

**IMPACT OF ROAD RE-ALIGNMENT ON MARKET CENTRES' DEVELOPMENT  
AND ROAD FUNCTIONALITY: A CASE STUDY OF NKUBU - THUCHI ROAD IN  
IMENTI SOUTH DISTRICT**

DUP

14.07.09

**SILAS KINOTI MURIITHI**

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**Department of Urban and Regional Planning**

**School of The Built Environment**

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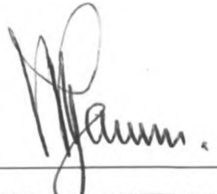
**DECLARATION**

This thesis is my original work and it has not been presented for award of a degree in any other university.

Signed   
\_\_\_\_\_  
SILAS KINOTI MURIITHI  
(Candidate)

Date 30<sup>th</sup> JULY, 2008

This thesis has been submitted for examination with my approval as the university supervisor

Signed   
\_\_\_\_\_  
PROF. PETER M. NGAU  
(Supervisor)

Date 12-9-2008

## DEDICATION

*To my wife Rodah and my children Doreen and Dennis for their love, inspiration, tolerance and support they accorded me all through the period of my study.*

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## ABSTRACT

The study seeks to find out the impact of road re-alignment on market centres' development and road functionality using a case study of Nkubu - Thuchi road in Imenti South District, in the Republic of Kenya. The study further seeks to find out how development of roads (particularly road re-alignments) and their functionality, and market centres' development affect each other, and how they may be planned to avoid conflicts and ensure their potential and functionality. The theoretical concept is that, a three-tier relationship exists between road re-alignment, market centres' development and road functionality, where; road functionality is a function of road re-alignment and market centres' development; and market centres' development is also a function of road re-alignment and road functionality.

The problems of Nkubu – Thuchi road re-alignment are mainly two fold. In the process of being paved in the mid 1980s, major re-alignments were made and some market centres were by-passed, resulting in loss of business. On the other hand, roadside developments have sprouted along the new highway re-alignment, subsequently affecting the functionality of the road.

The research methodology involved literature review, primary and secondary data collection, data analysis, interpretation and synthesis and subsequent recommendations to address short term mitigation measures and policy recommendations to address long term measures. For primary data collection, household questionnaires, road users' origin – destination (O-D) surveys, market centres' questionnaires and vehicle counts were carried out as well as interview schedules with key informants. Secondary data involved review of published and unpublished material, government reports, print media and the internet. Statistical Package for Social Sciences (SPSS) and Microsoft Excel were the main computer packages used for data analysis.

The study findings show that the main adverse impacts of the re-alignment of Nkubu – Thuchi road on the originally existing market centres which were by-passed, are poor access roads leading from the “new” main road into the old market centres, poor service

roads within the old centres, and business competition from the roadside developments. About 84% of the respondents operating in the old market centres said the roadside developments have affected their businesses negatively, and about 84% of the drivers interviewed said they do not like driving into the old market centres due to poor access roads and lack of business. However, 93% of the drivers responded that they would drive into the old market centres if the centres were well planned and developed with good roads.

On Road functionality, the main adverse impacts are roadside developments/businesses and increase in accidents. About 66% of the drivers interviewed preferred that the roadside businesses be moved and conducted further away from the road, while about 80% of the pedestrians interviewed said the greatest danger/risk while walking along the “new” road is fear of being run over by speeding motorists since there are no provisions for pedestrian walkways.

Studies further revealed that, not only market centres and the road functionality were affected adversely, but also the local community, learning institutions and other institutions. Kaguru Farmers Training Institute for example had its land severed into two portions by the “new” road and today they have had to improvise a culvert as a tunnel to pass their animals and small farm tractors.

The study recommendations include provision of all-weather access and service roads into the old market centres, control of roadside developments and relocation of those that are operating on the road reserves, and provision of road furniture and pedestrian walkways (near the market centres)

As a policy recommendation, the study calls for integration of land use planning and road design engineering to ensure sustainable growth of market centres and efficient road functionality.

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## CHAPTER 1: INTRODUCTION TO THE STUDY

### 1.1 Introduction

Road re-alignment and development is a land use phenomena. The re-alignment could involve a complete or partial change of the existing road alignment. As such, it has both positive and negative impacts on growth of the country's economy. On the positive impacts, the re-alignment enhances road functionality by ensuring uniform speeds and uninterrupted traffic flow. This in turn enhances transportation as an economic activity, which in turn enables other social and economic activities to grow. On the negative, the re-alignment may by-pass some existing market centres which lose business and eventually collapse while at the same time encouraging growth of unplanned and uncontrolled roadside developments, a number of which contribute to highway accidents and environmental and social degradation.

Road re-alignments in Kenya have been necessitated by the need to upgrade existing roads. Historically, upon colonization in Kenya, the railway was considered as the major means of transport. The need for roads arose when they were considered as feeders to the railway in order to link up agriculturally viable areas which were far from the railway. Most of these roads were concentrated along the Mombasa - Kisumu railway corridor, with the highest concentration in the central high lands. Other major road networks were developed in the areas of European settlements such as the Ruiru - Kiambu - Limuru region and around Eldoret and Kitale. Other roads were constructed for administrative purposes (Obiero 1978).

Nkubu - Thuchi road was first constructed as an earth road in the 1920s and upgraded to bitumen standards in mid 1980s (Alexander GIBB, 1980)

After independence in 1963, the government focus was to develop the rural areas (former native reserves) which had been left to stagnate. The vision was set out in Sessional Paper No. 10 of 1965 - African Socialism and its Application to Planning in Kenya, but it was not realized mainly due to lack of strong political will to act. However, in the second National Development Plan (1970 - 1974), the government committed itself to opening up rural areas for development mainly focusing on road infrastructure. Consequently, the



apportionment of government expenditure of Kenya Pounds 43 million was set aside for roads with 46% being for trunk roads, 34% for feeder (rural access) roads and 20% for special development road projects (Obiero, op cit). This triggered the need to upgrade existing roads in order to link up towns and other major urban centres with efficient road network and to open up rural areas for development; hence, necessitating road re-alignments. In the case Nkubu – Thuchi road, the consultant, Sir Alexander Gibb and Partners completed the design for the re-alignment and upgrading of the road (from an earth road to bitumen) and subsequent feasibility study in 1979/80 (Alexander GIBB op cit).

Planning for roads is part of planning for transportation. Road transport is the most common used mode of transport worldwide. In Kenya, the road transport network accounts for over 80% of the country's total passenger and 76% of freight traffic. Kenya's road network consists of about 64,000 kilometres of classified road system and about 113,000 kilometres of unclassified road system giving a total of about 177,000 kilometres of road network. The urban road network covers approximately 10,000 kilometres or 5.6% of the total road network but with a carrying capacity of over 70% of all vehicles in the country (Draft National Transport Policy, 2004)

## **1.2 Problem Statement**

A good and well maintained road network is a great potential in a country's economic development; not only by providing transportation, but also communication, employment, trade and social interaction. A good road reduces travel time, increases access and connectivity to various centres, maximizes vehicle use and reliability and reduces travel costs for both goods and passengers.

In 2003, Hon. Raila Odinga, then Minister for Roads and Public Works while addressing Kenya Roads Board Directors said, "the importance of road transportation network in a country can be compared to the importance of blood vessels in the body of a human being or veins in the leaf of a plant". In May 2008, Dr. F. Nyangaga, the Executive Director of Kenya Roads Board, while addressing a roads conference in Johannesburg South Africa, quoted J. F. Kennedy, one of the most renowned American Presidents, as once having

said, *“Our Wealth did not create our Transport Infrastructure; Our Transport Infrastructure created our Wealth”*.

The main purpose of re-aligning and paving (tarmacking) the Nkubu – Thuchi road was to link up Embu and Meru towns in Eastern Province with a good and high speed highway, which would also shorten the distance between the two towns by about 30 kilometres, avoiding numerous curves predominant on the old road. The two towns of Embu and Meru are major urban centres in Kenya with a very rich agricultural hinterland. The new highway too, was intended to open up other areas along the road to economic development (GIBB Africa (1979)).

A tarmac road existed from Embu town to Thuchi, a distance of about 28km on the southern end, and from Meru town to Nkubu, a distance of about 14km on the northern end. Hence the new road re-alignment started from Nkubu to Thuchi; hence the name, Nkubu –Thuchi Road (Figure 3.1 page 3).

Much as the new highway was a great joy and relief especially to the Meru people as it provides efficient transportation mainly from greater Meru District to Nairobi, there are claims that a number of negative impacts are associated with the road. These include the “death” of the originally vibrant market and trading centres along the old road; proliferation of roadside (ribbon) developments along the new highway; increase in accidents at various spots along the new highway with major fatal accidents occurring at the Nithi River bridge; environmental degradation due to increased pollution from the increased number of vehicles, land slides from the cut-and-fill areas along the new highway (especially the section between Keeria market centre and Mutonga river), increased soil erosion from the road embankments, clearing of vegetation cover along the highway corridor; social and psychological effects due to displacement of families initially living within the lands acquired compulsorily and now taken up by the new highway; breakdown of the traditional moral fabric of the local Meru community due to increased interaction in the course of trade along the new highway among many others.

The new road functionality too, has been affected by development of roadside structures and businesses. Some developments have encroached onto the road reserve posing great danger to the pedestrians from the speeding vehicles on the highway. As a safety measure, bumps have been erected on the highway at some of the market centres to reduce risk of accidents, but which in turn inconvenience motorists as the function of uniform speed and smooth traffic flow meant for the highway is curtailed.

This study examines the impact of Nkubu – Thuchi road re-alignment on the growth and development of the market centres, and the road functionality.

### **1.3 Statement of Purpose**

The purpose of the study is to *examine* the effects of Nkubu - Thuchi road re-alignment on the market centres in Imenti South district; both the originally existing centres along the “old road” and the new developments along the “new highway”. The study also examines the road functionality of the new highway in the light of unplanned and uncontrolled roadside developments. Finally, the study makes recommendations for planning approaches/policy to ensure growth and sustainability of markets along highways, as well as efficient road functionality.

### **1.4 Research Questions**

The study was set to answer the following questions:

1. What factors were taken into consideration in the design of the re-alignment?
2. What impact has the road re-alignment made on the market centres on the old road section?
3. How has the functionality of the new road been affected by the re-alignment and growth of new market centres?
4. What planning approaches/policy can be applied to ensure improved road functionality as well as sustainable growth/development of market centres along major highways in Kenya?

## 1.5 Objectives of the Study

The main objective of the study is to find out the effects of road re-alignment (Nkubu – Thuchi road) on both old and new markets centres, and road functionality. The study seeks to achieve the following specific objectives:

1. To *examine* factors taken into account in road re-alignments.
2. To *assess* the impacts Nkubu –Thuchi road re-alignment has made on both the old and new market centres along the road section.
3. To *assess* how the functionality of the new road has been affected by the re-alignment and growth of new (roadside) market centres
4. To *recommend* Planning/Design approaches that can be applied to ensure improved road functionality and sustainable growth/development of market centres' along major highways in Kenya.

## 1.6 Assumptions of the Study

The study assumes that:

1. Information will be found both on the Road Design Manual and the Nkubu – Thuchi road feasibility study report carried out on the re-alignment of the road in the early 1980s, and from other necessary sources.
2. Traders both in the old and new market centres, road users (drivers, passengers and pedestrians), residents within the highway corridor and relevant road authorities will be willing to provide information requested for.

## 1.7 Justification of the Study

According to the Road Design Manual (1979), roads have two basic functions which, from a design standpoint, are incompatible. These are:

- 1) To provide traffic *mobility* between centres and areas; and;
- 2) To provide *access* to land and properties adjoining the roads.

Class A and B trunk roads are deemed to fulfill the basic function number one (mobility) designed for economic gain only. As such when designing these trunk roads, concern is mainly on mobility between the desired destinations (Origin-and-Destination (OD)). The issue of accessibility for social aspects along the highway corridor is of less concern. Road design data and information is mainly from O-D surveys. Not much attention is paid on what happens between the destination centres.

It is only recently, after the enforcement of the Environmental Management and Coordination Act (EMCA) of 1999, that Environmental Impact Assessment (EIA) studies have been made a mandatory requirement and a component of the feasibility studies in road construction (GIBB Africa and Tecslult, 2006). However, although EIA does address (to some extent) the social – economic aspects/implications of a new road construction, EIA does not and cannot sufficiently address planning issues geared at ensuring growth and sustainability of markets and trading centres along the highway corridor and efficient road functionality.

Planning to ensure growth and sustainability of these market centres along the highway corridor and its environs and efficient road functionality is indeed the crux of the matter of this study. Of equal importance is planning to secure road/highway reserves to curtail notorious encroachments which are normally a-pain-in-the-neck during future road expansions/re-alignments. It is therefore necessary that planning methods (policy/approaches) be developed to identify the transportation needs applicable particularly taking into account the interaction between the market centres, the neighbouring land uses (some of which could be compatible and others incompatible) and the functionality of the new highway development. A highway development will most certainly impact on change in land use and land values.

Proper planning calls for recognition that road projects are likely to lead to modifications within the communities living along the corridors, influencing various aspects of lifestyles, trade, travel patterns, social aspects and other activities. Unlike the environmental impact assessment studies which are normally carried out prior to

undertaking the project, this study focuses on the effects of an already existing highway on both markets and trading centres that existed before its re-alignment and construction as well as those which have come up after the construction; and how the roadside developments impact on the road functionality. The study can be compared to an environmental audit but it is different in that it is specifically focusing on planning issues as opposed to only environmental issues.

It is expected that the study will establish the missing link (knowledge gap) between highway planning and functionality vis-à-vis growth and sustainability of small markets and trading centres along the highway corridor. As such, the study is expected to be useful to policy/decision makers such as the Ministry of Roads and Public Works (MoR&PW) in deciding what link roads need to be rehabilitated in order to open up and activate existing market and trading centres, and enhance road functionality; the Kenya Roads Board (KRB) in deciding what and why certain link roads need to be financed for rehabilitation and maintenance to ensure value for money; the Ministry for Lands and Settlement (Physical Planning department) in reassessing/reviewing the planning policy with a view to specifically directing that highway planning (including re-alignment) should be carried out by urban and regional (physical/spatial) planners in consultation with highway engineers in order to ensure that economic and social growth is sustained not only at the origin and destination (O-D) centres but also throughout the highway corridor. Other stakeholders expected to benefit from the study are the Local Authorities and the Constituency Development Fund (CDF) committees, who, by liaising with the Physical Planning department and the Ministry of Roads and Public works/Road Authorities can be assisted in identifying suitable areas where link roads can be opened using *their* finances to ensure social and economic growth especially in their rural market and trading centres and to decongest traffic in the bigger urban centres.

It was therefore justifiable to carry out the study of Nkubu –Thuchi highway section in Imenti South district as a representative sample area on the effects of highway re-alignment and development in Kenya with a view to replicating the recommendations to other similar areas country-wide.

## 1.8 Scope of the Study

The study area was limited to a 25 Km long and 5Km wide corridor (2.5Km on either side of the road within which most of the market centres and other facilities lie) commencing at Maara River which forms the boundary of Imenti South and Meru South districts close to Keria market centre and ending at Nkubu town which is 14 Km to Meru town. The study area corridor thus covers an area of about 125Km<sup>2</sup>. However, the area of about 10Km<sup>2</sup> covering Nkubu town was excluded after it was found out that the town was not by-passed by the road re-alignment and secondly, carrying out studies on Nkubu town would have blown the scope of study beyond manageable limits. Hence the study area was reduced to 115Km<sup>2</sup>.

The study mainly focuses on the markets and trading centres' activities which are related to the transportation aspect. The study area was selected in order to address these issues within the same district jurisdiction (Imenti South District) and because the urban centres within the chosen section of the road are relatively smaller compared to Chuka and Nkubu towns and therefore, any mitigation measures recommended can be implemented effectively to curb further growth of unplanned roadside developments, resuscitation and growth of the old market centres and to enhance road functionality.

Two urban centres and one market centre were selected for the detailed study. The urban centres are Igoji and Kanyakine and the market centre is Ntharene.

1. The two urban centres (Kanyakine and Igoji) were selected because:

- a) They are the two major urban centres after Nkubu town which lie along the Thuchi – Nkubu road. Igoji and Kanyakine are also the division headquarters of Igoji and Kanyakine divisions respectively.
- b) Old Igoji market centre is about 1.5Km from the new road alignment while Kanyakine market is only about 100m off the new road. Therefore a comparative analysis is easily done based on distance from the road and level of roadside developments.

2. Ntharene market centre was selected because of its uniqueness. Ntharene was not served by the old Nkubu – Thuchi road. It was an interior local centre with hardly any reasonable access road. The new road therefore found it in its present location. The market centre is characterized with an open-air market on the road reserve. The market is famous for selling indigenous food crops such as yams, arrowroots, sweet potatoes, bananas and fruits of all kinds on the road reserve. During period markets (market days), the road reserve area is a bee-hive of activity as bananas are ferried from various places in the district and sold at the site before being parked, loaded onto waiting lorries and ferried to Nairobi and other parts of the country.

## **1.9 Research Methodology**

The study methodology is summarized as shown in figure 1.2 at the end of this section.

The research methodology followed four main stages:

- a) Research Design
- b) Data Collection
- c) Data Analysis and Interpretation
- d) Conclusion and Recommendations

### **1.9.1 Research Design**

The research design involved the overall preparation and approach to the study. This involved desk studies and surveys which investigated possible sources of data and information; data categorization and mode of data collection, and how to access and collect it; preparation of data collection survey instruments; sources of funds to carry out the study; training of research assistants, mobilization, preparation of the research programme and budget (cost-estimates); methods of data analysis and interpretation; and recommendations and conclusion.

### **1.9.2 Data Collection**

Data collection was divided into two; primary and secondary data.



### 1.9.2.1 Primary Data

Primary data was collected through formal interviews by use of structured questionnaires, interview schedules and vehicle counts schedules (Appendix 1). Code GPS observations were carried out to map out important sites not shown in the topographical sheets such as the new road alignment, tea and coffee factories, schools and health facilities among others. Eye observations and photography was also done extensively.

#### a) Survey Instruments

Survey Instruments consisted of three sets of *structured questionnaires* (household, road users and business community (markets)), *interview schedules* (in form of structured questions) for key informants and *vehicle count and categorization sheets* showing columns for each category of vehicle. The sheets also show columns for non-motorized mode of transport as well as motorcycles.

The *household questionnaire* targeted the households living within the study area; the *road users' questionnaire* targeted drivers, passengers and pedestrians; and the *business community (markets) questionnaire* targeted business people both in the old market centres and the roadside market developments.

The *interview schedules* targeted key informants who included the Chief Engineer (Roads), Ministry of Roads and Public Works (MoR&PW); the Executive Director of Kenya Roads Board (KRB); the District Physical Planning officer in-charge of Imenti South District, and seven institutions, namely, Kaguru Farmers Training Institute; Igoji Teachers College; St. Lucy's School for the Blind; St. Mary's Girls secondary school; Kanyakine Boys High school; Ntharene primary school and Kanyakine District hospital. *Vehicle counts* targeted motorized and non-motorized vehicles on the main tarmac (Nkubu – Thuchi) road as well as vehicles into and out of Igoji and Kanyakine market centres.

## **b) Sampling Frame**

### **(i) Households**

In order to get a representative coverage of the study area, a map of the district was prepared and the 125km<sup>2</sup> study area clearly marked (5km-wide corridor along the road for 25km). Further maps were prepared enlarging the actual study area for more clarity. Every two research assistants were allocated an area of about 23km<sup>2</sup> (an area of about 10km<sup>2</sup> covering Nkubu town was excluded) with clear instructions to conduct an interview in at least one homestead per every 1 – 1.5km<sup>2</sup> on either side of the road to ensure achievement of a good and systematic sample distribution (the sample was about 1.25% of the district population density).

### **(ii) Road Users Origin – Destination (O-D) surveys**

Three survey sites were selected; one close to the junction to Igoji market centre, the second one close to the junction to Kanyakine market centre and the third by the roadside at Ntharene market. The sites were selected because these are the areas where vehicles usually stop to drop or pick passengers and also in order to capture vehicles going into and out of the market centres. Systematic sampling procedures were used to select vehicles for interview of drivers and passengers (in some instances, an interviewer (research assistant) would ride in a matatu or bus in order to conduct an interview with a driver or passenger and alight at the next interview section). Random interviews for pedestrians were also done.

### **(iii) Business Community**

Systematic sampling was used to select the business peoples' respondents in order to ensure that views from different business were received. Businesses on both the old and new market centres were sampled in proportion to their sizes.

### **(iv) Vehicle Counts**

Vehicle counts were conducted at two cordon stations and one screen line. One cordon station was set at Maara river bridge, the southern entry into Imenti South District/the study area at Keeria Market centre; a screen line at Igoji market centre and the second cordon station at Thingithu river bridge past Nkubu town and close to the north boundary of the Imenti South District. Vehicle counts were also done at Igoji and Kanyakine junctions with the new road to capture vehicles going in and out of the old market

centres. Since there are no specific rush hours, vehicle counts were done for twelve hours per day (6am – 6pm) for seven continuous days beginning on a Sunday and ending on a Saturday. Vehicle counts at the cordon stations and screenline were recorded as north-bound for those traveling towards the Meru town direction and south-bound for those traveling towards the Nairobi city direction. Vehicles going into Igoji and Kanyakine market centres from the Nkubu – Thuchi tarmac road were recorded as in-bound and those from the market centres as out-bound. As the vehicles were counted, they were recorded in respective columns in the vehicle count and categorization sheets in order to note each category of the vehicle (motorcycle, car, minibus/van, bus, pick-up/light truck, lorry/truck and non-motorized transport).

### **c) Sample Sizes**

Systematic Sampling method was used. However, since it was not possible to count all the households within the study area, the district population density was used; by taking the population density, multiplying it with the study area size and then dividing by 5 (number of persons per household – the National Census figure). For the Origin – Destination surveys, the sample size was determined after vehicle counts were done. A total of 293 questionnaires comprising of 88 household questionnaires, 76 business community/markets (old markets – 51 and roadside markets – 25) questionnaires and 129 road users O–D survey questionnaires (drivers – 44, passengers – 43 and pedestrians – 42) were administered with over 75% respondent achievement. Seven (7) heads of institutions within the study area were interviewed and a seven-day vehicle count and categorization carried out.

#### **1.9.2.2 Secondary Data**

Secondary data was obtained through desk studies, a review of published and unpublished works, government publications such as development plans, annual reports and sessional papers, the population census, relevant Acts of parliament, the feasibility study on the re-alignment of Thuchi – Nkubu road (1979/80), the Road Design Manual and the Physical Planning Handbook, print media and internet sources among others.

### 1.9.3 Data Analysis and Interpretation

Both qualitative and quantitative **data analysis** methods were employed. For Quantitative data, closed-ended questions were coded before going to the field. Open-ended questions whose responses could be categorized were also coded after fieldwork to form additional quantitative data upon data entry (keying in). All quantitative data was analyzed using SPSS (Statistical Package for Social Scientists) computer software in order to easily generate frequency tables and percentages of various responses as per the questionnaires administered in the field. Further analysis was done using Excel computer software in order to present results in form of frequency distribution tables, pie-charts, histograms and bar charts for ease of interpretation.

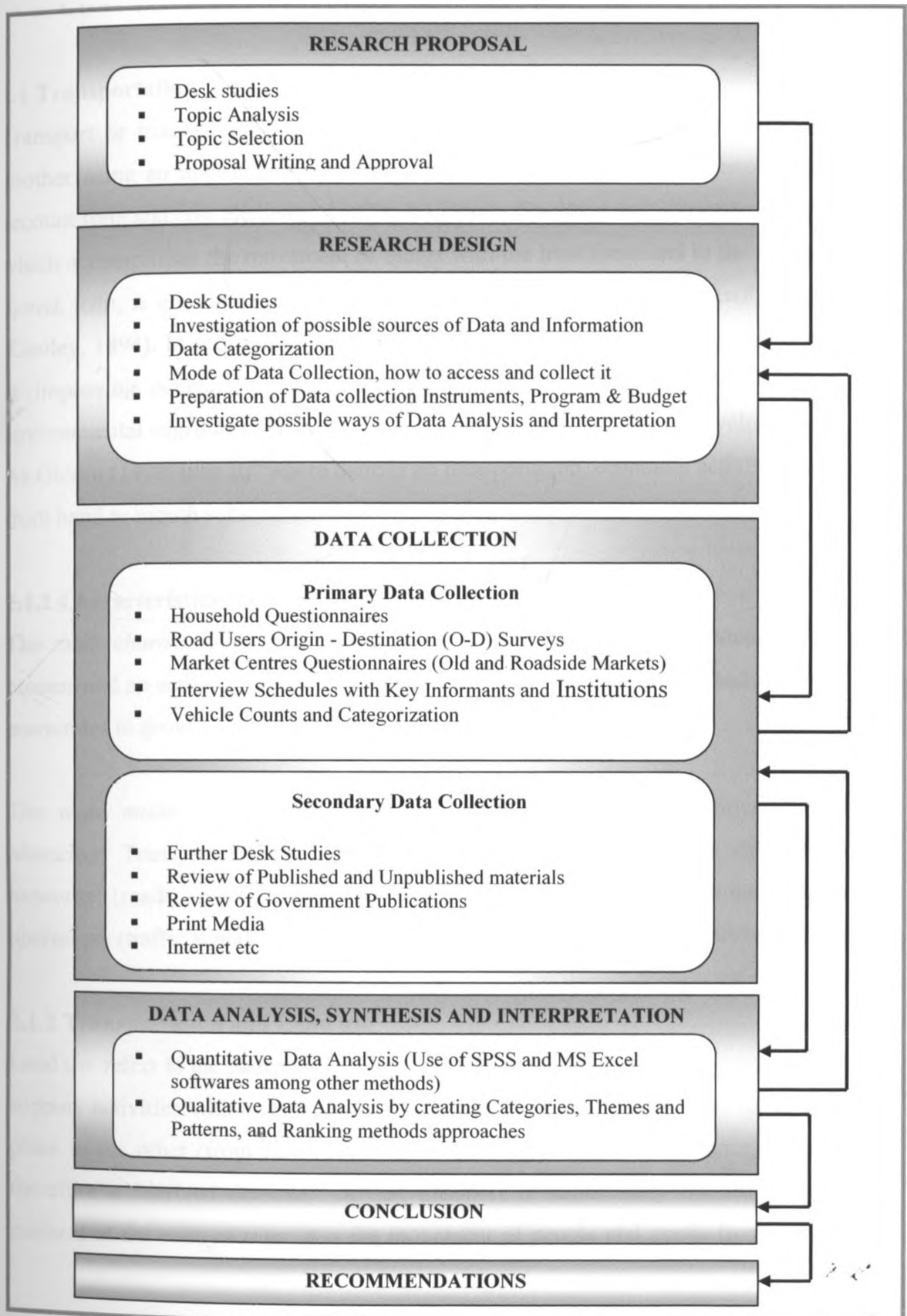
Qualitative data analysis involved synthesizing data from interviews with key informants, discussions, observations and photography. The process involved data organization; creating categories, themes and patterns using codes and ranking method; analyzing and interpreting the information simultaneously drafting short reports to be compiled with the main report; all in an effort to assess the respondents feelings and expectations within the study area.

**Interpretation** of results was based on data analysis from both the primary and secondary information.

### 1.9.4 Conclusion and Recommendations

The **Conclusion** is drawn based on the study experience and findings and suitable **recommendations** made to address both specific and long term measures. Specific recommendations are made to address specific adverse effects after field findings, and policy recommendations to address long term and lasting solutions to highway planning. These are expected to create positive impact in future planning/development of highways in order to ensure road functionality and growth and sustainability of towns, urban and market centres along highway corridors such as the Nkubu –Thuchi highway are sustained.

**Figure 1.2: Research Methodology Chart**



Source: Author, 2007

### 2.1 Transportation

Transport or transportation is the movement of people and goods from one place to another using an appropriate means and mode to satisfy a particular need taking into account time and cost elements. As Charles Horton Cooley puts it, "transportation is best which accomplishes the movement of things with the least force and in the shortest time. *Speed*, then, is one fundamental test, while *economy of force (cheapness)*", is the other (Cooley, 1894). In addition to speed and cheapness, good transportation should also aim at improving *accessibility* and quality of services in general, and minimizing on environmental *degradation* in order to ensure growth and sustainable development.

As Obiero (1978) puts it, "where there is no transportation, economic activity is restricted from hand to mouth subsistence levels".

#### 2.1.1 Characteristics and Modes of Transport

The main *characteristic* of transportation is that, it is a need, a service, a facility, a process and an activity. Transportation is in itself an economic activity and it drives other economies to grow.

The main *modes* of transport are combinations of *vehicles* (Motorized and None Motorized Transport (NMT) such as walking, human/animal-drawn carts, bicycles), *networks* (roads, railway, pipeline, waterways, airways and communication) and *operations* (traffic signals, ramp meters, air traffic controls as well as policies).

#### 2.1.2 Transportation and Land use

Land use refers to the pattern of activities for which land is used for. In essence, land uses support activities which are spatially separated. People need transport to go from one place to the other (from home to work, to shop, back home for instance). Transport is therefore a "derived demand," in that transport is unnecessary but for the activities pursued at the ends of trips; it is the movement of people and goods from one place to

another. Good land use keeps common activities close and linked. Poor land use concentrates activities far away, de-linking them from other destinations.

### **2.1.3 Transport and Communication**

The greatest achievement in transportation is in the area of information transfer. This ranges from the early days when messages were delivered by use of human couriers to the present day of the internet services. Transport and communication are both substitutes and complements. The growth in transport would be impossible without communication, which is vital for advanced transportation systems, from railroads which want to run trains in two directions on a single track, to air traffic control which requires knowing the location of aircrafts in the sky at any one time. Thus, it has been found that the increase of one generally leads to more of the other.

### **2.1.4 Transportation and the Environment**

Transport is a major user of energy. It burns most of the world's petroleum. Hydrocarbon fuels burnt produce carbon dioxide, a green house gas widely thought to be the chief cause of global climate change. Petroleum-powered engines, especially inefficient ones, create air pollution, including nitrous oxides and particulates (soot). Sulfur released through the exhaust is the cause of acid rain.

Other environmental impacts of transport systems include noise pollution, traffic congestion, toxic runoff from roads and parking lots that can pollute water supplies and aquatic ecosystems, and automobile-oriented urban sprawl, which can consume natural habitat and agricultural lands. (<http://en.wikipedia.org/wiki/transport>).

### **2.1.5 History of Transportation**

Transportation has evolved over a long period of time beginning with use of porters (human strength), followed by the use of the beast of burden (especially the camel), the wheeled *carts*, the *steam engine* (Cooley, op cit), to the present day high speed powered *gasoline vehicles*, *planes*, *ships* and *electric trains*. Research is still advancing towards replacing the gasoline vehicles with electric and solar energy powered vehicles in order to minimize vehicular pollution on the environment.

On roads, historically, many roads were simply recognizable routes without any formal construction or maintenance. A road was simply any path fit for riding. The first pathways were the trails made by migrating animals. Today, roads are almost exclusively built to enable travel by automobile and other wheeled vehicles. In most countries, road transport is the most utilized way to move goods and passengers.

## 2.2 Theories Related to Transportation

### 2.2.1 Cooley's Theory

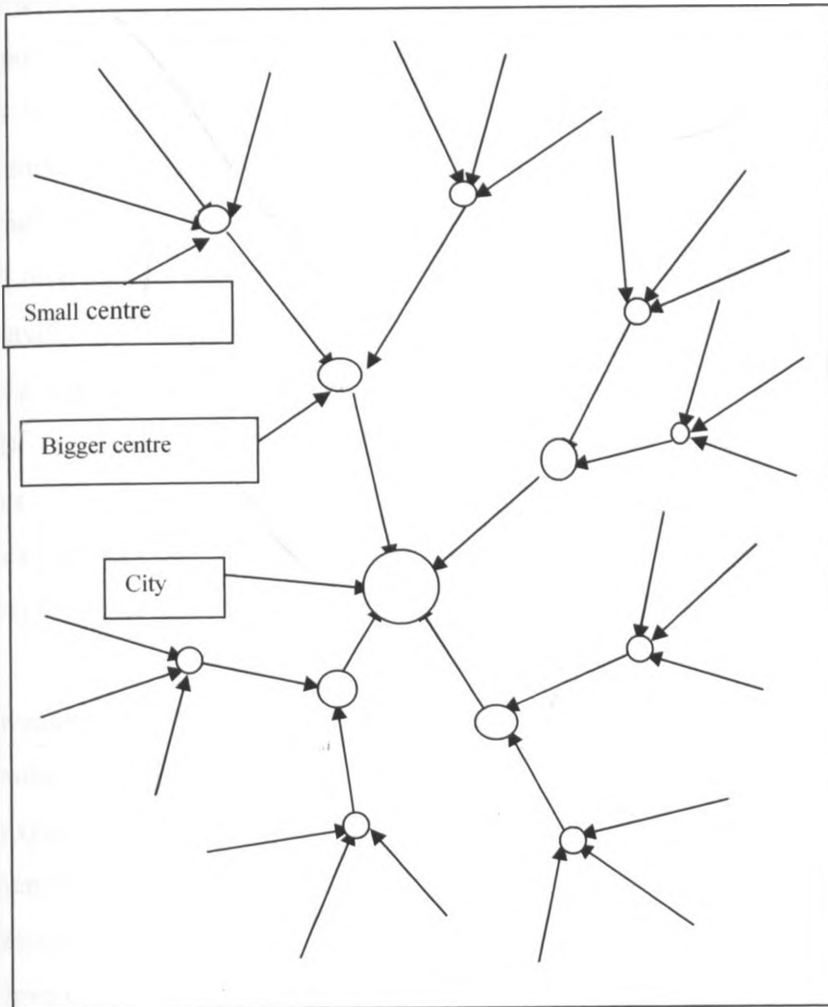
In building roads, Cooley (1894) argues that the natural way has always been a tendency to take the shortest route. However, the literal and absolute application of this principle would require the building of roads from every point to every other. This could easily turn the whole surface of the earth into roads using enormous labor and the complete destruction of the farms. It is therefore clear that some sort of a compromise must be made between the principle that calls for directness and the principle that calls for economy of labor and space. Cooley's theory sees the solution that requires a complexly *branched system*. In this system, each neighborhood would collect what it has to send at some central point where the movement would proceed by a common road. These central points, again, would stand in the same relation to one another as the farms in a neighborhood; the roads from them would concentrate at other points, and so on, until, finally, all the longest movements would end up traversing a few great roads of which a number of the most important would meet at the center of the country (the city).

Cooley's theory (in my understanding) depicts a natural *radial* type of road network similar to river tributaries leading into a big river which leads into a bigger river and finally flowing into the sea.

Figure 2.1 shows the authors interpretation of Cooley's theory.



**Figure 2.1: Radial Road Layout**



Source: Author, 2007

### **2.2.2 Economic Base Theory**

The Economic Base theory may be considered as the first element of a theory of transportation and development. The theory expresses the idea that growth of a region is directly dependent on the strength of its trade with other regions. That is, the growth of an area is directly determined by its ability to market its products and services outside its boundaries. The belief was strongly held by Hyot in the 1930s. Hyot thought that the ability of a city to sustain its economic activity depends on its ability to export goods and services to the rest of the world. He also advanced that the total size of the economic activities of a city is a constant multiple of the export sector (Meyer, 1971).

The role of transportation in as far as the application of Base Theory is concerned consists of providing the interregional - geographical linkages on which the flows of export goods will be channeled. Viewed from this perspective, the demand for transport facilities is therefore a derived demand; it is the nature of the basic sector which determines the geographical direction of transportation links (from production centres to markets) and also the appropriate selection and coordination of technologically different modes of travel. Commodities or services have specific transportation or shipping characteristics, such as weight, volume, divisibility, and perishability, to which one mode or a specific combination of modes will be best-adapted. An important aspect of transportation planning should therefore consist of fitting technological mode characteristics (capacity, number of transfers, size and type of containers, speed of travel among others) to the transportation characteristics of the products.

The major weaknesses of the Base theory are that; (1) it is limited, in general, by its descriptive rather than analytical nature; (2) its validity, both as an historical explanation of regional expansion and as a conceptual tool for implementing development programs dwindles when the sizes of regions increase; (3) it has little application to the problems of an underdeveloped region which is characterized among other things by a seemingly inability to develop an export base (Meyer, op cit).

### **2.2.3 Trade Theory**

Trade theory was initially developed by David Ricardo to deal with movement of goods among nations, but most of it also apply to movement of goods among regions, cities within a region or even within an urban centre itself, as well as movement between rural and urban regions (Meyer, op cit). The theory focuses on *comparative advantage* based on relative productivity between nations or regions. Comparative advantage refers to the relatively greater efficiency and quality that one region has over another in producing a commodity when the price of such commodity is expressed in terms of other like commodities that another region can produce or manufacture. For example, if two regions 'A' and 'B' both produce tea, and region 'A' has good and efficient transportation of its

tea to the market than region 'B', marketers would prefer doing business with region 'A' irrespective as to whether region 'B' has equally good quality tea (even if sold at slightly a lower price). The comparative advantage in this case is not only about quality and price, but reliability which can be guaranteed by efficient transportation. What determines the volume and direction of a region's exchange is therefore its efficiency in producing/manufacturing and distributing its goods at an advantage over other regions.

Comparative advantage is therefore, as a result of two components; *production advantage* and *transportation advantage*. As Cooley (op cit) put it, quick transportation diminishes the need for holding large stocks of goods. Cooley also held the view that, "were all other conditions stationary, efficient transportation would tend to diminish the need for capital in production and exchange". He argued that, one use of capital is to *tide* over the period between production and consumption; thus in so far as the facility of movement shortens this period, it does away with the need for capital. That is, a consumer would not need to spend a lot of capital and investment in stock-piling if he is sure that the producer and supply would efficiently and reliably supply the goods promptly.

Efficient transportation too has direct effects upon prices. It makes them lower and also lessens the variations of the prices of any particular commodity in different times or places. The cost of movement enters into the price of all that has to be moved; and for this reason alone, without regarding more indirect results, prices fall with cheaper conveyance. Likewise, the tendency to equality of price at different times and places follows from the action upon supply and demand.

### **2.3 Theories of Market Centre / City Development**

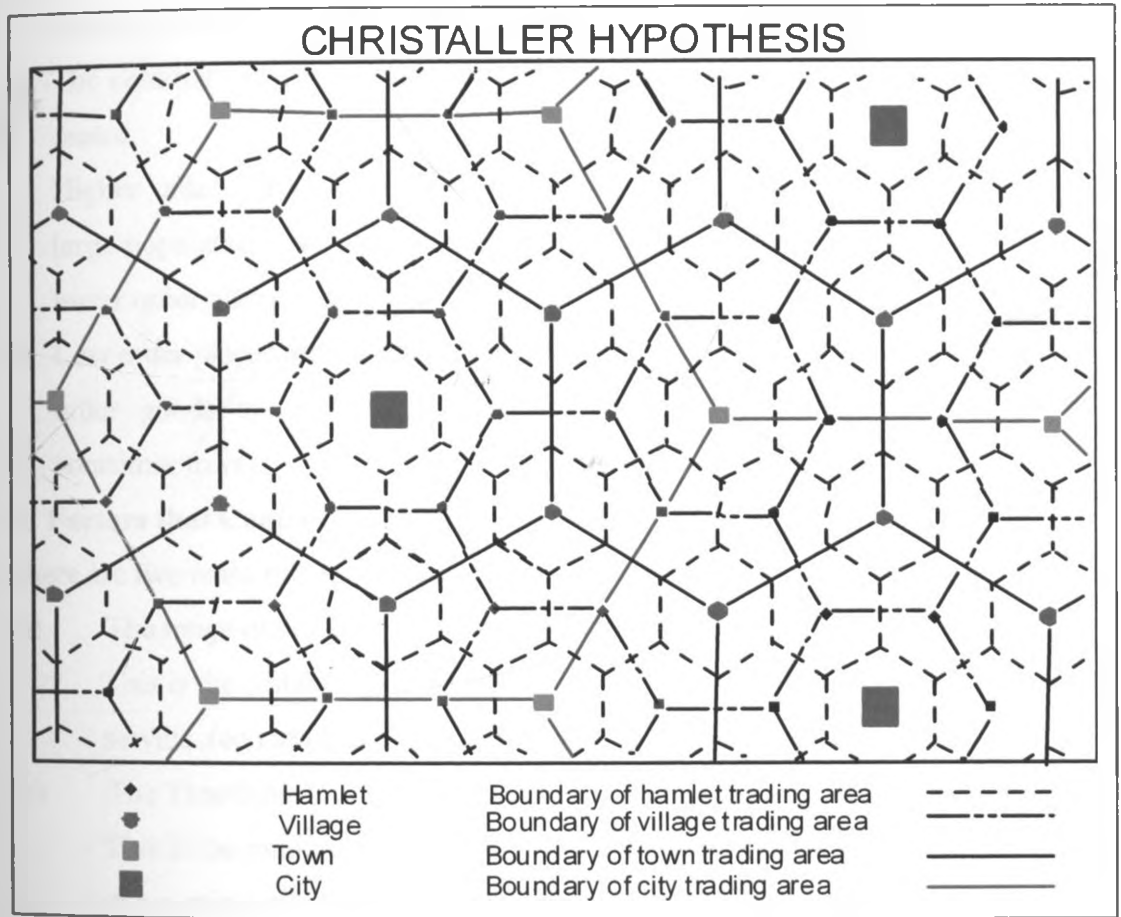
A number of theories have been developed which attempt to generalize the development of markets and urban centres or cities (commonly referred to as "Central Places"). It is beyond the scope of this study to discuss details of various theories of city growth. However, one of the most generally representative theory of urban centres' developments; the *Central Place Theory*, is discussed briefly below, while highlights of some of the other theories are also given.

### 2.3.1 The Central Place Theory by Walter Christaller

Central Place Theory was formulated by Walter Christaller, a German geographer by profession. He formulated the theory as his doctoral dissertation published in 1933, under the title "Central Places in Southern Germany." (*website: <http://www.urbanization.com>*)

Figure 2.2 below demonstrates Christaller's hypothesis. The smallest level is designated by the hamlet, the second level by the village, the third level by the town and the larger fourth level by the city.

**Figure 2.2: Walter Christaller's Hypothesis**



Source: James H. J. 1981: Urban Geography – An Introductory Analysis

In its simplest terms, Christaller's scheme proposed that towns with lowest level of specialization would be equally spaced and surrounded by hexagonally shaped hinterlands. For every six of these towns, there would be a larger, more specialized city which in turn would be situated an equal distance from other cities with the same level of

specialization as itself. Such a city would also have a larger hexagonal service area for its own specialized services; more specialized settlements would also have their own hinterlands and be located at an equal distance from each other (Johnson, 1981).

