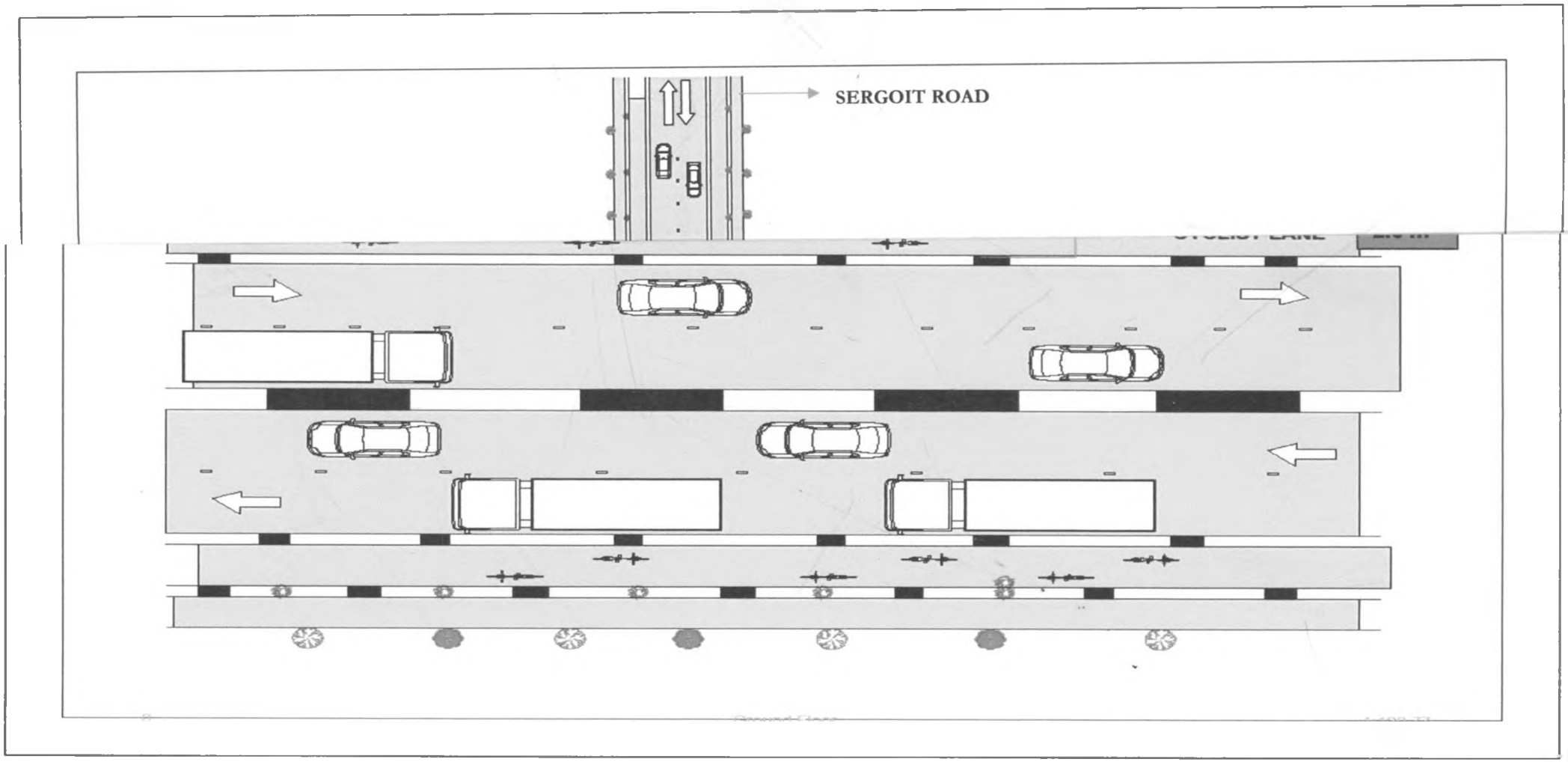
Beyond traffic control elements or in conjunction with them, physical restructuring of intersections can be undertaken in those instances where the severity of flows warrants it. This encompasses strict channelization of lanes, designating and reserving space for right-hand and left-hand turning movements.

