THE IMPACT OF NAIROBI - THIKA HIGHWAY ON LAND VALUES, LAND USE, SETTLEMENTS, AND ITS IMPLICATIONS IN LAND USE PLANNING.
This Thesis is my original work and has not been presented for a degree in any other University.

Signature: Gathungu Kariuki

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ACKNOWLEDGEMENTS:

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This study has been taken as a result of the recognition of the significance of problems of rapid urbanization taking place in different areas in Kenya. These developments form major pillars of our spatial structure and determinants of the future land use pattern in these area, and unless these developments are controlled and co-ordinated in time they might result in the misuse of resources. The study has therefore set out to examine the impact of improved accessibility in a rural-urban fringe, where the land use is predominantly agricultural, in between two rapidly expanding urban areas, viz Nairobi and Thika.

The thesis has proceeded by first examining the characteristics of Nairobi-Thika region and the historical developments of the Nairobi-Thika highway, thereby analysing the land use aspects. This has proved that this is an area of valuable agricultural activities not only to the region as such but also to the country as whole. Urban encroachment on to this land is very rife. It has been found that Nairobi metropolitan Growth strategy encouraged the continual concentration of urban development towards Thika along the highway.

A much closer examination of this problem has further been undertaken in terms of the highway's impact on land values, land use and settlements.

The highway impact has been proved to be a major force behind the shifting of urban land values from the urban
centres mainly Nairobi to the rural-urban fringe especially in the area adjoining the highway. The result of this has been proved to be premature subdivision of land for urban development and land speculation which has not only removed land from agricultural production, but also wasted resources on provision of services to scattered settlements.

The highway improvement has also been a factor in the increased counter activity in the study area together with the problems facing Nairobi in the provision of employment, housing and servicing its population. This highway has also increased the development of dormitory settlements.

It is considered that urbanization is inevitable in this region and therefore land use planning is necessary for better utilization of resources both the natural and the committed extra resources in the study area like the highway investment. The study also reveals that the settlements are rapidly developing in the study area with very low environmental quality, no employment facilities, no servicing and therefore rely on either Nairobi or Thika for their needs. For better utilization of resources and intensive use of the highway which represent a public cost on transportation. It has been therefore suggested that a policy for encouraging employment facilities to locate along the highway be formulated. Priority where such facilities should be located is given at Kasarani/Kahawa, Ruiru and Kalimoni which are already existing population centres with acute employment problem.
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CHAPTER ONE

INTRODUCTION:

1.1. The Problem:

The growth of Nairobi from a simple settlement in 1900 to, not only the principal urban centre of population; but also the social, economic and communication hub of the whole country - a classic primate city in the 1970's has raised some policy issues, among other people the regional and physical planners.

The central issue, however, revolves around how to accommodate and provide a population of 3-4 million at the turn of the century.¹

The related issues of employment, land availability, transportation and servicing of the population by the year 2000 A.D. have been examined and documented in form of a report 'Nairobi Metropolitan Growth Strategy' completed in 1972.²

The report observed and recommended on matters of land availability to the city. When the following category of opportunities was considered in a theoretical form of city structure falling in three broad classifications.

a) Accretive growth in which additional to the city are made around the periphery as well as by increasing density in the centre.
b) Linear growth in which developments is concentrated along particular corridors centred on important transportation routes.

c) Satellite growth in which developments are located in our more new or expanded towns physically separate from the principal urban areas, the growth of which would be restricted.

Relating these options to the contrasts of opportunities potential are of expansion evolved in order of preference.

1. Concentrate linear development linking Nairobi and Thika.


It is in view of the foregoing strategies that the problem is initially visualised. The expansion of Nairobi on to the periphery and concentrated linear development toward Thika is given priority number one. This form of urban sprawl has got its implications on the hinterland of the city and the Thika Road.

The hinterland of Nairobi, being what it is today (agricultural); the above strategies pose a great threat of urban encroachment on agricultural use in the region.

Even if we ignore the implications of the 'report' as a mere report without the necessary authority to authorise such development; other factors present in the area would still
bring about eminently the threat to agricultural land in the region by urban uses. Of these factors, accessibility is a critical one in urban sprawl developments.

Urban land use take preference of the most accessible site in an effort to reduce operational costs; viz. transportation vis-a-vis land rents. Therefore sprawl developments will start along the major transportation corridors to and from the core areas, and the areas neighbouring these access arteries where the land rents are relatively low to those of the core area.

The encroachment on agricultural land by urban use does not possess the same impact mainly due to the role of such a region play both in the National and regional economies.

The area under the current study is in an area of both national and regional agricultural importance. It is an area where two major cash crops, coffee and sisal are produced which earns the country foreign exchange, at the same time providing the inhabitants with employment and the city of Nairobi and Thika Municipality with raw materials for their processing industries.

The area is also a source of some of the food stuffs and dairy products consumed in the two urban areas. Therefore urban encroachment on agricultural land should be considered in view of the tripple impact it might have in the region.
Rapid population growth in urban areas has been a push factor of encroachment on agricultural land in and around Nairobi, as the population grows, and with the experiences of developing countries where urban population growth rate is usually several times the National one due to migratory factors, the rents rise and so are the land values, with the other related problems viz. the city government not being in a position to provide adequate housing, the rising cost of materials, the high building standards; the residential uses and other urban land uses which are less profitable escape into the periphery using routes where land values are predominantly agricultural and therefore low. Such location where land values are low and still they can enjoy some of the facilities in the core with no extra cost are readily utilized.

The consequences of such activities are not only interfering with the environment but they also give rise to secondary conflicts which have a tendency of impairing the operation of main activities.

Urban developments following major access arteries produces a gap in regional inequalities and eventually these regional imbalances become noticeable land marks in our spatial structure.

**SUMMARY:**

The major problem facing Nairobi-Thika region as a result of road accessibility are:
1. The threat of agricultural land use in the region by urban developments; using accessibility criteria in their locational matrix.

2. The growth of sprawling settlements and their environmental problems.

3. Land speculation.

4. The discrepancy that exists between settlements in the region.

1.2. PURPOSE OF THE STUDY:

The purpose of this study is therefore to critically examine and analyse the encroachment on agricultural hinterland by a growing metropolitan area. The study looks upon improved accessibility as the cause factor of such encroachment, especially how highway accessibility has encouraged urban sprawl on the outlying periphery and agricultural district of a city over time and space.

The threat is examined with reference to a case study of Nairobi-Thika highway improvement. The study examines the impact of the highway improvement on three aspects viz. land values, land use and settlements.

As a study of land use in absence of any comprehensive land use planning legislation, it examines the land allocation in the context of the price mechanism in a market economy where users are competing.

While many planners have developed different theories about accessibility in relation to spatial structures of
metropolitan areas, there is an attempt here to provide a departure from these traditional views to a more realistic approach in the evaluation of accessibility.

Land values are therefore employed while not downplaying the elements of tenure speculation and locational matrix.

In this study selected settlements are studied in an attempt to provide an alternative to the growth strategy while accepting the fact that settlements develop largely on their service function and their spatial management.

Our concern here will be to examine whether the highway improvement can be a basis of rapid encroachment on agricultural land in the periphery of a growing city or urban settlements.

It is assumed that access improvement in form of highways acts as a trigger to high land values on the neighbouring land, which consequently influences the change of use and hence the spatial structure of settlements. It is therefore doubtful whether the emphasis of metropolitan growth should be geared to high class access routes through agricultural potential areas. The study argues for a comprehensive land use planning policy.

1:3 SIGNIFICANCE OF THE PROBLEM

The area of concern is the land between Nairobi and Thika towns, an area of about six hundred square kilometres of high agricultural potential. This area forms part of
Kenya's potentially good agricultural land which is only twenty five percent of the total area. Currently the land under study is under coffee; sisal and cattle ranches.

The study acquires its significance in regards of the use and misuse of resources where allocation is left to open market operations.

Land as a factor of production will leave on its own, move to high returns viz. highest bidder which may not be necessarily the best user, in terms of the National and regional aspects. Thereby denying the area and sector with a major resource. In here a degree of dependency exists between the study area - Nairobi-Thika towns and the National economy viz.

National - Foreign exchange earnings from the export of coffee, sisal and other agricultural products.
Regional - A source of raw material for processing in Nairobi and Thika
- A source of foodstuffs.
- Employer of Rural population.

The study is located in a metropolitan region in Kenya - perhaps the only such region in Kenya, with a highway investment of unique category (Dual Carriage Way in rural district). Therefore; it acquires a special importance in view of the fact that other highway improvement projects may be evaluated on the basis of Nairobi-Thika results.
SCCOPE OF THE STUDY

To analyse the problem systematically; the thesis has been arranged into several chapters. Chapter one deals with the introduction of the problem, its significance purpose of this study scope, a short review of previous work, research methodology and problems of research.

Chapter two deals with the location of the study area and it is in this chapter that the background information is analysed and recorded. This chapter also examines the pre-improvement criteria used by the Ministry of Works.

The following three chapters, viz. chapters three through five examine the existing pattern of land values, land use and settlements as affected by the highway improvement - chapters three and four consists of a brief argument on the theoretical aspect, general pattern developed over time and the impact of the highway improvement. Chapter five looks at the existing nature of settlements, Ruiru and Kalimoni (Juja) their environmental and spatial problems and the impact of the highway improvement.

The sixth chapter examines the implications of the highway improvement impact on land use planning in a metropolitan growth region. The latter part of this chapter forms a land use policy for development of the region in two sections. Section one consists of a policy on urbanisation and section two is on agricultural policy.
The policy forms a part of the protective measure for the protection of potential agricultural land.

Chapter seven and the final one deals with the synthesis of the problem. This is where the problem is restated again with the findings and conclusion. This also includes suggestions for further research.

1:5 A BRIEF REVIEW OF PREVIOUS WORKS.

The previous works on this subject have been carried out in the U.S.A., unfortunately little has been done in Kenya. However, Dr. S.S. Yahya looked at the 'changing pattern of land values land use in suburban Nairobi'. He examined the effect of urban encroachment on suburban agricultural districts.

He assumed that land values and land use in peri-urban Nairobi are changing rapidly and therefore his study was to examine the factor triggering this rapid change. He noted the following factors as instrumental in the change:

1) The land use contrasts according to sectoral differential in the city based on racial components.
2) The increasing distance from the and the influence of accessibility on location criteria.
3) The ever increasing large number of small farm units around the periphery.

These factors were examined in relation to socio-economic forces working from within and without the city. He concludes that:-
1) The city is gradually transforming the rural countryside.

2) The peri-urban district is constantly being invaded by urban development and land holding sizes are changing from large to smaller and smaller units.

3) Land value decreases with distance from the city centre towards the periphery.

4) There is a high element of land speculation.

The study of Dr. Yahya differs with the current one in that the latter examines a particular area as affected by improvement of accessibility while the former looks at the city’s built-up area and the immediate hinterland.

The other study related to the current one is that one done by Kinyanjui P.H.K. which examined the impact of a new road through the hinterland of western side of Nairobi. He is of the view that the road would lead to rapid urbanization of the area in the form of extended urban sprawl, and this is a threat to the lucratative Market-gardening activity in Kikuyu which supplies Nairobi with market-garden products.

In his study, Kinyanjui examined the development of settlements in the area by people who are trying to exploit the Nairobi housing problem in building rental houses for the people of Nairobi, who cannot get accommodation. He expresses the fear of these dormitory settlements with no employment centres of their own and lacking in planning
and management. He also notes the possible decline in agricultural commodities especially market-gardening if the development of these settlements are not controlled in time.

He argues for planning policy in the division in an effort to curb land speculation and protecting the agricultural land.

Though the study looks similar to the current one they differ in that the former looks at the impact of a new Road in the aspect of land use only, while the latter examines the impact of highway improvement and upgrading between two urban areas; examining the impact in three aspects viz. land values, land use and settlements.

Nairobi metropolitan growth strategy is the other study related to the current one. The growth strategy looks at the growth opportunities, potential and problems of Nairobi by the year 2000 A.D. with a view to provide a population of 3-4 million people. The strategies opportunities and potential are illustrated on map I which also shows the priority for growth and development. The strategy's recommendation of concentrated urban development towards Thika is also illustrated on the map. The study group's assumption was that the growth strategy was to avoid some structural quantitative and physiographic thresholds in the growth area.
Such thresholds exist in the East in form of long uneconomical service line, and noise pollution, in the south the National Park and in the west prohibitive land values.

Therefore, the Northern periphery was the option with comparatively less thresholds and also processing committed public investment in transportation.

The current study examines the growth strategy possible implication in land use planning and development. Map I also shows the thrust of development (shown by the broad Arrows) if ever the growth strategy was adopted.

In U.S.A. a lot has been done on this subject and the study of Wheeler B.O. \(^{10}\) of Washington is worth mentioning. His was from the point of view of the working of land market along the rural urban fringe and the relation of this landmarket, to modern highway facilities. Wheeler pointed out how property values in a peri-urban area tend to vary with the availability of modern transportation facilities. He observed that a substantial increase in property value with highway improvement in Washington.

The other study worth mentioning is that of Raticliff, R.U. \(^{11}\) on his work on the growth of metropolitan areas. He notes that metropolitan areas found their origin in the emergence of countemporaly urbanization making their transition from substance to market economy. The transit
system became vital to the maintenance of a properly functioning urban organization; he also looked at the movement of goods and services from one specialise area to another in the metropolitan region.

CONCLUSION

Looking at a modern highway in the metropolitan area, it has acted as a decentralizing factor to the rural urban fringe in forms of 'Spoke like' extensions of the city, aligned with transportation facilities. In Kenya the part played by the highways have not yet been fully examined and their implication in planning.

1.6 RESEARCH METHODOLOGY

The following methods were used in collecting data and information necessary for this study.

1.6.1 INTERVIEWS:

A number of interviews were conducted in the study area, for the purpose of obtaining the views of the residents on the various aspects of concern and the road. Government officials and other people involved in one way or another in the various aspects of the study area were interviewed.

1.6.1A GOVERNMENT OFFICIALS

i) The staff of the Nairobi City Council, particularly those in the valuation and planning sections were interviewed to ascertain the unimproved site value which is the Council's basis of rating. On the
valuation of Roy-Sambu and Kahawa farm areas. The views of the planning section were vital in the establishment of a possible policy suggestion concerning the growth towards Thika.

ii) Staff interviews at Kiambu District Officers. Kiambu district headquarters were visited for the purpose of obtaining a research clearance from the District Commissioner. Also the district Agricultural Officer was interviewed together with the staff of the Kiambu County Council. The district Registry officials were also interviewed with the view of getting their views towards land sales and transfers in the area neighbouring the study area.

iii) Foreward planning section of the Road Branch (Ministry of Works). This was visited inorder to establish the criteria used in the investment and also to establish whether post-construction evaluation is done. The discussion of the real need to evaluate the impact of any of the Ministry of Works roads project in the republic. Also this section help me with the traffic counts. The factor of safety, planning together with the location were discussed in view of the subsequent land use. Also the question of the extension of the highway to Muranga and Nyeri was highlighted.
iv) The staff at Thika Municipal hall, were interviewed though the interviews tended to revolve around the issues of the future growth of Nairobi and around the interrelationship with Nairobi and revaluation of 'Nairobi Metropolitan Growth strategy' recommendations especially on the issues (1) a new town at Thika and (2) concentrated development between Nairobi and Thika.

v) Interviewed with officials of Kenya Railways was designed to facilitate the establishment of the Road-Railway competition before and after highway improvement. This was thought as useful for the purposes visualising the relative impact in transportation.

vi) The staff of Lands Departments, were interviewed with a view to obtain the following categories of information. (1) The land values of the farms via land acquisition. (2) The land tenure and number of transactions which are undergoing this area. (3) The land regulations in the area.

vii) Staff at coffee research foundation at Ruiru were interviewed in order to get the information on basis of agricultural productivities and the ideal coffee estate holding and the future of coffee in Kenya.
viii) Staff of Ministry of Agriculture, were interviewed similarly to (vii) above through areas other than coffee were covered here.

1.6.1B LOCAL RESIDENTS

Oral interviews were conducted whenever the author deemed necessary for the purposes of obtaining and ascertaining information obtained in documents especially on the aspects of land value and speculation, ownership and 'metropolitan growth strategy'. The views come out clearly in the following few chapters.

1.6.2 PERSONAL OBSERVATION

The author being a resident in the study area for quite a long time, and previously a valuation officer assigned in the same area, has observed road improvement and structural changes taking place along the route and also the change in land ownership. He has also noted these changes with unlimited interest.

1.6.3 DOCUMENTS:

Throughout the survey, various documented information has been recorded on the various aspects of the thesis. It is the author's interest to mention these documents here.

i) East African Meteorological Abstracts: for rainfall; temperature and humidity.

ii) The valuation Rolls—both main Rolls and supplementary valuation Rolls: for Nairobi Thika and Ruiru.
1.7 PROBLEMS

Various problems were encountered during the research which greatly affected the way the survey was carried out, and consequently the final report.

The major problem encountered during the survey was in the access to the documents which contained the information
needed. Despite the fact that a research clearance had been granted from the Office of the President; departmental heads found it not sufficient to allow me access to the relevant information documents such as the land files, not to mention that the research clearance was only issued at the end of the period when field surveys were supposed to be completed.

It is important to note here that land in Kenya is a sentimental commodity and any dealing in it at times becomes political as well as a security risk. Noting this the author was extremely cautious with the method of conducting the survey and at times had to delay for months without pursuing an interview. It should be mentioned here that the methods of collecting data and some original aims had to be amended. This is purely due to the political sensitivity of land ownership in the study-area. Time was the other problem encountered during the whole period of survey and writing. As mentioned earlier research clearance was late and therefore a lot of work overlapped with other course work.

Another problem was lack of Toposheets Kenya Maps coverage scale 1:50,000 for the study area. The survey and preparation of Maps in Kenya is done by the Survey of Kenya. The print over the whole period as the negatives were lost in transit between Britain and Kenya. This made it impossible for the author to prepare the necessary maps in time. At the time of writing; the negatives were still not available.
The use of aerial photographs also proved limited. Again this is the responsibility of the Survey of Kenya to prepare them. The ones available only covered parts of the study area at different years. The department has no library where one could make references with ease without necessarily going under the bureaucratic pipeline and hence the expense in terms of money and time were substantial.

Finance was the other problem as the research grant was not enough to carry out the work adequately. Noting the nature of the problems the author encountered in the field the thesis was compiled.
FOOTNOTES:

1. From Nairobi urban study group report, the actual figures are 4.2 million using high growth rate (7 per cent per annum) and 2.88 million using low growth rate, (4.9 per cent per annum).

2. City Council of Nairobi.


4. Coffee is the largest single foreign exchange earner for the country.

5. Urban population growth rate is at 7 per cent per annum. National Growth rate is 3.4 Kenya population census 1969.

6. The potential agricultural in Kenya is around the highlands zone; The rest of the country has little and very unreliable rainfall which makes agricultural development very difficult if not impossible.


9. Op. cit. as 1 above and also map 1 where the potential growth is analysed in view of this strategy.

10. Wheeler, B.O. 'Effect of free way access upon suburban real property values' pp. 21-83.

REFERENCES:

1. Nairobi Urban Study Group: Nairobi Metropolitan growth Strategy
   Nairobi City Council 1972 unpublished.


CHAPTER TWO

STUDY-AREA

2.1 Location and Extent

The study area is located between Nairobi and Thika urban areas. It is within the Nairobi Metropolitan growth strategy region. Map 2 shows the extent of the study area within this region.

The area lies between 0° and 1° South of Equator, with the Nairobi-Thika highway running more or less in the centre. The area therefore extends 10 kilometres on both sides of the road. This region therefore falls between 36°5' and 37°5' East. The area bounded in this region is about 600 square kilometres.

In administrative terms the area partly forms parts of Nairobi-Kiambu and Thika administrative units. The 10 kilometre mark on each side of the road is taken to be the extent of the region for the study purposes; determined on the basis of the following considerations: -

1) It is the control area of the highway in terms corridor development and accessibility factors. Patterns of land values and land uses in any area beyond this line of demarcation are considered to be least affected by the direct impact of highway development.