### 1. The Basic Features of the Central Place Theory

Central Place Theory has been the subject of much analysis and empirical testing in the past decades. The basic features of the theory are:

- a) The basic function of a city is to be a central place providing goods and services for the surrounding tributary area,
- b) The centrality of a city is a summary measure of the degree to which it is a service centre
- c) Higher order places offer more goods, have more established and business types, large populations, do greater volumes of business, and are more widely spaced than lower order places and;
- d) Low order places provide only low order goods to low order tributary areas; these low order goods are generally necessities requiring frequent purchasing with little consumer travel.

### 2. Factors that Control the Distribution of Central Places

There are two main factors that control the distribution of central places. These are:

- (a) The range of Good

This is the distance over which people are prepared to travel to obtain a particular service. (eg medicine, food staff, administrative/office services etc)

- (b) The Threshold

This is the minimum amount of purchasing power necessary to support the supply of a particular “good” (or service) from a central place.

The range of a particular service from an urban centre has an *upper limit*, which is determined by competition from other places which supply the same service; and a *lower limit*, which is controlled by the threshold necessary to allow it to function.

The two factors, *range* and *threshold* contribute to the hierarchy of central places.

For example; more specialized services require a larger threshold and also dictate an extensive range. Hence they are found in those larger settlements which provide enough

purchasers to support them, drawn both from their own populations and from that of their extensive zones of influence. Larger centres also provide less specialized services which, compete with those provided by smaller centres in between the large centres. However, all said and done distinctive groups of services will develop on those settlements which provide approximately, the correct threshold for their survival, within the range (or zone of influence) appropriate for these services.

In summary, the central place theory advances that the two main activities which form the city are the range of goods and the threshold. Thus, the centrality of a city is a summary measure of the degree to which it is a service centre.

### **2.3.2 Other Theories related to Urban Centres development**

Some of the other theories related to Urban Centres development include;

The *concentric zone theory*: - model is based upon the notion that the development of a city takes place outwards from its central area to form a series of concentric zones of influence. The *sector theory*: - developed by Homer Hyot, advanced the idea that once contrasts in land use had arisen near the city centre (perhaps originally as a result of mere chance) these differences/contrasts were perpetuated as the city expanded depicting a wedge-like pattern from the city centre, mainly following on transportation routes.

The *Multi Nuclei Theory*: - was more or less developed to try and reflect both the concentric and sector theories in real-life applications. This theory suggests that cities have an essentially cellular structure in which, distinctive types of land uses have developed around certain growing points or “nuclei”, within the urban area.

### **2.4 Rural Transportation**

Rural transport is key to development particularly for most developing countries which rely on agriculture as the mainstay to economic growth and development and poverty reduction.

Rural transport focuses on two interlinked elements;

- 1) The mobility of rural people, and;
- 2) Physical Access to services.

*Mobility* is determined by the means available (both motorized and non-motorized) for people to transport themselves and their goods. Mobility is also determined by the state of transport infrastructure, mainly rural roads, tracks, trails, paths, as well as footbridges which link up interior rural road networks.

*Physical Access* on the other hand is determined by the location of facilities and services, schools and health services and markets in relation to existing mobility conditions in a rural area. Of crucial concern is the linkage of rural access roads to the tertiary (minor), secondary and primary roads as well as the trunk roads that connect to the outside market where rural produce should be destined to ensure reasonable returns to the rural communities and the country at large.

#### **2.4.1 Role of Rural Transport in Poverty Reduction**

Poverty reduction is one of the key global development policy priorities. It is the overarching objective of the Millennium Development Goals (MDGs). In developing countries, rural poverty levels are much higher than in urban areas. The poverty level in rural areas stands at 63% worldwide, reaching 90% in some countries like Bangladesh and between 65% and 90% in Sub-Saharan Africa (Njenga, 2007).

#### **2.4.2 Rural Transport and the Millennium Development Goals**

The Millennium Development Goals (MDGs) were adopted by the member states in 2000, as a framework of measuring development progress. However, the catalytic role of transportation although very key to all the eight MDGs' was not clearly brought on board.

Investment in improved transport infrastructure and services for example, can be effective in lowering import prices, increasing agricultural production and easy access to markets. This would further create and facilitate access to employment; thus contributing to "eradication of extreme poverty and hunger" – MDG Goal No.1.

Improved Mobility and Accessibility can lead to major steps towards achieving the MDG Goal No.2 – "Universal Primary Education", as both teachers and students as well as facilities would easily get to schools and other learning institutions.

“To Promote Gender Equality and Empower Women” - MDG Goal No.3, improvement in mobility would reduce the women’s burden of loads over their heads and backs and in turn empower them to take more control over their lives by increasing their access to the markets, exposure to education and information, their opportunities to participate in income generation, and community and political activities.

Improved mobility and accessibility not only assists the sick but also enhances immunization of children. Hence contributing towards MDG Goals Nos 4 and 5 – “To Reduce Child Mortality and Improve Maternal Health care” respectively.

Improved accessibility would ensure success of most immunization programmes against HIV/AIDS, malaria and other diseases, thus contributing towards MDG Goal No. 6 – “To Combat HIV/AIDS, Malaria and other Diseases”.

When a new road is built to open up a semi-arid area for example, more people settle in the area; and with more people, more trees and a better environment. (Good examples in Kenya are Naivasha, along the Nakuru highway corridor; Kahawa Sukari and Kitengela among others; thus, more people more trees, better environment); hence contributing towards MDG Goal No. 7 – “To Ensure Environmental Sustainability”.

Transport provides the links between rural access areas and the outside world; hence development of global partnership for development; thus contributing towards MDG Goal No. 8 – “To Develop a Global Partnership for Development” (<http://www.globaltransportknowledgepartnership/ruraltransportation,2007>)

### **2.4.3 Integrated Rural Accessibility Planning (IRAP)**

Integrated Rural Accessibility Planning (IRAP) has its origins in the works of the International Labour Organizations (ILO) in several African and Asian countries in the 1980’s.

IRAP process generally consists of three stages;

- 1) Data collection



- 2) Data Analysis and Prioritization
- 3) Project Identification and Preparation

### 1) Data Collection

The aim in the data collection stage is to collect the information required for determining the existing access situation. Ensuring participation of representatives of the different communities is crucial in obtaining appropriate data required for further IRAP process. This stage also includes the processing of the data in order to facilitate its subsequent analysis.

The data collected relates to travel and transport patterns of the households with regards to different services and facilities, as well as the characteristics of the existing infrastructure and services.

### 2) Data Analysis and Prioritization

Analysis of data collected in stage one enables the planner to understand the main access problems and identify possible interventions that would improve rural accessibility. The process consists of a spatial and sectoral analysis, where priority communities are identified for each sector and priority sectors are identified for each community.

Two important tools used in the data analysis and prioritization are the ***accessibility Indicator (AI)*** and ***Accessibility Mapping (AM)***.

The *accessibility Indicator (AI)* is used to determine the level of access of a certain community or group of communities to a particular service or facility. In its most basic form, AI is the product of the number of households seeking access and the average travel time required to access the particular product or facility.

That is;  $AI = HH \times TT$ ; where;

HH is the number of households; and TT is the travel time.

*Accessibility Mapping (AM)* is a prerequisite for visualizing the spatial nature of rural accessibility. Mapping helps both the planner and the communities concerned to explain, discuss and understand the different aspects of access, as well as the impact of potential interventions. The mapping varies from simple sketches to detailed Geographical Information Systems (GIS).

- 2) Data Analysis and Prioritization
- 3) Project Identification and Preparation

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### 3) Project Identification and Preparation

In this final stage of IRAP, process interventions that will improve the accessibility of the communities in the area which the planner is responsible are identified and prioritized (<http://www.globaltransportknowledgepartnership/ruraltransportation.2007>)

#### 2.5 Impacts of Road Re-Alignment

Every transportation facility, construction, operation and service has some impact on the activity system, both in urban and rural areas. These impacts range from direct *physical effects* on the natural environment to the more indirect *social and economic effects* on the surrounding neighborhoods and the highway corridor (Mayer and Miller, 1984).

##### 2.5.1 Physical impacts

The four major physical impacts include *construction impacts on the ecology, impacts on air quality, energy consumption and noise* (Mayer, et al).

The impacts on the *ecology/environment* begins when the road is under construction; land is consumed, natural ecosystems are disturbed, and topographical patterns are altered as a result of “cuts and fills”, bridges and tunnel constructions, excavations from the ‘borrow pits”, rock explosions, severance of trees, and damage to adjacent property and vegetation among other ecological effects such as destruction of flora and fauna.

The impacts on *air quality* begin at the construction stage and continue into the operation stage. The impacts include vehicle emissions of noxious gases such as carbon monoxide (CO); hydrocarbon (HC) emissions as a result of unburnt fuel and oil; nitrogen oxides such as nitric oxide (NO) which is toxic, and nitrogen dioxide (NO<sub>2</sub>) which can irritate the eyes, nose, throat and lungs; sulphur oxides as a result of oxidation of sulphur found in gasoline. Sulphur oxides can also irritate the eyes, nose, throat and lungs. Assorted particulates resulting from the vehicles are also a major source of air pollution especially in cities.

The *noise* impacts like air quality begin with the construction during explosions and continue in the operation stage. Exposure to high levels of noise over extended periods can have detrimental effects on the physical and mental health of human beings.

The petroleum fuel consumption through vehicles is quite a large significant proportion of a country's total *energy* consumption. In the United States and Canada for example, highway vehicles are the largest single consumers of petroleum energy (Mayer, et al).

### **2.5.2 Economic Impacts**

Increased accessibility provided by transportation system improvements influences the location of new transportation facilities which can play a major role in determining transportation investments and other investment activities as well as policy decisions.

On the other hand, if a transportation facility like a road is re-aligned and its new location by-passes existing markets and trading centres, business in these centres is bound to greatly decrease and the incomes of the communities diminished (Mayer, et al).

### **2.5.3 Social Impacts**

The social impacts associated with construction and operation of transportation facilities primarily involve the physical displacement of people and social institutions during the facility construction and the effects on neighborhood cohesion once the facility is in operation, (Meyer, et al). Categorized generally, the social impacts of displacement include:

*Family and social ties* – These may be weakened or broken by geographic separation or relocation.

*Attitudes and behaviour* – Attitude and behaviour may change as part of psychological response to separation from neighbors or familiar surroundings.

*Disruption of neighborhood patterns* - Relocation of large numbers of households may weaken or dissolve “community cohesion” in both the abandoned and new neighborhoods involved.

*Business people's reactions* - Along with financial losses, business owners may lose steady customers and goodwill associated with their businesses when forced to relocate.

*Relocation housing and land availability* - Replacement housing that is both livable and matches the needs of the relocated households and land that has both economic and sentimental value has to be found.

Social impacts of transportation mainly tend to have greater adverse effects on the elderly, low income earners, the physically disadvantaged/disabled and ethnic groups more than other groups, both in urban and rural areas (Meyer, et al).

## **2.6 Road Re-Alignment and Roadside Developments**

Road Re-alignments encourage Roadside developments. Roadside or Ribbon development means building houses and other structures along the roads radiating from a town, or along highway corridors and road reserves. From a wider perspective it could also include doing business such as loading and off-loading, market trade among other none road activities deemed to interfere with the intended smooth usage of the road.

Early history shows that roadside developments came about as a result of increased motor car ownership which meant that houses built along the roads would be attractive and sellable even though they might be remote from the urban centres and other services as long as they were easily accessible. Building on the roadsides was attractive to developers because they did not have to waste money or plot space constructing roads to access to the properties. However, increased roadside developments generated great concern in the United Kingdom during the 1920s and 30s, as well as in many other countries. The practice became seen as antithetical (mutually incompatible) to efficient use of resources and as a precursor to urban sprawl. Thus the key aim for the United Kingdom's post-war planning system was to halt ribbon developments which eventually led to the introduction of green belt policies ([http://en.wikipedia.org/wiki/Roadside\\_developments](http://en.wikipedia.org/wiki/Roadside_developments))

### **2.6.1 Impact of Roadside Developments on Road Functionality**

Any development allowed to “grow” alongside a rural highway, unless it has been planned and designed correctly, will generate traffic and pedestrian movements that can lead to accidents that could otherwise have been prevented. Vehicles turning into or out

of premises cause particular problems, especially when the vehicles have to cross an opposing stream of traffic. Likewise, vehicles packed along the road, either to drop or pick up passengers, or for the owners to do shopping and or have some refreshment cause untold inconvenience for through traffic and in many occasions even accidents.

Pedestrians crossing or walking along the road near such developments are also frequently involved in accidents.

Research in developed countries shows that the accident rate on a rural highway doubles at about 15 businesses/km or 6 accesses/km and as a result tight restrictions on such developments have been in place for many years. Service roads with properly designed junction accesses are one of the standard solutions.

In many developing countries, lack of planning and development control has allowed roadside developments to become a major problem to road functionality, from individual sellers of market produce scattered along a highway to the many kilometres of ribbon (linear) development that can be seen in a number of countries. Villages frequently move to a highway after it has been constructed or upgraded. As a result, two basic problems are at the heart of this – access to buyers of produce and access to good transport are usually in conflict ([http://en.wikipedia.org/wiki/Roadside\\_developments](http://en.wikipedia.org/wiki/Roadside_developments)).

## **2.7 Planning for Transportation**

Transportation planning is the field of Land use planning involved with the siting of transportation facilities. The primary purpose of any transportation planning effort is to inform or generate information useful to *decision makers* on the consequences (both negative and positive) of alternative transportation.

### **2.7.1 Conceptual Models in Decision-Making in Transportation Planning**

Historically, transportation planning has followed the *rational planning process* based on the *rational actor model*, of defining goals and objectives, identifying problems, generating alternatives, evaluating alternatives, and developing the plan. This model traditionally assumes a rational, completely informed set of decision makers whose decision process is based on maximizing the attainment of an explicit set of goals and

objectives. However, with the emerging of other models for planning such as *satisficing*, *incremental planning*, *organizational process*, *political bargaining* and the rising importance of *environmentalism*, planners are increasingly expected to adopt a multi-disciplinary approach to planning (Meyer, et al)

### **2.7.2 Elements of Decision-Making in the Development of Transportation Planning Process**

The major elements of decision making in the development of a transportation planning process include; *pluralism*, *resource allocation*, *consensus-seeking*, *problem simplifying* and *uncertainty avoiding*.

### **2.7.3 Role of a Planner in Decision-Making Transportation Planning**

The role of a planner is one of planning with interest public groups and officials rather than planning for a perceived unitary general public. As Edmund Burke puts it; “planning is no longer the exclusive domain of experts. The task facing planners today is that of determining who should be involved, what functions citizens should serve, and how to adopt a planning method to a process involving a wide range of interests and groups. The planner has become both a technical expert and an organizer.” (Burke, 1979)

As Meyer puts it, “the role of the planner thus becomes one of planning *with* the interested public groups and officials, rather than planning *for* a unitary general public, as in the rational planning tradition approach” (Meyer, et al)

. Thus, both Burke and Meyer concur that a planner should no longer plan *for the people* but rather *with the people*.

This calls for pragmatic planners and not mere technocrats. As Meyer recons, “if planners are to adopt this more “open” process of planning, they must have information on the desires and attitudes of the community with respect to both general directions for the planning process and specific reactions for or against plan and project proposals” (Meyer, et al)

## 2.7.4 New Approach to Transportation Planning

Good examples of countries which have embraced the model of Decision-Making approach to transportation planning are the United Kingdom (UK) and the United States of America (USA). Other countries like Botswana, India, Bangladesh, Peru and Cambodia have formulated and developed rural transportation policies that address effective rural connectivity.

### 2.7.4.1 United Kingdom (UK)

In the *United Kingdom* transport planning has traditionally been a branch of civil engineering. In the 1950s and 1960s it was generally believed that the motor car was the future of transport with public transport playing only a marginal role. The role of the transport planner was to "*predict and provide*" - to predict future transport demand and provide the network for it, which usually involved building more roads.

With effect from the mid 1990s to the present period, view on transport planning in the United Kingdom has since changed from the focus on the motor car to a new approach based on integration; integration within and between different types of transport; integration with the environment; integration with land use planning and integration with policies for education, health and wealth creation. In 2006 the Transport Planning Society of United Kingdom redefined the key purpose of transport planning as "*to plan, design, deliver, manage and review transport, balancing the needs of society, the economy and the environment*" ([http://en.wikipedia.org/wiki/transportation\\_planning](http://en.wikipedia.org/wiki/transportation_planning)).

Consequently, the role of the transport planner has changed from the traditional "*predict and provide*" to more key roles which demand that transport planners must: 1) take account of the social, economic and environmental context of their work; 2) understand the legal, regulatory policy and resource framework within which they work; 3) understand and create transport policies, strategies and plans that contribute to meeting social, economic and environmental needs; 4) Design the necessary transport projects, systems and services; 5) understand the commercial aspects of operating transport systems and services; 6) know about and apply the relevant tools and techniques;



and 7) Be competent in all aspects of management, in particular communications, personal skills and project management.

#### 2.7.4.2 United States of America (USA)

In the *United States* transportation planning is in the midst of a shift similar to that taking place in the United Kingdom; that is, moving away from the singular goal of moving vehicular traffic, to one towards an approach that takes into consideration the communities and lands which streets, roads, and highways pass through ("the context"). This new approach, known as *Context Sensitive Solutions (CSS)*, seeks to balance the need to move vehicles efficiently and safely with other desirable outcomes, including historic preservation, environmental sustainability, and the creation of vital public spaces; thus "*thinking beyond the pavement*" ([http://en.wikipedia.org/wiki/professional\\_transportation\\_planner](http://en.wikipedia.org/wiki/professional_transportation_planner))

#### 2.7.4.3 Republic of Botswana

The Republic of Botswana Roads Department "Kgotla" (villages) Access Roads Policy requires that, "Any road development should include the provision of roads to all "kgotlas" within 10km of the road as part and parcel of the road under design/construction". The "Kgotla Policy" ensures that planning and construction of roads benefit the communities within the neighbourhoods not only from transportation services, but also other social-economic benefits.

In the construction of the Letthakeng – Dutlwe Road for example, kgotla access roads type 5A (6m carriageway and 0.5m shoulders) were provided to the villages of Ditshegwane, Sesung/Matsebothoko, Maboane, Takatokwane and Dutlwe. The construction of the roadbed, fill, pavement layers and surfacing as well as the side fill slopes of the access road were to the same standards as the main road.

In addition to the development of the kgotla access roads, various other facilities are also provided to enhance the economic and social growth along the road corridor. In the case of the Letthakeng – Dutlweroad, 23 boreholes were provided to kick-start the growth of

the area whose economic activity is 'subsistence agriculture, comprising principally the raising of cattle and other livestock, together with some small scale subsistence cultivation of dry land crops such as sorghum and millet. The boreholes too supplied water for the construction of the road' (Construction Review Journal, October 2006)

#### **2.7.4.4 India's Rural Transport Policy**

India's rural transport policy principles are anchored mainly in the rural access programme known as Pradhan Mantri Gram Sadak Yojana (PMGSY). This programme was launched in 2000 with the purpose of *providing all-weather access to unconnected settlements*. PMGSY is a 100% Centrally Sponsored Scheme. An important strategy for PMGSY is to ensure convergence with other ongoing programmes in the health, education and rural income sectors. The program is also integrated with the inland water transport policy in order to ensure seamless interface between the water and surface transport (<http://www.globaltransportknowledgepartnership/ruraltransportation,2007>)

#### **2.7.4.5 Bangladesh Rural Transport Policy**

The Rural Transport policy directions are contained in the National Land Policy of 2004, issued by the Bangladesh Ministry of Communication. The policy objectives among others are to *provide paved connections* between all the economic growth centres and the country's road network; to increase rural incomes through use of labour-based methods of roads construction and maintenance and; to improve roads design – including segregation and gradient bridges to reflect the wide diversity of users (<http://www.globaltransportknowledgepartnership/ruraltransportation,2007>)

#### **2.7.4.6 Cambodia Rural Transport Policy**

The policy, under the Ministry of Rural Development (MRD) 2007, recognizes the need to establish Village Development Committees (VDCs) which are foreseen as capable of mobilizing the potentials of the villages to create conditions to ensure the sustainability of rural development projects with direct participation of villagers.

The foreseen vision of the new policy is: “Every person living in rural Cambodia will have year-round access to basic needs, economic and social facilities, services and opportunities.” The goal has been stated as “*to efficiently develop and manage sustainable rural transport infrastructure, modes and services*”, with one of the specific objective being improved access to ensure optimal economic returns on investment, *connectivity to higher order transport infrastructure*, benefits to society; and the use of local resources (<http://www.globaltransportknowledgepartnership/ruraltransportation>,2007)

#### **2.7.4.7 Peru Rural Transport Policy**

Rural Transport Policy objectives in Peru have been implemented in the context of Peru Rural Roads Programme (RRP). The policy objective is to improve access for poor rural populations to basic social and economic services and income generating activities through the *provision of a dependable system of rural roads*. The programme also aims at piloting an inter-modal transport system in the jungle regions that would improve access in areas where river transport plays a key role. The programme seeks to optimise development effectiveness and sustainability through community involvement, with a particular emphasis on gender inclusion (<http://www.globaltransportknowledgepartnership/ruraltransportation>,2007)

#### **2.8 Transport Policy in Kenya**

Kenya has not had a comprehensive transport policy since independence in 1963. Discrete transport policies have been formulated through various National Development Plans. It was not until May 2003 that the then Minister for Transport, Hon. J. N. Michuki appointed a committee vide Gazette Notice No.3080 of 9<sup>th</sup> May 2003, whose mandate was to prepare a National Transport Policy covering all modes of transport. The committee submitted its policy recommendations in February 2004.

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## **2.8.1 Brief on Transportation Policies vide the National Development Plans (1964 – 2007)**

### **2.8.1.1 The 1964 - 1970 National Development Plan**

The government emphasis within the plan period was on improving the International and National trunk roads (classes A and B). The central government was responsible for the construction and maintenance of those trunk roads using both private contractors, the National Youth Service (NYS) as well as the central government's Public Works Department (PWD).

Although emphasis was on the national roads, the government too did not neglect the rural roads which were supposed to boost agricultural production. The government spent about Kenya pounds 21.5 million towards the support of development programs for agriculture, tourism and fisheries and settlement schemes (National Development Plan, 1964 – 1970).

### **2.8.1.2 The 1970 - 1974 National Development Plan**

Government emphasis over this plan period was on maintenance of the trunk roads already constructed and more so on opening up feeder roads to rural areas which had no roads. The apportionment of government expenditure of K£ 43 million was set aside with 46% being for trunk roads, 34% for feeder roads and 20% for special development road projects (National Development Plan, 1970 – 1974).

### **2.8.1.3 The 1974 – 1978 National Development Plan**

Government emphasis over this plan period was on maintenance of already existing roads. Consequently, the government's budget for roads was reduced from the previous 30% to 20% of the total development expenditure (National Development Plan, 1974 – 1978).

### **2.8.1.4 The 1979 – 1983 National Development Plan**

The government's policy over the plan period was still on maintenance with emphasis on capacity building both for human resource (personnel) and equipment. The required

manpower was to be trained and equipped accordingly from the National level to the District level. Specific measures taken were; enforcing rules relating to axle-load and vehicle dimensions in order to control overloading; Road safety, through expansion of the government motor vehicle inspection centres, increase of police patrols to enforce traffic rules and management of matatus to comply with traffic and transport rules.

To create employment, both private and public contractors were encouraged to use labour-based methods as well as use of locally available raw materials (National Development Plan, 1979 – 1983)

#### **2.8.1.5 The 1984 - 1988 National Development Plan**

Emphasis over this plan period was to strengthen the paved roads to take in move axle loads (from 8 tons to 10 tons per axle) and to upgrade and maintain unpaved roads already existing. Consequently, tax on heavy vehicles was increased (through road tolls) to cover for maintenance costs (National Development Plan, 1984 – 1988)

#### **2.8.1.6 The 1989 - 1993 National Development Plan.**

Focus over the plan period was on sourcing for more funds for road maintenance as well as further enhancement of the 'Rural Access Roads Programmes (RARP)' and the 'Minor Roads Programmes (MRP)'. For the national roads, maintenance funds were sourced through user-charges by tolling. Through RARP and MRP efforts were made to ensure that all opened up rural roads were graveled.

In urban areas, the government focused on dualling and widening urban roads to accommodate more traffic and reduce traffic jams (National Development Plan, 1989 – 1993).

#### **2.8.1.7 The 1994 - 1996 National Development Plan.**

Over the plan period, the government policy prioritization was on provision of funds for maintenance, rehabilitation and modernization of existing transport facilities in a cost-effective and sustainable manner. The idea of raising more funds and in a more cost-

effective method as opposed to toll stations (which were riddled with corruption) had been identified following success stories in other countries like Ghana. By 1993, the Road Maintenance Levy Fund (RMLF) Act was enacted to enable levying of fuel supplies per litre of fuel at the port of entry. Consequently toll stations as collectors of road tax were abolished.

In urban areas the plan emphasized on provision of Non-Motorized and Intermediate Modes of Transport (NMIMT) and provision of transport facilities for the disabled (National Development Plan, 1994 – 1996)

#### **2.8.1.8 The 1997 - 2001 National Development Plan**

The government's main emphasis over the plan period was on maintenance and more so, the institutional framework for the management and coordination of the maintenance funds (mainly the RMFL and toll funds). This saw the formation of the Kenya Roads Board (KRB) through an Act of Parliament, 'The Kenya Roads Board Act, 1999'. KRB's mandate is to oversee the maintenance, rehabilitation and development of the entire road network in the country. Other policy emphases were:

- 1) Use of labour-based methods for both private and public contractors whenever found more cost-effective;
- 2) Provision for pedestrian and bicycle lanes in urban areas;
- 3) Establishment of dual carriage ways and provision of separate-grade interchanges or use of traffic lights at intersections instead of roundabouts to ease traffic flow (National Development Plan, 1997 – 2001).

#### **2.8.1.9 The 2002 - 2007 National Development Plan**

The 2002 – 2007 National Development Plan focused on the Economic Recovery Strategy for Employment and Wealth Creation (ERSEWC).

The government recognized the importance of road infrastructure as a catalyst to economic recovery. Under the economic recovery programme, the government intended

to improve road transportation through provision of durable quality standard roads within the strategy period in order to boost economic development. In order to improve the quality of materials used in road construction and provide efficient and safe transportation, the following actions were to be taken:

- 1) Update the road design manuals and specifications through enhanced research activities on all road making materials.
- 2) Enhance cost effective designs for roads and other civil engineering structures.
- 3) Enhance quality control during construction, maintenance and rehabilitation of all works.
- 4) Reforming the legal, institutional and regulatory framework with a view to enhancing the proper design of roads, integrity in road contracts' procurement and allowing private sector participation in management of selected roads (National Development Plan, 2002 – 2007).

### **2.8.2 The National Transport Policy (NTP) Formulation**

The NTP formulation was initiated under the auspices of the 2002-2007 National Development Plan which recognized transport sector as a facilitator of rapid economic growth and reconstruction, poverty reduction and wealth creation for the country.

#### **Main challenges of the Policy**

The main challenges identified as besetting the transport sector included; poor quality of transport services, transport system not being fully integrated, urban environmental pollution, institutional deficiencies, inappropriate modal split, and lack of a vision for the transport sector among others.

#### **Recommended Interventions to address the Challenges**

To address the challenges, the policy recommended that interventions leading to enhanced transport sector performance be pursued. These include; integration of transport with national development plans/priorities, increasing investment in transport



infrastructure and operations as well as responding to market needs of transport, enhancement of transport services and quality, consumer protection, catering for consumers with special needs, ensuring fair competition, and integrating information and communication technologies in transport development and operations. Other recommendations included the need to eliminate impediments to non-motorized and intermediate means of transport, the need to enhance transport safety and security, the need to develop and maintain a safe and secure transport system, sustainable utilization of the environment, *integration of transport and land use planning*, appropriate use of weather and climate information, and development of requisite human resource capacity among others (Draft National Transport Policy, 2004).

### **2.8.3 The Road Sub-Sector Transport Policy (RSSTP)**

The RSSTP expounds further on the National Transport Policy specifically focusing on the Road Sub-sector. The policy recognizes that the scope of the road transport infrastructure comprises the entire road network in Kenya. It includes all the classified and unclassified roads, urban and rural roads, public or private roads, adopted or unadopted roads, as well as all road facilities upon which road transport operates.

The policy further recognized that road transport averaged over 25% of the total output annually in the transport and communications sector (1998 – 2002 plan period); and that the road transport mode accounts for over 80% of the total internal passenger and freight in the country (Draft National Transport Policy, 2004).

The Road sub-sector transport policy recognizes six (6) major sectors, all of which are related. These are;

- 1) The Road Transport Infrastructure;
- 2) The Non-Motorized and Intermediate Means of Transport (NMIMTs);
- 3) Rural and Inter-Urban Transport services;
- 4) Urban Road Passenger Transport service;
- 5) Road Traffic and safety policy; and
- 6) The Road Freight Transport policy.

All the six sectors adopted the vision of the overall National Transport Policy (NTP) but each sector has a specific mission to address the specific needs of the sector (Draft National Transport Policy, 2004).

In spite of the National Transport Policy not taking effect since the submission of the recommendations in 2004, the roads sub-sector through the efforts of the Kenya Roads Board (KRB) and the Roads Department of the Ministry of Roads and Public Works (MoR&PW) has restructured the institutional framework by creating three Roads Authorities; the Kenya National Highways Authority (KeNHA), to be in charge of National roads; the Kenya Urban Roads Authority (KURA), to be in charge of Urban roads and the Kenya Rural Roads Authority (KeRRA) to be in charge of Rural roads. The authorities are empowered by an ACT of parliament, “The Kenya Roads Act, 2007,” and they are expected to commence operations by the beginning of the Financial Year 2008/2009. The purpose of creating the authorities (which are State Corporations) is to de-link direct implementation of road works by both the central government and the local authorities in order to achieve effectiveness and efficiency.

## **2.9 Planning for Roads**

The road to development begins with the development of a road. Poorly designed, built and maintained roads are unsustainable and consequently they become an economic burden to everyone, especially rural communities.

### **2.9.1 Road Transportation Planning Data Collection Techniques**

#### **a) Household Travel Behaviour Surveys**

This is the most detailed and best way of getting the most complete information. However, it is tedious, time consuming and expensive (for developed countries, telephone and mail-back questionnaires approach is usually used). Household surveys provide timely data on socio-economic characteristics and travel behaviour; numerous person, household, and trip characteristics can be obtained in a household survey (Mayer, et al).

## b) Origin and Destination (O-D) surveys

Trips are made both over time and over space. That is, each trip has an origin and a destination located at specific geographical points.

Origin and Destination survey is an initiative to collect current and reliable information about trip patterns and travel choices of area residents. Information about where people go, why they go there, and when and how they choose to get there is an important resource for transportation planners. The data can help planners and engineers to estimate the demand on existing transportation facilities, calibrate or verify travel forecasting models, determine the feasibility of new routes or facilities, identify travel characteristics from specific types of land use, and determine the adequacy of parking or other terminal facilities.

The types of trips to be observed include those internal to a planning study area, those that are made between such areas, or those that pass through the study area. This merits a number of types of boundaries and trips for special attention. These include;

**Cordon** – The perimeter established as a boundary of the planning study area.

**Screen line** – An imaginary line established to divide the study area into parts to check the accuracy of survey data.

**Internal Trip** – A trip having either its origin or destination in the study area but which crosses the cordon line.

**Through Trip** – A trip having both its origin and destination outside of the study area (Mayer, et al)

## c) Inventories

Transportation planners should not only be aware of the characteristics of travel demand in an area (collected through home interviews and O-D surveys). They must also have data on the physical characteristics of the land use and transportation systems which handle the demand. Types of inventories include; the highway network inventory, a transit network inventory and a land use inventory (Mayer, et al)

#### **d) Highway and Transit Counts**

Highway and transit counts are used for a variety of purposes, which include validating survey data, establishing traffic flow trends, assessing the transportation impact of large traffic generators and determining the environmental impact of transportation facility operations.

Major types of traffic counts efforts include; *Cordon counts* and *Screen line counts*.

*Cordon counts* – These counts are undertaken to obtain estimates of the total number of vehicles movements occurring within an area defined by the cordon, and the number of vehicles entering or leaving.

*Screen line counts* – The purpose of screen line counts is to evaluate the completeness and accuracy of the reported trip data within a cordon study area. To enhance accuracy of the data, screen line points should be chosen very carefully; often natural barriers to traffic such as rivers are used because they involve a minimum number of crossing points (Mayer, et al).

#### **(e) Special Data Collection Efforts.**

Special data collection is normally for purposes of assessing project feasibility and or evaluating a (recently) completed project. Site surveys are undertaken to obtain information from shoppers and traders, drivers and passengers, users of facilities such as access roads, recreational, health, education, social facilities etc. The purpose of special data collection surveys can range from identifying the characteristics of specific trip types to determining the feasibility of new services to these sites. The surveys can be conducted in person (by use of focused discussant questions/interviews) or by distributing questionnaires (Mayer, et al).

### **2.9.2 Road Infrastructure Planning/Design in Kenya**

#### **2.9.2.1 The Road Design Manual**

The Road Design Manual sets forth the policy and standards to be adopted for the design of roads in Kenya. The contents of the manual are partly guidelines and recommendations to be considered, and partly standards which as a general rule should be adhered to in road design.

The manual is divided into four parts:

- Part I: Geometric Design of Rural Roads
- Part II: Geometric Design of Urban Roads
- Part III: Pavement Design
- Part IV: Bridge Design (including other major structures)

Of importance to this study is Part I (Geometric Design of Rural Roads) of the Manual. This however was last reviewed and released for use in January 1979 (Road Design Manual, 1979).

### **I. Basic Traffic Service Functions of Roads**

According to the manual, roads have two basic traffic service functions;

- 1) To provide traffic mobility between centres (origin and destination), and;
- 2) To provide access to land and properties adjoining the roads.

From the design point of view and to some extent social and economic aspects, the two functions are incompatible. For roads whose major function is to provide mobility to cater for through (transit) and long distance traffic between origin and destination, high and uniform speeds, and uninterrupted traffic flows are most desirable. On the other hand, roads whose major function is to provide access to adjacent lands and property, high speeds are both unnecessary and undesirable, particularly for safety reasons (Road Design Manual, 1979).

From the economic and social point of view, the same scenario is replicated. That is, for purely economic considerations, high speed and uninterrupted traffic flow is desirable, while from a social point of view easy access to households is more favourable. Thus, the agony of a road design engineer is to come up with a design criteria desired to marry the two incompatibilities.

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## 2. Road Classification in Kenya

Road Classification is categorized as per functional connectivity or the Origin-and-Destination (O-D) linkages:

Class A – These are *International Trunk Roads*, linking centres of international importance and crossing international boundaries or terminating at international ports such as Mombasa.

Class B – These are *National Trunk Roads* linking nationally important centres and connecting to the international class ‘A’ roads.

Class C – These are *Primary Roads* linking provincially important centres to each other or to higher class roads.

Class D – These are *Secondary Roads* linking locally important centres to each other or to a more important centre or to a higher class road.

Class E – These are the *Minor Roads* which form any link to a minor centre. It is the lowest class of the road classification in Kenya.

Special Purpose Roads (SPR) – These are roads such as those serving in the national parks and game reserves, forest roads, sugarcane, tea and coffee roads among others.

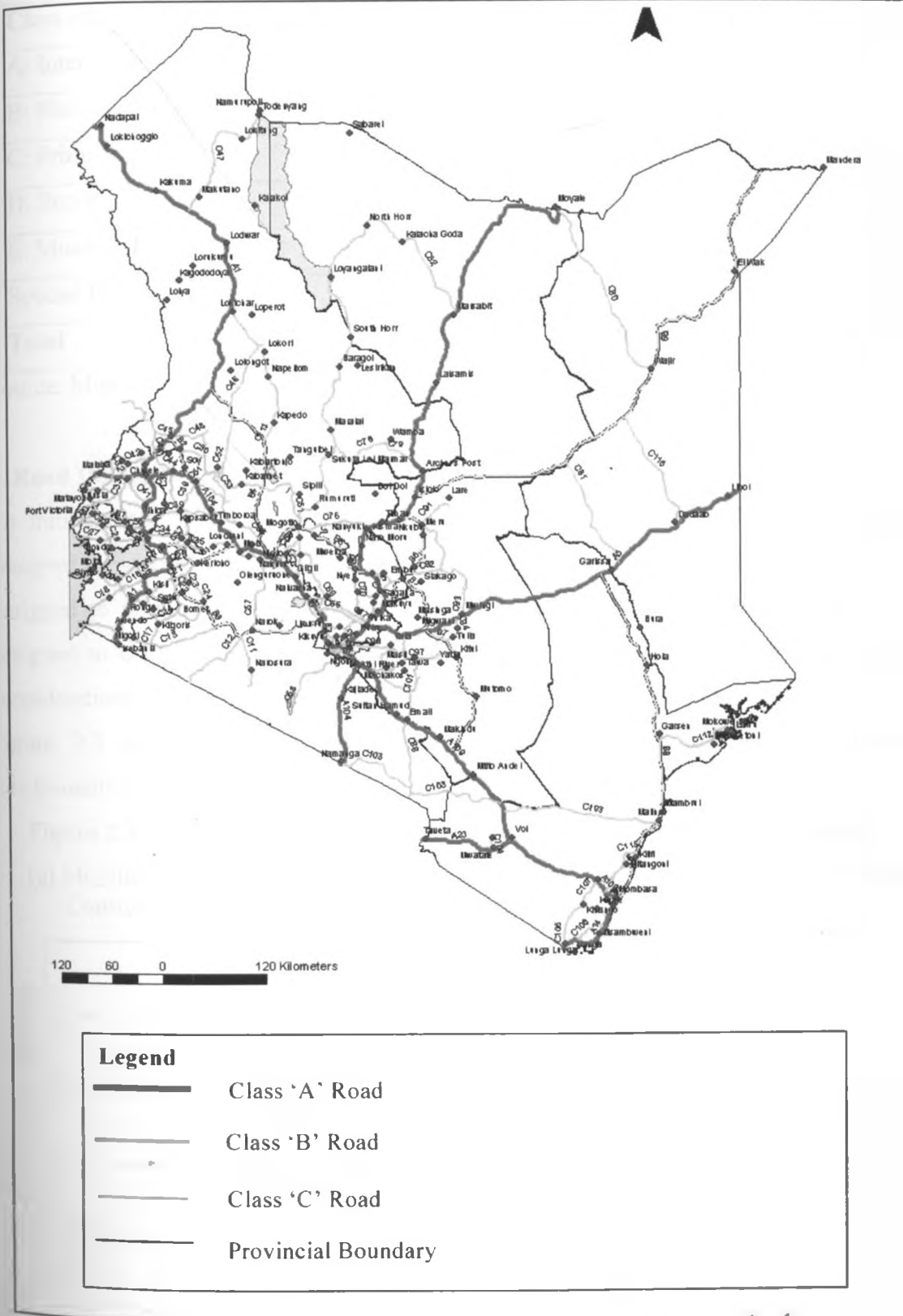
Other Roads – These are any other roads other than those categorized above. They include private roads.

Class A and Class B roads are also commonly referred to as *highways* in Kenya.

(Road Atlas, 1991 and Road Design Manual, 1979)

Map No.1 and table 2.1 below show the Kenya Road Classification Network of classes A, B and C and the Condition and Length (in kilometres) of the Classified Road Network in Kenya respectively.

# Map No.1: Kenya Road Classification Network: Classes A, B & C



Source: Kenya Roads Board Website - [www.krb.go.ke](http://www.krb.go.ke)

**Table 2.1: Condition and Length (in Km) of the Classified Road Network in Kenya**

Class of Road	Bitumen	Gravel	Earth	Total
A: International Trunk Roads	2,806.72	715.11	94.48	3,616.31
B: National Trunk Roads	1,516.47	819.29	346.14	2,681.90
C: Primary Roads	2,766.05	3,601.64	1,627.90	7,995.59
D: Secondary Roads	1,259.73	5,701.93	4,087.73	11,049.39
E: Minor Roads	641.85	8,215.89	18,048.57	26,906.31
Special Purpose Roads	139.51	4,929.69	6,253.78	11,322.98
<b>Total</b>	<b>9,130.33</b>	<b>23,983.55</b>	<b>30,458.60</b>	<b>63,572.48</b>

Source: Ministry of Roads and Public Works (MoR&PW), 2007

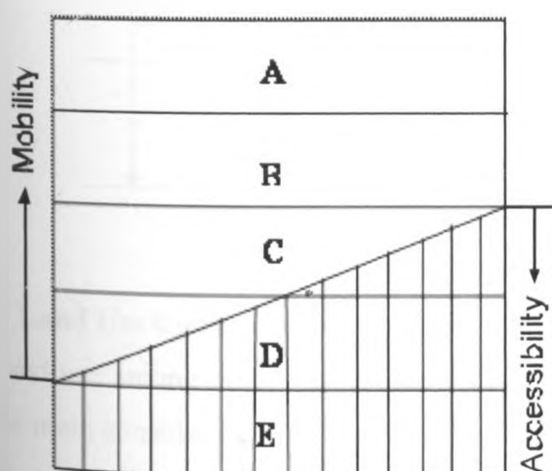
### 3. Road Design Criteria

To mitigate on design requirements, Class A and B roads have their functionality designed to provide *mobility* only (mostly for economic considerations) while Class E is designed to provide *accessibility* only (for social considerations). Class C and D are designed to combine mobility and accessibility to cater for both economic and social considerations. The categorization is fairly rational for design purposes.

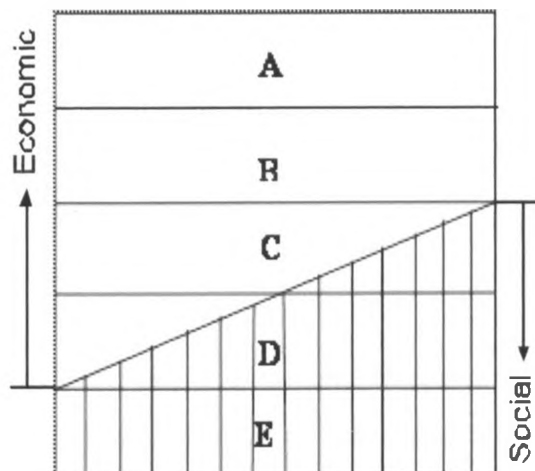
Figure 2.3 shows the author's diagrammatic interpretation of the road classes' functionalities.

**Figure 2.3: Road Classification Functional Considerations as per the Manual**

(a) Mobility Vs Accessibility functional Considerations



(b) Economic Vs Social functional Considerations





#### 4. Road Reserves

Road reserves are provided in order to accommodate future road connections or changes in alignment; road width or junction layout for existing roads and to enhance the safety, operation and appearance of the roads. Table 2.2 below shows the desired road reserves for various classes of roads.

