

THE *MATATU* MODE OF PUBLIC TRANSPORTATION IN THE
MUNICIPALITY OF KISUMU, KENYA:

BY

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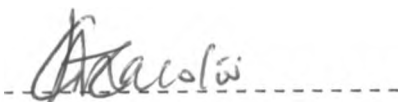
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DEDICATION

In memory of my beloved father the late Isaac Awino whose inspiration and determination enlightened me to pursue academic excellence. May the Lord rest his soul in eternal peace.

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J.O Awino

1998.

ABSTRACT

This study has examined the nature of urban public transport in the MoK as it relates to *matatu* transport in the (MoK). It begins by describing the growth and origin of the MoK's public transport system by illustrating how the present role and prospects of public transport system shaped by the mobility and growth in urban population, territorial expansions and the institutional policy structures. Urban transport plays a vital role in the economy of Kenya particularly in the major urban centres which generate a major share of the gross domestic product (GDP). The transport needs of urban workers are most acute in these centres amongst which is the MoK, the third largest urban centre in Kenya.

Matatus are an intermediate form of transportation. They are also known as paratransits (Fouracre and Maunder, 1979). The paratransits are a prevalent mode of urban public transport not only in the MoK but also in Urban Centres of the Less developed countries (LDCs).

The objectives of this study were, to examine the role and future prospects of *matatu* transport in the MoK, to examine how the operational and organizational characteristics of *matatus* contribute to the efficiency and reliability of urban transport, to analyze how the private sector provides and controls the *matatu* transport to achieve urban transport objectives, to examine the nature of employment provided by *matatu* transport and whether it contributes in solving the problem of urban unemployment and finally, to examine the constraints affecting urban transport in the MoK and suggest some solutions.

The study advanced various hypotheses. The first hypothesis was; There is no significant relationship between the number of used and newly acquired vehicles operated as *matatus* and the number of operators who have acquired credit facilities hence the large number of low quality *matatus* in the MoK. Secondly, in the employment offered by *matatus* there is no significant relationship between the level of education of the operators and their income because the *matatu* sector like other urban informal sectors is an open one where skill may be more important than formal education in determining earnings. Thirdly, there is no significant difference between the number of *matatus* operating to the low income residential zones and those operating to the high income residential zones. The research methodology used in this study employed interviews and questionnaires in the collection of data. Sampling techniques were used to select the respondents for interviews. Qualitative analysis such as the measures of central tendencies, frequency distribution tables and histograms and, analytical techniques such as the Simple Linear Regression Analysis, the T-statistic and the Chi-square statistic were used in testing the hypotheses of the study. The personal computer (PC) was used in all these procedures. The theoretical framework of this study is based on urban transportation system and the interacting facilities. The model is incorporated in this study to project and evaluate the level of service of the *matatu* transport as it relates to the future urban growth and travel demands.

The study found out that urban public transport in the MoK is inefficient and inadequate in the quality and quantity of

service offered. The study found out that urban public transportation in the MoK is dominated by the *matatus*. *Matatu* transport was found to play a significant role in meeting urban transport demands. The *matatus* were found to be profitable to the owners and also offered a wide array of employment to young urban migrants. The private sector was found to play an important role in the provision and control of *matatu* transport although their primary goal is to make profit. The major problems that plague *matatu* transport and urban public transport in general were found to be; rapidly increasing population, inadequate maintenance of roads and vehicles, low quality and quantity of operating fleet, lack of termini due to inadequate land, unlimited competition for road space with non-motorised transport and imprecise policy framework.

This study recommends that in order to improve the quality of urban transport in the MoK, the urban planners should place suitable factors both in the physical and social environment such as improvement and regular repair of roads, improvement of road safety through use of traffic control devices, construction of primary access roads to improve access to the low income residential areas and upgrading of *matatu* termini and stops. The impact of urban transport should be felt in both policy and physical terms.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASK	Agricultural Society of Kenya
CBD	Central Business District
CBS	Central Bureau of Statistics
CON	City of Nairobi
GDP	Gross Domestic Product
GoK	Government of Kenya
KBS	Kenya Bus Services
KBL	Kenya Breweries Limited
KIRDI	Kenya Industrial Research Development Institute
KPA	Kenya Ports Authority
KPLC	Kenya Power and Lightning Company
KR	Kenya Railways
LDCS	Less Developed countries
MDCS	More Developed Countries
MoK	Municipality of Kisumu
MoM	Municipality of Mombasa
NBS	Nyayo Bus Service
NYS	National Youth Service
OECD	Organization of European Community Development
PSV	Public Service Vehicle
TRRL	Transport and Road Research Laboratory
WBMAS	World Bank Matatu Assistance Scheme

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CHAPTER ONE

THE INTRODUCTION

1.0 Introduction

This study is concerned with the *matatu* mode of public transport which is an intermediate form of transit available to the majority of urban dwellers in the Municipality of Kisumu (MoK). In many urban centres of the Less developed countries (LDCs) there are several transport modes operating in parallel to one another. These reflect either the subdivision of a large market, quality of transport or the different stages in transport history of the urban centres. Urban transport is a field where the urban centres of the LDCs have so far been unable to devise solutions which meet their specific socio-economic conditions. Although many comprehensive landuse transportation studies have been undertaken for many urban centres, few have been implemented due to high costs and limited benefits of the solutions proposed. It is becoming clear that large and rapidly growing urban centres in the LDCs cannot afford to follow capital intensive mass transport systems commonly found in the More Developed Countries (MDCs). An alternative mode in the area of urban public transportation has been the development of para-transit or intermediate systems which are now operational in many urban centres of the LDCs. In the MoK and other urban centres of Kenya, these modes exist in the form of *matatus*. In other urban centres of the LDCs they exist in various forms known by different names although their structural characteristics remain the same. They are known as *Jeepneys* in Manila, Phillipines, *Jitneys* in Tehran, Iran, *Tros tros* in Accra, Ghana, *Gbakas* in

Abidjan, Cote d'Ivoire, Rickshaws in Calcutta, India, Dolmus in Istanbul, Turkey, Poda podas in Sierra Leone and Dala dala in Tanzania (Fouracre and Maunder, 1979:171-182).

Public transport is commonly a matter for public policy making. Urban governments are usually directly involved in the provision and maintenance of roads, quality and quantity licensing of vehicles, and in traffic control. However, in the MoK, like in most other urban centres of the LDCs, matatu transport has emerged as a venture of the private owners with little control from the local authority. They have also emerged as an important alternative of urban public transport available to the majority of urban dwellers. This study examines the role and future prospects of the matatu public transport in the MoK.

1.1 Statement of the problem

Urban public transport is one of the most essential services within the urban centres and has come to be regarded as the life-line of urban centres. As urban centres grow, greater concentrations of population and functions increase the importance of interaction amongst its various zones and put a high value on the quality and efficiency of its transportation system. An efficient transport system is therefore required in which total supply is adequate to meet demand and patterns of supply match needs. The transport needs of the urban workers is most critical particularly the urban poor.

The MoK has not developed a comprehensive solution to its urban public transport problem. Various attempts in the past to introduce public transport modes have not been very successful due to the high costs involved. Like in other urban centres of

Kenya and the LDC's an alternative in the area of urban public transport has been the development of paratransit or intermediate systems also known as *matatus*. Their emergence has been spontaneous developing to fill the transportation demand in the MoK. The *matatus* are however, provided and controlled by the private sector as a form of enterprise. The private sector have a free reign and are not accountable to the public in a significant way. The main problem is how to achieve a coordinated provision of the service when each entrepreneur is pursuing their own private goals without as much accountability to any public authority. This study therefore seeks to find out how the private sector provides and controls the *matatu* transport to achieve urban transport objectives.

The intermediate modes have widely been regarded as low cost modes which are cheaper to provide and operate. The current economic recession coupled with economic hardships has made the acquisition of the vehicles operated as *matatus* a most expensive venture. This has affected the rate at which the fleet size is expanding and more so, the quality of the operating fleet. A problem therefore exists in the attempts to acquire the vehicles which can be operated as *matatus* while at the same time aiming at improving the quality and quantity of service which the *matatus* offer. The problem is further compounded by the inability of most of the operators to raise capital for the purchase of the vehicles to operate as *matatus*. This study has addressed this problem by relating the number of operators who have acquired credit facilities with the number of used or newly acquired vehicles operated as *matatus*. The study has also addressed the problem of the physical infrastructure in the MoK by attempting to establish whether it has contributed to the low

quantity of operating fleet and the large number of used vehicles operated as *matatus*.

The problems addressed in this study are all geared towards creating an enabling environment for the private sector and an improved transport service to the urban dwellers.

1.2 Objectives of the Study

The general objective of the study is to examine the role and future prospects of *matatu* transport in the MoK. The specific objectives are to;

- (i) examine how the operational and organisational characteristics of *matatus* contribute to the efficiency and reliability of urban transport.
- (ii) examine the role played by the *matatu* mode of public transport in meeting the transportation demand in the MoK.
- (iii) to analyse how the private sector provides and controls *matatu* transport to achieve urban transport objectives.
- (iv) to examine the nature of employment provided by *matatu* transport and whether it contributes in solving urban unemployment problems.
- (v) to examine the constraints affecting urban public transport in the MoK and suggest some solutions.

1.3 Hypotheses of the Study

The hypotheses that were advanced in this study were:

- (i) H_0 There is no significant relationship between the number of new and used vehicles operated as *matatus* and the number of operators who have acquired credit facilities, hence the large number of low quality *matatus* in the MoK.

H₁ Alternative.

(ii) H₀ In the employment the *matatus* offer there is no significant relationship between the level of education of *matatu* operators and their income because the *matatu* sector like other urban informal sectors is an open one where skill may be more important than level of education in determining earnings.

H₁ Alternative.

(iii) H₀ There is no significant difference between the numbers of *matatus* operating to the low income residential zones and those operating to the high income residential zones.

H₁ Alternative

1.4 Review of Literature

This section provides a critical appraisal of the studies previously carried out on intermediate modes of urban public transport. Contributions of past researchers are reviewed and their valuable aspects, weaknesses and gaps appraised as they relate to the present study. This study, therefore, brings out new contributions in the light of the weaknesses and gaps observed.

Previous studies on the evolution of intermediate modes of urban public transport reveal their increasing importance in many urban centres both in the MDCs and in the LDCs. Brambilla and Longo (1977) recognized the intermediate modes of transport as

a promising alternative to the conventional system of the bus and train within the urban areas of Europe. They justified the popularity that intermediate modes have as being that of their adaptability to specific traffic-control objectives, inexpensiveness, convenience as a change from the poorly organized conventional public transportation systems and that they can be quickly organized to provide a demand oriented service. The flexibility of the system also allows for a gradual implementation which can parallel other improvements in public transportation. The objectives of the conventional public transport system in urban centres of Europe have tended to focus on reducing the number of private automobile on the roads. This objective has not succeeded very well and the recent introduction of intermediate modes such as car-pools, subscription car, shared taxis and dial-a-ride services among others, has been applauded. In the urban centres of USA, they observed that intermediate modes have been subsidized; for instance, in Danville and Illinois where Federal funds have been used to provide a subscription transportation service. They noted however, that combining intermediate measures with existing conventional transport systems increases mobility and at the same time decreases the use of private automobiles.

Cresswell (1979) also observed that in the urban centres of Europe public transport is now more concerned with limiting the private use of automobiles in preference to public transportation. He found out that in some urban centres, solution to public transportation problems has been the conventional modes of the bus, trams, and underground-type railways. But while buses and trams compete for road space with the private automobiles and commercial tracks and thus are often

the victims of congestion, underground railways are enormously expensive to build. However, he noted that *cabtracks* and *minitrans* which are intermediate modes, have been researched as alternative modes to supplement the existing urban transport modes. This study presents the *matatus* transport as an alternative mode in the MoK which should be supported to achieve wider transport objectives.

The competing needs of public transport and private automobiles have posed such a big problem in the urban centres of the MDCs such that suggestions have been put forward on whether to completely ban the private automobiles from the urban centres or pedestrianise some parts of the urban centres. Thompson (1979) observed a variety of ways which different urban centres have adopted to tackle these problems. These include; full motorization as in Los-Angeles, USA; weak-centre strategy as in Copenhagen, San Francisco and Chicago; strong-centre-strategy as in Paris, France, Tokyo, Japan and Hamburg, Germany; low-cost strategy as in Bogota, Colombia, Lagos, Nigeria and Istanbul, Turkey and lastly, traffic limitation strategy seen in London, Singapore and Vienna. Thompson (1979), however, recognised that no urban centre exactly matches these archetypes and that they all apply primarily to major cities of one million people or more. The problems of smaller urban centres are seen to be of a different magnitude though the policies of dispersal or concentration, on one hand, and the relative levels of satisfying the demands of cars and public transport stay the same, on the other hand.

In the MDCs public modal concern is a recent phenomenon as previously concern was with the relationships between landuse and transportation networks, automotive air pollution and noise,

public transport and the planning of residential areas and, public transport and industrial location among others (Webster and Bly 1978). The necessity of public modal choice has been affected by the increase in car ownership which has created numerous traffic problems in the urban centres. This study assumed the efficiency of the mass transit modes and only considered the choice of modes in relation to the environmental implications. The present study considers the choice of modes from the perspective of cost and level of service available.

Bly (1987:109-126) study on managing public transport examined the commercial profitability and social services of urban transportation modes. Basing his analysis on the objectives of public transport policy, he examined the difficulties of ensuring maximum efficiency and effectiveness when much of the revenue comes from subsidies and when the goals are poorly satisfied. He argued that the social objectives of public transport influences the provision of transport services which erstwhile may be tailored to serve only profitable customers. He also noted that the operating system depends on the management level. The small operations are characterized by personal tracking of all aspects of operation while large operations require some form of information system to enable management to keep track of performance. He, however, did not consider the profitability of the modes in the absence of a subsidy a feature which this study aims to examine. He examined other features of public transport modes such as service reliability, ridership and the maintenance of low-demand services and observed that the growth of emphasis on social factors has greatly widened the range of objectives which public transport policies are intended to satisfy. He also noted that assessing

the extent to which transit provision is successful in the wider social aims and ensuring that the costs are justified is inherently very difficult.

The effects of public transport subsidies have also been studied by Bly and Oldfield (1968:415-428). They found out that the output per employee and the productivity of the vehicle dropped significantly where such subsidies existed. They observed that although subsidies may be beneficial, their introduction to a commercial environment inevitably affected the operators objectives and had side effects quite separate from the general intention of making the services better and cheaper. The operation of an urban public service by the private individuals or companies has greater achievements than public subsidies which they see to have wider social objectives which are not very clearly defined. There is a tendency for subsidies to undermine operator efficiency. This study failed to address the availability of resources to the private sector which is one of the determinants in the provision of quality and quantity of service. The availability of capital particularly ready access to credit is regarded as essential in determining the quality of *matatus* in the MoK.

Studies on modal choice decisions have been done by Recker, et al (1967) who analyzed the determinants of various travel choice acts and also examined the effect of residential location on choice of mode to work in Bristol, United Kingdom. He found out that modal choice is also affected by household interaction and the specification of individual activity programmes. He observed that although opinions differ on the actual decision-making unit, whether the household or the individual, household interactions do constrain the range of alternatives available to

the individual. Sharp (1967) study on urban passenger transport in Strafford, UK found that a major factor influencing the demand for travel into the Central Business District (CBD) is where people choose to live. The decision of where to live according to his findings, can be the result of a complicated "trade-off" between the housing costs, cost of travelling to work and relative pleasantness of different areas of residence. The other factor that he cited as determining the demand for travel into the CBD is the number of jobs available there. However, he observed that the transportation demand caused by shopping, schooling and recreation are also important. A similar study by Macoloo (1989) found out that even in the urban centres of the LDCs the "trade-offs" still apply with the majority of the low income earners opting to live near their work places within the urban centres where they can minimize on transport costs. These studies have provided a clear picture of the benefits associated with well organized and co-ordinated urban public transport. However, the intricacies of providing a public transport service through private initiatives has not been well addressed by majority of these studies. This is an important aspect of transport planning and a gap which the present study seeks to address. The studies have also not addressed the sustainability of the individual and local initiatives in the provision of public services especially in the LDCs where the provision of public services by the authorities has been faced with difficult financial and managerial problems. In the MDCs where the above reviewed studies are based, the question of low cost transportation strategies have only been recently adopted and are mainly geared towards satisfying the environmental needs such as

overcoming congestion and limiting air pollution within the urban centres.

The urban transport problems of the LDCs are, however, unique when viewed in terms of the operating environment and the main players in the field of public transport. This can be seen from the various studies on urban public transport coming from the LDCs. Urban transportation literature in the LDCs point out the alarming situation within the transportation sector. World Bank (1986) sector paper examined the conditions of urban public transport in LDCs. The document observed that although only about one quarter of the developing world's population is urban, typically more than one half the national output is produced in the urban centres. This underscores the role of public transport in these countries. The document observes that despite low levels of automobile ownership, congestion in the urban centres is already severe in degree, in daily duration and in size of the areas affected. Public transport is inadequate both in levels of service and in the areas served. However, the document observed that possibilities do exist for combating the threatened deterioration in urban transport facilities, particularly of road space in congested areas. Secondly, large improvements in the efficiency of transport undertakings and their co-ordination and finally, reduction of transport requirements by closely relating transport facilities to improvements in urban physical patterns.

The document noted that the wide gap between levels of bus service that the poorer population can afford and those of the private car makes the provision of intermediate levels of personal transport more important. The document concludes by arguing that provision of low cost public transport providing greater access to job opportunities and improvement on facilities

for commercial traffic, cyclists and pedestrians can contribute to greater public mobility in the LDCs.

This uncertain situation in LDCs has also been analyzed by Walters (1979). He observed that the LDCs present different problems than the MDCs in that they are less responsive to various transportation proposals and implementations. He, however, noted that the LDCs have a wide option of transport solutions to choose from. The study also relates the transportation problems caused by the concentration of vehicles in the urban centres within the LDCs. He regards the use of public transport as a solution to the problem of automobile concentration in urban centres; although he argues that large urban centres suffer from traffic congestion with or without the private automobile. He sees the solution to urban transport problems as being cured in part by non-transportation solutions such as pedestrianizing streets.

Barrett (1988) reviewed the urban transport constraints in urban centres of West Africa in which he noted the extensive participation of private operators in the provision of public transport services. He observed that by keeping their operations small, private operators are able to keep costs down. All publicly operated vehicles in the region were found to have government subsidy. Within the same region, Sada et al. (1981) in a study on urban transport in Nigeria argued that the primary goal of transportation planning is the minimization of total system costs or the maximization of net benefits less costs. They have advocated for low cost remedial measures implementable on a short term.

Other studies on intermediate modes have been done by Fouracre and Maunder (1977:171-182) in which they observed that

public transport in the urban centres of the LDCs is probably determined by urban size, land use and per-capita income. Political and pressure groups were also found to be distorting factors. Studies in New Delhi, India show that rising incomes affect modal choice with people changing from walking to private, personal and public modes of transport (Meier 1977:57-63). Studies on the rising popularity of intermediate modes in Asia and Latin America have been examined by Walters (1979:191-206) based on Mini-buses in Kuala-Lumpur Malaysia; Thomas and Sengupta (1978:221-229) based on Rickshaws in Calcutta India and (Heraty, 1979:189-190) based on the Mini-buses in Kingston, Jamaica. All these studies observed that the inadequacies of conventional modes gave way to the legislation which permitted the licensing of intermediate modes. However, the intermediate modes are seen as complementing the conventional modes of public transport. Apart from their public transport roles, intermediate forms of public transport have also been identified as generating and offering employment and income especially to the majority low-income groups in their respective urban centres. These studies have also observed the low cost strategies that have been undertaken by various urban centres of the LDCs. However, their main concern has been to highlight the wider transport problems experienced in the urban centres of the LDCs. These studies view the introduction of intermediate modes in the urban transport scene as solving all the important problems of inadequate urban transport. The current study seeks to correct this oversight. The reviewed studies have also failed to recognize that the operations of the intermediate modes have their associated problems such as lack of institutional recognition, inadequate capital for implementation and inadequate maintenance of

infrastructure. These and several other short-comings have not been adequately addressed by these studies and the present study seeks to fill these gaps.

Urban centres in Kenya including the MoK, have adopted the low cost strategy approach based on *matatu* modes of public transport. The growth of these modes have nevertheless faced numerous pitfalls that have limited their benefits as a suitable mode of public transport in Kenya. Studies on *matatu* modes in Kenya have also overlooked the above scenario attempting only to consider the intermediate modes as a solution to urban transport problems without providing a blue-print on the structural mechanisms. Studies on *matatu* transport have also tended to concentrate in the City of Nairobi (CoN). These include studies by Situma (1977), Barwell (1979), Kapila et al. (1982), Osundwa (1987), Obudho (1993) and Aduwo (1990). These studies based on the *matatu* mode of public transport, examined various issues ranging from vehicle design, ridership, insurance, credit finance, route terminals, employment prospects and profitability among others. They, however, considered the *matatu* only as an emerging industry in the field of urban transportation without delving into the intricacies of providing and controlling the sector to achieve the wider transport objectives for the urban centres. This has created room for new studies based on the new developments since the legalization of the *matatus*. These studies also considered the operations of *matatus* along side several other modes most notably the Kenya Bus Service (KBS) and the commuter train. They also examined the choice of modes by commuters in a multi-modal situation. Osundwa (1987) in such a study examined the choice of commuting modes in the CoN. In an environment where there are several modes, she found out that the

socio-economic factors play an important role in the choice of public modes of transport. The most important of these being the income levels of commuters. A similar study by Hovell, et al. (1975) examined the factors that affect the demand for urban travel and modal choice with the aim of assisting an evaluation of public transport vis-a-vis its competing modes. In both studies the findings were that the choice made between modes is determined by the cost attached to them, including non-monetary costs such as time and comfort. The present study has examined the choice based on a unitary motorised public mode alongside non-motorised modes. The decision to travel when confronted by a single mode in the absence of competing modes does not rely on any quality attributes but through the modes reliability and capacity.

Aduwo (1990) in a study on *matatu* modes of public transport in the CoN examined their efficiency and other quality attributes which attracted the *matatus* to the users. The study found out that the *matatus* were attractive to the users due to their reliability, comfort, affordability and efficiency among others. The study also examined the contributions of the *matatu* mode of transport as a complementary mode to the KBS, taxis and the commuter train. The study observed that the *matatu* mode of public transport had room for improvement in quality and quantity of service which could enhance their role as an efficient urban transport mode. The present study also seeks to establish if the same findings of the above study are applicable to *matatu* modes of public transport in the MoK.

Urban transport in the MoK has not been adequately researched. The few studies that have been carried out have not adequately addressed urban public transport. These include

studies by Wera (1981), Kola (1993) and Mbeche (1990). Wera (1981) recognised the viability of operating intra-urban bus service in the MoK. The study based on urban transport planning of the MoK found that 70% of trips made in the MoK fell within distances that operating a bus service would be economical. According to this study 68% of this distance (about 5 Kms) was by 1981 covered by *matatus* while about 18% was covered on bicycles or on foot. A study by the EARS company in conjunction with the MoK in 1980 found that a substantial subsidy was required to operate an economical bus service. The study recommended, among others, that the MoK have 49% share-holding about Kshs.3 million, guarantee protection from competition by *matatus* and also to ensure the possibility of operating beyond the urban boundaries. Due to limited funds the MoK was unable to raise the required amount of money which led to the abandonment of the venture. Mbeche (1990) highlighted the potentials of operating *matatus* and buses in the MoK but pointed out the inadequacies on the physical infrastructure which has contributed to the collapse of numerous public transportation modes. Kola (1993) study on the role of non-motorised modes of transport in the MoK pointed out that urban transport in the MoK is generally constrained by the inadequately planned and maintained road network which has resulted to traffic congestion in large proportions. This is worsened by the general lack of traffic control devices. The study also examined the contribution of the *matatu* mode of transport in the movement of both goods and passengers. The study noted that the road network in the MoK was designed and planned without due consideration of other modes of transport such as the handcarts, bicycles and pedestrians as evidenced by the lack of pedestrians and cyclists

lanes. This oversight in the transportation system planning has contributed to numerous accidents involving the non-motorised modes and the motorised modes. The non-motorised modes were also found to hinder traffic movement because they share the same road space yet their speed is slow. The potentials of *matatus* as a major public transport mode has been ignored by these studies although their contribution to urban transport is extremely enormous. The reviewed studies have also not adequately addressed the long term potentials of *matatu* mode of public transport as an immediate and existing mode which is sustainable if the relevant policy and institutional recognition is accorded to the sector. This study aims at complementing the above reviewed studies by filling in the gaps left in the realisation of *matatus* as a potential urban public mode of transport.

1.5 Justification of the Study

Despite more than a decade of attempts to arrest the migration of rural populations to urban centres in Kenya, urban growth continues at an alarming rate. It seems likely that this trend will continue well into the future, and that the urban population will increase from the present level of 22% to about 40% over the next 15 years Obudho (1993:99-112). In economic terms, the urban areas have been relatively successful in accommodating this growth. Well over half the GDP is produced in the industrial and service sectors which are mainly located in the urban areas. More than half the transport resources (vehicles and fuel) are also consumed in these areas.

The accelerated urbanization has generated a number of urban problems, the result of which has been a continuing state of

deterioration affecting most of the urban centres. One of the most critical aspects of this process is that the urban population growth is far out-stripping the growth of employment and the economic base of the urban areas. The public sector has been unable to accommodate this increase in the population through the provision of infrastructure most of which are lacking or are in a poor state of disrepair. These include drainage, sanitation, garbage collection, water supply, housing and transport facilities, among others. There is also an acute shortage of resources to fund the required additional infrastructure in the major urban areas. To a large extent, the facilities date back to the colonial period and have not been improved significantly since that time. This is particularly true of the urban road networks and the provision of transport facilities especially as is related to those modes of transport for public use. A major backlog of maintenance and improvement work has accumulated. As a result, travel speeds are low, traffic congestion is common, and transport is inefficient. Many of these problems can be resolved relatively cheaply through improved maintenance, traffic management and enforcement. The high concentration of transport and industrial resources in the urban centres and the existing poor state and inefficiency of the road networks, makes the benefits of such improvements to be potentially very large, not only in terms of economic rates of return but also in terms of savings to the national economy. Apparently, due to the inadequacy of employment opportunities in the urban formal sector, there exists a large proportion of the population participating in informal sector activities which today play a major role in the provision of additional infrastructure and services. Such informal sector activities are

widespread in nearly all spheres of urban life including even the provision of urban public transport services (Aduwo and Obudho 1990).

