

THE IMPACT OF CIRCULATION ARTERIES ON NAIROBI'S URBAN FORM

By:

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Bachelor of Architecture, Honours (U.O.N)

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2011/2012

DECLARATION

This is my original work and to the best of my knowledge has not been presented for the award of a degree in this or any other university.

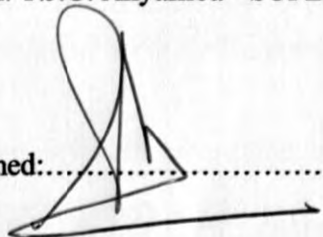
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DEDICATION

To my beloved parents, brothers and sisters

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LIST OF ACRONYMS

BRT – Bus Rapid Transit

CABE - Commission for Architecture and the Built Environment

CBD – Central Business District

CCN/NCC -City Council of Nairobi / Nairobi City Council

DRSRS - Department of Resource Surveys and Remote Sensing

EMCA -Environment Management and Coordination Act

GC - Ground Coverage

GoK – Government of Kenya

IPPUC -Instituto de Pesquisa e Planejamento Urbano de Curitiba (Institute for Research and Urban Planning of Curitiba)

ISOCARP -International Society of City and Regional Planners

KeNHA -Kenya National Highways Authority

KIPPRA -Kenya Institute for Public Policy Research and Analysis

KURA -Kenya Urban Roads Authority

MARS -Modern Architectural Research Group

MGS -Metropolitan Growth Strategy

NOMA-SEARCH - Norwegian Masters-Southern and East African Research Cooperation for Habitat

NUSG –Nairobi Urban Study Group

PR -Plot Ratio

UNEP –United Nations Environmental Program

UON – University of Nairobi

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ABSTRACT

Circulation arteries are more than just lines of potential movement; they are stages for observation, presenting opportunities and challenges of diverse social, functional and economic nature. Failure for example to introduce compatible development models through planning & design often leads to overwhelmed physical infrastructure & the thriving of informality; subjects whose costs are significant in terms of most human, social, economic, and environmental variables.

The main objective of this study therefore was to investigate the relationship between circulation arteries and urban forms in Nairobi, to determine how such a relationship can be utilized positively to structure urban precincts. The study adopted qualitative, descriptive case-study research method to analyze the cause and impact. Structured direct observation and interview of key informants was used to collect data from the ground and from architects and urban planners, to help inform the various archival and documentary materials collected prior and during the study.

It emerges that from the beginning planning in Nairobi merely compartmentalized the city into functional zones with little attention given to the fabric that interconnects the zones. The study thus proposes creation of urban design guidelines to steer the development of arterial-oriented built form's in Nairobi by exposing their spatial adaptations, and as a means to bridging the gap between urban planning and architectural design.

CHAPTER ONE: INTRODUCTION

"In the study of town-planning and civic art, the main problem which is to be considered is the means of locomotion, as it is the problem from which all the others relating to the design of a city derive"¹

CHAPTER OUTLINE:

- 1.0 Background to the study*
- 1.1 Problem statement*
- 1.2 Objectives of the study*
- 1.3 Relevance/Justification*
- 1.4 Proposition*
- 1.5 Limitation/Scope*
- 1.6 Definition of operational terms*
- 1.7 Thesis structure*

1.0 BACKGROUND

Reforming the urban planning system is a critical challenge in urban sector reforms in the face of burgeoning problems of urban growth and population concentration in cities, especially in third-world countries. The efficiency of urban settlements largely depends upon how well they are planned, how economically they are developed and how efficiently they are managed, key in this case being circulation arteries linking different locations within the ever expanding limits. However, the urban planning process in the past has suffered from many inadequacies. The process of planning has been long, its implementation weak, and has largely been confined to the detailing of land use, paying inadequate attention to environmental responses.

¹ *Rational Architecture of Cities: Fundamental Principles of the Lineal City*, in Ben Matteson, writing-cities-mit.wikispaces.com/file/view/matteson_11.329_v01.doc

Circulation arteries are platforms for functional, economic and social development hence should be attractive, active and well functioning. The Government of Kenya has various guidelines intended to guide and control the design and planning of the streets within its urban centers but have either been unsuitable, un-effectively implemented or outrightly disregarded. With mounting infrastructural and land pressures in Nairobi, some streets have been pedestrianised to accommodate more people, some have been converted from two way to one way for similar reasons, and still in some cases buildings have been brought down to allow for road expansion. Nevertheless, in both planned and unplanned settlements continuous transformations are happening as urban dwellers & managers attempt to take advantage of every existing open space, be it a road, railway or riparian reserve leading to continued redefinition of the urban environments.

1.1 PROBLEM STATEMENT

Over years, Nairobi's planning has functionally compartmentalized the city with undue consideration as to the nature of circulation channels linking her divergent zones. Similarly, official plans do not factor compatible development that respects the character of circulation channels and adjacent areas so that a gradual transformation in the built environment is not evident. This fails to tap into the huge opportunities offered by circulation arteries resulting in among others continued sprawl, overwhelmed & shabby physical environments and thriving informality; subjects with significant impacts on city's social, economic and environmental outlook which the study explores.

As noted above, the problem is generally related to the city's spatial aesthetics and functional structure, key being her continued growth and responses to development tools. It is observed that over time, different parts of the city have grown from within and from without, with a complexity of socio-political and institutional influences which often defeat planning systems mandate in city's growth, that is, to protect amenity and the environment in the public interest (CCN, 2004, p. 1). Thus despite the fact that circulation arteries constitute the main quotient of urban fabric, their planning objectives are hardly executed, and developments often go ahead of their realization. In addition, it is generally observed that with decreasing primacy of existing circulation channels in terms of development and access, varied urban character is observed, with globalisation setting in through the setting of large bill-boards, posters and Smog. These observations point to dynamic attributes associated with circulation channels which the study attempts to unravel.

1.2 OBJECTIVES OF THE STUDY

The author seeks to explore three main objectives, namely:

- (i) To investigate if there are any design-based urban planning strategies considered in the determination of the nature and location of circulation channels.
- (ii) To inquire into the relationship between the size of Circulation Channel's and the resultant urban forms/uses.
- (iii) To explore how circulation channels have/may be used to structure urban precincts.

1.3 RELEVANCE/JUSTIFICATION

From various regional and local levels, Nairobi's urban dynamics presents vibrant city but a look at its facts in the Nairobi's Vision 2030 Metro Plan (GoK, 2008) presents some startling facts. The population of Nairobi is noted to have increased from a mere 100,000 inhabitants in 1948 to some 3.5 million and 4.7 million people for night and day population respectively by 2005. These projected statistics also show that by the year 2020 Nairobi's night population alone will be a staggering 6.7 Million people (GoK, 2008, p. 27). Some of the consequences of such a growth are increased mobility, security and spatial needs. The value of a functioning system economically and socially thus cannot be overemphasized.

Although the city displays a strong monocentric form due to activity concentration on the CBD, other forms can be discerned such as polycentric, sectoral and linear forms. Planning has however continued to allow for fresh development, subdivisions, change of use, and amalgamations without considering the macro-impacts in terms of form & connectivity. The current character of development thus indicates a more of demand-led instead of infrastructure-led systems (Mwaura, 2006, p. 3) yet it can be argued that long-term urban problems can be best tackled through close working relationship between land-use and transportation planning. Change of zoning for example from residential to office and commercial ideally mean complete reconstruction and widening of existing roads but developments are continually being carried out without equal upgrading of existing infrastructure.

It should be understood that as land is absorbed for urban purposes, open land areas disappear with finality, and its redemption expensive. Considering the way in which public land has been treated, public concerns about problems caused by sprawling urban development from the loss of cherished open spaces and environmental degradation to haphazard development patterns, transformations and traffic gridlock, it defeats the hypothetical proposition on the role of current planning. This thesis explores how the relationship of development control tools and proper consideration of circulation arteries can be used towards the design of efficient urban environments.

1.4 PROPOSITION

The subject of the relationship between urban forms and the inherent circulation channels is broad. Nonetheless, the author assumes that there is a pattern in which urban forms are shaped by the character of surrounding channels functionally, socially and economically. The author also assumes that circulation arteries constitute the city's key frameworks and further attributes the current relationship between built forms and circulation channels to the gap that exists between urban planning concepts and design interventions.

1.5 LIMITATION/SCOPE

This study was undertaken over a specified period of time using limited financial resources. To overcome these constraints, manageable representative cases were selected and analyzed, with the support of in-depth archival and documentary evidence. There were also the institutional bottlenecks and bureaucratic procedures in accessing some of the vital resources for the study leading to frequent time consuming follow-ups.

The inquiry also recognized roads, railways and water-ways as the predominant circulation arteries with varying potentials in the city of Nairobi. However due to the limitations stated above, this study engaged superficially on the all the three but granted study emphasis to roads.

1.6 DEFINITION OF OPERATIONAL TERMS

This section defines some of the key terms used in the thesis and whose meanings for the sake of this study are taken as follows:

Arteries/Channels: Refers to routes of potential movements which can be roads, railways or waterways along which an observer customarily, occasionally, or potentially moves (Lynch, 1960, p. 47).

Form: Refers to the shape, visual appearance, or configuration of built objects; their two or three-dimensional profile.

Sprawl: Refers to the spreading out of the city and its suburbs over more and more rural land at the periphery of the city over time, with the style of that conversion being more important than the amount of the conversion.

Streetscape: Refers to the perspective view along a street, especially of the natural and man-made elements in or near the street right of way, including street trees, lawns, signs, street lights, above-ground utilities, drainage structures, sidewalks, bus stop shelters and general street furniture.