Figure 6-6: Sample Interventions for Vehicular and N-M Traffic.



Source: Author's Construct

Figure 6-7: Intersections Management Plan: The Case of Uganda Road – Oginga Odinga – Oloo Roads Junction



6.12 TRAVEL DEMAND MANAGEMENT (TDM)

Transportation Demand Management (TDM), which restricts vehicle use in a designated area, is another effective means to solve traffic congestion on road networks. A prerequisite for introducing TDM would be availability of public transportation services to reach destinations in the designated area without relying on private vehicles. Due to the fact that those influenced by TDM are diverse and their perceived losses seem great, it becomes very important to build consensus among stakeholders under a strong political leadership (JICA, 2008).

Construction of the by-passes and conversion of Uganda Road into an Urban Road will open-up more space in the ECBD of the roads. This will reduce the number of vehicles entering the ECBD, of the vehicles which have no business entering the ECBD. In this case, the goods in transit vehicles not headed for Eldoret will have to by-pass the ECBD, taking a detour from Annexe, through Kipkaren to Bahari beyond the Municipality boundary. To ensure implementation of the utilization of the by-passes, there would be need to evolve by-laws to enforce this directive.

6.13 ACTION PLANS

6.13.1: Short-Term Strategies Within 1 year: Quick Wins

- ✂ Conversion of Uganda Road to an urban primary distributor, closing it off to all goods traffic not designated for Eldoret. The Road should allow a minimum of light commercial vehicles only in the area occupied by the ECBD.
- ✂ Implement area-wide traffic calming measures: speed humps, re-shaping of intersections, re-location of bus stops, road markings and signage, traffic signals, NMT crossings, especially in the central area.
- ✂ Change all parking orientation from angular to parallel in the central area to create more space for moving traffic. Priority streets include Ronald Ngala Street; Oginga Odinga Street; Kenyatta Street; Oloo Street; and Muliro Street, and Arap Moi Street.
- ✂ Restrict right-turning movements through the conversion of two-way streets to one-way streets. Priority should be streets joining Nairobi-Uganda road, like Kenyatta Street, Ronald Ngala Street.
- ✂ Remove all parking lots along Nairobi-Uganda road to allow for the road to operate as a dual carriageway for MT, and provide space for Cyclists.
- ✂ Improve all walkways within the central area: clear verandahs of traders and hawkers; open (remove garbage) and upgrade (pave and drain) alleys; channelize pedestrians to designated crossings
- ✂ Criminalize parking within 50m from the intersections to improve on traffic safety.

- ✂ Fence off shop frontages along Nairobi-Uganda road to control pedestrian access to the road and channelize movements and crossings.
- ✂ Designate PT termini outside the central area: along Uganda road, at Tagore; Kisumu; Nandi; and Iten roads. Passengers should then use improved walkways to access the ECBD
- ✂ Restrict town service PT operations to designated roads and terminals only: Only intercity buses should go through Nairobi-Uganda road from Sergoit Street to the North of Uganda Road to Tagore Road to the south and restricting town service-vehicles to Nandi road, and other parallel roads.
- ✂ Pass necessary legislation and by-laws for urban transport development and management.
- ✂ Move all the informal street-traders from the pavements until the designs of the streets have been improved to accommodate them with the necessary facilities provided for their operations.
- ✂ Restriction of heavy commercial vehicles destined for the industries in the areas surrounding the ECBD, and those that carry finished industrial goods from industries like Raiply Industries and the Cereals Board, among others, would have to by-pass the ECBD using either the Northern by-pass or the expanded Old Uganda Road, to join the main highway past Maili Nne, or to join the main highway (the new section of the A104) to Nairobi at Bahari.