Despite being the third largest urban centre in Kenya the MoK has not evolved a similar urban transport system like those found in the CoN and Municipality of Mombasa (MoM) Aduwo, (1990). It can largely be said that the urban transport system in the MoK is still evolving. This study focuses on the MoK not only because of its unique urban transportation system but also due to the scant literature on public transportation modes in the region. The study on the MoK was also prompted by the deteriorating urban infrastructure and aimed at understanding how the public transport modes cope with the poor state of roads, inadequate resource investment and lack of institutional recognition among others. Almost all residential areas: Manyatta, Obunga, and Arina, among others, are unapproachable from the CBD. Deep gullies make it impossible even for the most powerful four-wheel drive vehicles to venture into the estates. It is thus a wonder that the *matatus* can operate in such an environment.

As the top MoK officials grapple with the urban problems, rain and dust continue washing away whatever little remained of former roads. The ring-road that goes around Nyalenda and Pand Pieri is a conglomeration of potholes. Only a few vintage *matatus* with rusty frameworks dare use the route. Many vehicles are unable to venture into Pand-Pieri and Nyalenda estates because of huge gullies that mark the landscape. Residents of these estates have to pay extra charges for *matatu* and taxis.

It has been observed that the *matatu* mode of transportation is flexible and can be provided with limited financial investment

and are convenient for shorter routes within the intra-urban movement. (Kapila, et al,1982). More so, it has been realised that the *matatu* can operate in areas where there are difficult roads and which reduces the efficiency of bus operation. The nature of roads in the MoK are in a poor state and badly needs repair. Despite this poor state of affair, private operators have continued to provide *matatus* for public transportation. Other qualities that have encouraged the operation of *matatus* within the MoK range from the absence of a bus service and low levels of car ownership among the urban dwellers which imply that majority of the people rely on public modes to enhance their mobility. The expansion of the MoK boundaries has increased the commuter distances, hence journeys have become prohibitive to cover on foot or by cycling. The *matatus* then are seen as offering the quite important role of mobility within the MoK in the absence of alternative urban public modes.

Incidentally, their operation has been left to the private sector with little accountability to any public body. The routing, scheduling and other operational capabilities are uncoordinated and haphazard. This is due to individual ownership of the modes. There have even been calls in some quarters that they be phased out and replaced with more organised transport especially the bus. While they are being criticized, an appreciation of their role has been increasing since they are considered flexible, a major source of informal sector employment and as an indigenous and potentially capital-saving adaptation of transport technology in the LDCs. This study is called for to unveil the importance of the *matatu* operation by providing the data upon which reference can be made. The important role that private individuals play in the provision of urban public

transport within the MoK also needs to be recognised. This study seeks to explore the possibilities of encouraging this individual initiative so that an integrated and well co-ordinated transport system may be realised. The study also seeks to recommend some solutions to the problems faced by matatu operators and the MoK in providing this essential urban service.

1.6 Scope and Limitations of the Study

The study focuses on *matatu* mode of public transport in the MoK. The study was limited to urban public transport that commences and terminates its journeys within the MoK boundaries. Inter-urban transport has not been considered in this study.

The study is based on the provision of urban transport service. This study has taken the *matatu* the unit of study. The *matatus* in the MoK can be regarded as belonging to the wide range of public transport modes. They are often smaller in size than the conventional bus and therefore carry less fare paying passengers ranging from five in the case of saloons popularly known as *Kondele* to about twenty-five in the case of mini-buses. They have more flexible routes, often offer close to "door-to-door" services and make journeys at will.

The major problem encountered during the research on this study was inadequate data on *matatu* transport and the general urban transportation in the MoK. This limitation was overcome by carrying out the primary data collection to fill the gaps that existed. The results of the study were therefore not affected by the inadequate secondary data in the MoK.

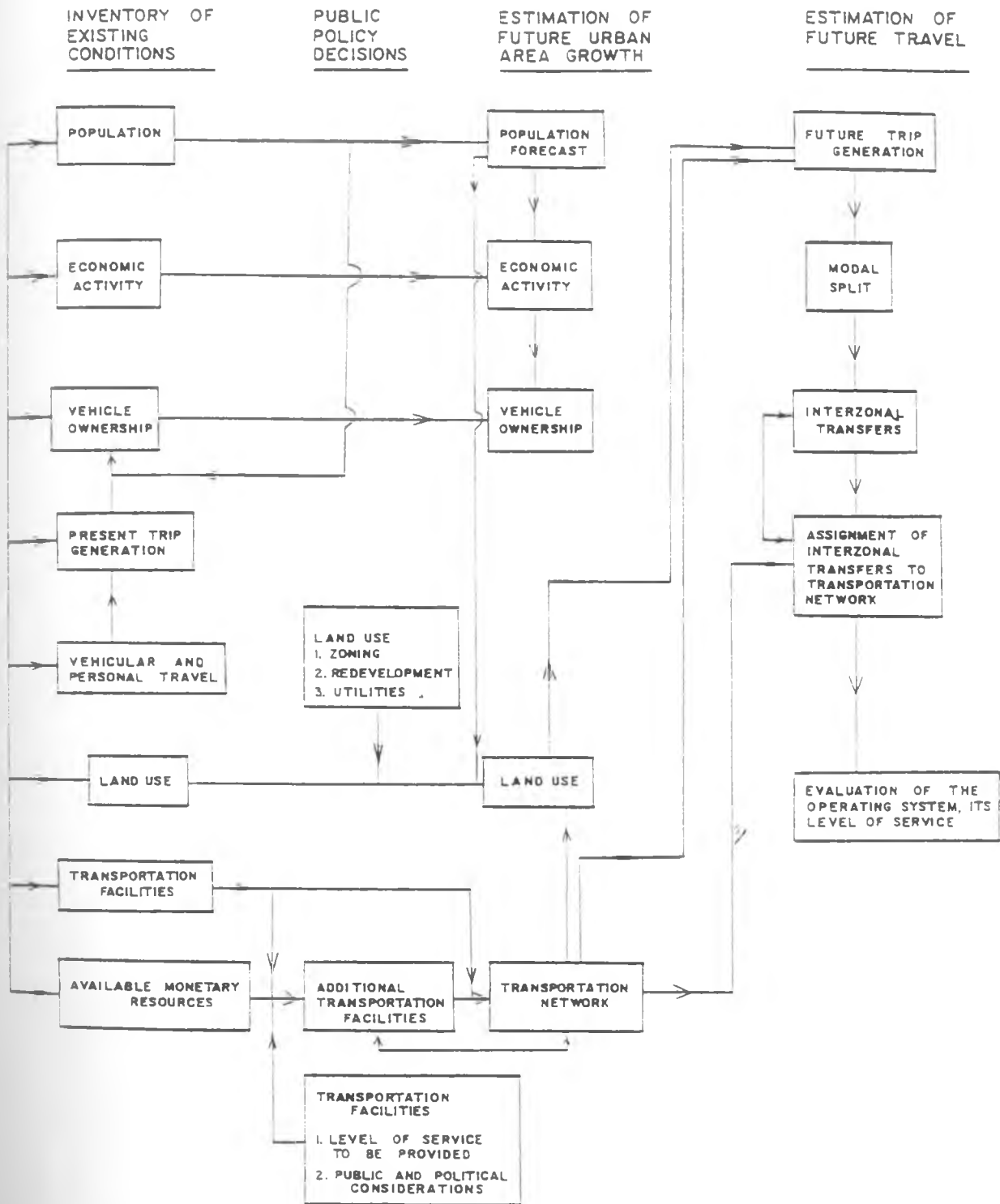
1.7 The Theoretical Framework

An urban transportation system is comprised of both the infrastructure and the services provided in an urban area which permit an individual to leave one location and travel to another. There are several characteristics of this system and its operation that are important in understanding the role that transportation has in an urban area. These include the system and facility performance, provision of mobility, construction and operational impacts of transportation facilities on the surrounding activity system and the inter-relationship between operating environment and transportation. It is theorized, however, that these factors mentioned above are dependent on three main factors, namely, the multiplicity of agents taking decisions likely to affect the system, the existence of different levels of analysis reflecting the partial points of view of these agents and possible desegregation of the system. Three main agents are concerned, more or less directly, in the production of service and the conditions under which it is carried out. These are the operator responsible for running the system, local authority responsible for organization and which defines service levels and state which is responsible for legislation. To these may be added other decision making agents which may influence, to a greater or lesser degree, how the transport system functions or which are affected by these changes made to the system. For example, users who decide whether they are going to use the system and in what way, operator personnel whose working conditions are closely linked to the management methods used and the level of service offered, unions representing the personnel, operators in the urban area whose costs are affected by the

transportation system and mass media among others. These agents are sometimes organised into influential interest groups and their objectives may differ and sometimes be conflicting. In addition to the partial point of view of each of the above mentioned decision makers, it is possible to identify at least two levels of analysis; the first level is limited to the financial impact on the system and the second level provides a broader perspective. The first level of analysis is limited to analysing relationships between demand receipts, service, expenditure and demand and the impact of these on the operators financial situation. Socio-economic and political issues which can be affected by the presence or absence of a public transport mode are included in the second level of analysis. This second factor arises because in large urban areas a public transport system consists in the juxtaposition of several sub-systems (taxis, buses and matatus, among others) by geographical area (corresponding to the different administrative authorities) or by operating organization /individuals.

Within the framework of urban public transport planning, the operation of matatus in the MoK has been examined. There are three basic elements that constitute public transport planning process. The first is forecast of demand for the system at the various levels of facility provision being considered. The second is description of economic and environmental changes that will accompany the development of the system at these same levels of facility provision.

Fig. 1-1 The Theoretical Framework



Source Slightly adapted from Memmont, M and H. R. Bone (1983)

Finally, an evaluation of the system in terms of benefits and disbenefits accruing from the various options considered.

The conceptual model is based on the different groups who are affected by the operation of the system. These are people with very different view points on the suitability of the system. These groups are the operators, users and non-users. The operator is concerned with such matters as capital costs, operating revenues and, viability of the system from an institutional view point such as union cooperation or governmental control and intervention. The user or consumer of a transportation undertaking, is concerned with such factors as monetary cost (usually in terms of fare), journey time from real origin to real destination, safety and security, reliability, comfort and convenience. In addition to these directly involved parties there remains frequently a large number of people who while neither travelling themselves on a particular system nor causing goods or people to move, are affected by the proposals of the transportation planner. Such non-users of particular transport facilities are affected by such factors as air, water and solid waste pollution, noise, visual intrusion, safety, landuse changes, social disruption and economic effects.

A successful transportation system should balance the needs of the operator and the user against the benefits and disbenefits accruing to the non-user (Figure 1:1): shows the transportation demand of an urban area and its interacting facilities.

1.8 Operational Concepts and Definitions

Intra-urban transportation:

This is used to refer to the mode of transportation that commences and terminates its journeys within the urban boundaries.

Load factor:

This is the number of people required to fill a public vehicle and the amount of time it takes to fill before taking off. Load factors in buses is higher than matatus and taxis.

Matatu:

The term is used to encompass the intermediate modes of public transport as distinguished from the conventional bus which provide urban transport services to the urban dwellers. These are vehicles that carry fare paying passengers and vary in size. Their is not less than ten passengers and not more than twenty-five passengers.

Municipal area:

This is the area that may be termed as the full functional urban region. This is usually a large, fairly contiguous built up area which may transcend any number of political or administrative boundaries but which functionally acts as a single, unified region.

Municipality of Kisumu:

The area under the jurisdiction of the Municipal authority as stipulated in the local government authority act. The area will also be defined by the extent covered by the provision of municipal services.

Public transport:

The modes which are differentiated from the privately owned automobiles and which ply urban routes ferrying fare paying passengers. Usually, they are privately owned.

Modal split:

The proportion of trips that accrue to the various competing modes of transportation.

Route:

The origin-destination distance along which the public modes ply.

Terminus:

This refers to the point of embarkation where commuters pick the transport modes or where they alight. Bus-stop can also be used to refer to termini. However, the termini usually have the other role as points where the passengers can take some form of refreshment as they wait to board.

Trip:

This is defined here as a single journey made by an individual between two points by a specified mode of travel and for a defined purpose.

Trip generation:

This is the number of trips generated in each zone for a particular journey purpose.

Trip distribution:

Describe how many trips originating in one particular zone end in the other zones.

Urban public transport:

This is used here to refer to two basic modes; the "mass transportation" which involves large vehicles usually seating thirty people or more, and "para-transit" which

offers individualised service in smaller vehicles such as taxis and *matatus*.

Urban transit:

Is service within the metropolitan areas provided by motor buses, taxis, *matatus* commuter train, etc.

1.9 Organization of the Chapters.

The main focus of this study is to examine the role and future prospects *matatu* public transport in the MoK. The introductory chapter gives the background to the research problem from which the literature review, study objectives, justification, scope and significance and operational concepts and definitions are spelt out. Chapter two discusses the physical and human background of the study whereas chapter three outlines the research methodology adopted by the study.

Chapter four analyses the nature and role of *matatu* mode of public transport in the MoK. By focusing on the set objectives, the chapter examines the growth and development of *matatu* mode of public transport, their organizational and, operational characteristics and the major constraints to their operations. chapter five examines the social and economic characteristics of the *matatu* operators and closes by discussing the geographical distribution of *matatu* operations. The last chapter gives a summary of findings, conclusions and recommendations of the study.

CHAPTER TWO

THE STUDY AREA

2.0 Introduction

This chapter examines the physical, human and economic background of the study area. The study area is taken to include the built-up area and the peri-urban areas of the MoK. This chapter starts by discussing the historical development from the period when the first rail-head reached the urban centre to the present. The chapter also examines the geographic and physical factors, demographic and residential distribution, industrial, communication and road network. Finally, the chapter concludes by giving an overview of the existing situation of the urban public transport in the MoK.

2.1 Geographical Background

2.1.1 Position and Size

The MoK is located in Kisumu District which lies within longitude 33°20' E and 35°20' E and latitudes 0°50' S (figure 2:1). It covers a total area of 421.43 sq. Km of which 158.68 sq. Km are under water. To the south west of the district lies Rachuonyo District, to the South is Kisii District, to the east is Kericho District and Siaya District to the west. Vihiga and Nandi Districts are to the north and northwest respectively.

2.1.2 Physiographic Features

Kisumu District can be divided into three topographic zones, namely, the Kano plains, the upland area of the Nyabondo and the

midland areas of Maseno. The upland area is comprised of ridges which rise gently to attitude 1835m above sea level while the Kano plains lie on the Rift Valley which is a flat stretch bordered to the north and east by the escarpment.

The MoK is situated at the head of Winam gulf of Lake Victoria and rises gradually from about 1131 metres (3720) ft. on the lake-shore to over 1170 metres (3850) ft. in the southern parts of the MoK (figure:2.2). In the north-eastern parts it rises to about 1186 metres (3900) ft. It stands on a down-faulted lava ridge in the floor of the Nyanza Rift-valley which extends some 129 Km from the lake until it is concealed beneath the volcanic out-pourings of Tinderet hills. Topographically the MoK's expansion is limited by the Nandi hills to the north, lake Victoria to the south and west and the Miwani sugar plantations and Kano irrigation scheme to the east.

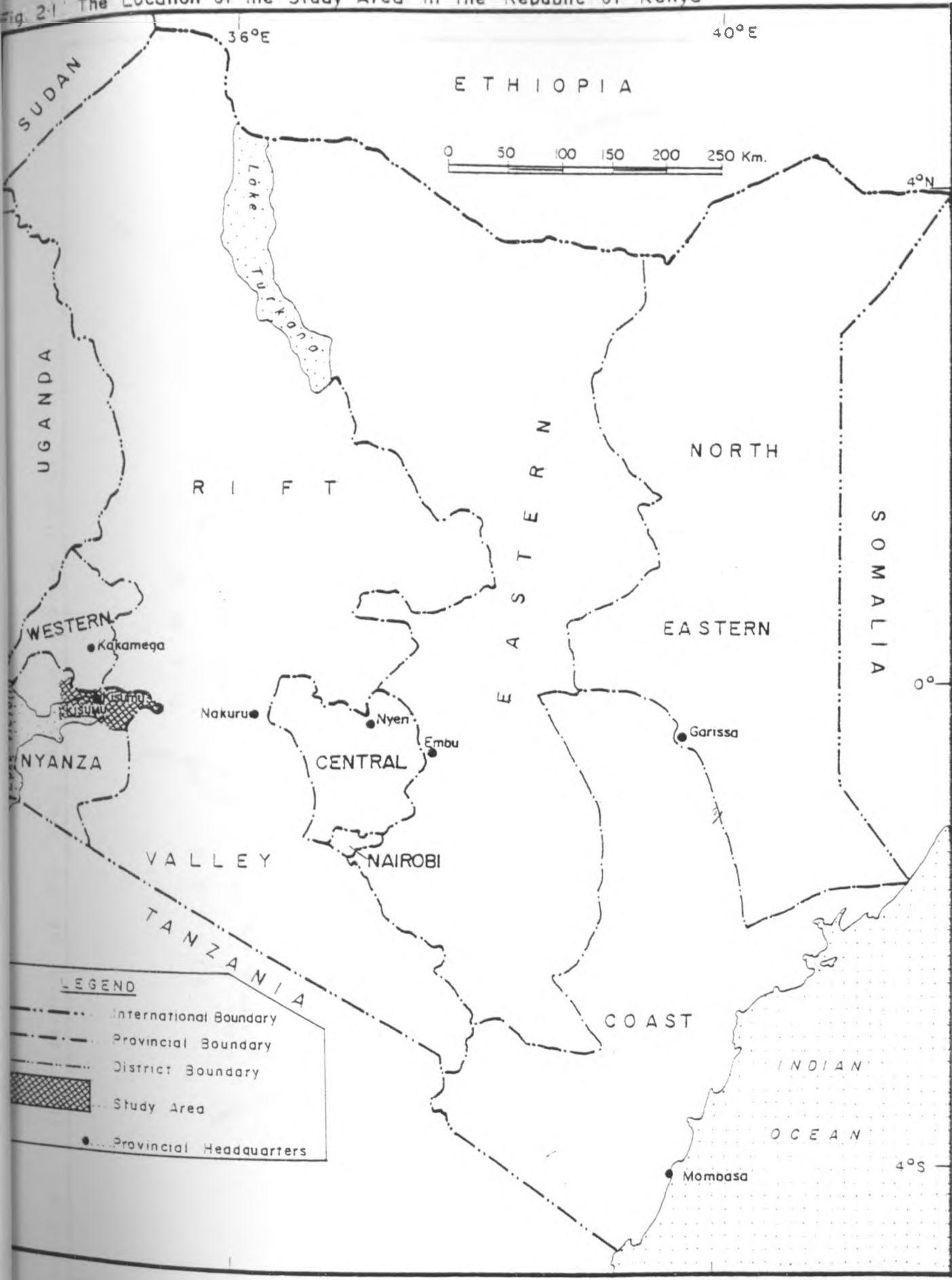
Kisumu District lies in a depression that is part of a large lowland. It surrounds the Nyanza Gulf. The processes associated with the formation of the Rift valley are, believed to have influenced some of the notable physical features, namely; the scarps in the north, east and south and the associated hill slopes that spread across the vast Kano plains (Ojany and Ogendo, 1973:18-55). The area is well suited for sugar, maize and sorghum and has a high potential for irrigation whereby rice does well. Zero grazing is another potential in the area. There are three major rivers, all flowing into the Nyanza gulf. These are Sondu, Nyando and Kibos rivers. However, heavy silting of these rivers especially Nyando and Sondu has resulted in the formation of an extensive lakeside swamp and vegetation. The physiography

of the district is varied due to the presence of the Rift valley stretching from the west to east. It ranges from associated foot slopes and Piedmont plains to the Kano plains which occupy a major part of the District. The geology of the district is characterised by overhanging huge granite rocks at Kisian and the legendary *Kit Mikayi* in Maseno Division.

2.1.3 Soils

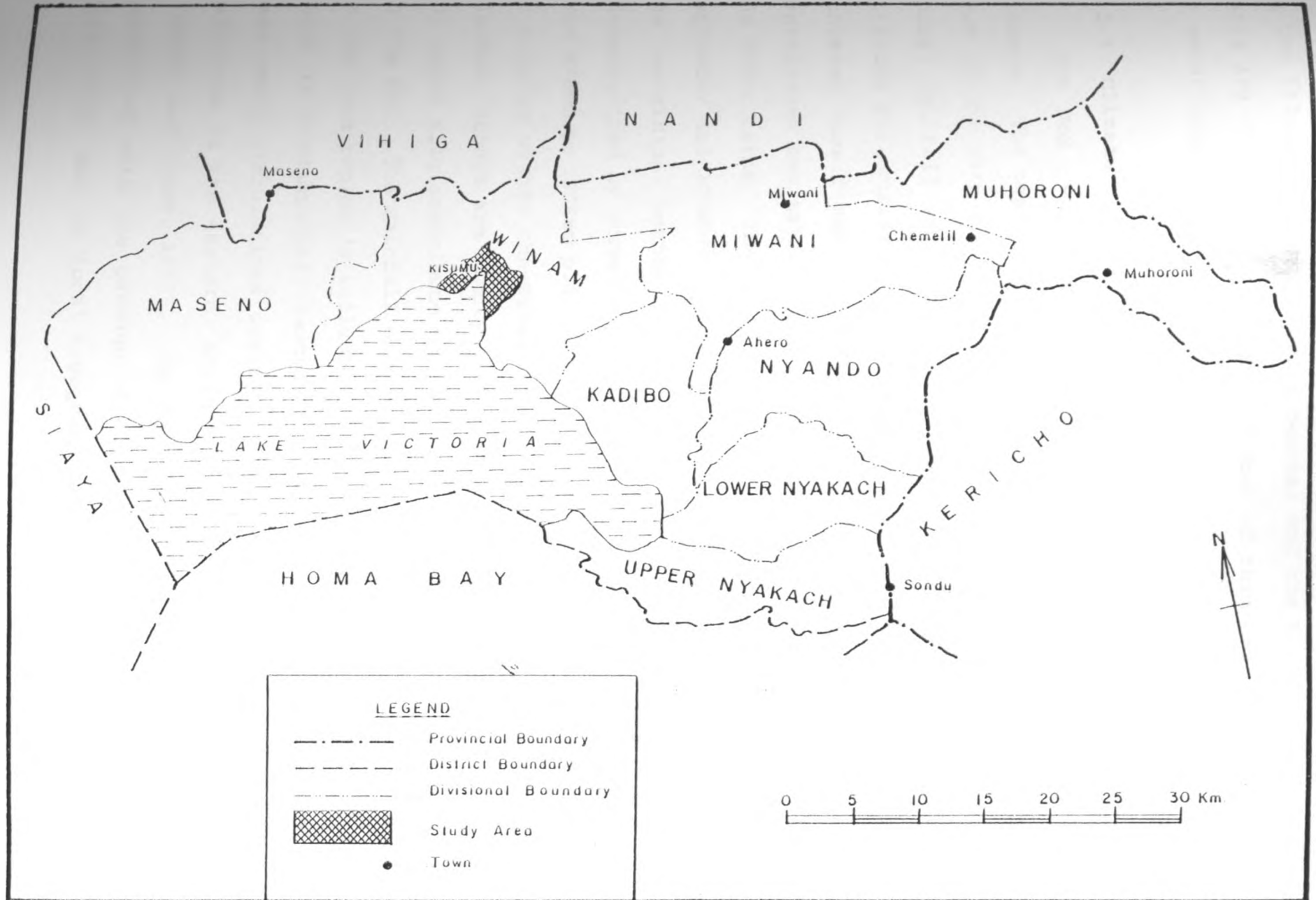
The soils of Kisumu District are mainly those that have been derived from the Nyanzian and Kavirondian rock systems which are the oldest rock systems in Kenya. The north western part of Kisumu has ferrasols which have developed from the granites of the rocky South Kakamega uplands. These soils are of low fertility and have rock bases not more than 80 cm from the surface. On the Kano plains, the soils have developed from the lacustrine mudstone and recent flood plains. The soils are deep varying from very dark brown to dark grey. These are cracking clay and are a complex of well drained to imperfectly drained soils. They have a moderate to high fertility and are subject to water logging since they are occupied by permanent or seasonal swamps. The upland area of Nyabondo has soils developed on intermediate igneous rocks such as the phonolites and trachytes. These soils are well drained and deep with small inclusions of small bottomlands of gleysols. On the fringes of the Lake Victoria's beaches and winam gulf, the soils are of varying fertility, most of which are susceptible to waterlogging. The fertility level of the soils in Muhoroni, Maseno, Nyabondo and Kajulu areas is fairly high. Akala area lying on the far north-west of Kisumu has soils ranging from low to moderate fertility.

Fig. 2.1 The Location of the Study Area in the Republic of Kenya



Source: Survey of Kenya, 1989

Fig 2 2 The Location of the Study Area in Kisumu District



On the fringes of Lake Victoria beaches and the Winam Gulf, the soils are of varying fertility and most of them are susceptible to water-logging.