Transformations: A thorough or dramatic change in form or appearance over a period of time.

Typology: Refers to the general form, structure, or character distinguishing a particular circulation channel or built form from another; hence, potentially a pattern or model after which can be made.

Urban Form: Refers to the physical layout and design of the city; the overall shape and pattern of an urban area based on its visual and material impact, density, traffic patterns and topography.

1.7 THESIS STRUCTURE

This thesis has been structured into six chapters, each dealing with particular aspects of the study:

1 This chapter focuses on the general introductory appraisal to the study which encompasses the problem definition, objectives of the study, its relevance, limitations, scope and study's proposition. It also features the overall structure of the thesis.

2 This chapter constitutes the literature review section which is an analysis of relevant data from books, journals, research papers and internet, connecting theory and practise. This section is concluded with the drawing of a conceptual framework.

3 This chapter is committed to the methods applied in carrying out the research. It outlines the research design, the research strategies, criteria for selecting study cases, techniques for collecting & analysing data and final presentation techniques.

4

This chapter focuses on Urban History of Nairobi, which forms the bedrock upon which the current city was embedded. It previews the city's informal and formal planning strategies through her motorized and non-motorized epochs thus benchmarking the study.

5

This chapter focuses on the actual findings and analysis of data from the study. It interprets and explains the findings with regard to the study objectives.

6

This chapter elaborates on the study's conclusions and recommendations as derived from the study. Areas for further research are also suggested.

CHAPTER TWO: LITERATURE REVIEW

'City planning finds its validation in the intuitive recognition that a burgeoning market society cannot be trusted to produce spontaneously a habitable, sanitary, or even efficient city, much less a beautiful one' - Murray Bookchin, the Limits of the City (1986)²

CHAPTER OUTLINE:

- 2.0 Introduction
- 2.1 Historical movements in planning
- 2.2 Theory of the city
- 2.3 Urban Morphology
- 2.4 Legal and political frameworks: practice, codes & guidelines
- 2.5 Desk-study of Curitiba, Brazil
- 2.6 Conclusion
- 2.7 Conceptual framework

2.0 INTRODUCTION

The city has been the focus of many scholars who have tried to understand and describe how they exist/have existed over time. *Table 2.1* below outlines contributions of some internationally renowned urban theorists/designers.

Table 2.1: Outline of some urban theorists contributions

URBAN THEORIST	APPROACH ADOPTED
Lynch, 1960 and 1984	The Image of the City: Analyses and formulates urban components and organizing principles which help in legibility of urban areas. Good City Form: A summation & Extension of his vision
Thomas Gordon Cullen 1961	The Concise Townscape: A key motivator in the townscape movement who created the concept of 'serial vision', defining the urban landscape as a series of related spaces.

² www.aboutplanning.org/quotes.html

Jacobs, 1961	<p>Death & Life of Great American Cities: Asserts that for the shaping of healthy and liveable cities; with vitality being a component of abundant street life the following are necessary:</p> <ul style="list-style-type: none"> • Gathering of various functions in city fabric as opposed to zoning (mixed use) • Diminution of urban block-size • Increasing the pedestrian density
Aldo Rossi, 1966	<p>Architecture of the City: Introduces the concepts of 'historicism' and 'collective memory' to urban design, and proposes a 'collage metaphor' to understand new and older forms within the same urban space.</p>
Jan Gehl, 1971	<p>Life Between Buildings: Focuses on improving the quality of urban life by re-orienting city design towards the pedestrian and cyclist. Advocates for a sensible, straightforward approach to improving urban forms.</p>
Colin Rowe, 1978	<p>Collage City: Presents a critical analysis of the origins, ideologies and shortcomings of Modernist City Planning.</p>
Bill Hillier, 1984	<p>Introduced the concept of Space Syntax to predict how movement patterns in cities would contribute to urban vitality, anti-social behaviour and economic success.</p>
William H. Whyte, 1988	<p>City; Rediscovering the Centre: His work is based on careful observation, and contradicts other conventional wisdom, for instance, the idea that pedestrian & auto traffic be separated.</p>
Peter Calthorpe, 1989	<p>The Pedestrian Pocket: Developed a manifesto for sustainable urban living via medium density living, as well as a design manual for building new settlements in accordance with his concept of Transit Oriented Development (TOD)</p>
Rob Krier, 1979, 1991	<p>Urban Space: Classifies streets and squares morphologically and suggests geometric classification of urban spaces (squares and streets) Puts forward the compositional set of rules that determine the combination of urban and architectural elements regarding circulation scheme, spatial hierarchy & rhythm.</p>
Cliff Moughtin, 1992	<p>Urban Square; Street and Square: Asserts that when urban space is considered as a three-dimensional element, urban space becomes 'figure' as a positive element and buildings become its 'ground'. He suggests analysis of figure-ground or a mass-to-void relationship to identify urban fabric structures.</p>

Source: Author

The present growing concentration of populations in cities especially of the countries of the Third World, demands that serious consideration be accorded to their physical forms and structures. This study attempts to examine a brief history, theory and practise of planning and urban forms/structures advanced to address related problems of urban growth.

2.1 HISTORICAL MOVEMENTS IN PLANNING

According to (Walters, 2007, pp. 20-21), planning's formative history is usually constructed around three separate movements that occurred at the end of the 19th Century, framed as reactions to urban squalor and harsh living conditions in UK and USA:

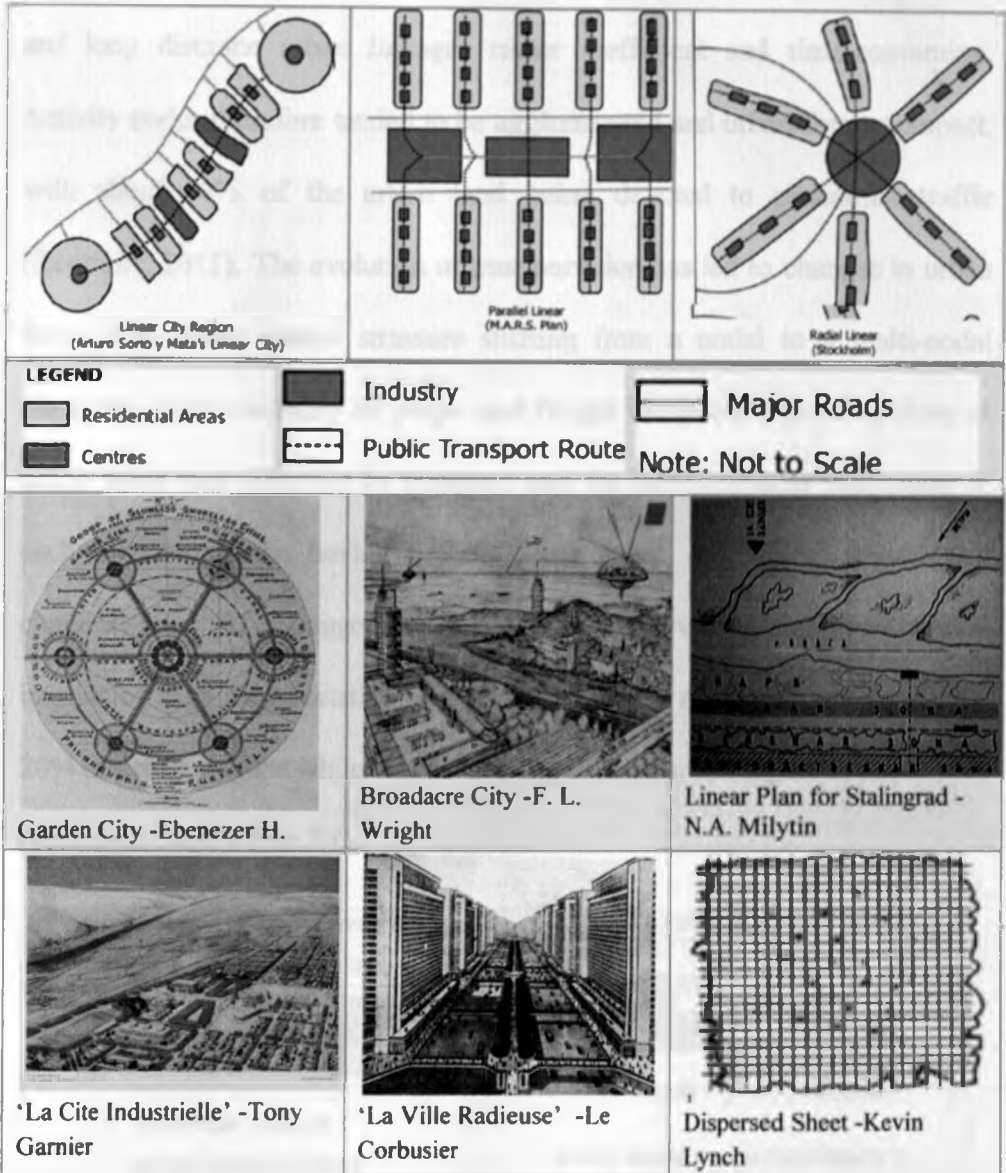
- (i) the formative years (late 1800s to c. 1910)** dominated by figures such as Garden City pioneer Ebenezer Howard (UK) and City Beautiful designer Daniel Burnham (USA) pushing for public health reforms;
- (ii) the modernist period (c. 1910–1970)** encompasses the birth, development and consolidation of the profession of planning, during which time regional and national initiatives were formulated in both countries and schools of planning were created in British and American universities; and
- (iii) the postmodern era (1970 to the present)** characterized by recurring crises where planning as a civic enterprise was attacked from within the profession and from without.