2. The soil classification (Map 3) in the study area also falls the same pattern and direction of the road. Both sides of the road have almost one soil type
Map 1 DEMARCATION

LEGEND

- BUILT-UP AREAS
- METROPOLITAN GROWTH STRATEGY RECOMMENDATION
- POTENTIAL URBAN DEV. & GROWTH DIRECTIONS
- DENSE POPULATION GROWTH

BOUNDARY (TOWNS)
BOUNDARY (STUDY AREA)
ROADS
RAILWAY
FOREST

Nairobi-Thika Region

Scale 1/1,000,000
0 5 10 km
0 5 10 ml

g. kariuki (BA-LE) 1977
extending all the ten kilometres from the road.

3. Nairobi Metropolitan growth strategy looked at this area as the area of the most probable concentrated development.

The area covers a region of large scale or extensive farming, consisting of large coffee and sisal estates and cattle ranches. With concentrated activities where urban orientation emerges stronger.

The highway forms a central feature in the region demarcating land use and the scale of farm holdings; on one side of the highway there is the large scale sisal farms and cattle ranches with areas going beyond 1500 hectares per unit while on the other side are more small farms ranging between 0.45 and 400 hectares. The intensity of land use also follows a similar pattern as the land holding being more intensive in the area with small sizes and less intensive on the large scale holdings.

Various factors that pertains to this distribution pattern discussed later but include the soil climatic factors, land carrying capacity and the crop suitability.

2.2 GEOLOGY AND TOPOGRAPHY:

The actual area forms the transitional area of the Upper Athi Basin and the Kikuyu Dissected physiographic units.
The geological activities in the area are akin to these physiographic units and are of the Miocene and the latter pliocene periods. In the Kikuyu dissected slope more recent volcanic series were superimposed. These include the Nairobi Trachyte in the western part of Upper Athi basin.

The study area falls in two topographical units which moreless follow the physiographic units. These are:

i) The Broad ridge topography akin to the Kikuyu Dissected Plateau: This consists of broad-flat-topped and rounded ridges separated by steep convex to uniform sided valleys. On the upper units of this division the valleys are narrow, but lower down they broaden out.

ii) The Gently Undulating Very Broad Ridges: This region is lower down where the highway passes and the ridges are broader due to various streams upstream joining up to form rivers and the valleys though deeply incised have also widened out due to lateral cutting by the rivers.

The ridges in the upper part of the region have tops gently undulating topography and it becomes flatter and poorer drainage condition pertain in the lower parts east of the highway tending towards the plain.

Here it is important to note that subsidiary drainage has developed along low lying land between the undulations. These drainage channels are marked by belts of poorly drained
Map 3 Soils

LEGEND

- Sandy clay loams
- Friable clays (litosolic)
- Shallow stony soils
- Black-dark grey clays
- Laterite/rock friable clay
- Alluvium
- Friable clays (ando-like)

Nairobi-Thika Region

Scale 1:100,000

10m
5km
5km

Nairobi, RA(LE) 1959
soils. (Map 3). The undulations of the ridge tops have concave slopes and therefore a catenary relationship between the soils found.

2.3. SOILS.

Like topography; the soils of the study area follow the same physiographic units and three major soil categories are well established, although other soil categories occur; they are not extensive in extent, but are limited to small localities. The three well established categories are:

a) Dark red friable clays (LATOSOLIC).

Found in the area of Broad ridge topography which lies on the west and north-western parts of the study area. (See map 3). These soils are deep; six metres being not uncommon, and have a good water storage capacity. They were formed from volcanic rocks although similar soils derived from the basement complex occur elsewhere outside the study area.

b) Red friable clays (Silty CLAY LOAMS).

These differ from (a) above in that they are less humic and have a lower total exchangeable base content, less saturated and a weaker structure. They occupy the summits of, upper and middle slopes of the 'very broad ridge topography region'. These soils are shallow due to inadequate weathering of the parent rock. The other reason is due to the fact that in some parts a laterite cap has formed over the rock.
surface becoming a protective cover. This has changed the drainage condition. The soil is found west of the Nairobi-Thika highway. (see map 4).

c) Shallow Yellow-Brown to Red friable clay. (LATERITE/ROCK FRIABLE CLAYS).

These soils occur in the south west corner of study area and along the highway and stretches eastward to the boarder of the study area. (see map 3).

These soils are shallow and those over rock tend to be redder than those which occur over laterite; mainly at the edges. In geological terms these are youthful soils formed after the removal of black clay by erosion processes. The genesis though however; indicate that they result of seepage water from higher ground being checked by the chance of slope and poorer drainage conditions at the foot of the slope. Here, Iron and alluminium from the seepage water were decomposed forming Laterite sheets.

d) Black-Dark Grey Clays:

These occur in the eastern side of Nairobi city and in some thin track in the study area in an east-west direction. (Map 3).

These soils were formed when the whole area formed a large basin bonded by the Machakos hill in the east, Ngong hills in the south; the eastern highland of the Rift Valley; and the north being bonded by Ithanga-Kakuzi hills. During the wet cycle the basin formed
a Lake and Colluvium and alluvium materials were deposited within the basin from surrounding hills. When the lake resided the deposits were transformed into the present black soils. Due to poor drainage of the soil despite the slopes, and slow weathering of the underlying rock; the soil has acquired gradually the characterized of being weathered 'in situ'.

e) Dark-Greyish-Brown Molten Clays (Alluvium and VLSI SOILS).
These occur in shallow depressions on both sides of Thika Road. The depressions occurred due to minor fissuring. Where there was a junction of two such fissures, a sink hole was formed. However, the soils are also found in old drainage lines which have been filled with ash and colluvium. Where there was the present rock material exposed, the soils were developed under impeded drainage conditions such as water logging. The interesting feature of these soils is their acidity and molten in contrast with alkaline nature expected due to seepage water.

f) Peaty Swamps.
These occur in the main valley bottoms of rivers in the study area on both sides of the road. To the east they are wider and the rivers flow in three manner through the papyrus swamps. These have also
been a result of impeded drainage. Conditions as referred to 'd' above.

2.4. CLIMATE AND VEGETATION.

The climate of Nairobi-Thika region can be defined through the consideration of the rainfall figures which tentatively follow the topographical factors. In the 'Broad Ridge Topography' region the rainfall is between 1000-1250 mm per year falling in two main seasons viz. March through May and November. The seasons are commonly known as the 'long' and 'short' rains respectively.

The temperatures are high throughout the year with mean maximum and minimum at about 25°C and 15°C respectively. In the region of 'very broad ridge topography' further east of the Broad ridge topography, the annual precipitation is about 750-1000mm. The rainfall also occurs in two season though in this region they are much shorter.

The temperature are high throughout with mean temperatures at 27°C maximum and 14°C minimum. (See appendices A-C).

The natural vegetation is almost extincts especially in the 'Broad Ridge topography' region; west of the Thika road where it has been cleared out to make room for plantation crops like coffee. The region was covered by forest which was dense further west and less dense towards the East.

In the region of the very broad ridge topography where the rainfall is much more scanty, clearing has not been
intensive like the former region, and therefore tracks of the original natural vegetation can be found. This is made of tall grass which was dry at the time of the survey. The grass usually grows tall during the rainy seasons.

2.5. POPULATION

The region falls within three administrative units viz. Nairobi - Kiambu and Thika as noted earlier. In Nairobi, the region comprises of Kahawa, Ruiru and Kasarani locations. While in Kiambu it forms the Lower settled Areas Ruiru Urban and Rural and Juja. In Thika it forms part of Thika Rural.

The areas covered is about 600 square kilometres with a total population of 47064 people in 1969, with a density of 67 people per sq. km. Using the Natural growth rate of 3.4% per annum the present population is estimated at about 61973 people with a density of about 38 persons per sq. km. Comparing the population of 1969 census and that of 1962 a growth rate of 3.4% per annum is arrived at. Map 4 shows the population growth rate between 1962 and 1969. The actual population figure are in Appendix 'B'.

The absolute densities do not carry much significance, but a look at the population table of 1969 shows the relative density which are much more meaningful.

High densities were revealed at the following areas within the region:-

Kahawa 477 persons per square kilometre
Ruiru (urban) 557 persons per square kilometre.
Thika 1217 persons per square kilometre.
Ridgeways 247 persons per square kilometre.
Kasarani 341 persons per square kilometre.

Low densities over the same period were recovered in the following areas:

Ruiru rural 54 persons per square kilometre.
Thika rural 27 persons per square kilometre.
Juja 39 persons per square kilometre.

The western side of the road in the region referred to earlier as the region of 'Broad ridge topography' shows higher population densities than the eastern side (very Broad Ridge Topography). A characteristic that reflects the effects of the soil and climatic conditions.

After 1969 census there have developed sprawldic settlements around Kasarani, Kahawa, Ruiru and Kalimoni which the author observed, though it was difficult to carry out another census survey, the population of this area has greatly increased as will be evident later in settlements due to the increase of the number of physical structures coming up in the afore mentioned places.

2.6 HISTORICAL DEVELOPMENT OF THE HIGHWAY

Thika is only 41.7 kilometres from Nairobi City Centre by Road. This settlement was established in 1910 between Blue Post Hotel and the crossing of Muranga-Nyeri track and
Thika and Chania rivers.

Nairobi-Thika Murunga track was established in 1908, which was a motorable earth road running at the edge of the Kikuyu country. During this period the road was not important to European colonizers as the railway was much more in use. Nairobi Thika Railway was opened in 1913. Noting from the history of colonization, the roads; leave alone Thika Road played a minor role in passenger transport and therefore their development was rather slack more so where the same route was served by a railway line.

Nairobi-Thika road saw little improvement between the First and the Second World Wars, but towards the close of Second World War, the road was upgraded by the war prisoners mainly Italians, because of the administration rapid movements of military equipments and personnel. Despite the improvement the road remained difficult to use during the rainy seasons.

At the close of World War II the Land adjacent to railway line and the road was more intensively settled by the war veterans. Agricultural activities became more intensive and extended to new areas; making the road more intensively used. The road was even more intensively used following the automobile innovations in the Western World which continued to be made during the war and post war periods. With more intensive use, and the rains making the road impassible in the wet season it became necessary to
bituminize the road if movement was to be made. This was much so during the early 1950's when the administration needed rapid movement of military supplies and personal to Kiambu, Muranga, Nyeri, Embu, Meru and Nyandarua areas to combat the Mau Mau terrorists. Therefore the road was bituminized during this period. During this period the road was a single carriage way.

During the post-independence period the country has experienced rapid economic development, and so is the region; with Thika becoming the fastest growing industrial town in Kenya. This fast growth increased the need for accessibility and the problems of congestion, safety and standard along the road arose. The problems raised the need for a major policy decision in the mid-sixties. It was not until 1969 that Thika road was considered for upgrading and improvement. In consideration for upgrading the following factors were taken into account

1. The age of existing bitumen.
2. Traffic growth rate.
3. Safety and speed.
4. Life-span of the bitumen.

The Ministry of Works report noted that the existing road was to reach its capacity in 1969/71 and at this time a solution was required for the congestion problem.

Considering the above factors and problems, two options were arrived at; these are:-
1. **Widening of the existing road to a 22 ft or 6.6 metre standard to be constructed on the stretches which does not meet this standard.** This option was faced with shortcomings in that it would reach its capacity too soon, 1978; and again congestion and other problems would require a solution by 1979, therefore a second option was considered in light of this.

2. **A second carriageway:**

   This was to be constructed in 1969/70, noting that the existing carriageway was in a position to accommodate a one way traffic for another 25-30 years i.e. beyond the evaluated period. However, it was noted that on the basis of reduction of operating costs it was economical to repair the existing carriageway before then.

The cost/benefit analysis Technique was used to analyse the benefits and costs and the following factors were noted:

1. Cost savings on operation and working time.
2. Savings in accidents costs.
3. Saving in Maintenance costs.

On item No. 1 the group analysed it at length though the savings in working time was difficult to assess. There was no evidence available to accommodate the magnitude of item No. 2 and in No. 3 the group used discounted cash flow method to assess it.
The upgrading of Nairobi-Thika road was started in 1969/70 with the following design standards:

1. A dual carriage with 100 k.p.h. speed standard.
2. Pavement width 6.6 metres
3. Shoulder width 1.8 metres
4. Life 20 years.

The road was to have limited access to a certain degree but was not to conform with Motorway standards in this respect.

The improvement was phased out into three phases viz:

1. 1969/70 ......... £ 252,000
2. 1970/71 ............ £ 504,000
3. 1971/72 ............. £ 504,000

The total cost of the improvement was at K.£ 1.26 million and tendered by Mowlem international, a Nairobi based international construction company. The improvement was complete in the course of 1972.

The criteria used during the pre-construction period made no consideration of the effects of the dual carriage way on the adjacent land; especially in the aspect of land values; land use and settlement. There has been no economic evaluation or the earlier mentioned aspects which forms the subject matter of this thesis.
FOOTNOTES:

1. W.T.W. Morgan: Nairobi city and region. op. cit. fig. 2.

2. Similar soils occur in Kangundo area or Machakos district.


4. As '3' above. op. cit. pp. 11.


6. Appendix B and C Rainfall

7. As '6' above

8. Appendix A Temperatures.

9. As '6' above

10 As '8' above.


12. National Development Plan


14. The population of Ruiru has gone up considerably since the establishment of 'Githunguri Ranching Company' in 1971 and within the Plot allocation by same company in 1974 in 'Waira's Village to the south of the present Ruiru town. The density of Ruiru is therefore in the region of 5,500 persons per square kilometre.


19. op. cit. pp. 6 as above.
20. op. cit. pp. 7 as above.
21. op. cit. pp. 8-9 as above.
22. op. cit. pp. 10 as above.
REFERENCES:


CHAPTER THREE:

LAND VALUES

3.1 THEORETICAL APPROACH.

This section dwells on the explanation of land values where the theory is examined together with location aspects.

It should be appreciated that any piece of land has a locational matrix that is associated with it. Such as residential, industrial, agricultural, commercial and any other activity which might locate in it. The aspects of land valuation have been not worthwhile in the explanation of the working of the market economy. Where land is treated like any other factor in a world of scarcity and choice. In this context land has many competitors and in the absence of any controls the price mechanism becomes the sole determinant of land use.

The study is, however, dictated by the condition prevalent in the study area and therefore deviates from the theoretical concentric zones due to the topography and soil conditions and historical development. However, this does not dismiss Van Thunen's consideration of the concentric pattern of land values in an agricultural district.

The traditional location theory dwells\(^\text{on}\) the industrial than other functions as emphasized by Weber and Lösch\(^2\). Modern location theory suggested by Hurd\(^3\) brings out clearly the relationship between value and location 'value depends on \(\ldots\ldots\ldots\ldots\).nearness'\(^4\). By eliminating the
intermediate steps we may that, value depends on nearness which basically reflects on location theory. The emphasis that Hurd puts in relations to any particular site, and nearness must relate to the various aspects such as site amenities market, transportation and further complementarily aspects of each activity which may decide on this site.

Hurd's reference is only on city land but he forms quite a good outline of theoretical approach for any land. Traditionally the rent increases appear as charges which the owner of a relatively accessible site can impose because of the savings which the use of his site make possible. This traditional view is quite strong on the complementarily of rents and transport costs. Rents are usually reflected on the valuation and hence in land values. This view refers to transportation as a means of overcoming 'friction of space' and the better and efficient the transportation; the less the friction. While transportation overcomes friction, site rental and transport costs represent the cost of what friction remains.

The foregoing analysis brings about the interdependence of the site rental and transportation. Ignoring the question of the friction element, we find the relationship of site rentals and transport costs. The cost will, to a great extent depend on the nature and quality of transit systems available at any particular time and location.
Where the transit system is efficient and of high quality, the costs are usually low. Therefore an activity could locate for away along this system where the rents are low but still be in a position to accomplish its objectives and financial commitments. The site will become competitive and eventually due to demand and speculation the land values will rise.

The following model would help in providing an analytical view of the above explanation.

Assume that costs-rents are associated directly with travel time.

\[ 2T (S_o - S_i) V_t. \]

Where \( T \) = Annual number of trips to the focal point of activities in this case the Central Business district.

\( S_o, S_i \) = Travel time associated with two sites near the C.B.D. and away from the C.B.D. respectively.

\( V_t \) = Valuation of travel time.

If rents are same at 'So' and 'Si' then activities would choose 'So' as long as the corresponding values of 'So' and 'Si' differ by more or less than the difference in their associated travel-time cost to the C.B.D. some would desire to make a move. In equilibrium; the annual rents are the two sites which differ by:

\[ R_o - R_i = 2T (S_o - S_i) V_t. \]

For all 'O's and 'i's

At this stage if we assume that any other activity other
In this model locational constraints are only transport costs Viz. $2T(S_{\text{max}}-S_0)VT$ as rents will be zero at the outskirts.

Therefore the E site rentals t transport costs = Maximum travel time value, any activity will incur in relation to the C.B.D.

On the basis of the above analysis and explanation, a highway improvement from a central business district would provide direct benefit to those activities located adjacent to it. The site rents and hence the land values would tend to rise.

If $0$ is the total number of activities measured in travel time units,

Then;

Aggregate Total Cost $= \frac{2}{3} \frac{\Pi S_{\text{max}}^2}{\Theta} \cdot 2T S_{\text{max}} VT$.

and

Aggregate rents $= \frac{2}{3} \frac{\Pi T S_{\text{max}}^3 VT}{\Theta}$.
From the above formula, it is evident that if a transit or highway improvement reduces $S_{max}$ to some fraction $\alpha$ of its former value $(1-\alpha)$ times the original value of transportation cost, and supposedly the same proportionate reduction in aggregate land rents.

Equations (A) and (B) differ proportionately by a factor 2. Therefore if transport costs are reduced to some factor $n$ from the original value; the rents will reduced by $\frac{n}{2}$.

A highway improvement may alter land use in a location by altering the productive opportunities available to another location. This is termed as 'neighbourhood effects' and hence the change in land values. The desire of activities to change location moves the model out of equilibrium and this results in a change in land use as new locations are opened up by the improvements. If this happens the productive opportunities in a new location are altered and hence as new structure of land use and spatial structure evolves. Due to market forces demand and supply, land rents eventually will rise and consequently the land values.

The movement of activities using the accessibility cost savings leads to urban sprawl where the access facility originate from an urban centre, the sprawl extends into the rural fringe, thereby superimposing land values which are foreign in the area. The result is pre-mature subdivision of land for urban development where services are inadequate or lacking, thereby removing land from agricultural production and denying the
3.2. DEVELOPMENT OF THE LAND VALUES PATTERN

The development of the pattern of land values in the study area is analysed in this section under three subheadings viz. (i) 1901-1960; 1961-1966 and 1967-1970. Each of these period divisions is based on the political and socio-economic factors affecting the study area.

3.2.1 1901-1960

Before the European colonization, land values in Kenya could only be traced as matter of traditional and cultural outlook of each ethnic community. Therefore the traditional values were predominant in the land values in the area occupied by each community. So was the land tenure too. The Maasai for instance, had their values based on grazing units and they were culturally pastorists, while the Agikuyu values were in the 'Githaka' system reflecting both arable and pastoral values. The Githaka system allowed the Agikuyu to barter their land for with stock units.

At the dawn of colonization the British Government passed legislation affecting the land the settlers were to occupy. 1902 Crown Land Ordinance was the first attempt to give the settlers legal occupancy of the land in Kenya. Grants were made under this Land Ordinance of upto 150,000 Acres or 60,000 hectares for 999 years. During this period, it was practically impossible to develop such size of land and what followed was a period where the earlier settlers
started selling land to the late comers and this is the origin of land speculation in Kenya. Land became a commodity for sale and this was the first step in development of land value in the modern sense in Kenya.

In 1909 land values emerged in forms of the currency denominations, and land values around Nairobi were in the range of Rs. 2-3 per acre for farms.\(^5\)

In order to bring about land development and curb land speculation the 1915 Crown Land Ordinance was passed which stipulated conditions in grants for land development. Such conditions like 'In three years after the grant, if the grantee will have spent \(£\) 1,000, he will be given an option to purchase the land at Rs. 2 per Acre.\(^6\) This should be seen as the first government step in setting up land values for farms. The grant terms were easy and land was to be cheap to allow rapid settlement and development to support the railway which was at the time was making heavy losses.\(^7\)

During the World I little was done in the form of settlements and European settlements resumed after the war and land was again sold or granted to them. The sale price this time was higher than the period preceding the war by Rs. 2-6, and the land values than were between Rs. 4-8 per acre.