2.1.4 Climate

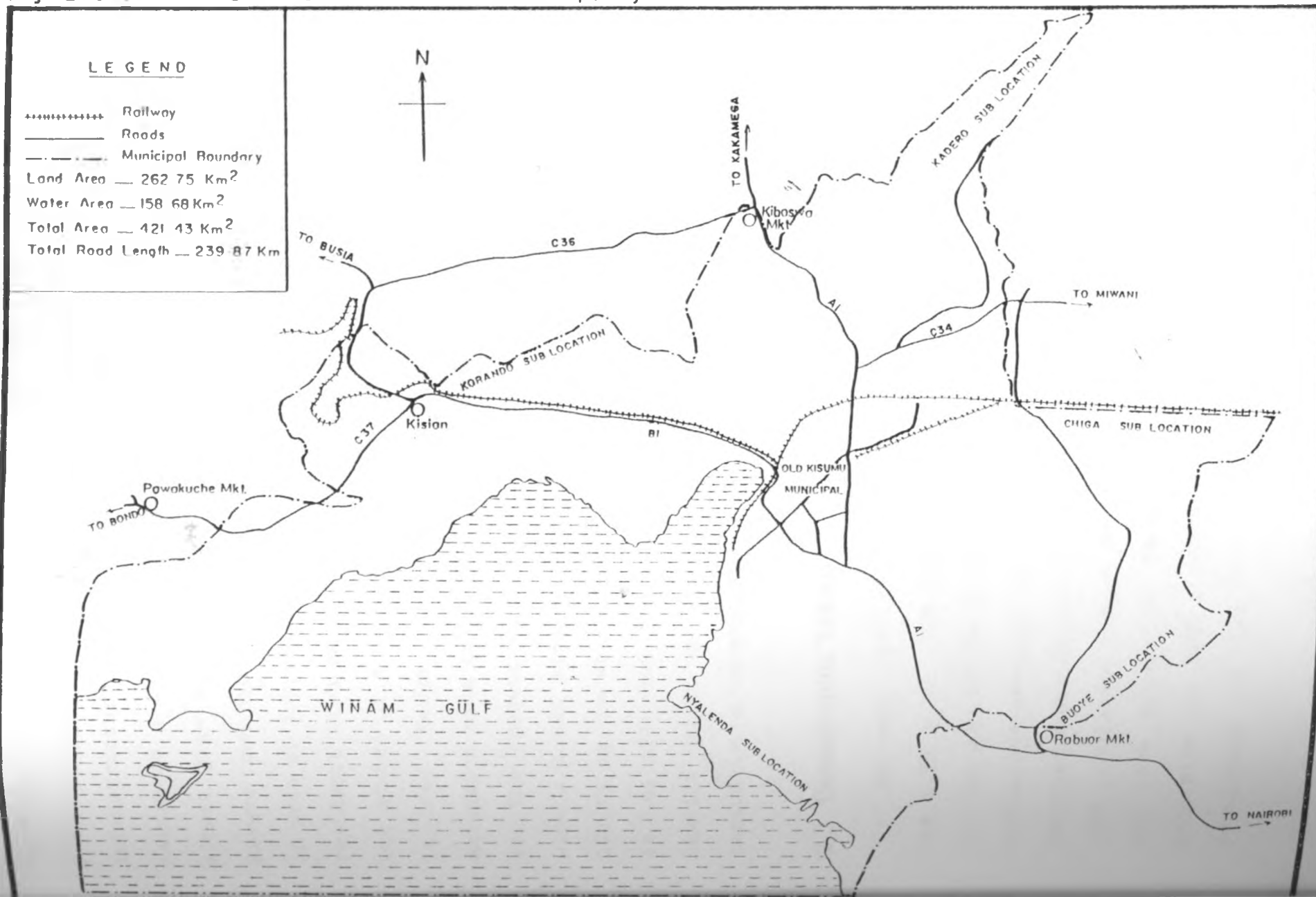
The MoK experiences a warm to hot and generally humid climate. The mean annual maximum and minimum temperatures vary from 25 to 30°C and from 9 to 18°C, respectively. The mean annual rainfall range is from 560mm to 1630mm and varies with altitude and proximity of the region to the Nandi Escarpment, the Tinderet massif and the nearness to the lake shore. The MoK experiences two major rainy seasons, that is the long rains and the short rains. The former usually occur between the months of September and October while the later fall between March and May. The remaining months are not entirely dry as they are characterized by occasional showers. The annual rainfall varies from 876mm to 1306mm p.a. The rains usually affect the movements of traffic within the urban centre. Whereas some roads become flooded, others are simply impassable during the rainy seasons. The rains also contribute to the numerous potholes on many roads in the MoK. The rainfall experienced in the MoK and other parts of the lake region is influenced by synoptic scale seasonal flow which is predominantly easterlies throughout the year and the meso-scale circulations created by the lake in the presence of highlands in the eastern, southern and northern neighbourhoods (Ogendo and Ojany, 1973). The main rain generating systems are associated with the passage of the Inter-Tropical Convergence Zone (ITCZ) and the local topographical features in relation to

the presence of Lake Victoria. The presence of the lake and the surrounding hills or high terrain within and on the flanks of the district are key factors determining the rainfall distribution and amount.

2.2 Historical Background

Kisumu was founded in 1898 and grew up as the terminus of the Uganda railway whose construction reached lake Victoria in 1901 (Obudho and Waller, 1976:81-126 Obudho and obudho, 1979 and Obudho, 1995). It was found to be strategically sited as a terminus and port for both the rail and steamer services on lake Victoria. It also provided a suitable settlement hence it was made an administrative centre by the colonialists. It was named port Florence and during this period it provided the only communication link with the ports of Uganda and Tanganyika. In 1903, It had expanded and acquired an area of approximately two and a half miles. Even though the urban area continued to grow, it's growth was not stable due to the colonialists major concern for gaining good administrative bases other than urban development. By 1920, there were already some erected shops and the India "dukawallas" had started some commercial activities within the urban centre (Obudho and Waller, 1976). There was only one street and a few modes of motorised transport as trips were mostly covered on foot and other forms of non-motorised transport such as bicycles. The development of commercial activities attracted many people to the urban centre as they could get employment and enjoy the existing social and other economic facilities. The development of the urban centre in both

Fig. 2 3 The Boundaries of the Municipality of Kisumu



physical size and in population was met by lack of proper planning and this resulted into the inadequacy of the existing infrastructural facilities (Groot, 1978). The urban area grew mainly as a result of rural urban migration. It's population almost grew steadily with its boundary expansion. By 1941, Kisumu town had a population of approximately 11,000 people with an area of approximately 15 sq. km. By 1960 it had 24,000 urban residents with an area of about 21 sq. km. The MoK was awarded the status of a municipal board in 1941 and a municipal council in 1960 (Kenya, 1992 and Obudho, 1993). The 1972 boundary extension made it's total land area to be approximately 417 sq. km. The present boundary of the MoK includes 14 sub-locations with a total area of 421.43 sq. km of which the land area is 262.75 sq. km while 158.68 sq. km is occupied by water (Otieno, et. al, 1994 and fig 2:3). About 50 sq. km fall within the heavily built-up inner urban area. The remaining area is basically un-urbanized.

2.3 Demographic Trends

Between 1948-1962 the average rate of growth for the MoK was 5.6% p.a. The highest increase was among the indigenous African population as opposed to the non-African population whose population remained small. In the 1948 population census, MoK recorded a population of 10,899. This increased to 32,526 in the 1962 population census and 32,431 in the 1969 population census. The 1979 population census recorded 185,214 people in MoK. According to the population census of 1989 the MoK had a population of 192,733 and ranked third in both area and

population to the CoN and MoM.

Table 2:1, Demographic Trends (1948-2015).

YEAR	1948	1962	1969	1979	1989	1996	2015
POP.	10899	32526	32431	185214	192733	223617	313033

Source: Kenya 1989, CBS 1989, 1995.

Based on the 1989 population census, there were 192,733 people in the MoK with an annual growth rate of 2.33% p.a. From (table 2.1) it is clear that the MoK is experiencing a rapid increase in its population which is projected to reach 313,033 by the year 2015. According to the 1989 population census results, the MoK had a sex ratio of 1.1. This ratio can be explained by the fact that more men now migrate with their families to live in the MoK and also more females are employed in the urban sector. The total number of households was found to be 47,690 which is very low as compared to 382,863 households found in the CoN and 124,468 households found in the MoM (Kenya, 1989). The increase in population in the MoK is attributed to the natural increase of the urban residents, rural-urban migration and urban boundary reclassification (Todaro and Rempel, 1992 and Ominde, 1992). However, the rapid population increase in the MoK can be linked to the lack of opportunities in the rural areas and the perceived better opportunities in the MoK which has continued to attract more rural migrants.

2.4 Land Use Pattern

The MoK has three distinct land use patterns on which physical infrastructure installations and services are based. The first zone is the CBD which is part of the "old town" and where all urban services are installed. The second zone is the peri-urban areas of Manyatta, Nyalenda, Obunga, Pand-pieri, Dunga and Bandani where some urban services are in place. Finally, there are the essentially rural areas which became part of the MoK after the most recent urban boundary expansion (Mugwan'ga, 1993). The MoK has no physical master plan save for a document prepared in 1983 intended to guide urban planning up to the year 2013 (Mugwan'ga 1983:4). In the absence of documented zones, industrial developers purchase freehold land from their owners and put up industries and other unplanned structures, resulting to industries being scattered all round the MoK. However, traces of traditional zoning can be seen in the MoK whereby the CBD stands out clearly and comprises of several business and commercial establishments, office blocks, stores, financial establishments and high class hotels, among others.

2.4.1 Industrial Location

There is also a distinct zone of industries. Light industries are located along the Kisumu-Nairobi railway line and along Obote Road and Makasembo Road towards the north of the MoK. Heavy industries are located near the lake Victoria and comprise of the oil handling industries, marine workshop and the locomotive engineering workshop at the Kenya railways depot. The MoK's industrial area stretches from the offensive factory area

to the north, southwestwards and then southwards just beyond the railway station (Ogendo, 1972).

There are various other industries located in the MoK. The main agricultural industries include food processing industries such as grain milling, miscellaneous food and dairy products processing, manufacture of bakery products, processing of soft drinks and chocolate and sugar confectionary (Ogendo, 1972:19). The main agricultural non-food processing and fabricating industries in the MoK are the furniture and fixtures fabrication, textile processing, saw milling, soap and edible oils processing, clothing fabrication, fibre processing and footwear and other leather goods fabrication. Service industries found in the MoK are the motor vehicle repair, boat and steamer repair, railway locomotive repair, printing and publishing, metal products processing and fabrication, non-electrical machinery repair, water processing and supply and glass and allied products manufacture (Ogendo, 1972). Most of the manufactural operatives are daily commuters from the residential estates in the MoK and the peri-urban settlements. These people require urban public transport to reach their work places on a daily basis especially the *matatus*. According to the industrial census of 1957, the MoK had 7.83% of the total industrial establishments in the seven main urban centres of Kenya. By 1961 the MoK had increased its share to 7.94% of the total. In number of establishments, it thus held the third place after the CoN and MoM. Most of these establishments employed very few people as shown by a census of persons engaged which was 1,441 in 1957 who were people employed mainly in the manufacturing industry. By 1961, the share of the

MoK had fallen to 4.41% of the total number of persons, placing it 5th after the CoN, MoM, Thika and Nakuru, (Ogendo, 1972 and Ominde, 1968). The most important industry in the urban centre then was steamer, boat building and repair at the marine engineering workshop. This, however, has changed recently. The major employer with 54% of the total employees is the informal sector industry, (Kenya, 1994). These people are employed in community, social and personal services, manufacturing, wholesale and retail, restaurants and hotels. The MoK is now an important centre for manufacturing, commercial and retailing, financial and transportation.

2.4.2 Residential Distribution

The residential capacity of the MoK is rapidly expanding. The residential areas of the MoK are classified into three categories, namely, high density, medium density and low density areas. The low density residential areas are located between Nkrumah and Nairobi Roads and are mainly occupied by the high income earners. These areas generate low traffic for the public transport modes hence they attract very few public transportation modes. The medium density residential areas are located to the west of Nyerere Road and along Kenyatta Highway. They include Kibuye, Tom Mboya, Robert Ouko, Ondiek, Arina, Okore, Makasembo, Pembe-Tatu, Mosque, Patel and Argwings flats (Wera, 1981:58). These areas require public transport mode and they generate adequate traffic for public transport modes. The medium density residential areas are occupied by majority of the middle income earners. The high density areas which are most populous are

inhabited by majority of the low-income groups. These areas have a high demand on the public transport modes. They also include the peri-urban settlements where private developers have put up low class housing developments (Macoloo, 1985). The low rental housing units in these residential areas attract low income earners who cannot afford housing in the high or medium cost areas. Majority of these people are also recent urban migrants (Macoloo and Mitullah, 1993). These areas include Nyalenda, Kanyakwar, Mamboleo, Kondele, Bandani, Kibos, Otonglo, Shauri-Moyo, and Nyamasaria. Public services within the high density residential areas are generally lacking or are of low quality and quantity. The most affected are sanitation, roads, garbage collection, housing and electricity supply among others. Poor roads affect the cost of providing public transport to these areas hence residents have to pay more.

2.5 Transport and Road Network

The total road network in the MoK covers 239.87²km (Otieno, et al, 1993). A greater part of the road network developed in the pre-independence period when the vehicle and population size in the MoK was still low. The vehicle and population sizes have increased tremendously over the years yet very little improvements have been done to improve the road network. Inadequate land reserved for the road development has also resulted in the difficulties in road expansion. There are two categories of roads in the MoK. The international roads and the urban roads. The international roads or the national grids link the major urban centres East African Co-operation countries. They

also link the MoK to Uganda, northern Tanzania, Rwanda, Burundi and southern Sudan. From the MoK they connect to Uganda's capital Kampala through Busia or Malaba. These roads carry very heavy traffic and are designed to meet such requirements. In Kenya they are maintained by the central government through the Ministry of public works. The international roads enter the MoK as single-carriage ways and cause congestion and traffic jams near the municipal market.

The urban roads are internal roads constructed by the MoK. They include streets and avenues and serve the CBD, industrial and residential zones. Those constructed up to about 1970 were well designed and properly constructed incorporating adequate leaves for telephone, water lines, foul and storm water drains (Mugwan'ga, 1993). These roads have since deteriorated to dangerous levels due to lack of maintenance and have become dangerous for motorists, pedestrians and cyclists. There are several incidents of motorists knocking down pedestrians or ramming on to telephone or electricity poles and even head-on collisions with on-coming traffic as they try to avoid the potholed roads. There is need for the improvement of the urban road network to ease transportation problems in the MoK. The road network in the MoK is generally of grid iron or rectangular in structure. These roads provide rapid access within the urban centre inner structure. They include Oginga Odinga Street, Jomo Kenyatta Highway, Otieno Oyoo Road, Ondiek Highway and Obote Road. In addition to these urban motorable roads are numerous other access roads which have been designed to reduce possible congestion and increase route choice within the urban centre.

These access roads serve local traffic within the MoK. Other than the roads serving the CBD area and the distributor roads linking the MoK with its hinterlands, the rest of the MoK is poorly served by access roads. Peri-urban areas incorporated in the MoK are not served by any classified motorable roads while other parts of the MoK have dirty foot paths.

2.5.1 Air Transport

Kisumu airport serve a greater part of the western Kenya region and is supported by a score of airstrips scattered in various parts in western Kenya region. The medium sized airport serves mainly light and medium sized aircraft. It is used by special charters as well as Kenya airways scheduled flights. Kisumu airport remained dormant for several years following the collapse of the East Africa Community (EAC). Scheduled flights between the MoK and the CoN resumed in the mid 1980's and provides an important service to air travellers (Mugwan'ga, 1993:1). Kisumu airport's greater potential is in regional air traffic providing a convenient link with Mwanza, Bukoba and Entebbe on the lake shores of Tanzania and Uganda as well as Central African countries.

2.5.2 Water Transport

The MoK was the headquarters of the Lake Victoria marine services before the collapse of the EAC. Water transport linked the MoK with Musoma, Mwanza, Bukoba all in Tanzania and Port Bell in Uganda. Water transport has declined and the MoK is now linked to local ports by steamer services between Homa-bay,

Kendu-bay, Kowuor, Asembo-bay, Muhuru-bay and Mbita. The vessels used are inadequate both in quality and quantity. This is due to the equally low levels of cargo and passengers and cargo. The revival of the EAC may improve the steamer services between the lake victoria ports due to the perceived increase in the volume of trade between the EAC countries.

2.5.3 Railway transport

The MoK was founded as a terminus of the Uganda railway. Rail transport links the MoK with the Western Kenya region and the rest of the country. The main facilities of the Kenya railways located in the MoK are the main depot, regional offices, marshalling yards, good stores, administrative offices and locomotive repair workshops. A minor extension links the MoK to Butere in western Kenya. Railway transport is used extensively for cargo transit although passenger transport is also very important. There is no railway extension within the MoK to distribute urban traffic. Several small urban centres have developed along the railway line such as Koru, Miwani, Chemelil, Muhoroni, Kibigori and Kibos along the Kisumu-Nairobi line and Maseno, Kisian and Butere along the Kisumu-Butere line. Regular commuters from these centres use the railway transport to and from the MoK. The passengers who arrive by train exert a sizeable pressure on the MoK's volume of traffic. The container port established at Kibos has increased the importance of the MoK as a major railway depot.

2.6 Socio-Economic Background

The MoK is situated at a focal point and serves as the major industrial, commercial and transport centre in western Kenya region (Obudho and Waller, 1976). It also serves as the provincial and district headquarters of Nyanza Province and Kisumu District. The MoK offers comparatively better educational, health, recreation, transport and other social amenities than the surrounding urban centres. This coupled with the numerous employment opportunities in the formal and informal sectors attract job seekers from a greater part of western Kenya. The informal sector is the major employer in the MoK providing self employment opportunities to the rural migrants who are unable to be absorbed in the formal sector (Mugwan'ga, 1993). The formal sector also employs a significant proportion of the urban population. The MoK requires an improvement in the existing infrastructure to cope with the rapid urbanization taking place. Improvements are required in critical areas such as drainage, sanitation, water supply, housing, garbage collection and provision of transport facilities.

THE RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the research methodology used in the collection, analysis and presentation of the relevant qualitative and quantitative data. The term "Methodology" here simply means the research technique or tool used to gather and analyse data. According to Bailey (1978) methodology is the philosophy of the research process. This includes the assumptions and values that serve as a rationale for research and the standards or criteria that have been used for interpreting data and reaching conclusions.

Interviews and questionnaires were used in the collection of data while sampling techniques were used to select the respondents for interviews. In the analysis of the data collected, both qualitative and quantitative techniques were used. Qualitative analysis methods used were descriptive statistics, measures of central tendencies; mean, mode and median, frequency distributions tables and graphs. The main analytical techniques used were the Simple linear Regression Analysis (SLRA) and the Chi-square statistic.

3.1 Sources of Data

In this study, both primary and secondary data sources were used. Secondary data was obtained from both published and unpublished sources. A detailed literature review of the past studies on matatu mode of public transport was done so as to provide a basis on which the current study could be conducted.

such data embody, among others; the results of previous studies, information contained in official statistical publications, authoritative statements and proclamations, documented decisions by local and central governments all dealing with aspects of the *matatu* mode of the public transport specifically and public transport in general. Primary data collection was aimed at filling the gaps that existed from the secondary data collection. Some hypotheses were advanced and these guided the course of the field survey which was conducted. Primary data collection involved the administration of questionnaires in the move. Informal interviews with the *matatu* operators and users and participant observation technique. The areas from which primary data was collected were *matatu* termini and the central bus station. Primary data was also collected from the bus stops situated along the roads which the *matatus* ply. The major roads along which survey was done were; Market-Nyalenda-Pandpieri-Dunga; Market-Bus station-Arina Estate-Joel Omino; Avenue-Brilliant Bar-Manyatta market; Kibuye market-Arina Estate-Manyatta primary-Callbox-Cornerlegio; Standard Bank-Aga Khan-Mosque Estate-Okore Estate-Kondole and Standard Bank-Kenyatta Highway-Nyanza general hospital-Kondele.

3.2 Sampling Procedure

The sampling techniques adopted in this study were simple random sampling, systematic sampling. Sampling was adopted due to its relative advantages of time saving and the huge expense of surveying an entire population. The basic units of survey were the individual, persons in the category of the drivers, conductors and owners of the *matatus*. The commuters also formed

the unit of survey. The sum total of these units of survey formed the population in this study.

Systematic sampling technique is used to get a sample from a defined population that is placed on a list. It involves dividing of the population by the number needed for the sample then selecting a smaller number than that arrived at by the division and finally, starting with that number selecting every k^{th} element. The $1/K$ Systematic sample procedure was used to select individual *matatu* operators for interview. An inventory of *matatus* was made for each route number. There were 8 routes along which different *matatus* operated. An inventory of *matatus* was made from each route. The total number of *matatus* operating was found to be four hundred and eighty. The sample size was reached by dividing the number of routes by the number of operating *matatus*. This was followed by a simple random selection of the first vehicle to be interviewed. Thereafter the k^{th} element which was every 3rd vehicle to arrive at the terminus was interviewed. A total of 60 conductor operators were interviewed. 60 operator drivers who included owner drivers and employee drivers were also interviewed using the Systematic sampling technique hence a total of 120 operators were interviewed. Simple random sampling was applied in the selection of commuters to be interviewed. The sample size for the commuters was 120. The correct sample size is dependant upon the nature of population and the purpose of the study. Usually the size of the sample depends on the size of the population to be sampled. Around 30 cases is considered the minimum for studies in which statistical data analysis is to be done (Bailey, 1978:84). Simple random sampling was used because it is a probability sampling where each person in the population has an

equal probability of being chosen for the sample. The interview of commuters was made simple because the loading time for *matatus* was long thus there was enough time to interview the commuters who were boarding *matatus*.

3.3 Design of Questionnaires

The field survey employed three designed questionnaires. These were directed at three groups of the respondents who included the *matatu* operators, users and the urban planning department of the MoK. The questionnaires used were open-ended. This had the advantage of allowing the respondents to answer adequately and to freely express their views. A blank space in which the respondents were required to fill in was provided for. The questionnaires were designed to bear relevance, double barrelled, ambiguous, leading and abstract questions were avoided. The questionnaire for operators of *matatus* aimed at gathering information on their social and economic status such as their age, marital status, ownership of vehicles, income and earnings and employment prospects of *matatus* among others. There were total of 62 questions directed to the *matatu* operators. There were a total of 12 questions for the commuters. These were divided into two parts. The first part had the introductory questions while the second part raised question on modal choice number of journeys, length of journeys, and the journey costs.

3.4 Research Tools

The materials used for research included writing materials such as notebooks, pens and pencils and the questionnaires. A

base map was also used. Field assistants were also enlisted to assist in the research.

3.5 Procedures of Data Analysis.

After the collection of data, it was first edited to remove information that was not relevant to the study and to correct the errors that occurred due to possible omissions. The data was summarized and compiled for analysis. The next step after editing was coding of the data. Since the data collection involved the use of the structured questionnaires, coding was done in order to make it easier to group responses and assist in data entry. The data was then entered into the computer for analysis. The statistical package for the social sciences (SPSS) programme was used in the analysis of data. Other information was manually analysed.

3.6 Methods of Data Analysis

Both qualitative and quantitative methods of data analysis have been used in this study. This aimed at analysing the raw data obtained from the field survey.

3.6.1 Qualitative Analysis

The qualitative or descriptive analysis mostly helps in analysing how variables are distributed. It also helps in summarizing a large quantity of collected raw data. Qualitative analysis was useful in this study because the design of the questionnaires used in the collection allowed for varied responses. The methods used were measures of central tendencies,

mean, mode and median, percentages, frequency distribution tables and graphs. Frequency distribution tables and histograms were very useful in showing the number of occurrences of variables in the data set and a clear graphic presentation. The Scientific package for Social Sciences (SPSS) program was used in qualitative analysis of data.

3.6.2 Quantitative Analysis.

The Simple Linear Regression Analysis (SLRA) and the Chi-square were the main analytical techniques used to analyse the hypotheses of the study. The SLRA is a statistical technique through which the relationship between a dependent (response) or criteria variable and the independent (explanatory) or predictor variable can be analysed. It makes use of the two variables X and Y where:-

X is the independent variable

Y is the dependent variable.

The underlying model of the SLRA adopted is :

$$Y_i = B_0 + B_1 X_i + E_i$$

Where ;

Y_i = ith observation of the dependent variable;

B_0 = regression constant (the Y-axis intercept);

B_1 = The slope of the regression line;

X_i = The ith observation of the independent variable;

E_i = The ith value of the random error.

The above model for the SLRA makes the following assumptions:

- (i) The independent variable consists of a set of fix values, not a set of sample measurement;

- (ii) The values of the dependent variable Y are normally distributed;
- (iii) The variance of the values of the dependent variable is constant for all values of the independent variable;
- (iv) The values of the residuals from the regression between the variable have a normal distribution; and
- (v) The values of the residuals from the regression between the two variables are independent of each other.

To test the significance of the relationship between the two variables, the t-test was used. The calculated "t" is compared with the tabulated "t" at significance level of 0.05 degrees of freedom $n-1$. If the calculated "t" is less than the tabulated "t", then the relationship is statistically significant and is not by chance.

The main disadvantage of the SLRA is that the predictive formula of the regression line does not indicate an obvious causal relationship between variables being tested. In this case correlation was done to determine the strength of the relationship between the dependent variable and the independent variable. This involved the calculation of the simple correlation coefficient (r) which indicate the nature and direction of the relationship. The coefficient of determination r^2 was further calculated to determine the proportion of influence of the independent variable on the dependent variable. The SPSS programme was used in all the analysis of the SLRA.

The Chi-square was used to test the hypothesis of no significant difference between the number of *matatu* trips ending at the low income residential zones and those ending at the high income residential zones. The Chi-square test evaluates the probability of obtaining a set of observed frequencies from a

population having assumed frequencies. It is used to test the difference between the observed frequency distribution and the expected one. It can also be used in both the one sample cases and more than one sample cases. The following steps apply in the Chi-square test;

- (i) take the difference between the observed frequency and the expected or computed $(O_i - E_i)$.
- (ii) Square the difference between the observed and the expected values $(O_i - E_i)^2$.
- (iii) divide the value in (ii) by the expected value for all the categories or classes in the contingency table to get the X^2 statistic.

$$X^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$$

E

The probability of the Chi-square occurring by chance is then obtained to decide whether the observed and the expected are significantly different. This is found by using the tabulated X^2 statistic at the given level of significance. If the calculated value is higher or lower than the tabulated then the hypothesis of no significance is rejected at the selected significance level.