Since the last two decades of the 19th Century, several forms of urban growth were proposed by several social reformers and urban planners. Some of the most notable are:

- The 'La Ciudad Lineal', a linear city of 30,000 population proposed near Madrid by Don Arturo Soria y Mata in 1882;
- The Garden City of 32,000 population advanced by Ebenezer Howard in 1898;
- The 'La Cite Industrielle', a partially linear industrial city of 35,000 population published in 1901 by Tony Garnier, a French architect;
- The 'La Ville Radieuse' and 'City of Tomorrow' designed for 1.5 and 3.0 million people respectively on the linear principle by Le Corbusier, a Swiss architect and planner;
- The Linear Plan for Stalingrad prepared in the 1930s by N.A. Milyutin;
- The Linear Plan for London prepared by the MARS Group of architects in 1937 and published in 1941;
- The Jose Sert's Plan for a group of towns with a total population of about 960,000 people;
- The Broadacre City prepared in 1940 by Frank Lloyd Wright and its versions suggested by Melvin Webber;
- The Dispersed Sheet and the Galaxy Plans of Kevin Lynch; and
- The 'Five Fingers Plan' of Copenhagen centered on rail and the Radial Plan of Stockholm.

Most of these plans were linear in form. The linear disposition is explained by the importance attached to public transportation and communication in urban development (Obateru, 2008). The radial city plans developed after the initial sets of linear plans were generally adaptations of the linear concept. Such were the 'La Ville Radieuse', 'City of Tomorrow', the 'Five Fingers Plan' of Copenhagen and the Radial Plan of Stockholm, *Table 2.2*.

Table 2.2: Some proposed forms of urban growth



Source: Compiled by author

The emphasis of the Broadacre City and the Dispersed Sheet Plans which are American, emphasized on low density urban development and dispersal of urban functions over the entire metropolis (Obateru, 2008). Frank Lloyd Wright 1924 vision of Broadacre city however was perfectly attuned to the conditions of its time (Hall, 2002, p. 312). For Wright just as for Howard, the built forms were merely the appropriate expression of a new kind of society (Hall, 2002, p. 314).

Historically, movement within cities tended to be by walking, making medium and long distance urban linkages rather inefficient and time-consuming. Activity nodes therefore tended to be agglomerated and urban forms compact, with about 10% of the urban land being devoted to pedestrian traffic (Rodrigue, 2011). The evolution of transportation has led to changes in urban form, with urban spatial structure shifting from a nodal to a multi-nodal character. As the mobility of people and freight increased, a growing share of urban areas was allocated to transport and the infrastructures supporting it, each transport mode having unique performance and space consumption characteristics. At an aggregate level, measures reveal a significant spatial imprint of road transportation. In Western Europe, roads account for 15% - 20% of urban surface while for developing countries, this figure is about 10% (Rodrigue, 2011), *Fig. 2.1*.

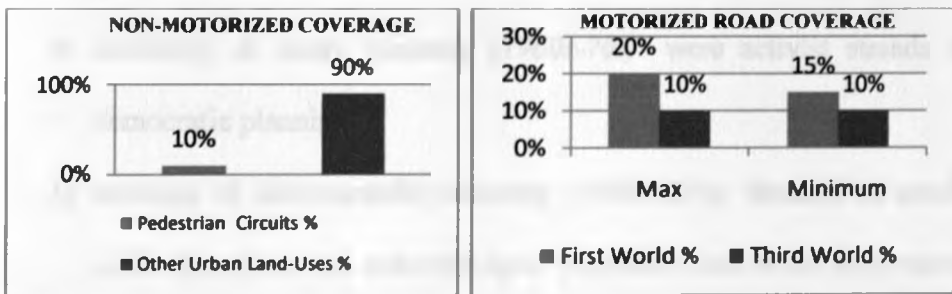


Fig. 2.1: Land-uses in the non-motorized and the motorized eras
 Source: Author

The car brought with it major unanticipated consequences for urban life and has become a serious cause of environmental, social, and aesthetic problems in cities. It damages the social fabric of communities, fosters suburban sprawl, beget transformations and endangers other street users. It has however not been possible to know with certainty what physical design measures should be taken to bring about a given social/economic objective (Hall, 2002, p. 358).

2.2 THEORY OF THE CITY

Six main categories of planning strategies have been theorized and practiced over the past 100 years (Walters, 2007, p. 31), some with strands of place-making that brought about the urban design field:

- 1) *Traditional or comprehensive planning (first half of the 20th C):* focused on producing clear statements about the form and content of new developments.
- 2) *Systems planning (1950s-1970s):* promoted more scientific and analytical view of the city as a set of complex processes, and was less interested in any form of final physical plan.
- 3) *Democratic planning (1960s onwards):* arose as a result of loosening the traditional, repressive barriers of class and race, and giving more people a voice in the formation of their future.
- 4) *Advocacy & equity planning (1960s-70s):* were activist strands of democratic planning
- 5) *Strategic & incrementalist planning (1950's-60's):* focused on small-scale objectives and acknowledged pragmatic real-world constraints. They are still influential today, particularly in America.
- 6) *Environmental planning(1960s-70's):* has its roots as far back as Howard's Garden City, but most directly evolved during the 1960's-70s when many implications of global development were first widely understood'. The growing environmental crises of climate change/global warming have furthered this approach.

In 1927, Patrick Abercrombie warned about the dangers of conceiving master planning as a static exercise in physical typologies, crediting Patrick Geddes with enriching the process of town planning and avoiding the discipline becoming merely a sterile and mechanical mix of typological clichés (Walters, 2007, p. 60). In the context of modern architecture, Rossi tried to find out a solution to the problem – *'what should be the inner logic of the whole structure of a town'?*, (Rossi, 1984). In his writings, Rossi criticized the lack of understanding of the city in current architectural practice. He argued that a city must be studied and valued as something constructed over time; of particular interest to him were urban artefacts that withstand the passage of time. Rossi held that the city is conceived as a spatial system composed of many parts that remembers its past. To him the part and whole character of a city challenges an aspect of functionalist theory i.e. zoning.

2.2.1 City Image

a) Building the Image

Most often, our perception of the city is not sustained, but rather partial, fragmentary, mixed with other concerns. Nearly every sense is in operation, and the image is the composite of them all. As manipulators of the physical environment, city planners and designers are primarily interested in the external agent, in the interaction which produces the environmental image. Different environments resist or facilitate the process of image-making. A clear image enables one to move about easily and quickly. A vivid and integrated physical setting, capable of producing a sharp image, plays a social role as well.

b) Legibility

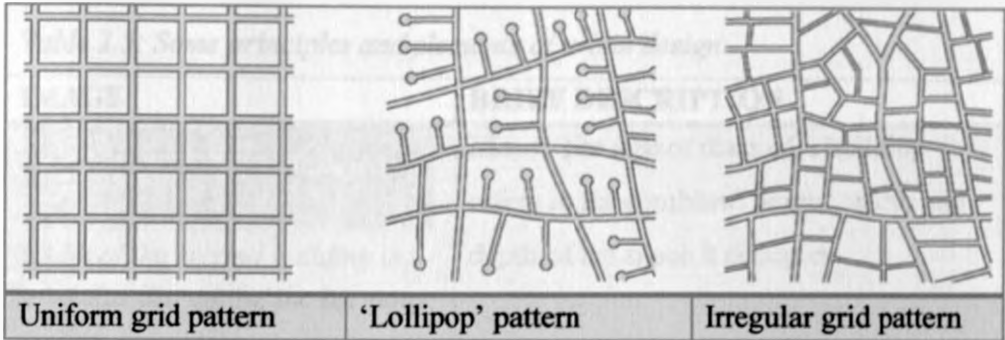
This refers to the ease with which city's parts can be recognized organized into coherent patterns, (Lynch, 1960). Legibility is crucial in the city setting and rebuilding through the perceptual theory. Although clarity or legibility are by no means the only important property of a beautiful city, it is of special importance when considering environments at the urban scale. Good forms are supported by the presence of others and by special way-finding devices: maps, street numbers, route signs, bus placards (Lynch, 1984).

Kevin Lynch describes mental maps obtained from residents in Boston, Los Angeles and Jersey (Lynch, 1960). He observed that where blind spots existed, it affected how people moved around, how they gave directions to others and also contributed or reinforced fears they may have had about certain neighbourhoods, hence the emotional and physical well-being of the inhabitant population. He moves from these maps and observations and tries to develop rules of thumb for urban design. Lynch describes paths, one of the five key city elements he identifies, and connects it to the visual experience noting that a greater part of city's experiences arise from movement through it. This places the aesthetic theory on facets of perceptual theory where proportion is important to the overall massing of the building as well as the building's details and path related accessories.

On the other hand, most legible streets layouts have been found to be the ones laid out on a deformed or irregular grid, as they create more interesting overall street pattern, provides direct, connected routes which are easy to understand and gives people a clearer view ahead, than the 90° turns and blind bends

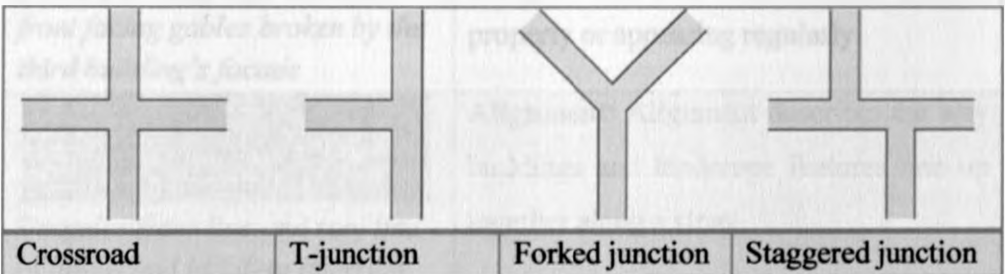
created by uniform grids (Burton & Mitchell, 2006, pp. 73-74). It also means that forked, staggered and T-junctions can be used, rather than cross-roads, which keep the number of alternative routes to a minimum and provide a focal point at the end of the streets, *Table 2.3&2.4.*

Table 2.3: Streets patterns



Source: (Burton & Mitchell, 2006, p. 73)

Table 2.4: Forked, staggered and T-junctions reduce the number of routes to choose from and provide a focal point at the end of the street








Source: (Burton & Mitchell, 2006, p. 73)

Although the uniform grid provides a pattern of well-connected streets the layout of identical streets and cross-roads can be as confusing as the 'lollipop' pattern. The irregular grid pattern also has small perimeter blocks and connected streets but creates a variety of block and street shapes.