Land for European settlement was not however bought from African, but was taken as the African were said to have no interest in land except for near cultivation as they were in
the initial stages of development. Therefore the land values established then had an European bias since the true market condition were not allowed to prevail.

The Africans challenged the European ownership of land in the country, so much so, that the British Government appointed a commission of enquiry to establish how much land was taken from the Africans and the required amount of compensation. The report was published in 1933.

The area taken in the study area was considered in the report under the following headings.

i) Kamiti River Block - Area - 7.72 square miles.
   Occupants were 154 families.
   Cultivated area 308 Acres.
   Total assessed compensation = Rs. 555.
   Value per acre was assessed at Rs. 2.

ii) Ngewa - Chania land block.
   Area taken - 17.1 square miles
   in 1902 it was uninhabited.
   Alienated in 1905.
   Owned by 42 families.
   Cultivated area = 84 acres.
   Total compensation assessed at Rs. 165.
   Assessed Value per acres Rs. 2

From the above extracts, it is clearly evident that the British Government was to give compensation for cultivated areas only. The uncultivated areas according to the
commission's report had no value. The compensation was based on the land values at the time of alienation and not that of enquiry.

The consideration that uncultivated land had no value was meant to suit the European interests such that no compensation was to be paid out for the bulk of the settled land. The view that the uninhabited land had no owner and that European could settle on it at zero costs was contrary to the 'Agikuyu' traditional brief. The believed that the Europeans were 'Allot' temporary occupants whose rights in the land could be revoked at will.

During the 1930's Data is scant on any land sales. This was chiefly due to the great depression, and it could be assumed that land values like every thing else suffered during this period. Land values had only to recover later in the post war period after 1945 when values rose to £ 200 for farms around Nairobi. During this period the land values were affected by four factors: viz.

1) Commodity Prices
2) Socio-political aspects
3) Character of land under sale
4) Land control system.

3.2.1A COMMODITY PRICES:

Commodity prices in the world market contributed much to the development of the land values in the study area in the
<table>
<thead>
<tr>
<th>YEAR</th>
<th>COFFEE PRICE METRIC TON</th>
<th>COFFEE LAND VALUES HA.</th>
<th>SISAL PRICE/ METRIC TONNE</th>
<th>SISAL LAND VALUES PER HECTARE</th>
<th>MEAN ANNUAL LAND VALUE/ HA.</th>
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<td>1945</td>
<td>-</td>
<td>894</td>
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<td>6205</td>
<td>10432</td>
<td>-</td>
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</table>

period, specifically 1945-1960. This was due to the fact that the land in the study area was principally agricultural producing commodities such as coffee and sisal for the world market.

Table 3.1 tabulates the relevant coffee and sisal prices in the world market during this period against the corresponding land values. Analysing the figures from the table 3.1.; it is evident that land values fluctuated with fluctuation of commodity prices in the world market. The prices had an dictating effect on the land value in the following year:-

For example:

In 1950 the Price of coffee per ton was K.Shs. 4722.
The land value in 1951 when the price dropped to K.Shs. 4127 was K.Shs. 2805 per hectare. In 1952 the land values were at K.Shs. 2581 though the price of coffee had gone up to K.Shs. 6434. 12

3.2.1B SOCIO-POLITICAL FACTORS:

The socio-political condition within the colony were also instrumental in shaping the pattern of the land values during this period. Political and social disturbances generally affected the investment market and the property market forming part of it, is no exception. Therefore, such events as the end of the World War II Mau Mau nationalist war in 1952 and its close in 1959, and Princess Margaret's visit to Kenya in 1956 are period of marked levels of land
1945 was the end of World War II and the analysis in table 3.1. and also illustrated in figure 3.1. shows that land values were pulling out of the depression forced by the war.

In 1951 and 1952, this was the dawn of the Mau Mau Nationalist movement challenging the European supremacy and occupation of land in the colony then. The Nationalist movement activities within the country are seen at this period as a major factor affecting land values not only in the study area but also the whole country. At this time little was known about the future of the country and the investors never wanted to put their money in land which was the cause of Nationalist war.

Princes Margaret visited the country and her visit boost the morale of the investors and land values are seen to be pulling out of the temporary depression forced by the Mau Mau Nationalist war.

At the close of the 1960's, a period when it became evident that independence was to come the European land owners were not sure whether to quit the country or stay under an African Government. Furthermore they were not sure if the African Government would guarantee the security of their investments. Under these sets of circumstances most of them choose to sell and quit the country. This flooded the land market thereby pushing the value down and again in this period there is
a slump. The trend in land values illustrate graphically in figure 3.1 shows these peaks and through associate with these socio-political factors.

### 3.2.1C CATEGORY OF LAND UNDER SALE:

This factor has influenced the land values as far as the compilation of the data is concerned. The annual land values in all the land values tables in this thesis, the means are compiled from the land sales of each year. Therefore if the land under sale in any one year is developed or underdeveloped this aspect will be reflected in the land values of that particular year.

As the case stands, land values to the west of the highway have remained higher than those to the East of the highway. This is a factor which we can attribute to the land development in the area. To the west of the highway the area is used for coffee growing while the East is predominantly ranches and sisal estates. Therefore if in any year there was more land sold on one side than the other the land values of that year reflects the values of the side where more land was sold.

### 3.2.1D LAND CONTROL SYSTEM:

Land control in Kenya goes as far back as 1902, but the 1944 land control ordinance had a greater impact than any other preceding ordinance. The ordinance had the following provisions:

1) No transfer of land was to be allowed in the scheduled
Table 3.2. LAND VALUES IN NAIRI THIKA REGION IN 1945-1960

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Land Values P. Hac.</th>
<th>Total Area P.A.</th>
<th>Annual No. Sales</th>
<th>Annual Mean Value Per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coffee</td>
<td>Mixed</td>
<td>Sisal</td>
<td>Ranching</td>
</tr>
<tr>
<td>1945</td>
<td>894</td>
<td>426</td>
<td>250</td>
<td>25</td>
</tr>
<tr>
<td>1946</td>
<td>1856</td>
<td>570</td>
<td>254</td>
<td>-</td>
</tr>
<tr>
<td>1947</td>
<td>2855</td>
<td>640</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1948</td>
<td>3620</td>
<td>1302</td>
<td>202</td>
<td>-</td>
</tr>
<tr>
<td>1949</td>
<td>4522</td>
<td>897</td>
<td>177</td>
<td>-</td>
</tr>
<tr>
<td>1950</td>
<td>4722</td>
<td>1176</td>
<td>336</td>
<td>-</td>
</tr>
<tr>
<td>1951</td>
<td>4127</td>
<td>2020</td>
<td>506</td>
<td>-</td>
</tr>
<tr>
<td>1952</td>
<td>6434</td>
<td>1942</td>
<td>555</td>
<td>256</td>
</tr>
<tr>
<td>1953</td>
<td>8856</td>
<td>2020</td>
<td>814</td>
<td>161</td>
</tr>
<tr>
<td>1954</td>
<td>6702</td>
<td>2996</td>
<td>-</td>
<td>124</td>
</tr>
<tr>
<td>1955</td>
<td>7732</td>
<td>2035</td>
<td>687</td>
<td>-</td>
</tr>
<tr>
<td>1956</td>
<td>7438</td>
<td>2277</td>
<td>530</td>
<td>328</td>
</tr>
<tr>
<td>1957</td>
<td>6641</td>
<td>1836</td>
<td>-</td>
<td>142</td>
</tr>
<tr>
<td>1958</td>
<td>5340</td>
<td>1352</td>
<td>931</td>
<td>-</td>
</tr>
<tr>
<td>1959</td>
<td>9122</td>
<td>1826</td>
<td>812</td>
<td>-</td>
</tr>
<tr>
<td>1960</td>
<td>10482</td>
<td>2071</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source 1976 survey
G. 2.1. LAND VALUES MEANS AND COMMODITY PRICES BETWEEN 1945 - 1960

The trend analysis of values and prices over the sixteen years of the study area is presented in Table 3.2, which shows all the categories of the main commodities and prices over the sixteen years. The study area is one of the major coffee-producing areas in the country, and the data used in this analysis are based on the prices of coffee and other commodities.

The data on coffee prices and land values in the study area are presented in the diagram. The coffee prices are shown by the dashed line, and the land values are shown by the solid line. The data were obtained from the National Statistics Bureau and the Ministry of Agriculture, and they were standardized to make the comparison easier.

The coffee prices show a general trend of increase over the sixteen years, with some fluctuations. The land values show a similar trend, with some fluctuations as well. However, the coffee prices show a more significant increase than the land values.

In conclusion, the trend analysis of the coffee prices and land values in the study area shows a general increase over the sixteen years, with some fluctuations. The data used in this analysis are based on the prices of coffee and other commodities, and they were standardized to make the comparison easier.
area to non-whites.

ii) That approval of sales was to be on the basis of satisfactory scheme of land development.

iii) That it had to stabilize the land prices such that World War II veterans could be able to buy. These conditions stipulated by the ordinance interfered with the property market and result was that the market was no longer on the basis of willing buyer vis-a-vis willing seller. This had of course some effects on land values in the study area. Though it has been difficult to collect data on this aspect.

Having analysed the factors that effect the land values pattern between 1945-1960, the values of the pattern have been tabulated in table 3.2. which shows all the categorized values together with the mean value for each year. The total area sold and the number of transactions are also tabulated to show viability of the figures arrived at during analysis.

**TABLE 3.3: A COMPARISON OF COMMODITY PRICES AND LAND VALUE IN THE NAIROBI-THIKA REGION BETWEEN 1961-1966**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>COFFEE PRICE PER TONNE</th>
<th>COFFEE LAND VALUES PER HECTARE</th>
<th>SISAL PRICE PER TONNE</th>
<th>SISAL LAND VALUES PER HECTARE</th>
<th>MEAN ANNUAL LAND VALUES/HA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>6690</td>
<td>8110</td>
<td>-</td>
<td>500</td>
<td>3520</td>
</tr>
<tr>
<td>1962</td>
<td>5624</td>
<td>5760</td>
<td>-</td>
<td>350</td>
<td>2240</td>
</tr>
<tr>
<td>1963</td>
<td>5478</td>
<td>6420</td>
<td>-</td>
<td>860</td>
<td>2620</td>
</tr>
<tr>
<td>1964</td>
<td>6590</td>
<td>8640</td>
<td>3416</td>
<td>500</td>
<td>2925</td>
</tr>
<tr>
<td>1965</td>
<td>6260</td>
<td>8840</td>
<td>1800</td>
<td>840</td>
<td>3105</td>
</tr>
<tr>
<td>1966</td>
<td>5868</td>
<td>14100</td>
<td>1532</td>
<td>760</td>
<td>5600</td>
</tr>
</tbody>
</table>

### TABLE 3.4: LAND VALUES IN NAIROBI-THIKA REGION IN 1961-1966

<table>
<thead>
<tr>
<th>YEAR</th>
<th>AVERAGE LAND VALUES IN RESPECT OF LAND USES PER ANNUM</th>
<th>TOTAL AREA UNDER SALE</th>
<th>ANNUAL NO. OF SALES</th>
<th>ANNUAL MEAN VALUE PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COFFEE</td>
<td>MIXED</td>
<td>SISAL</td>
<td>RANCHING</td>
</tr>
<tr>
<td>1961</td>
<td>8110</td>
<td>3053</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>1962</td>
<td>5760</td>
<td>2750</td>
<td>350</td>
<td>60</td>
</tr>
<tr>
<td>1963</td>
<td>6420</td>
<td>3150</td>
<td>860</td>
<td>35</td>
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<td>1964</td>
<td>8640</td>
<td>2460</td>
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<td>60</td>
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<tr>
<td>1965</td>
<td>8840</td>
<td>2770</td>
<td>840</td>
<td>90</td>
</tr>
<tr>
<td>1966</td>
<td>14100</td>
<td>7300</td>
<td>760</td>
<td>235</td>
</tr>
</tbody>
</table>


#### 3.2.2. 1961-1965

This is the second period in the development of the pattern of land values in the study area. The period was one of political anxiety to both the Africans and the Europeans. For the Africans; they wanted land distributed to them free as they had fought for it, while the Europeans wanted safe-conduct for their properties.

From the above views one new factor envolved which interfered with the development of the pattern of land values. The factor was of course legislation. This period was characterised with rigorous land legislation and amendments after another in the Land Control aspects. Before handing over political power to the African Government the colonial administration wanted to make sure that the
FIG. 3.2. LAND VALUES AND COMMODITY PRICES BETWEEN 1961—1966

Values & Prices in KSh.'000


--- Coffee Prices per metric tonne
--- Sisal Prices per metric tonne
\(\sqrt{\text{Land Values (annual means)}}\)
Europeans had a fair deal and in 1960 Land Control Regulations were repealed and also in 1961 which saw two amendments. In 1963 the Land Control Regulations as amended in 1961 were to stay in force till 1965, only their application to be extended till enactment of the Land Control Act of 1967.\(^{15}\)

The analysis illustrated in tables 3.3. and 3.4. reveals that the factor discussed in section 3.2.1. of this chapter still affected the land values to these were commodity prices, social-political factors, character of land under sale and finally the legislation. In this section I wish to dwell much more on the legislation as the effect of the other three factors is similar to that in the preceding period.

Between 1962 and 1964 the land values were depressed though coffee prices were relatively high. A factor which could be attributed to the political uncertainty in the country. Land values reached their record fall since 1946 viz. K.Shs. 2240 per hectare. Though categorised land values such as for coffee at the same period was at K.Shs. 5000 per hectare.\(^{16}\)

Land values started picking up in 1965 when the mean value was at K.Shs. 3200 per hectare and trend continued in 1966 and 1967. In the same period coffee land went up from K.Shs. 5000 to K.Shs. 14100 per hectare, and started falling in 1968 due to the fall in the price of coffee in the world market.
The rise in land values in the study area after 1964 could be attributed to the security guarantee of property ownership in the constitution and the land control Acts enacted in this period. Coffee and sisal prices effects during this period are analysed in fig. 3.2.

3.2.3. LAND VALUES, IN 1967-1976:

The present pattern of land values in the study area, may be seen to originate, in 1966 when the political arena looked more settled than the previous period. At this time the economic development path for the country was defined in a Government Sessional Paper. After this the forces which were interfering with market forces in land were done away with as land legislation ceased altogether.

This period in terms of the study area saw the planning, implementation, and the use of Nairobi-Thika highway improvement. It is in this period where the highway improvement impact on land values is examined, noting of course the previous factors affecting the development of the pattern.

The land values analysis is tabulated in table 3.5 and illustrated by figure 3.3. From this analysis a pattern emerges. For the purpose of analysis the values have been categorised into four groups respective of the land uses in the study area. The values have been reduced to annual means basis per hectare. The table also shows the annual mean
value for each category of land use in the study area.

**TABLE 3.5: LAND VALUES IN NAIROBI-THIKA REGION IN 1967-1976.**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>COFFEE</th>
<th>MIXED</th>
<th>SISAL</th>
<th>RANCHING</th>
<th>SOLD SALES</th>
<th>MEAN VALUE PER H.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>13100</td>
<td>7900</td>
<td>-</td>
<td>400</td>
<td>794</td>
<td>6</td>
</tr>
<tr>
<td>1968</td>
<td>10200</td>
<td>6200</td>
<td>300</td>
<td>200</td>
<td>6679</td>
<td>8</td>
</tr>
<tr>
<td>1969</td>
<td>7300</td>
<td>6900</td>
<td>1900</td>
<td>-</td>
<td>1492</td>
<td>5</td>
</tr>
<tr>
<td>1970</td>
<td>6900</td>
<td>4400</td>
<td>1200</td>
<td>-</td>
<td>2780</td>
<td>5</td>
</tr>
<tr>
<td>1971</td>
<td>8000</td>
<td>-</td>
<td>500</td>
<td>300</td>
<td>4221</td>
<td>6</td>
</tr>
<tr>
<td>1972</td>
<td>9800</td>
<td>5400</td>
<td>500</td>
<td>-</td>
<td>3337</td>
<td>7</td>
</tr>
<tr>
<td>1973</td>
<td>14900</td>
<td>5800</td>
<td>-</td>
<td>-</td>
<td>606</td>
<td>6</td>
</tr>
<tr>
<td>1974</td>
<td>15400</td>
<td>7200</td>
<td>1000</td>
<td>-</td>
<td>8687</td>
<td>14</td>
</tr>
<tr>
<td>1975</td>
<td>15100</td>
<td>4800</td>
<td>1400</td>
<td>-</td>
<td>9048</td>
<td>8</td>
</tr>
<tr>
<td>1976</td>
<td>15700</td>
<td>9700</td>
<td>3600</td>
<td>600</td>
<td>9176</td>
<td>8</td>
</tr>
</tbody>
</table>


value for each category of land use in the study area.

From analysis, land values in the study area have been observed to fluctuate over the years with marked variations in land values according to the land uses. The variations cannot be attributed solely to the highway improvement because other factors have played a part in the development of the pattern. These factors are:

i) Urban influence.

ii) Land use.
Fig. 3.3 LAND VALUES MEANS AND COMMODITY PRICES BETWEEN 1967 — 1976

- Coffee Price per metric tonne
- Sisal Price per metric tonne
- Land Values (annual means)
iii) Commodity prices.

iv) Land ownership trends

v) The highway impact.

3.2.3.1 URBAN INFLUENCE:

Figure 3.4. is an analysis of land values between Nairobi and Thika along the road. The analysis reveals that around the city boundary the land values are high reflecting urban encroachment in the agricultural periphery. The value recorded here is K.Shs. 84000 per Hectare. This value is neither urban nor agricultural but a transitional value where both urban and agricultural users are mixed up. The land holdings here are small and few exceed 8.09 hectares. Majority are between 0.451-2.02 hectares.

The land values falls to K.Shs. 12000 near and around Ruiru. This is because as one moves away from Nairobi the urban influence becomes more and more remote. The land values in Ruiru township however reflect the urban influence. The values are at K.Shs. 428000, 37200, 16400 for commercial, residential and industrial users respectively. Land values, however falls as one moves from Ruiru towards Thika. The value between Ruiru and Thika are in the range of K.Shs. 9500, 4000, 6000 per hectare. As one approaches Thika the land value rises again to K.Shs. 11000 per hectare. This is again reflective of urban influence. Land values at Thika town are high, and purely urban. The following are the land values recorded at Thika Town:-
**TABLE 3.6: A COMPARISON OF COMMODITY PRICES AND LAND VALUES IN NAIROBI-THIKA REGION IN 1967-1976.**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>COFFEE PRICE METRIC TONNE</th>
<th>COFFEE LAND VALUES PER HECTARE</th>
<th>SISAL PRICE METRIC TONNE</th>
<th>SISAL LAND VALUES PER HECTARE</th>
<th>MEAN ANNUAL LAND VALUES/HA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>5212</td>
<td>13100</td>
<td>1437</td>
<td></td>
<td>7100</td>
</tr>
<tr>
<td>1968</td>
<td>5854</td>
<td>10200</td>
<td>1470</td>
<td>300</td>
<td>4200</td>
</tr>
<tr>
<td>1969</td>
<td>5583</td>
<td>7300</td>
<td>1495</td>
<td>1900</td>
<td>4900</td>
</tr>
<tr>
<td>1970</td>
<td>7440</td>
<td>6900</td>
<td>1291</td>
<td>1200</td>
<td>4200</td>
</tr>
<tr>
<td>1971</td>
<td>5864</td>
<td>8000</td>
<td>1506</td>
<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>1972</td>
<td>7022</td>
<td>9800</td>
<td>540</td>
<td>500</td>
<td>5200</td>
</tr>
<tr>
<td>1973</td>
<td>8739</td>
<td>14900</td>
<td>4903</td>
<td></td>
<td>10300</td>
</tr>
<tr>
<td>1974</td>
<td>9819</td>
<td>15400</td>
<td>7860</td>
<td>1000</td>
<td>7900</td>
</tr>
<tr>
<td>1975</td>
<td>9397</td>
<td>15100</td>
<td>5028</td>
<td>1400</td>
<td>7600</td>
</tr>
<tr>
<td>1976</td>
<td>22310</td>
<td>15700</td>
<td>5028</td>
<td>3600</td>
<td>7400</td>
</tr>
</tbody>
</table>


Commercial Land K.Shs. 66700.
Residential Land K.Shs. 324000.
Industrial Land K.Shs. 258000.

Figure 3.5. is a profile of the above land values pattern analysis between Nairobi and Thika.