**Table 2.2: Road reserve widths for various classes of roads**

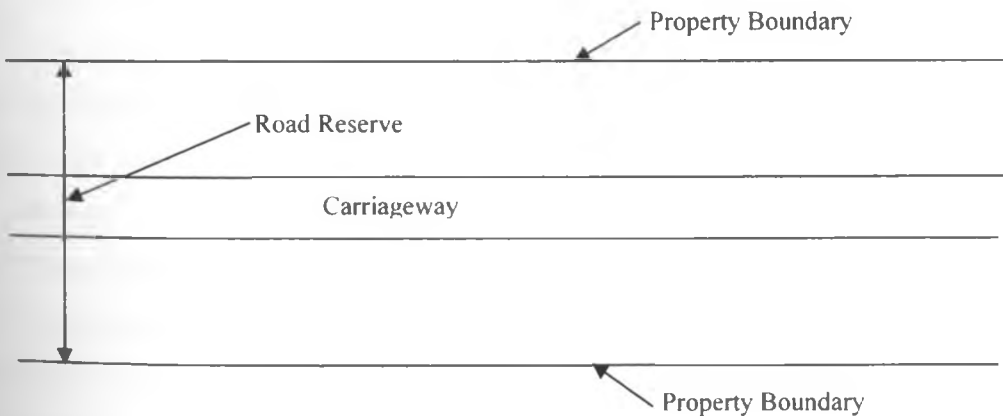
FUNCTIONAL CLASS	ROAD RESERVE WIDTH (METRES)	
	DESIRABLE	REDUCED
A	60	40
B	60	40
C	40	40
D	25	25
E	20	25

Source: Road Design Manual, 1979

NB: Road reserves for dual carriage ways may be increased above the given values.

Figure 2.4 below shows a sketch demonstrating a road reserve.

**Figure 2.4: Sketch Plan of a Road Reserve**



#### 5. Land Use Considerations in Road Design

Land use among other factors like topography, geology and physical features, is one of the main consideration in route location and road re-alignments. Man-made features such as agriculture, industrial, commercial, residential and recreational developments 'are

important controls for the route location and final design. Likewise, information regarding topography, land use and physical features are essential considerations. The manual provides that, “in this respect, it is necessary to consult with physical planning authorities in order to co-ordinate the road project with existing and proposed land uses and to protect the selected route from conflicting development” (Road Design Manual, op cit).

## **6. Environmental Considerations in Road Design**

No road design is without positive and negative effects on the environment. However, the location and design of a road should be focused at maximizing on the positive effects and minimizing on the negative effects to the environment.

Factors to be considered in the location and design of a road project include:

- (1) The preservation of the natural beauty of the countryside
- (2) The preservation of areas and land use of particular value, including:
  - National parks and other recreational areas;
  - Wildlife and bird sanctuaries;
  - Forests and other important natural resources;
  - Land of high agricultural value or potential;
  - Other land use of great economic or employment importance; and
  - Historic sites and other man-made features of outstanding value.
- (3) The prevention of soil erosion and sedimentation.
- (4) The prevention of health hazards by ponding of water leading to the formation of swamps.
- (5) The avoidance or reduction of visual intrusion.
- (6) The prevention of undesirable roadside development
- (7) Operational effects such as noise and air pollution, vibration and severance of areas.

The manual provides for consultations with other professionals in order to “seek expert advice and services to reach a proper evaluation of the problems and establish adequate remedial measures” (Road Design Manual, op cit).

## **7. Road Safety Considerations in Road Design**

Safety considerations in road design have two different objectives:

- 1) To provide design features aimed at preventing accidents, and;
- 2) To provide design features aimed at reducing their seriousness when they occur.

Design considerations to prevent accidents include; provision of physical separation between motor vehicles and non-motorized traffic; avoidance of situations where drivers must make more than one decision at a time; proper location and design of junctions, with particular emphasis on sufficient sight distances, minimum conflict points, and clearly defined and controlled traffic movements; provision of proper drainage of the road surface, among others.

Design considerations to reduce seriousness of accidents when they occur include; making roadside slopes as flat as feasible (desirably 1:4 or flatter); placing road signs and lighting supports far enough from the carriage way to make them unlikely to be struck by an out-of-control vehicle; drainage structures be designed such that out-of-control vehicles can run over them without serious damage; safety fences (guard rails) be provided at dangerous places like bridge piers and abutments among others (Road Design Manual, op cit).

## **7. Access Control and Road Design**

The manual provides that, “in order to preserve major roads as high standard traffic facilities, it is necessary to exercise access control, whereby the right of owners or occupants of land to access is controlled by the Highway Authority” (Road Design Manual, op cit).

Table 2.3 below shows the desired level of control against functional classification.

**Table 2.3: Functional Class and Level of Access control**

FUNCTIONAL CLASS	LEVEL OF ACCESSSSS CONTROL	
	DESIRABLE	REDUCED
A	Full	Partial
B	Full	Partial
C	Full or Partial	Partial
D	Partial	Unrestricted
E	Partial or Unrestricted	Unrestricted

Source: Road Design Manual, 1979

**Full access control** means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and prohibiting direct private access connections.

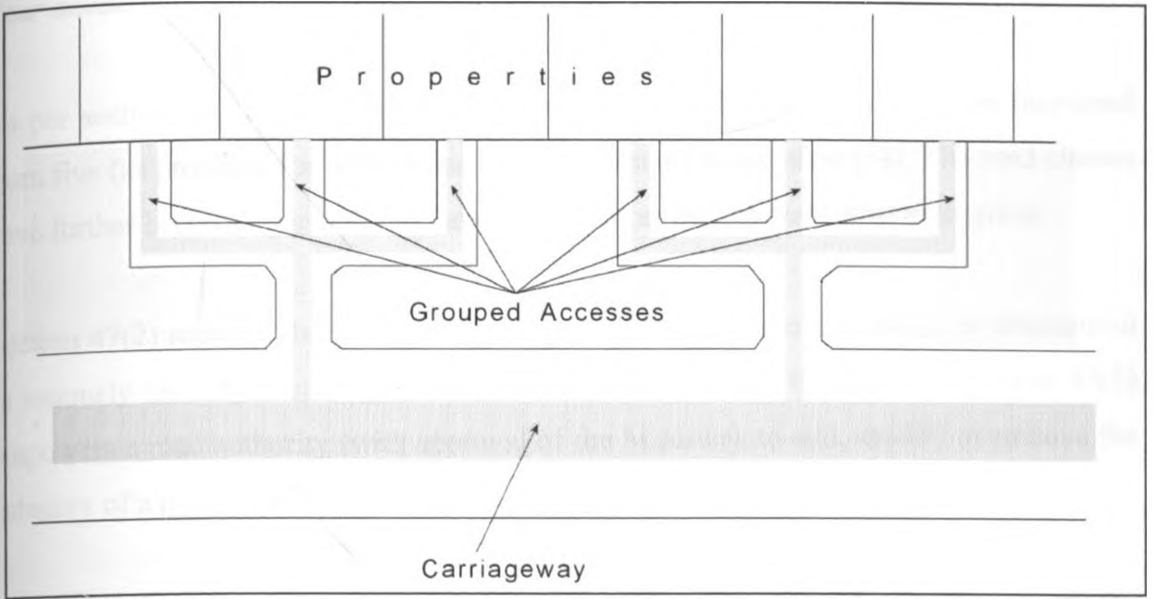
**Partial access control** means that the authority to control access is exercised to give preference to through traffic to a degree in that, in addition to access connections with selected public roads, there may be (some) private access connections.

**Unrestricted access** means that preference is given to local traffic, with the road serving the adjoining areas through direct access connections. However, the detailed location and layout of the accesses should be subject to approval by the Highway Authority in order to ensure adequate standards of visibility, surfacing and drainage among other requirements.

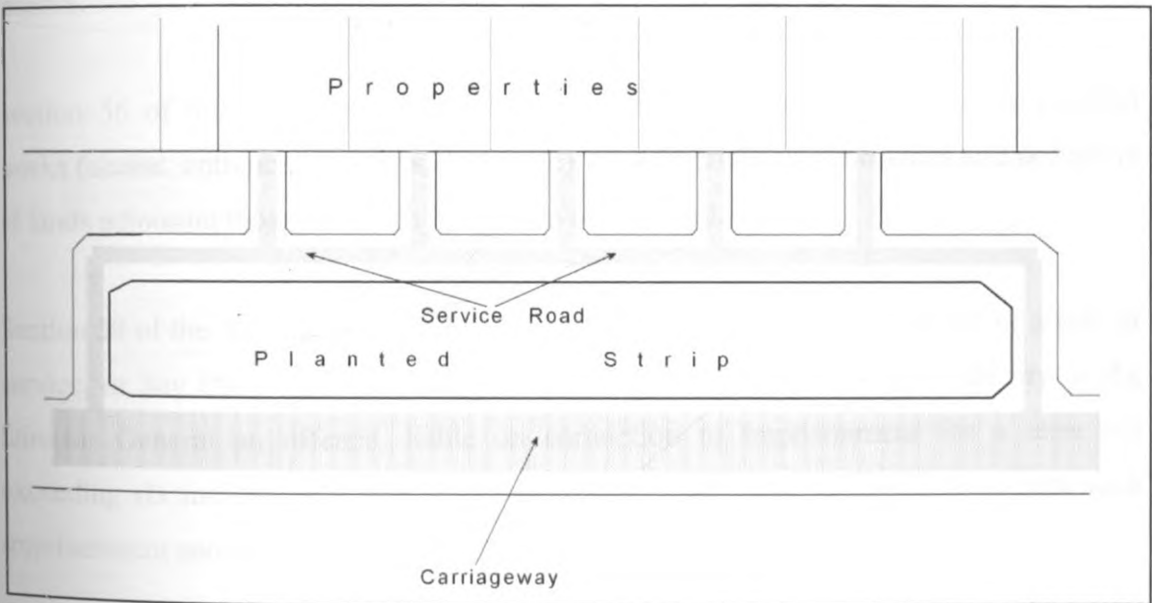
Access control is accomplished either by careful location of accesses, grouping accesses to reduce the number of separate connections to the through traffic lanes or by constructing service roads which intersect the individual accesses and join the through lanes at a limited number of properly located and designed junctions (*unfortunately, the Manual on Roadside Development and Control is not yet published*) (Road Design Manual, op cit).

Figure 2.5 and figure 2.6 below show a sketch plan demonstrating Grouped Accesses and a sketch plan demonstrating a Service Road respectively.

**Figure 2.5: Sketch Plan of Grouped Accesses**



**Figure 2.6: Sketch Plan of a Service Road**



### 2.9.2.2 The Kenya Roads Act, 2007

The Act is an Act of Parliament to provide for the establishment of the Kenya National Highways Authority (KeNHA), the Kenya Urban Roads Authority (KURA) and the Kenya Rural Roads Authority (KeRRA), to provide for the powers and functions of the authorities and for connected purposes.

Prior to the enactment of this Act, the Ministry of Roads and Public Works did not have a clear statute with which to explicitly carry out its operations.

As per section 47(1) of the Act, the number of road classifications has been increased from five (as provided for in the Road Design Manual) to eighteen (18). The road classes have further been categorized into three categories as per the three road authorities.

Section 47(2) requires that each public road should have a number, name or description to uniquely identify it among all other roads of its class in the country. Section 47(5) empowers a road authority (with approval of the Minister), to add, modify or remove the category of a road within its jurisdiction.

Section 49 of the Act gives absolute powers to a road authority to control any operations or dealings (erection of structures and other works on, over or below) within a road reserve.

Section 56 of the Act provides for construction and maintenance of accommodation works (access, entrances, culverts, drains etc) for the benefit of the owners and occupiers of lands adjoining those on which the road is constructed.

Section 59 of the Act makes hawking, selling or exposing for sale any article or goods or service, or any other trade or business, on a road reserve without the authority of the Director General an offence, liable on conviction to imprisonment for a term not exceeding six months, or a fine not exceeding fifty thousand shillings, or to both such imprisonment and fine.

Section 70 of the Act empowers an Authority to consult with the users of its road facilities and services.

### **2.9.2.3 The Physical Planning Act and the Physical Planning Handbook**

#### **1. Physical Planning Act, CAP 286.**

The Physical Planning Act is an Act of Parliament to provide for the preparation and implementation of physical development plans and for connected purposes. It was enacted in 1996 and its provisions, as provided in section 2 of the Act, apply to all parts of the country except such areas as the Minister may by notice in the Gazette specify.

In Part IV (A) - Regional Physical Development Plans, section 16(1) states the purpose of regional physical plans as “improving the land, and *securing suitable provision for transportation*” among other purposes. Section 16(2) First Schedule, refers to (rural) transportation as part of the provisions to be considered as a matter which may be dealt with at policy level in the preparation of the Regional Physical Development plans. At analysis level, the issues to be dealt with include; population and human settlement pattern trends, land potential and land values, land tenure and natural resource endowments, employment and income characteristics, growth and pattern of urbanization, and rural-urban migration patterns among others.

#### **2. The Physical Planning Handbook**

The physical planning handbook in use to the present day was compiled by the Department of Physical planning in October 1992. Preparation of a new handbook to incorporate the provisions of the physical planning Act commenced eight years ago (year 2000) but it is yet to get to the shelves of planning practitioners.

In as far as rural roads network is concerned, the handbook (1992) says nothing more than just replicating the provisions of road reserve widths as provided in the Road Design Manual (Table 2.2 page 48)

#### **2.9.2.4 Nkubu – Thuchi Road; Feasibility Study (1979/80)**

The economic feasibility study and final design reports were carried out by Sir Alexander Gibb and Partners (Africa) between 1978 and 1980 as per the terms of reference (TOR) provided by the Ministry of works.

### **1. Brief on Economic Feasibility**

The TOR with respect to economic feasibility study required the study to evaluate the economic worth of the project with regard to the benefits which would arise from reduced vehicle operating costs and maintenance costs, if any. Additional benefits, especially those related to agricultural development which may arise from the execution of the project, were to be described and quantified as considered necessary. Further, the beneficiaries of the project were to be identified and the scale of the benefits to each beneficiary calculated where possible.

### **2. Brief Summary of Findings and Conclusion of the Feasibility Study**

Dualism analysis with respect to; rural-urban, formal-informal, industrial-agricultural and large farm-small farm concluded that investment and development in the road project area would improve the equity of income distribution in the economy.

The improved road surface and shorter length of the project road (by 30Km) implied a reduction in vehicle costs of about 65%. Diverted traffic due to improved road would result further increase in benefits of about 30%. Further, maintenance costs per kilometre were estimated to be less on the new road and these lower costs taken together with the shorter alignment of the project road implied a significant saving.

In view, therefore, of the project's benefits to both the national and local economy of the area and its contribution towards effecting an equitable distribution of incomes it was concluded that the project be undertaken forthwith.

### **3. Brief on Design Standards**

The design of the new road was generally in accordance with the Ministry of works new (1979) design standards for a type III road with a design speed of 60km/h, but with reduced design speeds in a few exceptional circumstances for economy. Twenty kilometres of single width climbing lanes were also provided. The design capacity of the new road was about 430 vehicles per hour at an average speed of 41 km/h, or 4,525 vehicles per day at an assumed peak hour factor of 9.5%.

Table 2.4 below shows a summary of the design standards:



**Table 2.4: Summary of Nkubu – Thuchi Road design standards**

Subject	Standards
Pavement Width	6.50m plus widening in curves of radius 180m and less
Shoulder width	1.0m except against climbing lanes where width would be 0.5m
Normal Camber	2.5%
Maximum super-elevation	6.0%
Minimum horizontal curvature	50m exceptionally and 125m generally
Maximum gradient	8% generally but 10% where financial considerations dictate
Normal passing sight distance	325m
Reduced passing sight distance	225m

Source: Nkubu –Thuchi feasibility Report, 1978/80

On design of road junctions, it was provided that *“All side roads will be surfaced 20 metres back from the junction in order to minimize the amount of mud carried onto the major highway”*.

## 2.10 Road Condition and Maintenance in Kenya

### 2.10.1 Road Condition

In 2004, Kenya Roads Board commissioned a consultant to undertake a Road Inventory and Condition Survey (RICS) to assess the actual condition of Kenyan roads. The exercise was completed for classified roads. For unclassified roads, the exercise is still going on and it is expected that after completion, the process of re-classification of the entire road network will be effected. The Ministry of Roads and Public Works on the other hand has (in 2007) commissioned a study; the “Road Sector Investment Programme (RSIP)” geared at establishing the potential and worthiness of roads in Kenya as a precursor to commissioning Private Public Partnerships (PPPs) in road projects undertakings.

Table 2.5 shows the condition of classified roads as per the 2004 RICS results.

**Table 2.5 Condition of Classified Roads in Kenya**

<b>Road Condition</b>	<b>Percentage</b>
Excellent	1.1%
Good	17%
Fair	49.2%
Poor	26.7%
Very Poor	6 %
<b>Total</b>	<b>100%</b>

Source: Kenya Roads Board, 2004

The table shows that only about 18% of classified roads in Kenya are in good condition. Majority of the roads (49%) are in fair condition while about 33% are in poor condition (explanation of Road Condition Rating is given in Annex IV, page 191).

### **2.10.2 Road Maintenance**

Road maintenance in Kenya is financed by the Kenya Roads Board Fund. The bulk of the fund is from the Fuel Levy which by the end of the Financial Year 2007/2008 was slightly over eighteen billion Kenya shillings. Other funds include Road Tolls and Coffee Cess which amounted to about three hundred million and sixty million respectively in the Financial Year 2007/2008 (Kenya Roads Board, 2008).

Table 2.6 below shows the Kenya Roads Board Fund collection and disbursements for the Financial Years 2001/2002 to 2007/2008.

**Table 2.6: Kenya Roads Board Fund Collections and Disbursements**

<b>Financial Year</b>	<b>Total Collections (Kshs)</b>	<b>Total Disbursements (Kshs)</b>	<b>Balance Carried Forward (Kshs)</b>
2001/02	7,948,193,618	7,736,761,082	211,432,586
2002/03	7,950,532,714	7,651,571,502	298,961,212
2003/04	9,344,071,365	8,400,000,000	944,071,365
2004/05	10,410,319,958	9,443,805,001	966,514,957
2005/06	10,607,520,981	10,110,430,489	497,090,492
2006/07	17,312,588,968	16,089,145,357	1,223,443,611
2007/08	19,690,352,717	18,507,357,979	1,182,994,738
<b>Total</b>	<b>83,263,580,321</b>	<b>77,939,071,410</b>	<b>5,324,508,961</b>

Source: Kenya Roads Board, 2008

For the Financial Years 2001/02 to 2005/06, the fuel levy collection per litre of fuel (both petrol and diesel) was Kshs 5.80. This figure was revised upwards to Kshs 9.00 per litre of fuel with effect from the Financial Year 2006/07.

As per the Kenya Roads Board Act, 1999, the disbursements of funds are made to designated Road Agencies which include; Roads Department in the Ministry of Roads and Public Works, which takes 57% for maintenance of class A and B trunk roads, and class C primary roads; District Roads Committees (DRCs), which take 24% distributed equitably to all districts for maintenance of class D secondary roads and other district roads; all Constituencies, which take 16% distributed equally to maintain roads in the constituencies, and the balance of 3% to Kenya Roads Board Operations. However, after

the review of the collections per litre from Kshs 5.80 to Kshs 9.00, Kenya Roads operations percentage was revised downwards to 2% with 1% going to the City Council of Nairobi.

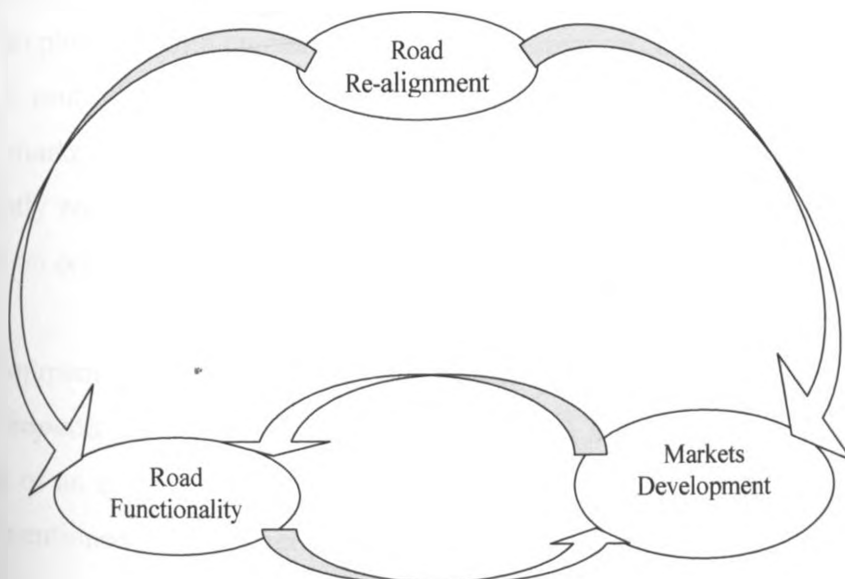
With the enactment of The Kenya Roads Act, 2007 and formation of the three Road Authorities, Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA) and the Kenya Rural Roads Authority (KeRRA), the disbursements with effect from the Financial Year 2008/09 shall be revised as per the Act, with KeNHA getting 40% for the classes A, B, and C; KURA 15% for Urban Roads; KeRRA 32% for classes D and E and other rural roads, which includes 20% to the Constituencies and 12% to the districts; Kenya Roads Board 2% for its operations; Kenya Wildlife Services (KWS) 1% for maintenance of roads in the national parks and game reserves, and 10% for emergency works (Kenya Roads Board, 2008).

## 2.11 Conceptual Model: Integrated Road Re-Alignment and Land Use Planning

### 2.11.1 The Theoretical Relationship between Road Re-alignment, Market Centres' Development and Road Functionality

Road re-alignment, markets centres' development and road functionality have a **three-tier** relationship as shown in figure 2.7 below.

**Figure 2.7: Relationship between Road Re-Alignment, Market Centres' Development and Road Functionality**



Source: Author, 2007

The relationship is such that, when a road is re-aligned, it passes mostly through a new corridor by-passing existing markets and difficult terrain. The functionality of the road in as far as maintenance of high and uniform speeds, and uninterrupted traffic flow is concerned, is achieved. On the other hand, businesses in the by-passed markets gradually decline and eventually collapse as customers (especially transit customers) decrease. At the same time new businesses emerge along the new road corridor where goods and other services can be accessed easily. However, as the new businesses grow they result into road-side developments. These road-side developments in turn affect the road functionality as the uniform speeds and traffic flows are interrupted mainly by erecting humps as a measure to reduce traffic accidents.

Mathematically, road functionality is a function of road re-alignment and market centres' developments; and, market centres' development is too a function of road re-alignment and road functionality. That is;

$$(i) \quad RF = f(RR+MD)$$

$$(ii) \quad MD = f(RR+RF) \text{ Where;}$$

RF = Road Functionality; RR = Road Re-alignment; MD = Market centres' Development

### 2.11.2 Integrated Road Re-Alignment and Land Use Planning

As noted earlier (Road Design Criteria, page 47), highway planning including re-alignment/upgrading of existing highways especially in Kenya follows a rational approach to planning with emphasis on Origin-Destination (O-D) surveys. This focuses at ensuring a route selection which would shorten the distances (by-passing most of the existing markets and trading centres), maintain high and uniform speeds and consequently reduce travel times between the destinations to be connected in order to maximize on economic gain (Road Design Manual, op cit).

The development of the highway has both *positive* and *negative* impacts.

*Positive impacts* associated with development of a highway or re-alignment and upgrading of an existing one includes; increased and uniform speeds/reduction of travel time (as mentioned above); increased activity (production and trade especially between

the origin and destination centres – economic gain); increased land values along the highway corridor; employment creation especially during the road construction period; increased number of vehicles, and hence improved travel and transportation of people and goods and services (especially between the O-D centres); technological transfer such as knowledge on construction of cut-off drains and gabions to control soil erosion among others.

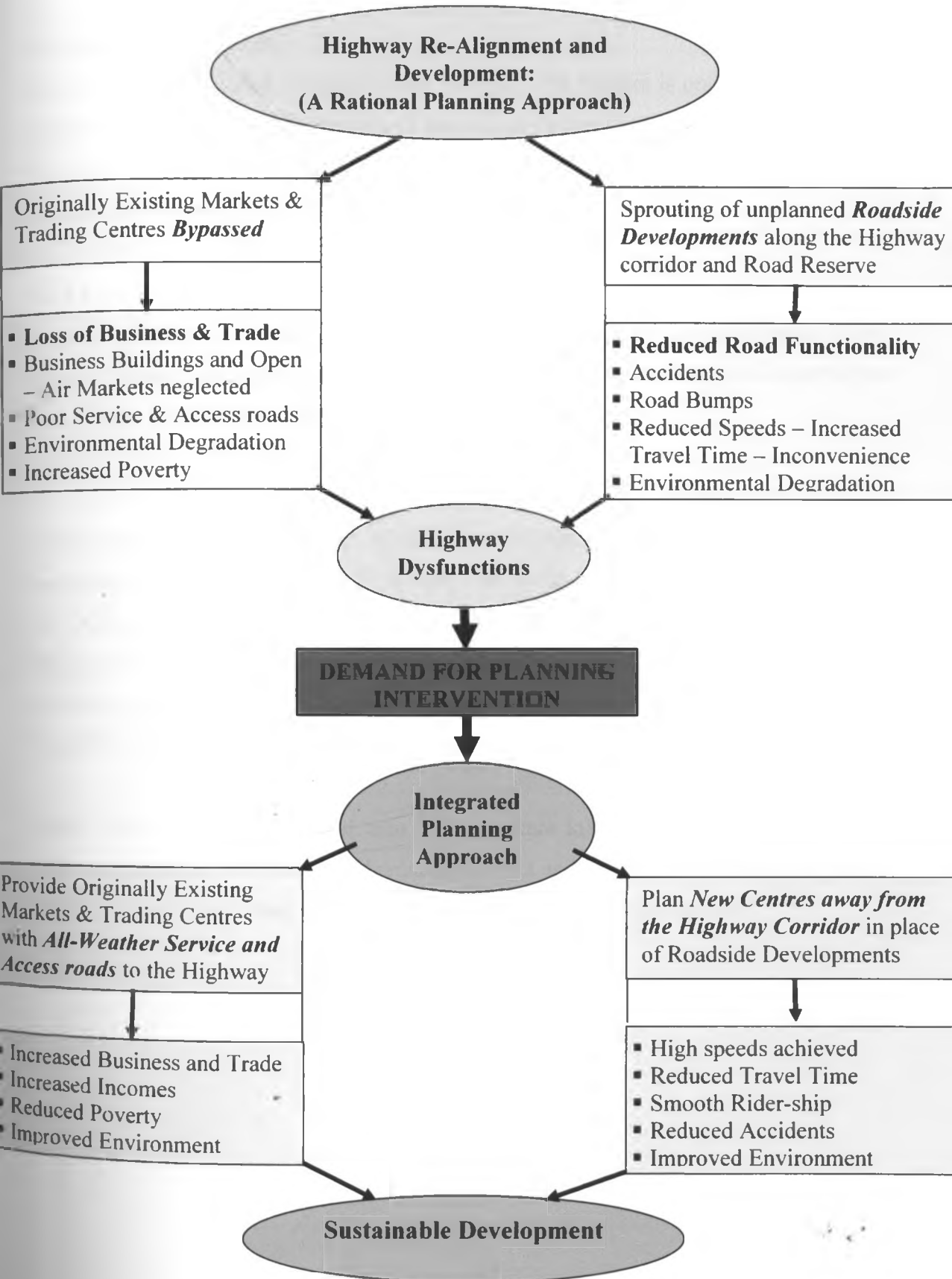
*Negative impacts* include; loss of business in the by-passed markets and trading centres (as mentioned above); loss of productive land, displacement of people and separation of families from the acquired land for road construction; loss of vegetation cover along the carriage way; sprouting of unplanned and uncontrolled roadside developments; increased vehicle speeds leading to increased traffic accidents; increased soil erosion from the road surface run-off and through the cut-off side- drains among many others (Gichuki, 2001)

To enhance the positive gains, and to mitigate on the negative impacts, there is need for embracing an all-inclusive, consultative and integrated approach to planning for highway transportation. This would ensure; timely road maintenance; regulation of land subdivisions to avoid unproductive agricultural land sizes; by-passed markets and trading centres have good and reliable access roads as well as all-weather motorable service roads connecting to the highway in order to ensure continued growth of the centres; upcoming centres are planned and controlled to avoid unplanned developments which impact negatively on the road functionality; minimum destruction of property and minimum displacement of people; appropriate land and property compensations as well as environmental impact assessment (EIA) and environmental audits (EA) on road projects; thus, leading to sustainable development.

Enhancing the positive gains and mitigating on the negative impacts would also ensure inter-linked functionalities resulting in achievement of intended high speeds on the highway; reduced travel time; smooth rider-ship; reduced accidents; increased business and trade; increased incomes; poverty reduction and improved environment; thus leading to good road functionality, market growth and subsequent sustainable development.

Figure 2.8 below shows the diagrammatic representation flow chart of the Conceptual Model of an integrated road re-alignment and land use planning focusing mainly on the negative impacts on by-passed market centres and unplanned/uncontrolled roadside developments which impact negatively on the road functionality; all as a result of a rational planning approach to highway re-alignment and development, and the necessary planning mitigations to ensure sustainable development.

**Figure 2.8: Conceptual Model – Integrated Road Re-Alignment and Land Use Planning**





## CHAPTER 3: BACKGROUND OF THE STUDY AREA

### 3.1 Imenti South District

The study area is located in Imenti South District. The District is one of the three new Districts formed after the subdivision of the original Meru Central District in late 2006. The other two are Imenti North District and “Imenti Central District” (but which has retained the old name, Meru Central District).

#### 3.1.1 Location and Size

Imenti South District falls in Eastern Province of the Republic of Kenya. It borders Meru Central District to the north, Meru South District to the south, and Tharaka District to the East. To the west, the district tapers to the tip of Mt. Kenya.

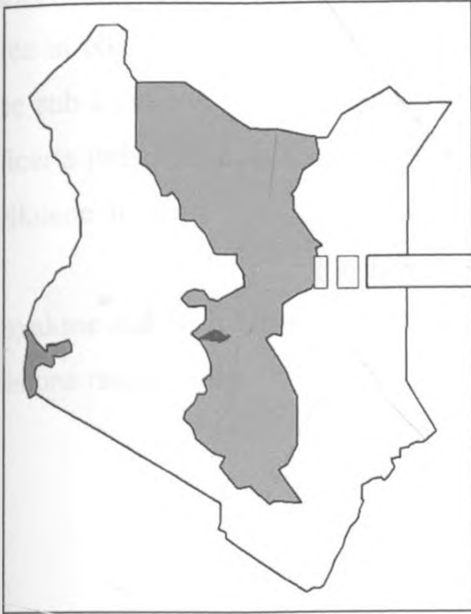
The district is one of the few districts that are centrally located on the map of Kenya. The district lies to the immediate south of the equator within latitude  $0^{\circ} 01'$  and  $0^{\circ} 12'$  South, and longitudes  $37^{\circ} 18'$  East and  $37^{\circ} 34'$  East. The extreme west point of the district is the Mt. Kenya Mbatian Peak at 5,199 metres above sea level (Survey of Kenya Topographical Maps).

Mbatian peak is the highest point, not only in the district, but in the whole of the Republic of Kenya, and the second highest point in Africa, after Kilimanjaro in Tanzania.

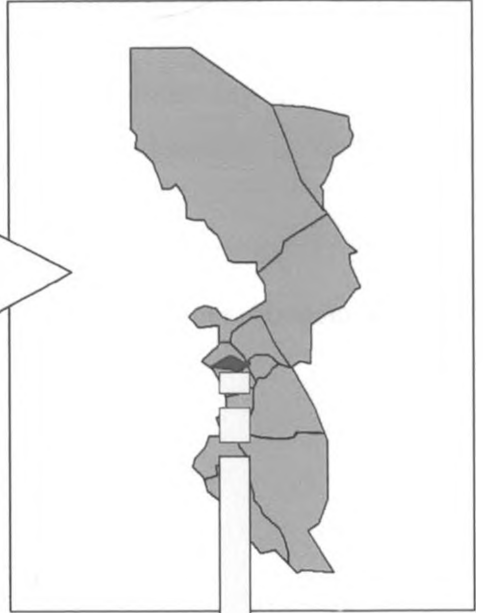
Imenti South District has a total area of 633 square kilometers of which 393 square kilometres is under cultivation and human settlement and 240 square kilometres is part of the Mt. Kenya Forest. Thus, about 38% of the district is under forest cover.

**MAP No.2: CONTEXT MAP**

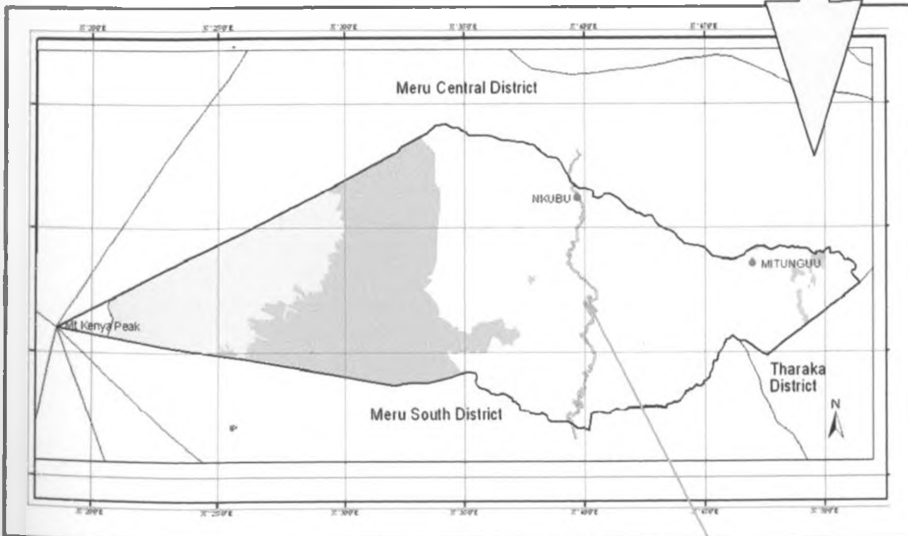
**NATIONAL CONTEXT: REPUBLIC OF KENYA**



**REGIONAL CONTEXT: EASTERN PROVINCE**



**LOCAL CONTEXT: IMENTI SOUTH DISTRICT**



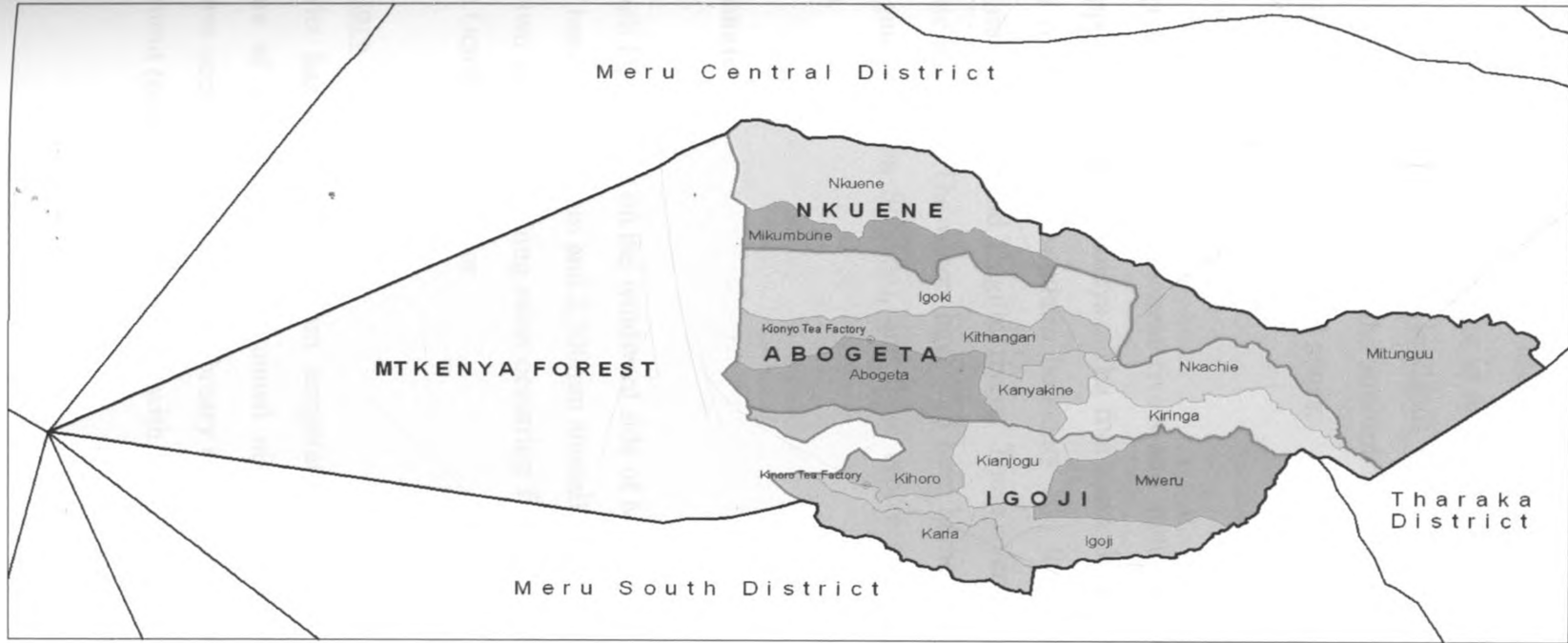
THUCHI - NKUBU ROAD B6  
SUBJECT STUDY AREA

### **3.1.2 Administrative Boundaries.**

Imenti South District, which also doubles up as the South Imenti Constituency comprises of three administrative divisions, namely; Nkuene, Abogeta and Igoji; fourteen locations (three in Nkuene division, six in Abogeta division and five in Igoji division) and thirty three sub locations. Also categorized as a “division” but not under any specific District Officer’s jurisdiction, is the “Forest Division”. The district headquarters is Nkubu Town in Nkuene division.

Kanyakine and Igoji Urban centres are the Divisional headquarters for Abogeta and Igoji divisions respectively.

### MAP No.3: IMENTI SOUTH DISTRICT: ADMINISTRATIVE MAP



Prepared by Author, Kinoh SM, 2007



District Boundary derived from the Meru Central District Development plan 2002-2008 and the Kenya Constituencies Boundary Map

Division and Location Boundaries and names adopted from the Meru Central District Development plan 2002-2008

District Boundary	
Division Boundary	
Location Boundary	
Location Name	Nkuene
Division Name	<b>NKUENE</b>



### **3.1.3 Physiographic and Natural Characteristics**

#### **3.1.3.1 Relief and Drainage**

##### **Relief**

Imenti South District shares the peak of Mt. Kenya with the other districts of the Mt. Kenya region, namely; Imenti North, Meru Central, Meru South, Embu, Kirinyaga and Nyeri North Districts. The wide range in altitude in the District, ranging from a low of about 700m in the extreme eastern lowlands to the Mt. Kenya Peak of 5,199m in the extreme west point, has influenced the atmospheric conditions leading to a wide variety of micro-climates and agro-ecological zones.

##### **Drainage**

The district has numerous permanent rivers and streams, mostly originating from the forested upper zones of Mt. Kenya. The five main rivers are Mara River (which also forms part of the district's southern boundary and the boundary of the study area), Mutonga, Iraru, Kithiinu and Thigithu rivers. These rivers supply adequate surface water for domestic purposes. The waters have also been harnessed for irrigation (for example, the Mitunguu Irrigation Scheme), and there are recent plans for hydroelectric power generation.

#### **3.1.3.2 Climate**

##### **Rainfall**

Imenti South District lies on the windward side of Mt. Kenya which receives ample relief rainfall of between 1,250mm and 2,500mm annually. The rainfall pattern is bimodal and comes in two seasons; the long rains occurring from mid March to May and the short rains from October to December.

##### **Temperature**

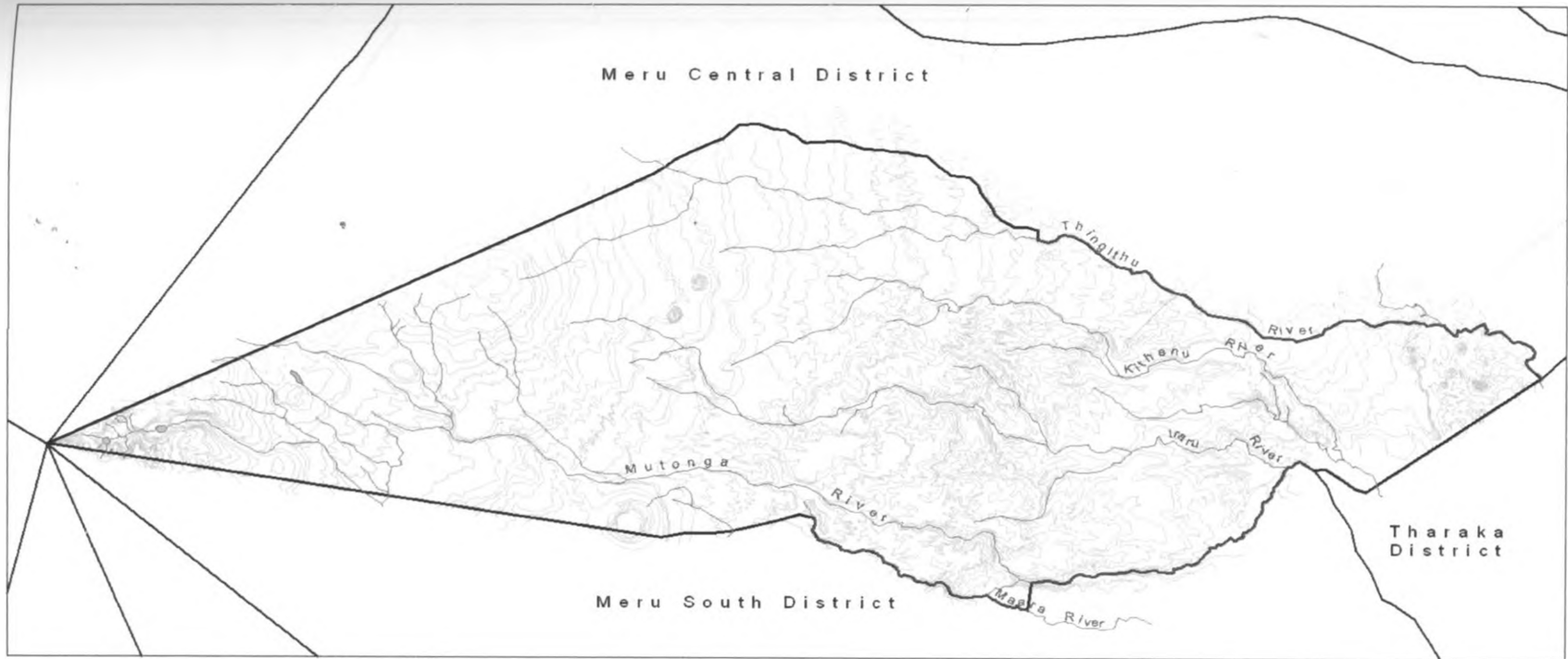
The District has a mean maximum temperature of 24.5° C and a mean minimum temperature of 12.4° C giving an annual mean temperature of 18.45° C. The high temperatures occur in the month of February and the low temperatures in July. The Mt. Kenya summit (peak) is usually covered with snow throughout the year and temperatures

are normally at sub-zero degrees. The summit temperatures are therefore treated as outliers and they are not included in the mean temperature calculations.