Moughtin also argues that the form of a street can be analysed in terms of the number of polar qualities such as straight or curved, long or short, wide or narrow, enclosed or open, formal or informal. Street form can also be analysed

in terms of scale, proportion, contrast, rhythm or connections to other streets and squares. This constitutes principles and elements of design whose application affects the expressive content of form, *Table 2.5*. No matter which analysis is followed the street has two main characteristics directly related to form; it is at one and the same time both path and place.

Table 2.5: Some principles and elements of urban design

IMAGE	BRIEF DESCRIPTION
 <p><i>Width of the second building is irregular disrupting the harmony</i></p>	<p>Mass: The size or mass of a building refers to the combined height, width and depth of the space it occupies.</p>
 <p><i>Pattern is created by dominant front facing gables broken by the third building's facade</i></p>	<p>Pattern: Defined by the uniform arrangement of similar elements or forms, either concentrated on a particular property or appearing regularly.</p>
 <p><i>Irregular floor line and roof line of the second building interrupt the vertical alignment</i></p>	<p>Alignment: Alignment describes the way buildings and landscape features line up together along a street.</p>
 <p><i>Third building dimensions are out of scale in relation to the streetscape</i></p>	<p>Scale and proportion: Describes the relationship height to width, as well as the proportionate relationship of its individual elements to the building as a whole.</p>
 <p>WRONG - BUILDING ORIENTATION IS INCONSISTENT WITH THE EXISTING STREET PATTERN.</p> <p>RIGHT - BUILDING ORIENTATION IS CONSISTENT WITH THE EXISTING STREET PATTERN.</p>	<p>Orientation: This is a related, but separate, design issue that is, how a building is located on site, and the direction it faces</p> <p><i>Shows effects of good and poor alignment</i></p>

Source: Compiled by author

Streets have often been regarded as routes for motor vehicles to the extent that their function as place have been overlooked (Moughtin, 2003, pp. 133-134). The ratio of width of street to height of enclosing buildings remains critical for good street design (Moughtin, 2003, p. 141).

2.2.2 Theory of Permanence

This theory is related to hypothesis of the city as a giant man-made object produced in the process of time, which affects collective and individual artefacts (Rossi, 1984). Rossi argues 'urban history' is the most useful way to study urban structure where the persistence of the city is revealed through 'monuments' as well as through the city's basic layout and plans. According to Rossi, cities try to retain their axis of development by maintaining the position of their original layout and growing according to the direction and meaning of their older artefacts. However, he notes that permanence may be 'propelling' or 'Pathological'.

Rossi identifies 'Primary Elements' of a city as those that function as nuclei of aggregation, and are dominant in nature playing a permanent role in the evolution of the city overtime to constitute its physical structure (Rossi, 1984). Rossi explains that one can experience the form of the past in monuments, and that monuments as urban artefacts become important elements which helps to constitute the total picture of an urban context. To Rossi, sometimes monuments become pathological as they stand in isolation from the present.

2.3 URBAN MORPHOLOGY

Urban morphology approaches human settlements as generally unconscious products that emerge over long periods, through the accrual of successive generations of building activity. This leaves traces that serve to structure subsequent building activity and provide opportunities and constraints for city-building processes, such as land subdivision, infrastructure development, or building construction. Articulating and analysing the logic of these traces is the central question of urban morphology.

Urban morphology provides an understanding of the form, creation and transformation processes, spatial structure and character of human settlements through an analysis of historical development processes and the constituent parts that composes the settlements, (Topçu, 2012, p. 2). In this essence, urban morphology is used as an important assessment tool or method in determining the change-transformation processes of urban fabrics, making sense of the historical roots of spatial and functional structures and bringing them to the present day. The basic premises for the typo-morphological studies are hinged on three main principles (Topçu, 2012, p. 2):

- (i) Urban form is defined by three fundamental physical elements: buildings and their related open spaces, plots or lots, and streets.
- (ii) Urban form can be understood at different levels of resolution. Commonly, four are recognized corresponding to the building/lot, the street/block, the city and the region.
- (iii) Urban form can be understood historically since the elements of which it is comprised undergo continuous transformation and replacement.

Conzen considered land uses, building structures, plot pattern and street pattern to be the most important (Conzen, 1960)³. Buildings, particularly the land uses they accommodate, are usually the least resilient elements. Although more enduring, the plot pattern changes over time as individual plots are subdivided or amalgamated. The Street plan also tends to be the most enduring element. On the other hand, the main topic of the studies conducted by (Krier, 1979) was the examination of urban history and historical urban pieces through morphological and typological analyses, while (Rossi, 1984) studied sociological, cultural and psychological reasons for the formation of urban form and fabric. Considering the diverse approaches used by scholars, it was necessary to preview some of the tools used in morphological studies .

2.3.1 Space Syntax

This theory studies space⁴ as a pattern of relationships (Peponis, 2002). It attempts to make explicit the spatial relationships that underlie our everyday experience of the designed environment and the way it functions culturally and socially. The aim of space syntax is to arrive at an understanding of principles of spatial design and a critical evaluation of precedents and prospects. Syntactic analysis is a space-based and evidence-based way of bringing architecture, urban design, planning and transport planning together (Hillier & Tim, 2010). It assumes there is an intelligible structure to built space as it is perceived and explored by users moving through space.

³See (Topçu, 2012, p. 2)

⁴ Spaces are understood as voids (streets, squares, rooms, fields, etc.) between walls, fences and other impediments or obstructions that restrain (pedestrian) traffic and/or the visual field.

To deal with street connectivity and design, it represents space as a network of potential lines of movement. It studies the possible paths that link any two locations (topology); number of direction changes along a path (directional structure); distance between intersections, length of uninterrupted street lines, and streets widths (metric properties) in street networks. It assumes basic dynamics of the city as a form-function where movement-seeking land uses seek locations that are movement-rich, while others, often including residences, migrate to less-movement rich parts of the network, with feedback and multiplier effects, that is, where one shop appears, others tend to follow. It also assumes that streets from which other streets can be reached with fewer directional changes attract more people. This then tend to attract retail and other land uses that depend on the volumes of pedestrian traffic, and consequently the volumes of both pedestrians and uses are multiplied.

Hillier uses axuality and convexity to represent the whole system of space. Convex organisation of a system describes the degree to which any space extends in two dimensions - literally its variation in width (localised), whereas the axial organisation describes the degree to which any space can be extended linearly (globalised), *Fig. 2.2 & 2.3*. This has implications for both use and legibility.

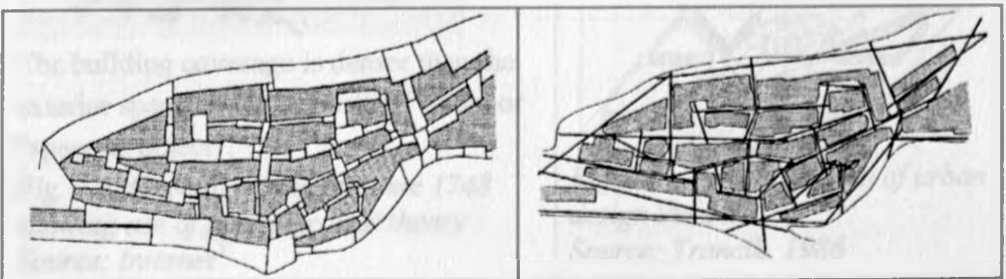


Fig. 2.2: Convex map of the town G

Fig. 2.3: Axial map of town G

Source: (Hillier, Hanson, & Peponis, 1987, p. 223)

2.3.2 Space and Anti-Space

Gestalt theory separates space into two;

- (i) Space: can be measured; it has definite and perceivable boundaries; it is discontinuous in principle, closed, static yet serial in composition.
- (ii) Anti-space: is shapeless, continuous, lacking of perceivable edges or form.

The first example of space and anti-space was from the 1748 mapping of Rome by Giambattista Nolli, *Fig. 2.4*. He used that information to understand the issues inherent with spatial design and formulated a collection of three theories that he believed, formed the basis of successful urban design, *Fig. 2.5*.

(i) Figure Ground Theory.

(ii) Linkage Theory.

(iii) Place Theory.



The building coverage is denser than the exterior space, creating positive voids, or “space as object”.