Land values away from Nairobi-Thika highway show very little or no relationship with urban influence. This is mainly
due to their uses and accessibility.

For Example:

Near the city boundary the land between 0-5 kilometre from the Road commands about K.Shs. 24000 per hectare while away off viz. 5-10 kilometre sells at K.Shs. 9500 per hectare.

Land values as affected by the highway are analysed in table 3.6. where the values are tabulated with two distinctions, those between 0-5 ms. and 6-10 on both sides of the highway.

3.2.3 II LAND USE:

Land use is an important determinant of land values. In assessing land values, the legal user is considered as opposed to the use practised. The land values therefore will fluctuate with the type of legal user and condition at the time of valuation. The value will reflect on the conditions such as intensity of use profitability and also management.

Noting that the land uses in the study area are agricultural, the conditions of each parcel are very much reflected in the land valuation. Therefore land values to the west of the highway are higher than those to the East. This is mainly because:-

1) Coffee is the main land user to the west of the highway, while to the east sisal and ranching dominates.
ii) In the East the land use is more extensive while in the west, land use is intensive hence the distribution of land values in the study. This is analysed in table 3.6.

3.2.3.III COMMODITY PRICES:

Land values have during the period under consideration been affected by the fluctuations in commodity prices in the world market. The analysis in table 3.7, and the diagramatic representation in fig. 3.5. shows the effects the analysis land values fluctuated more or less according the fluctuations of the commodity price. The effect is usually seen in the following year. This is particulary so with the two commodities that are produced in the study area, viz. coffee and sisal:-

For Example:

In 1970 coffee price per tonne rose from K.Shs. 5580 in 1969 to K.Shs. 7440 in 1970, the land values for coffee land from K.Shs. 6900 in 1970 to K.Shs. 8000 per hectare in 1971. Though the coffee price per tonne in 1971 was only K.Shs. 5864.

In the same period sisal price per tone fell from K.Shs. 1495 in 1969 to K.Shs. 1291 in 1970 the corresponding land values for sisal land were K.Shs. 1200 and K.Shs. 500 per hectare despite the fact that sisal price rose to K.Shs. 1506 per tonne in 1971.
The fluctuation in land values follow those of the commodity prices because the profitability of activities is taken into account in land valuation the methods used in valuation briefly are:

1. **INVESTMENT METHOD**

   Land value is the reflection of the activity of land. Therefore land value can be defined as follows:
   \[
   \text{Land value} = \frac{\text{Gross Revenue} - \text{Costs (expected)}}{\text{Rate of Capitalization}}.
   \]

   From the above definition the following factors should be noted,
   i) The gross revenue is affected by the commodity prices. As the price of coffee or sisal, rises or falls the gross revenue is equally affected.
   ii) If the cost remains static, or retains a constant trend, the changes in the prices of commodities will affect the net revenue which is capitalized to get land values.
   iii) If the socio-political conditions do not change; (these effect the rate of return) the magnitude net revenue remains the single determinant of land value. Costs are assumed to be constant.

   From the above analysis, it is revealed that land value will therefore depend on the magnitude of net revenue which depends on the commodity prices.

2. **COMPARISON METHOD**

   This method uses sales comparables which could also be
affected by commodity prices as they fluctuate. The comparables are compiled using sales data collected in the field. However, the data must be from a similar locality and use. As the force of commodities changes, then the comparables' constitution changes, and hence the values.

The two methods above are the ones generally used in land valuation though there are others, mainly used for cross-checking. However, the Commissioner of Lands uses another method which is analysed below:

3. **Built-Up Method**

This method takes all items on the subject land and their values are assessed individually and then all individual item values are added to obtain a final figure. For example:

A coffee land holding with all the necessary utilities and facilities to carry out the activity efficiently would be valued under the following manner.

Coffee land at K. Shs. X per hectare = Nx  
Farm house = Y  
Coffee factory = 0  
Labour Lines = r  
Farm machinery and other miscellaneous = k  
Roads = t  
Water reservoirs etc. = s.

The value of the land = K. Shs. Nx + Y + 0 + r + k + t + s.
This method also takes account of the commodity prices especially in value the land use eg. coffee or sisal lands, since it uses sales comparable in assessing the values. Therefore from the above explanation of the workability of the three methods, it is clearly evident that they are all affected by the fluctuation in commodity price in the world market.

These fluctuation are illustrated in table 3, 8.

3.2.3 IV LAND OWNERSHIP TRENDS:

This is another factor that is not limited to the study area alone, but applies to the whole country. Noting that most land in the study area is in form of alienated Government land either in freeholds or leaseholds of a remainder term of 999 years. Prior to 1963 the land was owned by an immigrant community viz. Europeans and Asians. In 1963 the independent Government was confronted with the following problems:

i) Landlessness among the Africans.

ii) Sustaining the National Agricultural production by a viable economic land ownership.

iii) European demands for a constitutional guarantee of their rights of land.

The third problem was settled by section 75 of the Kenya Constitution Act. The first and the second were to be settled by a gradual transfer of land from the immigrant community without necessarily disrupting the national economy.
The gradual transfer of land has taken place in three forms analysed below:-

i) Individual and partnerships who have money and therefore can purchase the land with the aid of the Agricultural Finance Corporation and Agricultural Development Corporation. This has led to such evils as land grabbing.

ii) Purchases by the Government, for the resettling the landless.

iii) Group Co-operatives Movements which buy the land and either retain it as a single unit, or subdivide a portion retaining the greater portion as single unit or subdividing the whole unit.

The latter two forms of transfer have had the effect of increasing the density in population of the areas affected. The land holding have increased, and consequently land values have been affected. The Group-Co-operatives movement and the partnerships are subdividing farm which the land corporately bought. This is due to differences arising immediately after the purchase. Of course the difference are concealed during the period they are trying to raise money for the purchase price. The results of these subdivision are:-

i) low productivity.

ii) Development of urban activities as developing residential houses for owner occupation or rental purposes. This situation is perpetuated by Nairobi's inability to
provide adequate housing facilities for the population.


<table>
<thead>
<tr>
<th>DISTANCE IN KMS. FROM NBI-(ROY SAMBU) TO THIKA (31 KMS)</th>
<th>0 - 5</th>
<th>6 - 10</th>
<th>11 - 15</th>
<th>16 - 20</th>
<th>21 - 25</th>
<th>30 - 35</th>
<th>36 - 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-10 LEFT OF HIGHWAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9460</td>
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<td></td>
</tr>
<tr>
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<td>5510</td>
<td>9430</td>
<td>12050</td>
<td>3990</td>
<td>6580</td>
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</tr>
<tr>
<td>640</td>
<td>1200</td>
<td>1200</td>
<td>670</td>
<td>1980</td>
<td>2900</td>
<td>280</td>
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</tr>
<tr>
<td>420</td>
<td>300</td>
<td>240</td>
<td>150</td>
<td>420</td>
<td>200</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>6-10 RIGHT OF HIGHWAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11020</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9460</td>
<td></td>
<td></td>
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<tr>
<td>11190</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9990</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6820</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8420</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB. Urban land values are excluded from this table.
Source: 1976; Survey.

3.2.3.V THE HIGHWAY IMPACT.

The highway impact is analysed in this section from both the spatial and periodic dimensions, viz. Distance from the highway and highway improvement respectively.

1. DISTANCE FROM THE HIGHWAY: (SPATIAL).

The analysis in table 3.7 reveals that land values adjacent to the highway are higher than those away from it on both sides of the highway. The diagramatic illustration fig. 3.4 shows the pattern of land values east and west of
FIG. 3.4. Land Values on the Western side of Nairobi—Thika Highway

Land Values in KSh '000

Kilometres

0-5 Kms from the highway

6-10 Kms from the highway
FIG. 3.5. Land Values on the Eastern side of Nairobi—Thika Highway

Land Values in KSh'000

0-5 kms. from the highway
6-10 kms from the highway
the highway. From the table and the figure, it is evident that land values are higher between 0-5 kilometres than between 6-10 kilometres though those to the west are higher than those to the east. A factor explained earlier in the section of land use.

2. **HIGHWAY IMPROVEMENT. (PERIODIC).**

The effect of highway improvement is analysed and an examination of the mean values along the road and also away from it during pre- and post-highway improvement periods.

Land values during the pre-improvement period (1967-1969) were below K.Shs. 4000 per hectare. In the area between 6-10 kms. from the highway while between 0-5 kms., the land values were at K.Shs. 7000 per hectare. During the highway improvement period (1969-1972) the land values rose up to K.Shs. 8000 adjacent to the highway and remain at K.Shs. 4000 for the land away from the highway. In the post-construction period (1972-1976) land values have established new levels and now the road the mean value have reached K.Shs. 10200 and away from the road the values are at K.Shs. 7000.

The above analysis is illustrated in table 3.8 showing the land values in respect to each user during the period classified above. Analysing the effect according to each category of each land use have shown increments especially for sisal land and ranches. The increments in land values since highway improvement is a reflection of the 'enhanced
The highway improvement has reduced traffic congestion, and increased the growth of traffic as revealed in chapter 4 of this Thesis. The effects of this, is that activities have looked upon the study as an alternative location, such as industries and residential housing rents. Ruiru, Kahawa, Kasarani and Kalimoni have been affected, and the result has been that land values which were traditionally agricultural have changed to other levels reflecting on the new land use.

**TABLE 3.2. LAND VALUES DURING PRE-POST HIGHWAY IMPROVEMENT PERIOD.**

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISTANCE FROM THE LAND</th>
<th>COFFEE VALUE</th>
<th>MIXED USE VALUE</th>
<th>SISAL LAND VALUES</th>
<th>RANCHING LAND VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-IMPROVEMENT</td>
<td>0-5 kms</td>
<td>6900</td>
<td>13700</td>
<td>5990</td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td>6-10 kms</td>
<td>3700</td>
<td>9640</td>
<td>3700</td>
<td>1100</td>
</tr>
<tr>
<td>DURING IMPROVEMENT</td>
<td>0-5 kms</td>
<td>8100</td>
<td>14200</td>
<td>7200</td>
<td>2452</td>
</tr>
<tr>
<td></td>
<td>6-10 kms</td>
<td>3970</td>
<td>8200</td>
<td>4900</td>
<td>1125</td>
</tr>
<tr>
<td>POST-IMPROVEMENT</td>
<td>0-5 kms, 10200</td>
<td>16340</td>
<td>9820</td>
<td>3210</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>6-10 kms</td>
<td>6600</td>
<td>12050</td>
<td>7860</td>
<td>1310</td>
</tr>
</tbody>
</table>

*Source: Compiled with help of the Lands Department Annual Reports, and 1976 Survey.*
3.3. SUMMARY:

It has been noted that the early development of the pattern of land values was closely associated with the socio-political developments in the country. The reasons for this kind of relationship were those associated with the development of the former 'white Highlands'.

Legislation has been noted as a major factor that has affected land values through the years. It had controlled the density of occupation and the racial composition of the people in the study area. Though the Africans were in majority in the study area they were labourers and legislation did not allow them to own or lease land in the study area. Therefore their numbers could be increased without necessarily affecting land values.

Although the Europeans were a migrant, minority community, they were allowed to own-lease or sell land in the study area. Therefore their numbers affected the land values, so legislation had to guard against land speculation, and their conditions of grants on sales had to be stipulated in a legal nature, viz. land was only to be sold if:

i) Agricultural development was granted.

ii) No transaction to non-white was to be allowed.

Political and social factors are also proved to have been instrumental to the evaluation of the present pattern of land values all through the period.
The highway improvement has also shifted land values from Nairobi towards Thika with the latter being a rapidly growing industrial town in the study area, and the problems facing Nairobi such as unemployment, housing and services, and more urban activities are taking location in between Nairobi and Thika. Thika too has become very attractive for industrial locations. This could be seen as a stimulant for higher land values.

The highway improvement has increased the accessibility aspect of the study area. Using the land values theory this provision of higher accessibility provides higher land values for the more accessible sites. This has been revealed along the highway although to a limited extent due to the land use pattern and other factors discussed earlier.

The changes in land values do not follow the classic approach in relation to a single market centre due to the fact identified, that the products of this region are not exclusively for Nairobi-Thika market nor to the Kenyan Market for that matter. The agricultural product produced are for the over seasoned market in which they form just a small proportion of total supply. Therefore factor affecting the supply condition of other producers and hence the prices consequently affect the land values.

This is a very unstable situation facing the land values as they keep on fluctuating as the commodity prices changes in
the world market, in short demand and supply conditions. Such changes are the ones affecting the coffee in 1975-77 where the price has rose from K.Shs. 15200 to K.Shs. 61200\textsuperscript{23} per tonne in such a short period, and the replacement of sisal fibres by artificial fibres in 1972.

These conditions have by far affected the development of land values and the pattern now does not look natural of a pre-urban rural district. This calls for a formulation of policy to stabilise the land values in the Region.
FOOTNOTES:

2. A. Weber: The Theory of Location of Industries and transportaion, and A Losch Economic of Location.
4. 'Value depends on economic rent and rent on location and location on convinience and convinience on nearness.'
6. 'Memoir of Sir Michael Bludell' 'So rough a wind.'
8. A view expressed by then the Governor of Kenya Sir Arthur Herdige: 1909 a view upheld late by Lord Lugard.
15. In 1961 the Governor Made a regulation lender the power of Section 14 of Legal Notice (LN.) No. 529 of 1960. These powers were that Governor could make regulation governing the land transaction viz. subdivision,
assignment of leases, lease sale, mortage or creation trust. (These were to be included later in 1968 land control Act). These 1961 regulations governed the Land in the White Highlands where the following factors could be noted:

i) Kenya was an agricultural country and hence European agriculture was important to the economy. Abrupt changes in land ownership would wreck the economic standing of the country.

ii) Therefore a transaction could be refused consent on economic and agricultural maintenance grounds.

The other forms of legislation during this period were LN. 245 and 457 of 1963 which extended the power under LN. 17 of 1963 to 1965 and consequently and 1966 actually till the Land Control act was enacted in 1967.

18. Kenya Government Session paper No. 10 of 1966. 'African Socialism and its application in planning in Kenya: In this paper the economic path of development was outlined favouring mixed economy.
19. op. cit. table 3.5.
22. Group-co-operatives and partnership are usually breaking either because of those who are given the responsibility
of running them are involve in other affairs that they neglect the duties or due to petty jealousy.
REFERENCES:

1. Von Thunen: et. lat.
5. Hurd, R.M. Principles of City Land Values 1903 Chicago University Press.
7. Sir Michael Bludell: Sor Rough a wind.
15. Gamble Hays: Adverse and Beneficial effect of
highway on property values Transportation research Record No. 503 pp. 37-48.


18. Lands Department annual Reports.
CHAPTER FOUR

LAND USE:

CONCEPTUAL APPROACH

Von Thunen's work seems to be the pioneer in this field: He maintained that the optimal spatial pattern of land use resulting from competitive bidding of land would be one which friction of distance in the system is minimised; rents are maximised. He concluded that rents varied directly with accessibility. As accessibility increases the friction of distance is diminished.

He analysed the problem of what products a farm should produce given its location with respect to a single market, and concluded that products had different transport costs attached to them and would produce different net returns at a given distances from the market. In his formulation the draws a special importance of accessibility in the locational matrix of activities.

The location theory benefited later from Alonso's Model of demand for land using the relationship established by Thunen: Viz rents and land use, accessibility and location. Alonso's Model concludes that land use is a trade-off between site rent and accessibility and that the most accessible site represent, therefore the highest values per unit area, a characteristic confirmed in the last chapter. High land values were evident along the highway and in the near periphery while further from the city and away from the highway low land values were recorded.
Husback\(^3\) investigating on the relationship of land value or the Price of Land and the city looked at the following conditions, size of the unit of land, the location of it in relation to the city, means of transportation and the planning regulations. These conditions apply almost in the same way in the study area. As this study looks at the effects of a transit system between two urban areas, the aspects of location, means of transportation and size of Land Units are considered in comparison to the following model formulation by Haback.

\[
\text{Land Value (Price)} = \mathcal{L} (\text{size}, \text{D loc}, \text{D city}, \text{D highway}, \text{D railroad}, \text{Loc}, \text{Zone}, \text{Tax-X})
\]

where:

- **Price** = per unit value of land
- **Size** = area of parcel of land
- **D city** = Distance from a Major Urban centre or city.
- **D highway** = Distance from Major Urban access highway.
- **D railroad** = Distance from Railroad.
- **Loc.** = Location of the land unit within the urban centre of Suburban area.
- **Zone** = Zoning or other restrictive land use policies which are applicable to the parcel.
- **Tax** = Structure of the property taxes.
- **X** = Vector representing other characteristics eg. topography, deferred payments and contracts expected to affect land prices.
In his analysis Husback notes that urban demand Model is Micro-point-in-time for individual buyers of underdeveloped land parcels. The Micro orientation explain the variation across each land transaction and not to each individual buyers total demand for; nor aggregate demand for Land.

The reference he make of point-in-time explains the fact that factors affecting expected Land productivity (which may change over time) are constant. Such changes in accessibility cost affect land prices over time, due to changing of unexpected cost factor of land use.

Though they have given expected value at any 'point-in-time', the limitation to single urban centre removes the need to bring about the inter-urban factors which may affect the land market, such factors are, population changes, geographical concentrations e.t.c.

In summing up the theoretical and conceptual analysis on land use in a peri-urban agricultural district, accessibility has been evidently advocated as a determinant factor in location of activities which form a land use pattern. Efficiency of a transit system in such an area becomes absolutely vital in location decisions of the various economic units seeking location.

4.2. LAND-USE PATTERNS IN THE STUDY AREA.

The study area falls in the former 'white Highlands' and therefore the pattern of land use reflected the values of the
settlers, and still today the pattern has not changed very much. The salient feature of the land use pattern as traced to day have been analysed in Map 5 and shows the following:-

A. AGRICULTURE.

1. Plantations
   (i) Coffee
   (ii) Sisal

2. Ranching

B. TRANSPORTATION

1. Road
2. Railway

C. URBAN

1. Nairobi (Northern Suburbs).
2. Ruiru
3. Thika

D. MISCELLANEOUS LAND USES.

Table 4.1. LAND USE CATEGORIES IN THE STUDY AREA.

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>AREA IN HA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>16000</td>
</tr>
<tr>
<td>Sisal</td>
<td>9500</td>
</tr>
<tr>
<td>Dairy and Ranching</td>
<td>23249.5</td>
</tr>
<tr>
<td>Forestry</td>
<td>425</td>
</tr>
<tr>
<td>Institution</td>
<td>350</td>
</tr>
<tr>
<td>Urban</td>
<td>1650</td>
</tr>
<tr>
<td>Water Reservoirs</td>
<td>22.5</td>
</tr>
<tr>
<td>Transportation</td>
<td>591.5</td>
</tr>
</tbody>
</table>

Source: 1976 Survey of the study area.
FIG. 4.1 LAND USE CLASSIFICATION IN NAIROBI–THIKA REGION

In considering agricultural land use on practice in this region the following factors must be borne in mind:
(a) The type of farm holding.
(b) The position of the farm holding.

Within the study area there are two types of farm holding which may be classified as commercial or extensively cultivated. The extent of crop cultivation and mechanization.

Fig. 4.1 shows the land units in the periphery of the City. Most of these are less than 0.25 km² and are usually less than 15 hectares in area.
AGRICULTURE.

Agriculture is the main stay of the region. About 80% of the land is under some form of agricultural activity. The main agricultural users are plantations of coffee and sisal; and ranches. There is however small areas used for subsistence agriculture within the coffee estates and further down in the river valleys.

In considering agricultural land use and practice in this region the following factors must be borne in mind:

(a) The type of land holding.

(b) The quality of land holding.

(a) The Type of Land Holding.

Basically there are two types of land holding which have been identified in the study area. These are:

(i) Large Scale, where the practice is commercial and either intensively or extensively cultivated depending on the crop cultivated and mechanization.

(ii) Small Scale, these are land units in the peri-iphery of the city of Nairobi, and are usually less than 8 hectares. Majority of them are between 0.451 and 2.021 hectares. They are also commercial in a sense that, some have been converted into residential uses fully while others have retained some coffee despite of the residential developments.

(b) The quality of Land Holding.

The factors constituting this aspect have been already
dealt with in chapter 2. These are topographical soils and climatic conditions.