6.13.2 Short Term Plans: 1-5 Years

- ✂ Provide traffic signals at Oginga Odinga, Oloo, Ronald Ngala Street and Muliro Street intersections with Uganda Road.
- ✂ Provide NMT bridges across River Sosiani at least every 200m;
- ✂ Upgrade all gravel roads in the surrounding areas to the ECBD to bitumen standards with NMT facilities. Priority should be given to those on the north of Nairobi-Uganda road to relieve congestion from the central area.
- ✂ Re-design Nandi – Tagore road corridor to serve town services PT, cyclists, and NMT, through Arap Moi Street.
- ✂ Acquire land for future transport developments: park and ride; BRT; terminals; road expansion.
- ✂ Establish a Transportation Unit with the responsibility for transport planning, development and operation.
- ✂ Prioritize road development and maintenance in accordance to their functions in the urban road network.

- ✂ Re-designing of all the ECBD roads to accommodate the street-traders at designated points to avoid the conflicts arising from invasion of pedestrian-walkways by the traders. Priority should be given to busy pedestrian corridors like Tagore Street and Elijah Cheruiyot, as well as the wider outer sections of Uganda Road where pedestrian walkways are provided.
- ✂ Integration of ramps in roads designs to cater for needs of the disabled.
- ✂ Beginning the process to green the ECBD through ambitious tree-planting campaigns on the main streets
- ✂ Creation of continuous dialogue with other Government departments and key stakeholders in the implementation of the key strategies of the decongestion plans.

6.13.3 Long Term Plans: Periods Covering Up-to 10 Years and beyond

- ✂ Increase coverage of traffic signals within the ECBD
- ✂ Upgrade Old Nairobi Road to bitumen standards to connect with the road to Kipkaren, and then to Uganda road past Mitaa road.
- ✂ Extend the road to Cereals Board to connect with Mitaa road to serve as an inner by-pass.
- ✂ Upgrade Elgeyo road up to RVTTI, including all its links to Nairobi road.
- ✂ Upgrade Nairobi-Uganda road to a dual carriageway between Old Nairobi road and Maili Nne. Also the Kisumu road up to Airport.
- ✂ Appropriately upgrade all roads within 2 km radius to bitumen standards to help traffic distribution.
- ✂ Creation of a by-pass to the eastern side of the ECBD that will break the heavy traffic on Kisumu Road opening onto Uganda Road through Oginga Odinga Road. Oginga Odinga Road will have to be converted to an Urban Road. The new by-pass would cater for vehicular traffic not aimed for the ECBD.
- ✂ Restrict entry of small capacity PT and private cars to central area (2 km radius) and encourage use of large capacity buses through fiscal incentives.
- ✂ Restrict urban sprawl: approval of high density development and urban rejuvenation within the central area; off-street parking; controlled development; Use of urban growth boundaries to preserve agricultural and forest land through rigorous use of comprehensive planning shaped outside the Municipality by statewide planning goals.
- ✂ Construction of designated Bus Transit Routes (BTR) to cater for the growth and anticipated growth of the Municipality of Eldoret.
- ✂ Construction of a functional modern rail transport system, integrating the international standard gauge that can effectively move passengers quickly and safety between Mombasa and Kampala through Eldoret.

Table 6-4: ECBD Decongestion Action Plans

The Table 6-4 below features the specific identifies action plans:

Strategy	Activities	Inputs	Implementation Schedule		
			Quick-Wins	1-5 years	5-20 Years
Improve road shapes to conform with the desired functions and uses	Re-classify all roads within the municipality in accordance with their Functions.	• TA assistance to Municipality. • Use the digital map. • In liaison with MOR.	●	●	
	Acquire land for road reserves that conform to the re-classified network.	• Demarcate land required for network development. • In liaison with MoL, negotiate with owners for compensation.	●	●	
	Provide NMT facilities in all roads through construction of new walkways and cycle tracks or through recovery of existing road cross section.	Funds from KRB, CDF, and LATF can be used as these facilities should be seen as "restoration" of the existing roads for current users.	●	●	
	NMT Crossing of Sosiani River every 200 metres			●	
	Upgrade all gravel roads within the central area to bitumen standards with NMT facilities. Priority is those on the north of Nairobi-Uganda road to relieve congestion from the central area.			●	
	Re-design Nandi – Tagore road corridor to serve town services PT, cyclists, and NMT.			●	
	Acquire land for future transport developments: park and ride; BRT; terminals; road expansion.			●	
Institutional Capacity Building	Create a Transportation Unit within the Engineering Department and staff with personnel with urban transport background (Engineer, Planner)	The PSC recruitment of professionals MCE	●	●	
Reduce accidents and collisions.	Implement area-wide traffic calming measures,	Traffic Police to advise on black-spots and		●	●