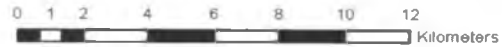
### **Drought**

Although Imenti South District is categorized as high potential with more than 50% of arable land, it experiences occasional droughts in the lower ecological zones covering the eastern parts of Nkuene division (Mitunguu location). However, this phenomenon can be arrested if more water is harnessed for irrigation into these areas (already, the Mitunguu area under the irrigation settlement scheme is rated as the highest in production of bananas, fruits and horticultural produce in the country).

# MAP No.4 (a): IMENTI SOUTH DISTRICT: RELIEF AND DRAINAGE MAP

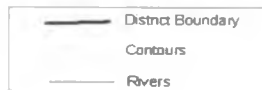


Prepared by Author, Kinoti SM, 2007

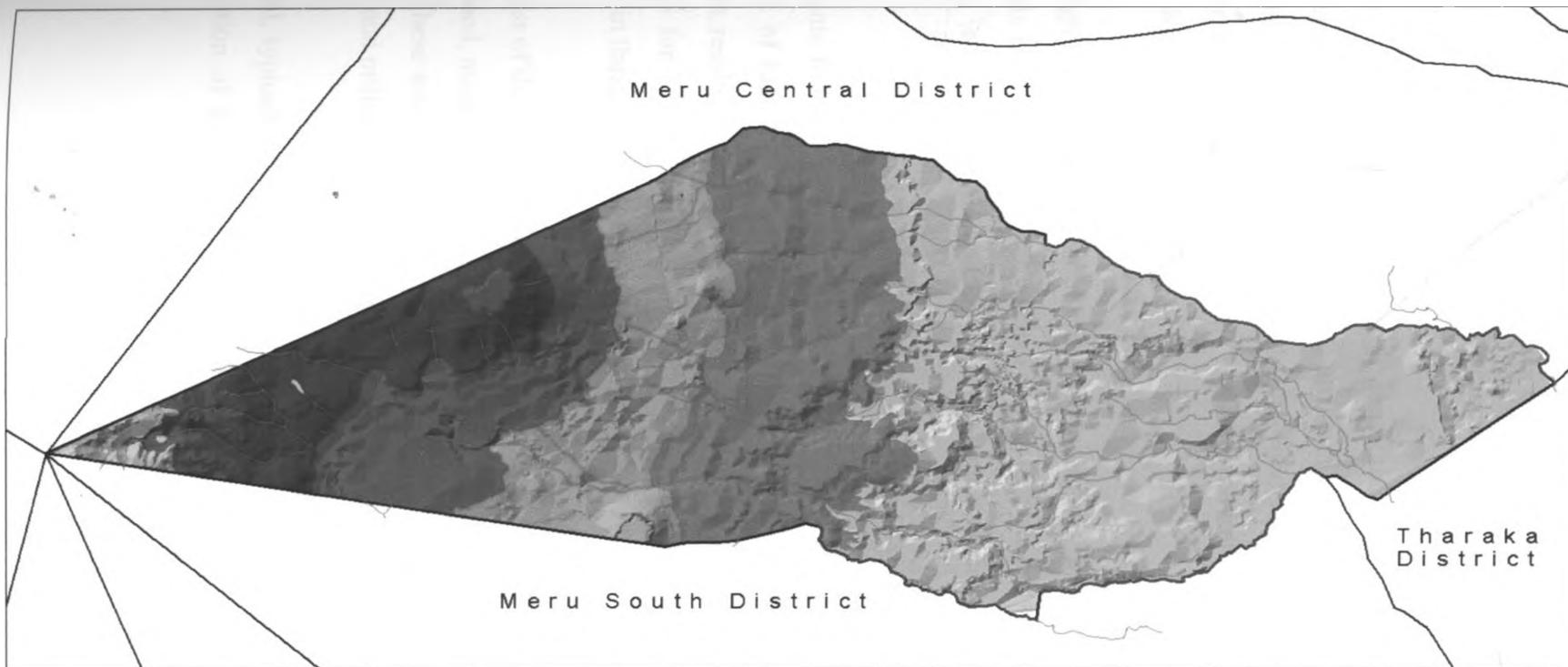


Contours and Rivers digitised from SoK Topographical map sheets

For Relief vertical appreciation, see map No 3 (b) The Digital Terrain Model (DTM)

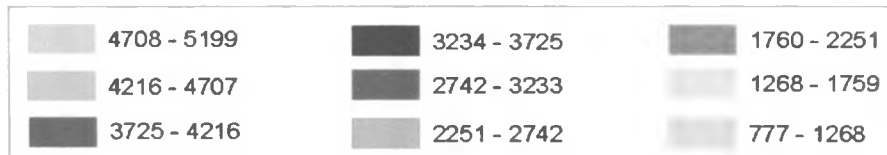


**MAP No.4 (b): IMENTI SOUTH DISTRICT: RELIEF DIGITAL TERRAIN MODEL (DTM)**



0 1.5 3 6 9 12 15 18 Kilometers

Prepared by Author, Kinoti SM, 2007





### 3.1.3.3 Soils and Soil Classification

Soils in Imenti South District and to a larger extent, in the whole of Mount Kenya Region are influenced by the mountain (Mt Kenya). The profile of the soils, from the mountain peak to the west of the district, and eastwards to the eastern lowlands vary appreciably. There are no soils around the peak of the mountain.

To the west of the district, on the high parts (above 4,000m above sea level), soils of variable fertility (unit 5M on the map) are found. These soils are imperfectly drained, dark greyish brown, very friable, shallow to moderately deep, loam to clay loam soils with rock outcrops and ice/snow in the higher parts. Land use in this tropical alpine zone is the Mt. Kenya National Park.

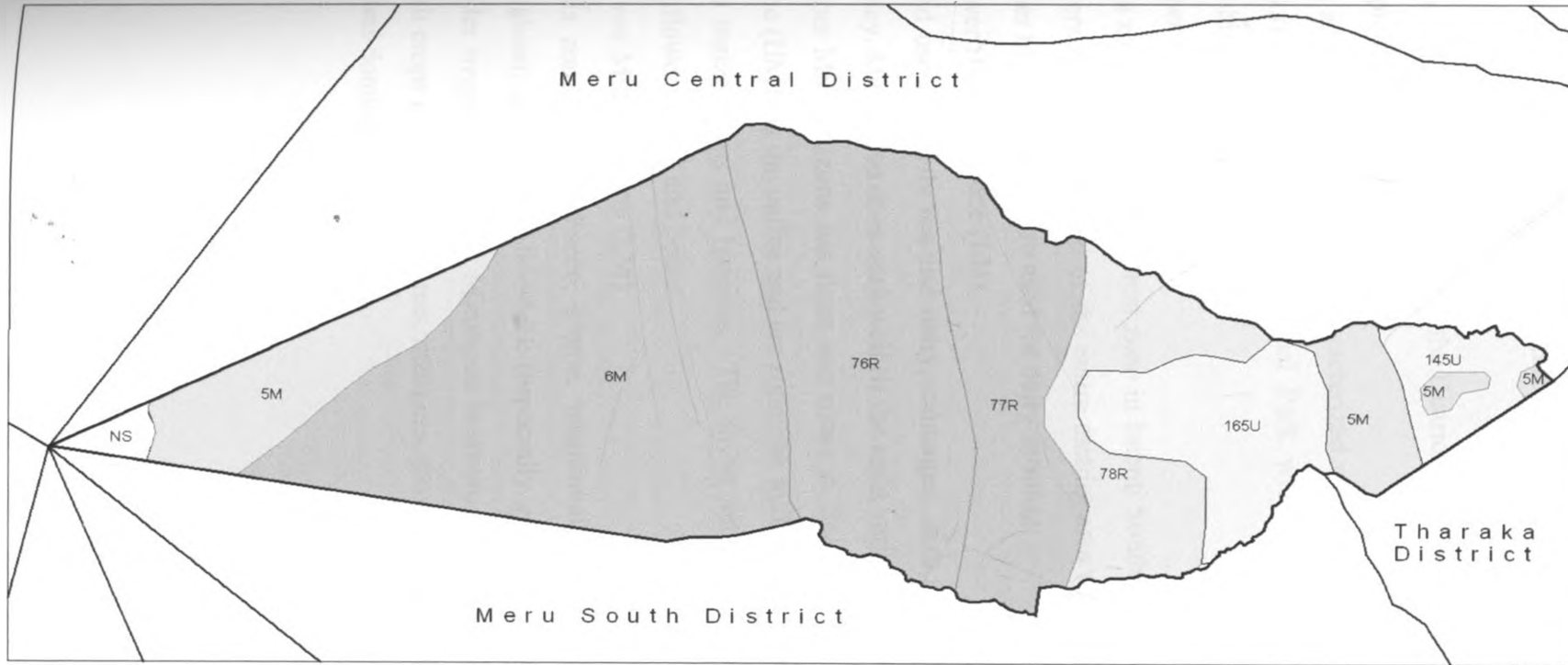
On the slightly lower area, soils of moderate to high fertility (unit 6M on the map) occur. These soils are very deep, dark reddish brown to dark brown, very friable and smeary, clay loam with thick acidic humic top soil. Land use in this zone is mainly forest and dairy.

The volcanic foothills of the mountain are dominated by soils of unit 76R, 77R and 78R which are of high to moderate fertility. These soils are very well drained, extremely deep, dark reddish brown to dark brown, friable clay with acidic humic top soil (humic NITSOLS for 76R and 77R and CAMBISOLS and chronic ACRISOLS for unit 78R). Land use in these zones is mainly dairy and tea, coffee and a variety of food crops.

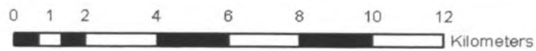
To the East of the district, soils are characteristic of units 165U and 145U. These soils are well drained, moderately deep to deep, dark red to yellowish red, friable, sandy clay loam to clay. These soils are of moderate to low fertility. They are suitable for cereals such as sorghum and millet but horticulture and tropical fruits also do very well under irrigation.

In general, typically the greater part of the district has red, friable clay soils with great accumulation of iron oxide in the soil. These soils are very fertile but sensitive to erosion.

# MAP No.5: IMENTI SOUTH DISTRICT: SOIL CLASSIFICATION MAP



Prepared by: Author, Kinoti SM, 2007



Soil Classification derived from the Farm Management Handbook of Kenya, Vol II Part C East Kenya (Eastem & Coast Provinces), 1983

For Soil classification details, see report

NS	No Soil	6M	} Moderate to High fertility	165U	} Low fertility
5M	Variable fertility	76R		145U	
78R	Moderate fertility	77R			



### 3.1.3.4 Agro-Ecological Zones and Land Use

The agro-ecological zones and land use (agriculture), just like the soils, are as a result of the Mt Kenya influence. The exploitation of the soil potential depends on climatic conditions such as rainfall and temperatures which are also influenced by the mountain.

The major Agro-Ecological Zones in the District and their respective Land uses are:

1) Tropical Alpine Zone (TA)

The alpine meadow zone is characterized with rocks and glaciers (at the mountain peaks). Land use is a National Park with the main activity being mountain climbing.

2) Upper Highland Zone (UH)

This zone is mainly the forest zone in Imenti South District. The Mt. Kenya Forest covers more than a third of the entire district area (about 38%). Some parts of the upper highland zones are used for dairy farming.

3) Lower Highland Zone (LH)

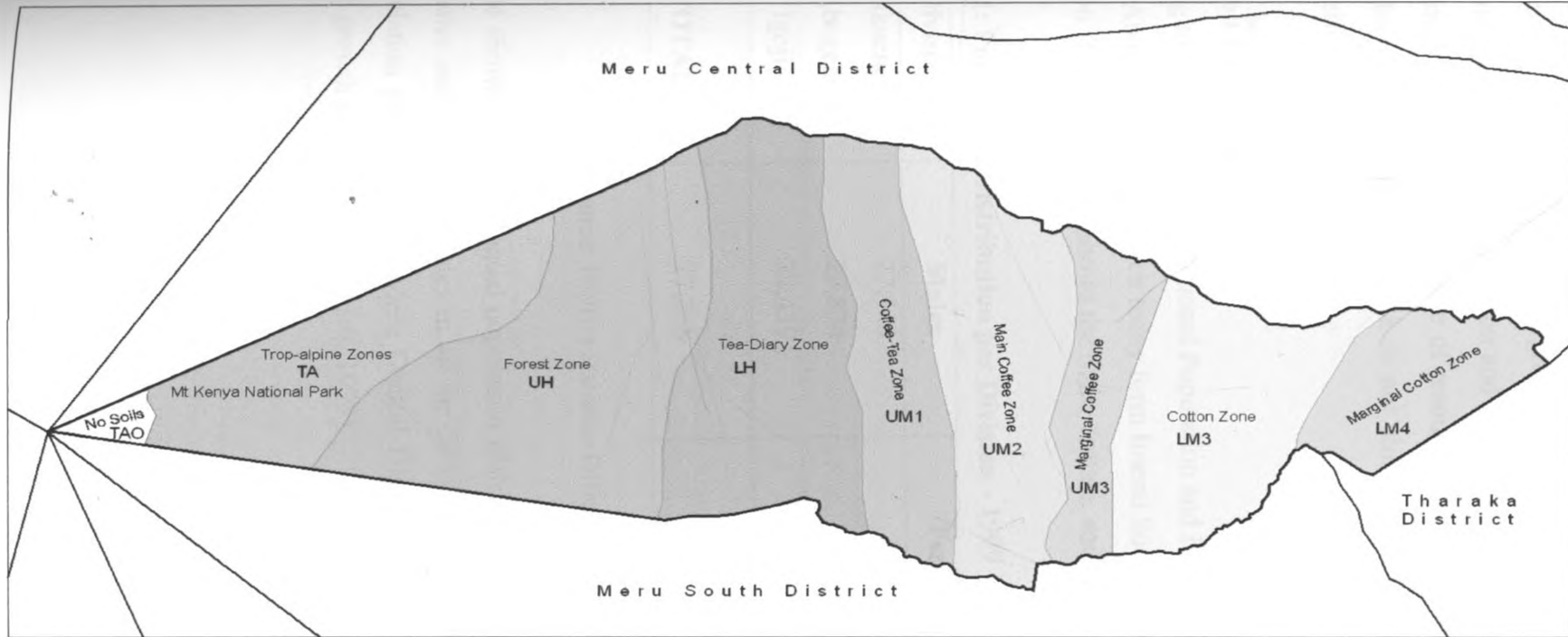
Land use is mainly tea and dairy; cabbages, Irish potatoes, kales and carrots and barley. Maize also does very well (if the right variety is planted).

4) Upper Midland zone has three sub zones in Imenti South District. The upper sub zone (UM1) is the coffee and tea zone; the middle sub zone (UM2) is mainly coffee and maize, yams and bananas. The lower sub zone (UM3) has marginal coffee, sunflower, maize and beans.

5) Lower Midland Zone (LM)

This zone grows tobacco, cotton, traditional food crops (TFC) such as millet, sorghum, cassava and livestock (especially goats). Where the zone has been put under irrigation such as Mitunguu location, very high yields of horticultural and fruit crops especially bananas, mangoes, pawpaw, and Asian vegetables and French beans dominate.

# MAP No.6: IMENTI SOUTH DISTRICT: AGRO-ECOLOGICAL ZONES AND LAND USE MAP



Prepared by: Author, Kinoti SM, 2007



Ecological zones and land use derived from the Farm Management Handbook of Kenya, Vol II Part C East Kenya (Eastern & Coast Provinces), 1993

### Ecological Zones

TAO - Tropical Alpine Zone (Mountain summit)	LH - Lower Highland Zone
TA - Tropical Alpine Zone	UM - Upper Midland Zone
UH - Upper Highland Zone	LM - Lower Midland Zone



### 3.1.4 Population and Human Settlement

#### 3.1.4.1 Population Distribution and Density

Population trends of a region such as size, distribution, density, structure, composition, fertility, mortality, morbidity and migration have far reaching implications for future socio-economic conditions of a region and transportation. A rapid increasing population leads to inequality in terms of share of resources. Todaro (1982) has indicated that the main problem of population growth is not simply a problem of numbers but that of human welfare and of development.

#### Population Distribution

According to the 1999 Kenya National Population and Household census, the divisions of Nkuene, Abogeta and Igoji which today form Imenti South District had a total population of 156,396. Table 3.1 below shows the male, female, and total population per division.

**Table 3.1: Population Distribution per Division - 1999**

<b>Divison</b>	<b>Males</b>	<b>Females</b>	<b>Total</b>
Nkuene	27,945	27,979	54,924
Abogeta	27,874	28,407	56,281
Igoji	22,439	22,752	45,191
<b>TOTAL</b>	<b>77,258</b>	<b>79,138</b>	<b>156,396</b>

Source: District Statistics Office – Meru, 2007

The table shows an almost equal population distribution within the three divisions, and that females out-numbered males in all the divisions. As per the 1999 National Census the population growth rate of Meru Central District was 1.48%, much lower than the National growth rate of 2.1% (Census, 1999).

## Population Density

Population density world wide, tends to be influenced by land productivity and availability of water. Consequently the people tend to be concentrated around water sources and where the soils are fertile. Table 3.2 shows the population density per division.

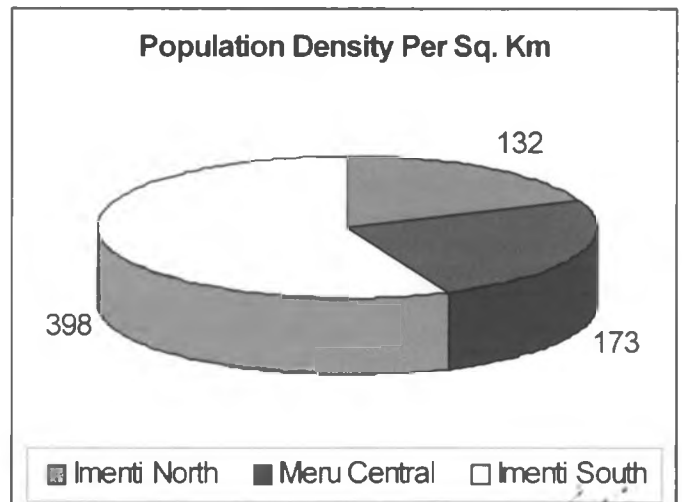
**Table 3.2: Population Density per Division – 1999**

Division	Area (Km <sup>2</sup> ), less Mt. Kenya Forest and Park areas	Population	Population Density (pop/Km <sup>2</sup> )
Nkuene	131.4	54,924	418
Abogeta	148.5	56,281	379
Igoji	113.1	45,191	400
<b>TOTAL</b>	<b>393</b>	<b>156,396</b>	<b>Av. density 398</b>

**Source:** Derived from data from Meru Central District Development Plan 2002-2008 & Ministry of Agriculture, Meru Central District Resource Management Guidelines, 2006.

The table shows an evenly distributed population density in all the three divisions. The evenly distributed population and population density is testimony to availability of fertile soils, water and conducive climate in the entire district.

The Imenti South District average density (398 persons/Km<sup>2</sup> in 1999) is very much higher than the other new districts of Meru Central and Imenti North which have population densities of 173 and 132 persons per km<sup>2</sup> respectively.



**NB: The Population densities exclude the areas under forest cover.**

### 3.1.4.2 Human Settlement Pattern

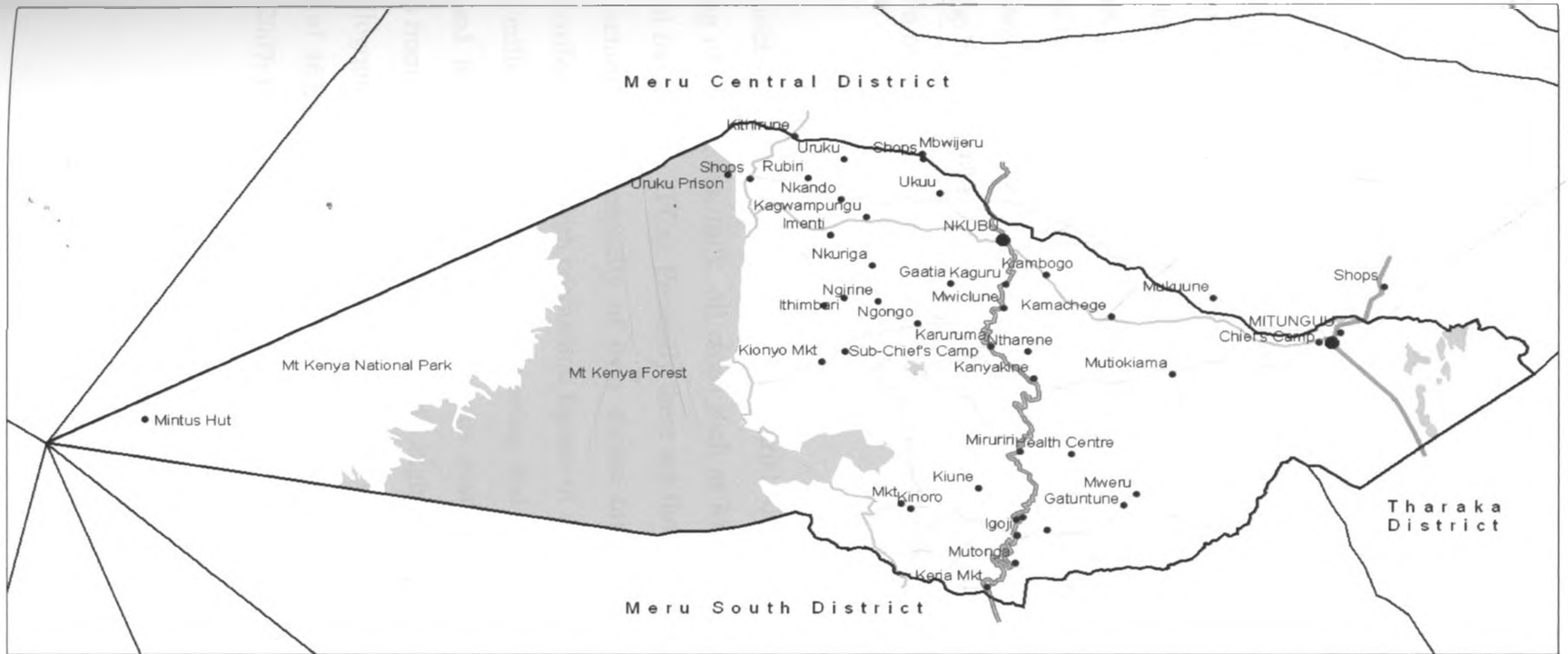
Human settlements are the habitat where people and other systems that support human life interact to make the settlement livable in the best way possible. As such, the pattern and dynamism of settlements are useful yardsticks for measuring the level of human activities which include physical and environmental dimensions, social and cultural dimensions, economic dimensions and institutional dimensions. Thus, the distribution and location of settlements reflect the opportunities within their hinterlands (Maleche, 1998)

Settlements are also manifestations of the functional relationships between different types and levels of human habitat. Most settlements specialize in the provision of different services to people resident in different regions and are therefore important indicators of flows and interactions between different sectors of the economy of any given region.

The settlement pattern in Imenti South District is basically rural and fairly distributed evenly through out the district with few pockets of higher concentrations within the urban centres. The two major urban centres in the district are Nkubu Town and Mitunguu urban centre. These urban centres had populations of 7,725 and 3,724 as per the 1999 census respectively, contributing a combined 7.3% of the total district population (District Statistics Office - Meru, 2001).

The high population density in the district is a major challenge as it is continuously depleting agricultural land through fragmentation (subdivisions into very small, agriculturally uneconomic parcels). This could result to encroachment into the forest zone and or rural-urban migration as the increasing demand for land exerts undue pressure on the limited resource. According to the District Development Plan 2002-2008 report, there are pockets of poverty in the “slums” already coming up in Nkubu and Mitunguu urban centres.

# MAP No.7: IMENTI SOUTH DISTRICT: SETTLEMENT PATTERN MAP



Prepared by Author, SM Kinoti, 2007



Settlement market / urban centres mapped from SoK Topographical sheets and from GPS ground observations





### 3.1.5 Social Economic Activities

Social economic activities provide important indicators for assessing the rate and level of growth and development in a region. The activities could be agricultural, commerce, trade and industry, depending on the nature of a region.

According to the District Agricultural Office Annual Report, 2006, agriculture is the main economic activity in Imenti South District with most farmers involved in various agricultural and livestock production activities. Important cash crops are tea, coffee, barley, tobacco, and various horticultural crops such as French beans, snow peas, Asian vegetables, cabbages, mangoes, avocados and pawpaw.

Food crops are of a wide variety. The main food crops include maize, beans, Irish potatoes and bananas, as well as traditional food crops (TFCs) such as millet, sorghum, arrowroots, yams, sweet potatoes and cassava.

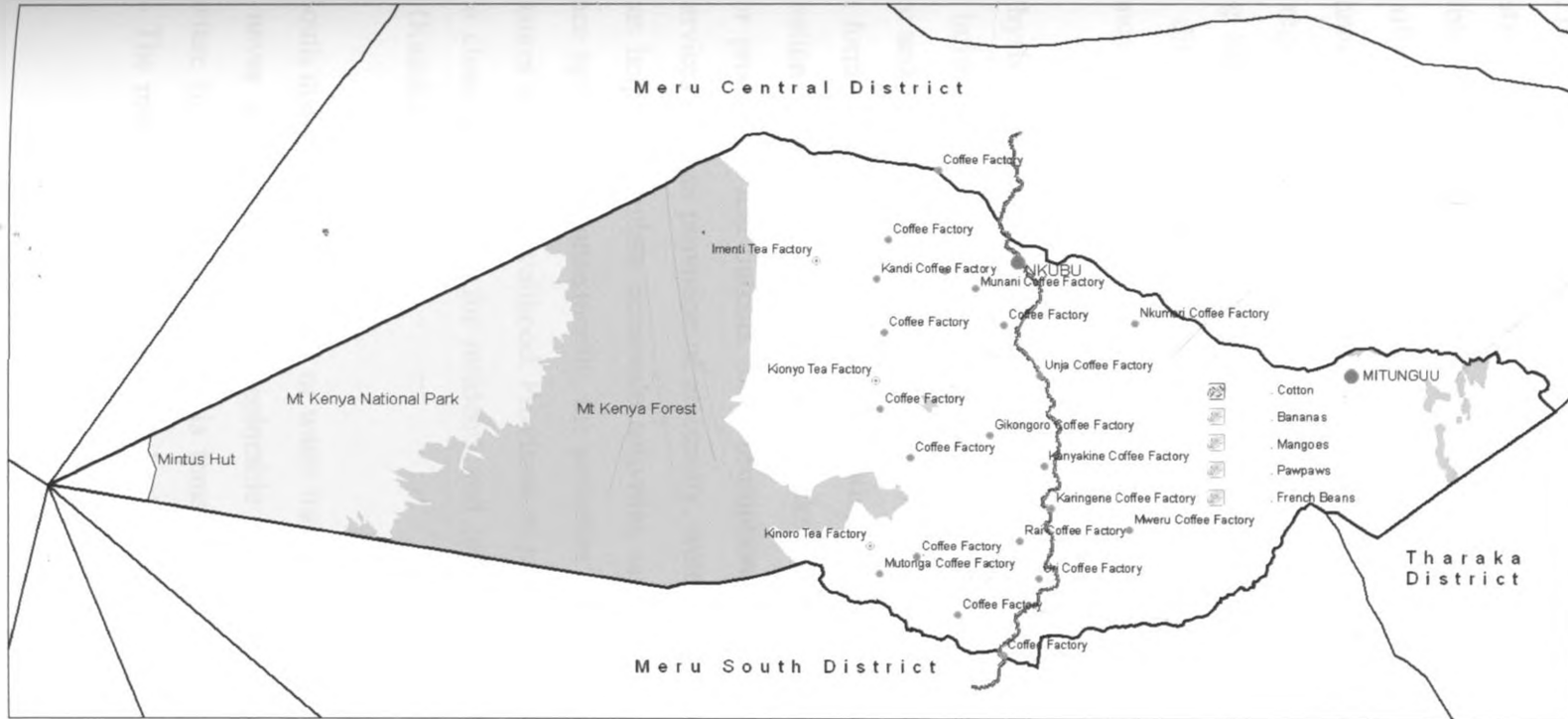
Almost all the crops are grown extensively in all the three divisions and there is potential for even higher yields through use of high-yield-variety (HYV) seeds, farmyard manure, better crop husbandry and better marketing arrangements. For example, horticulture production has increased steadily since 1995 (Annual Report, 2006: District Agricultural Office)

The District has high potential for industrial development especially through the processing of coffee, tea, milk, oil crops such as Macadamia and sunflower as well as traditional food crops (TFCs). Presently there are three tea factories (Imenti, Kionyo and Kinoro factories) with capacity of over eleven million kilograms of tea per annum; eighteen coffee societies with production figures of nearly ten million kilograms per year; sorghum/millet/finger millet flour processing and packing (for use for porridge) both locally and for export and other numerous small entrepreneurial industrial activities. Earnings from tea and coffee are some of the highest in the district. For example, at Kshs 42 per kilogram of tea and Kshs 24 per kilogram of coffee, the two cash crops would give a return of 462 million and 240 million Kenya Shillings annually respectively (Annual Report, 2007: District Trade and Industry Office).

Livestock is a major activity in the district and a major potential for industrial development. Livestock population estimates in June 2005 show there were 24,089 dairy cattle, 3,646 beef cattle, 7,189 hair sheep, 16,425 indigenous goats, 61,360 local poultry, 1,733 pigs, 3,176 rabbits, 11,076 long hives etc. Dairy production alone has led to formation of five cooperative societies and five self-help groups and a substantial production of milk which has contributed a great proportion to the over one billion Kenya shillings annual earnings in the greater Meru Central District (Annual Report, 2005: District Livestock Development Office).

Other potential industries to be established soon are the horticultural processing plants. These include banana flour and banana powder; banana wine and beer; canned fruit and fruit juices; fried banana slices; pawpaw wine, etc. Others include honey processing, fried macadamia, stone crushing etc (Industrial Development Potential Project Profiles, 2007: DIDO, Meru Central District).

## MAP No.8: IMENTI SOUTH DISTRICT: AGRO-ECONOMIC MAP



Prepared by Author, SM Kinob, 2007



### Agro-Economic Centres/Activities

• Urban Centre	☒ Cotton	▭ National Park
• Tea Factory	☒ Horticulture	
• Coffee Factory	▭ Forest	

The park and forest mapped from SoK Topographical map sheets  
Tea and coffee factories and towns mapped from SoK Topographical map sheets and from GPS ground observations

### **3.1.6 Physical and Social Infrastructure**

Infrastructure in general refers to the body of facilities and services, both physical and social that are used in the production process. These facilities and services facilitate economic production and makes it more efficient. Infrastructure services act as lubricants or catalysts in the social-economic development activities that support life and make it more livable, comfortable, easy, sufficient and enjoyable.

The role of infrastructure in development includes; enhancing development potential of land; enhancing property values; enhancing security; improvement of inter-linkages between regions, settlements and different land uses both in rural and urban areas; and enhancing investments and promoting economic and social growth. Infrastructure too provides direct employment opportunities for the people during development and maintenance (Kasuku, 2005).

#### **3.1.6.1 Physical Infrastructure**

Physical infrastructure includes the roads and bridges, railways, airports and airstrips, electricity and water supplies as well as sanitation and communication services. These facilities form the linkage network stimulating both economic and social activities. Transportation infrastructure for example, links various sectors and allows access to inputs for production and outputs for consumption. On the other hand, infrastructure supply services such as provision of electricity, water and communication in urban and rural areas help to stimulate economic activities especially in the informal sector and subsistence agriculture. Consequently, the activities increase the incomes for the people, which ensures sustainable livelihood. Provision of proper solid and human waste disposal ensures a clean environment for residents and reduces the occurrence of water borne diseases (Kasuku, op cit).

Imenti South district has no railway or water transport and the only airstrip at Mitunguu area is never in use due to its deplorable condition. The most notable physical infrastructure in Imenti South District is transportation infrastructure, mainly the road network. The road classification network in the district comprises of one class B road

(Road B6); one class C road (Road C92); five class D roads (D474, D475, D476, D482 and D483); and eight class E roads. Road B6 (Keria – Nkubu road) which runs across the district on a south-north direction for about 25Km from Maara river at Keria market on the southern boundary to a short distance past Nkubu town on the north, and Road D476 (6Km), are the only paved bitumen (tarmac) roads in the district. All the other roads (including road C92) are earth roads. The earth roads are impassable during the rainy seasons and too dusty during the dry period. Road B6 (which is currently under rehabilitation), has been in the past riddled with massive potholes and blockages from landslides (Mutonga River area) making driving along the road a nightmare. Poor roads in a very highly agricultural productive area like Imenti South District is not only a loss to the district but a great loss to the country's economy as well.

### **3.1.6.2 Social Infrastructure**

Social infrastructure includes education, health, religious and other community facilities and services. These facilities and services contribute to the complete and wholeness growth of the human being. Needless to say then that, "an illiterate society is a doomed society, and a sick society is a dead society". An educated and healthy individual is able to confront issues head on and at the same time handle the issues with sobriety.

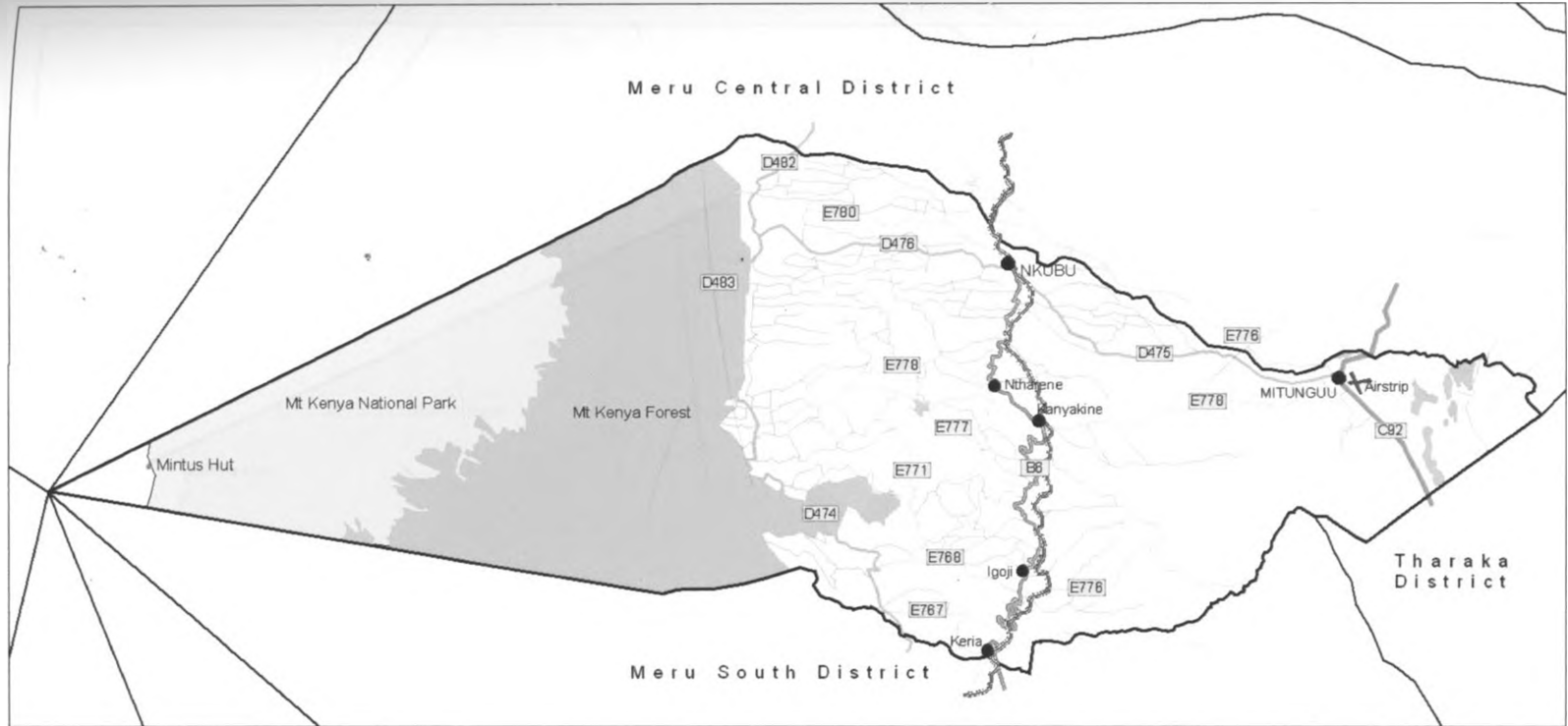
Education and health are the key factors to human resource development. Sustainable growth and development is entirely dependent on the ability of the human resource to effectively utilize other available resources.

Imenti South District, and generally, the entire Meru region is characterized as a high potential region in Kenya. The district human resource therefore becomes extremely important in exploiting the resource potential in the district; be it in skills development, agricultural production or industrial development. Human resource development provides the base for economic growth. Indeed, an individual, whose well-being is catered for adequately (through health, education and shelter) is able to develop his/her abilities towards being self-sufficient and can therefore contribute positively to development.

In the Meru Central District Development Plan (2002 – 2008), human resource in the district was identified and given priority. In education and training, the priority was to “make basic education accessible to all; introduce relevant curriculum that meets market demands at all levels of learning; expand opportunities and boost enrolment for tertiary learning institutions”. In health and nutrition, the priority was to “make health services accessible to all; promote primary healthcare amongst the general population; and to provide health education down to the grass root levels.” (District Development Plan (2002 – 2008))

The infrastructure cross-sector linkage requires that, to improve accessibility to learning and health institutions, there is need for improved road network as a priority, and other linkages will automatically follow later.

# MAP No.9: IMENTI SOUTH DISTRICT: PHYSICAL INFRASTRUCTURE MAP

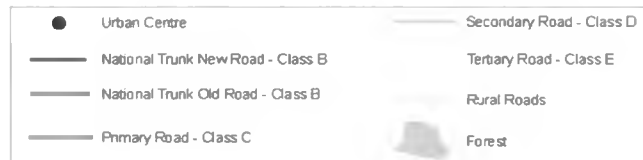


Prepared by: Author, SM Kinoti, 2007

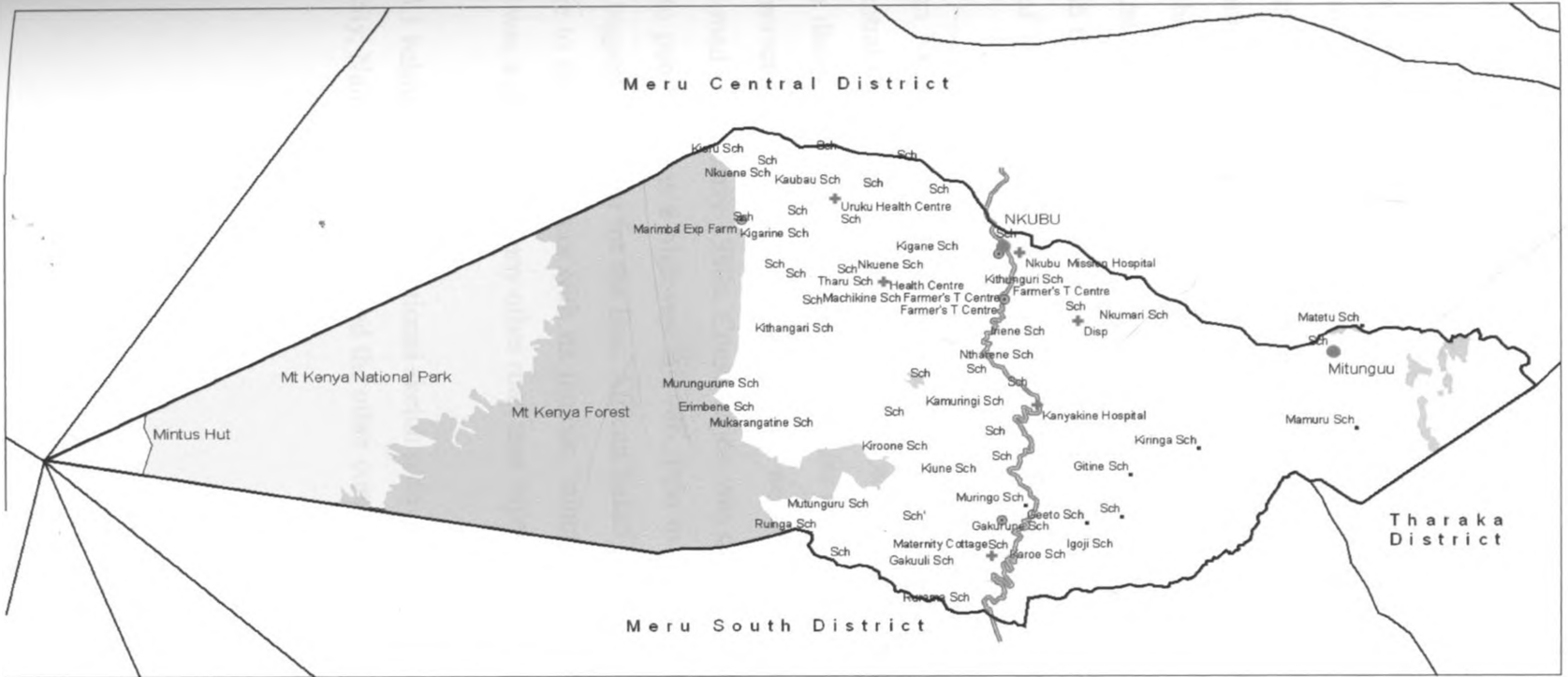


Roads, Parks and Forest digitised from Survey of Kenya Topographical map sheets

Urban Centres mapped from SoK Topographical map sheets and from GPS ground observations



# MAP No.10: IMENTI SOUTH DISTRICT: SOCIAL INFRASTRUCTURE MAP



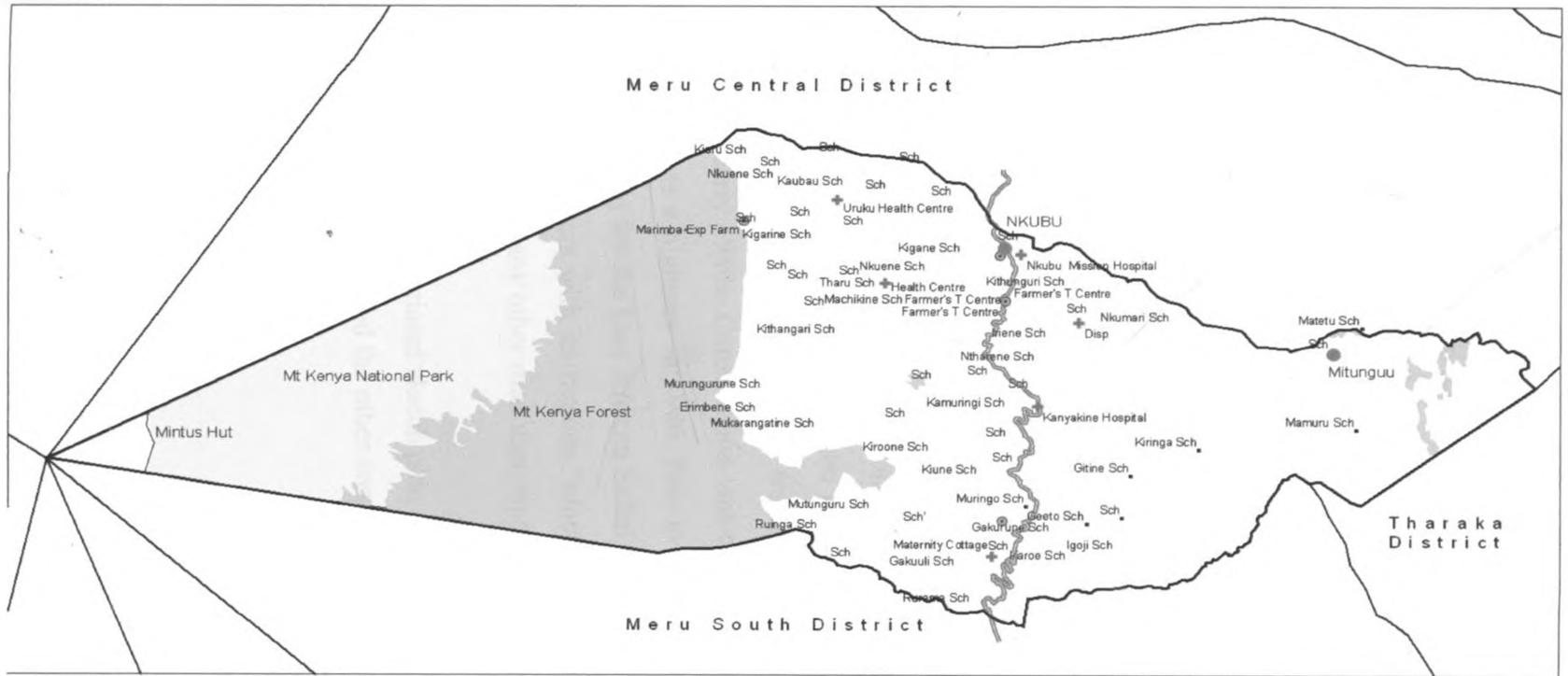
Compiled by Author, SM Kinoti, 2007

- Urban Centre
- Main Road





# MAP No.10: IMENTI SOUTH DISTRICT: SOCIAL INFRASTRUCTURE MAP



Compiled by Author, SM Kinoti, 2007

- Urban Centre
- Main Road



## **3.2 Keeria – Nkubu Road Corridor**

### **3.2.1 Location**

Keeria – Nkubu road is 25km long. It is part of the 54km Nkubu –Thuchi highway which was re-aligned and paved in the early 1980s. The road is also part of the classified National Trunk Road designated B6 in the Kenyan Road Classification network. The B6 road branches off from the Nairobi – Nyeri International Class A2 road at Makutano junction and forms part of Kirinyaga and Mbeere districts boundary. The road traverses and serves the rich agricultural region of Mount Kenya districts of Kirinyaga, Embu, Meru South, Imenti South, Meru Central and Imenti North districts, and connects back again to the same road A2 at Subuiga, a small market centre between Nanyuki and Isiolo towns. Road B6 is also the only road that opens and links up Tigania and Nyambene districts in the northern region of greater Meru district as well as the marginal (semi-arid) districts of Tharaka and Mbeere to the outside world.