Fig. 2.4: G. Nolli's map of Rome 1748 showing use of figure-ground theory
Source: Internet

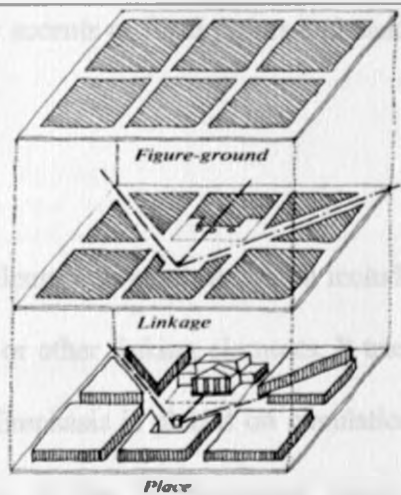


Fig. 2.5: The illustration of urban design theories
Source: Trancik, 1986

⁵ <http://www.canberra.edu.au/schools/design/sites/cubic/groups/21/SPACE-standards.html>

a) Figure Ground Theory

Spatial orientation is defined by the configuration of urban blocks that collectively form districts and neighbourhoods. It is the articulation and differentiation of solids and voids that make up the fabric of the city and establish the physical sequences and visual orientation between places (Trancik, 1986, p. 97). Precedent studies reveals three important components:

- (i) **Three-dimensional frame**; defines the edges of space, the degree of enclosure, and the characteristics of the spatial wall. Transparency, opacity, openings, and surface ornament have significant impact on the character of space, as does the vertical mass to horizontal space. Scale and the way this frame meets the ground plane are also major factors.
- (ii) **The two-dimensional pattern**; refers to the treatment and articulation of the ground plane in terms of materials, texture, and composition.
- (iii) **Objects in space**; refers to elements of streetscape such as sculpture, water features, and trees that provide accents or focal points and make the street memorable.

b) The Linkage Theory

This is derived from lines connecting one element to another, which include streets, pedestrian ways, linear open spaces or other linking elements. It tries to establish a structure of ordering streets. Emphasis is placed on circulation diagram rather than the spatial diagram of the figure-ground theory. Movement systems and efficiency of the infrastructure take precedents over patterns of defined outdoor space.

c) The Place Theory

Place theory adds the aspects of human needs, cultural, historical and natural contexts, which it offers the physical space additional richness by incorporating unique forms and details indigenous to the setting. Socio-cultural values and visual perception of space users are important considerations for the design of circulation channels.

2.3.3 Transects

Transects draw cross-sections through imaginary landscapes, identifying six types of environmental zones, each defined by its morphological character and moving from T1 (Rural Preserve) through ascending scales of suburban and urban areas leading to the densest area T6 (Urban Core), see *Fig. 2.6*.

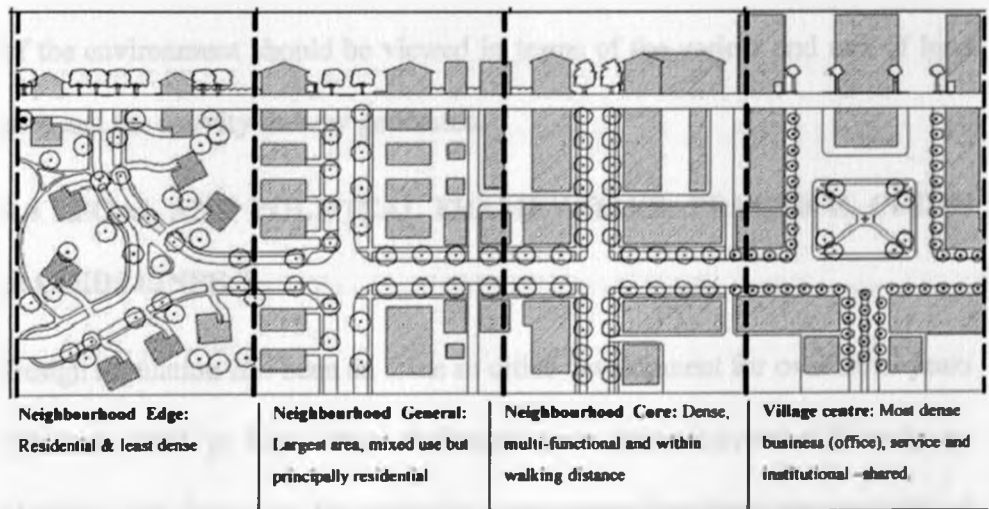


Fig. 2.6: Transect of Haynie-Sirrine neighbourhood, Greenville, SC, 2001
 Source: (Walters, 2007, p. 113)

Transects are the main tools used in American form-based coding. Their hierarchy of urban conditions incorporates a wide variety of uses within patterns of traditional urbanism, thus managing the different timescales of urban development (Walters, 2007, p. 113).

2.3.4 Visual Analysis

Moughtin defines legibility as the ways in which people perceive, understand and react to the urban environment (Moughtin, 2003, p. 220). Lynch developed techniques for analysing legibility and suggested ways in which the concept can be used to structure urban environments classified as paths, nodes, districts, landmarks and edges.. He demonstrated that a legible environment is one that is capable of being structured by people into accurate images.

According to Bentley et al, 1985 'both physical and visual permeability depend on how the network of public space divides the environment into blocks: areas of land entirely surrounded by public routes', that is, the choice of movement the environment presents to the user (Bentley, McGlynn, & Graham, 1985). Just like (Jacobs, 1961) the aforementioned argue that vitality of the environment should be viewed in terms of the variety and mix of land uses and the activity thereby generated.

2.4 LEGAL AND POLITICAL FRAMEWORKS: PRACTICE, CODES & GUIDELINES

Design regulation has been an issue in cities development for over 2000 years (Walters, 2007, p. 83). Urban challenges have been analyzed differently by planners and designers for example some argue that they are products of regulation crisis, calculative thinking or burden of management (Imrie & Street, 2011). This is to say that building regulations do not emerge in isolation, or at the hands of distant bureaucrats.

Arthur Coleman Comey (1886-1954), a graduate landscape architect from Harvard argues that the limitation of the height of buildings for example is an

important issue in civic development, affecting land values and character of larger cities. In determining a reasonable regulation of height, he argues it will be noticed that factors of congestion, light, air, and to a large extent the architectural effect vary in nearly a direct ratio as the width of the street upon which the building faces. He thus concludes that the width of street would seem to be an essential element in the regulation of building heights.

Despite several similarities of objectives and techniques, the differences between the planning/design systems in different countries make easy transfer of concepts and methodologies from one country to another difficult. There has been much discussion comparing Britain's Plan-led Regulations/Codes and American Form-Based Zoning Ordinances which I examine briefly.

2.4.1 British Use-Based /Plan-Led Codes

Planning practice in Britain has been shaped for long by detailed guidance notes on planning policy issued by the central government; which establishes the objectives and preferred mechanisms for action to be adopted by local governments. In this system, private developers are expected to follow planning directives to get their projects approved, and only in exceptional cases will developments that do not comply with the plan be permitted.

However, the government has radically overhauled the planning system, and is seeking to guarantee better design through design coding. This is because it was observed that so much suburban development in Britain was falling below expected standards, thus beginning in the 1990s, British planning policies began to embrace urban design concepts (Walters, 2007, p. 12). A greater part of it is attributed to Gordon Cullen's 'Notation' system developed in the mid-

1960s meant to improve the standards of new housing design in the towns and villages, which was well illustrated and full of sensible advice about urban spaces and contextual architecture.

In recognition of the importance of Urban Design, Britain conceived Commission for Architecture and the Built Environment (CABE)⁶ (Walters, 2007, p. 62). In a 2002 document by CABE '*Urban Design Guidance*', her author Robert Cowan wrote:

"... a master plan should show in some detail how the principles are to be implemented. If the master plan shows an area designated for mixed-use development, ...it should show a layout (of buildings, streets and other public spaces) that will support such uses ... by ensuring that the footprints of the buildings are appropriate ... (Cowan: p. 13)⁷"

Current typical master plans sets out proposals for buildings, spaces, movement and land use in three dimensions and match these aspirations with an implementation strategy, *Fig. 2.7*. This new scope and content for master plans is very similar to the American one where urban design guidelines and codes act as the generative 'DNA', establishing consistent design principles across a wide range of projects (Walters, 2007, pp. 92-93).

⁶ the government's advisory body on architecture and the built environment

⁷ In (Walters, 2007)