	such as speed humps, re-shaping of intersections, re-location of bus stops, road markings and signage, and traffic signals, especially in the CBD.	potential solutions MCE to offer the funds and implement changes Ministry of Roads to effect increased signage and marking, especially of classified roads.			
	Traffic Signage at Oginga Odinga Street, Oloo Street, and Muliro Street Intersections and other areas of the CBD.		•	•	
	Cycle lanes and tracks from main origins and destinations, especially between the CBD and residential and commercial areas.	Ministry of Roads to introduce the changes, especially of classified roads. Funds from the MCE for increasing the cyclist width allowance.	•	•	•
Reduce general street insecurity	Install street lights along important primary, secondary, and residential roads and streets, especially those with high NMT volumes.	Ministry of Roads to introduce the changes, especially of classified roads. Electricity supply from KPLC Funds for installation of the street-lights MCE to set funds for street-lighting of all roads in the ECBD.	•		
Reduce overall congestion	Relocate street traders to side streets and along roads with heavy pedestrian traffic, and	Provision of land for street traders Funds for establishing side-street shopping areas	•	•	
	Relocate matatu terminus from the town centre to land on the peripheral areas to cater for traffic from different areas	Land for locating new *matatu* parking: ✂ Around Paul's Bakery ✂ Near the Railway Station ✂ Just before the Bridge on Kisumu Road Funds for purchasing the land.	•		
	Boda Boda (bicycle and motor cycles) should be relocated to peripheral areas to cater for traffic from different roads.	Land for locating motor-cycle/cycle taxi parking. Funds for purchasing the land.	•	•	
Promulgate by-laws for land development.	Improved structure planning for the MCE to organize land uses.	MCE by-laws	•		

Legislate policies and by-laws for parking, and traffic regulation		National Transport policy MCE by-laws	•		
Road maintenance	Prioritise maintenance on the basis of road functions and traffic levels.	Funds for routine repairs Technical expertise	•	•	
	Appropriately upgrade all roads within 2 km radius to bitumen standards to help traffic distribution.	Funds		•	•
Upgrading of Major Roads.	• Upgrade Nairobi-Uganda road to a dual carriageway between Old Nairobi road and *Maili Nne.* • Kisumu road up to Airport. • Iten Road	Transport Plan		•	•
Creation of by-passes	Upgrade Elgeyo road up to RVTTI, including all its links to Nairobi road.			•	•
	Upgrade Old Nairobi Road to bitumen standards to connect with the road to Kipkaren, and then to Uganda road past Mitaa road.			•	•
	Extend the road to Cereals Board to connect with Mitaa road to serve as an inner by-pass.			•	•
	Appropriately upgrade all roads within 2 km radius to bitumen standards to help traffic distribution.			•	•
	The Northern By-pass, passing through Old Nairobi Road, Kidiwa, and joining the Uganda Road just past Raiply Industries			•	•
	The Southern By-pass, passing through Outpost, Langas, Maili Nne and joining Uganda Road.			•	•

Source: Author's construct, 2010.

6.14 RECOMMENDATION FOR FURTHER RESEARCH

As far as this study is concerned, the areas of sustainability, transportation planning, and sustainable transportation have been widely studied. Because of the dynamic nature of the transport sector, much need to be done in linking the concept of sustainability in its widest sense in transport, integrating environmental, social and economic perspectives rather than singly or predominantly focusing on the environment. However, the issues surrounding decongestion, as cross-cutting as they have been observed to be, need to be tackled wholistically without necessarily pacifying one of the elements and endangering the people in other areas. This study suggests the importance of sustainable CBD decongestion.