4.2.A. PLANTATIONS:

Plantations of coffee and sisal occupy most of the land in the study area. They extend from Nairobi's Northern suburbs to even beyond Thika Municipality. Due to their in position in the economic set up of the region as well as the National one those two crops have been considered separately in the nature of their land use.

4.2.A1 COFFEE:

Coffee is the major foreign exchange earner for the country and the main producing area is Nairobi - Kiambu - Thika region and a large portion of this fall in the study area. This area is centred around Ruiru where the coffee Research Foundation is located. Noting the importance of this region as main producer of coffee the area also leads the National production on area basis.

Table 4.2. analyses and compares the coffee production in the study-area with the National and co-operative production, in the years 1971 through 1975. The study area have been in the leading position in production per unit area. Surpassing that of National and co-operative production.

In 1971 the National Production per unit area was at an average of 719 kgs while the study area was 1015 kilogrammes per hectar, that of cooperative was only 505 kilogramms per
hector. The cooperative production was just below half the production figure of the study area. The following years shows a continuation of the above trend.

Table 4.2. Coffee Yields Comparison: Study Area V. National and Cooperatives (Small Holders).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>1015</td>
<td>1322</td>
<td>1395</td>
<td>1370</td>
<td>1675</td>
</tr>
<tr>
<td>National</td>
<td>719</td>
<td>896</td>
<td>857</td>
<td>765</td>
<td>-</td>
</tr>
<tr>
<td>Small Holders</td>
<td>510</td>
<td>628</td>
<td>735</td>
<td>627</td>
<td>-</td>
</tr>
<tr>
<td>Difference with National</td>
<td>296</td>
<td>426</td>
<td>538</td>
<td>605</td>
<td>-</td>
</tr>
<tr>
<td>Difference with Small Holders</td>
<td>505</td>
<td>694</td>
<td>660</td>
<td>743</td>
<td>-</td>
</tr>
</tbody>
</table>

The figures are in Kilogrammes per hectare

Source: (Compiled with the help of Coffee Board of Kenya Nairobi 1976.

The area under coffee in the study area is 12543.0 hectares though the total area in the coffee region is about 16000 hectares. The difference in these two figures is formed by the land under mulching, steep river banks, Marshy area and the areas in the suburban Nairobi occupied by urban development data for these uses was difficult to collect especially on all the three former uses except the fourth one.

The coffee plantation occupy the area on the western side of the highway. The area is divided into three coffee growing regions viz., Nairobi, Lower Kiambu settled area, Ruiru and Thika. Tables 4.3 - 4.6 analyses the coffee
growing area in the study area using the above regional classification. These figures have been worked in percentages to show the size of land holding and the level to which 'parcellation' has affected the land.

From the tables it is clearly evident that Nairobi area has the largest number of land holding under 8 hectares. About 45.21 percent of the area under consideration which falls in Nairobi/under 8 hectares holdings, and only a small proportion which forms an ideal coffee estate viz. 81-202 hectares. This category in Nairobi has only 4.11 per cent with no holding going beyond 202 hectares. It should be noted here that this is an urban fringe where land is very expensive and the urban demand for underdeveloped land is higher than anywhere else. Therefore land holding can be only in small parcels, between 0.451 - 2.21 hectares. The only limit to sub division is the planning regulation i.e. zoning and land speculation. Another factor affecting land holding in this region is land ownership in the urban fringe is becoming a fashionable status-symbol among the rich section of the community.

A high proportion of coffee has been maintained in those small parcels inspite of urban developments. This is due to the factor which Morgan observes, "high prices of coffee have brought prosperity to coffee growers and where the suburbs of Nairobi have extended into the coffee belt a surprising amount of coffee has been retained in small plots; Too profitable to
LEGEND (Hidgeways)
Area which rapidly being encroached

C - Coffee
F - Forest

Notice the small portions of coffee on the plots beside the houses.
consider removing.\(^9\)

Plate I illustrates the type of land holding in the suburbs of Nairobi, especially Northern area of the city. Numerous parcels are visible in the plate. Notice the urban developments within the coffee plantation. This area is Ridgeway's location of Nairobi (Part of the Northern Suburb).

The survey results reveals that more land is under going subdivision in the urban fringe area, especially around Nairobi. This is due to urban influence and speculation. With the boundary extension in 1963 based on no economic reason but due to political motive coffee land was included in the city and was open to competition with other urban uses. With the result land in the fringe area was sub divided since the planning control allowed sub-division up to a minimum of 2.021 hectares.

It is also evident from the survey results that coffee has a huge priority in the suburban plots. This conforms with Morgan's observation.\(^10\) More so today when the coffee price in the world market is at £ 4000 per ton, local market is at £ 3029\(^11\). At this price level of coffee as a land user is in a position to compete with urban users. This may change as the price is high due to some supply problem facing the main producers.\(^12\) If this change occurs then coffee will not be in a position to compete with other users and if price mechanism and profit motive prevails as the main determinants of land use more subdivision of the estates especially to the North will
occur. This conforms with Husbak's reference of Micro-panel-in-time, analysis explained earlier in this chapter.

Subdivision of coffee farms in the peripheral areas of Nairobi have occurred in the past where the dictating factor was profitability of coffee farming as compared with urban uses. With the latter uses being more profitable they out bid the coffee use. Such areas are Kyuna, Loresho, Kitsuru and United Nations Environmental Programmes offices and the Kenya Technical Teachers College at Gigiri have all located in the North-western and Northern suburbs in previous coffee estates.

The survey further reveals that Thika town have influence subdivision of coffee estate to smaller parcels. About 35.23 per cent of the land holdings in Thika coffee district are below 8 hectares. These small parcels are concentrated around Thika Municipality owned mostly by 'Hobby farmers'. In Ruiru district where a sizeable urban settlement is lacking the percentage of land holding below 8 hectares is very small. In fact it is only 5.56 per cent reference to Table 4.5.

**DISTRIBUTION OF COFFEE LAND IN THE STUDY AREA**

Coffee land in the study area is mainly located in the west of the highway. The distributions figures and tables 4.3 - 4.5 and 4.3 - 4.7 shows exactly the area under coffee in each of coffee district viz. Nairobi, Ruiru and Thika. The table further shows the type of land ownership in the coffee
LEGEND - KAMITI
Area undergoing rapid urbanization

C - Coffee
U - Urban Developments
area. From the tables it is evident that small plots around Nairobi and Thika are individually owned as opposed to large estates between the two towns. The actual percentage of these small parcels under individual ownership is 69%.

Another factor that the surveys reveals is that more and more coffee land is becoming under co-operative ownership. About 13 per cent of the total coffee land is under co-operative ownership. The co-operatives have opted to large parcels as opposed to small ones and using the classification of parcels used by the Coffee Board of Kenya, they own in the following percentages:

Table 4.3: Coffee Land Under Co-operative Ownership:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Percentage of Co-operative Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figures in Hectares</td>
<td>Ownership</td>
</tr>
<tr>
<td>0.451-8</td>
<td>0%</td>
</tr>
<tr>
<td>9-20</td>
<td>9%</td>
</tr>
<tr>
<td>21-40</td>
<td>31.8%</td>
</tr>
<tr>
<td>41-80</td>
<td>18%</td>
</tr>
<tr>
<td>81-202</td>
<td>17%</td>
</tr>
<tr>
<td>Over 202</td>
<td>0%</td>
</tr>
</tbody>
</table>


The importance of co-operative land ownership is due to the inherent factors such as their management problems and resultant subdivision due to differences arising among the co-operative owners. The subdivisions of land have got their implications in land use and the most significant are:-
**TABLE 4.4** COFFEE LAND OWNERSHIP IN THE STUDY AREA AND SIZES.

<table>
<thead>
<tr>
<th>AREA IN HECTARES</th>
<th>NO. OF UNITS IN EACH CATEGORY</th>
<th>CO-OPERATIVE COMPANY-LEASE OWNERSHIP</th>
<th>&amp; OWNERSHIP</th>
<th>INDIVIDUAL OWNERSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0.405-8</td>
<td>49</td>
<td>24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9-20</td>
<td>43</td>
<td>21</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>21-40</td>
<td>22</td>
<td>11</td>
<td>7</td>
<td>31.8</td>
</tr>
<tr>
<td>41-80</td>
<td>50</td>
<td>24</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>81-202</td>
<td>35</td>
<td>17</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>203-400</td>
<td>6</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Over 400</td>
<td>1</td>
<td>0.048</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>206</td>
<td>100</td>
<td>26</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: Coffee Board of Kenya Register of Coffee Plantation and Coffee Growers Cooperative Societies.

**TABLE 4.5** COFFEE LAND DISTRIBUTION IN NAIROBI

<table>
<thead>
<tr>
<th>AREA IN HECTARES</th>
<th>NO. OF UNITS IN EACH CATEGORY</th>
<th>CO-OPERATIVE COMPANY-LEASE OWNERSHIP</th>
<th>&amp; OWNERSHIP</th>
<th>INDIVIDUAL OWNERSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0.405-8</td>
<td>33</td>
<td>45.21</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9-20</td>
<td>25</td>
<td>34.25</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>21-40</td>
<td>7</td>
<td>9.59</td>
<td>2</td>
<td>28.57</td>
</tr>
<tr>
<td>41-80</td>
<td>5</td>
<td>6.85</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>81-202</td>
<td>3</td>
<td>4.11</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>203-400</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Over 400</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>73</td>
<td>100</td>
<td>6</td>
<td>8.44</td>
</tr>
</tbody>
</table>

Source: Coffee Board of Kenya
FIG. 4.2 COFFEE LAND HOLDINGS SIZE DISTRIBUTION IN THE STUDY AREA

No. of holdings in each category

Area of holding in ha.
FIG. 4.3 COFFEE LAND HOLDING SIZE DISTRIBUTION IN NAIROBI (STUDY AREA)
### TABLE 4.6  COFFEE LAND DISTRIBUTION IN RUINU

<table>
<thead>
<tr>
<th>AREA IN HECTARES</th>
<th>NO. OF UNITS</th>
<th>CO-OPERATIVE OWNERSHIP</th>
<th>COMPANY-LEASE &amp; OWNERSHIP</th>
<th>INDIVIDUAL OWNERSHIP</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.405-8</td>
<td>3</td>
<td>5.56</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>33.3</td>
<td>2</td>
<td>66.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-20</td>
<td>3</td>
<td>5.56</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>66.67</td>
<td>1</td>
<td>33.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-40</td>
<td>9</td>
<td>16.68</td>
<td>4</td>
<td>44.44</td>
<td>3</td>
<td>33.33</td>
<td>2</td>
<td>22.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-80</td>
<td>22</td>
<td>40.74</td>
<td>6</td>
<td>27.27</td>
<td>12</td>
<td>54.55</td>
<td>4</td>
<td>18.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81-202</td>
<td>22</td>
<td>20.37</td>
<td>2</td>
<td>18.18</td>
<td>8</td>
<td>72.73</td>
<td>1</td>
<td>9.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203-400</td>
<td>5</td>
<td>9.26</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 400</td>
<td>1</td>
<td>1.85</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>54</td>
<td>100</td>
<td>12</td>
<td>22.22</td>
<td>32</td>
<td>59.26</td>
<td>10</td>
<td>18.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Coffee Board of Kenya.

### TABLE 4.7  COFFEE LAND DISTRIBUTION IN THIKA

<table>
<thead>
<tr>
<th>AREA IN HECTARES</th>
<th>NO. OF UNITS</th>
<th>CO-OPERATIVE OWNERSHIP</th>
<th>COMPANY-LEASE &amp; OWNERSHIP</th>
<th>INDIVIDUAL OWNERSHIP</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.405-8</td>
<td>13</td>
<td>16.51</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>46.15</td>
<td>7</td>
<td>53.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-20</td>
<td>15</td>
<td>19.05</td>
<td>1</td>
<td>6.67</td>
<td>5</td>
<td>33.35</td>
<td>9</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-40</td>
<td>6</td>
<td>7.62</td>
<td>1</td>
<td>16.67</td>
<td>1</td>
<td>16.67</td>
<td>4</td>
<td>66.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-80</td>
<td>23</td>
<td>29.21</td>
<td>2</td>
<td>8.70</td>
<td>18</td>
<td>78.26</td>
<td>3</td>
<td>13.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81-202</td>
<td>21</td>
<td>26.67</td>
<td>3</td>
<td>14.29</td>
<td>18</td>
<td>85.71</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203-400</td>
<td>1</td>
<td>1.27</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 400</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>79</td>
<td>100</td>
<td>7</td>
<td>8.86</td>
<td>49</td>
<td>62.03</td>
<td>23</td>
<td>29.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Coffee Board of Kenya.
FIG. 4.5. COFFEE LAND HOLDING SIZE DISTRIBUTION IN THIKA (STUDY AREA)
FIG. 4.4. COFFEE LAND HOLDING SIZE DISTRIBUTION IN RUIRUI (STUDY AREA)

No of holdings in each category

Area of holding in ha

0 10 20 30 40 50 60

0.4 0.9 20 41 80 81 202 203 400 Over 400
(i) Development of the owner's house.

(ii) The neglect of coffee.

These implications in land use tend to change the previous land use to a new one, which have periodic characteristics viz. During the peak period in coffee prices the owners tend to care for coffee which they had otherwise neglected during the period of low coffee prices.

Most of the coffee farms have their own factories usually located on the river beds these factories differ in size depending on the size of the estate. In total there are 85 coffee factories in the study area.

EMPLOYMENT IN THE COFFEE AREA.

Employment in the region is seasonal with great variation during the picking-time. However, the survey revealed that the permanent labour may be classified as follows:-

Field Labour = Nx 1 man.
Drivers = 6
Factory = 4
Management = \( \frac{2}{Total \ N+12} \)

Where N= No. of Hectares: 1 Man per Hectare.

Therefore as the ideal coffee in the study area is of about 80.94 Hectares the total permanent labour force = 93 persons.

As there arose some difficulties in visiting all farms, the above criteria was used to estimate the labour force
in the coffee growing area, a figure of 15170 was arrived at.

The employment figure is higher during the picking period and also this figure varies with the crop in any one year, to another.

In the large estates especially those held on leases by or owned by companies they have office establishment thereby employing office staff.

4.2.42 SISAL:

Sisal is the other plantation crop cultivated in the study area, and ranks third in size of land use after ranching and coffee.

The total area under sisal is about 9500 hectares about 18.55% of the total land covered by the current study.

Sisal is usually economically cultivated in large scale and the survey reveals that the average sisal holding is about 857.44 hectares.

Table 4.7 illustrates a sample of the sisal land holdings in the study area.

The main growing area is concentrated around Kalimoni where a factory for manufacturing sisal products is located. The sisal estates, however extend from the eastern part of Nairobi to Thika and beyond, mainly on the eastern side of the Nairobi Thika highway.
Table 4.8 Sisal Landholdings in the Study Area.

<table>
<thead>
<tr>
<th>L.R. NO.</th>
<th>Area of Holding in Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>5872</td>
<td>469.96</td>
</tr>
<tr>
<td>29/2/1</td>
<td>484.42</td>
</tr>
<tr>
<td>10090/14/3</td>
<td>546.34</td>
</tr>
<tr>
<td>10090</td>
<td>718.33</td>
</tr>
<tr>
<td>280/3</td>
<td>563.42</td>
</tr>
<tr>
<td>11449</td>
<td>2115.00</td>
</tr>
<tr>
<td>280/4</td>
<td>564.10</td>
</tr>
<tr>
<td>280</td>
<td>1963.00</td>
</tr>
<tr>
<td>10083</td>
<td>517.00</td>
</tr>
<tr>
<td>280/5</td>
<td>632.80</td>
</tr>
<tr>
<td>Average</td>
<td>657.44</td>
</tr>
</tbody>
</table>

There are 47 sisal estates in total in the study area and 10 sisal factories serving these sisal growing estates. These sisal estates are owned by companies and there was no evidence of individual ownership. There has been a tremendous abandonment of sisal activity in the study area due to poor sisal prices in the world market and also low demand due to competition with synthetic fibres.

Table 3.5 shows the fluctuations of the world sisal prices. It is evident that in 1972 sisal prices in the world market were at their 'Rock-bottom', viz Ksh. 540 per ton. During this period sisal estates were abandoned or sold to group co-operatives especially around Ruiru and Kalimani which
later subdivided the land into small individual holdings. In 1970 L.R. 10090 to the west of Kalimoni was subdivided into 30 plot each of 4.451 Hectares and the new owners have opted to other form of agriculture e.g. cattle raising subsistence crops and many others.

Around the same period the East African Sisal Estates L.R. No. 10900 were purchased by a group co-operative society from Githunguri constituency. The area of estate west to Nairobi - Thika Road and adjacent to Ruiru was sub-divided into residential plots - each member being allocated with a plot. The area east of the Road was left untouched. The sisal stumps continue to grow with nobody bothering about them. The present use of this estates is only small cultivated patches for subsistence or goat raising on a very small scale by individual members of the Group-Co-operative. The reason given for the abandonment of sisal growing were:-

(i) Sisal needs alot of farm mechanisation and this kind of investment; the new owners could not maintain leave alone to install.

(ii) the present owner were unemployed landless and therefore with no means of livelihood, therefore opted to subdivision to offer them with something to live on.

(iii) the problems facing the day to day running of the group-co-operatives as highlighted in chapter 3.

Subdivision has therefore reduced the amount of land under sisal and thereby affecting the sisal yields.
4.2A. Ranching:

Ranching is the most extensive and largest land use in the study area. Some of the ranches are so big that they exceed 6000 hectares.

Table 4.8 takes a sample of some of the ranches in the study area illustrating their sizes.

Ranching is concentrated around the area to the south East of Kahawa extending towards both Nairobi and Ruiru east of Nairobi-Thika highway.

The ranches are mainly for beef cattle and this is the main rearing area in the metropolitan growth area, they extend into Kangundo in Machakos District.

It is evident from the table 4.8. that, there are very few ranches which are under 1000 hectares, and there are even some extending to 6,000 hectares.

4.2B Transportation:

The main means of transportation in the study area are road and railway. The total area under transportation land use is about 591.5 hectares which comprises of the following table 4.10.

The railway line runs almost parallel to the highway. The roads joined to the highway serving the study area as access routes. Due to this aspect of railway and road running almost parallel and in the same direction the rail/road
<table>
<thead>
<tr>
<th>L.R. NO.</th>
<th>Area in hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>7049</td>
<td>2929.18</td>
</tr>
<tr>
<td>284</td>
<td>2023.47</td>
</tr>
<tr>
<td>285</td>
<td></td>
</tr>
<tr>
<td>3572</td>
<td>1454.47</td>
</tr>
<tr>
<td>2953</td>
<td>1057.00</td>
</tr>
<tr>
<td>10901/2/3/2</td>
<td>6513.15</td>
</tr>
<tr>
<td>4973</td>
<td></td>
</tr>
<tr>
<td>4974</td>
<td>1216.11</td>
</tr>
<tr>
<td>4975</td>
<td></td>
</tr>
<tr>
<td>68/6</td>
<td>1328.08</td>
</tr>
<tr>
<td>4968</td>
<td>1352.08</td>
</tr>
<tr>
<td>2887</td>
<td></td>
</tr>
<tr>
<td>2312</td>
<td>1598.54</td>
</tr>
<tr>
<td>3580</td>
<td></td>
</tr>
<tr>
<td>6826</td>
<td></td>
</tr>
<tr>
<td>6832</td>
<td>942.05</td>
</tr>
<tr>
<td>6845</td>
<td></td>
</tr>
<tr>
<td>6838/38</td>
<td>1058.70</td>
</tr>
</tbody>
</table>

Source: 1976 Author's Survey.
Table 4.10  Transportation Means Classification, Area, and Length.

<table>
<thead>
<tr>
<th>Category</th>
<th>Length in Kms</th>
<th>Area in Hect.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Classified Roads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) International Trunk 'A'</td>
<td>31.8</td>
<td>159.0</td>
</tr>
<tr>
<td>(ii) Secondary 'C'</td>
<td>123.5</td>
<td>185.7</td>
</tr>
<tr>
<td>(a) All weather 'C'</td>
<td>66.8</td>
<td>100.2</td>
</tr>
<tr>
<td>(b) All weather Loose surface 'C'</td>
<td>56.7</td>
<td>85.5</td>
</tr>
<tr>
<td>2. Unclassified Dry Weather</td>
<td>95.6</td>
<td>141.8</td>
</tr>
<tr>
<td>3. Railway</td>
<td>42.0</td>
<td>105</td>
</tr>
</tbody>
</table>

Total Area Under transportation = 591.5

Source: 1976 Author's Survey

competition was identified in the field. This is analysed in Appendices D, E and F of traffic counts and Railway freight.