The limitations of the Chi-square statistic are;

- (i) all data used in it must be in frequencies. It can therefore not be applied in interval scale data;
- (ii) Its contingency table containing the observed frequencies must have at least two columns;
- (iii) samples are assumed to be independent hence can not be applied in dependent sample cases and;
- (iv) it is assumed that sampling is done randomly

CHAPTER FOUR

THE NATURE AND ROLE OF *MATATU* MODE OF TRANSPORT IN THE MOK.

4.0 Introduction

This chapter examines the various aspects *matatu* mode of public transport. The main focus is on the operational characteristics, organisation, productivity, efficiency and ridership. The non-transport roles of *matatus* are also examined. The *matatu* mode of transport serves a greater percentage of the urban population in the MoK. Alternative modes of urban transport in the MoK are taxis and non-motorized modes such as the bicycles. A bus service operated briefly by the Nyayo Bus Service (NBS) but has since stopped its operations and the co-operation put under receivership. Whereas the taxis are reserved for more specialised ridership, the NBS were inadequate and their contribution in urban transport was of little significance. The bicycles are significant where they apply although they tend to be limited to distances less than three kilometres from the urban centre. The *matatus* play the major role in linking up of various functional zones in the MoK.

4.1 Public Transport in the MoK

Public transport in the MoK is done by motorised modes such as *matatus* and taxis. These are supplemented by private modes which include private automobile, motor-cycles and non-motorised modes such as bicycles. Other journeys are done on foot. The other modes of transport that can be seen in the MoK are the

inter-urban modes which pass through the MoK to link it with other urban centres. The matatus are the oldest means of public transport in the MoK. Their emergence can be traced to the period when the boundary expansions brought in distances of more than 3-5 kilometres. These could not be efficiently covered on foot hence the need to operate a public mode of transport was created. The demand on public transport has increased progressively with the expansion of the urban population.

The population of MoK is expected to grow at about 3.1% per annum from about 192,733 in 1989 to more than 300,000 by the turn of this century. The majority of this growth is expected to take place among the low income groups and will be mainly due to urban natural increase more than rural to urban migration (Obudho, 1976, 1977 and 1995). The demand for both public and private transport is also increasing at a similar rate. This will result in heavy concentration of vehicular modes in the MoK and thus calls for a review of the existing transport policy and new traffic management approaches. The urban transport sector in the MoK however, suffers from several weaknesses such as; poor or non-existent urban transport policies, inadequate training opportunities in the transport sector, lack of investment in urban infrastructure, inadequate expenditure on road maintenance, insufficient use of traffic management and lack of statistics and data.

The majority of public transport in the MoK is provided by the private sector which has responded to fill up the inadequacy created by the limited capacity and low quality of public transport. The private sector that provide the matatu modes of transport is dominated by individual entrepreneurs who may occasionally own more than one matatu. The entrepreneurs are

also characterized by high competition in the transport market their ability to remain in operation being determined by the investment that they put in their vehicles particularly in regards to maintenance. The public transport modes are also complemented by privately organised institutional transport. The institutions which provide modes of transport include schools, hospitals, industrial establishments, parastatal organizations, non-governmental organizations (NGO's) and the civil service, among others. The institutional modes are organized as collective transport either by bus or mini-bus. Whereas some institutions own buses or mini-buses for the transport of their employees, others rely on hired vehicles to transport their employees during the morning and evening hours. Table 4.1 shows some institutions which provide transport modes to their employees or clients.

Table 4:1 Institutional Transport in the MoK.

Institution	No. Of vehicles used
K.B.L	2
K.P.A	2
K.R	-
Hospitals	4
Schools	-
KIRDI	1
K.P.L.C	-

Source: Compiled by the author.

The institutional organized transport apply only to the employees or clients of the institutions. Nevertheless, they contribute to a significant proportion in urban mobility in the MoK.

4.2 Operational and Vehicular Characteristics.

It has been mentioned that the private sector provides the public modes of transport in the MoK. There are several types

of vehicles which are used as matatus (table 4:2). These vary by carrying capacity, vehicle design and mode.

Table 4:2, Classification of Matatu Types

Vehicle type	Carrying capacity Seated	Carrying capacity Standing
Nissan/Kombi	18	20
Converted Pickup	14	20 - 25
Peugeot 504 Estate	12	12
Saloon car	6 - 8	6 - 8
Mini-bus canter	30	40 - 45
Mini-bus	25	35 - 40

Source: Compiled by the author.

The saloon matatus constitute about 27.5% of the total number of matatus operating in the MoK (table 4:3) while the Mini-bus constitute 7.5% which is the least percentage. Converted Pickups form 20.5%, Peugeot estate 13.25%, Mini-bus canter 18.75% and Nissan/Kombi 12.5%.

Table 4:3, MoK, Percentage of Operating Matatus, 1993.

Vehicle type	Av. Number	Percent (%)
Saloon cars	110	27.5
Converted Pickups	82	20.5
Mini-bus canter	75	18.75
Peugeot 504 Estate	53	13.25
Nissan/Kombi	50	12.5
Mini-bus 25 seater	30	7.5
Total	400	100

Source: Compiled by the author.

The responses on the operations of matatus revealed that on average, each matatu operating in the MoK makes 8 passenger return trips per day. This is an average of 120 kms per day using 30 litres of fuel or travelling at 4 km per 1 litre of fuel. The average passenger trip length in the MoK is 5 kms.

This adds up to 780 kms in a month or 9,360 kms annually (Appendix 7). Along shorter passenger distances, the matatus make as many as 20 passenger return trips per day. The average number of vehicle return trips, however, depends on the vehicle carrying capacity or the load factor. The matatu saloons which have a small load factor take a shorter time to fill passengers hence they make the largest number of return trips.

Operators generally have freedom of choice as to which routes they operate. Most operators operate along fixed routes whereas others change from one route to the other depending on the demand and time of the day. The operators on fixed routes have formed route associations to protect their interests from pirates. There are about 10 route based associations with a centralized coordinating body which acts as a pressure group. The major function of the route associations is the administration of order at the termini while at the same time acting as a welfare body for the members.

The criteria for route selection by matatu operators is based on the distance to be covered, potential demand available, profitability of the route, nature of road and age of the vehicle (basically the mechanical state of the vehicle). These factors are independent wherever they apply. The matatu owners personal preference is also another factor in determining the route along which they operate. The age of the vehicle is important in route selection because new vehicles in a strong mechanical state can operate over long distant routes without much difficulties while old vehicles in a poor mechanical state are put on short distance routes. Owners of new matatus rarely operate their vehicles on routes with poor roads as the potholed and gullied roads contribute to the rapid mechanical breakdown of the vehicles.

There is general preference of routes with road conditions that are fair and which have minimum mechanical effects on the vehicles. Along routes whereby the roads have been washed away and what remains are potholes and gullies, there are few *matatus* in operation and commuters here pay more. The routes which have the largest number of *matatus* in operation are those which link the low income residential zones. As has been observed earlier, those areas have a very high demand on urban public transport.

A larger proportion of *matatus* are driven by employed drivers while the others are driven by owner drivers. In the former category, there are three types of arrangements which the owners make with the employed drivers. The first type of arrangement is whereby the owner hire the *matatu* to drivers on a daily basis. The owner takes care of the vehicle repairs, taxes, insurance and tyres while the driver pays for the running costs such as fuel, oil, the traffic police and the touts (self styled conductors). At the end of the day the driver remits to the owner on agreed percentage of the total earnings (usually 65%) while he keeps the remaining percentage (35%) as his earnings. The second type of arrangement is whereby the driver remits a fixed amount of money to the vehicle owner. Any amount of money which remains after this deduction is kept by the driver as his wages. This arrangement has the disadvantage that it contributes to overloading, speeding and recklessness on the part of the drivers as they try to raise a large balance for their wages. The third arrangement involves the employment of a driver on a fixed monthly salary.

On average, the *matatus* operate on a six day weekly basis. The majority of the operators work without leave or rest except for one day off over the weekends. Occasionally, this is also

the time when the *matatu* is taken to the open air garages for repairs. The *matatus* also operate on an average of thirteen hours per day with most operators commencing their operations between 5.30 am and 6.30 am and stopping between 8.00 pm and 10.30 pm. Most operations however, stop only when there are no more commuters to be carried.

4.3 Service Reliability and Vehicle Maintenance

The reliability of *matatus* modes of transport is largely based on the degree of their organization without which the level of their services would be inadequate. The general view about the *matatu* operations has been that of poor co-ordination and disorganization. They have been associated with haphazard operations, recklessness and other equally negative concepts. It was however observed that the *matatu* operations are well co-ordinated albeit on an informal basis. The vehicle operating periods are well defined. The daily schedules are also determined by the organization available at the termini or route number. Generally, *matatus* load passengers at the termini. This is based on a first come first to load basis. The first vehicle at the terminus at the beginning of the day loads first. The other vehicles are booked on a cardboard in the order of arrival and they load passengers in that sequence. After a return trip, a vehicle joins the queue at the end. The order is observed by all the *matatus* plying one route. There are terminus officials whose duty is to ensure that the order is observed.

The reliability of the *matatus* is also affected by the quality of operating vehicles. The survey revealed that majority of the fleet size is comprised of second hand vehicles or

vehicles whose mechanical strength has diminished. There are very few brand new vehicles in operation. Of the *matatus* whose operators were interviewed, 62.5% of them operated second hand *matatus*. These are also vehicles that were purchased from the second, third or fourth original owners. Only 37.5% of the operators had acquired brand new vehicles (table 4:9). The operators interviewed noted that the acquisition of brand new vehicles was very difficult as well as uneconomical. The difficulties in acquiring brand new vehicles for use as *matatus* included lack of capital, lack of credit facilities, high bank interest rates and lack of guarantors or security which financial institutions require before they can loan out money to individuals. There is also inadequate organisation into co-operative units by the *matatu* operators. Their organizations are only welfare oriented with little impetus on financial lobbying. The operations of brand new vehicles is also discouraged by the large number of roads in the MoK which are poorly maintained and contributes to rapid mechanical breakdown of the vehicles. Low quality vehicles are a common feature in the MoK's public transport system. These seem to cope with the poor roads although their reliability is greatly compromised.

The reliability of the *matatus* is also linked to their maintenance and repair. On average, the maintenance and repair costs vary with the mechanical problem and the availability of vehicle spares for the type of vehicle make. The Peugeot spares were found to be more readily available than all the other vehicle spare parts. The maintenance problems most commonly cited were carburettor problems, gearbox, brakes, loose springs and overheating. Tyres were also a constant cause of vehicle breakdown as those interviewed could only afford to purchase

retread tyres which cost less than brand new tyres but whose lifespan is lower than new tyres. These mechanical problems lead to a higher rate of vehicle breakdown and failure to operate is therefore very high. The operators were found to be spending many hours in the informal or *Jua Kali* garages with their vehicles. This reduces the vehicle productivity and hence low profits. Other than the *Jua Kali* garages, the *matatu* operators also spend a lot of time attending court cases due to traffic offences which range from obstruction, expired road licences, uninsured vehicles, unroadworthy vehicles or unlicensed drivers (table 4:4).

Table 4:4, Frequency of *Matatus* Failure to Operate along *Kondele* Route.

Days	Breakage	Garage	Court	Other	Operating	Total
Mon	03	04	06	03	44	60
Tue	04	06	05	05	40	60
Wed	09	07	04	01	39	60
Thur	06	03	07	03	41	60
Fri	10	07	05	02	36	60
Sat	10	10	00	10	30	60
Sun	11	14	00	05	30	60

Source: Compiled by the author.

The operators of *matatus* prefer to use the informal or *Jua Kali* garages for their maintenance and vehicle repairs as opposed to the formal garages. This is because of their suitability as an informal, cheap and accessible to majority of the operators. The *Jua Kali* garages have also evolved as an informal cheap response to widespread user demand in a similar way that the *matatus* have developed. The *Jua Kali* mechanics have also developed their skill and tools of trade to suit the mechanical problems that occur from time to time. Their charges are equally flexible to what their clients can afford. Kapila et al. (1982) observed that any policy of upgrading the *matatu* mode of public transport would be incomplete if it did not cover the servicing system; in particular, training and upgrading of skills of the *Jua Kali* garage mechanics which would contribute to improving the industry. The *Jua Kali* garages are affordable to *matatu* operators unlike the formal garages which are expensive. The operators also use the *Jua Kali* garages as a way of minimizing costs of operation. The *Jua Kali* garages are numerous within the MoK and majority have developed a customer-client relationship.

The reliability of *matatus* is also related to the safety of the vehicles used. The *matatus* have always been depicted as an epitome of road accidents. In the MoK, critics of these modes have described them as death traps. The survey, however, revealed that there are few accidents associated with the intra-urban *matatus*. The police records show that most vehicular accidents that occur within the MoK involve only a small percentage of the *matatus* and where the *matatus* have been involved, they have only been minor mishaps. The low accident rates involving *matatus* is attributed to the slow vehicle speeds; potholed roads which reduce the speed at which *matatus* move,

small number of vehicular modes and the shorter passenger distances. There are road accidents that occur despite the reasons cited and usually result into injury or even death. The poor maintenance of the *matatus* which make them look unroadworthy help create the impression that they are death traps, for instance, their possibility of catching fire and burning with all the occupants. The low quality of the *matatus* also implies that very few are insured to carry passengers. A significant number of vehicles used as *matatus* for instance, the saloon *matatus* are privately registered vehicles whose owners have converted illegally for use as public service vehicles. Most vehicles used as *matatus* would incur high insurance costs which the operators would be unable to meet.

4.4 Profitability Levels of Matatu Transport

Matatu operators get their revenue from the fares paid by commuters and also when they hire out the vehicles for other uses such as funeral trips, weddings and tours among others. The *matatu* operators usually fix their own fares. The fares charged vary from each destination, distance covered, nature of the roads and prices of fuel at any given time (table 4:5). Usually an increase in the price of fuel automatically leads to a hike in the fares charged. The fares charged also vary with the level of demand at any given time. During the low peak periods like weekends, the fares charged are negotiable whereas during the peak periods they remain fixed. The fares charged also increase during the late evening hours.

The levels of profitability of *matatus* is determined by the carrying size of the vehicle. The Mini-bus was found to be the

most profitable matatu to operate, followed by the Mini-bus canter and the converted Pickup matatu. The next profitable matatu was the Nissan/Kombi type while the least profitable was the saloon matatu. Nevertheless, these vehicles provide the owners with substantial earnings.

Table 4:5, Fare Index by Destination

Destination	Fare (ksh)	Distance (km)
Nyalenda	10	4
Kondele	12	5
Otong'lo	15	9
Bandani	12	8
Manyatta	10	6
Mamboleo	15	8
Migosi	12	6
Arina	10	4

Source: Compiled by the author.

Table 4:6 shows the vehicle average daily and annual revenues.

Table 4:6, Average Revenues by Type of Vehicle (KSH).

Description	Daily	Annual
Converted Pickup	1570	527520
Mini-bus Canter	1750	588000
Saloons	840	282240
Peugeot 504 Estate	920	309120
Nissan/Kombi	1588	197568
Mini-bus	2625	882000

Source: Compiled by author.

Other than the load factor, there are several factors which determine the profitability levels of a matatu. These factors are related to minimizing of the operation costs. Firstly, the matatu is profitable if the owner purchases third party insurance cover and does not pay taxes on the earnings from the matatu. The matatu operators in the MoK prefer the third party insurance cover to comprehensive insurance cover because the former is viewed to be cheaper and economical whereas the latter is

expensive and also increases the operation costs. In several other cases, the operators prefer to give bribes to the traffic police and continue to operate without the insurance cover or other vehicle licences. This explains why there are usually very few *matatus* operating whenever there is a police crackdown on unroadworthy vehicles or illegal operators. Secondly, it is economical for operators to purchase a temporary form of the PSV road licence rather than purchase the formal PSV road licence. The former is a temporary document with an expiry duration of fourteen days. The latter is expensive but lasts for a longer duration. Thirdly, the *matatu* is profitable if its operating lifespan is longer. The number of years in which a *matatu* will operate determines the levels of profitability. The initial years after purchase of the vehicles are usually characterized with repaying of loans or recovering the money used to purchase the vehicle. This can last a period of about two and four years. After this period, the revenue earned is considered as the profit. The lifespan of a *matatu* can, however, be lengthened by observing regular and adequate maintenance and repairs, operation along well maintained roads, short vehicle distances and observing the right carrying capacity among others. Fourthly, a *matatu* is profitable if the vehicle is a second hand one rather than a brand new vehicle. The cost of a new vehicle exceeds the profit margins of the *matatu*, hence, second hand vehicles which are considerably cheaper are preferred. New vehicles have a longer lifespan and are profitable in the long run. It is more profitable for a *matatu* owner to employ a driver who remits all the daily earnings while the owner meets the running costs rather than demanding a fixed percentage of the daily revenue with the driver keeping the surplus earnings. It was observed that most

vehicles used as *matatus* in the MoK have a shorter lifespan because they are purchased from the third or even fourth owners. The *matatu* operators also do not reinvest adequately into the business hence majority of the *matatus* are ramshackles while the number is also small.

The expenditure on *matatus* include fixed expenditures such as capital costs, vehicle insurance, PSV licence and variable expenditure such as fuel cost, crew salaries, tyres, maintenance and repair costs. The *matatus* use both diesel and petrol fuel for the diesel and petrol engines, respectively. The type of fuel which is economical is diesel although the diesel engined vehicles are more expensive than the petrol engined vehicles. By 1993, the cost of the different types of fuel were Ksh. 21.75 and Ksh. 22.75 for diesel and petrol fuels, respectively. On average, a litre of fuel lasts for about 3-4 kms depending on the vehicle capacity, make and level of maintenance. The average number of crew operating in a *matatu* was found to be two that is, a driver and a conductor. There are also touts and terminus officials who operate from the terminus and who are remunerated from the proceeds of the *matatus*. The *matatus* create employment for those in the low income category. According to the operators survey, the average monthly income of drivers was Ksh. 3,000.00 while the conductors were earned an average of Ksh. 2,000.00 per month. The touts earned Ksh. 900.00 per month in the form of daily allowances. Terminus officials were paid Ksh. 10.00 per vehicle departing from the terminus at any one time. According to this category touts are the lowest paid *matatu* workers. The survey revealed that the *matatus* in the MoK generated about Ksh. 8 million per month which averages Ksh. 96 million per year. The *matatu* sector generates additional income for dealers in motor

vehicles, tyres, spare parts and accessories, insurance companies and financial institutions, among others. Several of these are however unquantifiable.

4.5 Ownership Structure

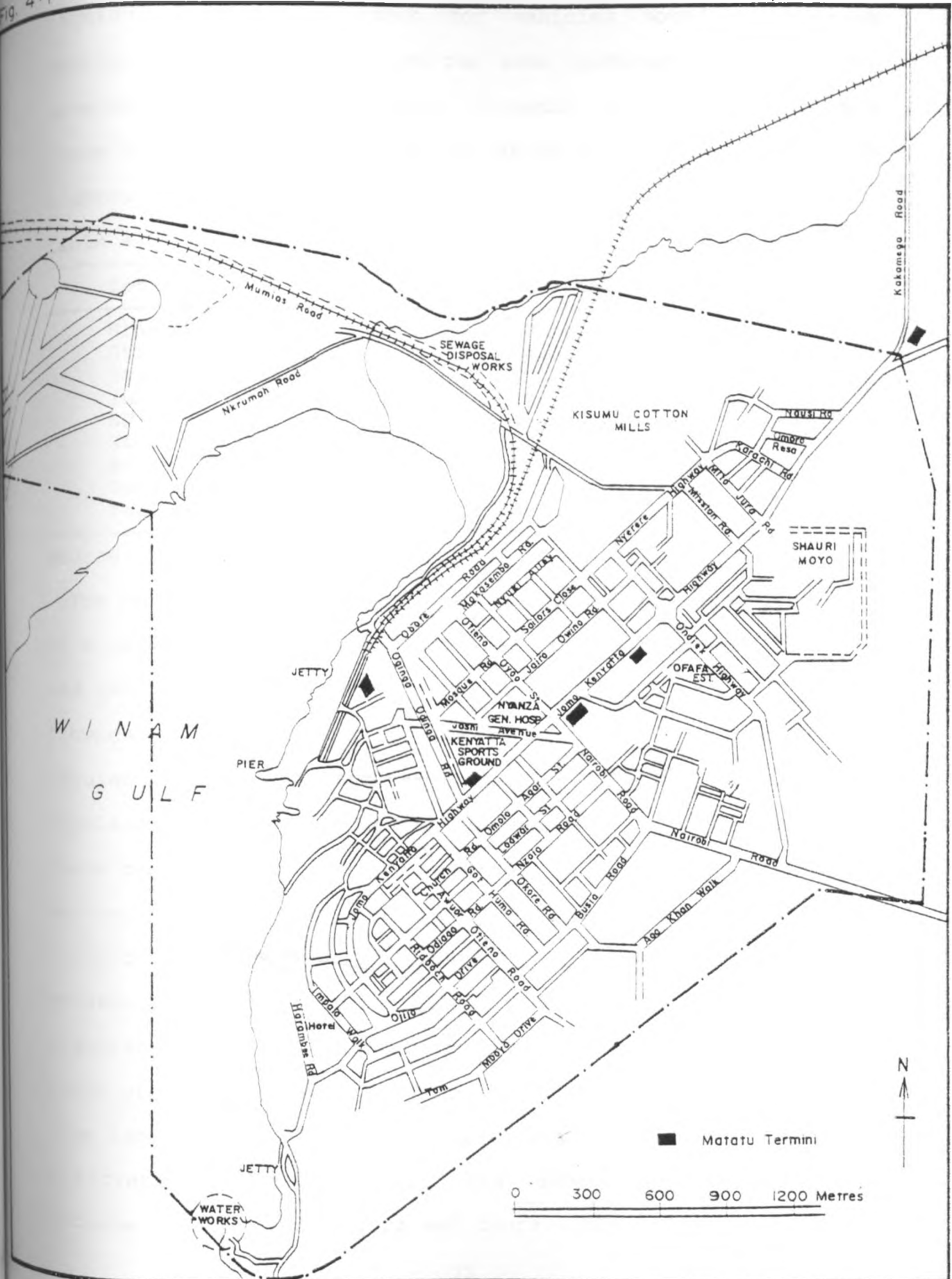
The survey revealed that *matatus* operating in the MoK were owned by private individuals. About 96% of the vehicles were individually owned while 4% were owned in association with family members or business associates. The occupations of the owners was found to vary from one another and it was rare that the owners depended wholly on the proceeds of the *matatu*. The drivers and conductors interviewed revealed the number of *matatus* that they or their employers owned. It was found that 95% of the individual owners operated only one *matatu*, 3% operated two *matatus* while 2% operated more than three *matatus*. The study also found that 75% of the *matatus* were operated by employed drivers while 25% were operated by owner drivers. The *matatu* drivers worked with one conductor in the *matatu*. The conductor collected fare from the passengers while also alerting the driver to stop for alighting passengers along the way. The conductors and employed drivers were occasionally relatives or family members of the *matatu* owner. The owner drivers employed conductors on a temporal basis and paid them allowances at the end of a working day. Saloon *matatus* had the least number of employed conductors. The drivers played the dual role of collecting the fares and driving the *matatu*.

4.6 Terminus Organization.

The study on *matatu* termini examined how they are organized.

The term "terminus" was defined as the space required by any public service vehicle at the end of its route for turn-around, waiting and picking of passengers. In the MoK, the termini are the points where the vehicles heading for a particular destination pick up their passengers. These are well known points to the passengers who also flock the termini to board *matatus*. The termini are located at the CBD and also at the destination points. *Matatu* operators in the MoK use various points as the termini (table 4:7 and fig.4:). There is a high level of organization at the terminus presided over by a group of terminus officials. The termini have been acquired from the Kisumu Municipal Council (KMC) who lease them out to operators. The operator who holds the terminus licence guarantees the holder the control of a specific route number or vehicles bound for one

FIG. 4.1 The Location of Matatu Terminals in the Municipality of Kisumu



Source Field Survey, 1993

destination. The licence of other route numbers are held by different operators even if they operate from one extensive terminus for it is common for vehicles bound to various destinations to operate from the same terminus, for instance, matatus destined for Bandani, Otonglo, Airport, Rabuor and Nyang'ande which operate from the BP Petrol Station on Kenyatta Highway.

Table 4:7, MoK Matatu Termini

Location	Destination
Standard Chartered	Kondele
Standard Chartered	Manyatta
Standard Chartered	Migosi
Jubilee Market	Nyalenda-PandPieri-Dunga
BP Petrol station	Bandani/Airport
BP Petrol Station	Otonglo
BP Petrol Station	Rabuor/Nyang'ande
Central Bus Station	Arina/Brilliant
Yellow line	Mamboleo

Source: Compiled by the author.

The membership of a route number guarantees an operator the use of a terminus space. Membership fee ranging from Ksh. 4,000.00 and Ksh. 6,000.00 is paid to the operator holding the terminus licence. On becoming a member an operator observes the regulations governing the terminus space. The fares are set and regulated by the operators at the terminus. The termini have route based associations whose purpose is to organize the day to day activities at the termini. There are terminus officials elected from the body of matatu owners and whose duty is to enforce and run the operations at the terminus. The terminus association acts as a welfare body to the members and also as a lobby group protecting the interests of matatu owners operating from the terminus. The terminus officials include a chairman, a secretary and a treasurer. The members of the association include drivers, conductors and touts. The officials dues are

paid from the common purse contributed by each *matatu* at the end of a working day. The terminus association disciplines the touts, raises money to bail out members arrested for traffic offences and assists the families of members in case of bereavement. The terminus organization has created much order which has given the *matatu* operations credibility among the critics of these modes of transport.