The 54km Nkubu – Thuchi section of road B6 runs within Meru South, Imenti South, Meru Central and Imenti North districts, with only a short distance (about one kilometre) in Embu district. Initially, the Thuchi - Nkubu road was an earth surface road having been constructed in the 1920s (GIBB 1979). It was re-aligned and constructed as a paved (tarmac) road in the early 1980s. Construction was completed in late 1985 and the road opened to public use as a highway in 1986. Prio to getting paved, Thuchi-Nkubu road was the biggest attraction for the East African Safari Rally. The road offered the greatest challenge to the rally drivers with its famous “ninety nine” corners. On the other hand, the road was a nightmare to any other road user especially during the rainy seasons.

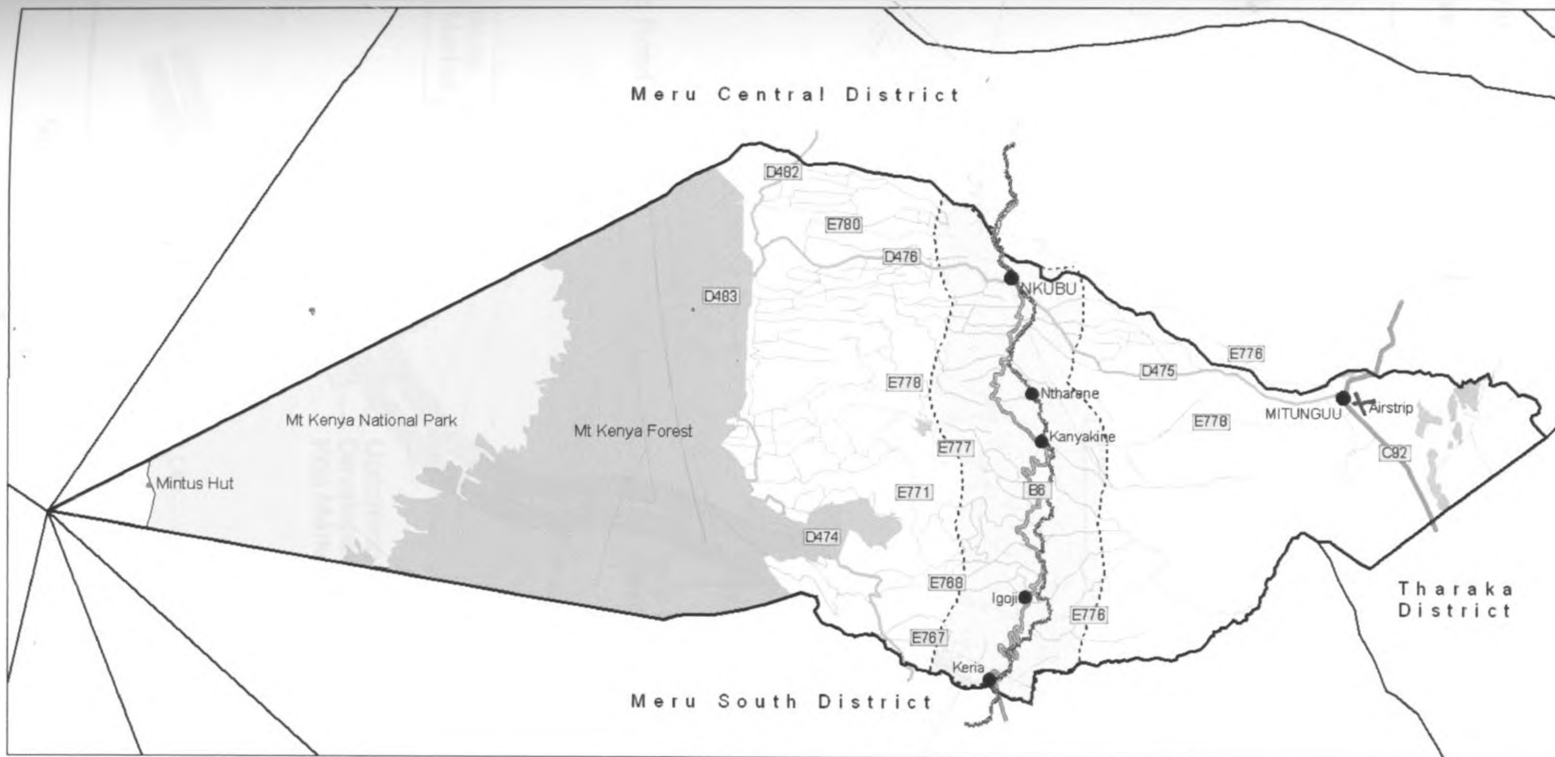
Figure 3.1 below shows the locational sketch plan of the study area in relation to the capital city, Nairobi, Mt. Kenya and the other connecting roads.



Map No. 11 shows the location of Keeria – Nkubu Road corridor within Imenti South District. The 25 km road runs from the southern boundary of Imenti South District (Maara River), to the northern boundary of the district about 2km north of Nkubu town. This section of the road traverses through the district's market centres of Keeria, Igoji, Kanyakine, Ntharene and Nkubu Town among other small rural market centres.

The study area is limited within the 25km corridor, covering a distance of about 2.5km on either side of the road within which the above market centres and most other facilities fall. The study focuses on the market centres of Igoji, Kanyakine and Ntharene.

**MAP No.11: IMENTI SOUTH DISTRICT: STUDY AREA:KERIA - NKUBU ROAD CORRIDOR**

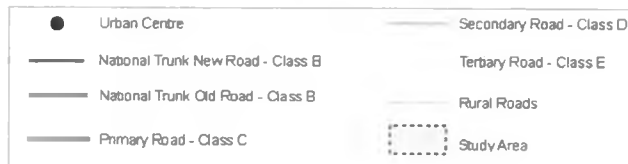


Prepared by Author, SM Kinob, 2007



Roads, Parks and Forest digitised from Survey of Kenya Topographical map sheets

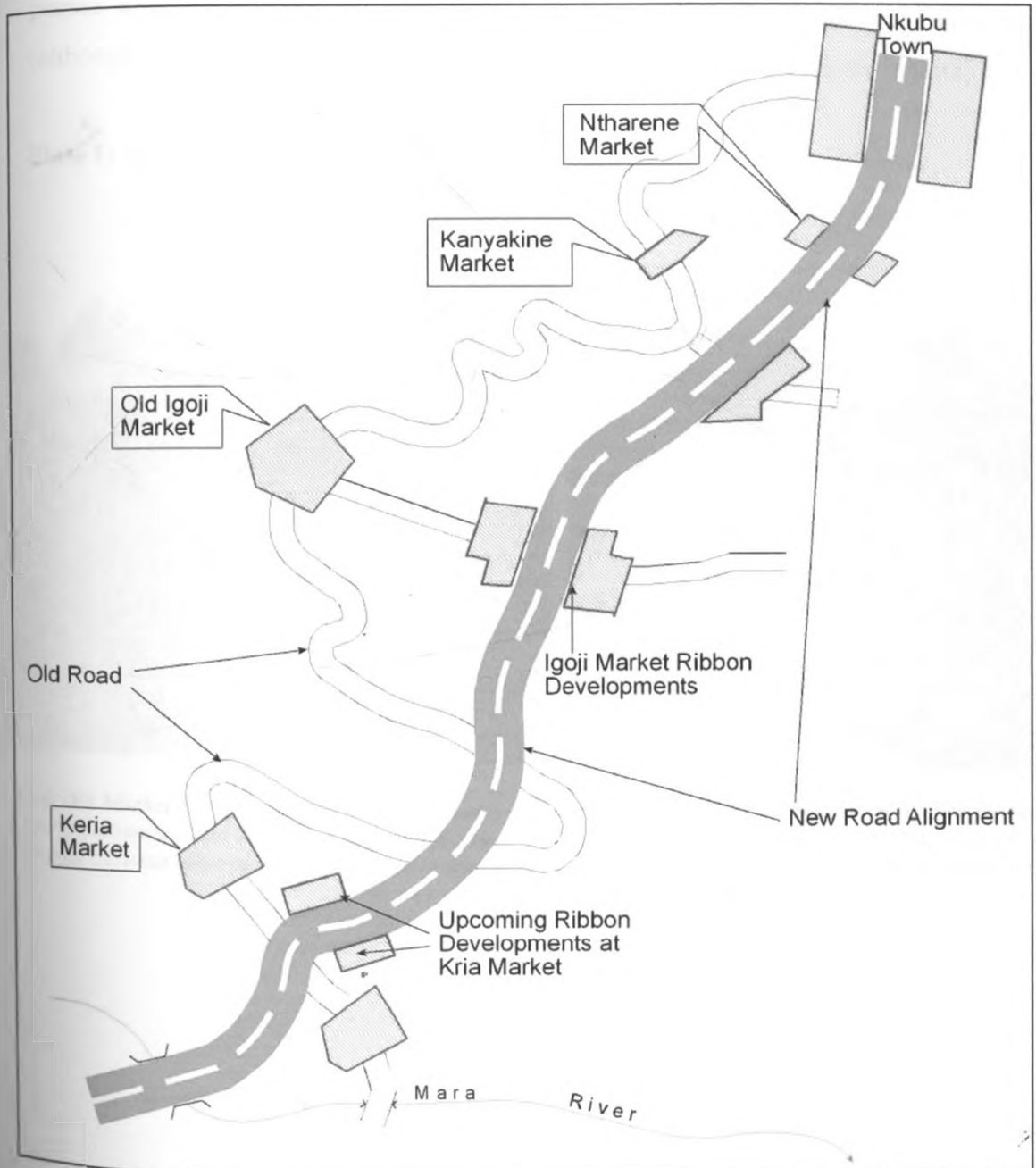
Urban Centres mapped from SoK Topographical map sheets and from GPS ground observations



### 3.2.2 Keeria - Nkubu Road Re-alignment and Market Centres

Figure 3.2 shows the Keeria – Nkubu Road Re-Alignment, along with the old road section and old markets and upcoming developments. A number of market centres were affected by the re-alignment of the road. Of specific concern to this study, are, Igoji, Kanyakine and Ntharene market centres.

**Figure 3.2: Keeria – Nkubu Road Re-Alignment Corridor**

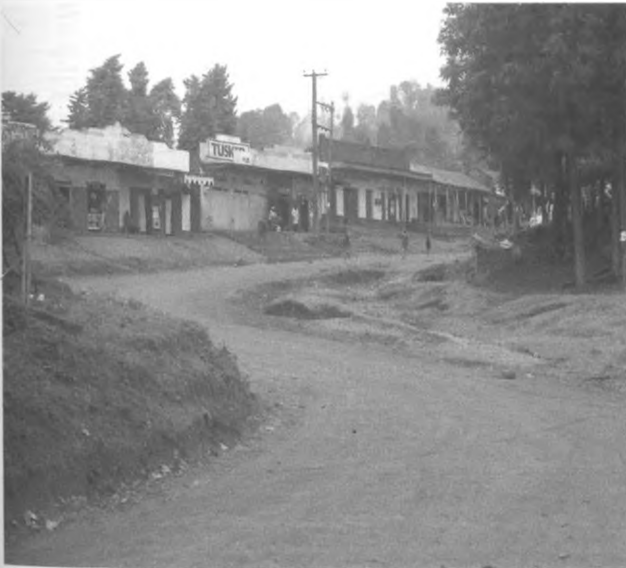


Source: Author. 2007

## 1. Igoji Urban Centre

Igoji urban centre is the division headquarters of Igoji Division (figure 33). In the locality of the urban centre are major learning institutions such as St. Mary's Girls high school, Igoji Teachers College and St. Lucy's School for the Blind among others. The new road alignment bypassed the market centre leaving it about 1.5Km away. Consequently, Igoji market has most roadside developments along the highway and also along the old road close to the highway. St. Mary's and St. Lucy's schools were also bypassed and the distance to Igoji Teachers College became longer and more hilly (although a permanent access was provided on the hilly portion but poorly maintained)

### Plate 1: Igoji Market Centre

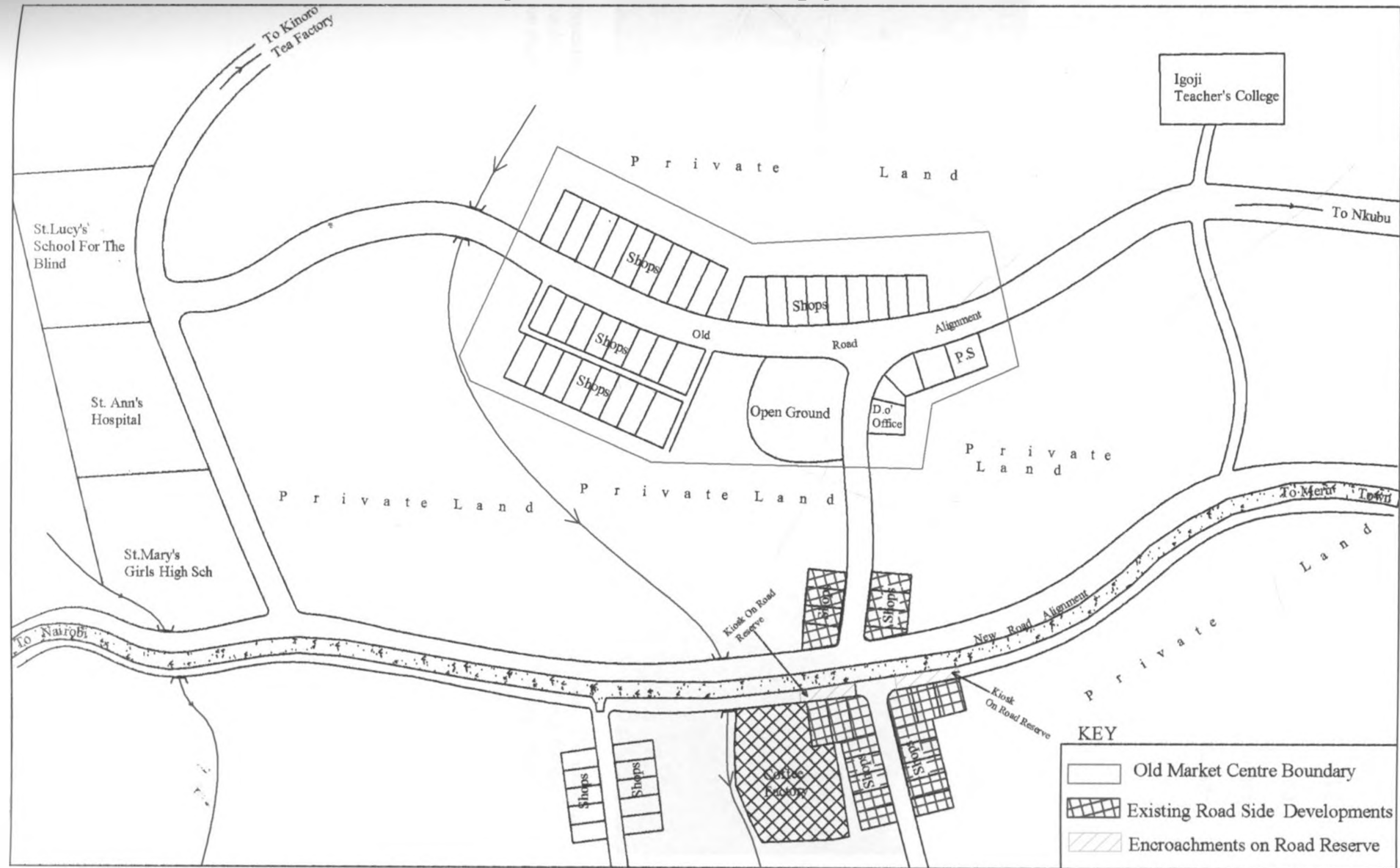


*Igoji Old Market Shopping Centre: The old road is poorly maintained and most shops are closed. Very minimal business takes place at the shopping centre*



*Igoji Roadside Shopping Centre: The shopping centre has permanent buildings, with some of the buildings falling within the 60m road reserve.*

Figure 3.3: Sketch Plan of Igoji Urban Centre





## 2. Kanyakine Urban Centre

Like Igoji, Kanyakine is an urban centre and the division headquarters of Abogeta Division (figure 3.4). Within Kanyakine centre's locality, are learning institutions like Kanyakine Boys High School and primary school, a catholic mission church, centre and school, PCEA church and school and a Kanyakine District hospital among other institutions. All these institutions together with the market and shopping centre were cut-off from direct access to the main road after the re-alignment of the highway.

### Plate 2: Kanyakine Market Centre

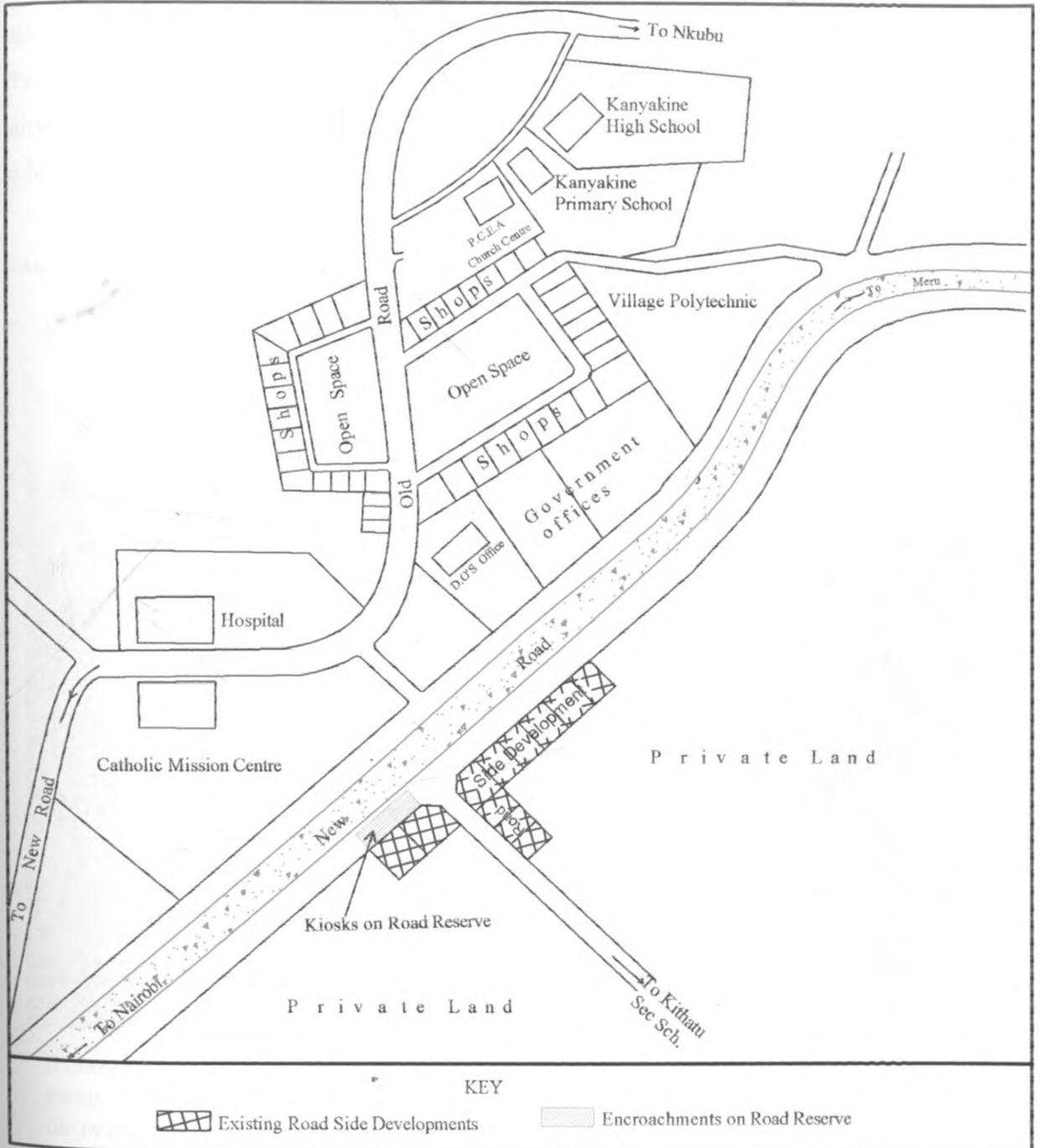


*Old Kanyakine Market Centre: Old shopping centre in the background and part of the old Nkubu – Thuchi Road, on the foreground.*



*Kanyakine Roadside Developments: The shops are built on Freehold Tenure private land. Hence development control is difficult to implement*

Figure 3.4: Sketch Plan of Kanyakine Urban Centre



### 3. Ntharene Market Centre (See Figure 3.5: Ntharene Market centre)

Ntharene is a relatively smaller centre than the other two (figure 3.5). However, it is famous as a banana market centre as well as fruits and traditional food crops like yams and arrowroots. Bananas are brought to the centre for sale, packing and loading into waiting trucks for transit to Nairobi, Mombasa and other destinations. However, due to very poor access roads into the market centre, all the business is carried out on the new highway road reserve. It is very common on a market day to find banana loads blocking the busy highway.

#### Plate 3: Ntharene Market Centre



*Ntharene Old Market Centre: Background shows the shopping centre. The foreground is an open space set aside for an open – air market, but instead open – air market business is conducted on the road reserve.*

**Plate 4: Ntharene Market – Business on Road Reserve**



*Ntharene Market: Normal Daily market business conducted on the Road Reserve*



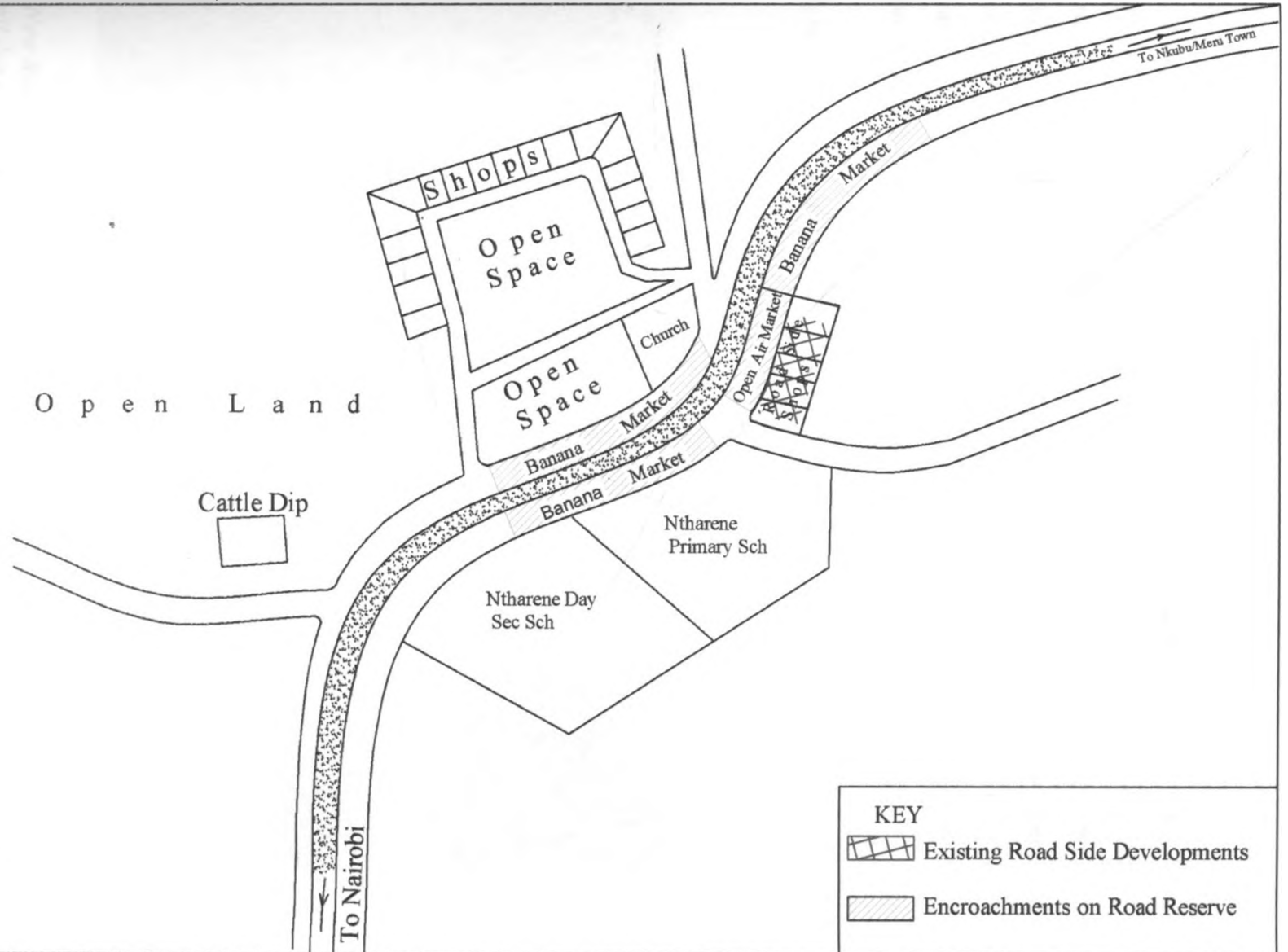
*Ntharene Market: Encroachments onto the road reserve. On Market days, even the carriage-way is turned into a market space.*

**Plate 5: Ntharene Market – Poor Access Roads**



*Plate 4(e): Ntharene Market: Poor approach and exit roads into and out of the g centre. It is virtually impossible for vehicles to access the shopping centre even during dry spells .This facilitates business at the road reserve*

Figure 3.5: Sketch Plan of Ntharene Market Centre



## 2. New Road Condition

The road is an asphalt paved road with a surface dressing finish. However, in many occasions, the road is neglected and bad potholes and rutting dominate the road surface. In spite of the re-alignment of the entire Nkubu - Thuchi highway in the early 1980s, the road still has a number of sharp bends prone to motor accidents. The topography of the area is rugged and prone to land slides. In 1997, during the El-Nino rains, the road was cut-off between Keeria market and Mutonga river after a section of the road was swept-off down the valley. Again in 2003, the road was blocked for weeks by mudslides and rock boards falling from up the hill-sides at the same spot. This problem is now a perennial recurrence phenomenon.

### Plate 7: New Road Condition



*New Road Condition. Evidence of potholes and tarmac surface basically worn off due to lack of maintenance. (Photo by Author: April 2007)*

## 2. New Road Condition

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### Plate 7: New Road Condition



*New Road Condition. Evidence of potholes and tarmac surface basically worn off due to lack of maintenance. (Photo by Author: April 2007)*

## CHAPTER 4: IMPACT OF NKUBU – THUCHI ROAD RE-ALIGNMENT

### 4.1 Social – Economic Profile

Tables 4.1 (a) and (b) show information on a household survey conducted on 88 respondents within the study area. The survey was meant to assess the general social-economic welfare of the community within the study area and their general response with regard to the Nkubu – Thuchi road re-alignment. Table 4.1 (a) shows that 93% of the respondents were aged over 25 years with 82% being married and that 100% of the community are Christians.

**Table 4.1 (a): Social Profile of Respondents**

Sex		Relationship to Head of Household		Age in Years		Marital Status		Religion	
Sex	%	Relation	%	Age	%	Status	%	Religion	%
Male	48%	Self	52%	18 – 25	7%	Married	82%	Christian	100%
Female	40%	Spouse	38%	26 – 35	23%	Single	14%	Muslim	0%
		Son/daughter	9%	36 – 45	18%	Single parent	2%	Other	0%
		Other	1%	46 – 55	28%	Widow/widower	2%		
				Over 55	24%				
<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>		<b>100%</b>



**Table 4.1 (b): Education, Occupation/Employment and Annual Gross Incomes of Respondents**

Education		Occupation/Employment		Annual Gross Incomes	
Education Level	Percentage	Occupation	Percentage	Income Range (Kshs)	Percentage
No formal education	11%	Formal employment (Public/private sector)	25%	Less than 24,000	8%
Primary level	33%	Self employed	21%	24,000-60,000	28%
Secondary level	34%	Farmer	48%	60,000-120,000	37%
Tertiary college	16%	Manual labourer	3%	120,000-240,000	19%
Village polytechnic	1%	Other	3%	240,000-600,000	5%
University level	5%			More than 600,000	3%
<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>

Table 4.1 (b) shows that 89% of the community have formal education ranging from primary to university level. This shows that the literacy levels in the study area are way above the National adult literacy levels of 65%. On employment, 25% have formal employment in the public/private sector, 21% are self employed and 48% are farmers. The table further shows that poverty levels at less than 8% in the study area are very low compared with the National poverty levels at 44% (people earning less than one dollar or Kshs 65.00 per day). The study area can therefore be categorized as among the most literate and the richest areas in Kenya.

### 4.1.1 Housing

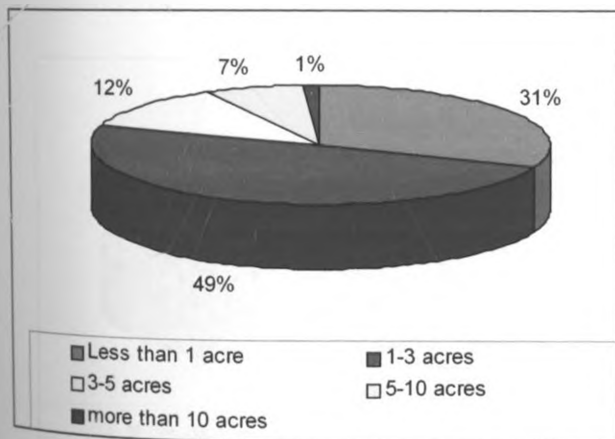
**Table 4.2: Type of materials for the Main Residential House**

Type of floor finish		Type of wall		Type of roof	
Floor	Percentage	Wall	Percentage	Roof	Percentage
Floor tiles	1%	Stone blocks	19%	Roofing tiles	2%
Cement	56%	Timber	66%	Iron sheets	97%
Earth	37%	Clay/mud	15%	Grass	1%
Other	1%	Other	0%	Other	0%
<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>

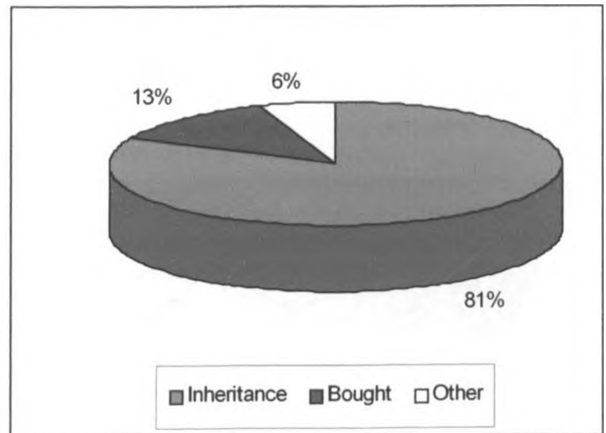
According to field survey as shown in Table 4.2, 57%, 85% and 99% of the community within the study area have their main residential houses built with permanent floor, wall and roof materials respectively.

### 4.1.2 Land Tenure

**Chart 1(a): Size of Land**



**Chart 1(b): Nature of Land Acquisition**

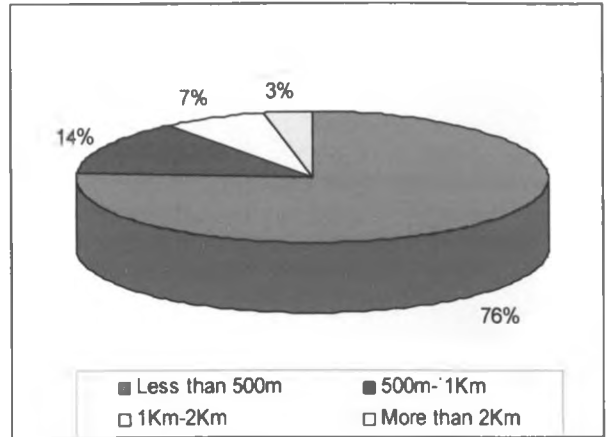
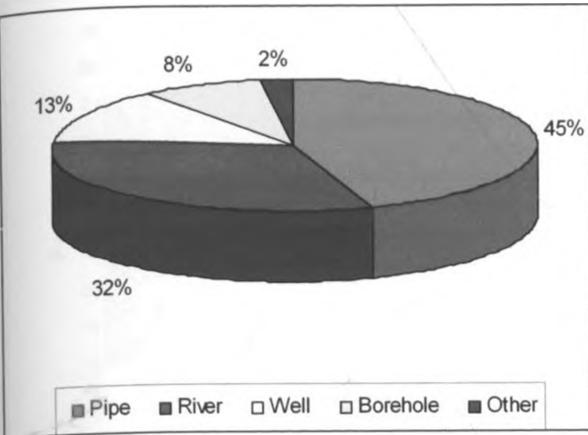


According to field survey as shown on Charts 1(a) and (b), 80% of the people own not more than three acres of land with 81% acquiring through inheritance. 13% own through purchase.

### 4.1.3 Domestic Water and Distance from Home to Source

Chart 2(a): Domestic water source

Chart 2(b): Distance to water source

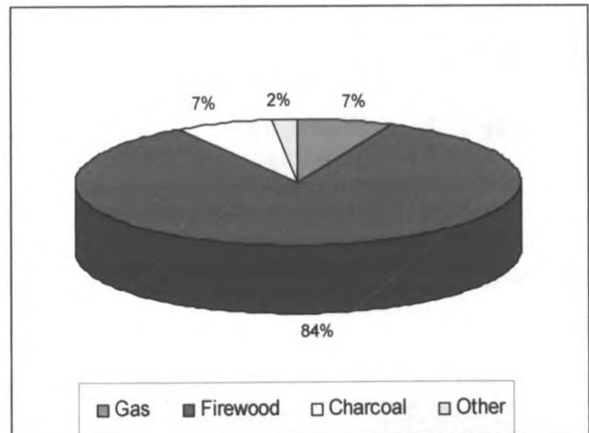
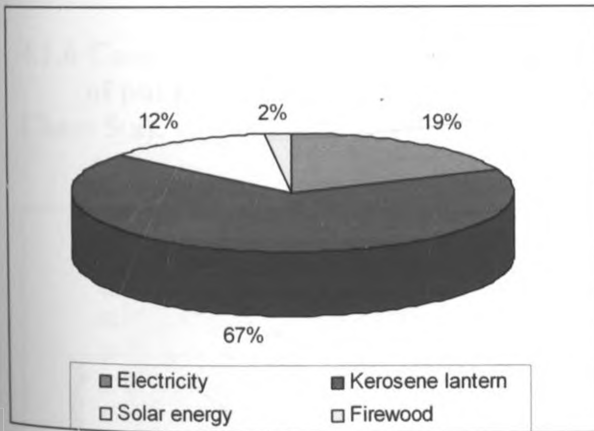


As shown in Chart 2(a), 45% of the people have piped water for domestic use. 32% draw water from the river with 13% and 8% getting water from wells and boreholes respectively. As shown in chart 2(b), 76% access domestic water within a distance of less than 500m. Access to clean water in rural areas nationally is 49%.

### 4.1.4 Main Source of Energy for Lighting and Cooking

Chart 3(a): Energy for Lighting

Chart 3(b): Energy for Cooking



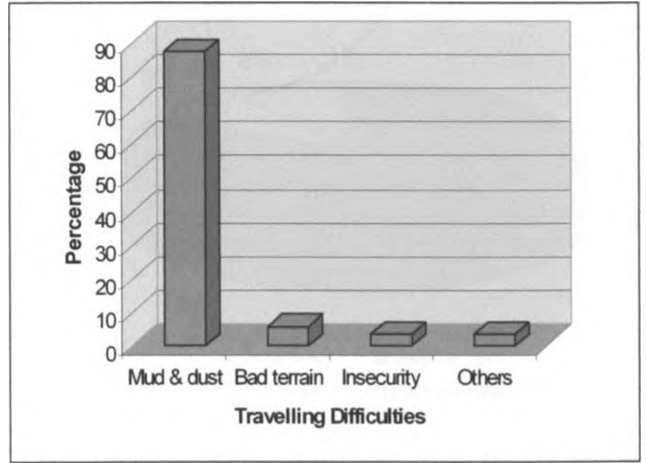
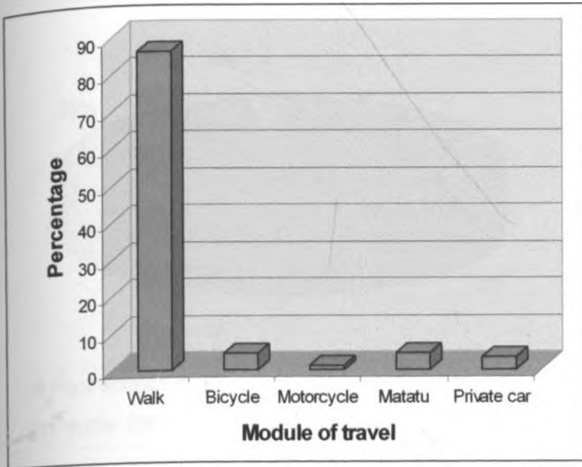
According to field survey as shown in Chart 3(a), 67% use kerosene fuel for lighting, 19% electricity and 2% use solar energy. 19% electricity connection is way above the national rate which stands at less than 10%.

Chart 3(b) shows 84% of the people, use firewood as a source of energy for cooking.

#### 4.1.5 Mode of travel to the main (Nkubu –Thuchi) road and Difficulties experienced while traveling

Chart 4(a): Mode of Travel

Chart 4(b): Travelling Difficulties

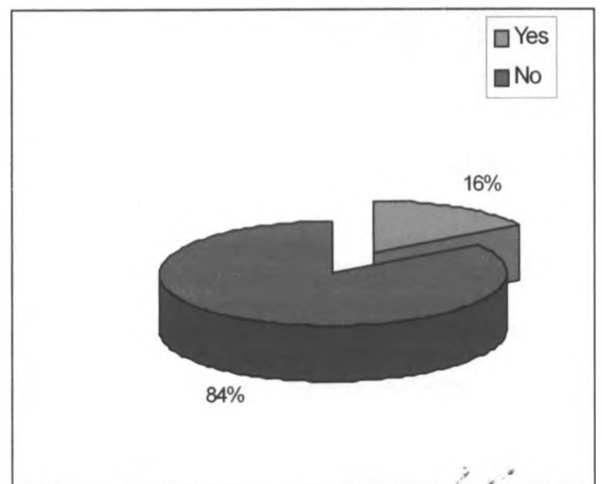
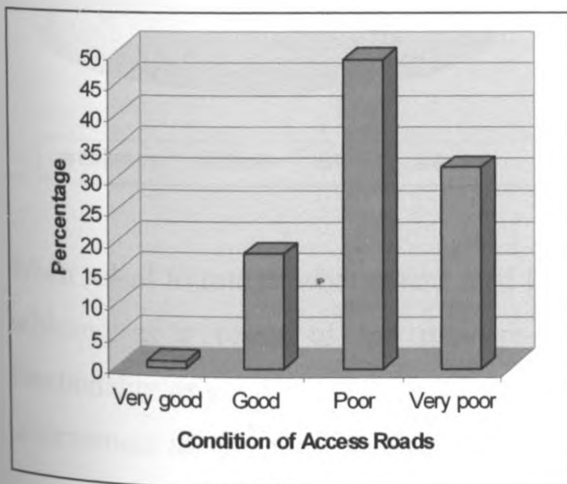


As shown in charts 4(a) and (b), field survey revealed that over 86% of the people within the study area walk to the main road with 88% giving the main difficulties experienced while traveling as mud in the rainy seasons and dust during the dry spells. When asked to comment on the condition of access roads to the main road, 81% rated them as poor and very poor (49% as poor and 32% as very poor) and 18% rated the access roads as good. 84% said that there is no availability of public transport in their locality (Charts 5(a) and (b) below).