PARK STREET/MOOR
STREET

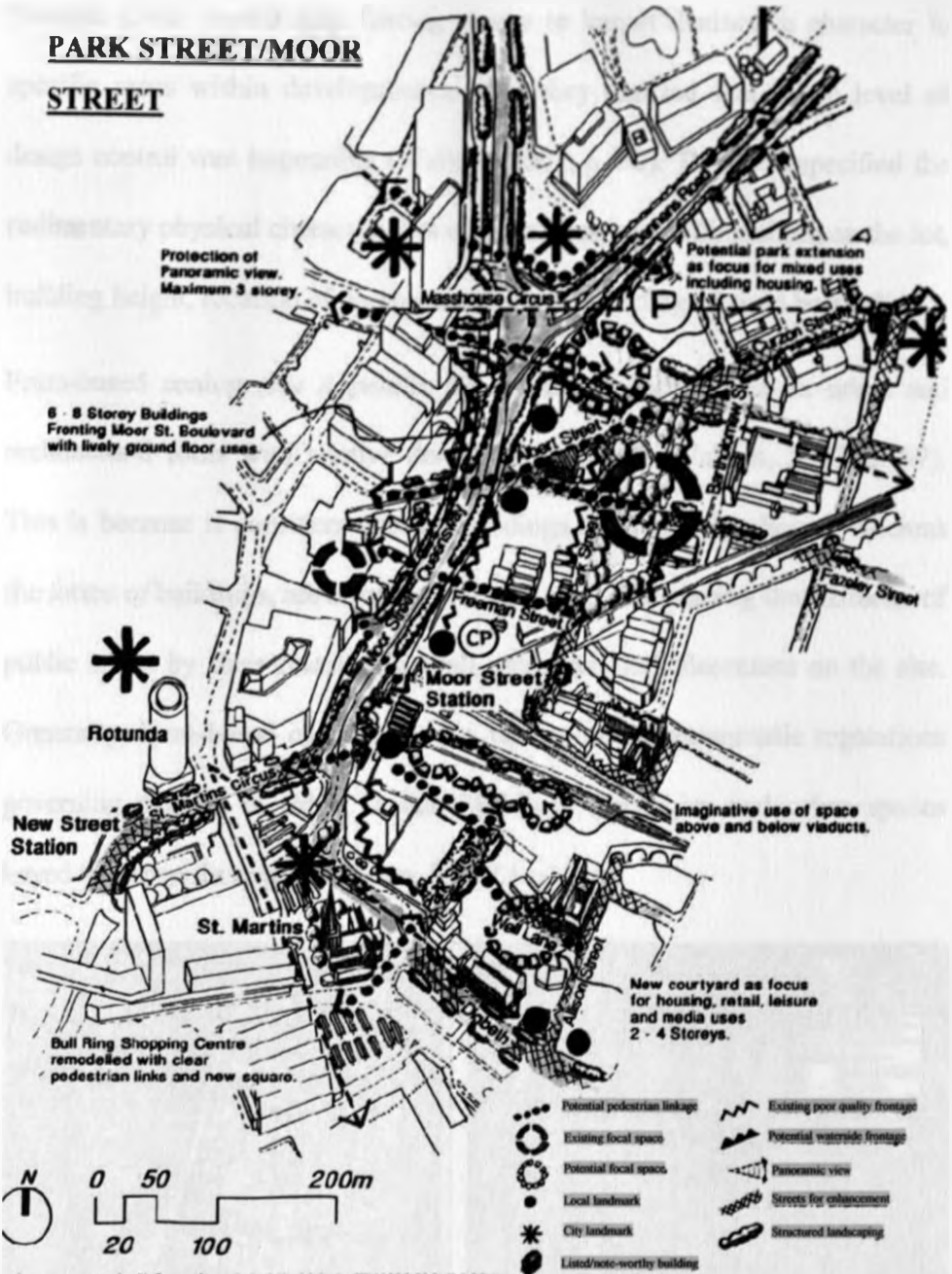


Fig. 2.7: Urban design framework for Digbeth Millennium Quarter, Birmingham, UK, 1996

Source: (Walters, 2007, p. 108) Prepared by Birmingham City Council, this urban design framework provides extensive three-dimensional detail

2.4.2 American Form-Based Codes

Planning in the USA is almost exclusively a local matter with different states acting almost entirely distinct of others. American codes are attributed to the works of Andres Duany and Elizabeth Plater-Zyberk whose studies on

'Seaside Code' ended with finding a way to impart distinctive character to specific areas within developments, after they realized that high level of design control was impossible (Walters, 2007, p. 90). The code specified the rudimentary physical characteristics of each class, controlling siting on the lot, building height, location of porches and how outbuildings should be handled.

Form-based zoning (*see Appendix II*) ordinances focus more on urban and architectural form with relative de-emphasis of use (Walters, 2007, p. 97). This is because it considers uses *in* buildings often rapidly change, whereas the forms *of* buildings, are more long-lasting, thus determining the character of public space by their massing, overall character, and placement on the site. Generally, form-based codes comprise written and diagrammatic regulations governing matters of urban layout, buildings typologies and urban spaces keyed to a specific regulating plan, *Fig. 2.8 a) & b)*.



The master plan aimed at reviving & reinforcing the urban structure

Hierarchy of form-based zoning to regulate future development

Fig. 2.8: Wake Forest, NC, downtown Master Plan, 2003–2004
Source: (Walters, 2007, p. 98 & 99) - LG Town Planners & Architects.

Regulating plans are almost always site specific and derived from the master plan created for a particular development, normally by a community group (Walters, 2007, p. 98). Both the American and the British systems codes streets & sidewalks as a series of hierarchical types, (Walters, 2007, p. 135).

The Marxian view of planning is that the structure of a capitalist state, including its land-uses and activity patterns, is the result of capital in pursuit of profit and since capitalism wishes to circumscribe state planning as far as possible, there is an in-built contradiction creating an inadequacy where planning always solves one problem by creating another, (Hall, 2002, p. 369). Well stipulated plans however can provide a set of clear signals to the private sector, thus enabling it to make its own phased investment programs (Hall, 2002, p. 347). (Lang, 2005, p. 51) identifies the nature of infrastructure as what visually distinguishes one city from another as much as the nature of its architecture and summarises the whole issue of practical effectiveness of legal and political frameworks, *Table 2.6*.

Table 2.6: Likely degree of implementation of urban design guidelines

Level of Clarity	Steps in guidelines development and application			
	Formulation	Communication	Administration	Effectiveness
High	Clear operationally defined objectives and evaluation criteria based on empirical evidence	Written and illustrated guidelines that are publicly reviewed in meetings prior to acceptance	Single authority legally empowered to enforce regulations in control	Likely to be implemented and less battered by power relationships amongst stakeholders
Medium	Objectives and evaluation criteria specified in general terms using words such as appropriate	Written, illustrated and placed on public display in exhibitions. Feedback in written form	A centralised agency or well coordinated multiple under single authority	Partially implemented but subject to the whims of political change
Low	Advisory guidelines without operational definitions	Written and illustrated but not subject to any public review	Multiple agencies at the same time or in sequence	Loosely applied depending on architects and development values

Source: Adapted from (Lang, 2005, p. 301)

2.5 DESK-STUDY OF CURITIBA, BRAZIL

2.5.1 Introduction

During the second half of the 20th Century, the city of Curitiba, capital of Paraná Province in southern Brazil, saw its population grow from 120,000 people in 1940 to over 2.5 million by the turn of the century in its metropolitan area (Lang, 2005, p. 325). In the early part of this period of growth, Curitiba's development was guided by a master plan developed in 1943 by a French urbanist, Alfred Agache, which had proposed that growth should take place in a concentric manner from the centre out. With a population of 470, 000, a growth rate of 5% a year, and excitement generated by the design and development of Brasilia in the early 1960s, the municipality felt that a new plan was needed (Lang, 2005, p. 325). A competition was organized to generate ideas of what the city should be, and through it a zoning map was proposed by 1965.

2.5.2 Planning and Implementation

The winning scheme of Brazilian Jorge Wilhelm proposed that growth should take place in a radial, linear manner spreading out from the centre along five corridors (structural axes) so that transportation routes could most easily be integrated with new developments and vice versa, *Fig. 2.9*.

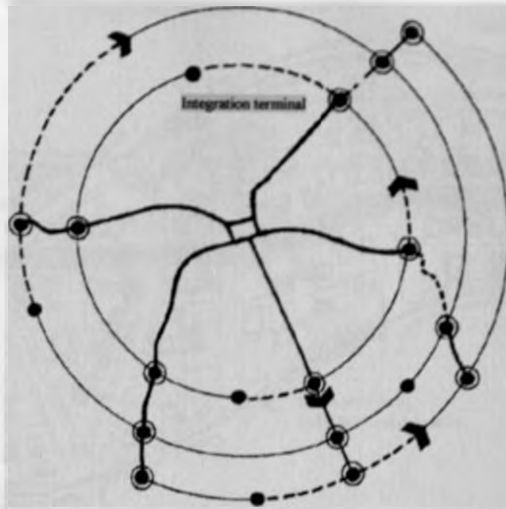


Fig. 2.9: The integration concept showing the five structural axes
 Source: (Lang, 2005, p. 326)

Consequently, in 1966 Curitiba created an independent planning institute, the Institute for Research and Urban Planning of Curitiba (IPPUC), to develop, supervise, monitor, and continually update the Master Plan. Its values were:⁸

- Promotion of linear urban city growth by integrating public transport, road network development, and land use along key ‘structural axes’;
- Traffic decongestion and preservation of the historic central city core;
- Management and control of land use citywide;
- Provision of economic support incentives to urban developers to realize land use aims and to assist in employment generation; and
- Improvement of infrastructure.

Curitiba’s bus system was thus developed as an integral part of the overall master plan with each of the structural axes developed as a “trinary system” comprising three roads, *Fig. 2.10*.

⁸ Integraçao do Sistema de Transporte Urbano de Curitiba, Buleze-Melo-Fialho-Neto-Junior-Karas, presented at Technical Meeting of Latin American Countries on Urban Transport, Brasilia, Sept 1985

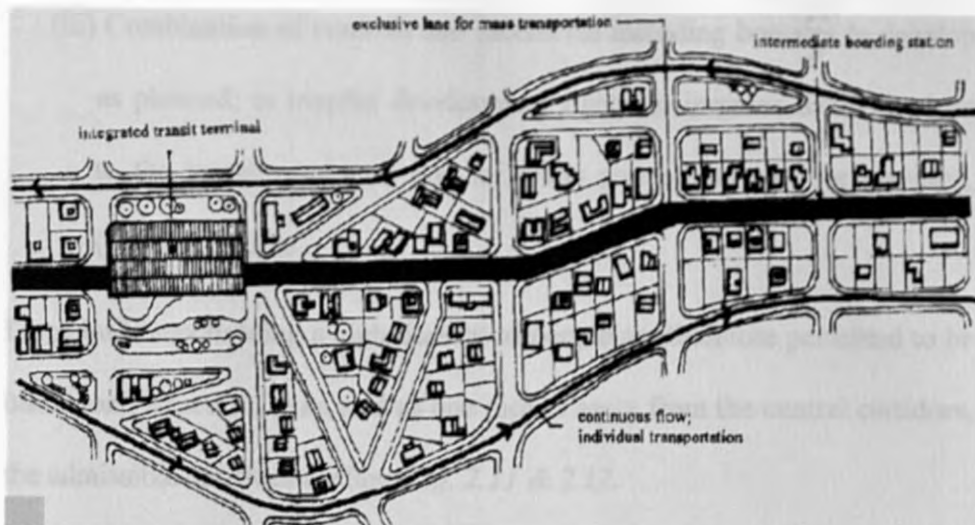


Fig. 2.10: The 'trinary' traffic system in the structural avenues
 Source: (Lang, 2005, p. 327)

Approximately one block from each side of the central bus way/service road, a one-way traffic road of three or four lanes has been developed for use by private vehicles. In the block width between the subway and the main traffic roads on either side, intensive, high-density land use development is permitted. This created a concentrated, high demand for transport services along a narrow corridor that can be met efficiently by a track-based public transport service.