4.7 Entry into *Matatu* Business.

The *matatu* business is part of the informal private sector where entry is dictated by individual entrepreneurship and investment. As in other informal sector activities, there is ease of entry. The operators interviewed revealed that several factors need be in harmony before a *matatu* can operate on the roads. These are identification of a profitable route, acquisition of a vehicle to operate as a *matatu* (such a vehicle need not be brand new) and acquisition of a disciplined driver. An entrepreneur also has to register with a route number by paying the membership fee for that particular route. Traffic regulations must be complied with such as the purchase of the public service vehicle (PSV) licence, the traffic police sticker, insurance cover and road licence. This is in line with the traffic laws of Kenya Cap. 403 part II section 95 of 1978, which states in part, "no person shall own, drive or be in charge of any public service vehicle on a road, unless there is in force in relation to such a public service vehicle licence issued.." (Kenya, 1978:435). The registration of *matatus* like other vehicular modes lie with the registrar of motor vehicles. This implies that the local government has little or no control

over the number of *matatus* operating in the MoK.

The entry into *matatu* business is also determined by access to credit facilities such as loans. The *matatu* owners' ability to purchase vehicles whether large or small, new or used depends to a large extent on the amount of capital that they have. The cost of used vehicles vary with the make and model of the vehicle although the ones commonly used as *matatus* cost between Ksh. 80,000.00 and over Ksh. 200,000.00. New vehicles on the other hand cost more, for instance, an Isuzu 3.3 NKR costs Ksh. 1.3 million (1993) which calls for access to credit facilities to enable entrepreneurs acquire vehicles. Banks and other financial organizations though being the prime provider of credit do not provide funds for the purchase of *matatus*. Individual entrepreneurs and operators of *matatus* acquire loans ostensibly for other purposes, for example, to purchase land, farming activities or building a house and then divert the funds to purchase *matatus*. Banks charge interest rates of between 17% and 22% per annum or more and require securities for the loans in form of land title deeds, house title or insurance policy. Many low-income entrepreneurs in the *matatu* business are, unable to provide such security hence bank loans are inaccessible to them. The survey revealed that majority of *matatu* operators about 54.2% purchased their vehicles with personal savings while only 20.8% purchased their vehicles through loans or credit facilities. About 25% purchased their vehicles from other sources such as sale of land and joint purchase with business associates among others (table 4:8). The *matatu* operators view the current lending conditions of most financial and credit organizations to be very high for them to afford. This is because majority of the *matatu* operators are low or middle level

income earners hence the high interest rates and securities required for the credit facilities make it hard for them to obtain credit. Still, there are operators who have never contemplated obtaining credit simply because they are unaware that such facilities are available to them.

Table 4:8, Matatu Operators Sources of Funds

Source of funds	No. Of operators	Percent %
Credit	25	20.8
Personal savings	65	54.2
Others	30	25
Total	120	100

Source: Compiled by the author.

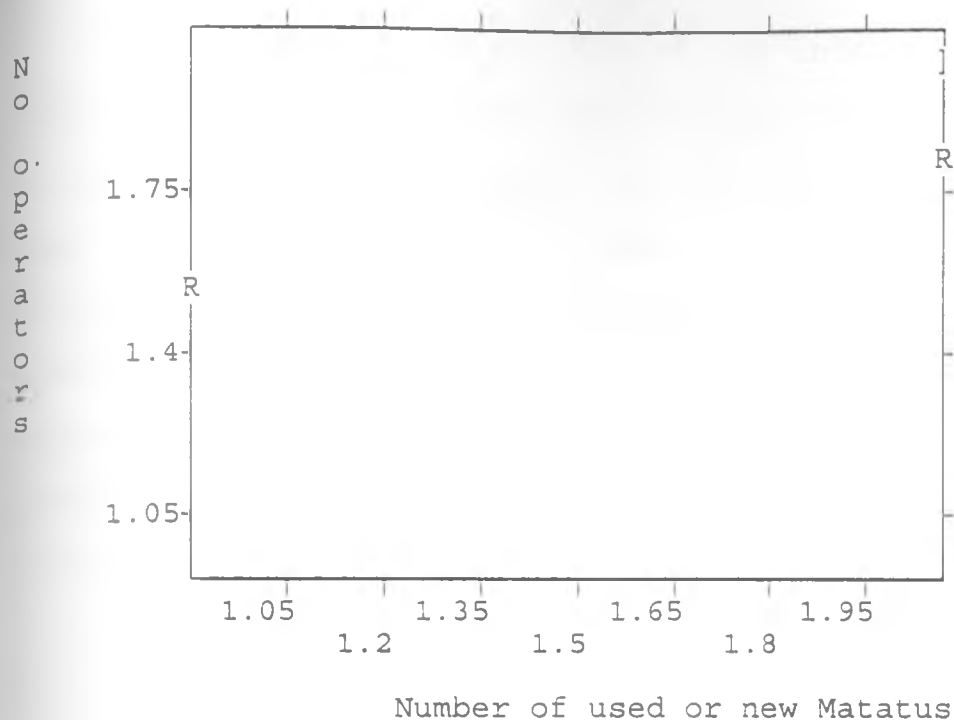
The major problems that the matatu operators experience in their attempts to acquire credit are the inability to meet the demand for security, lack of trust by the lending financial institutions to matatu operators, shorter loan repayment periods and high deposit demanded by financial institutions among others. Matatus financed by banks are also supposed to be insured comprehensively which is uneconomical to the operators as it raises the operation costs. Matatu operators have formed associations which they hope will boost their chances of acquiring credit to purchase new or second hand vehicles. The World Bank Matatu Assistance Scheme (WBMAS) has not been of much help to the matatu operators in the MoK and majority of the operators revealed that they were not aware of the existence of such a scheme.

The SLRA was used to test the null hypothesis that there is no significant relationship between the number of used and newly acquired vehicles operating as matatus and the number of operators who have acquired credit facilities. From the

regression output, the correlation coefficient $r=0.58029$ show that there is a positively correlated relationship between the number of used and newly acquired vehicles operating as *matatus* and the number of operators who have acquired credit facilities. This implies that there is no significant variation between the number of used and newly acquired vehicles operated as *matatus* and the number of operators who have acquired credit facilities. The regression line (figure 4:2) shows that there is a positive relationship between the number of used and newly acquired vehicles and the number of operators who have acquired credit. The coefficient of determination $r^2 = .33673$, indicates that the number of operators who have acquired credit accounts for approximately 33% variability in the number of used and newly acquired vehicles operated as *matatus* in the MoK. The test of significance of the correlation indicates that there is a significant relationship between the quality of *matatus* and the number of operators who have acquired credit facilities. This is so because the calculated value of "t" is greater than the critical value. This implies that although acquisition of credit accounts for only 33% variability in the quality of *matatus*, it is significant. It also indicates that there are other factors which determine the quality of *matatus* operating in the MoK. These were found to be the age of the vehicle, the model of the vehicle, profit margins level of vehicle maintenance and the nature of roads along which the vehicles operate.

Inadequate access to capital or credit has limited the expansion of the *matatu* fleet size in the MoK. Those who have ready access to credit may not be willing to invest in the *matatu* business. Operators mostly acquire vehicles which they are able to pay for.

Figure 4:2, Regression Plot of no.of used and newly acquired Matatus with no.of operators who have acquired credit.



Source: Compiled by the Author

According to the survey, 62.5% of the owners purchased their *matatus* as used or second hand vehicles whereas 37.5% purchased brand new vehicles (table 4:9). This accounts for the presence of a large number of low quality *matatus* in the MoK. Majority of the used vehicles had more than one previous owners. Most of these used vehicles are ramshackle and give an impression of being unroadworthy.

Table 4:9, New and Second Hand Purchased Vehicles.

Vehicle description	Percent %
New	37.5
Used/Second Hand	62.5
Total	100

Source: Compiled by the author.

4.8 Informal Sector Employment.

The *matatu* business is part of the informal sector which provides an avenue for a wide range of employment opportunities. The jobs created in the sector are both directly, for example, those employed as drivers, touts, conductors and terminus officials, and indirectly, for example, those associated with the industry such as informal garage workers, panel beaters, conversion workshop attendants and families of the owners and operators who derive their livelihood from the *matatu* business (table 4:10).

The attributes of the *matatu* business complies with some of the informal sector characteristics. These attributes include; the relative ease of entry into the market, skills not necessarily acquired in formal schooling, support of a wide network of informal sector activities like open air garages, lack of formally registered *matatu* companies, self supporting, labour intensive and family ownership of enterprise.

Table 4.10, Employment and Earnings Per Month by Vehicle Type.

	P/up.	Sal.	M-bus	M-bus can.	Estate	Nissan/Kom.
Drivers	1	1	1	1	1	1
Conductors	2	-	2	3	-	1
Total crew	3	1	3	4	1	2
<u>Earnings:</u>						
Drivers	3000	3000	6000	6000	3000	3000
Conductors	2000	-	2500	2500	-	2000
Touts	900	-	900	900	900	900

Source: Compiled by the author.

The *matatu* operators also set their own prices which depend on the current fuel prices and the trip distance. The above attributes distinguish the *matatu* business as an informal sector undertaking. The employment generated by the *matatu* business is

also substantial. ILO (1972) report and recommendations for greater support of the informal sector observed that the *matatu* business is labour intensive and can be part of the solution to Kenya's unemployment problem. The profitability of the *matatu* business is relatively high and if re-invested, the profits could make the business more dynamic. This calls for support of the *matatu* business by the Kenya government, users of *matatus* and interest organizations since supporting the sector would mean supporting those in the low-income categories and which is an end in itself as it fulfils Kenya's basic goal of greater equity and less unemployment.

4.9 Constraints Affecting *Matatu* Operations

Despite the important role which the *matatus* play in the MoK, several constraints affect their progress leading to inadequate realization of their potentials. Similar constraints affect the sustainability of investors initiatives in the provision of an important urban service. One of the major constraints is the high cost of variable expenditure on *matatus*. This include the high cost of vehicle spare parts and the unpredictable raising cost of vehicle fuel. Whereas the high cost of vehicle spare parts has pushed up the maintenance and repair costs, the unpredictable increase in fuel cost has created problems in projecting future expenditure and profits which has made the operators to work under uncertain circumstances.

The operators are also constrained by the operating environment which affect the profit margins and the vehicles lifespan. The nature of roads in the MoK is poor as a result of inadequate maintenance coupled by compromised standard

specifications by corrupt council officers and contractors. This has led to regular breakdown of *matatus*, mechanical deterioration and shorter lifespan. The profit margins are equally pulled down when vehicles spend more time in garages than on the roads. The road design standards also did not take into account several motorized and non-motorized modes operating alongside each other. Roads in the MoK are shared between the motorized and the non-motorized modes, particularly the bicycles, handcarts and pedestrians because the later categories have not been catered for in the design of roads. This has caused unlimited competition for the narrow road space, congestion and numerous accidents involving the non-motorized and the motorized modes of transport. There is also inadequate terminus space and *matatu* stops in the MoK. The central bus station is used by the inter-urban or upcountry modes of transport leaving very little space for the intra-urban modes such as the *matatus*. Operators of *matatus* commonly use petrol filling stations as their termini while others have curved out portions of recreation parks such as the terminus opposite Jubilee market for *matatus* destined to Nyalenda, Pand Pieri and Dunga. Improvement of roads in the MoK is necessary not only to save for productive investment but also to smoothen mobility by saving time. There is also need for official recognition of non-motorized routes such as the bicycle, handcarts and pedestrian lanes and the construction and improvement where such facilities are lacking. Long term urban planning should also cater for the creation of adequate terminus space for the projected increase of urban public transport modes. The environment in which *matatus* operate is also hampered by inadequate traffic management and control devices such as traffic lights, pedestrian crossings and speed signs. Although little

attempt has been made to introduce pedestrian crossings, they are still inadequate and pedestrians continue to cross the roads at any points. Absence of traffic control devices has led to increase in traffic jams and congestion especially on roundabouts with the result that motorists are caused a lot of inconvenience and confusion. Efficiency can be achieved if the traffic control devices are installed. Nevertheless, the *matatus* have made a significant impact on urban transportation in the MoK. The investors in *matatus* modes of transport continue to increase despite difficulties in finding financial support hence creating a positive impact on employment.

4.10 Non-motorized Modes of Transport

The most common non-motorized mode of public transport in the MoK are bicycles (Kola, 1995). These have developed alongside the motorized modes in the MoK and provide a low cost transportation to different categories of people. The bicycles are a significant non-motorized mode of transport in the MoK where they are used for commuting to work and for delivery of small parcels and goods. They are primarily used for the transport of persons rather than goods and materials. A modification to carry luggage especially in the front and the carrier seat is widely used in its manufacture. The bicycles are manufactured or assembled locally from imported components. The main advantages of the bicycle is that it is environmentally friendly as it does not combust oil, it is cheaper to maintain as the parts are available locally, it does not cost diesel or petrol and it requires little parking space. The limit of the bicycle is that it can carry no more than two persons. The MoK has also

not catered for the use of bicycles as reflected by the lack of bicycle lanes. The bicycles use the same road space with the motorized modes of transport which has contributed to numerous accidents involving the bicycles and the motorized traffic. There is need for official recognition of bicycle lanes and where such facilities are lacking, they should be introduced. There is also need for introduction of more robust designs of bicycles to replace the existing models. Such new models should have a rigid frame which permits both transport of people and movement of goods, together with attachments or trailers on the cycle frames. The bicycle can carry 10 times its own weight, and can have far reaching transport routes in the MoK.

The outstanding advantages of non-motorized transport modes is their non energy consumption, they also produce limited environmental pollution and require limited highly-skilled maintenance. Their major disadvantage is the difficulty of operation in congested motorized traffic as in the MoK where they are not accorded official recognition. The difficulty in finding financial support for the non-motorized transport in the MoK has also restricted their extensive use in the MoK. The problem is further aggravated in a progressing world where such simple, less glamorous technology are difficult to be promoted when everyone wants automobiles.

4.11 Bus Transport

Bus transport in the MoK was carried out by the NBS but they have since stopped operating and the company put under receivership. The buses were introduced in the MoK in 1980 and initially had a fleet of five buses. This was later increased

to ten although by 1993 there were only two buses in operation. The NBS had their headquarters at Mamboleo next to the Agricultural Society of Kenya (ASK) show grounds. The NBS were operated by the National Youth Service (NYS) personnel and linked several places in the MoK such as; Mamboleo, Wathorego, Kondele, Nyalenda, Makasembo, Ondiek, Arina and Manyatta. The NBS services which linked Mamboleo and the CBD also served commuters along the Kisumu-Kakamega road such as residents of Tom Mboya, Kibuye, New Nyanza general hospital, Kondele, Migosi and Nyawita residential areas. They also served commuters from Kanyakwar, Wathorego and Mamboleo. The bus operation in the MoK is on a very small scale and its impact is limited by the low quantity of service offered. Despite the high carrying capacity of the NBS, they were inadequate to meet the increasing demand on public transport in the MoK. The NBS operations in the MoK were constrained by inadequate vehicle spare parts, poorly maintained urban roads which are narrow in some areas leading to inaccessibility, inadequate bus stops and competition from *matatus* and taxis. The inefficiency and poor management by the operating crew also contributed to the collapse of the NBS. The NBS cooperation has since been put under receivership. Nevertheless, there is a great potential for the bus operation in the MoK because of a large market which is currently dominated by *matatus*. There is need for urban planners in the MoK to set aside adequate road space bus stops and termini to cater for future bus services in the MoK.

4.12 Summary

This chapter has examined the nature and role of the *matatu* mode of public transport in the MoK by showing their outstanding advantages as an urban transport service. It is observed that the *matatus* are a major mode of public transport in the MoK. Their structural and organizational characteristics are well suited to the environment in which they operate. They have more flexible routes, are privately owned, operate competitively among themselves and provide jobs and livelihood to a large number of people. The statistical analysis of the hypothesis has revealed that there is a significant relationship between the number of used and newly acquired vehicles and the number of operators who had acquired credit facilities. The constraints faced by *matatu* operations have also been examined in this chapter. It is noted that these problems are created by inadequencies of the environment in which they operate which has led to questions as to whether they are not beneficial as an urban transport mode. Their integration into the urban transport system has also not been given the official recognition as revealed by the lack of a clear policy about them. This chapter has also examined the nature of bus service in the MoK. It is realized that there is a potential market for a well organized bus service which can enhance the general public transport in the MoK. The role of non-motorized modes such as the bicycle is also noted as an important mode of urban transport which should be accorded official recognition particularly through the provision of bicycle lanes alongside the motor vehicle routes.

SOCIO-ECONOMIC CHARACTERISTICS OF MATATU OPERATORS AND TRIP CHARACTERISTICS OF USERS

5.0 Introduction

This chapter examines the social and economic structure of the operators of *matatu* services. The chapter also looks at the characteristics of *matatu* patronage. The operators who are the main players in the provision of transport services include the *matatu* owners, drivers and conductors. The study was concerned with their age, marital status, formal education level, work experience, access to credit facilities, acquisition of skills and their income, among others. These features were considered to be important because the *matatu* transport sector offers an alternative employment sector and an understanding of the type of people absorbed in the sector, therefore, becomes important. Majority of the rural-urban migrants who drift to seek for employment in the MoK end up being absorbed in the open sectors among which is the *matatu* sector. Most of these people are young males with little skills and education and often start as conductors in *matatus* before they secure other jobs or obtain other skills. This chapter also examines the trip characteristics of commuters who are directly affected by the provision of the various modes of transport within the urban centre. The aim was to find out the commuters' view point regarding the suitability of *matatu* modes of transport as it affects them in areas such as monetary cost, journey time from real origin to real destination, safety, security, reliability, comfort and convenience.

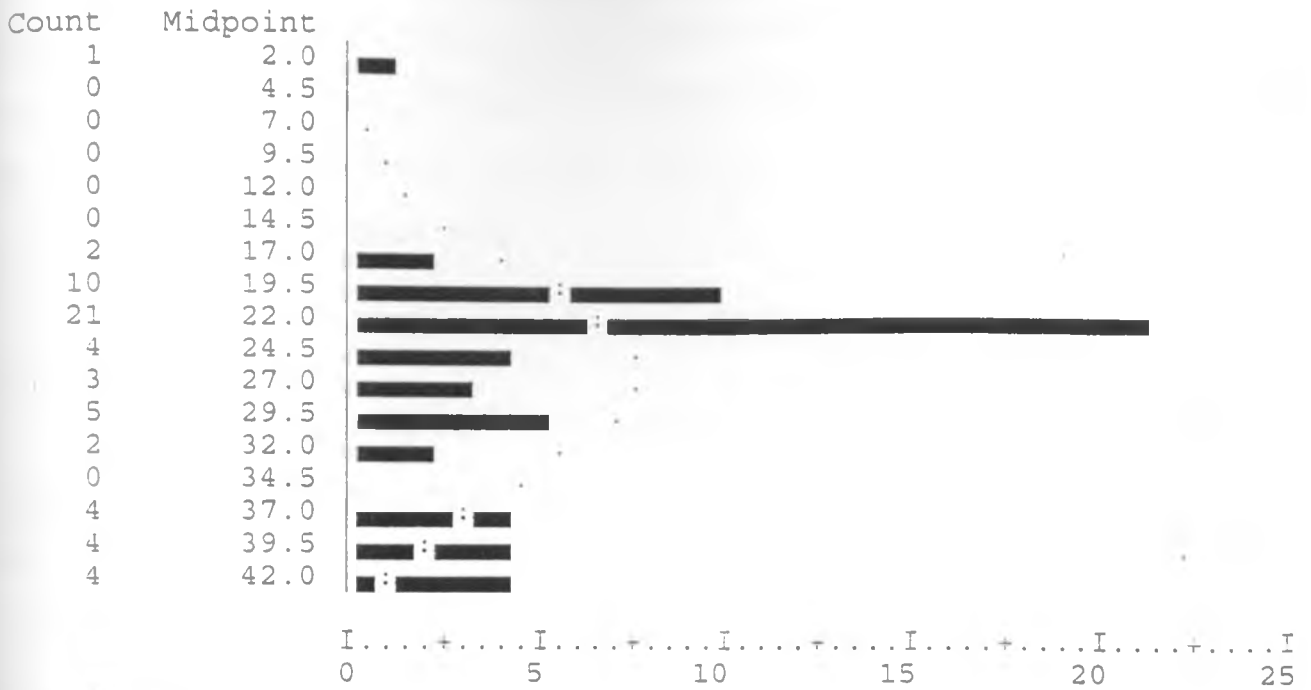
5.1 Socio-Economic Characteristics of *Matatu* Operators

The *matatu* transport sector is one of the various urban employment sectors which provide an avenue to a wide range of people whose lively-hood is dependent on it. These are the agents who are directly concerned in the production of service and the conditions under which it is carried out. Their working conditions which is largely affected by their socio-economic status is closely linked to the management, methods used and the level of service offered. The respondents included the *matatu* conductors, drivers and those concerned with the organization of the termini. The socio-economic characteristics examined included age, marital status, education, work experience, income and acquisition of skills, among others.

5.1.1 Age

The respondents were asked questions on their age. This aimed at determining the average age at which the *matatu* operators joined the sector. The age of an individual also determines other social aspects such as the marital status, number of dependants and number of years one has worked, among others. The mean age of conductors was found to be 26 years while the median and the mode was 23 and 20 years, respectively. Operator drivers had a mean age of 29 years, a median of 29 years and a mode of 22 years. The distribution of conductors age was high between 17 and 29 years with 22 years forming the peak. The drivers age distribution was high between 26 and 30 years with 29 years forming the peak (figure 5:1 and 5:2).

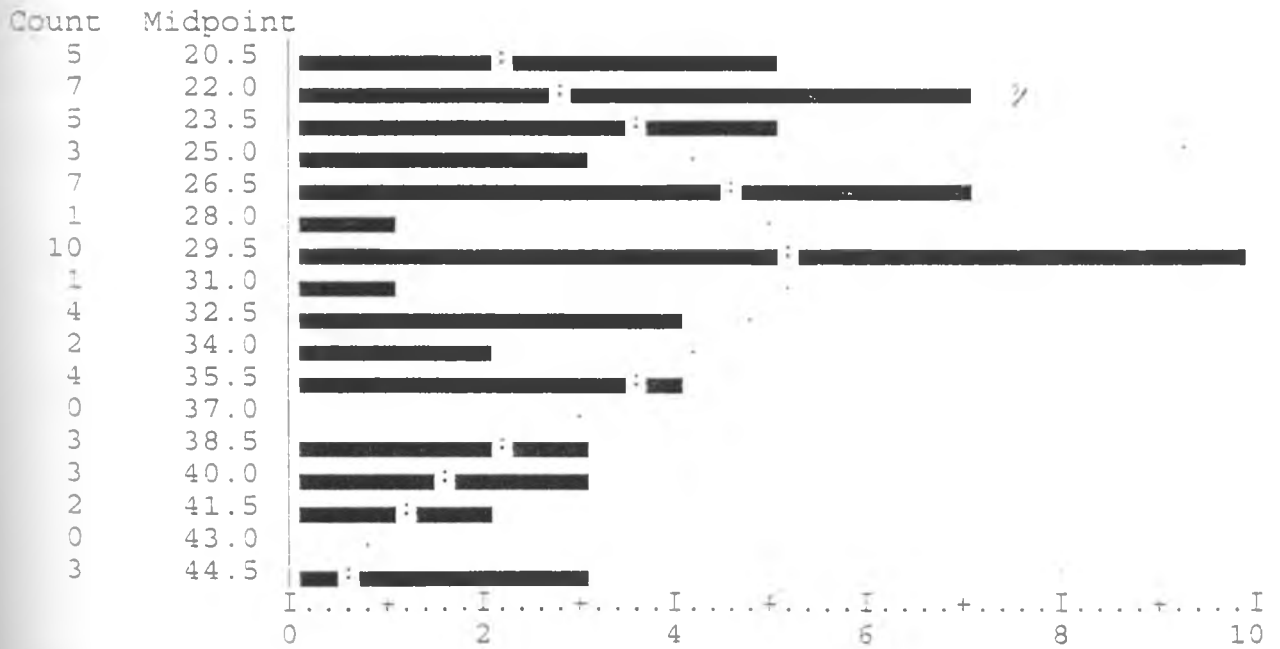
Fig. 5:1, Frequency Histogram of Matatu Conductor's Age



Source: Compiled by the Author.

Majority of the conductors were found to be young males probably primary school graduates who drifted to the MoK in search of employment. The youthful age of conductors also portray the *matatu* sector as an employer of young people with no employment skills.

Fig. 5:2, Frequency Histogram of Matatu Driver's Age



Source: Compiled by the Author.

The operator drivers were found to be much older than the conductors. This shows that majority of the drivers have worked elsewhere or started off as matatu conductors before they acquired their driving skills. There were more operator drivers above the 29 years of age than conductors (figure 5:2).

5.1.2 Sex

The survey on operators sex found that almost all the matatu conductors and drivers were males. The long and tedious working hours that is characteristic of the matatu sector seems to have scared away female job seekers. Female operators were not encountered and so it was assumed that matatu operations in the MoK is a male dominated enterprise. The urban labour force survey of 1986 revealed that most of the unemployed urban working age group (15-64 years old) are females as compared to males at a variation ratio of 3:1. The females were found to have a preference for clerical and service jobs. The matatu operations is a labour intensive sector requiring long working hours and working days. Conductors are also associated with indecency a possibility which may discourage female job seekers. A significant number of matatus are, nevertheless, owned by females who have employed drivers and conductors.

5.1.3 Work Experience

The survey revealed that the matatu conductors had a mean work experience of 2.7 years. The median and mode for work experience was 3 years. The matatu drivers had a mean work experience of 5 years and a median and mode also of 5 years. The work experience of matatu conductors constitute about 28.3% for those who have worked for 3 years and 1.7% for those who have worked for 7 years (table 5:1 and fig 5:3).