#### 4.1.6 Condition of Access roads to the Main (Nkubu –Thuchi) road and availability of public transport

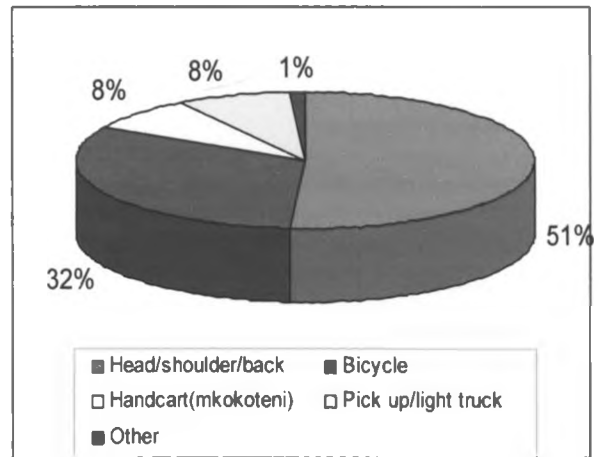
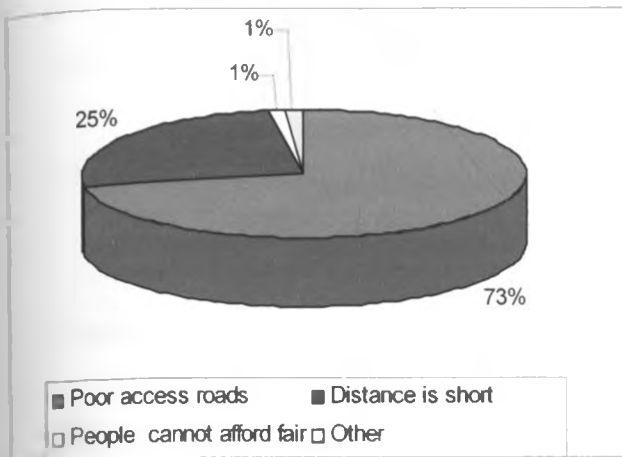
Chart 5(a): Condition of Access Roadshart

5(b): Availability of Public Transport



#### 4.1.7 Reason for Lack of Transport and Mode of Transport for Goods

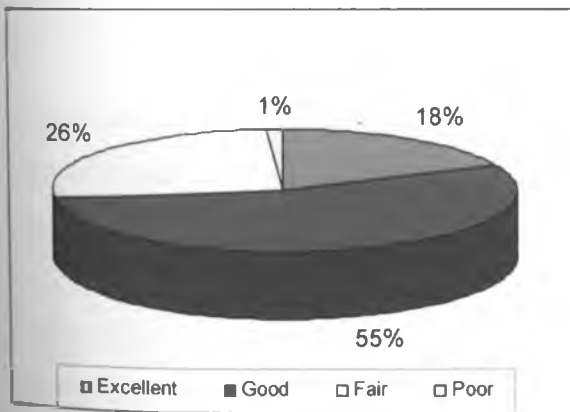
**Chart 6(a): Why lack of Public Transport**      **Chart 6(b): Mode of transport for goods**



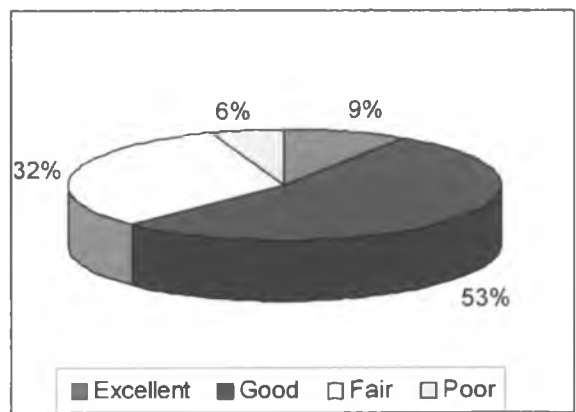
According to field survey, 73% of the respondents attributed lack of public transport to the main road to be due to poor access roads. 91% ferry their goods by means of non-motorized modes of transport (NMT) as shown in chart 6(b)

#### 4.1.8 Extent to which Road Functionality and Economic Activity have been achieved

**Chart 7(a): Road Functionality**



**Chart 7(b): Economic Activity**



When asked to rate to what extent road functionality and economic activities have been achieved as a result of the road re-alignment, 55% rated achievement of road functionality as good and 18% rated the functionality as excellent. About 26% rated the achievement as fair. On the other hand, 53% rated economic achievement as good, 9%

rated the achievement as excellent while 32% rated the achievement as fair. Thus, compared to the old road, the community's assessment of the functionality and economic achievements of the new road re-alignment and upgrading have been achieved at above 70% and 60% respectively.

#### 4.1.9 Advantages and Disadvantages of Nkubu –Thuchi Road Re-alignment

**Table 4.3(a): Benefits/Advantages**

<b>Benefits/Advantages</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Increased public vehicles; hence reduced travel time	53	60%
Increased land values	10	12%
Increased agricultural production	14	16%
Opening of new market centres	7	8%
Increased schools	2	2%
Increased social interaction	2	2%
<b>Total</b>	<b>88</b>	<b>100%</b>

Field survey found out that the main advantages the community feels have been brought by the road re-alignment are, increased public vehicles, 60%; increased agricultural production, 16% and increased land values, 12% (Table 4.3(a))

Table 4.3(b) shows the main disadvantages associated with the road re-alignment include; Increase in accidents, 33%; Loss of agricultural land taken away by the new road, 32% and Loss of business in bypassed market centres, 28%.

Mitigation measures suggested by the community are shown in Table 4.3(c). They include; improving old road and other access roads, 63%; planning and re-developing the

old markets, 19%; building more bumps to reduce accidents, 14% and providing better space for people to sell goods off the roads, 5%.

**Table 4.3(b): Disadvantages**

<b>Disadvantages</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Loss of agricultural land taken away by the new road	28	32%
Loss of business in bypassed market centres	25	28%
Increase in accidents	29	33%
Cut-off/displaced families	3	4%
Existing old road was neglected	3	3%
<b>Total</b>	<b>88</b>	<b>100%</b>

**Table 4.3(c): Mitigation Measures**

<b>Disadvantages to Advantages</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Improve old road and other access roads	54	63%
Plan and redevelop the old markets	16	19%
Build more bumps to reduce accidents	12	14%
Provide better space for people to sell goods off the roads	4	5%
<b>Total</b>	<b>86</b>	<b>100%</b>

## **4.2 Loss and Displacements/Social Impacts**

### **4.2.1 Loss of Valuable Agricultural land and Displacement of Families**

The re-alignment of Nkubu – Thuchi 60m-wide road for the 25Km stretch in Imenti South District consumed approximately 1.5Km<sup>2</sup> (150 hectares) of land. According to the District Agricultural Office, Meru, an ideal coffee tree produces 10kg/tree per year; hence 10 tons/acre but on average farmers get 5 tons/acre (Kiseve 2008, DAO's Office, Meru). Considering that the section of the road passed through a very high coffee productive zone, and assuming 50% (75Ha) of the land had been put under coffee, then at Kshs 27.00 per kilogram, the annual economic loss on coffee alone amounts to nearly Kshs 25 million to 35 million.

On the other hand, with a population density of nearly 400 persons per Km<sup>2</sup>, it can be argued that a total of 600 people or 120 families were displaced from within the road re-alignment reserve alone.

### **4.2.2 Displacement of Agricultural and Farming Activities**

According to field survey information, the road re-alignment passed through some farms severing them off into two separate and distinct portions. A case in point is the Kaguru Farmers Training Institute. Interview with the institute Principal revealed that the road re-alignment cut across the middle of the institute's land separating the school portion and the demonstration farm in addition to taking away three acres of the land (land reduced from 70 acres to 67 acres). As a result of the severance, tractors from the parking yard at the school portion have to drive more than a kilometre away to get to the farm portion. In addition, the new road opened the institution to accidents both for staff and animals. As a safety measure, the institution has improvised a safe pathway for the animals by laying a concrete slab through a culvert provided for a stream as shown in plate No.8 below. The culvert too serves as a tunnel to pass small farm tractors across the road. However, the pathway is usually wet, and impassable during rainy seasons.





**Plate 8:** Culvert improvised to serve as a tunnel for domestic animals and small farm tractors at Kaguru Farmers Training Institute  
*(Photo by Author, 2007)*

#### **4.2.3 Displacement of Learning and Other Institutions**

Information from field survey through interviews with various learning and other institutions namely; St. Mary's Girls High school, St. Lucy's School for the Blind, Igoji Teachers College, Kanyakine Boys High school, Ntharene Primary school, Kaguru Farmers Training Institute and Kanyakine District Hospital revealed that all (except Ntharene Primary school) had their entrances (gates) fronting the old road. With the new road re-alignment the institutions have been distanced from the main road and the access roads are very poor. Badly hit is St. Lucy's School for the Blind who have to guide their students all the way to the main road (a distance of 500m) when schools close and from the main road to the school during school opening days especially during rainy seasons. Equally hit are Kanyakine Boys High school who have to walk about 1.5Km through a bad road to the main road.



**Plate 8:** Culvert improvised to serve as a tunnel for domestic animals and small farm tractors at Kaguru Farmers Training Institute  
*(Photo by Author, 2007)*

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Plate 9(a) and (b) show the access roads into St. Lucy's and Kanyakine Boys respectively.



**Plate 9 (a) St. Lucy's School for the Blind, Igoji.**

Access from the new Nkubu – Thuchi main road is only about 500m long but it is impassable especially during the rains.

*(Photo by Author, 2007)*



**Plate 9 (b): Access Road to Kanyakine Boys High School.**

The access road is long (1.5Km) and impassable during rainy seasons for students, teachers and services to the school.

*(Photo by Author, 2007)*

#### **4.2.4 Road Re-Alignment and Moral Decay**

Information from field survey revealed that the new road has increased business, cultural and social interaction in the area with other communities from far and wide. These interactions have in turn broken the moral fabric of the local community. Of great concern is Ntharene market centre. As noted earlier, Ntharene was a local centre deep in the interior far away from the old road. The new road was both a surprise and excitement to the local people in the area.

Interview with the headmaster of Ntharene primary school, Mr. Julius Kithinji, revealed that the school has been affected negatively by the new road and especially the banana market at the roadside by the school fence. Students discipline has deteriorated due to influence from the moneyed traders; this has caused girl children dropouts due to early

pregnancies caused by child prostitution with the traders. The school's performance has deteriorated and a number of students rendered orphans after their parents have contracted HIV/AIDS or eloped with traders (especially single mothers). The school's fence is also continuously destroyed by the loads of bananas during market days. The moral decay aspect at Ntharene market was further collaborated during the interview with the Principal of Kanyakine Boys High school, Mr. Mwirigi and other roadside traders at the market.

**Plate 10(a): Ntharene Primary School**

The school fence is damaged by banana traders who pile bananas by the roadside next to the fence.

*(Photo by Author, 2007)*



**Plate 10(b): Bananas piled against the school fence**

On a market day, selling of bananas disrupts every other activity

*(Photo by Author, 2007)*



### **4.3 Impact on Market Centres**

According to Mayer and Miller (1984), the pattern of land use is influenced by the level of accessibility provided by the transportation system from one activity to another. Development of land for a particular land use results in generation of new trips originating from or attracted to the particular area or both. The contrary is also true. Bypassing an existing land use like a market centre reduces trips to and from the centre. This has a negative impact on business growth in the by-passed market centre.

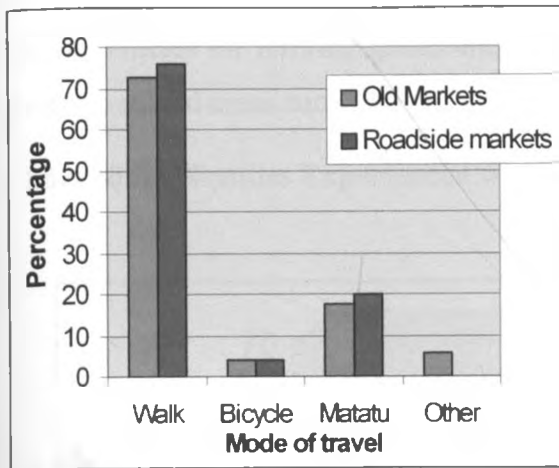
#### **4.3.1 Impact on Old (by-passed) and Roadside Market Centres**

Field survey was conducted on 76 respondents in the three market centres of Igoji, Kanyakine and Ntharene which included 51 respondents in the old markets and 25 respondents in the roadside market centres (in proportion to size of the centres). The survey was aimed at finding out the common mode of travel used by business community to their places of work; the difficulties experienced and how this is related to the re-alignment of the road; the types of business and business premises; the mode of transportation of goods and difficulties experienced; how the roadside developments have affected the old markets; and how the re-alignment of the road has affected economic growth in the old markets and roadside markets.

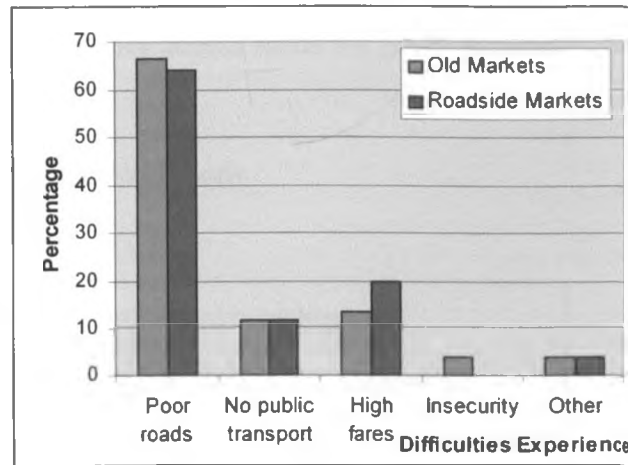
##### **4.3.1.1 Mode of travel and difficulties experienced**

According to the field survey as shown in chart No.8 below, 73% in the old market centres and 76% in the roadside centres walk to their places of work while 18% and 20% use matatus respectively. 67% of the respondents in the old markets and 64% in the roadside markets claimed that the main difficulties experienced as they travel to their work places is mud when rainy and dust when dry due to poor access roads as shown in Chart No.9 below. The poor access roads are also associated with lack of transport and high transport fares.

**Chart 8: Mode of Travel to Work Place**



**Chart 9: Difficulties Experienced while Traveling**



**4.3.1.2 Mode of Transportation of Goods and Difficulties Experienced**

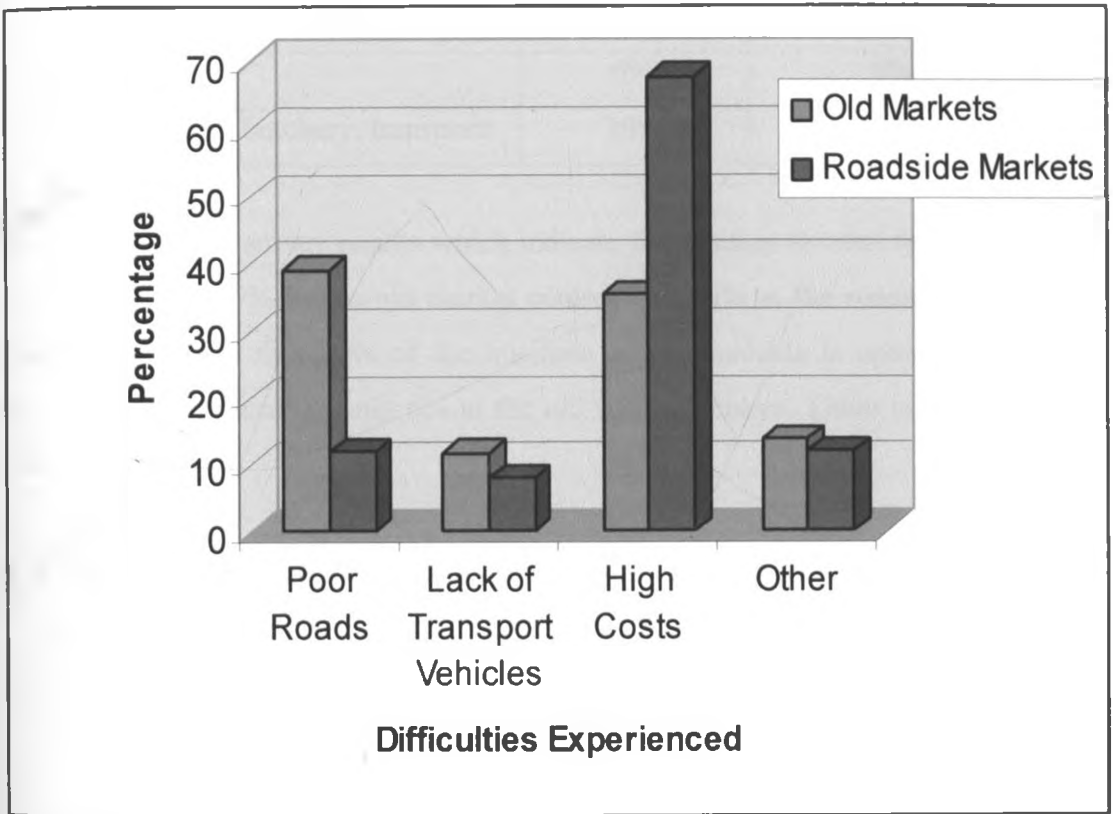
**Table 4.4: Mode of Transportation of Goods**

Mode of Transportation of Goods	Old Markets	Roadside Markets
Head/shoulder/back	18%	24%
Bicycle	27%	12%
Handcart(mkokoteni)	2%	0%
Light truck/pickup	39%	56%
Heavy truck(lorry)	8%	4%
Other	6%	4%

Table 4.4 shows field survey results which indicate that a total of 47% of the traders in the old market centres use non-motorized mode of transport to ferry their goods compared to 36% in the roadside markets. An equal 47% in the old market centres use vehicles compared to 60% in the roadside centres. The survey therefore shows that traders at the roadside centres have more access to motor transport than those in the old market centres. When asked what difficulties they experience while transporting their goods, traders in the old market centres rated poor roads as the greatest problem at 39% followed by high transport costs at 35% while traders at the roadside centres rated high

transport costs as the greatest problem at 68% with poor roads second at 12% (Chart.10). The high costs on transport of goods by roadside traders can partly be associated to their use of vehicles for ferrying goods and partly due to poor access roads for goods sourced from the inland areas such as bananas.

**Chart 10: Difficulties Experienced while Transporting Goods**



### 4.3.1.3 Type of Business

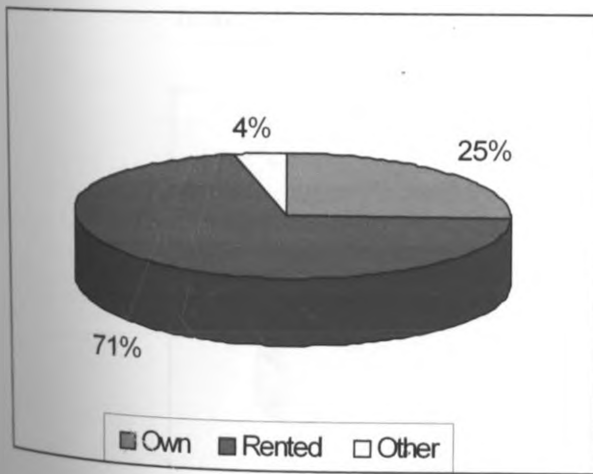
**Table 4.5: Type of Business**

Type of Business	Old Markets	Roadside Markets
Retail Shop	49%	56%
Wholesale Shop/Store	6%	0%
Open air Display/Temporary Kiosk	6%	20%
Hawking	0%	4%
Other (cobbler, butchery, transport)	39%	20%

Table 4.5 shows field survey results which indicate that trading at retail level is the main type of business at 49% in the old market centres and 56% at the roadside centres. Of importance to note is that 20% of the business at the roadside is open-air display or kiosks while this business is only 6% at the old market centres. There is no hawking at the old centres.

### 4.3.1.4 Type of Ownership of Business Premises

**Chart 11(a): Old Markets**



**Chart 11(b): Roadside Markets**

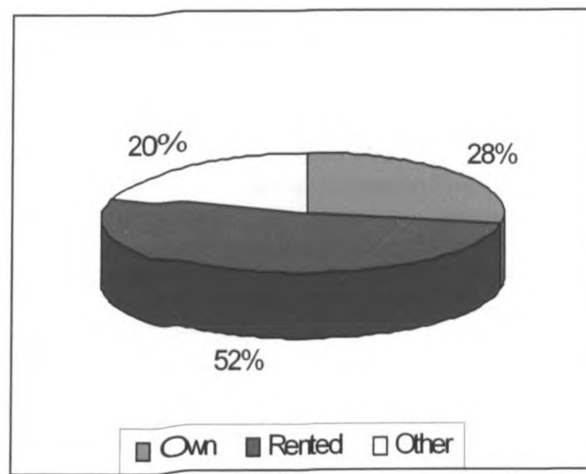


Chart 11 shows that majority of the traders both at the old market centres (71%) and roadside centres (52%) rent their business premises. Of significance to note is the 20% of the traders at the roadside market centres neither rent nor own their premises! This is



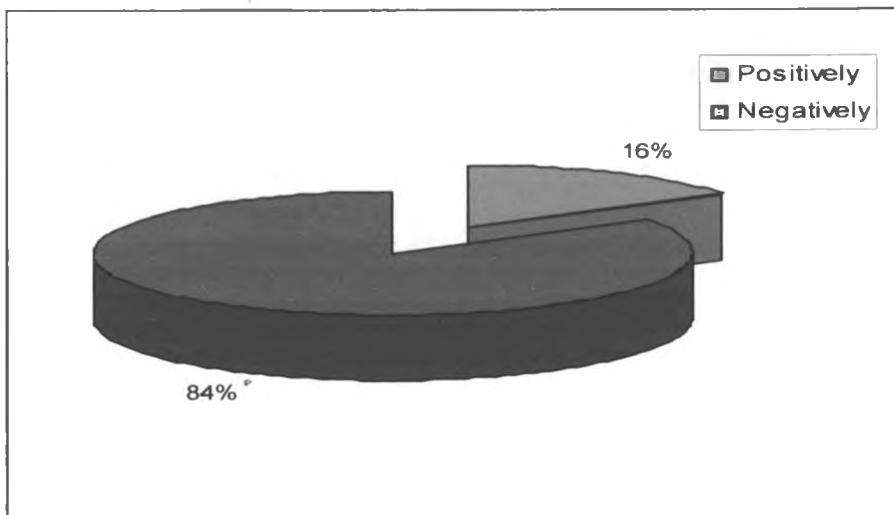
because these are the traders operating at the road reserves particularly at Ntharene market centre.

#### 4.3.1.5 Effect of Old Market Centres' by the Roadside Businesses

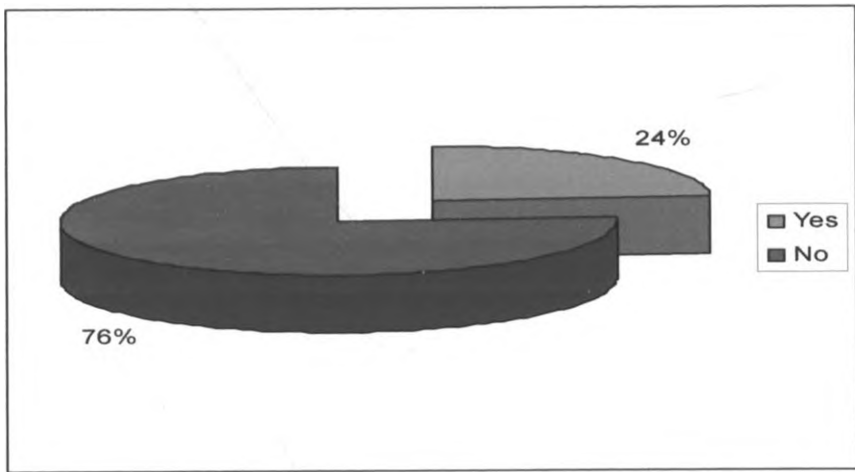
According to field survey as shown in chart No.12 below, 84% of the respondents interviewed in the old market centres said that roadside developments have affected their businesses negatively. They further claimed that traders operating shops at the roadsides premises do not pay land rent to the county council since they have put up their structures on freehold land while those at the old market centres have leases from the council. Hence there is no fair competition considering that the access roads to the old market centres are worse.

When the question was put to the roadside traders as to whether they would be willing to relocate to another “well developed site away from the roadside”, the response as shown in chart No. 13 was a resounding no!, at 76%. Many of those who responded no, claimed roadside business was vibrant and that they were satisfied with the returns while others claimed they have built their own premises after land subdivision.

**Chart 12: Whether Roadside Developments have affected Business in the Old Markets Positively or Negatively**



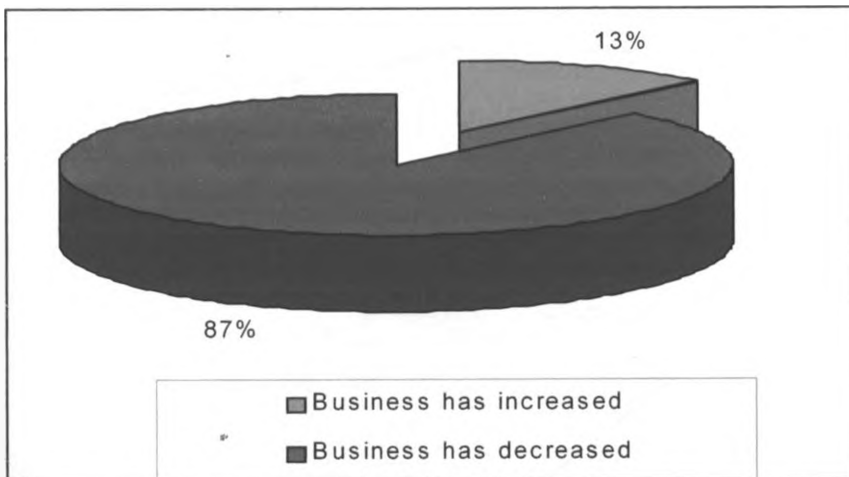
**Chart 13: Whether Roadside business community would like to move to another well developed site but away from the roadside.**



**4.3.1.6 Effects on Business in the Old Market Centres by the Road Re-alignment**

According to specific analysis performed on only respondents who operated their businesses in the old market centres before the road re-alignment, 87% claimed that the business has decreased after the market centres were bypassed upon road re-alignment (Chart No. 14).

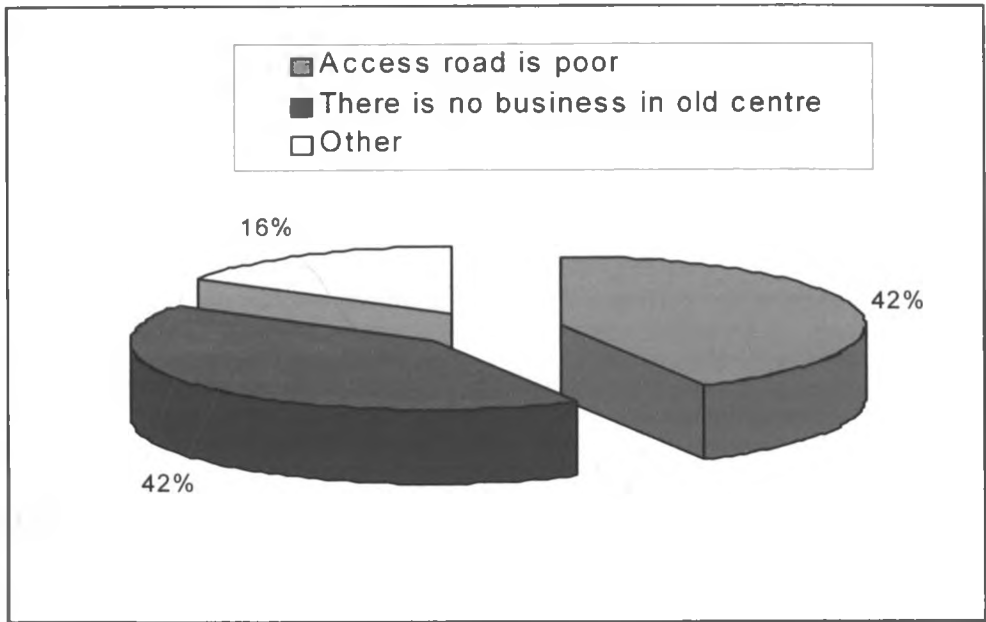
**Chart 14: Effect on Business in the Old Market Centres by the Road Re-alignment**



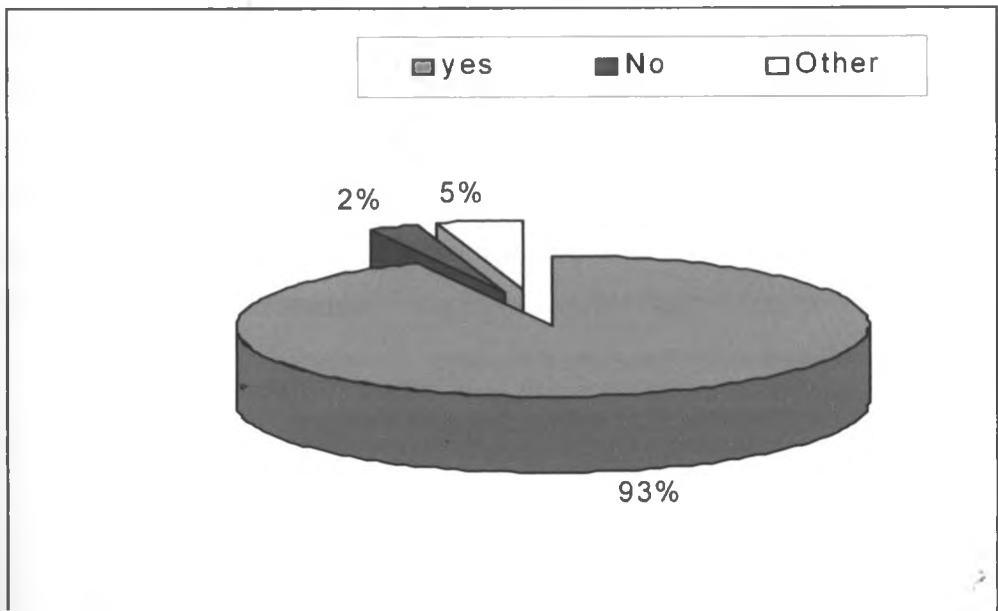
On the other hand, as shown in Chart 15(a), when drivers were asked why they do not like driving into the old market centres, 84% said it is because of poor access roads

(42%) and lack of business in the old centres (42%). Asked further whether they would drive into the old centres if the centres are well planned and developed with good roads, 93% replied affirmatively (Chart 15(b)).

**Chart 15(a): Why drivers decline to drive into the Old Market Centres**



**Chart 15(b): Drivers willing to enter (drive) into the Old Market Centres if the centres are well Planned and Developed with Good Access Roads**



#### 4.3.1.7 Old Market Traders Suggestions to Improve Business in the Old Market Centres

**Table 4.6: Old Market Traders Suggestions to Improve Business in the Old Market Centres**

<b>Suggestions</b>	<b>Respondents</b>	<b>Percentage</b>
Improve access and feeder roads	37	73%
Reduce taxation (council levies)	6	12%
Expand Nkubu – Thuchi road (to reduce accidents)	1	2%
Enforce traffic laws (to reduce accidents)	1	2%
Erect bumps near matatu stops (to reduce accidents)	1	2%
Resume open-air markets at the old market centres	1	2%
Build matatu stage	1	2%
Provide road furniture (to reduce accidents)	1	2%
Provide sanitation	2	4%
<b>Total</b>	<b>51</b>	<b>100%</b>

According to field survey as indicated in Table 4.6 above, when the respondents in the Old markets were asked to suggest what should be done by the government or local authority to boost their business, 73% suggested the access and feeder roads should be paved to make them all weather roads. This is a clear indication that the main cause of poor business in the old market centres is accessibility due to poor access roads which are mainly the sections of the old road.

### 4.3.1.8 Achievement of Road Functionality and Economic Activity by the Re-Alignment and upgrading of Nkubu –Thuchi Road

Chart 16(a): Road Functionality

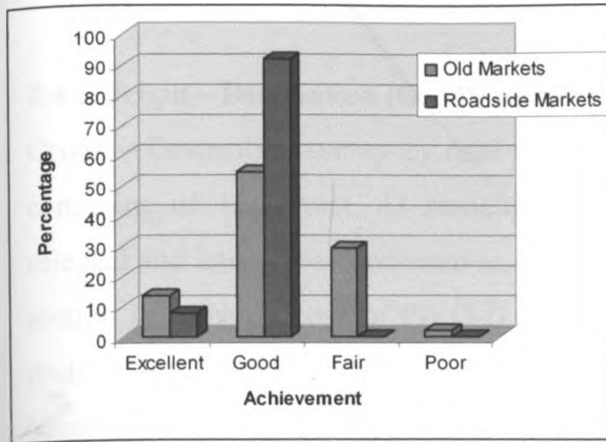


Chart 16(b): Economic Activity



When the question was put to the traders both in the old and roadside market centres to rate the achievement of Road Functionality and Economic Activity after re-alignment of the road, 100% (92% good and 8% excellent) of the respondents in the roadside centres and 63% (55% good and 14% excellent) rated the road functionality as good and excellent respectively as shown in Chart 16(a).

The achievement of economic activity was rated as 60% (56% good and 4% excellent) good and excellent by the roadside respondents and 72% (35% fair and 37% poor) fair and poor by the old market centres respondents as shown in Chart 16(b).

#### 4.4 Impact on Road Functionality

Nkubu \_ Thuchi road is classified as a class B road. Its main functionality therefore, in as far as road design is concerned, is to provide *mobility* (high speeds, reduced travel time, improved environment and smooth rider-ship) to *transit traffic*.

##### 4.4.1 Assessment of Accesses to Individual Parcels of Land Adjoining the Highway.

An assessment of accessibility to the highway for the adjoining parcels of land was observed along the length of the road within the study area. Findings showed that no grouping accesses or service roads were provided in the re-alignment of the road. In deed, there are as many accesses into individual parcels of land as there are number of land parcels.

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To further assess the road functionality, two types of field surveys were conducted:

- 1) Origin – Destination (O - D) surveys and;
- 2) Vehicle Counts and Categorization.

#### 4.4.2 Origin – Destination (O – D) Survey

Origin – Destination survey by road users was conducted on a total of 129 respondents consisting of 44 drivers, 43 passengers and 42 pedestrians. Interview sections were selected and interviews conducted as described in the research methodology discussed in section 1.9. The purpose of the O-D survey was to find out the respondents origin and destination of their journeys, frequency of their trips, purpose of traveling, the effects of bumps and roadside developments on their journey, and finally their general overall assessment of the achievement of the road functionality.

Analysis for drivers and passengers has been done simultaneously and separate from that of pedestrians.

#### 4.4.3 Analysis of Drivers and Passengers

##### 1. Number of Drivers Interviewed and Type of Vehicles

Table 4.7 shows the number of drivers interviewed and type of vehicles.

**Table 4.7 Number of Drivers Interviewed and Type of Vehicles**

Type of vehicle	No. of Respondents (Drivers)	Percentage
Private car	13	30%
Matatu	17	39%
Bus	1	2%
Light truck/ Pick-up	8	18%
Heavy truck[lorry]	4	9%
Other	1	2%
<b>Total</b>	<b>44</b>	<b>100%</b>

As shown in Table 4.7, majority of the drivers interviewed were matatu drivers at 39% followed by private car drivers at 30% and light trucks/pick-ups coming third at 18%.

To further assess the road functionality, two types of field surveys were conducted:

- 1) Origin – Destination (O - D) surveys and;
- 2) Vehicle Counts and Categorization.

#### 4.4.2 Origin – Destination (O – D) Survey

Origin – Destination survey by road users was conducted on a total of 129 respondents consisting of 44 drivers, 43 passengers and 42 pedestrians. Interview sections were selected and interviews conducted as described in the research methodology discussed in section 1.9. The purpose of the O-D survey was to find out the respondents origin and destination of their journeys, frequency of their trips, purpose of traveling, the effects of bumps and roadside developments on their journey, and finally their general overall assessment of the achievement of the road functionality.

Analysis for drivers and passengers has been done simultaneously and separate from that of pedestrians.

#### 4.4.3 Analysis of Drivers and Passengers

##### 1. Number of Drivers Interviewed and Type of Vehicles

Table 4.7 shows the number of drivers interviewed and type of vehicles.

**Table 4.7 Number of Drivers Interviewed and Type of Vehicles**

Type of vehicle	No. of Respondents (Drivers)	Percentage
Private car	13	30%
Matatu	17	39%
Bus	1	2%
Light truck/ Pick-up	8	18%
Heavy truck[lorry]	4	9%
Other	1	2%
<b>Total</b>	<b>44</b>	<b>100%</b>

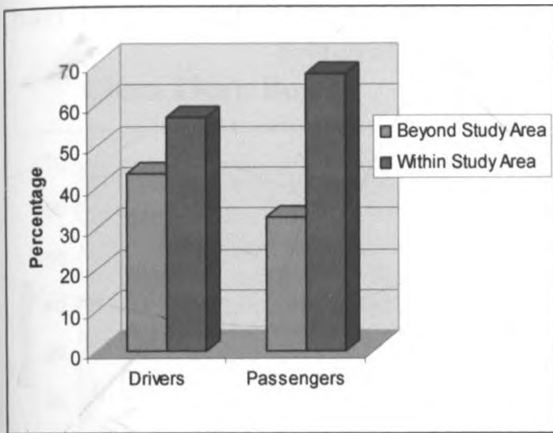
As shown in Table 4.7, majority of the drivers interviewed were matatu drivers at 39% followed by private car drivers at 30% and light trucks/pick-ups coming third at 18%.

## 2. Origin and Destination (O-D) of Drivers and Passengers

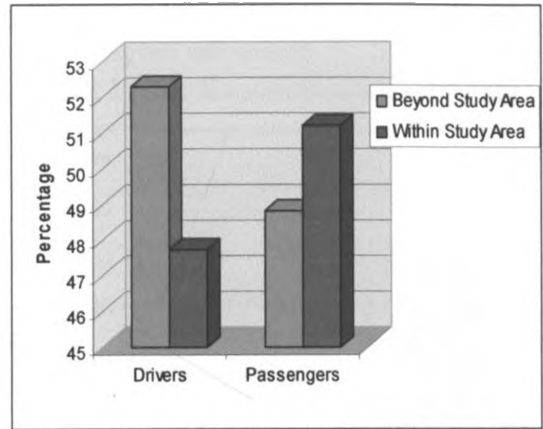
According to field survey as shown in Chart 17(a) below, 43% and 33% of the drivers and passengers respectively originated their journey beyond the study area while 57% drivers and 67% passengers started their journeys from within the study area. As shown in Chart 17(b), 52% of the drivers and 49% of the drivers and passengers ended their journeys beyond the study area while 47% and 51% of the drivers and passengers ended their journeys within the study area respectively.

**Chart 17(a) and (b): Origin & Destination (O-D) of Drivers and Passengers**

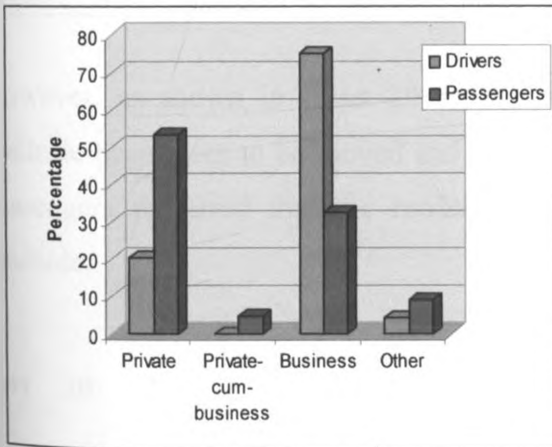
**Chart 17(a): Origin**



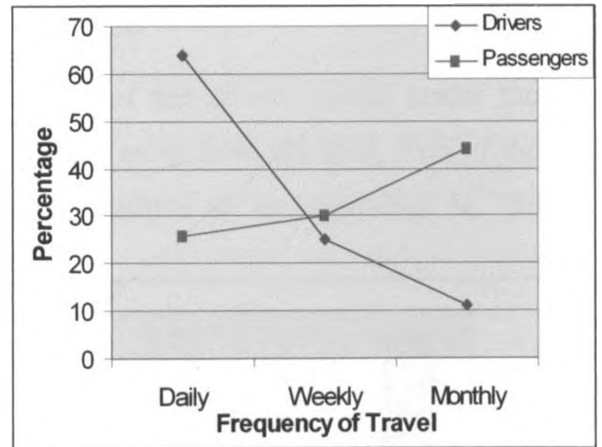
**Chart 17(b): Destination**



**Chart 18(a): Trip Purpose**



**Chart 18(b): Frequency of Travel**



According to field survey as shown in Chart 18(a), 75% of the drivers and 33% of the passengers travel for business purposes, and 21% and 54% on private affairs respectively.

As seen in Chart 18(b), 64%, 25% and 11% of the drivers travel daily, weekly and monthly respectively.



monthly against 26%, 30% and 44% of the passengers respectively. The graph shows an inverse relationship in terms of frequency of travel between drivers and passengers.

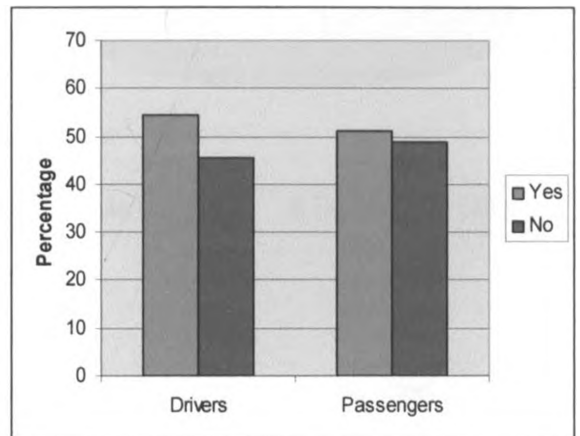
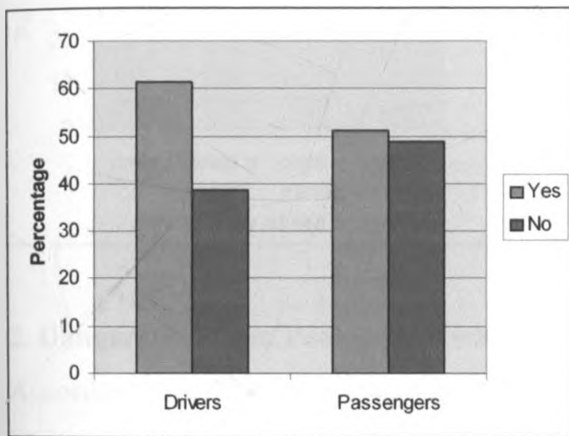
#### 4. Effect of Bumps and Roadside Developments on Drivers and Passengers

When the question was put both to the drivers and passengers as to whether bumps and roadside developments affect their smooth drive/ride adversely, 64% drivers and 51% of the passengers as shown in Chart 19(a) said they were affected by the bumps, and 55% of the drivers and 51% of the passengers said they were also affected by the roadside developments (Chart 19(b)).