2.5.3 Land Use Policies

IPPUC land-use strategies (Rabinovitch, 1996)⁹ changed the city growth pattern from radial to linear. Zoning laws merged with structural roads were put in place to structure the growth of the city with the following benefits:

- (i) Creating short walk distances to travel corridors
- (ii) Zoning land within two blocks of the bus way for mixed commercial-residential uses

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⁹ See also (Cervero, 1995)

(iii) Combination of controls and incentives including bonuses to develop as planned; to transfer development rights; to increase densities close to the transit corridors; and for using part of the plot for greening, (Friberg, 2000).

Large buildings holding a high density of people are therefore permitted to be built along structural axes, and as one moves away from the central corridors, the admissible densities decline, *Fig. 2.11 & 2.12*.

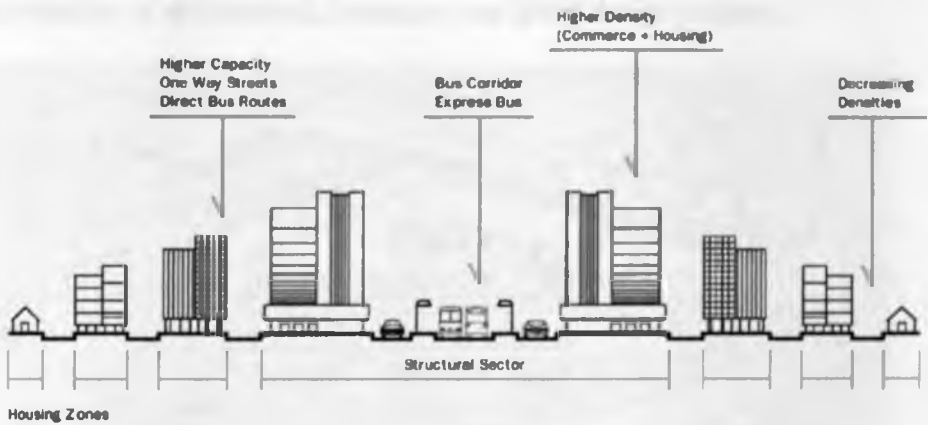


Fig. 2.11: Schematic arrangement of structural axes
Source: IPPUC, Rabinovitch & Hoehn, 1993; Creating a Linear City with a Surface Metro (Cervero, 1995)



Fig. 2.12: Curitiba -Zoning has been integrated into the transport plan and tall buildings are permitted only along the main routes
Source: (Friberg, 2000)

2.5.4 Urban Design Strategies

An open approach to information exists where all citizens can access data on every plot of land in the city and are often invited to participate on deliberations, with emphasis put on ensuring pleasing architecture. Armature for plugging in a broad array of urban design projects e.g. libraries and community centres, museums, theatres, parks and recreational facilities is provided, *Fig. 2.13*. Thus associated with the transportation network are a large number of architectural, landscape and urban design projects.

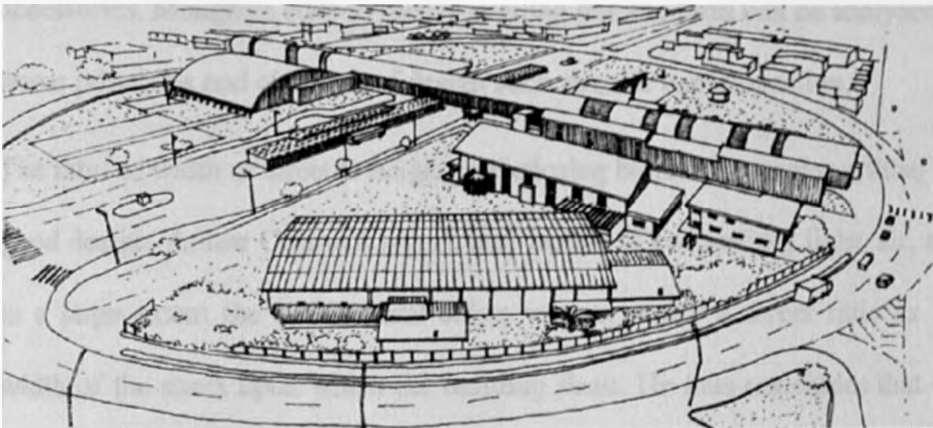


Fig. 2.13: A sample community centre plugged into the transportation system
Source: (Lang, 2005, p. 327)

The planning strategy received support with the power elite rallying around specific schemes and the media widely disseminating images of proposed schemes (Lang, 2005, pp. 328-329) making clear material gains.

2.6 CONCLUSION

The last two decades of the 19th Century saw several forms of urban growth being proposed by several social reformers and urban planners as reactions to changing socio-economic environments. The linear disposition that most of them took emphasized the strong correlation between urban form and circulation arteries.

Rossi's abstract theoretical idea conceived the city as a physical phenomenon, an instrument for man's delight through the aesthetic potential of its form (Rossi, 1984). His object of analysis 'typology' analysed the city as a whole constructed by its parts. (Lynch, 1960), presents legibility a concept akin to Rossi's especially in the identity of primary elements like paths as basics to the city. Lynch connects paths to visual experience placing the aesthetic theory on facets of perceptual theory where proportion is important to the overall massing of the building as well as the building's details and path related accessories. Moughtin adds to this by arguing that the form can be analysed in terms principles and elements of design such as scale and proportion.

The ratio of width of street to height of enclosing buildings remains critical for good design. Arthur Coleman argues that factors of congestion, light, air, and to a large extent the architectural effect vary in nearly a direct ratio as the width of the street upon which the building faces. He thus concludes that the width of street would seem to be an essential element in the regulation of building heights. From the various theoretical studies, it appears correlation between circulation arteries and urban form is pegged on history, functionality, safety, visual harmony, provision of urban services and introduction of appropriate incentives/bonuses. These factors however seem to converge on Urban Design as key in development of good city forms, especially its three-dimensional and contextual aspects, and thus should be the aim of any well-managed city.

2.7 CONCEPTUAL FRAMEWORK

The conceptual framework diagram, *Fig. 2.14* indicates the relationship between the dependent, in this case the urban form, and the independent variables, that is circulation arteries in summary. It attempts to connect the aspects of inquiry by considering policies as the intervening variables, and incentives as the additional factors for mitigating or pursuing a particular cause. A convergence of products of variables results in the creation of characteristic urban environment in terms of functionality, imageability, safety and provision of urban services.

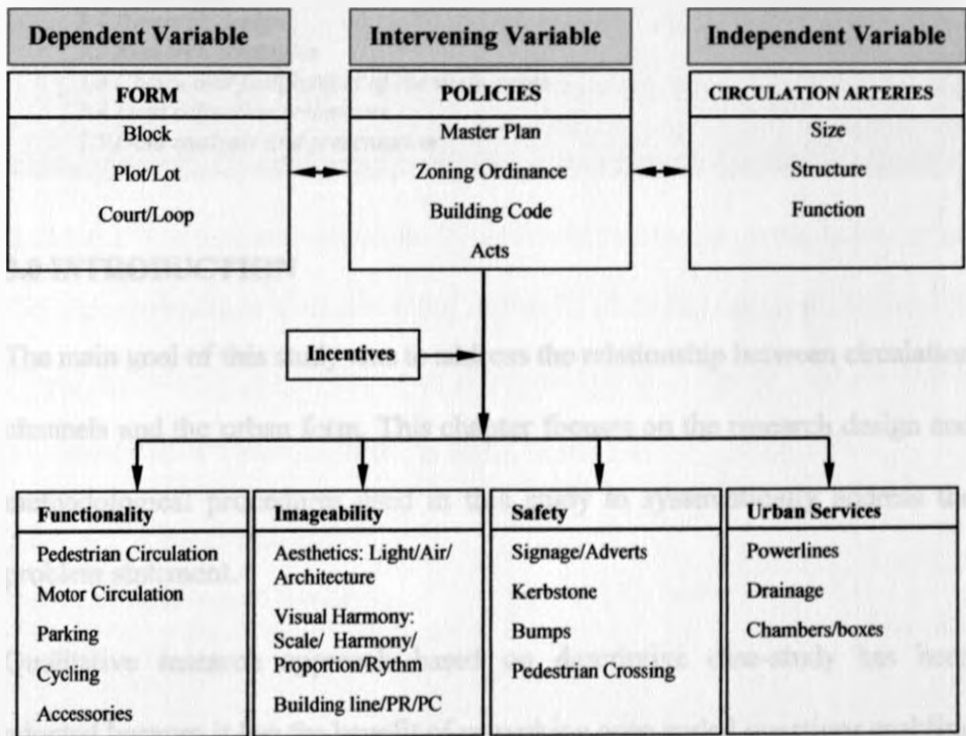


Fig. 2.14: Conceptual Framework Diagram

Source: Author compiled, 2012

CHAPTER THREE: RESEARCH METHODOLOGY

'When a planner speaks of implementing goals rationally, he implies that it is possible to demonstrate logically and experimentally the relationship between the proposed means and the ends they are intended to further' - Alan A. Altshuler, planner, The City Planning Process (1965)¹⁰

CHAPTER OUTLINE:

- 3.0 Introduction
- 3.1 Research design
- 3.2 Research strategies
- 3.3 Choice and justification of the study cases
- 3.4 Data collection techniques
- 3.5 Data analysis and presentation

3.0 INTRODUCTION

The main goal of this study was to address the relationship between circulation channels and the urban form. This chapter focuses on the research design and methodological procedures used in this study to systematically address the problem statement.