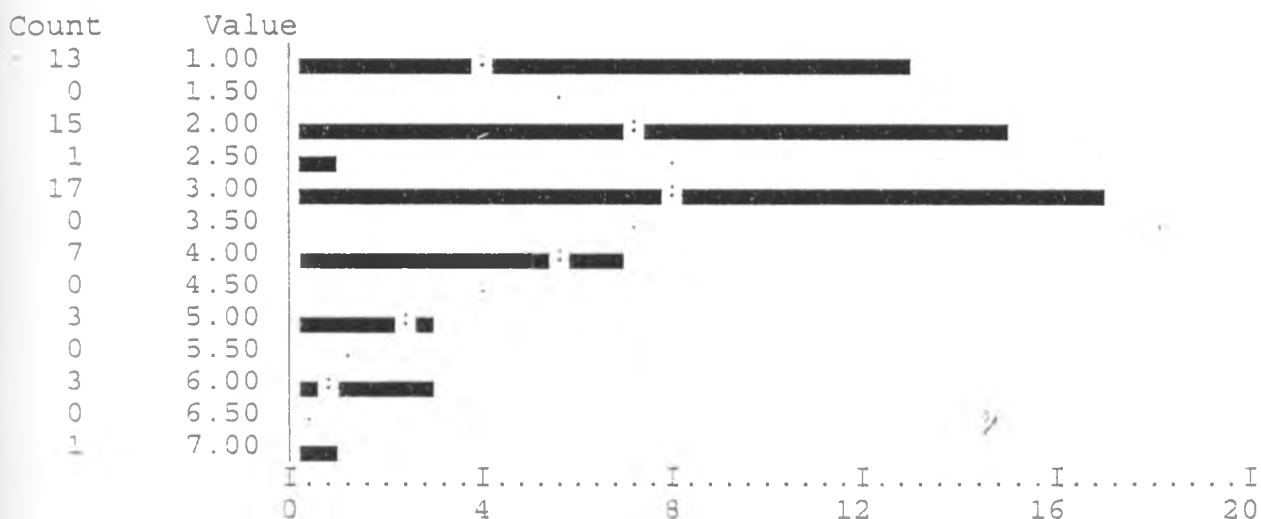
Table 5:1, Frequency Table of Work Experience of Matatu Conductor's

Value	Frequency	Percent
1.0	13	21.7
2.0	15	25.0
2.5	1	1.7
3.0	17	28.3
4.0	7	11.7
5.0	3	5.0
6.0	3	5.0
7.0	1	1.7
Total	60	100.0

Source: Compiled by the author

There were 18.3% of the matatu drivers who had worked for 5 years while only 1.7% had worked for 15 years (table 5:2 and fig.5:3).

Fig.5:3, Frequency Histogram of Operator Conductor's Work Experience



Source: Compiled by the Author

The matatu sector is a temporary employer for the conductors considering that only 28.3% had worked for 3 years as compared to 1.7% who had worked for 15 years. Majority of those who seek for employment in the matatu sector as conductors use the opportunity as a stepping stone to acquire other employment skills particularly that one of driving. This explains the few number of the conductors who have served for three or more years. Rural migrants and other male job

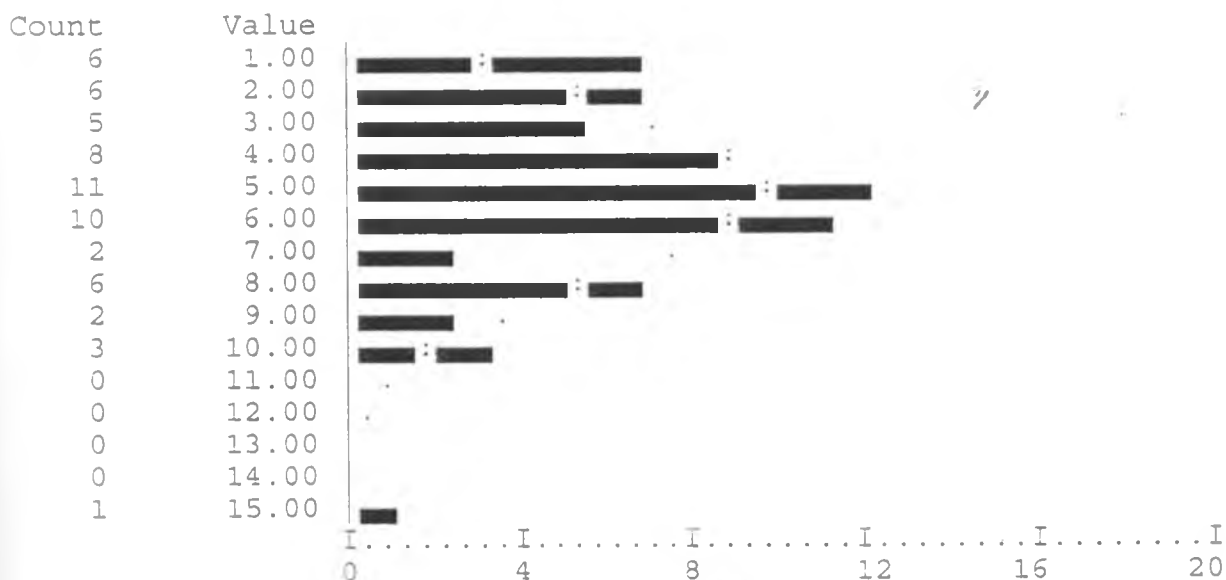
seekers with no skills at all are easily absorbed in the matatu sector from where they establish a basis for further training in the urban sector. Majority usually end up as drivers a skill which is learnt informally in their work place. The matatu drivers remain in their jobs for longer periods as can be seen in the higher percentages of those who have worked for more than 5 years.

Table 5:2, Frequency Table of Matatu Drivers Work Experience

Value	Frequency	Percent	Cum Percent
1	6	10.0	10.0
2	6	10.0	20.0
3	5	8.3	28.3
4	8	13.3	41.7
5	11	18.3	60.0
6	10	16.7	76.7
7	2	3.3	80.0
8	6	10.0	90.0
9	2	3.3	93.3
10	3	5.0	98.3
15	1	1.7	100.0
Total	60	100	100.0

Source: Compiled by the Author

Figure 5:4, Frequency Histogram of Matatu drivers Work Experience



Source: Compiled by the author

The survey on the drivers revealed that majority of them were at one

time *matatu* conductors. The large number of work experience of *matatu* drivers indicate that the *matatu* sector is a sustainable employment sector.

5.1.4 Marital Status

The survey on *matatu* operators marital status found that 56.7% of the conductors were married while 43.3% were single. This compares with 66% of the drivers who were married and 33% who were not married or were divorced (table 5:3).

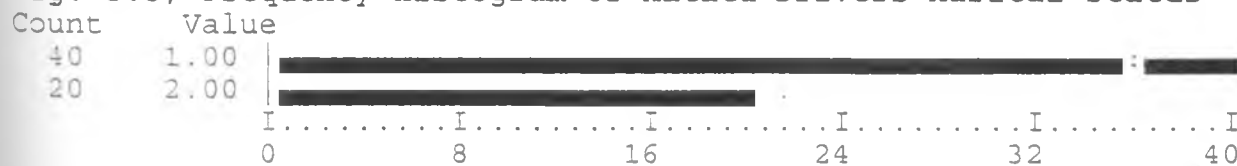
Table 5:3, Marital Status of *Matatu* Operators

	Married	Single	Total
Drivers	66	33	100
Conductors	56.7	43.3	100

Source: Compiled by the author.

The survey also found out that about 57% of the operators who were married had their families wholly dependent on their incomes. This indicates the supportive nature of the *matatu* sector which directly and indirectly acts as a major source of livelihood to majority of its employees and their dependants.

Fig. 5:5, Frequency Histogram of *Matatu* Drivers Marital Status



Source: Compiled by the author

5.1.5 Education

The results of the survey on *matatu* operators education revealed that conductors had a mean of 8 years of schooling and a mode and median also of 8 years. The *matatu* drivers had a mean of 10 years and a mode and median of 12 years of schooling (table 5:4 and figure 5:6).

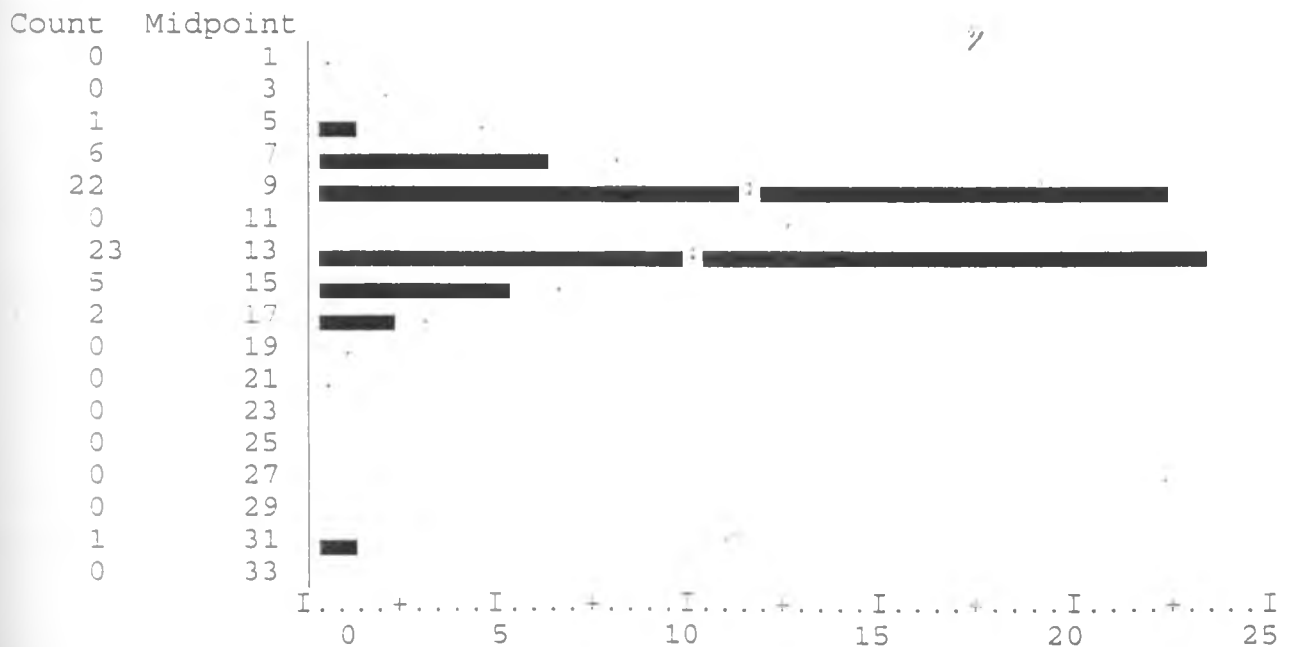
Those who had 8 years of schooling had attained primary education while those who had 12 years had attained secondary education. Majority of the matatu drivers had attained a higher level of education than the matatu conductors. Most of the conductors were found to be drop-outs from primary or secondary schools due to lack of school fees or other social-cultural problems. The matatu sector absorbs people with low level of education and skills. This calls for support from both the GoK and the private sector in order to be able to absorb an increased number of the unemployed with little or no skills.

Table 5:4, Frequency Table of Matatu Drivers Years in School.

Value	Frequency	Percent
4	1	1.7
6	1	1.7
7	5	8.3
8	22	36.7
12	23	38.3
14	5	8.3
17	2	3.3
30	1	1.7
Total	60	100.0

Source: Compiled by the author

Figure 5:6, Frequency Histogram of Matatu Drivers Number of Years in School



Source: Compiled by the author

5.1.6 Acquisition of Driving Skills

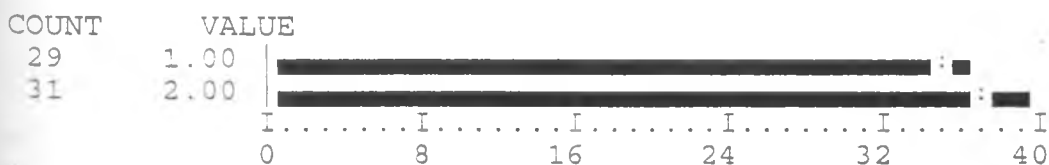
Matatu drivers were interviewed on how they had acquired their driving skills. The responses indicated that 48.3% acquired their skills formally from driving schools while 51.75% acquired their skills informally (table 5:5). The large number of matatu drivers who had acquired their skills informally confirms one of the characteristics of the informal sector that skills are more often acquired out of formal schooling (Kapila et. al, 1985). The matatu sector is associated with the informal sector industry. It was also found that majority of the matatu drivers were at one time matatu conductors and it was assumed that they acquired their driving skills during this time. It is common for the conductors to learn driving skills informally on the matatu which they work in. The driving lessons take place during the loading time under the guidance of the drivers. According to the police records, some accidents have been associated with these learner drivers in the MoK.

Table 5:5, Acquisition of Driving Skills.

Value Label	Value	Frequency	Percent
Formal	1	29	48.3
Informal	2	31	51.7
Total		60	100.0

Source: Compiled by the author

Fig. 5:7, Frequency Histogram of Acquisition of Driving Skills



Source: Compiled by the author

5.1.7 Income

The Simple Linear Regression Analysis (SLRA) was used to statistically test the null hypothesis that there is no significant relationship between the level of education of *matatu* operators and their income. The scientific package for social sciences (SPSS) computer programme was used in this analysis.

From the out put (Appendix 3) the simple linear correlation coefficient, $r = .272$ indicates that there is a positively correlated relationship between income of *matatu* operators and the number of years they spent in school. The regression line (figure 5:8 and table 5:6) show that there is a slight increase in income with the increase in the number of years one spent in school. There is a positive relationship between income and number of years in school. In the correlation matrix (table 5:6) the independent variable (income) is represented by X3 while the dependent variable (number of years in school) is represented by X4. The coefficient of determination $r^2 = 0.7372$ indicates that income earned by *matatu* operators accounted for 7% variability in the number of years in school. This indicates that the number of years *matatu* operators spent in school does not determine their income significantly.

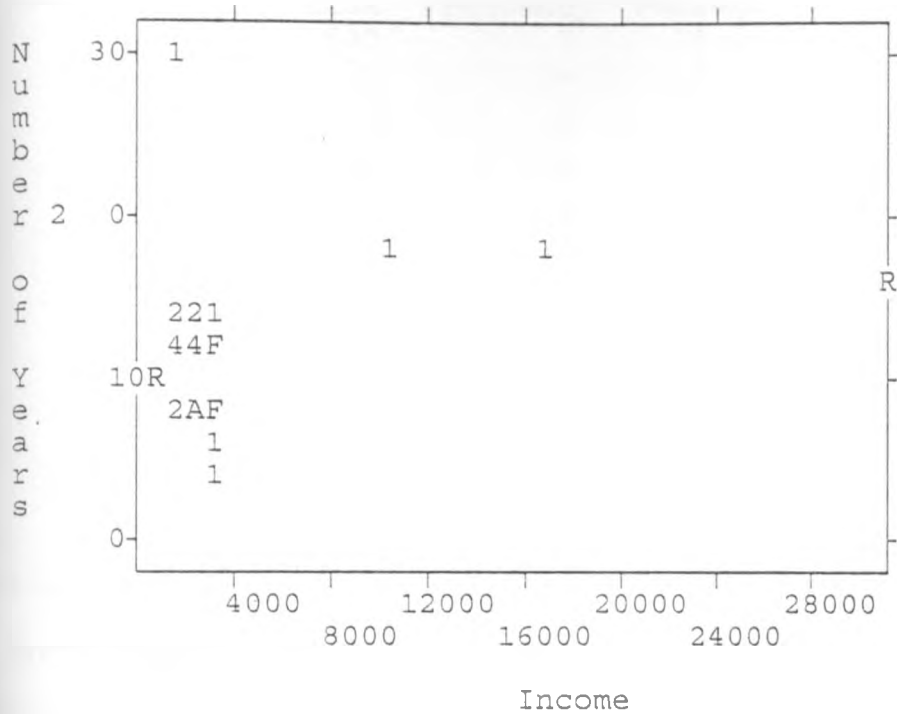
The test of significance of the correlation indicates that there is no significant relationship between the level of education of *matatu* operators and their income. This is so since the calculated value of "t" is less than the critical value. This means that although income accounts for only 7% variability in the number of years in school, it is not significant. The null hypothesis is therefore accepted. The findings conform to the informal sector characteristics whereby skill may be more important than formal education in the determination of earnings. Other factors may also count in determining the earnings in this sector such as the work

experience and the size of the vehicle used.

Table 5.6, Correlation Matrix of Income and Number of Years in School.

	X3	X4
X3	1.000	.272
X4	.272	1.000

Fig. 5.8, Scatterplot of Income with number of Years in School.



Source: Compiled by the author

The survey on matatu operators also found that the matatu conductors earned an average of Ksh. 1,287.50 Per Month. The median earning was Ksh. 1,300.00 Per Month while the mode was Ksh. 900.00 Per Month (table 5:7).

Table 5:7, Frequency Table of Income of Matatu Conductors.

Value	Frequency	Percent %
900	22	36.7
1200	2	3.3
1300	8	13.3
1500	22	36.7
1700	2	3.3
1750	1	1.7
2100	2	3.3
2300	1	1.7
Total	60	100.0

Source: Compiled by the author

The *matatu* drivers interviewed earned an average of Ksh. 3,458.00 per month. The median and mode for the drivers earnings was found to be Ksh. 3,000.00 Per Month (table 5:8)

Table 5:8, Frequency Table of Income of *Matatu* Drivers.

Value	Frequency	Percent
1500	9	15.0
2100	2	3.3
2300	3	5.0
2400	5	8.3
2500	2	3.3
2600	1	1.7
2760	3	5.0
2850	2	3.3
3000	20	33.3
3100	8	13.3
3500	3	5.0
24000	1	1.7
30000	1	1.7
Total	60	100.0

Source: Compiled by the author

Matatu drivers generally earned more than the conductors. The most highly paid driver earned about Ksh. 3,500.00 per month while the most highly paid conductor earned Ksh. 2,300.00 per month. The interview on the operators also revealed that there were no benefits enjoyed by the *matatu* operators apart from the salaries earned. These are benefits such as housing allowance, medical allowance, leave allowance and pension, among others. Majority of the conductors were paid their dues on a daily or weekly basis. The distribution of the total monthly earnings was also found to vary with the employer and the destination of the vehicle.

5.1.8 Number of Work Days and Work Hours.

The *matatu* operators were also interviewed about the number of their working days and hours. The aim was to determine the nature of *matatu* employment as to whether it is labour intensive or not. It was

found that the conductors worked for an average of 6.467 days in a week while the drivers worked for an average of 7 days in a week. The survey found out that 61.7% of the conductors interviewed worked for 7 days in a week, 23.3% worked for 6 days while 15% worked for 5 days in a week 9 (table 5:9)

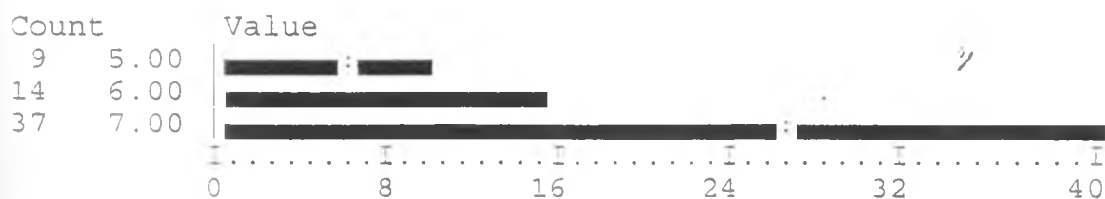
Table 5:9, Frequency table of Operator's Work Days

Value	Frequency	Percent %
5	9	15
6	14	23.3
7	37	61.7
Total	60	100

Source: Compiled by the author

The matatu operators interviewed revealed that they worked for practically all the days of the week except when they fell sick or when the vehicles broke down.

Fig. 5:9, Frequency Histogram of Number of Operators Work Days.



Source: Compiled by the author

The matatu operations are labour intensive. The operators interviewed revealed that they also worked for longer hours in a day. The average number of work hours in a day was found to be 11 hours, while the mode was 12 hours. The work hours began at 5:30 a.m or earlier and stopped at 8:30 pm or later. This implies that the matatu sector is a labour

intensive employment requiring long working days and working hours. Due to the stiff competition among *matatu* operators and the high costs of operations, the operators seek to maximize on the days and hours of operations. There is no formal leave for the operators and they stay at their places of work all the working periods. This aspect of *matatu* operations conforms with the informal sector characteristics of being labour intensive (ILO, 1972).

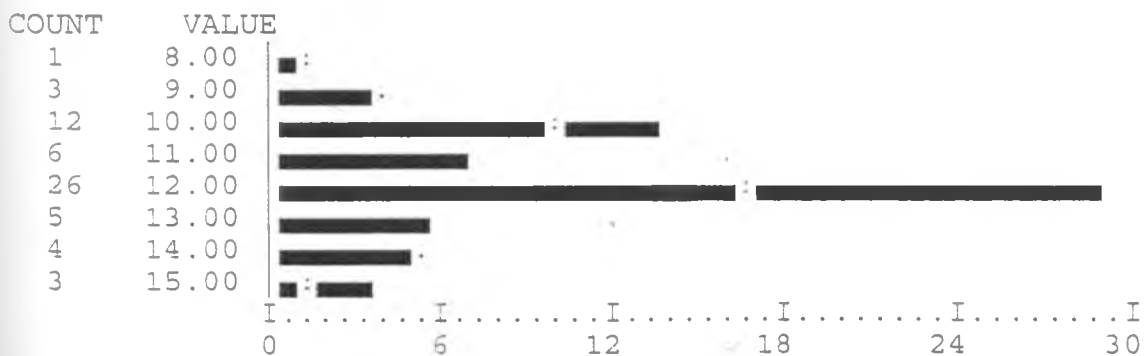
Table 5:10, Frequency Table of Operators Work Hours.

Value	Frequency	Percent
8	1	1.7
9	3	5.0
10	12	20.0
11	6	10.0
12	26	43.3
13	5	8.3
14	4	6.7
15	3	5.0
Total	60	100.0

Source: Compiled by the author

The *matatu* operation hours are also decided by the availability of commuters hence most of their operations stop only when there are no more commuters to be transported (table 5.10).

Fig. 5:10, Frequency Histogram of Operators Work Hours.



Source: Compiled by the author

5.2 Trip Characteristics of *Matatu* Users

The *matatu* users are essential in the operations of *matatus*. Their residential characteristics, nature and purpose of their journeys determine to a large extent the geographical distribution of the areas served by *matatu* transport. The availability of the *matatu* mode of transport also affects the users especially in terms of quantity, quality and cost.

5.2.1 Purpose of Commuter Trips

The commuters using *matatus* were interviewed about the purposes of their journeys made by using *matatus*. The aim of this interview was to determine the reasons for journeys made by using *matatus* and also to ascertain whether the *matatus* are only used for essential trips or both leisure and essential trips. The interview also aimed at finding out what other modes of transport are used by the commuters in the MoK. The simple random sampling technique was used to select commuters for interviews. This sampling technique was preferred because it is a probability sampling where each person in the population has an equal probability of being chosen. A total of 120 commuters were sampled using this technique from various termini. The results of the interview revealed that work trips accounted for 33.3% of all the trips made by those interviewed while shopping trips accounted for 5.8% of all the trips. Leisure trips accounted for 0.8% of the total trips made by *matatus* while school trips accounted for 15%. Both work and shopping trips accounted for 28.3% of the total journeys made using *matatus* (table 5:11).

The respondents interviewed also revealed that other modes used by commuters in the MoK include bicycles, motorcycles, bus and foot journeys. 35% of the respondents owned bicycles, 1.6% owned

motorcycles and 3.5% owned private cars. The level of car ownership was therefore found to be low as compared to bicycle ownership. Those who owned bicycles revealed that they used them for various journeys including journeys to work.

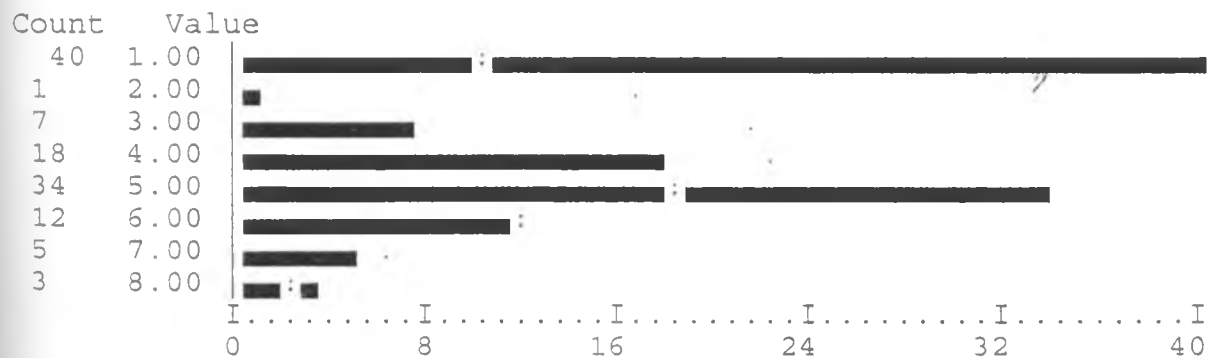
Table 5:11, Frequency Table of Commuter's Trip Purpose.

Value label	Value	Frequency	Percent
Work	1	40	33.3
Leisure	2	1	.8
Shopping	3	7	5.8
School	4	18	15.0
Work & shopping	5	34	28.3
Work,leisure & shopping	6	12	10.0
Work & leisure	7	5	4.2
Work & others	8	3	2.5
Total		120	100.0

Source: Compiled by the author.

Whereas some commuters made trips for single purposes, others made trips for more than one purpose. Work trips were the most important trips made by use of *matatus* as compared to other trip purposes (Figure 5:11).

Fig. 5:11, Frequency Histogram of Commuters Trip Purpose.



Source: Compiled by the author.

5.2.2 Geographical Distribution of *Matatu* Trips.

The geographical distribution of *matatu* trips was surveyed to find out the extent of coverage of *matatu* operations. The Chi-square

technique was used to statistically test the null hypothesis of no significant difference between the number of *matatu* trips ending at the low income residential zones and those ending at the high income residential zones.