The findings and recommendations of this study on **Sustainable CBD Decongestion: *its Application in the ECBD*** are by no means exhaustive. Sustainable decongestion frameworks need to be investigated in view of new roads expansion programmes. But this in itself may be viewed from the SUDP. Whether the SUDP for Eldoret will respond adequately to wider sustainability issues is still yet not known. For this reason this study recommends that the following researches be carried out:

1. The extent of responsiveness the SUDP to problems identified by the people and the technical team preparing the plans
2. A Strategic Environmental Appraisal (SEA) of the SUDP for Eldoret to understand how much the plan responds to the concerns of SD.
3. Applicability of Sustainable Decongestion of Inner City Renewal of the large metropolitan areas.

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APPENDICES

APPENDIX I: ECBD PEDESTRIAN (ROAD-SIDE) QUESTIONNAIRE

University of Nairobi

Department of Urban and Regional Planning

Declaration: *The principal aim of this interview schedule/questionnaire is to collect data for academic work. However, because this research is solution oriented and may be published, I hereby declare that* ***NO*** *personal information will not be revealed, whatsoever, unless in the case of public servants whose official positions may be cited.*

1. Name (*Optional*): .....
2. Sex: (a) Male (b) Female
3. Place of Birth.....
4. Place of Origin.....
5. Age (a) Below 18 (b) 18-30 (c) 31-39 (d) 40-49 (e) Above 50
6. Level of Education

   (a)Primary (b) Secondary (c) Polytechnic (d) College (e) University (f) None
7. Occupation *(Specify)*.....
8. Nature of job

   (a) Self employed/Business (b) Government Employee (c) Employed (Other)

   (d) Unemployed.
9. Sector of employment (a) Public (b) Private
10. What is your work schedule

    1) fixed working hours 8.00 am to 5.00 pm

    2) working in shifts day and night

    3) variable working hours

    4) Other. (Specify).....
11. Location of place of work (name of place and street).....
12. Other income generating activities (list them, please.)

    1) .....

2) .....

13. What mode of transport did you use to get to your place of work/business.....

(if more than one mode, indicate that which covers the longest distance)

(a)Walk (b) *boda-boda* (c) Motorcycle (rider) (d) Motorcycle (*boda-boda*) (e) Private car (self drive) (f) Private car (passenger) (g) *Matatus* (h) Bus

14. Give a description of all the trips you made yesterday .....

.....

.....

(Example is shown) .*Description of trips e. g.*

Home – work/ business – school – shopping/ pay bills visiting/ entertainment/ recreation – home

1 2 3 4

15. What was your mode of travel for each trip (Indicate approximate travel time for each trip)

example Trip 1 – walk - 30 minutes

1) Trip 1 ..... total duration.....

2) Trip 2 ..... total duration.....

3) Trip 3 ..... total duration.....

4) Trip 4 ..... total duration.....

5) Trip 5 ..... total duration.....

(if more than one mode, indicate that which covers the longest distance)

16. What time did you leave home for work/business/school yesterday .....

17. What time did you get to work .....

18. What time did you leave for home yesterday .....

19. What time did you get home.....

20. Suggest parking areas for vehicles on the following routes:

Road	Covering estates like:	Proposed Stage at:
Uganda Road	Kapsoya, Sugunanga, etc	
Uganda Road	Huruma, West Indies	
Kisumu Road	Langas, Pioneer	
Mitaa Road	West, Macharia, Kamukunji	

END

APPENDIX II: ECBD ENTERPRISES QUESTIONNAIRE

University of Nairobi

Department of Urban and Regional Planning

Declaration: The principal aim of this interview schedule/questionnaire is to collect data for academic work. However, because this research is solution oriented and may be published, I hereby declare that any personal information will not be revealed, whatsoever, unless in the case of public servants whose official positions may be cited.

1. Name of Respondent *(Optional)*: .....
2. Sex: (a) Male (b) Female
3. District of Birth.....
4. Age (a) Below 18 (b) 18-30 (c) 31-39 (d) 40-49 (e) Above 50
5. Level of Education

   (a) Primary (b) Secondary (c) Polytechnic (d) College

   (e) University (f) None
6. Occupation *(Specify)*.....
7. Nature of job

   (a) Self employed/Business (b) Government Employee (c) Employed

   (d) Unemployed. (e) Other *(Specify)*.....
8. Estate of residence.....
9. Purpose of coming to the CBD.....
10. Nearest Market/Centre.....
11. Could the service/goods be accessed in the estate/nearest market?