The traffic counts of the section between Nairobi and Thika reveals that there has been a tremendous growth of freight vehicles. Taking 1968 as the base year - viz 100% the freight traffic growth has been of the following magnitude at selected points along the highways.

One factor is evident from the following figures; there has been a tremendous traffic growth since the highway improvement in a descending order from Nairobi to Thika viz. from 250 percent at Ruaraka to -55.2 percent beyond
Table 4.11  Traffic Growth in the Study Area 1968-1975.

<table>
<thead>
<tr>
<th>Location</th>
<th>Traffic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruaraka</td>
<td>250.5 per cent</td>
</tr>
<tr>
<td>Kahawa</td>
<td>93.8 per cent</td>
</tr>
<tr>
<td>Ruiru South</td>
<td>76.01 per cent</td>
</tr>
<tr>
<td>Ruiru North</td>
<td>76.54 per cent</td>
</tr>
<tr>
<td>Kalimoni</td>
<td>52.41 per cent</td>
</tr>
<tr>
<td>Thika South</td>
<td>56.75 per cent</td>
</tr>
<tr>
<td>Thika North</td>
<td>-55.20 per cent</td>
</tr>
</tbody>
</table>

Source: M.O.W. Roads Branch.

Thika. The conclusion to make here is that the study area has generated a lot of traffic since the highway improvement was made. At this point we may assume that the highway improvement removed the bottleneck which held the traffic growth.

Using the Ministry of Works criteria of the need for road improvement viz. trip demand, cost saving, and time saving criterias it is possible to identify the impact of this highway improvement - in terms of induced demand for transportation this illustrate by the traffic analysis in the study area.

The traffic growth rates above at various points in the study area indicate the increased activities in the study area which demand interaction with city centre and Thika. More interaction is seen between Nairobi and the study area than with Thika. Traffic analysis support the above conclusion.
Commuter activity is on the increase since the highway improvement this is clearly seen in examining the growth of passenger cars between Nairobi and the study area. The following table shows that commuter activity is high between Nairobi and Ruiru.

Table 4.12 Traffic growth in the study area.

<table>
<thead>
<tr>
<th>Station</th>
<th>Light Duty Vehicle</th>
<th>Heavy Duty Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruarsaka</td>
<td>273 per cent</td>
<td>197 per cent</td>
</tr>
<tr>
<td>Kahawa</td>
<td>103 %</td>
<td>66 %</td>
</tr>
<tr>
<td>Ruiru South</td>
<td>71 %</td>
<td>86 %</td>
</tr>
<tr>
<td>Ruiru North</td>
<td>93 %</td>
<td>36 %</td>
</tr>
</tbody>
</table>

Source: 1976 Author Survey.

It is evident from the above table that a lot of traffic originates and ends up in this area especially between Nairobi and Ruiru where the figure for light duty vehicles are above 70%.

The increase in vehicle traffic within this region has led to decline in railway freight between Nairobi and Thika, Appendices D and F illustrate the Railway freight figures between Nairobi and Thika, where negative growth in railway freight is observed. In 1974 a negative figure of - 15.73% and in 1975 still a negative figure was observed - 24.97% for all freight through Nairobi route. The base year for this is 1972 when the highway improvement was nearing completion.

These figures indicate that there is a stiff rail/road competition and that the railway is loosing a lot of freight.
to the highway.

A survey of the means of transportaion of the major industrial firms located at Thika revealed that more and more industries are opting to use the road instead of the railway. Table 4.10 shows a list of the industries visited and their output or input and the means of transportation they use.

Table 4.13 Transportation Means for Industries at Thika.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Output/Input</th>
<th>Road</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya Canners Ltd.</td>
<td>55,000 tons</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Metal Box</td>
<td>100 million Cans</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Acif Ltd.</td>
<td>1.84 million metres</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>5 million bags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Textiles Industries</td>
<td>3.03 metres</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>5454 metric Tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nathi Brothers Ltd.</td>
<td>700,000 metres</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>300,000 shirts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya Torary Millo</td>
<td>8.4 million metres</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Kenya Textile Mills</td>
<td>5475 tonnes</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Kenya Tannine Extract</td>
<td>7000 tonnes</td>
<td>97%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: 1976 Author's Survey.

The above table indicates that most of industrial plants at Thika are using the road mainly in transportation of their raw material as well as the finished products. This also forms an impact of the highway improvement in the study area.

4.2.0 URBAN LAND USE.

Various urban settlements have been located in the study
area. These are the Northern surbarbs of Nairobi which represent urban sprawl in form of an expanding city outside its boundaries. The others are Ruiru, Kalimoni and again Thika extensions. Urban land use is dealt more in chapter 5 on settlements in the study area.

4.2. D MISCELANEOUS LAND USES

These are land use which cannot be urban agricultural or transportation but are existent in the study area. These include, institutional, forestry and water reservoirs.

(1) INSTITUTIONAL LAND USE

Various institutions have been located in the study area. The location cannot be attributed to the highway improvement as some of them dates as far back to the colonial period. These are; Military installation, Konyatta College at Kahawa, Kamiti prison at Kamiti, Coffee Research Foundation at Ruiru and Mangu High School which was sited adjacent to the road in 1971/72. Together all these institution occupy about 350 hectares.

Residential housing is however developing around these institutions. Such dwelling are visible at Kasarani near Kahawa, and Konyatta University College at Kamiti near the Nairobi New Prison. It is difficult to state clearly the impact of highway improvement on institutional land use, because except for Mangu High School which has been located adjacent to the highway. There is no new institution developed in the area since 1972. As far
New Nairobi Prison maybe there was no need for a new prison in earlier years. When the need arose, it was easier to locate it near the existing one. Therefore one cannot argue that this has been due to highway improvement.

(ii) FORESTRY:

There are only two forest area in the study area, these are Kamiti and Kiambu which are under the ministry of Natural Resources. Together these two forests occupy about 428 hectares. It was difficult to assess the highway impact as far as this land use was concerned.

(iii) WATER RESERVOIRS:

There are several water reservoirs in the study especially on the west of the road where coffee is grown. These are used for storing water to irrigate the coffee during the dry season. East of the road where drainage is impeded by topography rivers are forced to glow in marshes which forms small reservoirs used for watering the cattle. The whole area under reservoirs was estimate at about 22.5 hectares. The highway impact was difficult to estimate.

(iv) QUARRIES:

Quarries, exists around Kasarani, riverside estate to the east of the highway. Although marked growth in quarrying activities in this area was established, it was
difficulty to attribute it to the highway improvement. This would rather got increased growth in the building industry in the city.

These quarries produce, building stone, aggregate, clay tiles, quarry chips etc., needed in Nairobi and the surrounding region.

4.3 SUMMARY:

Land use in Nairobi-Thika region has been affected by the Nairobi-Thika highway improvement. The effect has been on varied degree depending on the type of land use, and how readily the land use can change as a result of improved accessibility.

Agricultural land use have been most in area around the town and where the price of the agricultural produce have been low. Urban developments using accessibility as their location criteria have sprawled on coffee land around Nairobi and to a less extend around Thika. Though the high price of coffee have tended to make coffee land resist the sprawl, other factor like proximity - accessibility and housing problems in Nairobi have tended to reduce the resistance. However, if the price of coffee drops to its previous levels this resistance will eventually disappear and hence the profitability of agricultural holding. This form of urban sprawl will consume more coffee land in the study area. This will produce not only a new land use but also a new spatial structure.
Low prices in agricultural products have affected land use and this is clearly evident in the sisal land use where more and more land in the centre of the study area away from urban influence have been subdivided and sisal growing abandoned.

A more direct highway improvement impact have been revealed in transportation land use where the highway is ferrfying the bulk of the freight between Nairobi and Thika. The growth of the passanger car traffic in the study area in a small period time off after the highway improvement is itself an indication of the impact on land use. This could be directly related to the growth of commuters using the road residing in the study area. The traffic counts reveals that beyond Thika there is a negative growth in traffic of passanger cars a factor which suggests that there is very little or no commuter traffic beyond Thika. High figures were recorded between Nairobi and Ruiru where commuting population is intense, though there is still a positive growth even beyond Ruiru.

Looking at land holding in the study area reveals that around Nairobi and Thika towns there is high proportion of small parcels of land used by the commuter population. The factor to consider here in terms of size is that they are too small, to keep a person full employed and the land value are high there. No peasant farmer could be able to raise the purchase price. Therefore they are owned by part-time or 'hobby'
farmers. Very few of these small parcels are recorded at Ruiru.

The growth of these small land holding may be related to peoples desires to own land and at the same time work or carry out business in the town using the efficient mean of transportation viz. Nairobi-Thika highway. This changes the structure of land use from agricultural-rural to an urban-agricultural. The land values also changes as the theoretical approach asserts in the first section of this chapter.
FOOTNOTES:

1. Van Thunen: Der-Isoliete Staat in Bezieling auf Landwirtschaft and Nationalokomic. Translated 1945: Reading in Economics.


5. The Kenya Census of Agriculture uses the term large farm area for the large scale farm operation because of the farmer legal distinction between 'scheduled' and 'non-scheduled' areas no longer exists.


7. Kenya Coffee earned K£84 million in 1975/76. This was more than any other single foreign exchange earner.

8. The survey results of the study area. Author's Survey, 1976.


10. Morgan: et. lat.

12. The supply problems referred here are:
   - The frost in Brazil which destroyed coffee plantation
     war
   - The Civil war situation in which was in Angola in 1976.
   - The political situation in Uganda
   - The Earth quakes which destroyed plantation in
     Guatemala and Nicaragua in South America in 1976.


14. Nairobi North-west and Northern Surburbs estates for
    the High Income brackets.

15. S.S. Yahya : The changing pattern of land value
    land use in suburban Nairobi op. cit.
    pp. 44.

16. This information was given by Dr. A.K. Kabaara,
    Director of Research at the Coffee Research foundation
    Ruiru.

17. This figure is obtained by averaging the sisal holding
    area.
REFERENCES:


2. Alonso: Location and land use: Towards a general theory of Rent.


CHAPTER FIVE: SETTLEMENTS

5.0. AFFECTED SETTLEMENTS

The upgrading of Nairobi Thika highway passed through two urban settlements viz. Ruiru and Kalimoni. The other area where the highway passes is either ranchland as sisal estates. Therefore this being the situation, the two settlements are analysed in this Chapter.

In analysing these settlement some selected indicators are used in identifying the Changes which have taken place in these settlements in order to justify the highway impact. However each indicator is dealt with on its own significance and whether the highway improvement is the causative factor or not is also analysed.

The indicators analysed include among others, population growth rate and densities growth of physical structures such as housing etc. services capacity and employment.

5.1. POPULATION GROWTH.

Urban population growth rates are normally a characteristic associated with the rural-urban migration. Hence the population growth rate of Nairobi is 6.8% per annum where the National growth rate is only 3.4% per annum. The urban growth rate is usually higher due to migratory element. The rural population faced with problems of landlessness and unemployment are forced to migrate to urban areas where there are better chances of getting a job. This forces the urban population to grow at a higher rate than the National
population growth. This is the situation with most of the urban areas in Kenya such as Nairobi Mombasa Nakuru Kisumu Thika etc.

High population growth is not confined to the big urban area but also to small settlements especially those with an employment base. In case of these small settlements the rural population is attracted by the availability of employment sector which uses unskilled labour. Not all the migrants get jobs in the formal sector, those who do not get employed are however reluctant to go back to their place of origin. The employed and unemployed migrants constitute a population increase to the already existing population.

Higher population growth rate above the national growth rate is imperative to urbanization. The other factor which might force the population to rise in smaller settlements is commuting. Commuters, usually to a well established employment centre, commute daily to and from work. If in the employment centre is faced with problems of housing and servicing of the population usually - people will use the efficient transit systems to the outskirts of the centre to find accommodation. This increases the population of the settlements in the outskirts of a big employment centre. In such a situation the more accessible settlements have a higher growth rate.

In the study area there are two of such settlements served by Nairobi-Thika highway. The first is Ruiru which is only sixteen kilometres from Nairobi city centre and only a few from the city boundary.
5.21 RUIRU:

Map 3 and plate 3 show the location of Ruiru in relation to the study area. Ruiru has had a spectacular population growth since 1969 census which indicate that by then Ruiru had a population of 1679. Annual growth rate of 0.4 per cent².

Table 5.1 analysis a population projections of Ruiru to the year AD 2000. At the time of survey the population of Ruiru was estimated at 16500 which some observers, like the local chief thought was abit too low, this was about 1426³ over the 1969 census figure: this figure was almost 8 times the 1969 population within a period of seven years. Refering to Table 5.1 Ruiru population projections in 1973 the department of urban and Regional Planning estimated the population at 2194 which indicated an annual growth of 7 per cent which is still too low.

At this point the question to ask is what has caused the spectacular population increase between 1973 and 1976?

The survey revealed that in 1974 about 3003 registered members of the Githunguri Constituency Ranching Company bought the former East African Sisal Estates Limited LR. 10900 toward the end of 1973. The company have subdivided the area of the farm to the South of Ruiru Town into small plots allocated to each individual member where he/or she have constructed a house. This forms another small town adjacent to Ruiru. A pilot survey census in 1976 revealed that about 85⁴ per cent of all the plots have been built upon. The
survey also revealed that every house had an average of 4-5 people. This was seen as the cause of the spectacular population increase in Ruiru. In a period less than two years.

The survey revealed that these people who bought the farm were previously landless and therefore took the farm as their new means of livelihood. At the time of survey there was very little done on the farm and even the sisal which was there was neglected.

A commuter element was evidence during the survey though data on this aspect was not compiled.

Table 5.1 Ruiru population growth projections.

<table>
<thead>
<tr>
<th>Year</th>
<th>Projection I</th>
<th>Percentage change</th>
<th>Projection II</th>
<th>Percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Law alternative</td>
<td></td>
<td>High alternative</td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td>612</td>
<td>7.2</td>
<td>612</td>
<td>7.1</td>
</tr>
<tr>
<td>1962</td>
<td>1624</td>
<td>7.2</td>
<td>1624</td>
<td>7.2</td>
</tr>
<tr>
<td>1969</td>
<td>1674</td>
<td>0.4</td>
<td>1674</td>
<td>0.4</td>
</tr>
<tr>
<td>1973</td>
<td>2194</td>
<td>7.0</td>
<td>-</td>
<td>8.0</td>
</tr>
<tr>
<td>1978</td>
<td>3078</td>
<td>7.0</td>
<td>-</td>
<td>8.0</td>
</tr>
<tr>
<td>1980</td>
<td>3523</td>
<td>7.0</td>
<td>3903</td>
<td>8.0</td>
</tr>
<tr>
<td>2000</td>
<td>13633</td>
<td>7.0</td>
<td>18192</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Source: Department of Urban and Regional Planning
Ministry of Lands and Settlements, Nairobi
5.2.2. POPULATION DENSITY:

Population Density in Ruiru in 1969 was at 557 people per square kilometre whereas that of the surrounding rural district was at 27 people per square kilometre. In 1973 the density was calculated at 731 persons per square kilometre.

The 1976 pilot survey revealed the density at 5500 people per square kilometre. This was about ten times that of 1969. In considering the population growth rate and density positive figure in the two aspects have been established, the question here is that; because the spectacular growth in population has occurred after the highway improvements, has it occurred because of the highway improvement or other factors?

The survey reveals that majority of these people come to this town because they were landless and they were members of Githunguri Constituency Ranching Company. Therefore the highway improvement could not have mattered to them. However the Commuter element indicates that the highway improvement has had an effect on the population growth and densities, although at very small magnitudes.

5.2.3. GROWTH OF PHYSICAL STRUCTURES.

The growth of housing structures is among the factors considered to justify the growth of towns in the study area.

Ruiru Town being close to Nairobi and Nairobi-Thika highway bypassing it could be affected in various ways; such as the decline in trade, therefore less development of
shopping and other trading facilities or growth in trade. With this the development of the necessary infrastructure to promote trade. During survey the following observations were made in connection with trade facilities and have been tabulated here below.

Table 5.2. Growth of commercial facilities at Ruiru: Percentage

<table>
<thead>
<tr>
<th>Shops</th>
<th>1969</th>
<th>1976</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail</td>
<td>26</td>
<td>40</td>
<td>54%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>6</td>
<td>4</td>
<td>-33.4%</td>
</tr>
<tr>
<td>Bear halls</td>
<td>6</td>
<td>14</td>
<td>133.4%</td>
</tr>
<tr>
<td>Tea-shops</td>
<td>?</td>
<td>5</td>
<td>?</td>
</tr>
</tbody>
</table>

In table 5.2 it is evident that since 1969 there has been positive and negative growth of trading facilities. The retail facilities have increased by 54% which is indicative of the growth of population in Ruiru Town. The wholesale facilities have decreased by 33.4% which could be looked at the decrease role of Ruiru as the supplying Centre of high order goods in the study area. With the improvement of the highway; congestion have been reduced and due to the distance in between Nairobi and Ruiru, the people have preferred to make the purchases in Nairobi.

Another facility which has been spectacular growth is beerhalls which have increased by 133.4% this is indicative of the population growth in Ruiru Town.
5.2.4 EMPLOYMENT.

Employment was the other indication used to measure the highway impact, though in 1969 data on employment was not available the new employment enterprises were used as the parameters.

The following is a list of the enterprises at Ruiru in 1969 and 1976 showing the employment figures of each firm where data was available.

<table>
<thead>
<tr>
<th>Employment firm</th>
<th>1969 employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Area Council</td>
<td></td>
</tr>
<tr>
<td>2. Central Government (Kenya Police)</td>
<td></td>
</tr>
<tr>
<td>3. Sapa Chemicals</td>
<td></td>
</tr>
<tr>
<td>4. Ruiru Bakery</td>
<td></td>
</tr>
<tr>
<td>5. East African Power and Lighting Company Ltd.</td>
<td></td>
</tr>
<tr>
<td>6. The Trading Centre</td>
<td></td>
</tr>
<tr>
<td>7. East African Railway Corporation</td>
<td></td>
</tr>
<tr>
<td>8. East African Post and Telecommunications</td>
<td></td>
</tr>
</tbody>
</table>

1976

<table>
<thead>
<tr>
<th>Employment firm</th>
<th>1976 employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Area Council</td>
<td></td>
</tr>
<tr>
<td>2. Central Government (Kenya Police)</td>
<td></td>
</tr>
<tr>
<td>4. East African Power and Lighting Company Limited</td>
<td></td>
</tr>
<tr>
<td>5. Trading Centre</td>
<td></td>
</tr>
<tr>
<td>6. East African Post and Telecommunication Corporation</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Industry</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Galvanising Nails and steel factory</td>
</tr>
<tr>
<td>8</td>
<td>Henkel Chemicals</td>
</tr>
<tr>
<td>9</td>
<td>Rolling steel industries</td>
</tr>
<tr>
<td>10</td>
<td>Timber and Saw mills</td>
</tr>
<tr>
<td>11</td>
<td>Ruiru Foam Mattress</td>
</tr>
<tr>
<td>12</td>
<td>Bakersy</td>
</tr>
</tbody>
</table>

Total employment figure: 510

There has been a growth of industrial firms in Ruiru, such as Galvanising Nails and steel industry, Henkel Chemical Ruiru Foam Mattress and Timber Mills which have increased the employment by 510 people. The firms have increased by 50 percent that of 1969. The above analysis shows that Ruiru is becoming a popular industrial location, although no major industrial have been located at Ruiru, smaller firms are taking the location due the facilities at Ruiru. Such as cheap land, water rates, and with Nairobi-Thika Road improved, the smaller firms' products can reach Nairobi-Thika towns at still competitive prices.

5.2.5. SERVICES.

The survey revealed that there has been no growth in services in Ruiru despite the population growth. The following list of the services available at Ruiru.

1. Water supply - piped but only in the old town, none at all to the new settlement.
2. Electricity is also to the old town.

3. Refuse waste disposal this also confine to the old town. There is a water borne waste disposal system which serves the part of town visible on plate one. Pit latrines are used in the new settlement.

Education facilities were also examined and there was only one nursery school 2 primary schools and one secondary school. There were no other forms of educational facilities. At the time of survey Ruiru had only 3 health facilities viz 2 private clinics and a public dispensary.