**Chart 19(a) and (b): Whether Bumps and Roadside developments affect the smooth drive/ride for drivers and passengers adversely**

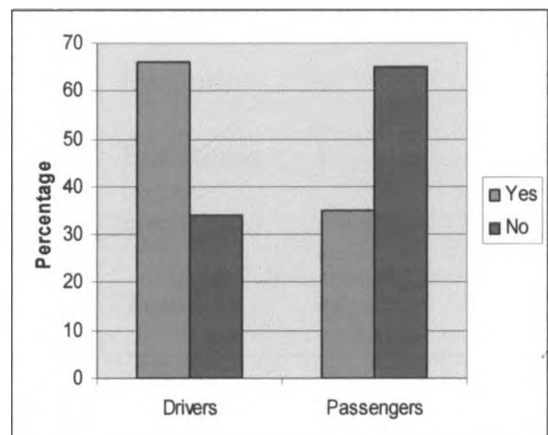
**Chart 19(a): Bumps**

**Chart 19(b): Roadside developments**



However, as shown in Chart 20 below, while 66% of the drivers would prefer the roadside businesses to be moved and conducted further away from the road, 65% of the passengers preferred that the roadside businesses continue to be conducted by the roadside.

**Chart 20: Percentage of drivers and passengers who would prefer that roadside businesses be moved and conducted further from the road**

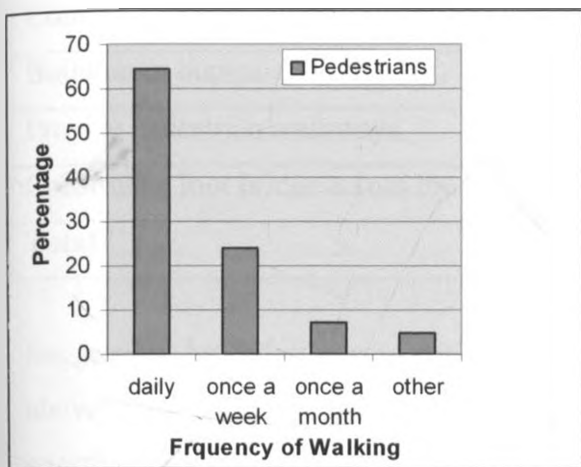


#### 4.4.4 Analysis of Pedestrians

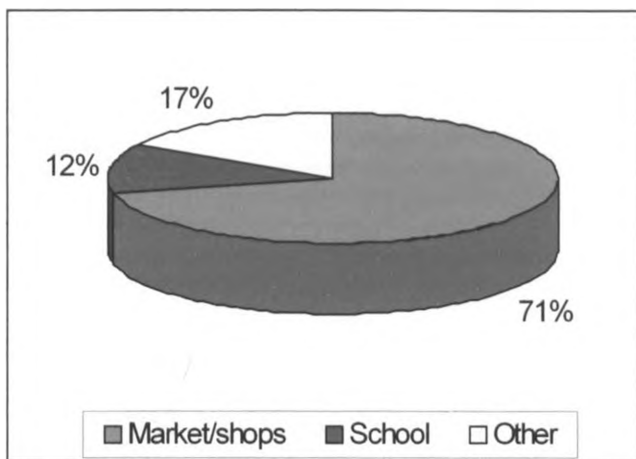
##### 1. How often pedestrians walk along Nkubu – Thuchi Road

Chart 21(a) below shows 64% of the pedestrians interviewed walk daily and 24% weekly along Nkubu – Thuchi road. About 71% walk to the markets and shops, 12% to school and 17% to various other places (Chart 21(b))

**Chart No. 21(a): How often pedestrians walk along the road**



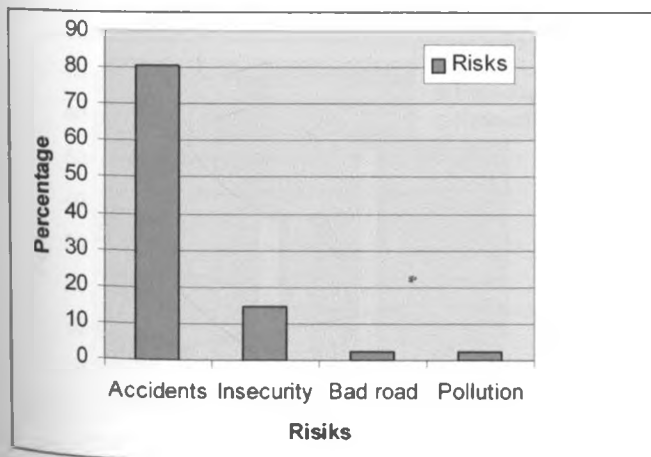
**Chart 21(b): Where they walk to**



##### 2. Dangers/Risks on Pedestrians while Walking

According to field survey as shown in Chart 22 below, 80% of the pedestrians sited fear of accidents and 15% insecurity as the main risks while walking.

**Chart 22: Dangers/Risks while walking**



Risks	Respond	%age
Accidents	33	80%
Insecurity	6	15%
Bad Roads	1	2%
Pollution	1	2%
<b>Total</b>	<b>41</b>	<b>100%</b>

### 3. Mitigations to reduce Risks as suggested by Pedestrians

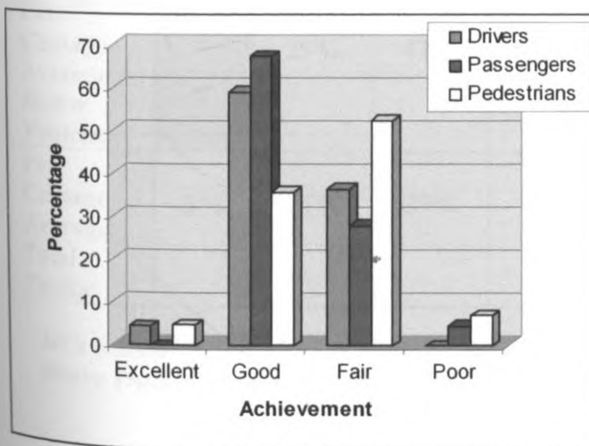
**Table 4.8: Mitigations suggested by pedestrians to reduce risks while walking**

Mitigations to Reduce Risks	Respondents	Percentage
Plan and develop a new market centre away from the road	3	9%
Improve the service and access roads into the old market centres	11	31%
Construct a by-pass for through traffic	9	26%
Build more bumps	7	20%
Provide pedestrian walkways	8	23%
Construct a foot bridge across the highway	3	9%
<b>Total</b>	<b>35</b>	<b>100%</b>

Suggestions by pedestrians to mitigate against risks while walking as shown in table 4.8 above include, improving the service and access roads into the old market centres, 31%; constructing a by-pass for through traffic 26%; providing pedestrian walkways 23% and building more bumps, 20% among other suggestions.

#### 4.4.1.5 Achievement of Road Functionality and Economic Activity after the re-alignment and upgrading of Nkubu –Thuchi road as assessed by Drivers, Passengers and Pedestrians

**Chart 23(a) Road Functionality**



**Chart 23(b) Economic Activity**



Field survey, as shown in Chart 23(a), shows that road functionality was achieved satisfactorily, with drivers rating the achievement at 64%, passengers 67% and pedestrians rating the achievement at 50%. On the other hand, Chart 23(b) shows the economic activity achievement rating as 50% by drivers, 49% by passengers and 41% by pedestrians, giving it a rather fair-to-poor rating.

#### 4.4.5 Vehicle Count and Categorization

##### 4.4.5.1 Keeria – Nkubu Road Section

**Table 4.9: Average Daily Vehicle Count and Categorization**

CENSUS POINT	TYPE OF VEHICLE							TOTAL MOTOR VEHICLES	TOTAL TRAFFIC
	MCs	CAR (< 7 passenger private vehicle)	MB/V (7 – 25 passenger vehicle & Matatu)	BUS (> 25 passengers)	PU & LT (<7tons)	L & HTs (7 tons & more)	(NMT) (Bicycles, handcarts, Animal carts etc)		
Thingithu Bridge	66	816	1,202	64	500	243	191	2,825	3,082
Igoji Junction	45	468	679	59	229	169	33	1,604	1,682
Maara Bridge	68	484	692	56	242	195	124	1,669	1,861
Average Total Daily Traffic	60	589	858	60	324	202	116	2,033	2,209
Per Centage Average Motor Vehicles		29%	42%	3%	16%	10%		100%	
Per Centage Average Total Traffic	3%	27%	39%	3%	15%	9%	5%		100%

*MCs – Motorcycles; MB/V – Minibus/Van; PU & LT – Pick-Up and Light Truck; L & HTs – Lorries and Heavy Trucks; NMT – Non-Motorized Traffic*

Table 4.9 above shows vehicle count and categorization carried out over a seven-day period (May 4<sup>th</sup> 2008 – May 10<sup>th</sup> 2008). The counts were taken for twelve hours (6am – 6pm daily) at the census points located at Thingithu River bridge at Nkubu town, Igoji junction and Maara River bridge at Keeria market centre.

The survey shows that Thingithu census point has about 43% and 41% more vehicles than Igoji and Maara census points respectively. This high vehicle density at Thingithu (Nkubu) can be attributed to the traffic movement between Nkubu town and Meru town. Nkubu town is a much bigger urban centre than Igoji and Kanyakine centres.

As seen from the table, the Average-Daily-Daytime-Traffic (ADDT) along Nkubu – Thuchi road within the study area/Imenti South district is 2,033 vehicles, 60 Motorcycles and 116 Non-Motorized Traffic (NMT). A count of 2,033 ADDT is a high density count for a rural road.

Excluding motorcycles and NMTs, Minibuses/mataus are the highest in number, at 42%, followed by cars at 29%. The high number of minibuses/matatus affirms the survey on drivers, majority (75%) of who responded that their trips are for business. The relatively high number of pick-ups/light trucks and lorries at 26% (combined 16% & 10%) signifies the fact that there is quite some substantial cargo movement along Nkubu – Thuchi road. Assessment of the total traffic shows motorcycles accounting for 3% and NMTs for 5%. Minibuses/Vans (Matatus) still lead in total traffic at 39% followed by cars at 27% and Pick Ups/Light trucks at 15%.

#### **4.4.5.2 Igoji and Kanyakine Markets: Inbound and Outbound Vehicle Count and Categorization**

Vehicles moving into the market centres from the main road (Inbound) and those joining the main road from the market centres (Outbound) were counted over a seven-day period from 6.00am to 6.00pm (May 4<sup>th</sup> 2008 – May 10<sup>th</sup> 2008).

Table 4.10 shows the total (Inbound and Outbound) Vehicle Counts and Categorization for Kanyakine and Igoji market centres.

**Table 4.10: Average Vehicle Count and Categorization - Igoji and Kanyakine Market Centres**

MARKET CENTRE	TYPE OF VEHICLE							TOTAL MOTOR VEHICLES	TOTAL TRAFFIC
	MCs	CAR (< 7 passenger private vehicle)	MB/V (7 – 25 passenger vehicle & Matatu)	BUS (> 25 passengers)	PU & LT (<7tons)	L & HTs (7 tons & more)	(NMT) (Bicycles, handcarts, Animal carts etc)		
Igoji	43						182		362
		58	9	3	47	19		137	
Kanyakine	25						123		354
		86	42	3	51	24		206	
Average Total Daily Traffic	34						153		358
		72	26	3	49	22		172	
Percentage Motor Vehicles		42%	15%	2%	28%	13%		100%	
Percentage Total Traffic	9%	20%	7%	1%	14%	6%	43%		100%

The survey shows an ADDT of 172 motor vehicles ply in and out of Igoji and Kanyakine market centres as opposed to 2,033 vehicles on the Nkubu - Thuchi highway. Excluding motorcycles and NMTs, 42% of the vehicles are cars as opposed to 29% on the highway, followed by pick-ups and light trucks at 28% compared to 16% on the highway, minibuses and vans at 15% compared to 42% on the highway and lorries and heavy trucks at 13% compared to 10% on the highway. The majority of cars are for private persons going to the various institutions (mainly teachers) and others to their homes. The small percentage of minibuses and Vans (15%) confirms survey on drivers, 75% of who said their trips are for business (mainly matatus), but with 84% responding that they do not drive into the old market centres due to poor access roads and minimal business. The high number of pick-ups and light trucks (28%) signifies delivery of goods from the inlands to the highway.

Assessment of total traffic (including motorcycles and NMTs) shows that 43% of the total traffic is NMT as opposed to only 5% on the highway. Likewise, motorcycles are three times more than on the highway (9% and 3% respectively). The very high percentage of NMTs confirms poor state of access roads demonstrated by the earlier surveys on households, market centres and road users. Household survey, for example showed that 91% of the respondents ferry their goods to the main road by use of NMTs (Chart 6(b) page 107).

#### **4.5 The Chief Engineer (Roads), the Executive Director of Kenya Roads Board and the District Physical Planning Officers' views on Road Re-Alignments**

##### **4.5.1 The Chief Engineer (Roads)**

On control of accesses onto the highways, the Chief Engineer suggested that an effective way is to incorporate other line ministries through an Inter-Ministerial Management Committee. On Roadside developments the engineer said that the enforcement is done through the Traffic Act, Cap 403 but the main difficulty is control of unauthorized developments. On role of physical planners in road re-alignment and upgrading, he said that planners' role is corridor demarcation. However, he agreed that there is need for multi-disciplinary project feasibility studies approach to road planning but little time is allowed for such consultations. On environmental impact assessments on road projects, the engineer was of the view that these do not add any value to the design and development of highways in Kenya, "since we are a developing country and in some places there are no roads which can facilitate economic development". On policy of providing all-weather access roads into market centres along a highway corridor, the engineer said this is a good policy and the access roads can be provided if funds are available. The engineer claimed that good roads do not contribute to accidents but they contribute to carelessness by drivers, who then cause accidents. However, he suggested that there is need for provision of pedestrian walkways to minimize accidents.

#### **4.5.2 The Executive Director of Kenya Roads Board**

According to the Executive Director, the main role of Kenya Roads Board is to oversee the road network in Kenya and coordinate its maintenance, rehabilitation and development.

The director said that there is no clear policy to ensure that roads leading to the market centres and other social facilities be developed, but Kenya Roads Board has issued key guidelines to road agencies that these roads should be given priority in road maintenance. He suggested that “the government should enact a deliberate policy of redeveloping roads from the main highway through the ‘dead’ market centres; and that these roads should be good and attractive to make road users use them”. The Director was of the view that a participatory approach to road planning should be embraced where, “before a road has been developed, all key players be involved in order to add value to the development plan”. To reduce accidents and maintain road functionality, the director suggested separate-grade junctions and pedestrian foot paths.

#### **4.5.3 The District Physical Planning Officer**

The planner said his main role in the district is “to prepare urban, regional and land use plans for the district and ensure compliance to the same”. However, he said that planners are not consulted during the planning and design of classified roads including road re-alignments, because, in his opinion, road engineers believe that road planning and design is an engineering issue; but which is wrong because it impacts on urban and regional land use systems to a big extent. As a planner, he said that the role he can play in determining the re-alignment of a road is growth re-direction, aesthetics of the re-alignment, safety and optimal land utilization, economic and social considerations and environmental impacts thereof. In order to ensure that by-passed market centres do not “die” but maintain sustainable growth, the planner suggested that upgrading of the roads to the market centres be done and control of urban spread along the new road through strict development control systems.

The planner agreed that there is need for collaboration between the departments of roads and physical planning and further suggested that the same collaboration be extended to



the respective professional bodies. From the planning point of view, the planner said that there is no policy with respect to highway planning. He suggested that this should be done to integrate road engineering and planning.

On access control onto the highways, the planner said this is the role of the road engineers but he suggested that if the two departments of roads and physical planning were well coordinated, direct entries could be minimized.

## CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

### 5.1 Summary of Findings

#### 5.1.1 The Road Design Manual, The Kenya Roads Act, 2007 and The Nkubu – Thuchi Road Feasibility Study

The design manual classifies roads in Kenya into seven classes (A-E) mainly based on connectivity. However, in terms of mobility and accessibility for economic and social considerations, the seven classes are grouped into three. Class A and B for mobility focusing mainly on economic returns; class C and D for both mobility and accessibility to combine economic and social gains and class E for accessibility on social considerations. Nkubu-Thuchi road being a class B road has its main purpose as that of providing mobility mainly for transit traffic and focusing on economic gains. This in essence means that accessibility for social considerations is not of much consequence in this class of roads. In deed, the Terms of Reference for the Nkubu – Thuchi Road Feasibility study required, first and fore most that the study be carried out to evaluate the economic worth of the project with regard to benefits which would arise from reduced vehicle operating costs and maintenance costs, and secondly, additional benefits, especially those related to agricultural development which may arise from the execution of the project.

The manual further provides for access control to preserve major roads as high standard traffic facilities by either careful location of accesses, grouping accesses or by constructing service roads. However, the Nkubu – Thuchi Road Feasibility Study and designs provided for junctions to be tarmacked only for 20m as a measure to prevent wearing off of the main road; there was no provision for grouped accesses or service roads.

The Kenya Roads Act (2007) on the other hand provides for accommodation works (access facilities or other works) for the benefit of the owners and occupiers of lands adjoining those on which the road is constructed.

Field survey has shown that there is no access control along Nkubu –Thuchi road as required by the manual; rather, there are as many access points as there are parcels of land fronting the highway. While this would be in conformity with the Kenya Roads Act (provision of accommodation works), it is in contravention with the requirements of the Road Design Manual for highways.

### **5.1.2 The Physical Planning Act, CAP 286; The Physical Planning Handbook, and The Road Design Manual**

The Physical Planning Act only refers to (rural) transportation as part of the provisions to be considered as a matter which may be dealt with at policy level in the preparation of the Regional Physical Development plans. Transportation is not considered as part of the matters to be dealt with at analysis level unlike population and human settlement pattern trends, land potential and land values, land tenure and natural resource endowments, employment and income characteristics, growth and pattern of urbanization, and rural-urban migration patterns among others.

The Physical Planning Handbook on the other hand, virtually says nothing about planning for rural roads save for duplicating the road widths provided for in the Road Design Manual.

The Road Design Manual on its part provides for consultations with physical planning authorities in order to co-ordinate road projects with existing and proposed land uses and to protect the selected route from conflicting development in as far as land use and road design are concerned.

### **5.1.3 Impacts on the Old Market Centres and Road Functionality**

Field survey and studies have shown that the main impacts of the re-alignment of Nkubu – Thuchi Road on the originally existing market centres which were by-passed, are poor access roads leading from the “new” main road into the old markets; poor service roads within the old market centres and business competition from the roadside developments and road reserves. About 87% of the respondents who operated their businesses in the old

market centres before the road re-alignment claimed that the business has decreased after the market centres were by-passed. Another 84% of the respondents operating in the old market centres said the roadside developments have affected their businesses negatively. About 84% of the drivers interviewed said they do not like driving into the old market centres due to poor access roads and also because there is no business at the centres. About 93% of the drivers however, responded that they would drive into the old market centres if the centres are well planned and developed with good roads.

On Road functionality, the main impacts are roadside developments especially businesses being operated on the road reserves. About 64% of the drivers and 51% of the passengers interviewed said they were affected adversely by the bumps. Another 55% of the drivers and 51% of the passengers said they were affected by the businesses operated at the roadside developments. Indeed 66% of the drivers preferred that roadside businesses be moved and conducted further away from the road.

Another dimension of road functionality is accidents. About 80% of the pedestrians interviewed said the greatest danger/risk while walking along the “new” road is fear of being run-over by speeding motorists since there is no provision for pedestrian footpaths.

#### **5.1.4 Impact on Other Road Users**

Studies further revealed that, not only the old market centres are affected by poor access roads due to the road re-alignment. The local community, learning institutions and other institutions are equally affected. About 81% of the household survey respondents (local community) rated the access roads from their homes to the main road as poor and very poor. About 73 % attributed the lack of public vehicles to the main road due to poor access roads; 91% ferry their goods to the main road by use of non-motorized mode of transport (NMT) with 51% using head or shoulder or back.

Interviews with learning institutions by-passed by the road re-alignment expressed concerns at the deteriorated state of the old road which still serves as the main access to the institutions.

### **5.1.5 Impact on Kaguru Farmers Training Institute**

Kaguru Farmers Training Institute for example had its land severed off into two portions by the “new” road and today they have had to improvise a culvert as a tunnel for their animals and small farm tractors. The entrance to the Institute was also misplaced far away from the main road.

### **5.1.6 Impact on Ntharene Primary School**

The businesses conducted on the road reserve against the school fence especially banana-trading at Ntharene market centre has impacted very negatively on the school, including moral degradation of the students.

## 5.2 Conclusion

The road to development begins with the development of a road. Roads are agents of change. The change is always intended to be positive, but a road can also impact adversely. Positive change stimulates development and contributes to poverty reduction. Poorly designed, built and maintained roads are unsustainable and consequently they become an economic burden to everyone.

The study has shown that there is lack of harmony between the Road Design Manual and the Kenya Roads Act, 2007 mainly with respect to provision and control of accesses to properties adjoining a highway. The study too has shown lack of strong recognition of transportation both in the Physical Planning Act and the Physical Planning Handbook.

On Nkubu-Thuchi Road re-alignment and upgrading the study has shown that much as the road functionality (increased speeds, reduced travel time, increased motor vehicles and smooth rider-ship) was achieved quite satisfactorily, the re-alignment also impacted negatively on the old market centres whose businesses deteriorated after they were by-passed by the new road. The study further showed that the main contributors to business deterioration at the old market centres are poor access roads from the main tarmac road into the market centres and service roads within the centres on one hand, and competition from the roadside developments on the other hand.

On road functionality the study showed that bumps, roadside developments/businesses conducted on the road reserves affect the road functionality adversely. Roads cannot be built where people have built on roads.

Other impacts of re-alignment and upgrading of the road include; business, social and cultural interactions between various communities, and impact on the environment. The business, social and cultural interactions may adversely impact on the cultural and social fabric of the local communities resulting to some degree of moral degradation. On the other hand, the environment through which the road passes too can be adversely affected

due to severance of the ecosystem (the vegetation, the wetlands, and the topography among others).

To address the adverse impacts, the study concludes that there is need for specific recommendations to mitigate on specific impacts, and policy recommendations to address long term measures.

## 5.3 Recommendations

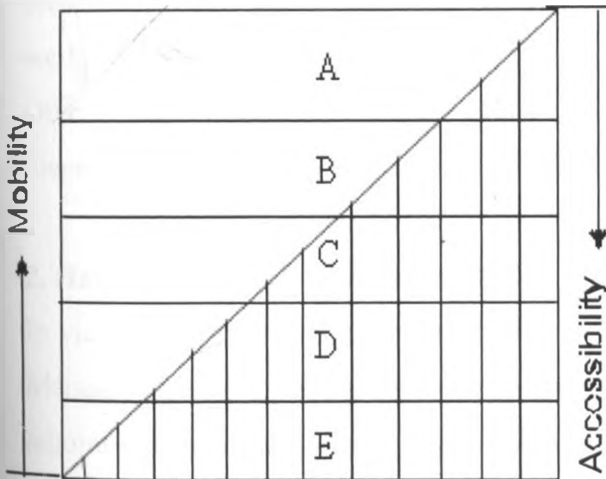
### 5.3.1 Policy Recommendations

#### 1. Review of the Road Design Manual

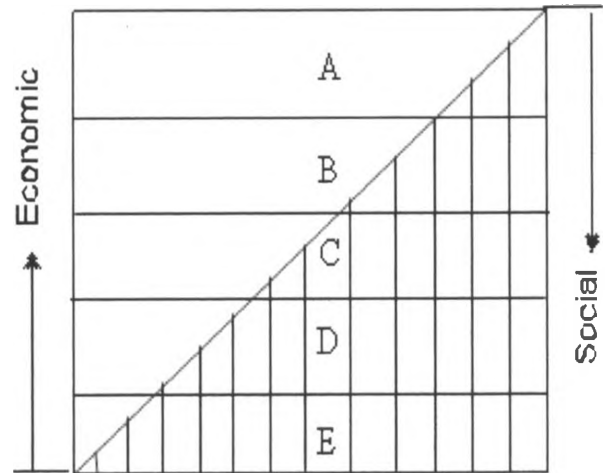
No economic gain is worth, without the social satisfaction. Likewise, no social satisfaction can be achieved without an economic input. It is therefore recommended that the Road Design Manual be reviewed to incorporate some degree of accessibility for social aspects in class A and B roads, and likewise some degree of mobility aspects for economic gains in class E roads. Figure 5.1(a) and (b), and Table 5.1 show the proposed recommendations with respect to mobility vis-à-vis accessibility / economic vis-à-vis social aspects.

**Figure 5.1 (a) and (b): Proposed Mobility/Economic vis-à-vis Accessibility/Social Considerations**

**(a) Mobility Vs Accessibility functional considerations**



**(b) Economic Vs Social considerations**



Source: Author, 2008



**Table 5.1: Current Status and Proposed Road Classification Functional Considerations**

Road Classification	Current Status		Proposed Recommendations	
	Mobility/Econ (Percentage)	Access/Social (Percentage)	Mobility/Econ (Percentage)	Access/Social (Percentage)
<b>A</b>	100%	0%	90%	10%
<b>B</b>	100%	0%	70%	30%
<b>C</b>	75%	25%	50%	50%
<b>D</b>	25%	75%	30%	70%
<b>E</b>	0%	100%	10%	90%

However, it should be clearly noted that the level of accessibility and social considerations on high class roads recommended should not in any way conflict with the intended functionality of the highway but rather complement the same. For example, providing a safe tunnel for Kaguru Farmers Training Institute to pass their animals as well as protect the stream would be one level of such accessibility/social functionality. Others could include provision of stand-pipes for water sources severed off; schools and dispensaries; and rest rooms among other social facilities.

## **2. Harmonization of The Kenya Roads Act, 2007 and The Road Design Manual**

In view of the likely contradiction between The Kenya Roads Act and The Road Design Manual particularly in as far as provision vis-à-vis control of accesses to properties adjoining highways is concerned, it is recommended that the Kenya Roads Act 2007 and the Road Design Manual should be reviewed and harmonized.

## **3. Review of the Physical Planning Act, CAP 286 and the Physical Planning Handbook**

Considering the characteristic of transportation as a need, a service, a process and an economic activity that drives other economies to grow, there is need to revise the First

Schedule of the Physical Planning Act to consider transportation at both the Analysis Level and the Policy Level.

The Physical Planning Handbook should also be revised to incorporate the consultative provisions provided for in the Road Design Manual in as far as land use and road design is concerned and to further give clear guidelines concerning roadside developments and control including land subdivisions and change of user (where need be).

### **5.3.2 Specific Recommendations**

1) Access roads leading from the main (Nkubu – Thuchi) tarmac road into the old market centres, and service roads within the centres as well as those leading to various institutions should be paved, preferably with an asphalt (tarmac) surface finish. Other access roads should also be improved to at least all-weather gravel standards.

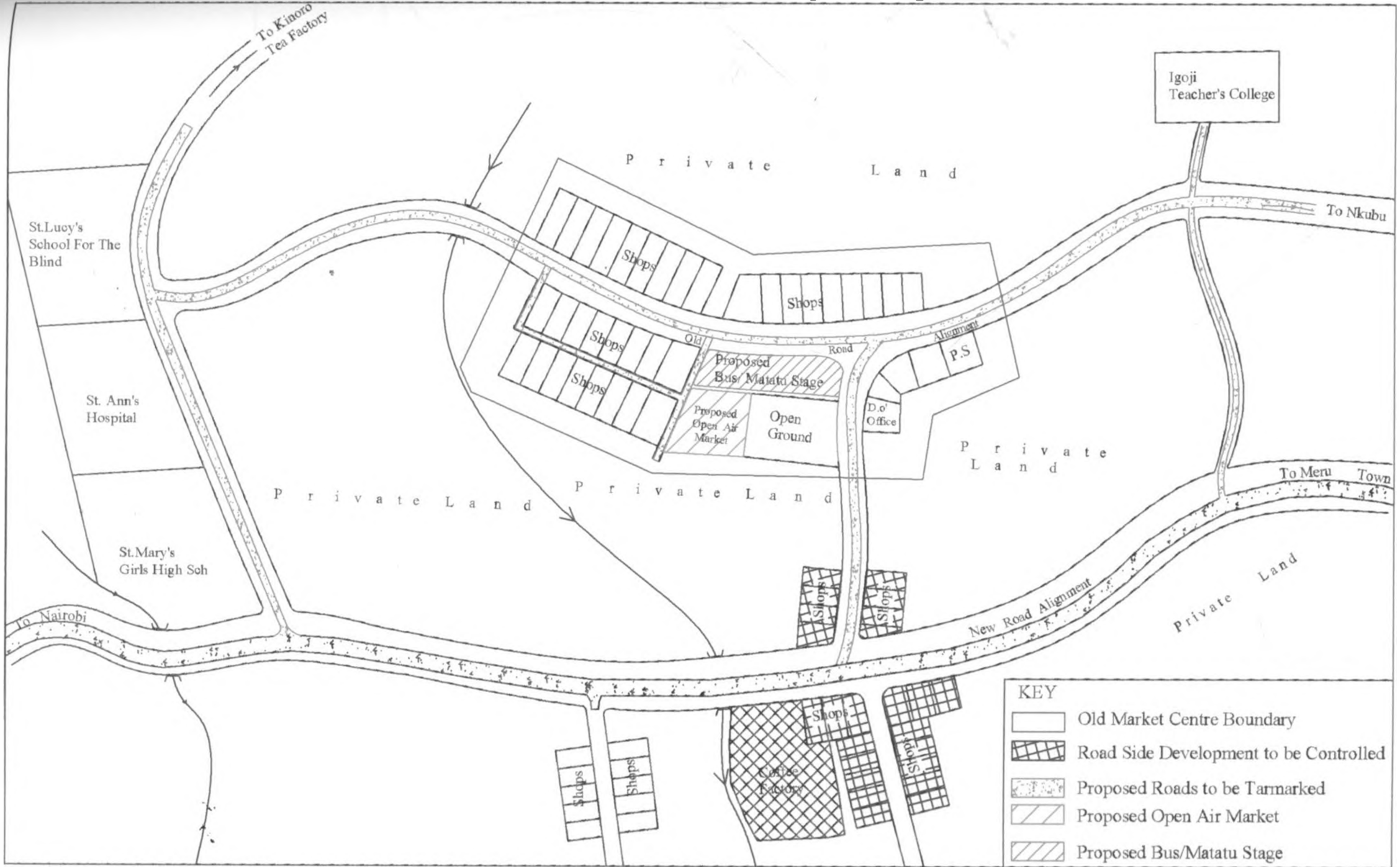
In the case of Igoji urban centre, the paved roads should cover the 1.5km access road from the main road to the old Igoji shopping centre, about 200m of service roads within the centre and about 3.5km of the old road loop starting from the junction with the new tarmac road at St. Mary's Girls secondary school, through St. Ann's hospital and St. Lucy's School for the Blind, then through the old shopping centre and connecting to Igoji Teachers college and back to the main tarmac road (Figure 5.2 page 144)

In the case of Kanyakine urban centre, it is recommended that the roads to be upgraded to asphalt surface finish should include; part of the old road from the junction with the "new" main road towards Nairobi, through the Catholic Mission Centre and Kanyakine District hospital; then through the market centre and all the way to Kanyakine Boys High school (a distance of about 2.5km); about 1km of service roads within the market centre (including the 60m long link-road to the tarmac road; the 300m service road to Kanyakine secondary and primary schools, and the 300m loop road from the shopping centre back to the main tarmac road) should also be tarmacked (Figure 5.3 page 145).

In the case of Ntharene Market centre, the roads to be paved include about 200m of the service roads within the shopping centre and 200m of the access road through the proposed open-air market/car park. This road would also serve the proposed banana market site (Figure 5.4 page 146).

- 2) Re-location of all businesses operated on the road reserves into the sites provided/proposed as open-air market sites within the old market centres as shown in figures 5.2, 5.3 and 5.4 for Igoji, Kanyakine and Ntharene centres respectively. As for Ntharene market centre, the businesses on the road reserve are of great concern on the functionality of the main road. As search, even if the open space available on the proposed sites is not adequate, more land should be sourced from the adjoining private lands (*the proposal replaces the cattle dip with the banana market site since cattle dips in the area have become obsolete*). The relocation can be undertaken as a joint venture between the Ministry of Roads (as the custodians of the highway) and the County Council of Imenti South District, the local authority in-charge of the market centres in Imenti South District. The relocation should also include providing lorry park/loading bays (particularly for bananas).
- 3) Control of any further roadside developments and planning for those that are existing in a manner that they would be compatible with the road functionality. The planning should include change of user from agricultural user to commercial, and ownership tenure from freehold to 99 year leaseholds in order to make it possible to impose the necessary development controls similar to the plots within the old market centres.
- 4) Provision of bus/matatu stations at the old Igoji and Kanyakine Market Centres after the access roads, service and loop roads have been developed in order to alleviate stopping of matatus and buses on the main road's carriageway.
- 5) Provision of walkways with vehicle separating guardrails for pedestrians at high populated pedestrian areas especially within the market centres' localities and schools. The study area market centres do not have very high populations to warrant construction of tunnels or footbridges.

Figure 5.2: Sketch Plan of Igoji Urban Centre - Proposed Mitigation Measures.



**Figure 5.3: Sketch Plan of Kanyakine Urban Centre - Proposed Mitigation Measures**

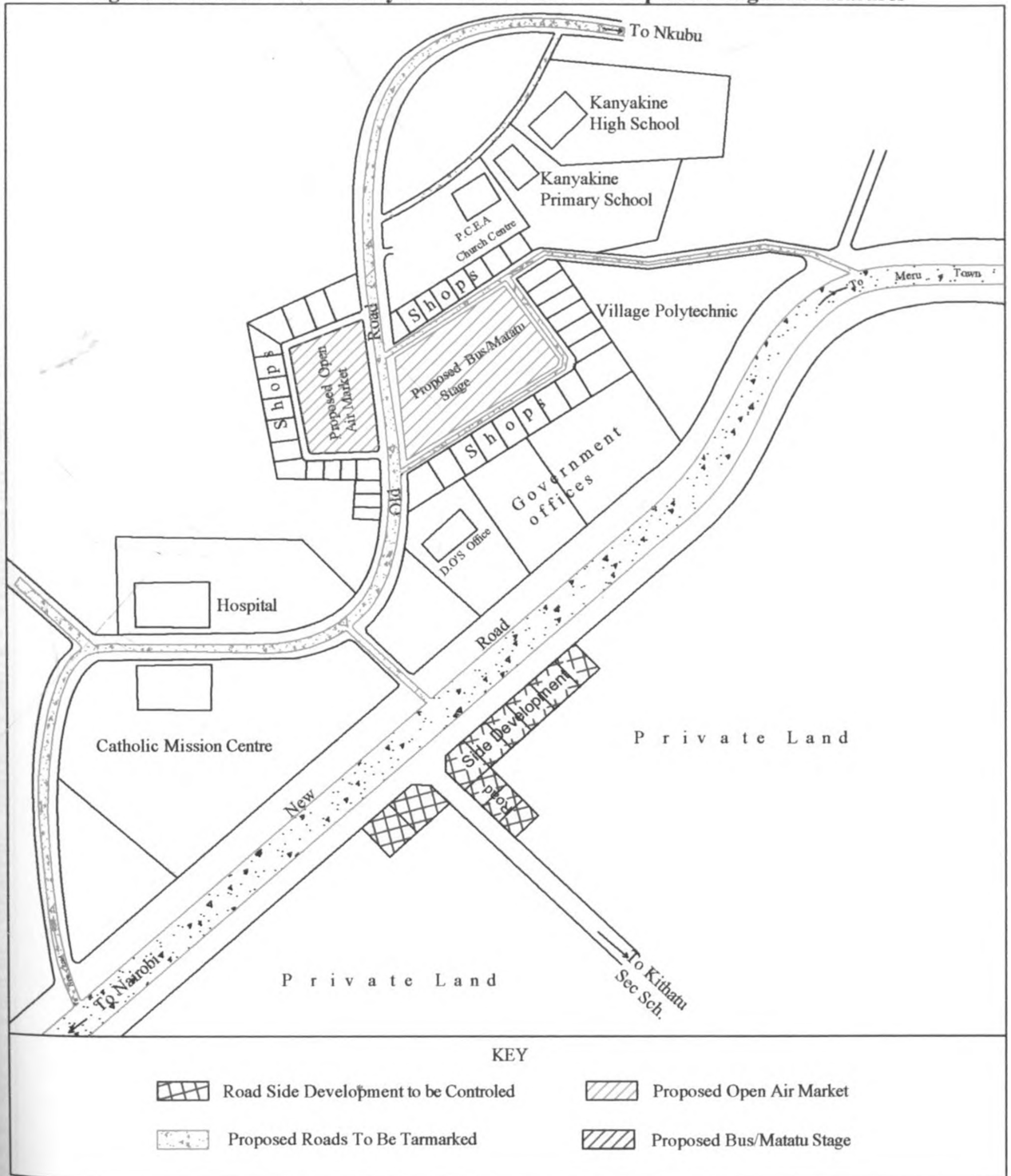
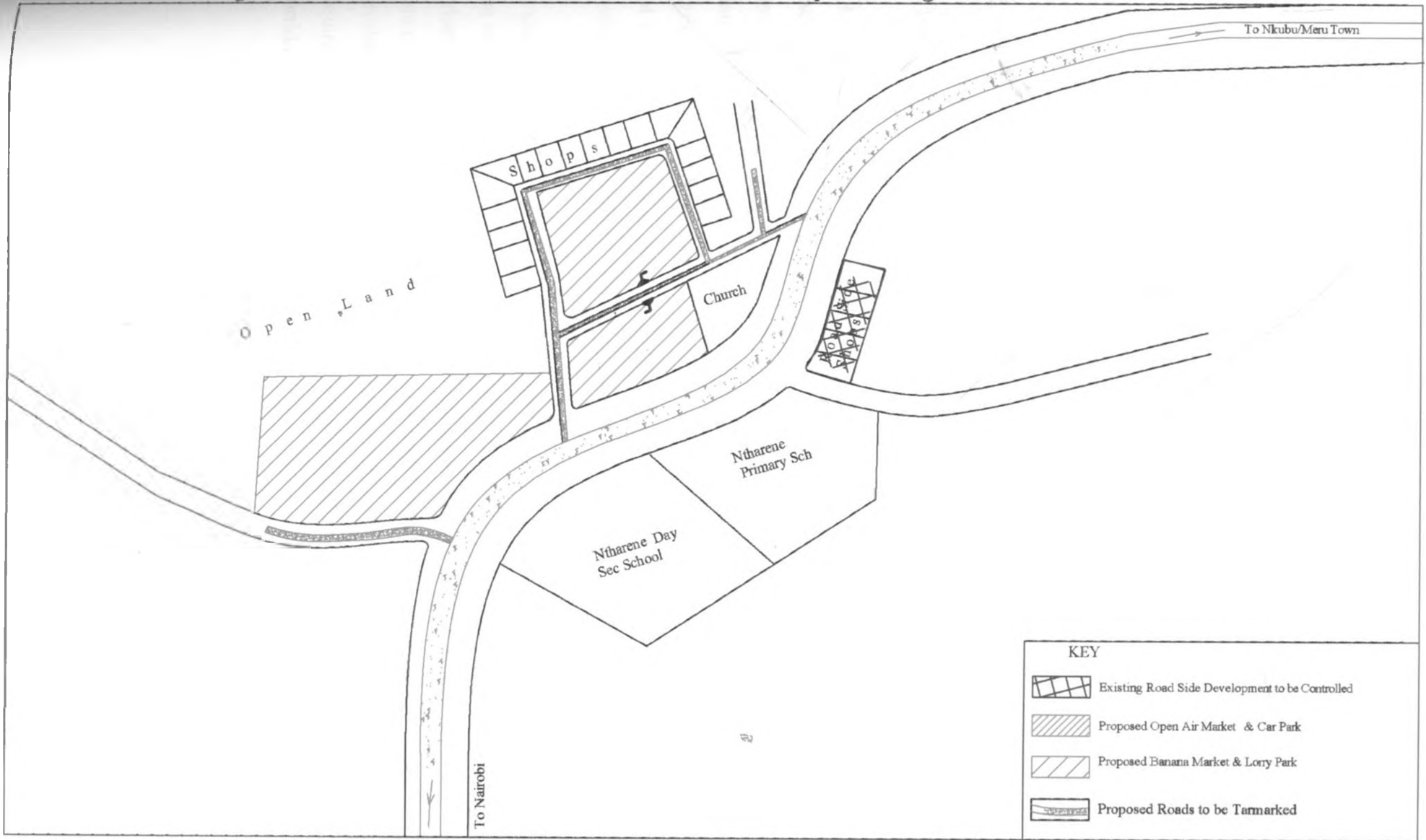


Figure 5.4: Sketch Plan of Ntharene Market Centre - Proposed Mitigation Measures.



- 6) The efforts by Kaguru Farmers Training Institute to improvise a culvert to be used as passage-way by both domestic and small farm tractors is a commendable innovation that needs to be appreciated. Kenya Roads Board should assess the innovation and consider assisting the Institute to improve the approach paths to the “tunnel” to make them more easily passable by the animals and the small farm tractors and to channel the stream into a culvert (as opposed to the open groove) to avoid contamination of the water. However, as long term measure, a proper tunnel should be constructed for the Institute. Kenya Roads Board should also consider providing a suitable access/entrance to the Institute from the main road.
  
- 7) The businesses conducted on the road reserve against Ntharene Primary and Day Secondary schools’ fences should be re-located and the schools assisted in putting up a permanent wall fence along their road boundaries.

### **5.3.3 Overall Policy Recommendation**

There is need for an Integrated Transportation Planning (ITP) approach for highway planning and design (particularly classes A, B and C). ITP should incorporate Land use Planners, Environmentalists, Land Economists/Economic Planners, Sociologists, Agriculturalists and Road Design Engineers. Consultations with the said experts should not only be as a matter of principal but as a matter of necessity. So in every main road construction, there should be clear terms of reference on what each expert should do.