    (a) Yes (b) No.
12. Street (b) Uganda Road (c) Elijah Cheruiyot Road (d) Oginga Odinga Street (e) Tagore Road
13. Type of business (a) Formal (b) Informal
14. Is your business licensed by the council (a) Yes (b) No
15. If business pays rates to the Council (a) Yes (b) No.

16. Ownership of the business:

(a) Owner (b) Owner's spouse (c) Employee (d) Caretaker

(e) Other *(Specify)*.....

17. Goods traded:

(a) Retail shop (b) Clothing (c) Green groceries (d) CDs/books

(e) Second-hand clothes (d) Curios/Carvings (e) Other *(Specify)*.....

18. What are your approximate daily earnings?

(a) Below Kshs.1000. (b) Kshs. 1000-2000 (c) Kshs. 2000-Kshs.5000

(d) Above Kshs. 5000.

19. Location: (a) In a shop (b) on a pavement

20. What led to your choice of Location for this business?

(a) Availability of space

(b) Availability of customers

(c) Higher profits

(d) Other (*Specify*).....

21. What problems does your business experience?

22. Do you experience Congestion in the ECBD? (a) Yes (b) No.

23. Which 6 Places would you rank as the **most** congested in ECBD[64] and what would you say are their causes? Provide their possible solutions.

Congested Place	Cause of Congestion	Possible Solution
1.		
2.		
3.		
4.		
5.		
6.		

24. What solutions would you recommend to curb the problem of congestion in the ECBD?

(a) Convert Uganda Road to be an urban street

(b) Construction of by-passes

(c) Relocate street traders to designated off-street markets

[64] ECBD - Eldoret Central Business District.

(d) Relocate the bus stations to areas out of the CBD

(e) Other *(Specify)*.....

(f) Other *(Specify)*.....

25. From where you live, which route (roads) do you follow to reach this place

(a) .....(b) .....

(c)..... (d).....

26. a. Do you own a car? (a)Yes (b) No.

b. If yes in (a) above, where do you park?

27. What problems do you associate with parking in the ECBD?

a. .....

b. .....

c. .....

28. How did you travel here? .....

(a) Matatus (b) Walking (c) Private Car

(d) Bicycle *boda boda* (e) cycle *boda boda* (f) Other (Specify).....

29. What is the importance of *matatus* in transport in Eldoret?

(a) Low-transport costs

(b) Flexibility to most places

(c) Quick

(d) Other *(specify)*.....

30. Problems associated with matatus?

(a) Lack of order (b) Congestion (c) Accidents

(d) Pollution (e) Other *(Specify)*.....

31. What solutions would you propose to solve the problems associated with matatus?

(a) Phasing out 14-seaters entering the CBD

(b) Out of town parking

(c) Stricter implementation of traffic laws

(d) Other (specify).....

32. What problems do you associate with *boda boda?*

(a) Lack of order (b) Congestion (c) Accidents

(d) Pollution (e) Other *(Specify)*.....

33. What solutions would you propose to solve the problems associated with matatus?

    (a) Phasing out 14-seaters entering the CBD

    (b) Out of town parking

    (c) Stricter implementation of traffic laws

    (d) Other (*specify)*.....

34. What problems do you associate with Uganda Road

    (a) Lack of order (b) Congestion (c) Acçidents

    (d) Pollution (e) Other (*Specify)*.....

35. What solutions would suggest to correct the problems associated with problems on Uganda Road?

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

-END-

APPENDIX III: TECHNICAL OFFICERS INTERVIEW SCHEDULE

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Declaration: *The principal aim of this interview schedule/questionnaire is to collect data for academic work. However, because this research is solution oriented and may be published, I hereby declare that any personal information will not be revealed, whatsoever, unless in the case of public servants whose official positions may be cited.*

Date..... Name of Interviewer.....