Administrative facilities and institution were also surveyed. The ones recorded were a police station, urban and area councils and a chief's office.

The surveyed services were inadequate in view of the spectacular population growth. The most deficient ones are water supply and wastes disposal though others are not very critical they need to be improved. With Ruiru population nearly over the expected target of year AD 2000 there is the need to re-examine the policy formulation for Ruiru.

5.3. KALINONI:

Kalimoni is located between Ruiru and Thika town on the Nairobi-Thika highway. Map 2 Plate 4 show the settlement. Notice that the Dual Carriageway passes roughly
in the middle of the settlement. Kalimoni is a settlement based on one industry viz. East African Bag and Cordage Limited processing sisal fibres from the surrounding. Formerly the settlement was confirmed to the eastern side of the highway. But in 1970 development of temporary housing structures started after the purchase of the farm opposite the sisal factory LR. No. 10090. The same indicators used in studying Ruiru were used.

5.3.1. POPULATION GROWTH AND DENSITY.

There were no previous population records for this settlement as in 1969 the population was considered together with the rural area viz. Juja.

The survey census estimated the population at about 9500 people. The factory has a residential area housing almost all of its employees and their families and the rest stay at the 'squater' settlement opposite the factory.

It was difficulty to calculate the growth rate for this settlement since there have been no previous population records. However a figure of 8-9 per cent per annum was arrived at using the growth rate of the housing structures. Population density was difficulty to calculate as the area under settlement is not demarcated. Assuming the area under settlement is one kilometre square, the density of 950 per hectare was arrived at, during the survey. This indicates that this area is congested as will be revealed by the consideration of the growth in housing structures.
5.3.2. GROWTH OF PHYSICAL STRUCTURES.

In 1969, there were about 800 housing units mainly owned by the East African Bag and Cordage Limited. These are the ones seen to the eastern side of the highway in plate 4. These houses were built-up of semi permanent material, murrain and cement finishes with corrugated iron sheets. The housing structures could be classified as follows:

(1) Row housing which was in three categories.
   Viz, (a) 2 x 12 units with a total of 24 units
   (b) 3 x 8 units with a total of 24 units
   (c) 15 x 6 units with a total of 90 units.

(2) Semi-detached housing
   2 x 331 with a total of 662 units

(3) Detached houses
   20 units

Total 820 units

In 1969 there were also five shops fronting the road and a primary school within the factory premises and that seemed about all there was at the time of the 1969 census.

At the time of survey in 1976 there was the evidence of new structures which have come up only recently. The following is a list of the extra structures coming up after 1969.

1. A police station with 22 housing structures and an office block.
2. There are also three shop and a small photo studio with the squatter settlement all built up permanent materials. 1 and 2 above have been built up to the west of the road, and are visible in plate 4.

3. The squatter settlement have been built of temporary material in row format. The structures provides about 30 more shops in form of small rooms; about 10 tea kiosks 14 bear halls and a private clinic.

In housing there are about 480 rooms occupied by different individuals and families. All in 60 row blocks. Most of the rooms measure 4 metres square, with very few going up to 5 metres square. The blocks are constructed of timber off-cuts and G.C.i sheets. This section of Kalimoni houses about 3000 people with no water supply or an efficient method of waste disposal. They rely on Thiririka river about half a kilometer away for water supply and pit latrines, in case of waste disposal. At the time of survey March 1977 the whole of the squatter settlement was submerged in flood waters ranging between 150 and 300 mm. high.

The growth of physical structure has been estimated at 12% in between 1970 and 1976.

5.3.3. EMPLOYMENT.

Employment was the other indicator used to measure the highway impact on this settlement. Of the record most the people are not employed in any formal sector especially the
occupants of squatter settlement. There has been no new employment facility locating up at this settlement, and therefore the East African Bag and Cordage Limited remains the major employer at Kalimoni employing about 3000 people. A figure which has not changed since 1969. The other employers are the Kenya Railways Corporation, the Ministry of State in the Office of the President (Kenya Police) and the commercial sector of the settlement viz shops - beer halls and tea kiosks. It was difficulty to know the real employment figures of the sector because most of the people are idle, and therefore cannot distinguish the full time keepers and attendants. However a figure of 126 people as the total number employed in the commercial sector was arrived at using the following criteria:

for shops on assumption of 1 service person.

<table>
<thead>
<tr>
<th>Shop Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>bearhall</td>
<td>4</td>
</tr>
<tr>
<td>teakiosks</td>
<td>3</td>
</tr>
</tbody>
</table>

Based on this basis the bearhalls employ about 64 and the teakiosks employ about 30 people. The clinic has one full time worker.

Most of the other people are employed as casual labourers in the neighbouring coffee estates who were difficulty to count during the survey due to the seasonality of their activity. There is a flourishing informal sector in the squatter settlement dealing with vegetable, furniture making and tinsmiths. There is also a high rate of prostitution during the survey not less than 70 rooms were occupied by such people.
5.3.4. SERVICES.

Little has been done in the provision of services at Kalimoni. Except for the police station and an extension of electric supply to some structure in the squatter settlement there has been nothing else. Therefore the level of services at this settlement are inadequate. The most affected services are water supply and refuse and wastes disposal. As a result the whole settlement west of the Thika Road is infested with flies and mosquitoes which are health hazards.

5.4. THE PROBLEMS OF DEVELOPMENT IN NAIROBI AND THIKA.

Nairobi and Thika form the two extremes of the study area; in the South is Nairobi and in the North is Thika. It is therefore reasonable to briefly look at the development problems confronting these two towns which would encourage settlement along the highway.

5.4.1. PROBLEMS IN NAIROBI.

Without going into details the following are the current problems that are confronting the city of Nairobi. Most of the problems are however inherent of high population growth rate which is 6.8 per cent per annum double the National growth rate.

1. Nairobi is faced with a congestion of housing facilities, with the result several squatter settlement have come up in the various sections of the city. Such areas
like Mathare valley, Kariobangi, Nairobi river valley etc. are examples of squatter settlements of people trying to look for accommodation.

2. The problem of unemployment in the city is growing at a higher rate than the national one due to the migrant population.

3. Land availability for the provision of services such as housing, water and sewerage is also becoming acute in the city when compared with cost involved land acquisition. The population projection estimates indicate that Nairobi will overspill the present boundaries by 1985, at the turn of the century the population will reach 4 million people. Such a high population will need more land for housing, Industrial transportation commercial and recreation which the city does not have at present. In an effort to examine how to provide for the population at the turn of century the Nairobi Metropolitan growth strategy noted the following as the major constraints to urban development.

i) Expansion the south west would be limited by the existence of Nairobi National Park.

ii) In the south and south east expansion would be limited by Nairobi Internation Airport and the New Nairobi Airport.

iii) To the East the soil condition are the major impindents
to urban developments as this is a zone of Black Cotton Soil and due to its lack of s.b.c. construction would be very expensive. This would produce a hazardous environment in case of laxity in planning.

iv) In the North west expansion would be also limited by the topography. Map 2 on physical indicates this a region of the narrow ridge topography characterised by deep river valleys and narrow ridges.

v) The North and north-east was noted to be an area of intensive agriculture with coffee and market-gardening and horticultural activities. The metropolitan growth strategy also noted that in this region land values are high due to the land tenure, and the size of land holding. During the survey it was observed that urban development were increasing in the region of intensive agriculture, at a scale that cannot be ignored.

The metropolitan growth strategy noted also that the ministry of Agriculture would like to see urban development discouraged in this zone. However, other factors are encouraging the development in the region. Such factors are, accessibility, the inability of the city to provide adequate housing for its population, the changing nature of land holdings and the application of the planning regulations within 5 miles of existing city boundaries and the housing prices and rents in Nairobi. This have encouraged housing developments around the peripheral areas. With good
accessibility the houses in a position to earn good incomes as those in the city. These settlements are dependent on Nairobi in that other than the physical housing unit, they depend on Nairobi for services such as education, shopping, recreation and entertainment, employments and other facilities. These settlements are unstable from environmental's and city's views as they lack in planning the congestion of services and facilities which they use which were not intended for their use, nor do they share in the cost of provision.

These development also shift land values to locations thereby making the land more expensive if not impossible for the city to acquire in case of urban expansion or renewal activities. This has been the case with Kangemi - Kawangware, Riruta and Dagoretti locations in Nairobi.

5.4.2. THE PROBLEMS IN THIKA.

The problems facing the development of Thika town are of a lesser magnitude when compared to those of Nairobi. This is because of the size of Thika is smaller, and has a very prosperous industrial base. The problems of unemployment housing and transportation are not acute as in Nairobi.

Thika like Nairobi also face shortage of finance for the development targets and therefore though the problem are much smaller are not ultimately solved. The most acute problem Thika faces is of expansion. Due to its Location Thika cannot expand Northwards because of the River which would increase the cost in infrastructural works such as
roads - sewers and water pipes. Therefore expansion would be either to the East or South or to the west. Where the council would be faced with the problems of land acquisition. The problem of housing for industrial workers at Thika was examined by a Danish team of experts in 1974 who expressed concern over the sabotage activities of the local African bourgeoisie on a realistic housing policy. The Danish team noted that the increase in the production in plots and houses in the pilot schemes gave the councillors immediate chances to get personal benefits. The activities, corrupt in nature were taking place openly which caused public concern and finally a Government action. Limiting the authority of the council in the housing projects and thereby the economic advantages of being a councillor. The council annoyed by the part played by the Danish Group in the limitation of their authority finally winded it up.

The problem of corruption of the councillors is not limited to Thika only but it is a common feature with all other municipalities in Kenya. This hinders the development of housing and other services and therefore the initial problems of congestion of facilities and services still remains more due to the increased population.

5.5 WHY URBAN DEVELOPMENT IS TAKING PLACE IN THIS AREA

Having analysed the settlements in the study area and also the problems facing the two major urban area in the study area, it is time to look at the reason why people are
prefering to settle in the study area.

In the previous analysis chapters of the impact of land values, land use and this one on settlements, it has been revealed that urban development is taking place in the study area. Such factor as landlessness have been considered in the previous sections of this chapter. Also considered in an earlier chapter is the African desire to own land as status symbol.

The other factors which are encouraging urban development in the study area are:

1) The housing problems in Nairobi which has caused the house rents and values to rise to such a magnitude that only a small part of the population can afford. This makes the uncontrolled housing developments in the peripheral area marketable to low income groups.

2) The existence of efficient transit routes between the city centre and the peripheral area is another factor that is encouraging the urban development outside the city boundaries where housing is not subject to planning and building standards. The houses developed are therefore of substandard materials and hence cheap such housing units can be seen around Kahawa, Ruiru and Kamiti in the study area.

3) The other factor which was mentioned earlier is the 'Hobby farming' which is becoming more popular with
top civil servants and business executives in Nairobi. This is even playing a large part in developing urban structures in the study area than any other factors. Land ownership in the study area has turned out to be a status symbol and therefore more and more people wish to own a piece while still they carry on with their business and employment in the modern sector in Nairobi, at the same time affording a status. This has led to a lot of 'parcellation' of land with 15 kilometre of the city centre.

The above factors were identified as the factors leading to rapid urbanization of the study area.

5.6. SUMMARY

It has been the object of this chapter to examine the patterns and process of development of settlements in the study area as affected by the Nairobi-Thika highway improvement. The study has dealt with the growth issues of the two settlements viz Ruiru and Kalimoni which are fully in the study area, and the problems of growth and development of the two bordering settlements Nairobi and Thika. The population growth and density, housing developments, employment and services provision were used as indicators in measuring the impact of the highway. Any increased growth in these settlement purely due to the accessibility factor is a highway improvements benefit. The survey of these settlement has revealed that various problems facing the human settlements in the study area. These problems as the survey results have revealed are caused by the socio-political policy issues
other than tangible development issues like the highway. The population of these settlement has also been seen too be affected by the same policy issue facing the settlements. With the land along the highway being cheap as compared with land elsewhere in the highlands it is easy for the group Co-operatives to acquire.

The highway improvement has been seen to have affected the settlement by increasing the commuting activities especially to the areas within the Nairobi city boundary. Such area like Ruiru, Kahawa, Kamiti and Ridgeway have been affected. Due to the high class accessibility facility and the problems facing the city government have facilitated the development of cheaper housing structure out side the city boundaries, these housing settlement are very low in environmental quality lacking in planning are visible in such area like Kasarani, Ruiru and Kalimoni.

The conclusion to make here is that this form of development is not the optimum and with previous experiences in Nairobi it will be difficult to pull down these structures in the future due to politics and therefore they might remain permanent landmark in the spatial structure which might emerge in the study area.

These settlement have been developing without an employment base of their own and therefore are only dormitory areas of Nairobi. This would at some future date call for
transportation solution for the people to and from work. It has been established in this chapter that the highway improvement impact on settlements has been to shift residences from Nairobi the surrounding area where the highway passes. In this area there are low planning standards or non are existent. There has been no corresponding shift of employment sector along the highway.
1. op cit Nairobi Metropolitan Growth Strategy
   Main Report.

   (Department of Physical Planning,

3. op cit 1976 author's survey.

4. op cit 1976 author's survey

5. op cit Ruiru Report.

6. op cit Rapport redeoaside cu DANIDA.
   (1972 Report by Danish Team for DANIDA.)
REFERENCES:


CHAPTER SIX

POLICY RECOMMENDATIONS.

The previous three chapters analysed the highway improvement impact on land values, land use and settlements in the study area. The problems which have resulted because of this development have been identified. The highway impact on land values as analysed is seen to be making land more and more expensive to purchase, the result has been more agricultural land being subdivided and urban developments are springing up all over the study area in its place. The problems of land speculation has been identified all along the development corridor.

The Nature of land is also changing with urban developments encroaching on the potential agricultural land to the North of the city (study area). This type of development as has been noted in the analysis is removing land from agricultural production and putting to urban use owing to the difference in value for the two use. The urban use does not come in at the optimism stage and hence, the result is a misuse in resources; misuse, because, agricultural activities are denied the land resource and urban activities are not optimally developed, therefore resources used in water supply, access roads and other infrastructural facilities are not optimally utilized. Problems have been identified in the development of settlements such as development of dormitory settlements
without proper planning water supply, waste disposal system and other social facilities, the consequence of these deficiencies in these settlements is a very low environmental quality. Forming noticeable landmarks is the spatial structure that might evolve in the future.

The policies needed for this area are those which are going to lead to the development of a stable environment both in urban and agricultural considerations. The metropolitan growth policy for this region should accommodate policy guidelines which safeguard agricultural land from encroachment by urban development.

6.1 POLICY APPROACH.

The issues identified in the analysis chapters require a policy which will guide the land use at present and in the future. Any feasible policy for this region should achieve both the National and regional aspirations viz, maintenance of the agricultural production for foreign exchange earning and providing both food and raw materials; and land for urban development for the region.

The policy also should achieve a functionally interdependent system where full integration of the economy is achieved minimising the inter-regional imbalances and at the same time maximising on the growth potential. From the national point of view urban growth is necessary for the rapid development of the country. Therefore the Government has adopted a
hierarchical designation of service centre throughout the country provided with the necessary urban infrastructure.

The policy therefore, should resolve the conflicts in land uses in the study area. Presently land is being removed from agricultural production pre-maturely for urban developments. This is not only denying the region a vital resource but the nation as well. It is therefore in the interests of the region and the Nation to have a growth policy where land is only allocated to urban developments when such developments are really feasible. Therefore a policy falling short of the above will not be a feasible one both from national and regional considerations.

The foregoing issues have therefore prompted an adoption of a policy recommendation which accommodate both the urban and agricultural interests of the region. In order to achieve a fully integrated spatial structure in the study area, an integrated policy on 'agricultural-cum-urban development' is recommended.

This policy consists of two components: viz one an urban development in the study area and secondly on agricultural development.

6.2 GROWTH POLICY.

The growth policy recommended is urbancum-agricultural viz. an integrated and well coordinate urban and agricultural development policy.
Map 6. Problem Areas

- **BUILT UP AREAS**
- **DIRECTION OF URBAN SPRAWL** (PROBLEM AREAS)
- **BOUNDARY STUDY AREA**
- **PRIMARY & SECONDARY ROADS**
- **BOUNDARIES OF GAZETTEED TOWNS**

**Naïrobi—Thika Region**

Scale: 1:100,000

G. Kariuki B.A(L.E.) 1977
6.2.1. **URBAN DEVELOPMENT.**

Map No. 6 clearly shows the problem areas where agricultural land is being encroached upon by urban development, it also shows the constraints in urban expansion of Nairobi. A look at map No. 5. on land use, shows that the area being encroached upon is presently used by prosperous coffee farming. Presently the threat on coffee farms is not as eminent as it was in 1975. This is purely temporary due to the current high prices of coffee on the market which is now more profitable than urban users. However, the situation changes in the future, the threat to agricultural land will be posed again. Examining the constraints of urban development in the east, south and west of Nairobi which have been analysed in chapter 5 the only side left with least problems is along Thika Road, the study area. It is clearly evident from the analysis that urbanization is taking place in this area, and any move to shift urban growth to other areas will be resisted due to the already existing trends.

Map no. 7 is a land use map showing the proposed land use model in the study area, it shows where each activity is to be located in order to achieve a stable land use pattern in the study area. The following are the components of the land use model in the aspect of urbanization.

1. Residential  
2. Employment centres  
3. Sewerage and  
4. Water supply and recreation facilities  

6.2.1.1. **RESIDENTIAL DEVELOPMENT.**

Residential development is presently taking place in the study area. Land owners are developing housing units for owner occupation or rental purposes. The areas which are affected are Kahawa, Kasarani, Ruiru, Kamiti and Rideways. These housing developments are faced with problems such as standards in design and materials, accommodation, environment and densities. These present problems in servicing of these areas as they are scattered all over the area, thereby increasing the cost of installing the services and utilities.

If proper servicing has to be introduced and maintained in this area proper density and design standards have to be invoked. As indicated earlier residential developments are encroaching on valuable agricultural land, in the study area the residential policy should help to avoid this conflict.

To avoid all these problems in land use conflicts, it is recommended that residential development should be concentrated along Thika road like other urban users. It should however at no place exceed 5 kilometre from the highway on the western side. This is based purely on the extent of coffee land (chapter 4).

On the Eastern side of the highway the residential development should only be limited by the safe health limits of the sewerage treatment facilities.
The question to answer now is what kind of residential development should be adopted for this area.

There are various types of residential policies being applied in Kenya and the most popular are; site-and-service schemes, and Tenant-purchase (mortgage). There are others like rental and owner occupier developments and any of these could be suitable for the area depending on need. The site-and-service schemes are presently being encouraged in most urban areas in Kenya for the low income groups which provides surveyed plots and essential services such as access roads, water and sewerage. This kind of scheme is currently undertaken at Donndora in Nairobi. The Tenant-purchase or (mortgage housing) are also being undertaken in Nairobi for the middle and high income groups. The success of the site-and-service schemes is not fully known yet, the tenant-purchase scheme has been very popular with the people and therefore could be implemented in the area recommended for residential development. However any form of residential development should be researched further before implementation. The residential areas include such other facilities like health, education and community centres.

6.2.1.2 EMPLOYMENT CENTRES.

It is recommended that industrial and major commercial activities be continue to form the employment centres for the study area. These should be located along the highway.
and the main criteria used in location should be journey to work. Therefore the residential and employment developments should be considered together in designing for the various locations of each of these activities. However since the mode of travel recommended for this region for the daily journeys is walking. The maximum distance between the residential and the employment centre should be five kilometres. The centres should be at a distance of 10 kilometres from each other.

Using this distance criteria the following areas are therefore recommended for development as employment centres: Kasarani/Kahawa Ruiru, Kalimoni and Thika.

Map No. 7 shows the areas assigned for the location of employment centres and the control area associated with each centre.

The above policy would help to reduce spending on public transport as the mode of travel is either walking or cycling due to the small distance involved. This also helps in avoiding the development of dormitory settlements which have no employment of their own but relies on Nairobi or Thika or any other established urban settlement in the area. This calls forth a shift in the industrial commercial locations from Nairobi and Thika to the study area, viz the recommended centres, Kahawa, Ruiru, Kalimoni and the southern side of Thika. To achieve this other infrastructural
facilities required to be provided in the study area. They should be installed as an inducement to attract the investors.