In the case of planners, the main component should be how to marry the proposed road use with the existing land use pattern (existing market centres, institutions, factories and industries, settlements and others) and at the same time proposing preferred land use pattern along the proposed highway corridor (planned and controlled roadside developments including subdivisions and change of user of adjacent lands). Any land required for planning purposes should be acquired together with acquisitions for the road corridor.

The environmentalist on the other hand should carry out an Environmental Impact Assessment (EIA) to address the impacts of the road on the existing environment (flora and fauna, topography, wetlands, drainage and soil erosion) and propose mitigation measures to conserve and sustain the environment for the best use of the road.

The economist should carry out a dualism analysis to assess whether the investment and development of the road in the area would improve the equity of income distribution in the economy as well as assessing the rate and mode of land and property compensations.

The sociologist should address the social impacts especially on the persons to be displaced and those to be relocated completely; families and family land to be severed off by the road as well as social impacts on the communities moral fabric upon construction of the road.

The agriculturalist should address the impacts on the agricultural production the new road would bring to the area compared with the production without the road, including loss of agricultural land on one part, and marketing of the produce on the other.

Other road users and stakeholders such as drivers, passengers, pedestrians, traders, farmers, learning and other institutions should also be consulted at appropriate times in the process of highway planning and design and their views taken up seriously.

The engineer should then consider and address the planner's and other experts' inputs as well as road users and stakeholders in his design in order to come up with a road that is, "a road for all road users" and not "a road for the motorist only".

The working of the ITP approach should be facilitated through a clear government policy and relevant Acts of Parliament such as the Physical Planning Act CAP 286, the Environmental Management and Coordination Act of 1999, the Kenya Roads Act of 2007, the Agriculture Act, the Water Act and the Survey Act CAP 299 among others.



The ITP approach coupled with the road users and stakeholders consultations in highway planning and design, would be in line with the “Context Sensitive Solutions (CSS)” approach currently being advanced in the United States of America, with the rallying call as, “thinking beyond the pavement” (section 2.7.4.2).

The feasibility study and design of Nkubu – Thuchi Road re-alignment provided that “on design of road junctions, *all side roads will be surfaced 20 metres back from the junction in order to minimize the amount of mud carried onto the major highway*”. This clearly shows that the purpose of the road was more “*onto the pavement*” and not the community.

In the Republic of Botswana, the road policy requires that, ‘any road development should include the provision of roads to all villages (“kgotlas”) within 10km of the road as part and parcel of the road under design and construction’ (section 2.7.4.3). The ‘provision of roads to the villages’ includes provision of other facilities such as sinking of boreholes. The purpose of the policy is to ensure that the local community maximizes on the benefits of the road and secondly, to ensure that the road functionality is sustained – free from roadside developments and encroachments onto the road reserves.

An ITP team would consider a similar policy recommended for Kenya which should probably state that, “in any highway construction in Kenya, all urban and market centres within 5km of the highway should be provided with all-weather access/loop roads leading from the highway, and service roads within the market centres”. Such a policy would ensure that growth and development of by-passed market centres (in the case of road re-alignment) as well as the functionality of the highway are sustained.

## 5.4 Areas of Further Research

1. Relationship between Road Re-alignment/upgrading with Accident occurrences.  
Re-alignment and upgrading of a road means increased traffic (both vehicles and people). There is also the analogy that “Good roads, more Accidents”. Research should be done to find out why accidents increase on a road after it has been upgraded into a better road whose functionality is meant for comfort and smooth rider-ship.
2. Impact of Road Re-alignment and upgrading on the economic, cultural and social fabric of the local community (especially those within the highway corridor). For example, on economic impacts, the 1.5Km<sup>2</sup> (150 hectares) of land taken up by the new Nkubu – Thuchi road within the study area/Imenti South District belt of the coffee zone translates to about an annual economic loss on coffee alone amounting to nearly Kshs 25 - 35 million
3. The Impact of Road Re-alignment and upgrading on the adjacent lands to the road corridor. The research should seek to find out why increased subdivisions take place along the highway corridor and how this impacts on the land production, land values and relocations by people by-passed by the “new” road.
4. Impacts of Road Re-alignment and the environment. In the case of Nkubu – Thuchi Road re-alignment, the “cuts” made through the hills have caused landslides of untold damage both to the farmers and the road functionality. The study would probably find out the cost-effective-analysis in the long term between using tunnels through hills as opposed to “cuts” and “fills”.

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APPEDICES

APPEDIX I: QUESTIONNAIRES

Questionnaire No. ...

UNIVERSITY OF NAIROBI

Date .....

DEPARTMENT OF URBAN AND REGIONAL PLANNING
M. A. PLANNING YEAR II - 2007/08.

Study on: "The Impact of Road Re-alignment on Market Centres Development and Road Functionality - A Case of Thuchi - Nkubu Road in Imenti South District"

Note: The information contained in this questionnaire shall be treated with confidentiality and shall be used for academic purposes only

District ..... Location ..... Sub location .....

I. HOUSEHOLD QUESTIONNAIRE

Part 1: Household Information (Bio-data/Social Economic)

(a) (i) Name of respondent (optional) .....

(a) (ii) Relationship to Household

1. Self 2. Spouse 3. Son/Daughter 4. Other (specify) ..... [ ]

(a) (iii) Sex: 1. Male 2. Female [ ]

(a) (iv) Age (years):

1. 18 - 25 2. 26 - 35 3. 36 - 45 4. 46 - 55 5. Over 55 [ ]

(a) (v) Marital Status

1. Married 2. Single 3. Single Parent 4. Divorced 5. Separated
6. Widow 7. Widower 8. Guardian 9. Other (specify) ..... [ ]

(a) (vi) How big is your family (Parents and Children)? [ ]

(a) (vii) Religion

1. Christian 2. Muslim 3. Hindu 4. Other (Specify)..... [ ]

(a) (viii) Education Level

1. No formal education 2. Primary level 3. Secondary level
4. Tertiary College 5. Village Polytechnic 6. University Level [ ]

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(a) (iii) Sex: 1. Male 2. Female [ ]

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Questionnaire No. ...

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Date .....

DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

**A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”**

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### I. HOUSEHOLD QUESTIONNAIRE

#### Part 1: Household Information (Bio-data/Social Economic)

(a) (i) Name of respondent (optional) .....

(a) (ii) Relationship to Household

1. Self      2. Spouse      3. Son/Daughter      4. Other (specify) .....

(a) (iii) Sex:    1. Male      2. Female     

(a) (iv) Age (years):

1. 18 - 25      2. 26 - 35      3. 36 - 45      4. 46 - 55      5. Over 55     

(a) (v) Marital Status

1. Married    2. Single    3. Single Parent    4. Divorced    5. Separated  
6. Widow    7. Widower    8. Guardian    9. Other (specify) .....

(a) (vi) How big is your family (Parents and Children)?

(a) (vii) Religion

1. Christian    2. Muslim    3. Hindu    4. Other (Specify).....

(a) (viii) Education Level

1. No formal education    2. Primary level    3. Secondary level  
4. Tertiary College    5. Village Polytechnic    6. University Level

**(a) (ix) Occupation/Employment**

1. Formal employment (public/private sector)    2. Self-employed    3. Farmer  
4. Manual labourer    5. Other (specify) .....

**(a) (x) Annual Expenditure (deduce expenditure estimates from the following questions)  
(Monthly responses to be changed to annual during analysis)**

1. How much do you pay as School Fees per year? .....
2. How much do you spend on food & household expenditure per month? .....
3. How much do you spend on farm implements per year? .....
4. How much do you spend on transport per month? .....
5. How much do you save from your earnings per month.....

**(a) (xi) Annual Gross Income (from employment and other sources) in Kshs – (Can be deduced from question (a)(x) above)**

1. Less than 24,000    2. 24,000 – 60,000    3. 60,000-120,000    4. 120,000 – 240,000  
5. 240,000 – 600,000    6. More than 600,000

**(b) Size and Materials for main house**

**(b) (i) How many living/bedrooms does your main house have?**

**(b) (ii) Type of floor finish**

1. Cement    2. Tiles    3. Earth    4. Other (Specify).....

**(b) (iii) Type of wall**

1. Stone blocks    2. Timber    3. Clay (mud)    4. Other (Specify).....

**(b) (iv) Type of Roof**

1. Iron sheets    2. Tiles    3. Grass    4. Other (specify) .....

**(c) What is the approximate size of your land?**

1. Less than 1 acre    2. 1 – 3 acres    3. 3 – 5 acres    4. 5 – 10 acres    5. More than 10 acres

**(d) What is the approximate current price of land per acre in this area? .....**

**(e) How did you acquire this land?**

1. Inheritance    2. Allocation by government    3. Bought    4. Other (specify) .....

**(f) What are your main sources of domestic water?**

1. Pipe      2. River      3. Well      4. Borehole      5. Rain harvesting

6. Other (specify) .....

**(g) How far is the water source from your home?**

1. Less than 500m      2. 500m – 1Km      3. 1Km - 2Km      4. More than 2Km

**(h) What do you use as the main source of energy for lighting?**

1. Electricity      2. Kerosene Lantern      3. Solar Energy      4. Torch      5. Firewood

6. Other (Specify).....

**(i) What do you use as the main source of energy for cooking?**

1. Electricity      2. Gas      3. Kerosene      4. Firewood      5. Charcoal

6. Other (Specify) .....

**Part 2: Road use related questions**

**(j) How many years have you lived in this area?**

1. Less than 1 year      2. 2-5 years      3. 5-10 years      4. 10-20 years      5. More than 20 years

**(k) How do you get to the main (Thuchi – Nkubu) road?**

1. Walk      2. Bicycle      3. Motorcycle      4. Matatu      5. Private car

**(l) How long do you take to get to the main road?**

1. Less than 15mins      2. 15 - 30 mins      3. 30 mins – 1 hour      4. more than 1 hour

**(m) What difficulties do you encounter while traveling from your home to the main road?**

1. Mud when rainy and dust when dry      2. Bad terrain      3. Insecurity

4. Others (specify) .....

**(n) How would you rate the condition of the access road from your home to the main road?**

1. Very good.      2. Good      3. Poor      4. Very Poor

**(o) (i) Is there public transport from your home to the main road?**

1. Yes      2. No

**(o) (ii) If yes, is it reliable?**

1. Yes      2. No (Comment .....

**(o) (iii) If no, why?**

1. Poor access roads    2. Distance is short    3. People are poor and cannot afford fare  
4. People like walking    5. Other (specify) .....

**(p) How do you transport (carry) your goods to the market?**

1. Head/shoulder/back    2. Bicycle    3. Hard Cart (Mkokoteni)    4. Light truck /  
pick up    5. Other (specify) .....

**(q) (i) Was your land affected by the Thuchi - Nkubu road re-alignment?**

1. Yes    2. No.

**(r) (ii) If yes, did you benefit from the re-alignment?**

1. Yes    2. No.

**If yes, how? Explain.** .....

.....

**If no, why? Explain** .....

.....

**(s) (i) Do you often cross the main road?**

1. Yes    2. No

**(s) (ii) If yes, why?**

1. To fetch water    2. To visit relatives    3. Shopping    4. To go to school  
5. Other (specify) .....

**(t) In your own understanding, what are the benefits/advantages of the road re-alignment?**

1. Increased public vehicles (matatus); hence reduced travel time    2. Increased land values  
3. Increased agricultural production    4. Opening of new market centres  
5. Increased schools    6. Increased social interaction

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**(u) In your own understanding, what are the disadvantages of the road re-alignment? (List three in order of greatest disadvantage)**

1. Loss of agricultural land taken away by the new road.    2. Loss of business in the by-passed market centres    3. Increase in accidents    4. Cut-off / displaced families    5. Existing old road was neglected    6. Environmental pollution (soil erosion, smoke from vehicles, etc).

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**(v) What should be done to turn the disadvantages to benefits? (List three in order of priority)**

1. Improve old road and other access roads
2. Plan and re-develop the old markets
3. Plant more trees to reduce pollution
4. Build more bumps to reduce accidents
5. Provide better space for people to stop them from selling their goods on the road side.

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**(w) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel road to a bitumen (tarmac) road was meant to achieve two main functions:**

- (i) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- (ii) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

**(w) (i) In a scale of 1 to 5 as follows;**

1. Excellent                      2. Good      3. Fair                      4. Poor                      5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

**(w) (ii) In your own assessment, what should be done to improve your rating?**

.....

.....

.....

.....

Questionnaire No. ....

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District .....Location..... Market Centre .....

**II. MARKET (BUSINESS PEOPLE'S) QUESTIONNAIRE**

**Part 1: General**

Name of Respondent (Optional).....

(a) Sex      1. Male      2. Female     

(b) How far do you travel from your home to your place of work?

1. Less than 1 Km      2. 1- 2Km      3. 2-5 Km      4. Over 5Km     

(c) How do you travel from home to your place of work?

1. Walk      2. Bicycle      3. Motorcycle      4. Matatu      5. Bus  
6. Drive (private car)      5. Other (specify).....

(d) What time do you take to travel to your place of work?

1. Less than 15mins      2. 15-30mins      3. 30mins – 1 hour      4. More than 1 hour     

(e) What difficulties do you experience which affects your travel to your place of work?

1. Poor roads (mud/dust)      2. No public transport (Matatus)      3. High transport fares  
4. Insecurity      5. Other (specify) .....

**Part II – Business People Operating at the Old Market Centres**

**(f) Type of building materials for the business premises:**

**(f) (i) Type of floor finish**

1. Cement      2. Tiles      3. Earth      4. Other (Specify).....

**(f) (ii) Type of wall**

2. Stone blocks    2. Timber    3. Clay (mud)    4. Other (Specify).....

**(f) (iii) Type of Roof**

2. Iron sheets      2. Tiles    3. Grass    4. Other (specify) .....

**(g) What type of business do you do?**

1. Retail Shop      2. Wholesale Shop/Store      3. Open Display/Temporary Kiosk  
4. Hawking      5. Other (specify) .....

**(h) (i) How long have you been operating in this place (urban/market centre)? .....**

**(h) (ii) Have you been doing the same business since you started?**

- Yes    2. No.

**(h) (iii) If no, what business were you doing before? .....**

**(h) (iv) Why did you change? .....**

**(j) (i) Did you start your business before or after the tarmac road was constructed?**

1. Before      2. After

**(j) (ii) If before, how has the re-alignment of the road affected your business?**

1. Business has increased      2. Business has decreased      3. No change

**(k) (i) Have you been operating your business in this same market since you started?**

- Yes    2. No.

**(k) (ii) If no, where did you come from? .....**

**(k) (iii) Why did you move to this place? .....**

**(l) Do you own this business premises or you have rented?**

1. Own      2. Rented      3. Other (specify) .....

**(m) Where do you get your goods from?**

1. From other bigger towns      2. From my own farm      3. From other farmers  
4. I make my own wares/goods      5. Other (specify) .....

**(n) How do you transport your goods from the source to your business premises?**

1. Head/shoulder/back      2. Bicycle      3. Hard Cart (Mkokoteni)      4. Light truck /  
pick up      5. Heavy truck (lorry)      6. Other (specify) .....

**(o) What difficulties do you experience when transporting your goods from the source to your business premises?**

1. Poor roads      2. Lack of transport vehicles      3. High costs      4. Other (specify) .....

**(p) (i) Have the Road-side developments (shops/markets) affected your business positively or negatively?**

1. Positively      2. Negatively

**(p) (ii) If positively, how?** .....

**(p) (iii) If negatively, how?** .....

**(q) (i) In your own assessment, What benefits/advantages can you say have been brought by the Nkubu – Thuchi Road to this market centre?**

(List benefits/advantages) .....

.....

.....

.....

**(q) (ii) Out of the benefits/advantages you have given above, rank three in order of priority (ie most beneficial/advantageous being number one)**

1. ....

2. ....

3. ....



**(q) (iii) In your own assessment, What disadvantages can you say have been brought by the Nkubu – Thuchi Road to this market centre?**

(List disadvantages).....

.....

.....

**(q) (iv) Out of the disadvantages you have given above, rank three in order of priority (ie most disadvantageous being number one)**

1. ....

2. ....

3. ....

**(r) Given a chance, what would you suggest should be done by the government/council on the Nkubu – Thuchi road and the neighbouring roads to enable you to boost your business?**

.....

.....

.....

**(s) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:**

(iii) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;

(iv) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

**(s) (i) In a scale of 1 to 5 as follows;**

1. Excellent    2. Good    3. Fair    4. Poor    5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

**(s) (ii) In your own assessment, what should be done to improve your rating?**

.....

.....

.....

**Part III – Business People Operating at the Road-Side Market Centres**

**(t) Type of building materials for the business premises:**

**(t) (i) Type of floor finish**

1. Cement      2. Tiles      3. Earth      4. Other (Specify).....

**(t) (ii) Type of wall**

1. Stone blocks    2. Timber    3. Clay (mud)    4. Other (Specify).....

**(t) (iii) Type of Roof**

- Iron sheets      2. Tiles    3. Grass    4. Other (specify) .....

**(u) What type of business do you do?**

1. Retail Shop      2. Wholesale Shop/Store      3. Open Display/Temporary Kiosk  
4. Hawking      5. Other (specify) .....

**(u) (i) How long have you been operating in this place (market centre)?** .....

**(u) (ii) Have you been doing the same business since you started?**

1. Yes    2. No.

**(u) (iii) If no, what business were you doing before?** .....

**(u) (iv) Why did you change?** .....

**(v) (i) Did you start your business before or after the tarmac road was constructed?**

1. Before      2. After

**(v) (ii) If before, how has the re-alignment of the road affected your business?**

1. Business has increased      2. Business has decreased      3. No change

**(v) (iii) If after, where were you operating your business before?**

1. At the old market centre      2. In another market centre      3. No where

4. Other (specify) .....

**(v) (iv) If you were doing your business at the old market, why did you move to the current site?**

1. Business poor at the old market after the road re-alignment    2. Poor access road from the  
main road to the old market    3. Other (specify) .....

**(w) (i) Have you been operating your business in this same market since you started?**

1. Yes 2. No.

**(w) (ii) If no, where did you come from?** .....

**(w) (iii) Why did you move to this place?** .....

**(x) Do you own this business premises or you have rented?**

1. Own 2. Rented 3. Other (specify) .....

**(y) Where do you get your goods from?**

1. From other bigger towns 2. From my own farm 3. From other farmers

4. I make my own wares/goods 5. Other (specify) .....

**(z) How do you transport your goods from the source to your business premises?**

1. Head/shoulder/back 2. Bicycle 3. Hard Cart (Mkokoteni) 4. Light truck /

pick up 5. Heavy truck (lorry) 6. Other (specify) .....

**(za) What difficulties do you experience when transporting your goods from the source to your business premises?**

1. Poor roads 2. Lack of transport vehicles 3. High costs 4. Other (specify) .....

**(zb) (i) If another site off the main road is well developed and availed to you to conduct the same business like you are currently doing by the roadside, would you move to the new site?**

1. Yes 2. No

**(zb) (ii) If yes, why?** .....

.....

**(zb) (iii) If no, why?** .....

.....

**(zc) (i) In your own assessment, what benefits/advantages can you say have been brought by the Nkubu – Thuchi Road to this market centre?**

(List benefits/advantages) .....

.....

.....

**(zc) (ii) Out of the benefits/advantages you have given above, rank three in order of priority (ie most beneficial/advantageous being number one)**

- 1. ....
- 2. ....
- 3. ....

**(zc) (iii) In your own assessment, what disadvantages can you say have been brought by the Nkubu – Thuchi Road to this market centre?**

(List disadvantages)

.....  
.....

**(zc) (iv) Out of the disadvantages you given above, rank three in order of priority (ie most disadvantageous being number one)**

- 1. ....
- 2. ....
- 3. ....

**(zd) Given a chance, what would you suggest should be done by the government/council on the Nkubu – Thuchi road and the neighbouring roads to enable you to boost your business?**

.....  
.....

**(ze) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:**

- (i) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- (ii) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

**(ze) (i) In a scale of 1 to 5 as follows;**

1. Excellent    2. Good    3. Fair    4. Poor    5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality                       2) Economic Activity

**(ze) (ii) In your own assessment, what should be done to improve your rating?**

.....  
.....

DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

**A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”**

*Note: The information contained in this questionnaire shall be treated with confidentiality and shall be used for academic purposes only*

District .....Location..... .. Urban/Market Centre .....

**III. ROAD USER’S (ORIGIN – DESTINATION SURVEY) QUESTIONNAIRE**

**Part I: Drivers**

(a) Sex: 1. Male      2. Female     

**(b) Type of vehicle**

1. Private car    2. Matatu    3. Bus    4. Light truck / Pick-up    5. Heavy truck (Lorry)

6. Other (Specify) .....

**(c) What is the origin of your journey?**

1. Beyond the study area      2. Within the study area     

**(d) What is the destination of your journey?**

1. Beyond the study area      2. Within the study area     

**(e) What is the purpose of your trip?**

1. Private    2. Business    3. Private-cum-business    4. other (specify) .....

**(f) (i) Do you often stop at this urban/market centre?**

1. Yes    2. No.     

**(f) (ii) If yes, what do you stop to do?**

1. Pick/drop passengers    2. Fuel.    3. Shopping    4. Accommodation

5. Other (specify) .....

**(g) How often do you travel through this road?**

1. Daily    2. Weekly    3. Monthly    4. At least once in a year    5. Other (specify).....

**(h) Do the bumps affect your smooth drive?**

1. Yes    2. No.F

**(i) Do the roadside developments affect your smooth drive?**

1. Yes 2. No.

**(j) Would you prefer that the roadside businesses be moved and conducted further from the road?**

1. Yes 2. No.

**(k) (i) Do you enter (drive) into the old market centre?**

1. Yes 2. No.

**(k) (ii) If yes, how often?**

1. Regularly (At least once a week) 2. Occasionally (About once in a month)3. (Rarely About

once in three months) 4. Very rarely (About once in more than three months)

**(k) (iii) What do you enter to do? .....**

**(k) (iv) If no, why?**

1. Access road is poor 2. There is no business in the old centre 3. Other (specify) .....

**(k) (v) If the old market centre is well planned and developed with good access roads, would you occasionally enter (drive) into the market centre?**

1. Yes 2. No. 3. Other (specify) .....

**(l) (i) Given a chance, what would you suggest should be done by the government/council on the Nkubu – Thuchi road and the neighbouring roads to enable you to boost your business/make your drive comfortable?**

.....  
.....

**(l) (ii) Rank three of your suggestions in order of priority**

1. ....

2. ....

3. ....

**(m) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:**

(v) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;

(vi) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

**(m) (i) In a scale of 1 to 5 as follows;**

1. Excellent                      2. Good    3. Fair                      4. Poor                      5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

**(m) (ii) In your own assessment, what should be done to improve your rating?**

.....  
.....

**Part II: Passengers**

**(m) Sex:**            1. Male            2. Female

**(n) What is the origin of your journey?**

1. Beyond the study area            2. Within the study area

**(o) What is the destination of your journey?**

1. Beyond the study area            2. Within the study area

**(p) What is the purpose of your trip?**

1. Private            2. Business            3. Private-cum-business            4. other (specify) .....

**(q) How often do you travel through this road?**

1. Daily    2. Weekly            3. Monthly            4. At least once in a year    5. Other (specify).....

**(r) Do the bumps affect your smooth ride?**

1. Yes    2. No.

**(s) Do the roadside developments affect your smooth ride?**

1. Yes    2. No.

**(t) Would you prefer that the roadside businesses be moved and conducted further from the road?**

1. Yes    2. No.            3. Other (Specify) .....

**(u) Would you prefer that vehicles drive into the old market centres?**

1. Yes    2. No.            3. Other (Specify) .....

**(u) (i) If yes, why?**

.....  
.....

(u) (ii) If no, why?

.....  
.....

(v) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:

- (i) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- (ii) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

(v) (i) In a scale of 1 to 5 as follows;

- 1. Excellent                      2. Good    3. Fair                      4. Poor                      5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality                       2) Economic Activity

(v) (ii) In your own assessment, what should be done to improve your rating?

.....  
.....

**Part III: Pedestrians**

(v) Sex:            1. Male            2. Female           

(w) (i) How often do you walk along this (Nkubu – Thuchi) road?  
1. Daily    2. Once a week    3. Once a month    4. Other (Specify) .....

(w) (ii) Where do you walk to?  
1. Market/shops    2. School            3. Other (Specify) .....

(w) (iii) How far do you usually walk?  
1. Less than 500m    2. 500m – 1Km    3. 1Km - 2Km            4. More than 2Km           

(w) (iv) How long dose it take you to walk?  
1. Less than 15mins    2. 15 - 30 mins    3. 30 mins – 1 hour            4. more than 1 hour           

(w) (v) Why do you walk?  
1. I like walking            2. Distance is short            3. I cannot afford transport fares  
4. Other (Specify) .....



**(x) (i) What dangers/risks do you anticipate on the road as you walk?**

(List the dangers/risks) .....  
.....

**(x) (ii) Of the dangers/risks you have given above, list three in order of priority (starting with the greatest danger/risk as number one)**

1. ....
2. ....
3. ....

**(x) (iii) In order to reduce the above dangers/risks, the following measures can be taken; choose three in order of priority.?**

1. Plan and develop a new market centre away from the road
2. Improve the service and access roads into the old market centre
3. Construct a by-pass for through traffic (vehicles)
4. Build more bumps across the highway
5. Provide pedestrian walk-ways
6. Construct a foot-bridge

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**(y) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:**

- (i) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- (ii) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

**(y) (i) In a scale of 1 to 5 as follows;**

1. Excellent      2. Good      3. Fair      4. Poor      5. Very Poor

To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

**(y) (ii) In your own assessment, what should be done to improve your rating?**

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

**APPEDIX II: INTERVIEW SCHEDULES**

**UNIVERSITY OF NAIROBI**

**DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II - 2007.**

**A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”**

*Note: The information contained in this questionnaire/interview shall be treated with confidentiality and shall be used for academic purposes only*

**I. INTERVIEW SCHEDULE WITH THE CHIEF ENGINEER (ROADS) – MINISTRY OF ROADS AND PUBLIC WORKS (MoR&PW)**

**Name (Optional) ..... Date .....**

1. According to the Road Design Manual, Trunk Roads (Classes A & B) should be designed to provide traffic mobility between centres (i.e. to cater for ‘through’ and ‘long-distance’ traffic with the main function being high and uniform speeds and uninterrupted traffic flows;). However, due to increased land subdivisions and other roadside developments such as petrol stations, car bazaars, bars and restaurants etc, numerous accesses are opening directly onto these roads. (Examples: Mombasa Road, Thika road, road B6 (Thuchi - Nkubu road) and many others);

*Does the MOR&PW have control over the limit of accesses onto the highways?*

- (i) Yes
- (ii) No

*(iii) If yes, why is it not enforced? And how should it be enforced?*

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

*(iv) If no, why? And what should be done?*

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

A road re-alignment and upgrading usually encourages road-side developments;

(a) *Do you have control over road-side developments, both on the road reserve and within the highway corridor?*

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

(b) *Is the MoR&PW involved or consulted in the development of roadside developments along road corridors?*

(i) Yes

(ii) No

(iii) *If Yes, how is the Ministry involved? And what are the difficulties in controlling the roadside developments?*

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.....  
.....

(iv) *If No, who provides accesses to the main road from these roadside developments?*

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

3. Use of bumps on a highway negates the intended road functionalities of uniform speeds and uninterrupted traffic flow. Secondly, when vehicles (especially heavy trucks) brake because of bumps, the vehicle tyres wear-off while the road pavement is eventually destroyed (causing rutting); *how can this be avoided or mitigated?*

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

4. A road re-alignment and upgrading usually by-passes markets and trading centres originally lying along the old road corridor. In the Republic of Botswana, the Government has a policy known as the "Roads Department 'Kgotla' (villages) Access Roads policy", which requires that, ***"any major (highway) road development should include the provision of roads to all 'kgotlas' (villages) within 10Km of the main road as part and parcel of the road under design / construction"***.

(a) *Is there any policy in Kenya (similar or equivalent to that of Botswana) which ensures that the bypassed markets do not “die” but maintain sustainable development?*

- (i) Yes
- (ii) No

(c) *If Yes, what is the policy? And why is it not enforced?*

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

5. Land use, among other factors like topography, geology and physical features, is one of the main factors for consideration in route location and road re-alignments. Likewise, transport decisions have a significant impact on the quality and character of the community development, including the locational patterns of economic and social activity. Urban and Regional Planners or spatial planners (commonly known as physical planners) specialize in land use planning for urban and rural centres as well as regional planning as a whole;

(a) *Do you agree that if these experts team up and work jointly with highway design engineers in highway planning and design, Kenya would have better roads (free from uncontrolled road-side developments, bumps and congestion)? If so, how can this collaboration be facilitated?*

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

(b) *Currently, is there any role that physical planners play in highway planning and design? If so, what role, and to what extent?*

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

6. In current road projects, there is demand for EIA to be conducted;

(a) *How is the collaboration between highway design engineers and the environmentalists?*

.....  
.....

(b) Does the EIA process delay the overall road project implementation?

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

(c) Has the EIA added value to design and development of highways? How?

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

7. For roads like Nkubu –Thuchi Road which were constructed before the requirement of EIA was put in force; *Are there plans to carry out Environmental Audits (EAs) on these roads?*

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

8. The Road Classification in Kenya is more to do with the hierarchy of *administrative centres* than level of road functionality. *How is this mitigated to ensure that some roads with very high level of functionality but classified at a lower class receive the attention they deserve? (Eg, a Class D road with a very high level of functionality as opposed to a Class B with a low level of functionality)*

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.....  
.....

9. The main objective of upgrading and re-alignment of Nkubu – Thuchi road from an earth road to bitumen standard in the early 1980s was to link up Embu and Meru and to open up the rich agricultural Meru region.

(a) *To what extent do you think this objective was achieved?*

.....  
.....

(b) The markets and trading centres along the old Thuchi - Nkubu road have since “died”; and in place unplanned and uncontrolled road-side developments have come up along the new highway. This in turn has affected the functionality of the highway as several bumps have been placed at every road-side urban centre as a safety measure against accidents. *What can be done to restore the activities in the old markets and trading centres as well as the functionality of the new highway?*

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

10. The Thuchi – Nkubu road traverses through a very rich agricultural potential region but characterized with an equally difficult terrain (valleys and ridges). *What can be done from transportation point of view to ensure that the potential is tapped to the maximum?*

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

11. Do you incorporate public participation in highway planning, design and development?

- (i) Yes
- (ii) No

If yes, how is this done?

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

12. When was the Road Design Manual last revised? Do you think the manual is representative of the road sector’s current demands? What should be incorporated in as far as highway planning is concerned?

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

13. The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:

- (vii) To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- (viii) To open up the area to more economic activity (eg increase economic activities in the market/town centres)

In a scale of 1 to 5 as follows;

1. Excellent    2. Good    3. Fair    4. Poor    5. Very Poor

(a) To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

(b) In your own assessment, what should be done to improve your rating?

.....

.....

.....

.....

14. “Good roads contribute to increase in road accidents”; *what is your comment on this statement?*

.....

.....

.....

.....

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A case of Thuchi – Nkubu Road in Imenti South District”

*Note: The information contained in this questionnaire/interview shall be treated with confidentiality and shall be used for academic purposes only*

**II. INTERVIEW SCHEDULE WITH THE EXECUTIVE DIRECTOR – KENYA ROADS BOARD (KRB)**

Name.....Date .....

1. What is the main role of Kenya Roads Board?

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

2. (i) Is KRB involved in any way in road construction/transportation planning?

(a) Yes                      (b) No

(ii) If yes, how?

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

(iii) If no, why? And how can KRB be involved?

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

3. A road re-alignment and upgrading usually by-passes markets and trading centres originally lying along the old road corridor;

*(i) Does KRB ensure that these bypassed markets do not “die” but maintain sustainable development?                      (a) Yes                      (b) No*



(ii) If yes, how?

.....

.....

.....

(iii) If no, why? And how can KRB be involved?

.....

.....

.....

4. A new road development or a road re-alignment and upgrading usually encourages road-side developments;

*What role can KRB play in ensuring that unplanned and uncontrolled road-side developments do not interfere with the maintenance of the road?*

.....

.....

.....

5. In the Republic of Botswana, the Government has a policy known as the “Roads Department ‘Kgotsla’ (villages) Access Roads policy”, which requires that, **“any major (highway) road development should include the provision of roads to all ‘kgotlas’ (villages) within 10Km of the main road as part and parcel of the road under design / construction”.**

*Do you think a similar policy should be considered in order to ensure that access roads to and from the main roads are well maintained?*

.....

.....

.....

6. Use of bumps on a highway negates the intended road functionalities of uniform speeds and uninterrupted traffic flow. Secondly, when vehicles (especially heavy trucks) brake because of bumps, the vehicle tyres wear-off while the road pavement is eventually destroyed (causing rutting).

*How can this problem be mitigated?*

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

7. Land use, among other factors like topography, geology and physical features, is one of the main factors for consideration in route location and road re-alignments. Likewise, transport decisions have a significant impact on the quality and character of the community development, including the locational patterns of economic and social activity. Urban and Regional Planners or spatial planners (commonly known as physical planners) specialize in land use planning for urban and rural centres as well as regional planning as a whole;

*Do you agree that if these experts team up and work jointly with highway design engineers in highway planning and design, Kenya would have better roads (free from uncontrolled road-side developments, bumps and congestion)? If so, how can this collaboration be facilitated?*

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

9. According to the Road Design Manual, Trunk Roads (Classes A & B) should be designed to provide traffic mobility between centres (i.e. to cater for ‘through’ and ‘long-distance’ traffic with the main function being high and uniform speeds and uninterrupted traffic flows;). The main objective of upgrading and re-alignment of Nkubu – Thuchi road from an earth road to bitumen standard in the early 1980s was to link up Embu and Meru with an efficient trunk road and to open up the rich agricultural Meru region.

However, the markets and trading centres along the old road have since “died” and in place unplanned and uncontrolled road-side developments have come up along the new highway. This in turn has affected the functionality of the highway as several bumps have been placed at every road-side urban centre as a safety measure against accidents.

*What can be done to restore the activities in the old markets and trading centres as well as the functionality of the new highway?*

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

10. The Thuchi – Nkubu road traverses through a very rich agricultural region (high quality tea and coffee production) but characterized with an equally difficult terrain (valleys and ridges). *What can be done from transportation point of view to ensure that the potential is tapped to the maximum?*

.....

.....

.....

11. Do you incorporate public participation in identification of road projects to be funded by KRB? If so, how is this done?

.....

.....

.....

12. When was the Road Design Manual last revised? Do you think the manual is representative of the road sector's current demands?

.....

.....

13. "Good roads contribute to increase in road accidents"; *what is your comment on this statement?*

.....

.....

.....

.....

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

A Study on: “The Impact of Road Re-alignment on Urban/Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”

*Note: The information contained in this questionnaire/interview shall be treated with confidentiality and shall be used for academic purposes only*

**III. INTERVIEW SCHEDULE WITH THE DISTRICT PHYSICAL PLANNING OFFICER IN CHARGE OF IMENTI SOUTH DISTRICT**

Name (Optional) ..... Date .....

1. What is your main role as a planner in Imenti South District?

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.....  
.....

2. As a planner, are you involved or engaged in any way (by consulting engineers and or engineers in the Ministry of Roads) when they are planning and designing classified roads including re-alignment/upgrading of existing roads?

(i) Yes                      (ii) No

(iii) If yes, how?

.....  
.....

(iv) If no, why? And what should be the position?

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.....

3. A road re-alignment and upgrading usually by-passes markets and trading centres originally lying along the old road corridor; These market centres eventually “die” as new others sprout up along the new highway corridor (with some right within the road reserves)

a) *What can be done to ensure that the by-passed markets do not “die” but maintain sustainable development?*

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.....

b) *Are the roadside developments along the Thuchi – Nkubu road in areas such as Igoji, Kanyakine and Ntharene planned?*

(i) Yes            (ii) No

(iii) *If yes, have the developments been done as per the plan?*

.....

(iv) *If no, why? And how can the developments be mitigated?*

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.....  
.....

4. Land use, among other factors like topography, geology and physical features, is one of the main factors for consideration in route location and road re-alignments. Likewise, transport decisions have a significant impact on the quality and character of the community development, including the location patterns of economic and social activity.

a) *As a planner, what role would you play in determining the re-alignment of a road?*

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.....

(b) *Do you agree that if planners team up and work jointly with highway design engineers in highway planning and design, Kenya would have better roads (free from uncontrolled road-side developments, bumps and congestion)? If so, how can this collaboration be facilitated?*

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.....

5. The Thuchi – Nkubu road traverses through a very rich agricultural potential region (eg high quality tea and coffee production) but characterized with an equally difficult terrain (valleys and ridges). *What can be done from transportation planning point of view to ensure that the potential in the area is tapped to the maximum?*

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6. Are there any existing approved Local Physical Development Plans for Igoji and Kanyakine urban centres and Ntharene market centre?

- (i) Yes            (ii) No

(iii) If yes, have they taken into account the roadside developments and the Thuchi – Nkubu sixty-metre – wide road reserve?

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(iv) If No, why? And how are the roadside developments to be mitigated to ensure the functionality of the highway is regained and sustained?

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7. In the Republic of Botswana, the Government has a policy known as the “Roads Department ‘Kgotla’ (villages) Access Roads policy”, which requires that, ***“any major (highway) road development should include the provision of roads to all ‘kgotlas’ (villages) within 10Km of the main road as part and parcel of the road under design / construction”***.

*What is your comment as a planner about such a policy?*

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.....

8. From the planning point of view, is there any policy with respect to highway planning?

- (i) Yes                      (ii) No

(iii) If yes, what is the policy and to what extent is it implemented?

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

(iv) If no, What should be done and how?

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

9. Due to increased land subdivisions and other developments such as petrol stations, car bazaars, bars and restaurants etc, numerous accesses are opening directly onto highways such as the Thuchi-Nkubu road, among many others.

a) *Do you as a planner, have control over the limit of accesses onto the highways?*

- (i) Yes                      (ii) No

(iii) *If yes, how do you ensure this is enforced? And why is it not enforced?*

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.....

(iv) *If no, who controls the accesses onto the highway? And how is this related to planning?*

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.....

10. The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:

- a. To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- b. To open up the area to more economic activity (for example, increase economic activities in the market/town centres)

In a scale of 1 to 5 as follows;

1. Excellent    2. Good    3. Fair    4. Poor    5. Very Poor

(a) To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

(b) In your own assessment, what should be done to improve your rating?

.....

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DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

**A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”**

*Note: The information contained in this questionnaire/interview shall be treated with confidentiality and shall be used for academic purposes only*

**IV: INTERVIEW SCHEDULE WITH LEARNING AND OTHER INSTITUTIONS**

District ..... Location ..... Sub location .....

Name of Institution .....

(a) What is the core function of your institution? .....

(b) (i) Was your institution established before or after the Thuchi – Nkubu road re-alignment?

1. Before      2. After     

(b) (ii) If before, was your institution by-passed by the new road alignment?

1. Yes      2. No     

(b) (iii) If yes, how did the re-alignment affect your institution?

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

(b) (iv) What should be done to enable you to maximize on the services of the new road?

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(c) The re-alignment and upgrading of Thuchi – Nkubu road from a gravel (marrum) road to a bitumen (tarmac) road was meant to achieve two main functions:

- a. To enhance the road functionality (increase motor vehicles, reduce travel time, give smooth rider ship etc) and;
- b. To open up the area to more economic activity (eg increase economic activities in the market/town centres)

In a scale of 1 to 5 as follows;

1. Excellent    2. Good    3. Fair    4. Poor    5. Very Poor

(i) To what extent do you think the above two functions have been achieved?

1) Road Functionality

2) Economic Activity

(ii) In your own assessment, what should be done to improve your rating?

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**APPEDIX III: VEHICLE COUNT AND CATEGORIZATION SCHEDULES**

Sheet No. ....

**UNIVERSITY OF NAIROBI**

Date .....

Start Time .....

**DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.**

End Time .....

**A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”**

**I. HIGHWAY VEHICLE COUNT SCHEDULE**

**District ..... Cordon/Screenline .....North/South Bound**

<b>MOTOR CYCLES</b>	<b>CAR (7 or less passenger private vehicle)</b>	<b>MINI-BUS/VAN (7 – 25 passenger vehicle &amp; Matatu)</b>	<b>BUS (&gt; 25 passengers)</b>	<b>PICK-UP &amp; LIGHT TRUCK (&lt;7tons)</b>	<b>LORRIES &amp; TRUCKS (7 tons &amp; more)</b>	<b>NON – MOTORIZED TRANSPORT (NMT)</b>

Sheet No. ....

UNIVERSITY OF NAIROBI

Date .....

Start Time .....

DEPARTMENT OF URBAN AND REGIONAL PLANNING  
M. A. PLANNING YEAR II – 2007/08.

End Time .....

A Study on: “The Impact of Road Re-alignment on Market Centres Development and Road Functionality – A Case of Thuchi – Nkubu Road in Imenti South District”

**II. MARKET BOUND VEHICLE COUNT SCHEDULE**

District ..... Urban/Market Centre ..... In/Out Bound .....

MOTOR CYCLES	CAR (7 or less private passenger vehicle)	MINI-BUS/VAN (7 – 25 passenger vehicle & Matatu)	BUS (> 25 passengers)	PICK-UP & LIGHT TRUCK (<7tons)	LORRIES & TRUCKS (7 tons & more)	NON – MOTORIZED TRANSPORT (NMT)
			1			

## APPENDIX IV: ROAD INVENTORY AND CONDITION SURVEY (RICS) CONDITION RATING

The following definitions provide a general description of the rating system:

Excellent (5) – To receive an **Excellent** rating, the feature<sup>1</sup> must be new or in like-new, well-maintained condition, and fully functional in all respects.

Good (4) – A **Good** rating indicates that the feature is in nearly new condition, and only needs some minor additional maintenance work. There should be no more than a 10 percent reduction in serviceability, functionality, or capacity of the feature.

Fair (3) – A **Fair** rating indicates that the feature is exhibiting occasional signs of distress or damage that are causing a noticeable reduction in serviceability, functionality, or capacity, in the order of 10 to 25 percent. Substantial additional maintenance or repair effort is required.

Poor (2) – A **Poor** rating indicates that the feature is exhibiting frequent signs of distress or damage that is causing a significant reduction in serviceability, functionality, or capacity, in the order of 25 to 50 percent. Major maintenance or reconstruction effort is required to restore the feature.

Very Poor (1) – A **Very Poor** rating indicates that more than 50 percent of the feature is beyond the point of restoration by routine maintenance and reconstruction or replacement is required.

Unknown (0) – This rating is used as the default condition for Quickmarks created by the Fast Team, since they will merely be locating the feature, not stopping to inspect it (RICS, 2004)

<sup>1</sup> – A Feature means the road and all its accessories (bridge, culvert, guardrails, drainage channels, road furniture and markings, bush clearing, among other features)

**APPEDIX V: FIELD DATA COLLECTION RESEARCH ASSISTANTS (PHOTO)**