The calculated $X^2 = (O-E)^2/E = 71.24$. The df is $(h-1) = 1$. At 5% significance level, the tabulated X^2 is 4.167 (table 5:12). The calculated X^2 of 71.24 is greater than the tabulated one hence the null hypothesis of no significant difference is rejected. There is a significant difference between the number of *matatu* trips ending at the low income residential zones than those ending at the high income residential zones. *Matatus* are complemented by non motorized modes such as walking and cycling otherwise majority of the people in the low income residential zones rely on the *matatus* to make their journeys. The low income residential zones of the MoK are not only highly populated but area also located far from the CBD which explains the high number of *matatus* operating to these zones. In the high income residential zones the *matatus* are still the main modes of transportation used but are complemented by private automobile and walking. Most of the high income residential zones are also located in close proximity to the CBD hence foot journeys are common. The *matatus* account for about two-thirds of the urban daily ridership in the MoK. The remaining one-third is shared between private automobile, institution transport and non-motorized transport modes such as bicycles and walking.

Table 5:12, X^2 Contingency Table for Trip Distribution

	Frequency	Expected	O-E	$(O-E)^2$	$(O-E)^2 / E$
Low inc.	360	400	-40	1600	4

High inc.	236	400	-164	26896	67.24
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Source: Compiled by the author

The main zones served by the *matatu* in the MoK are the CBD, the industrial zone, the eastern and southern residential zones and the outlying suburbs. This distribution pattern conform to the residential density distribution which is closely linked to the incomes and individual transport needs. Private transport is dorminant to the south and northeast of the CBD (figure 5:20). The major concentrations of *matatu* trips are found along various roads, the main ones being; Market-Nyalenda-Pandpieri-Dunga; Market-bus station-Arina estate-Joel Omino Avenue-Brilliant bar-Manyatta market; Kibuye Market-Arina estate-Manyatta Primary School-Callbox-corner Legio; Standard Bank-Aga Khan-Mosque estate-Okore-Kondele and; Standard Bank-Kenyatta Highway-Kibuye market-Nyanza general hospital-Kondele.

The out lying suburbs served by *matatus* are Ojola, Kisian, Obambo Nyahera, Ober Kamoth, Nyamasaria, Kibos and Mamboleo.

5.3.3 Trip Distribution and Characteristics by Time of Day

A survey was also conducted to determine the distribution and characteristics of traffic movement during the day. The aim of this survey was to establish the presence of traffic related problems such as congestion and traffic jams, among others. The survey also aimed at determining the travel patterns of the commuters.

The traffic survey revealed that traffic movement along major roads in the MoK is concentrated between two peak periods and a minor peak period. These are; the morning peak period between 7.30-830 a.m and the evening peak period between 4.00-5.30 p.m. The minor peak period occur between 1.00-2.00 pm. The major peak periods are

characterised by one directional movements. The inflow traffic is heavy while the out flow traffic is low during the morning peak period whereas the outflow traffic is heavy during the evening peak period (table 5:13).

Table 5:13, Traffic Census on Kenyatta Highway BP Station Round-about.

Time	7.30-8.30 Am	12.30-2.00Pm	4.30-6.00Pm
Inflow Matatus	360	210	354
Buses	03	02	03
Cars	212	110	221
Pedestrians	2350	3460	3900
Bicycles	318	413	432
Motor cycles	23	13	21
Out flow			
Matatus	345	180	360
Pass buses	03	01	03
Cars	130	98	250
Pedestrians	860	3200	3900
Bicycles	120	87	450
Motor cycles	16	5	19

Source: Compiled by the author.

5.3.4 Summary

In conclusion, this chapter has examined various aspects related to the socio-economic structure of the *matatu* operators such as their age, marital status, level of formal education income, and skills developed among others. The chapter has also examined the geographical distribution of the *matatu* ridership. It is noted that majority of the *matatu* operators are young people of between 22 and 29 years old. Majority of the operators have also had some formal education although mostly they are primary school dropouts. Most of them are married and have dependants who entirely depend on their incomes earned from the *matatu* employment. Nearly all the operators

were found to be males although there were female owners who have employed male conductors and drivers. The *matatu* operators had an average work experience of between 3 and 5 years. Majority had acquired their driving skills informally out of the school system. The *matatu* was found to be a major employer. The conductors earned an average of Ksh. 1287.00 per month while the drivers earned an average of Ksh. 3000.00 per month. The *matatu* operations is labour intensive and operators work for an average of 7 days in a week and 11 hours in a day. The *matatu* users were found to be heavily concentrated in the low income residential zones although a large number of users also come from the high income residential zones. *Matatu* mode of public transport in the MoK contributes not only in the movement of people between the functional zones but is also a major employment sector offering job opportunities to young people without adequate skills.

The chapter has also examined the findings of the hypotheses tests. It was found out that there is no significant relationship between the level of education and income of *matatu* operators. The simple linear correlation coefficient r of 0.272 indicated a positive relationship between income and number of years in school, although this relationship was found to be insignificant. It was also found out that there is no significant difference between the numbers of *matatus* operating to the low income residential zones and those operating to the high income residential zones. The Chi-square statistic used indicated a calculated value of 71.24 while the tabulated value was 4.167. The calculated value being greater than the tabulated one it was concluded that there was no significant difference. *Matatu* transport was found to be the most patronized motorized public transport in the MoK.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This is the final chapter of the study. It gives a summary of the research findings, conclusions and recommendations. Suggestions for further studies based on the findings of this study are also made.

6.1 Summary of Findings

The overall objective of this study was to examine the role and future prospects of *matatu* transport in the MoK. The study aimed at finding how the operational and organizational characteristics of *matatus* contribute to the efficiency and reliability of *matatu* transport in meeting the urban transport demand, analyse how the private sector provides and controls the *matatu* transport to achieve urban public transport objectives, examine the nature of employment provided by *matatu* transport and whether it contributes in solving urban unemployment problems and lastly, to examine the constraints affecting urban public transport in the MoK and suggest some solutions.

Some hypotheses were advanced and tested to help achieve the set objectives. Firstly, it was hypothesized that there is no significant relationship between the number of used or newly acquired vehicles operated as *matatus* and the number of operators who had acquired credit facilities hence the large number of used vehicles operated as *matatus*. Secondly, that in the employment offered by *matatus* there is no significant relationship between the level of education of operators and their income because the *matatu* sector like other urban informal sectors is an open one where skill may be more important than

formal education in determining earnings. Thirdly, it was hypothesized that there is no significant difference between the number of *matatus* operating to the low income residential zones and those operating to the high income residential zones.

The theoretical formulation was based on the urban transport system and the interacting facilities. The model was incorporated in this study in the projection and evaluation of the level of service of *matatu* transport in meeting the present and future urban growth and travel demands.

The methodology of research used in this study employed interviews and questionnaires in the collection of data. Sampling techniques particularly systematic and simple random sampling were used to select the respondents for interviews. Qualitative and analytical techniques were used to analyse the data and test the hypotheses of the study. Using the simple linear regression analysis to test the hypotheses, it was revealed that there is a significant relationship between the number of used and newly acquired vehicles operated as *matatus* and the number of operators who had acquired credit facilities. The correlation coefficient (r) of 0.58029 indicated a positively correlated relationship. The coefficient of determination (r^2) was 0.33673. This indicated that the number of operators who had acquired credit accounted for approximately 34% variability in the number of used and newly acquired vehicles operated as *matatus*. It also indicated that there were other factors which determined the number of used or newly acquired vehicles operated as *matatus*. The study found that inadequate access to capital or credit has limited the expansion of the *matatu* fleetsize and was also responsible for the large numbers of used vehicles operated as *matatus*. The study also found out that in the employment offered by *matatus* there is no significant relationship between the level of

education and income of operators. The simple linear correlation coefficient (r) of 0.272 indicated a positive correlation. The test of significance showed that the relationship was not significant. The calculated value of "t" was found to be less than the critical value (appendix 3). This conforms with the informal sector characteristics where skill may be more important than formal education in determining earnings. The Chi-square test revealed that there was a significant difference between the number of matatus operating to the low income residential zones and those operating to the high income residential zones. The calculated value of 71.24 was greater than the tabulated value of 4.167. The study found that public transportation in the MoK is both inefficient and inadequate. Public transport in the MoK was also found to be dominated by the *matatu* mode of transport. The *matatu* mode of public transport accounts for about 2/3 of the total journeys made in the MoK. The remaining 1/3 of the journeys are shared between private automobile, institutional transport and non-motorized transportation such as bicycles and foot journeys. Cycling and foot journeys were found to be the most important non-motorized transportation.

The *matatu* mode of transportation was found to play a very important role in urban public transportation in the MoK. The study revealed certain unique structural and operational features associated with the *matatu* modes of transport in the MoK. The study revealed that about 1/3 of the vehicles used as *matatus* are small, privately owned saloon vehicles which are not legally registered to operate as public service vehicles. This category of *matatus* locally known as "Kondele" are mostly owned by individuals employed in other sectors of the economy who are out to supplement their incomes. A few others are owned by business entrepreneurs. The saloon *matatus* commonly role switch from *matatus* to taxis depending on demand and time of day.

Among this category of *matatus*, the Peugeot 404 model was found to be the most common. The other types of vehicles commonly used as *matatus* were found to be converted Pick-ups, Mini-buses, Mini-bus Canters, Nissan/Kombis, and Peugeot estates. The study revealed that majority of the vehicles operated as *matatus* are second hand or used vehicles whose mechanical and physical components are well run down. There were few newly acquired vehicles operated as *matatus*. The study also found that the *matatu* operators rely on the *jua kali* (informal garages) for the maintenance and repair of their vehicles. The study revealed that the *matatus* are rarely serviced and only visit the garages when they develop mechanical problems. The reliability of the *matatu* modes was found to be greatly affected by the quality of the vehicles used, the level of organization, vehicle maintenance and repair. The majority of the vehicles used as *matatus* are also rarely insured to carry passengers.

The study revealed that the *matatus* are profitable to the owners. The profitability analysis done revealed that the operators try to keep the operations costs low in order to maximise on the profits. The study also revealed that the *matatus* modes of transport in the MoK generated about Ksh.8 million per month or Ksh.96 million in 1993. The *matatu* sector also generated additional income for dealers in motor vehicles, tyres, spareparts and accessories.

The study found that about 96% of the *matatus* were owned individually while 4% were owned in association with family members or business associates. About 95% of the individual owners operated only one *matatu*, while 3% operated two *matatus* and 2% operated more than three *matatus*. *Matatus* in the MoK operate from terminus spaces within the CBD. The study found that there was a high level of organization at the termini presided over by a group of terminus officials paid from the proceeds of the *matatus*. The study however

found that the termini were inadequate to accommodate all the *matatus* requiring the use of the termini and has resulted in some *matatus* using filling stations as their termini or stopping anywhere along the roads to pick or drop commuters. This has led to traffic congestion along the affected roads.

Entry into the *matatu* business was found to be easy just as in other informal sector activities provided one has a vehicle to operate as a *matatu* although other factors were also found to be important such as access to credit, purchase of insurance cover, identification of a profitable route and employment of a reliable driver among others. Access to credit by *matatu* operators was found to be difficult and only 20.35% of the operators interviewed purchased their vehicles through credit facilities. The majority of *matatu* operators were found to be low or middle income earners who are unable to provide the securities required by financial establishments for the extension of credit.

The study also revealed that the *matatu* sector provides an avenue for a wide range of employment opportunities. Those directly employed in the sector include drivers, conductors, touts and terminus officials. Those indirectly employed in the sector are informal garage workers, panel beaters and conversion workshop attendants.

The study also revealed that several constraints affect the *matatu* sector. The major constraints were found to be the high costs of vehicle spareparts, unpredictable rise in fuel costs, poor operating environment such as potholed and congested roads and lack of terminus space among others.

The study found that the non-motorized transport modes particularly bicycles play an important role in complementing the *matatu* modes in the movement of people. The study also revealed that a significant proportion of journeys in the MoK are covered on foot.

Bus transport in the MoK was found to be inadequately carried out by the NBS although there exists a wide market for the operation of a bus service.

The survey done on *matatu* operators revealed that the operators of *matatu* are mostly young people of between 22 years and 29 years old. Most of the young people absorbed in the *matatu* sector are primary and secondary school dropouts. The *matatu* operations was also found to be male dominated. The *matatu* operators earned an average of Ksh. 1,289.00 per month for the conductors and Ksh. 3,458.00 per month for the drivers. The study found that the *matatu* sector is labour intensive requiring long work hours and days. The study found that the distribution of *matatu* ridership was heavily concentrated in the low and middle income residential zones.

The *matatu* transport was found to be the major mode of public transport in the MoK accounting for nearly 2/3 of the total journeys made in the MoK thus playing a significant role in urban transportation.

6.2 Conclusion

The *matatu* mode of public transport provides the urban dwellers with an important linkage between the various functional zones. Their role within the overall public transportation in the MoK was found to be inadequate although very important. The *matatu* fleet size was found to be small and unproportional to the demand on public transport in the MoK. Their role in public transportation in the MoK can however be enhanced with the improvements in the road surface maintenance, increase in fleet size, the provision of adequate terminus space and the general improvements in traffic controls. Policy framework on urban transport also need to address the *matatu*

sector as a low cost alternative available to majority of the urban dwellers. These improvements may enhance the quality and quantity of service provided by the *matatus*.

The analysis has revealed that the low and middle income residential zones attract a significant number of *matatu* trips as compared to the other functional zones in the MoK. However, these are areas where the physical environment require special attention of the urban authorities particularly in respect to the road surface repair and additional network to make the areas more accessible and reduce the transport cost to the commuters and the operators of public modes. The MoK being a fast growing urban centre, there is a need to design a functional, efficient system with maximum possible network extensiveness. The analysis also revealed that there is a significant relationship between the number of used and newly acquired *matatus* and the number of operators who had acquired credit facilities. The difficulty in the acquisition of credit coupled with other factors has limited the expansion of the *matatu* fleet size as well as determining the quality of the vehicles operating as *matatus*. The analysis also revealed that there is a significant relationship between the level of education of *matatu* operators and their income. ' "

However, despite the important role played by *matatus* in public transportation in the MoK, their impact is not impressive considering that they are inadequate both in quantity and quality.

6.3 Recommendations

There are various factors which require to be addressed in order to improve the public transport in the MoK and the level of service offered by *matatus* in particular. These measures are recommended to three bodies who contribute directly or indirectly to the existence

of a proper public transport system in the MoK.

6.3.1 Recommendations to Planners and Policy Makers

The planners of public transport in the MoK should regard the *matatu* mode of public transport as an important private agency involved in the provision of an important urban service. The planners should encourage the private sector who provide these modes by the placement of suitable factors both in the physical and the social environment in which these modes operate. These should be reflected in;

- (a) the improvement and regular repair of roads,
- (b) improvement in road safety through the use of traffic controls devices and,
- (c) the construction of primary roads to improve access to the low income residential areas.

The Planners should ensure that the roads constructed conform to consultant design standards so that they are durable. Traffic control devices such as traffic lights, zebra crossings and speed directions should be installed in the MoK to guide motorists and pedestrians with a view to easing traffic congestion. The authorities should also upgrade *matatu* termini and stops. These should be ideally located within the CBD where they are conveniently accessible to the commuters. *Matatu* stops along the roads linking various destinations also require immediate attention of the authorities. There is also an immediate need to construct pedestrian and cyclists lanes in the MoK. The study found that the motorised transport share the same road space with the non-motorised modes such as bicycles, handcarts and pedestrians leading to congestion, low speeds and accidents thus calling for a separation of the modes. The pedestrian and cyclists lanes should be accorded official recognition with the aim of

improving traffic controls, reducing road accidents and the menace of traffic jams.

The planners also require immediately to address the issue of maximizing revenue collection by installing parking meters in the parking bays within the CBD. The parking bays also need to be upgraded so that they acquire a new look. The parking bays should also cater for non-motorised modes especially the bicycles which the study has identified as an important mode of transport in the MoK. The parking bays for bicycles should be designed to leave room for locking facilities to ensure security. Long term parking strategies should also consider the future expansion of vehicular modes. The planners should set aside adequate land for construction of storey car parks a strategy which will minimize the use of the little land available in the urban centre. Long term urban planning should also consider relocating the industrial area to the suburbs with the aim of deconcentration of traffic within the CBD area. Commercial services especially stores and supermarkets should also be encouraged to locate within the residential areas to minimize the number of shoppers who travel to the CBD.

The impact of urban transport in the MoK should be felt in both policy and physical terms.

6.3.2 Recommendations to the Government of Kenya

At the national level, the Government of Kenya (GoK) need to put in place a comprehensive policy approach to improving urban transport. This should include

- (a) precise diagnosis of the existing conditions,
- (b) simplistic and peacemeal implementation of the recommendations from studies and,
- (c) various area-wide traffic management improvements in the urban

centres such as integrated traffic signal schemes, traffic signing, road marking programmes, road safety improvements and construction of primary roads to improve access to low-income areas for public transport vehicles.

The major objective of the urban public transport planning should be geared towards improving the efficiency and quality of public transport operations while at the same time encouraging the private sector involvement.

The GoK also needs to develop a rational fare policy that allows operators to develop their business but also keep fares affordable to low income users.

Another vital role of the GoK is the mobilization of financial resources to ensure that the road network is adequately maintained and that transport needs are met by expanding the network to cater for increasing demands. The GoK can significantly increase the resources available to the transport sector by introducing higher fuel taxes, increasing motor vehicle import duties and taxes especially for high-engine-capacity private cars and trucks, and improving collection of parking levies. The objective of these actions should be to create revenue to maintain and expand the road network. One principal reason for the poor state of roads in the MoK is the low level of expenditure accorded to maintenance. A significant increase in road maintenance is a major requirement in the MoK. There should be developed a local institutional capacity to plan and implement comprehensive traffic and transport improvement programmes.

Effective traffic management requires strong enforcement of traffic regulations and bylaws. A well equipped police force is therefore a necessary prerequisite for an efficient traffic system. Particular attention should be given to the control of parking in the CBD. There is an urgent need to develop an urban transport policy

where more emphasis is given to maintaining and managing the existing transport networks than to seek to resolve problems through the construction of new roads.

6.3.3 Recommendations to Matatu Operators

Public transportation within the MoK is an expanding industry. The matatu operators should realize that they have a wide market which is yet to be captured. In order to improve the quality of their services, there is need for a better understanding of the physical, operational and economic environment in which they operate. They need to improve in transit implementation, operations, vehicle design and management so that they are able to cope with the demand on public transport.

The operators of matatu should also seek to unite the participants involved in the provision of public modes by way of an association. The union should form a cooperative society aimed at achieving not only collective bargaining power but also pooling of the financial resources available for the acquisition of credit, instituting discipline among the members and also ensuring a harmonious operating environment.

6.3.4 Recommendations to Researchers

The findings of this study have highlighted some areas in urban transportation that calls for further research.

- (a) future researchers of transportation systems in the MoK should consider carrying out a comprehensive research covering all aspects of traffic in the MoK.
- (b) the non motorised transport modes especially the bicycles should also be studied because their contribution to urban transport is of immense value particularly in terms of cost and environmental

protection.

- (c) future researchers should also consider carrying out a research on urban transport technologies and strategies to provide a clear picture on the alternative technologies which can be adopted by various agencies concerned with transportation in the urban areas especially in relation to mass transit modes.
- (d) there is also a need to study how the urban transport can be financed especially by the users, the government and other agencies.
- (e) researchers should also consider carrying out a comparative study of urban transportation between various urban centres in Kenya.
- (f) Finally the study recommends that future studies should examine and evaluate the economic and social impacts of transport projects and policies.

BIBLIOGRAPHY.

- Aduwo, I.G. (1990). The Role, Efficiency and Quality of Service of the Matatu Mode of Public Transport in Nairobi, Kenya. A Geographical analysis. Nairobi: Unpublished M.A Thesis, Department of Geography, University of Nairobi.
- Aduwo, I.G and R.A Obudho. (1998). Urban public transportation systems: A case of the matatu mode of Transport. Paper presented at the first international conference on Urban planning of Nairobi. 13-23 December, Nairobi.
- Aduwo, I.G and R.A. Obudho. (1992). The Matatu Mode of Public Transport in Nairobi. Nairobi.
- Bailey, K. D. (1978). Methods of social research. The Free press, New York.
- Barret, R (1988). Urban transportation in West Africa. Washington, D.C: The World Bank.
- Barwell, I. (1979). The Matatu public sector in Nairobi. London: Intermediate technology consultants ltd.
- Brambilla, R and G. Longo (1977). For pedestrians only. Planning, design and Management of traffic-free zones. New York; Architectural Press.
- Bly, P.H. (1987). "Managing Public Transport: Commercial Profitability and Social Services", Transport Research. Vol.21a:2.
- Bly, P.H and R.H, Oldfield (1986). The Effects Of Public Transport Subsidies on demand and Supply. Transport Research. Vol.21a, 6:415-428.
- Bovy, P.H and R.A Gakenheimer (1975). Urbanization and Urban Transport Planning in Developing countries: A Selected Bibliography. Council of Planning Librarians.
- Cresswell, R. (1979). Urban Planning and Public Transport. London: Construction Press.
- Fouracre, P.R and D.A.C Maunder (1978). "A Review of Intermediate Public Transport in Third World Cities". In Transport planning in developing countries.: Summer annual meeting, University of Warwick. England.
- Gakenheimer, R. (1978). The Automobile and the environment: An international perspective. Mit Press.
- Groot, F. (1978). African Lake Side Town: A study of urbanization in Western Kenya with Particular Reference to Religion. Unpublished Ph.D thesis, University of Gregorina.
- Hellewell, D.S. (1979). Restructuring urban public transport. In Cresswell, R. ed. Urban planning and public transport:40-50. The Construction Press, London.

- Heraty, M.J.(1979). "Paratransit in Kingston, Jamaica", In Transport planning in developing countries. Summer annual meeting, University of Warwick:183-190. England .
- Hovell, P.J et al.(1975). The management of Urban public transport: A marketing Perspective. London: Saxon House.
- ILO.(1972). Employment, Incomes and Equality: A strategy for increasing productive employment in Kenya. Geneva.
- Irandu, E.M.(1988). The Bus and Rail commuter services in Nairobi: The need for alternative Transport Planning strategies. Paper presented at the first international conference on urban planning of Nairobi. 13-23 December, Nairobi.
- Kapila, S. et al.(1982). The Matatu Mode of Public Transport in Metropolitan Nairobi. Nairobi: Mazingira institute project. Nairobi.
- Kenya, Republic of (1989). Kisumu district development plan. 1989-93, Government printer. Nairobi.
- Kenya, Republic of (1990). Population census. 1989, Government printer. Nairobi.
- Kenya, Republic of (1984). National development plan. 1984-1988, Government printer. Nairobi.
- Kenya, Republic of (1979). 1979 Kenya population census. Government printer. Nairobi.
- Kenya, Republic of (1989). Statistical Abstract. Nairobi: Government printer.
- Kola, M.O (1993). The Role of Non-motorized Mode of Transportation: A Case Study of Handcarts Operation in Kisumu Municipality, Kenya. Nairobi: Unpublished M.A Thesis, Department of Geography University of Nairobi.
- Longo, G and R. Brambilla (1977). For pedestrians only. Planning, design and Management of traffic-free zones. New York; Architectural Press.
- Macoloo, G.C (1984). Housing in Kisumu town: A Geographical study of demand, Supply and Policy. Nairobi: MA Thesis Department of Geography University of Nairobi.
- Mbeche, Oyuko. O(1990). A transportation study of Kisumu town with special reference to travel demand characteristics. Nairobi: Ph.D Thesis Department of Civil Engineering. University of Nairobi.
- Meier, A.K.(1977). "Becaks, Bemos, Lambros a Productive Pandemonium," Technology Review, :57-63.
- Memmont, M and H.R, Bone (1983) Transpotation demand in urban areas. London:Saxon House.
- Mugwang'a, E.H. (1993). Report and recommendations of the Kisumu convention. Kisumu:Kenya.

Nairobi City Council and Colin Buchanan and Partners. (1973) Nairobi Metropolitan Growth Strategy Report. Nairobi.

Obudho, R.A (1976). "The Urban Geography of Kisumu: A Bibliography" African Urban Notes;4:2.

Obudho, R.A and P.P Waller (1976) Periodic Markets, urbanization and regional planning: A case study from Western Kenya. Greenwood press. Westport, Connecticut.

Obudho, R.A (1977). " The Central Places in Nyanza province, Kenya". Africa urban notes: 5:4.

Obudho, R.A (1988). Proceedings of the first international conference on Urban Growth and spatial Planning of Nairobi Kenya. December 13-17. African Urban Quarterly:1:3 and 4. Nairobi.

Obudho, R.A., and Constance, E. Obudho. (1979). Urbanization, city and regional planning of metropolitan Kisumu: A bibliographical survey of an East African city. Monticello, 111: Council of Planning Librarian.

Obudho, R.A and G.O, Aduwo (1990). Small urban centres and the spatial planning of Kenya in Baker, J. (ed), Small town Africa: Studies in rural urban interaction. Uppsala: Scandinavian institute of African Studies.

Obudho, R.A. (1993). "Urban public transport in Nairobi, Kenya." In LET ed. Transports en Afrique Subsahara Lyon: Laboratoire d'Economie des Transport.

O.E.C.D (1973). Environmental implications of options in Urban mobility. Paris.

O.E.C.D (1974). Alternative transport technologies for developing countries. Paris.

O.E.C.D. (1980). Urban public transport: Evaluation of performance. Paris.

Ogendo, R.B (1972). Industrial Geography of Kenya. Nairobi: East African Publishing House.

Ojany, F.F and R.B, Ogendo. (1988). Kenya a Study in Physical and Human Geography. Nairobi: Longman.

Ominde, S.H. (1968). Land and population movements in Kenya. Heinemann. Nairobi.

Ominde, S.H. (1992). "Migration and child bearing in Kenya." In Ominde, S.H and C.N Ejiogu (eds). Population Growth and Economic Development in Africa. Nairobi: Heinemann.

Osundwa, K.C. (1987). Choice of Commuting Modes in an Urban Sector: A Case Study of Nairobi City. Nairobi: Unpublished research paper department of Economics. University of Nairobi.

Otieno, O et. al. (1993). Kenya Municipal Road Management Study.

Kisumu Municipality, Nairobi.