1. Name of respondent (Optional) ----------
2. Department/Section/Ministry----------
3. Designation (specify): ----------
4. Time Spent in Eldoret in that capacity. ----------

5. What are the conditions of the main roads in Eldoret Municipality?

Road	Description
Uganda Road	
Kenyatta Street	
Oloo Street	
Oginga Odinga Street	
Nandi Road	
Ronald Ngala Street	
Elijah Cheruiyot Street	
Sosiani Street	
Arap Moi Street	

Tagore Street	
Muliro Street	
Iten Road	
Elgeyo Border Road	
Kisumu Road	

6. Please, indicate the following for the main roads in Eldoret:

Road	Width	Year of construction	Condition	Pedestrian Walkway	Cycle Tracks

7. Give a description of the following parking facilities:

Terminal Facility	Description
Main Terminus	
Sosiani	
Kimumu	
Kapsoya	
North Rift Shuttles	
Rift Valley Shuttle	
Mololine Shuttles	

8 a. Which road in Eldoret is the busiest? ----------

b. Why is it the busiest?----------
---

c. How can this be corrected?----------

---

9. Is there a plan to decongest the town? (1) Yes (2) No

10. If there is a plan, which one is it? ----------

11. Is there a proposed by-pass road for decongesting the town ----------

12. If there is, which one is it?----------

---

13. Where would you like the following facilities to be located?

Facility	**Locations (Number them in each case)**
Street Lights	
Roundabouts	
Traffic Police Direction Points	
Police Road Blocks	
Terminal Facilities	

14. What would you like to see in the new Transport Master Plan for Eldoret Municipality?

---

15. Are there any documents that you know of that will assist us in this venture? Please, inform us of the sources so that we may access them as they may have relevant information for the planning of the Municipality of Eldoret.

END

APPENDIX IV: POPULATION PROJECTION MODEL

All population projections are based on the model, below, advanced by Lucey (1983)[65].

$$P_n = P_o\left(1 + \frac{r}{100}\right)^n$$

Where: P_n represents population of the n^{th} year, where

P_o represents population of base year

r represents the inter-censal population growth rate. For purposes of this study, the 4.9% inter-censal growth rate used has been determined by Kenya (1999)

[65] Lucey, T. (1983): *Quantitative Techniques.* London.: ELBS Publication, cited by Ochieng (2004)

APPENDIX V: TIME SCHEDULE OF THESIS RESEARCH (09 MARCH-30 JUNE 2010)

Activity	week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9	week 10
Research Proposal										
Preliminary Draft 0.										
Reconnaissance Study.										
Literature Review										
Detailed Field Survey										
Data Analysis and Report										
Presentation and Review Draft 1										
Draft 2 Write up/Design										
Draft 3 write-up and Correction										
Final Document and Thesis Defence										

Source: Author, 2010.

APPENDIX VI: BUDGET OF EXPENDITURE FOR THE STUDY.

Item	Funding (Kshs)	Expenditure (Kshs)
University of Nairobi Research Allowance	18,000	
Research Proposal and Preliminary Draft 0 Printing		500
Reconnaissance Survey for 2No. days		
Bus fare to Eldoret		1,000
Bus fare from Eldoret		1,000
Accommodation @ 1,200 per night for 2 nights.		2,400
Detailed Field Survey for 4 No. Days		
Bus fare to Eldoret		1,000
Bus fare from Eldoret		1,000
Accommodation @ 1,200 per night for 4 nights.		4,800
Printing of Survey Instruments		2,000
Base Map Development		
Scanning of hard copy A1 map@ Kshs. 500		500
Other Expenses		
SPSS data analysis		2,000
Draft 1Report Printing and binding		1,800
Draft 2 Report printing and binding		1,800
Draft 3 Report printing and binding		1,800
Final Thesis Printing of 4 copies @ Kshs 1,800		4,800
Binding of 4 No. reports @ Kshs 300 per a copy		1,200
Printing of 10 A2 Presentation Charts@ Kshs. 400		4,000
Expected Deficit*		(13, 650)
Total Cost/Expenditure	**18,000**	**31,650**

- The Kshs 13,650 deficit was met through the researcher's personal means.