6.2.1.3. SEWERAGE.

The survey results have indicated that presently the methods used for waste disposal and treatment are: septic tanks, pit-latrines for individuals and oxidation ponds for institutions and large establishments with an urban development of the size in this recommendation, the above forms are inadequate for the waste disposal.

In an effort to come out with the method for waste disposal, the connectional sewage treatment plants and oxidation ponds were compared, based on the following considerations.

1. The method to be adopted was to have a low level of foreign components, therefore should be cheap to construct if necessary with a very low level of skilled labour.

2. It should be efficient in operation.

3. Cheap to maintain.

4. It should promote higher agricultural production.

5. It should have the lowest risk of pollution.

The following table compares the oxidation ponds to sewerage treatment works, as far as the above factors are concerned.
Table 6.1. Breakdown of operation and maintenance cost of sewerage treatment systems.

<table>
<thead>
<tr>
<th></th>
<th>Oxidation ponds.</th>
<th>Sewerage treatment Works</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30,000 m³/d</td>
<td>32,000 m³/d</td>
</tr>
<tr>
<td><strong>Kshs.</strong></td>
<td><strong>Kshs.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Staff</strong></td>
<td>440,000</td>
<td>1,300,000</td>
</tr>
<tr>
<td><strong>Running costs</strong></td>
<td>70,000</td>
<td>162,000</td>
</tr>
<tr>
<td><strong>Supply service</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and equipments</td>
<td>50,000</td>
<td>96,000</td>
</tr>
<tr>
<td><strong>Transport and</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plant</strong></td>
<td>50,000</td>
<td>41,000</td>
</tr>
<tr>
<td><strong>Establishment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>expenses</td>
<td>150,000</td>
<td>13,000</td>
</tr>
<tr>
<td><strong>De-sludging</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ponds)</td>
<td>150,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>5,000</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>770,000</td>
<td>1560,000</td>
</tr>
<tr>
<td><strong>Income from sludge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>53,000</td>
</tr>
<tr>
<td></td>
<td><strong>770,000</strong></td>
<td>1560,000</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td><strong>7.0 cents/m³</strong></td>
<td><strong>13.2 cents/m³</strong></td>
</tr>
</tbody>
</table>

$m³/d = $ cubic metres per day

(a measure of sewerage flow)

Costs = cost of disposing the sewerage per cubic metre.
From the above analysis it is clear that oxidation ponds are cheaper to operate, and hence they are recommended to be used as the sewerage treatment system.

This system of oxidation pond satisfies the condition which had been stipulated earlier.

The other advantages of the system are:

- The ponds system requires few skilled personnel during construction, operation and maintenance.
- The ponds have a high ability to reduce disease causing micro-organisms in the process.
- The land used by pond could be easily reclaimed in future if the need arise. However the ponds have the disadvantages of odour, large land requirements and breaching grounds for mosquitoes.

The following is table showing the land requirements for ponds systems for various capacities.

<table>
<thead>
<tr>
<th>Capacity (m³/d)</th>
<th>Area Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>48000</td>
<td>246 Hectares</td>
</tr>
<tr>
<td>115000</td>
<td>580 Hectares</td>
</tr>
<tr>
<td>200000</td>
<td>958 Hectares</td>
</tr>
</tbody>
</table>

Comparing both the land requirements, costs of operation and maintenance advantages and disadvantages of ponds and
treatment works the oxidation ponds system is recommended for the study area. The only constraint on this system would be land requirement. The area recommended for the location of these oxidation ponds is to the East of the highway where land values are low and hence not prohibited. This system requires no chemical treatment as it is based on B.O.D. and retention period of 5 days; the effluent is free from noxious chemicals and hence can be used for irrigation. Noting the topography and climatic condition of this area the effluent would be of great economic importance. The area beyond the area occupied by the oxidation ponds almost flat forming a pane plain, and the climate is a dry one irrigation would be easily practised. The crops which would be grown under irrigation would be those in great demand in the urbanized highway zone and Nairobi-Thika markets.

However it would be necessary to research further in the monthly irrigational requirements for this area before implementation. It is the author's opinion that the effluent that would be produced when this area is fully urbanized would be able to irrigate about 1400 Hectares of farm land east of the highway.

6.2.1.4. WATER SUPPLY.

The problem of water supply will have to be solved in view of the growing population in the study area. The population is presently growing at about 5.5 per cent per annum. The policy recommendation in this Thesis considers
that urban growth along the highway would increase the population growth to about 10 per cent per annum, which would require more water. This makes the water supply shortage more acute which is presently from bore holes at Kahawa and rivers at Ruiru and Kalimoni.

Looking at one of the arguments put forward by the metropolitan growth strategy, which have been adopted in this thesis; for seeking alternative urban location for Nairobi. These is around long uneconomic service lines. Noting that most water supply for Nairobi comes through the study area, it would be essential to locate the water reservoirs in the area to the west of the highway on the higher grounds. However before the construction of the water reservoirs the water resources, evaporation rates and water requirements for the settlement should be carefully studied. The urbanized highway zone should be supplied from the reservoirs preferably by gravity thereby making savings on service lines and pumping station. The exact location of these reservoirs should be based on study of the water resources.

6.2.2. AGRICULTURAL POLICY.

The main concern of this thesis is the urban encroachment of valuable agricultural land in the study area.

The urban expansion of Nairobi into the study area has been seen to remove Land from agricultural production to premature urban development. This denies the region and the
nation of a vital resource. Therefore as much as an urban policy is necessary an agricultural policy is necessary. As already stated the policy recommended is an urban-cum-agricultural policy. Therefore this is a significant part of the policy recommendation. Map No. 7 shows clearly the area recommended for agricultural production. This area has a well developed coffee farming which is being encroached upon by residential development. It is in this area where the policy recommendation needs to emphasis more protection. With the fluctuations in the price of coffee noted earlier in chapter three the land use pattern is affected by these fluctuations. More land being turned to urban development during a low coffee price period and almost non-at-all during a price boom. It should be noted that once land is used for urban development it cannot be reclaimed for agricultural use in the future. Therefore a protection policy of the agricultural land is necessary in this area; preferably by legislation. The legislation should contain the safeguards in land subdivisions, land transaction like sale, mortgage and leases. This should not be seen however as new legislation but could be an amendments of the Land Control cap 301 of Laws of Kenya. The act should include more schedules of the limitations of the above transactions in such area as the study area.

The provisions of the legislation should achieve good crop husbandry and an intensive land use pattern in the agricultural zone. It could be a good idea also for the
Authorities to set up a 'coffee stabilization fund,' which collects revenue in the years when there is a coffee price boom from the coffee farmers and pay them back during the period of depressed coffee prices. Such a policy would have a stabilizing effect on the income of farmers and land values, and would also help to discourage urban encroachment, which is more rampant during the depressions in coffee prices.

It is also recommended that horticultural crops should be introduced in the study area, on the western side of the road. This should be done after a hydrological survey has been carried out. This should be done in relation with the water supply scheme. On the eastern side of the highway irrigation would be possible, as the land is available and water is also available from the sewerage effluent. This should help in producing more horticultural crops.

The types of crops should be those which are in high demand in the urbanised zone and Nairobi and Thika towns, such as vegetables, flowers, fruits, potatoes etc. The market and yield surveys should be carried out before the crops are recommended. The market garden products will also have a stabilizing effects on land use, as they will boost land value of the areas they occupy, thereby making them compete equally with urban users.

The agricultural strategy would achieve the following:

a) protect and discourage any form of urban development on the potentially rich agricultural land, by making
agricultural land user more competitive and profitable, such that they can compete for land with urban users.

b) create more employment for the people in the urbanised zone, especially in the horticultural activities, and irrigation.

c) supply the urbanized highway zone with the need foods and raw materials for the processing establishments

d) maintain a high level of foreign exchange earnings through the sale of coffee and market garden products.

6.3. IMPLEMENTATION.

The implementation of a growth policy for the study area would pose some problems which should be examined before embarking on implementation exercise. Such problems of administration arrangements are bound to arise because of the present administrative structure in the study area.

Presently the area is under the following administrative units which are different entities: Nairobi City Council, Kiambu County Council, Ruiru Urban Council and Thika Municipal Council. With such a varied administrative structure lags in implementation, power conflicts etc. do arise when all these authorities are involved in implementation.
These problems would arise due to the inherent problems facing the local authorities in Kenya viz. lack of adequate finances, specialised personnel to cope with arising problems and political patronage with members of the councils.

Therefore for ease in implementation uniformity in standards of design and materials, and proper enforcement of the policy. It is recommended that a Body with its members recruited from the present administrative authorities be created. The body should co-ordinate development matters within the regions. Addressing itself with the problems of the administrative units. This consultative body should have the powers of administering the growth policy and with the following functions:-

a) carrying out feasibility studies of both the urban and agricultural requirements for the study area.

b) consider all the intended land transactions, in the context, whether they are in the best interest of the study area.

c) approve all land use layouts

d) to be responsible for enforcing any legislation enacted relating to the matters of land use in the study area.

e) sorting out problems which may arise during implementation of the growth policy.
f) responsible for any vacant land whether urban or agricultural.

g) the body will also be responsible for designing the relevant tools which will foster fast development in the study area, such as taxes and others which help to curb land speculation.

Footnotes

1. National Development plan 1974-78
   op cit. p. 114

2. The list is not exhaustive but only the major land users have been considered.

3. Oxidation ponds are considered to have no Noxious small but they could be good breading grounds for mosquitoes.

4. Nairobi City Council, Master plan for sewerage development for Nairobi 1974
   Sweco Report.
   op cit. table IV

5. op cit 4 above.

6. ibid

7. The effluent has been considered to be in a position to irrigate 1400 Hectares of study area. Ibid
CHAPTER SEVEN:

CONCLUSION:

This study has been concerned with the form of growth policy that should be adopted for the Nairobi-Thika region. Noting the urban encroachment on valuable agricultural land in the study area. Urban sprawl developments have been observed to use the efficient access routes in their location criteria. Therefore, the study has attempted to appraise the contribution of Nairobi-Thika highway especially the highway impact on land values, land use and settlement in the adjoining area.

It has been observed that the highway improvement was based on a cost benefit analysis, of the vehicle traffic and the maintenance costs nothing was done in terms of its effect in the area it is constructed through.

The study also observes that the earlier trend in the aspects of land values land use and settlements are consequences of the former administration and its legislation. Today the issues no longer remain political or racial and hence the patterns are changing. The socio-economic factors viz. population growth, unemployment, land availability provision and maintenance of services, and financing of the local authorities have taken the former racial and political considerations thereby accelerating the urban sprawl development on the rural-urban fringe. The
CHAPTER SEVEN:

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highway access has offered these locations with an advantage by lowering the transport costs between them and the core areas (Nairobi and Thika) and hence more competitive. The result has been the movement of urban activities on the agricultural land. This has not been always based on rational decision but land speculation and the problems facing the urban area, the movements have not been optimal and hence the misuse of resources. It has been observed that due to changes in land values which have been promoted by the highway improvement, land use is consequently changing in the area, and so is land holdings. Evidence of fragmentation of large land holdings has been documented and it is on the increase with the population of 'hobby' farming. The changing nature of land use in the study area suggests that something should be done if the agricultural production has to be maintained at its present levels if not improved.

The study also examined the development of settlements in the study area and the impact the highway improvement has had on them. The study reveals that the author's feeling on development of dormitory settlement were justified as there has been a shift from productive sector employment to only minor service activities in most of the settlements surveyed. It was also revealed that since the highway improvement the role of the settlement in the context of service centres of the surrounding area has been minimal. This is because the residents, who are not commuters
prefer to travel to Nairobi or Thika to purchase higher order goods other than those of their daily need.

The threat to agricultural land, the development of settlement, the expansion and problems of Nairobi and the general misuse of land resources in the study area has been analysed in the context of the highway impact and conclusion in view of these; is that something must be done to guide the resource use.

It has therefore been strongly suggested that in order to stop such dormitory settlement urban encroachment on valuable agricultural land and to develop a more stable spatial structure in the study area, more employment centres be located in the highway zone. This should go together with introduction of intensive agriculture and irrigation producing horticultural crops. This suggestion should be seen as an effort to reduce the great dependence on the two well established urban areas in this region. This would help to create more stable settlements.

However, due to the recognition of the committed public investment in terms of communication in this region and other factor accelerating urbanization it was difficult to come up with a policy which would discourage urbanization. Therefore a policy of concentrated urban development along the highway was recommended with only one limitation that development on the western side of the Highway should not exceed 5 kilometres. Other recommendations took the form of control for land holding and land use.
Further research is required to determine such question as the type of legislation that would be effective in matters of land administration on land holding and land use. It is evident that the city will overspill its present boundaries, the question of extension of these boundaries will undoubtedly arise. It is therefore time that alternative forms of administrative structure be explored dwelling on the questions on whether the extension of boundaries is the most appropriate way of dealing with the problems subsequent to urbanization or creation of new bodies to administer the planning uses of the area. The powers and duties of the body such as the one recommended should be researched further.
BIBLIOGRAPHY:

BOOKS.

Morgan, W. T. W.  
Nairobi City and Region.  
Oxford University Press; 1967 Nairobi

Sejja E. W.  
The Geography of Modernization in Kenya  
Syracuse New York 1968.

Sejja E. W.  
The Spatial dimension of Modernization in  
Kenya.  page 19.1  
Bloomington 1966.

Government Printers:  Kenya National Atlas:  
Government Printer NBI. 1970

R. M. Scott  
The soils of Nairobi Thika-Yatta-Machakos.  

A. Weber.  
The location theory of industries and  
Transportations.  Fredrick 1968  
University of Chicago Press. Chicago

Stard R. M.  
Principle of City Land Values.  
1903: University of Chicago Press  
Chicago.

J. B. Carlson:  
Administration of Kenya Colony and  
Protectorate: 1945, Nairobi

Phayne  

A. Losch  
Economic of Location  
New Haven, Yale University Press 1954
Von Thuvren

Der koloniale Staat in Bazieling auf handwirtschaft und Nationale Ökonomie.


W. Alonso:

Location and land use: Towards a general
Theory of Rent:


Garrison Berry and others

Studies of highway development and
Geographical change

University of Washington Press, Seattle 1961

Wheeler B.O.

Effects of free access upon suburban
real property values. Seattle: Washington
University Press, 1950

Ratcliff R.U.

Urban Land Economics.

JOURNALS:


Hillard: Road planning in developing countries Road International, No. 66 1967.


Nairobi City Council: SWECO: Master plan for sewerage facilities in Nairobi 1974 City Hall.


Valuation Rolls for Nairobi Thika Ruiru


Ministry of Lands and Settlements
Land value map, M. of L. and S.
Thika Municipality: Thika Development Plan 1972-77

Bente B and Jorgan Anderson: Repport rednoresize on Danida -

Jorgan Anderson: Ekspertgruppeo arbejde med byplanlaegning b.g. boligbyggen i Thika August 1974.

Institute for Development Research


Government Printers, Nairobi 1970

Kenya Government: Kenya Population census

Government Printers Nairobi 1969

Kenya Government, Seasonal papers No. 10 of 1966 Government Printers Nairobi


APPENDIX A. TEMPERATURES.

<table>
<thead>
<tr>
<th>Temperature in °C.</th>
<th>J F M A M J J A S O N D YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute maximum</td>
<td>32 33 33 33 30 31 29 30 32 32 30 32 33</td>
</tr>
<tr>
<td>Mean maximum</td>
<td>28 29 29 27 26 25 23 24 27 28 26 26 27</td>
</tr>
<tr>
<td>Mean minimum</td>
<td>12 12 14 13 15 13 12 12 13 14 14 13 13</td>
</tr>
<tr>
<td>Absolute minimum</td>
<td>6 6 7 11 9 5 5 16 4 6 9 7 4</td>
</tr>
<tr>
<td>Diurnal variation</td>
<td>14 17 15 12 11 12 11 12 14 14 12 13 14</td>
</tr>
</tbody>
</table>

APPENDIX B.

RAINFALL VARIABILITY.

<table>
<thead>
<tr>
<th>THIKA</th>
<th>J F M A M J J A S O N D YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute maximum</td>
<td>117 200 253 488 309 95 61 39 56 344 419 194 1421</td>
</tr>
<tr>
<td>Upper Quatile</td>
<td>48 26 166 231 211 38 19 26 31 63 174 112 928</td>
</tr>
<tr>
<td>Lower Quatile</td>
<td>4 1 39 158 39 3 6 3 2 24 76 27 681</td>
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<tr>
<td>Absolute minimum</td>
<td>0 0 0 109 11 0 0 0 0 2 51 4 491</td>
</tr>
<tr>
<td>Average</td>
<td>33 27 95 209 124 23 15 17 18 62 145 71 839</td>
</tr>
</tbody>
</table>
### APPENDIX ‘C’

#### RAINFALL.

1. **NAIROBI 1675 M\(\text{A}\).**

<table>
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<th>Month</th>
<th>J. F. H. A. M.</th>
<th>J. J. A. S. O.</th>
<th>N. D.</th>
<th>YEAR</th>
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</thead>
<tbody>
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<td>Rainy days each month</td>
<td>4 4 8 15 14 7 4 5 4 7 14 10 95</td>
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<tr>
<td>mm. each month</td>
<td>35 48 119 201 120 41 15 24 24 58 98 69 855</td>
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2. **Thika: 1463m Asl.**

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<th>J. J. A. S. O.</th>
<th>N. D.</th>
<th>YEAR</th>
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<tr>
<td>mm per month.</td>
<td>33 27 95 209 124 23 15 17 18 62 145 71 859</td>
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## APPENDIX D. TRAFFIC COUNTS

### Ruaraka

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<th>HEAVY DUTY</th>
<th>GRAND</th>
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### KahaWa

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### 1 KM SOUTH OF RUIRU

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L.G. Light Goods vehicle
M.G. Medium Goods vehicle
H.G. Heavy Goods Vehicle

*Source: Ministry of Works, Road Dept. Nairobi*
APPENDIX D. TRAFFIC COUNTS

I KM NORTH OF RUIRU

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<th>LIGHT DUTY</th>
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<th>GRAND TOTAL</th>
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KALIMONI

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L.G. Light Goods Vehicle
M.G. Medium Goods Vehicle
H.G. Heavy Goods Vehicle

* Source: Ministry of Works, Road Dept. Nairobi
### Appendix D. Traffic Counts (cont.)

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<th>M.G.</th>
<th>H.G.</th>
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#### 1 K.M. North of Thika

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</table>

- L.G. = Light Goods vehicle
- M.G. = Medium Goods vehicle
- H.G. = Heavy Goods vehicle

Source: Ministry of Works Road Dept., Nairobi
PERCENTAGES OF TRAFFIC GROWTH ON THIKA HIGHWAY.

**RUARAKA.**

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<th>H.G.</th>
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<th>TOTAL</th>
<th>TOTAL</th>
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**KAHAWA**

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<th>H.G.</th>
<th>BUSES</th>
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<th>TOTAL</th>
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L.G. Light Goods vehicle
H.G. Medium Goods vehicle
H.G. Heavy Goods vehicle
APPENDIX E (cont.)

I KM SOUTH OF RUIRU

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I KM NORTH OF RUIRU

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L.G. Light Goods vehicle
M.G. Medium Goods vehicles
H.G. Heavy Goods vehicle
### APPENDIX E. (conti.)

#### KALIMONI

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#### I KM SOUTH OF THIKA

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#### I KM NORTH OF THIKA

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**L.G.** Light Goods vehicles  
**M.G.** Medium Goods vehicles  
**H.G.** Heavy Goods Vehicles
APPENDIX F.

RAILWAY FREIGHT TO AND FROM THIKA VIA NAIROBI IN METRIC TONNES

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<th>TO THIKA THROUGH NAIROBI</th>
<th>ANNUAL TOTAL</th>
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</table>

* Source - Kenya Railways Nairobi

RAILWAY FREIGHT BETWEEN NAIROBI AND THIKA.

FIGURE IN METRIC TONNES.

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<th>TO THIKA</th>
<th>FROM</th>
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<th>MOMBASA</th>
<th>UGANDA</th>
<th>W.K.</th>
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APPENDIX F:

RAILWAY FREIGHT BETWEEN NAIROBI AND THIKA.

FIGURE IN METRIC TONNES.

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<th>TO</th>
<th>NAIROBI</th>
<th>MOMBASA</th>
<th>UGANDA</th>
<th>W.K.</th>
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