- Owen, W.(1978) Automobiles and cities: Strategies for developing countries. In R. Gakenheimer ed. The Automobile and the environment: an international perspective, Mit press.
- Recker, W.W et al.(1986). A model of Complex Travel Behaviour. Transport Research Vol.20a: No.4.
- Sada, P.O, et al.(1981). Urbanization Process and Problems in Nigeria. Ibadan:Ibadan University Press.
- Sharp, C.(1967). Problems of Urban Passenger Transport. Leicester: Leicester University Press.
- Situma, L.(1977). The Matatu Public Transport in Nairobi. Nairobi:Nairobi city council.
- Thomas, T.H and K.S Sengupta.(1979). " Modal choice in public transport in Calcutta", In Transport Planning in Developing Countries. Summer Annual Meeting:221-229. University of Warwick. England.
- Thompsons, J.M.(1977). Great Cities and Their Traffic. London: Victor Gollancz.
- Todaro, M.P and H, Rempel.(1992) Rural to Urban labour migration in Kenya. In Ominde, S.H and Ejiogu, C.N eds. Population Growth and economic development in Africa. Heinemann,Nairobi.
- Walters, A.A.(1979). "The Benefits of mini-buses", The case of Kuala Lumpur (Malaysia)." In Transport planning in developing countries. Summer annual meeting:191-206. University of Warwick. England
- Webster, F.V.(1978).Some Implications of the Results of Elasticity Determinations. Symposium on factors affecting public transport patronage. Proceedings of the environment. TRRL. Report sr 413. Crowthorne.
- Wera, G.O.(1981).Planning for a Co-ordinated and Efficient Public Transport System for Kisumu Municipality.Nairobi: Unpublished M.A. thesis department of planning, University of Nairobi.
- Whitehouse, G.G. (1948). "The building of the Kenya and Uganda Railway".Uganda Journal:12.
- WORLD BANK. (1972).The Transportation Sector Working Paper Geneva.
- WORLD BANK. (1986).Urban Transport Sector Policy Paper. Geneva.
- WORLD BANK. (1975).Urban Transport. Washington D.C: The World Bank.
- World Bank. (1976).Investigative Survey on Appropriate Transport and Farm Mechanization Systems for Small Farmers in Kenya. Washington D.C.

APPENDICES

APPENDIX 1 Research Questionnaires

Identification:

I am a researcher/research assistant in a M.A research programme from the University of Nairobi. The research seeks to gather information about public transport in this town and is purely for academic purpose. Any information that you may volunteer to give will be treated with alot of confidentiality and only for the purpose of this study. I kindly ask for your assistance.

Operators Survey Questionnaire

RESEARCH SITE:.....

RESPONDENT SAMPLE NO:.....

DATE:.....

1. Name of respondent:.....

2. Sex:.....

3. Age:.....

4. Marital status:.....

5. No. Of dependants:.....

6. Level of education:

- (a) None
- (b) Primary
- (c) Secondary
- (d) Post secondary

7. Occupation:

- (a) Driver
- (b) conductor
- (c) Matatu owner

8. Working experience:.....Years.

9. Income:Kshs

10. Other occupation:.....

Organization Characteristics

11. Nature of operation : (a) part-time.....
(b) Full-time.....

12. How long have you been in the Matatu business?.....

13. Why did you join in the business?.....

14. How many matatus do you operate within this town?

15. Do you own the matatu: (a) jointly with others.....
(b) alone?.....

16. How did you obtain the funds for the purchase of this vehicle?.....

17. Did you purchase the matatu as

- (a) second hand.....
- (b) New.....

18. Vehicle design

19: Vehicle Passenger capacity.....

- (i) seated.....
- (ii) standing.....

20. Do you belong to any matatu organisation?.....

If yes, which one?.....

Operation Characteristics (Service Production).

- 21. How many days do you operate in a week?
- 22. Do you take any leave from work?..... For how long?.....
- 23. How many hours do you work in a day?.....hrs.
- 24. How many return trips do you make in a day?.....
- 25. What vehicle distance do you cover per day?.....
- 26. What are your daily earnings from the vehicle. Kshs.....

Service Reliability (Fleet-size Planning-waiting Time for High Frequency).

- 27. What is the measure of the vehicle load?.....
- 28. Do you have any schedules? yes/no
- 29. If no, what determines: (a) commencing time
(b) stopping time
- 30. Along which routes do you operate?
.....
- 31. What criteria do you use for route selection?.....
- 32. Do you operate from fixed terminals? yes/no
specify.....
- 33. What other functions do you use the Matatu for apart from carrying passengers?
- 34. Do you operate an express service or stop at all passenger (i)Terminals?..... (ii)Specify

Safety: Vehicle Reliability Affecting Service Reliability.

- 35. How many incidents of accident has the vehicle been involved?.....
- 36. What were the casualties in each incident?
- 37. What could have been the cause(s) of the accident(s) ?
- 38. What type of insurance do you hold for the (a) Passengers.....
(b) vehicle

Maintenance: Maintenance Production.

- 39. Age of vehicle.....
- 40. Number of breakdowns in the last week.....
Last month.....
- 41. How frequently do you service the vehicle? Service per-km of vehicle (km)
- 42. Frequency of failure to operate. (i) Last week
- (ii) Last month.....

Cost: Cost Prediction.

- 43. Average cost per vehicle kilometre.
- 44. No. of personnel employed.
- 45. Cost per employee.
- 46. Licence/ road tax.
- 47. Insurance.
- 48. Loan repayment/ savings.....
- 49. Running cost: (a) Fuel.....

(b) Oil.

(c) Tyres.

50. Maintenance and repairs cost Ksh.....

Revenue:

51. Fare index.....

52. Earnings per return trip.....

53. Average earnings per week..... month.....

Ridership: Occupancy.

54. Maximum passenger journeys.....kms.

55. No. of stops from origin to destination

56. Approximate distance between terminals

57. Potential passengers at each terminal.....

58. What problems do you experience in you operations?.....

59. What are your views about the public modes of transportation in the MoK?.....

Commuters Survey

RESPONDENT SAMPLE NO:.....

RESEARCH SITE:.....

DATE:.....

Introduction

Name of respondent

Sex.....

1. Age.....

2. Marital status.....

3. Occupation.....

4. Place of residence.....

5. Approximate income Kshs.....p.m

Modal Choice.

6. Do you own a: ?

(Tick one)

(a) private vehicle

(b) Bicycle.....

(c) Motor-cycle

7. For what purposes do you use it

8. What public mode(s) do you use in commuting to the town centre?.....

9. Why do you use the mode you have indicated?

10. How do you view matatu service within the MOK?.....

11. What do you think should be done to improve the public mode of transport within the MoK ?.....

Trip Characteristics

12. How many trips do you make within the town per day.....

13. How long is the

(a) trip length.....kms.

(b)

trip time.....hrs/min.

14. What are the purposes of trip?

(a) On working-days.....

- (b) During weekends.....
- 15. What is the distance from your place of residence to the nearest matatu terminal/stop.....
- 16. How long do you usually wait for matatus at the terminal/ stop?
- 17. How much do you pay for a return trip per day? Kshs.....

Municipal Planning Department

DATE:.....

OFFICER INTERVIEWED:

DESIGNATION:.....

- 1. How do you view the present urban transportation within the MoK ?.....
- 2. Are there plans to licence other modes eg. Buses ?.....
- 3. What is the MoK doing to introduce a municipal operated mode of transportation within the MoK?.....
- 4. What criteria do you use to licence the operation of Matatus within the MoK ?.....
- 5. What incentives do you provide to the private individuals who operate public modes in the MoK ?
- 6. What are the future plans for improving the urban public transportation within MoK ?.....

APPENDIX 2 REGRESSION OUTPUT OF No. OF USED AND NEWLY ACQUIRED MATATUS WITH NO.OF OPERATORS WHO HAVE ACQUIRED CREDIT

Equation Number 1 Dependent Variable.. X2 NO OF OPERATORS WHO HAVE ACQUIRED CREDIT

Block Number 1. Method: Enter

Variable(s) Entered on Step Number

1. X1 NO.OF USED & NEWLY ACQUIRED MATATUS

Multiple R .58029
 R Square .33673
 Adjusted R Square .32530
 Standard Error .32052

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	3.02500	3.02500
Residual	58	5.95833	.10273

F = 29.44615 Signif F = .0000

Equation Number 1 Dependent Variable.. X2 NO OF OPERATORS WITH CREDIT

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
X1	.458333	.084463	.580288	5.426	.0000
(Constant)	1.083333	.141334		7.665	.0000

End Block Number 1 All requested variables entered.

APPENDIX 3 REGRESSION OUTPUT OF INCOME WITH NUMBER OF YEARS IN SCHOOL

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	87304585.50706	87304585.50706
Residual	58	1096957374.49294	18913058.18091

F = 4.61610 Signif F = .0359

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
X4	322.58329	150.14270	.27152	2.149	.0359
(Constant)	65.49912	1675.84630		.039	.9690

APPENDIX 4 FREQUENCY OF MATATUS INTO THE CBD AT PEAK AND OFF PEAK HOURS

Road	Point of survey	Frequency at peak time	Frequency at off-peak time
Obote Road	Kicomi Factory	35	19
Ondiek Highway	Agoi junction	22	10
Nairobi Road	Museum	45	30
Kenyatta H/way	Kisumu girls	50	34
Kibos Road	Kondele	52	22
Ondiek Street	Hola jnc	18	08
Kilifi Road	Seko Toure jnc	20	09
Nyalenda Road	Royale hotel	23	08

Source: Compiled by the author

APPENDIX 5 COMMUTERS MOVED BY MATATUS 1993 ('00)

VEHICLE TYPE	DAILY	MONTHLY	ANUALLY
PEUGEOT 404	20	60	90
PEUGEOT ESTATE	13	34	67
SALOON	10	11	23
MINI-BUS CANTER	26	45	69
NISSAN/KOMBI	23	48	74
MATATU PICK-UP	34	57	97
MINI-BUS	57	78	192
Total	183	333	612

Source: Compiled by the author

APPENDIX 6 TRAFFIC DATA (VEHICLE AND PASSENGER CHARACTERISTIC)

DESCRIPTION	1	2	3	4	5	6	7	8
Max. Pass.Jys	8	7	5	12	12	3	7	5
No.Of stops	4	6	8	8	6	3	13	2
Appx.Distance	2	0.7	0.6	1	2	1	0.8	1.5
No.Of Vehicles	8	9	33	22	14	75	7	21
Fare Index	8	7	6	10	10	7	7	7
Waiting Time	20	20	10	30	25	10	25	30

KEY:

- 1:Mamboleo
- 2:Arina
- 3:Nyalenda
- 4:Rabuor

5:Otonglo
6:Kondele
7:Manyatta
8:Bandani

Source: Field Survey, 1993

APPENDIX 7 AVERAGE VEHICLE KILOMETRE BY TYPE OF VEHICLE

Vehicle Type	Daily	Monthly	Anually
Peugeot 404 saloon	400	1200	72300
Peugeot 504	350	1150	68900
Saloons	350	7500	76540
Mini-bus canter	279	2480	89650
Nissan/Kombi	400	1200	72300
Matatu Pick-up	560	2460	74570
Mini-bus 25 seater	300	1170	94690

Source: Compiled by the author

APPENDIX 8 SOCIO-ECONOMIC CHARACTERISTICS OF OPERATORS (CONDUCTORS)

SAMPLE	AGE	W/E	INC	YIS	DEP	OCC	W/D	WHRS	M/S
1	27	4	900	8	3	0	7	12	M
2	23	4	1300	12	1	1	7	12	M
3	42	6	1500	8	3	0	7	13	M
4	23	2.5	1500	8	0	1	6	11	S
5	21	1	1500	8	0	0	7	14	S
6	30	2	1500	8	2	0	7	12	M
7	25	1	1500	12	0	0	7	12	S
8	32	3	1500	8	0	1	7	12	S
9	36	4	1500	0	0	1	7	11	M
10	40	5	900	8	0	0	6	12	S
11	22	2	1300	12	0	0	6	09	S
12	22	1	1500	10	0	0	7	10	S
13	24	2	900	12	1	0	5	10	M
14	29	4	1300	10	0	1	7	11	S
15	23	3	900	8	1	0	7	14	M
16	27	4	900	12	1	0	7	10	M
17	29	3	1500	10	2	0	7	10	M
18	40	3	900	12	0	0	5	11	S
19	38	5	900	12	3	1	7	12	M
20	20	1	1500	3	0	0	7	12	S
21	21	1	900	6	0	0	7	12	M
22	20	3	900	8	1	0	5	12	M
23	23	2	900	0	1	1	5	12	M
24	41	2	1300	12	4	1	7	13	M
25	32	4	1500	10	4	1	5	15	M
26	40	1	900	10	3	0	6	14	M
27	23	3	1300	8	1	0	6	09	M
28	22	1	1700	8	2	0	6	10	M
29	21	1	1300	8	0	0	7	12	S
30	22	1	900	8	0	0	7	12	S
31	20	1	1500	8	0	0	7	12	S
32	23	2	1500	12	2	1	6	8	M
33	27	1	900	12	0	0	7	12	M
34	29	2	1500	8	0	0	7	12	S
35	40	3	900	8	0	1	7	11	S
36	38	3	900	12	1	1	6	10	M
37	20	4	1500	10	0	1	7	12	S
38	21	3	1700	8	5	0	7	12	M
39	20	7	1300	8	0	0	7	15	M
40	23	1	900	6	1	0	7	15	M
41	41	3	900	8	0	0	6	12	S
42	23	3	1500	12	0	0	7	10	S
43	22	2	2100	8	0	1	6	10	S
44	21	2	2300	8	2	1	7	12	M
45	19	3	1500	11	0	0	7	13	M
46	20	3	900	12	0	0	5	12	S
47	25	5	900	10	0	1	6	10	S
48	24	3	1500	8	0	0	7	11	S
49	20	2	900	8	2	1	6	09	M
50	17	6	1500	12	0	0	7	11	M
51	20	2	1200	0	0	1	5	12	S
52	22	3	1300	0	4	0	6	14	M
53	21	3	1500	4	1	0	5	13	M
54	22	1	900	5	6	0	7	10	M

55	20	2	1750	8	0	0	7	12	S
56	29	3	1500	12	5	1	7	10	M
57	23	6	2100	0	3	1	6	10	M
58	42	2	1500	7	0	0	5	12	S
59	38	3	1200	7	0	0	5	13	S
60	17	2	900	8	0	0	7	12	S

KEY:

W/E: Work experience
 INC: Income
 OCC: Other occupation
 W/D: Working days
 W/H: Working hours
 M/S: Marital status
 M : Married
 S : Single
 DEP: No.of dependants
 YIS: Years in school

Source: Field Survey, 1993

APPENDIX 9 OPERATING DATA BY MATATU TYPE

VEHICLE TYPE	M/P	M/C	S/C	MS	PSW	N/K
Operation days	7	6	7	6	6	7
Operation hrs	15	14	15	13	12	14
Average speed	30	30	40	30	30	40
Ave. Occupancy	14	25	6	25	8	14
Ave.Trip dist.	7	8	3	5	5	7
No.Of trips	15	7	20	15	15	6
Daily Rev.	1570	1750	840	2625	920	1588
Annual Rev.	527520	588000	382240	882000	309120	297568
Vehicle Insu.	9800	2100	1700	27000	9800	2100
LR tax. 900	1500	1200	1200	1500	1500	
Cost of Driver	36000	18000	36000	42000	36000	26200
Cost of Tout	10800	10800		10800		10800
Cost of Cond.	14400	16200		24000		
Fuel cost	278047	127180	191117	170330	170330	11219
Maint & Rep.	48000	120000	60000	35000	60000	40000
Total Expend.	354747	295779	315617	429129	277627	191818
Annual Rev.	57305	730000	202400	945000	34120	211680
Profit	172773	292221	66623	452000	31491	5750

Figures in Kenya shillings.
 Source: Compiled by the Author

APPENDIX 10 SOCIAL AND ECONOMIC CHARACTERISTICS OF OPERATOR DRIVERS

SNQ	AGE	W/E	INC	YIS	DEP	W/H	W/D	M/S	OCC	S/A
1	22	4	1500	12	2	15	7	M	0	1
2	24	3	1500	12	0	14	6	S	1	2
3	22	4	3000	8	0	14	7	S	0	1
4	39	3	30000	17	1	10	6	M	1	1
5	28	10	2760	8	0	12	6	S	0	2
6	22	8	2400	8	0	14	7	S	0	2
7	22	1	3000	12	5	10	7	M	1	1
8	35	15	2850	12	6	12	6	M	1	2
9	36	1	1500	14	0	15	7	S	0	1
10	27	6	3000	8	3	15	6	M	0	2
11	20	6	3000	8	2	15	7	M	1	1
12	30	5	1500	8	2	12	7	M	0	1
13	30	4	3000	12	0	15	6	S	0	2
14	34	6	3100	8	1	15	5	M	0	1
15	22	3	1500	12	4	14	6	M	1	2
16	39	10	2100	12	0	15	7	S	1	2
17	25	6	2300	12	1	15	6	M	0	2
18	27	4	3000	8	2	12	6	M	1	1
19	29	9	3100	12	0	10	7	S	0	1
20	31	2	1500	12	1	15	7	M	1	2
21	21	3	2760	8	4	14	7	M	1	1
22	26	6	2400	8	1	13	7	M	0	2
23	34	9	3100	6	6	14	7	M	0	2
24	30	8	3000	12	3	12	6	M	1	1
25	44	5	24000	17	5	15	7	M	0	2
26	40	8	3000	8	0	15	5	S	0	1
27	23	4	3100	8	6	12	7	M	1	2
28	35	6	15000	14	0	14	7	S	0	1
29	23	2	3000	8	0	15	7	S	0	1
30	20	1	3000	8	0	14	7	S	0	2
31	29	8	2400	7	2	12	6	M	1	2
32	30	7	3100	12	4	13	7	M	1	1
33	27	6	3000	12	2	12	6	M	1	2
34	24	6	2300	8	1	15	6	M	1	2
35	41	5	3000	12	6	14	7	M	1	1
36	32	8	2850	12	5	12	6	M	0	1
37	21	5	2760	8	1	14	7	M	0	1
38	30	2	2400	8	0	14	7	S	1	2
39	25	5	3100	12	2	14	6	M	1	1
40	25	1	3000	12	1	15	7	M	0	2
41	36	3	3000	7	0	12	7	S	1	1
42	40	5	2500	8	2	15	7	M	0	2
43	22	5	3000	7	3	13	6	M	1	1
44	29	4	3500	7	4	15	7	M	0	1
45	26	2	3100	12	0	12	6	S	1	1
46	32	4	24000	14	5	14	6	M	1	1
47	29	1	1500	8	1	14	7	M	0	2
48	27	2	3100	12	2	12	7	M	0	2
49	29	1	3000	12	2	10	6	M	1	1
50	40	1	3000	12	4	15	7	M		2
51	38	4	3000	8	5	15	7	M	1	2
52	41	5	3100	7	1	14	7	M	1	1
53	44	6	3000	14	0	12	5	S	0	2
54	32	5	2100	12	0	14	6	S	1	1

56	23	8	2600	12	1	15	5	M	0	2
57	26	7	3000	12	2	15	5	M	1	2
58	32	5	2500	8	0	12	7	S	0	2
59	22	6	2300	14	2	13	7	M	1	2
60	20	2	3000	14	0	15	6	S	0	1

Source: Compiled by the Author

KEY:

1 AGE	6 Working Hours
2 Work experience	7 Working Days
3 Income	8 Marital Status
4 Years in school	9 Occupation
5 Dependants	10 Skill Aquisition

APPENDIX 11 COMMUTERS TRIP CHARACTERISTICS

NO.	TRIPS	OPIN.	INC.	FARE	T/TIME	RESID	CAR	BICY	T/PURPOSE
1	2	1	1300	12	30	1	-	1	1
2	3	2	1300	12	30	1	-	1	1
3	3	2	5000	14	10	2	-	1	1,3
4	2	1	5000	12	15	1	-	-	1,2,3
5	2	2	900	12	10	2	-	-	1
6	1	2	-	14	10	2	-	-	2
7	1	2	1000	14	30	1	-	-	1
8	2	1	5000	20	30	1	-	1	1
9	2	2	5000	20	5	1	-	1	3
10	2	1	4000	14	30	1	-	-	1,3
11	4	1	4000	20	15	2	-	-	1
12	2	2	-	14	10	2	-	-	1
13	3	2	900	12	20	1	-	-	1
14	2	2	4000	12	15	1	-	-	1,3
15	1	1	7000	12	10-15	2	-	-	1,3
16	3	1	8000	14	5	3	-	-	1,2
17	2	2	5000	12	10-15	1	-	1	1
18	1	2	3000	14	20	1	-	-	1
19	2	2	6000	12	20	2	-	-	1
20	1	1	6000	14	10	3	1	1	1,3
21	2	1	7000	12	15	2	-	-	1,2,3
22	1	1	-	14	10	1	-	-	4
23	1	1	9000	14	10	3	-	1	1
24	2	1	6000	14	10	2	-	-	1,2
25	2	2	3000	12	15	2	-	-	1
26	1	2	4000	14	35	2	-	1	1
27	1	1	4000	14	35	2	-	1	1
28	3	1	9000	14	20	3	-	-	1
29	2	2	2000	12	15	2	-	-	1,2
30	2	1	4000	14	30	3	-	-	1
31	1	1	5000	12	15	2	-	1	2,2
32	2	1	7500	14	15	2	1	-	1,3
33	1	2	-	14	30	2	-	-	4
34	2	2	2000	14	15	1	-	1	1
35	3	2	2500	12	15	1	-	-	3
36	1	1	3500	12	20	2	-	1	3
37	2	1	11000	14	10	3	-	1	1,3
38	2	1	7000	14	10	1	-	-	5

39	3	1	2000	20	15	1	-	-	1
40	4	2	3000	16	10	2	-	-	3
41	5	2	2000	16	10	1	-	-	1
42	2	1	2000	12	15	1	-	-	5
43	1	2	900	14	30	2	-	-	1, 3
44	3	1	900	20	15	2	-	-	1
45	2	2	9000	20	10	1	-	-	3
46	2	1	11000	14	10	1	-	-	5
47	1	2	12000	12	30	1	-	-	1, 3
48	2	1	2500	14	20	1	-	-	1, 3
49	1	2	3000	12	20	2	-	-	1
50	2	1	3000	16	25	3	-	-	1, 2, 3
51	1	2	2500	12	20	2	-	-	1
52	2	1	3000	12	20	3	-	-	5
53	1	2	5000	14	20	1	-	-	1, 5
54	1	2	2500	14	20	1	-	-	5
55	2	2	2000	14	20	3	-	-	1
56	1	2	3000	20	15	2	1	-	1, 3
57	1	2	1100	16	15	1	-	-	1
58	2	2	900	16	10	1	-	-	1
59	3	2	900	16	10	2	-	-	1
60	3	2	2500	14	15	3	-	-	1, 3
61	2	2	1000	12	15	2	-	-	1
62	5	2	10000	14	10	1	1	1	1
63	4	2	2500	14	10	2	-	-	1, 3
64	1	2	2000	16	10	2	-	1	1
65	2	1	3000	12	15	1	-	1	1, 5
66	1	1	4000	12	15	1	-	-	5
67	2	1	4000	12	20	1	-	-	1
68	3	1	5000	14	10	1	-	1	1
69	2	1	3000	14	10	2	-	-	1, 2
70	3	1	5000	20	15	2	-	-	1
71	2	2	7000	20	10	1	-	1	1
72	3	1	1100	12	10	1	-	-	1
73	2	2	-	14	10	2	-	-	1
74	3	1	2500	14	10	1	-	1	1
75	2	2	3000	16	15	2	-	1	1
76	1	1	-	16	10	1	-	-	4
77	2	1	1000	14	25	2	-	1	1
78	1	1	-	14	25	1	-	1	4
79	1	1	5000	14	10	2	1	1	1, 3
80	1	2	-	12	10	1	-	-	4
81	1	2	-	14	10	1	-	-	4
82	1	1	-	14	10	2	-	-	4
83	2	2	1200	16	10	1	-	1	1, 3
84	2	1	900	16	10	1	-	-	5
85	2	2	2000	20	10	3	-	-	1, 5
86	1	1	1200	14	10	1	-	1	1
87	1	2	1100	14	10	2	-	-	5
88	1	1	-	12	15	3	-	-	4
89	2	2	7000	16	15	1	-	-	5
90	2	1	15000	12	10	1	1	1	1, 3
91	1	2	2400	20	25	1	-	-	1, 5
92	1	2	1200	12	20	2	-	1	5
93	1	1	-	20	10	1	-	-	4
94	1	2	-	14	10	1	-	-	4
95	1	1	900	20	15	2	-	-	1
96	1	2	2000	12	15	1	-	1	1
97	2	1	7000	20	20	3	-	-	1

98	3	1	11000,	30	15	2	1	1	3
99	4	1	2500	12	10	3	-	-	3
100	1	2	-	20	10	3	-	-	4
101	1	1	3000	14	10	2	-	1	5
102	4	2	2100	20	10	2	-	-	1,3
103	3	1	900	14	10	3	-	-	1
104	4	2	2500	20	15	2	-	-	1
105	3	2	9000	20	15	2	-	-	5
106	2	2	-	12	10	3	-	1	4
107	1	1	-	16	10	1	-	1	4
108	2	2	-	20	10	1	-	-	4
109	1	1	3600	20	15	1	-	-	1,3
110	1	2	11000,	16	15	1	1	-	1,2,
111	2	2	5600	16	15	2	-	1	1
112	1	2	8000	20	15	2	-	-	1
113	2	1	-	14	10	1	-	1	4
114	1	2	-	14	10	1	-	1	4
115	1	1	-	12	10	2	-	-	4
116	3	2	5000	14	10	3	-	-	1,2
117	2	1	3500	20	15	1	-	1	1,2
118	2	2	3000	20	15	1	-	1	1,3
119	1	1	2100	14	20	2	-	1	1
120	3	1	14000,	14	20	3	1	1	1

KEY:

RESIDENCE CODE

1. LOW CLASS
2. MIDDLE CLASS
3. HIGH CLASS

OPINION CODE

1. ADEQUATE
2. INADEQUATE

TRIP PURPOSE CODE

1. WORK
2. LEISURE
3. SHOPPING
4. SCHOOL
5. OTHERS

Source: Compiled by the author