Qualitative research approach based on descriptive case-study has been adopted because it has the benefit of provoking open ended questions enabling the researcher to explain factual issues, thoughts and feelings in detail. Consequently, one can even ask a respondent to propose his or her own insight into certain occurrences (Yin, 2002, p. 89). Three data gathering strategies that

¹⁰ www.aboutplanning.org/quotes.html

typically characterize this methodology have been used, that is: in-depth, open-ended interviews, direct observation, and written documentary or archival material. The idea of qualitative research is not to collate numbers but to be able to understand space and space users' feelings.

3.1 RESEARCH DESIGN

This refers to the research blue-print specifying type, methods and procedures for acquiring the information needed to achieve a goal with minimal expenditure of effort, time and money (Yin, 2002, p. 21). The process involved in conducting the study should also be described in detail to help other researchers in understanding one's study (Mugenda & Mugenda, 2002, p. 41). The purpose of having the research design is also to avoid a situation where the evidence collected does not address the research objectives or questions. The research questions for example enable the researcher to select the relevant strategy to conduct the research, while the prepositions provide directions to the type of data to be collected and the units of analysis define what the 'case is' (Sheuya, 2004, p. 49)¹¹, *Table 3.1*.

Table 3.1: Research design

<i>Research questions/objectives</i>	✓ Actors, actions, reasons, results
<i>Relevant data</i>	✓ Factual textual data, Maps & Photographs (typomorphological)
<i>Unit of analysis</i>	✓ Circulation arteries: -Size/Structure/Functions ✓ Form: -Urban Block/Lot/Plot/Court/Loop

Source: Author, 2012

¹¹ Citing (Yin, 1994:21)

3.2 RESEARCH STRATEGIES

There are many strategies applied in social sciences research but the most common ones include surveys, experiments, histories and case studies (Sheuya, 2004, p. 49). They are based on logic and are used to explore, describe and explain phenomena, each bearing inherent pros and cons related to the logic of collection and analysis of empirical evidence.

To investigate the impact of circulation Arteries on Nairobi's urban form, this study employs two key research strategies (not mutually exclusive) guided by three conditions, that is, the type of research, investigator's control over actual behavioural events and, the focus on contemporary and historical phenomena. As noted by (Yin, 2002, p. 5), when the research question is 'how' or 'why', and no control is needed over behavioural events the strategy can be case-study. He however notes that if there is no focus on contemporary events, then the strategy can be history. The two strategies then apply in this case.

3.2.1 Interpretive –Historical, Archival & Documentary Analysis:

This mode of research involved the searching of evidence concerning the phenomenon, collecting and organizing that evidence, evaluating it and constructing a narrative from the evidence that is holistic and believable. This involved the use of several available drawings and literature collected before and during the fieldwork which were then studied and compared with the current situation to verify impacts of circulation channels on Nairobi's built-forms. This mode of research involved the uses of Archival documents—from newspapers to institutional records and architectural plans—to provide the

required data. Non-verbal representations—especially plans and sketches—were considered a special source of data.

To clearly understand Nairobi's historical background and the contexts of her architecture and planning, this study explored some elements of historical research namely:

- a) The pre-existing social and institutional, economic and physical context in which developments in Nairobi occurred.
- b) The various actors, i.e. Architects, organizations and institutions, whose decisions and actions helped shape Nairobi's Built Form.
- c) The actions taken by the actors with the resources available.
- d) The acts: The functions and forms of the works generated and their impacts on the context and the resulting situation.
- e) The lessons learnt from the experience.

Library research thus involved intensive analysis of relevant books, journals and any other relevant publications relating to people's perception of built environment.

3.2.2 Case Study Strategy:

A case study is an empirical inquiry that investigates a phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident, (Yin, 2002, p. 13). This suited this study since it covers contextual conditions with the belief that they may be pertinent to the phenomena of study. According to (Yin, 2002, p. 15), case-study is a way of investigating an empirical topic by following a set of pre-specified procedures.

This study follows a protocol that spells-out the choice of study cases, data collection techniques and the methods of analysing data.

3.3 CHOICE AND JUSTIFICATION OF STUDY CASES

The choice of case-studies greatly determines the possibilities of generalisation. The main objective of qualitative methods is to obtain the greatest amount of information on a given phenomenon, and be able to learn the most. This means the researcher has to look for information rich cases (Sheuya, 2004, p. 53), that can either “most likely” or “least likely” confirm or falsify the proposition.

Evaluation of theories under literature review established that the main spatial values of the city are legibility (Lynch, 1960), crowd and mixed use (Jacobs, 1961), formal diversity (Krier, 1979), serial vision (Cullen, 1971), proximity, centralisation, enclosure (Norberg-Schulz, 1971), and figure-ground equilibrium (Rowe, 1979) & (Trancik, 1986) , see Table 3.2.

Table 3.2: Summary of analytical frameworks

UNITS OF ANALYSIS	MORPHOLOGICAL FEATURE	PARAMETERS
Form	1.Characteristics of the fabric	organic/regular
-Block	2. Scheme form	compositional / megaform/ form
-Plot/Lot	3. Distribution of channels	linear/planar distribution
-Court/Loop	4. Orientations and angles of paths	linear/angular
Circulation Arteries	5. Characteristics of urban blocks	existence/absence of rhythmic order
-Size	6. Enclosure levels	enclosed, semi-enclosed, unenclosed
-Structure	7. Figure-ground relationship	grid, angular, curvilinear, radial, axial, organic
-Function	8. Spatial hierarchy	existence/absence of hierarchichal order

ELABORATION

1. Organically arranged paths perform the dual function of movement and living in space, offering variety that generate interest.
2. Whereas compositional form is typical of functionalist urban design approaches, megaform consists of individual components that are integrated into a larger framework, while group form is the result of incremental accumulation of elements in space, typical of the spatial organisation of many historic towns (Birol, 2004).
3. Planar distribution of urban elements shows the existence of multi-directional and optional spatial order, while linear distribution means that space is monotonous, enforcing and insistent.
4. Angular connections of paths provide opportunities for pause, rest and re-orientation, and offer amazing spatial experience to users. More changes in direction along the path provide longer use of the space. Abundance of path intersections means that there is an optional spatial order.
5. Small urban blocks in length and width typologically allow maximization of commercial benefit by generating more street life (Krier, 1979). Functional diversity (mix of use) facilitates the formation of 'place' in urban space through longer use of urban space by various users (Jacobs 1961), enhancing social attributes
6. High level of enclosure means spatial definition (Norberg-Schulz, 1971).
7. Contradiction between organic and linear figure- ground relationships results deficiency in the legibility of space
8. Hierarchy implies a rank ordered change by size, shape or placement. It refers to the degree of importance existing among forms and spaces, and where such exists, it improves legibility.

Source: Compiled by author

Following the above insights, it was found crucial to systematically carry out the research in the following levels:

- (i) Context: A historical account as a basis of urban analysis
- (ii) Scale: Study of the city at various levels outlined by (Topçu, 2012, p. 2) - city scale, street/block, building/lot

a) Context:

Historical analysis covered land development patterns, zoning plans and arterial hierarchy/open spaces as evidenced from base maps at the local and global levels.

b) Scale:

Study of the city at different scales targeted developments of the neighbourhood to block-by-block developments, including functions, plot size, block size (modifications), Building volumes (Floor levels), Setbacks, Road widths/Sidewalks (general Street frontage). This called for typological classification to identify a few cases whose scope could be handled exhaustively. Type is neither a spatial diagram nor the average of a serial list but is fundamentally based on the possibility of grouping objects by certain inherent structural similarities/patterns (Yin, 2002) & (Moneo, 1978, p. 23)¹². Aldo Rossi notes that, type is characterized by a set of consistent structural characteristics, whether building type or public space type, which can endure despite changes in functions over time, thus permanent through history.

Selection of specific case areas for detailed analysis therefore relied on the following criteria:

- (i) The case should be a formal settlement
- (ii) The case should be representative of architectural/planning strategy/genre e.g. zoning for comparison.
- (iii) The area should have adequate documentation accessible for study

The formulation of 'type' led to the identification of study cases as follows:

- (i) **Mumias South Road -Buru Buru:** This is a planned middle-income residential settlement, with a specifically planned and documented central spine as its anchor.

¹² Cited in (Keitany, 2006)

(ii) **Moi Avenue -CBD:** Concentration of settlement began in the central traditional centre like in many cities of the world; consequently this area has seen the most land use changes representative of the motorized and non-motorized epochs (Morgan, 1967). It is a planned commercial zone, well documented.

3.4 DATA COLLECTION TECHNIQUES

The employment of each method of data collection was determined by the type of data that the researcher intended to collect at each stage. Selected data collection tools used included:

3.4.1 Interviews:

An interview is a formal or informal oral questionnaire, with the intermediate being referred to as in-depth interviews. Interviews were particularly useful for getting the story behind some of the experiences as they made it possible to obtain data meeting the objectives and offers opportunities to clarify questions. Whereas formal interviews have a tendency of limiting respondents, informal interviews can be too amorphous, hence this study utilized in-depth interviews, where standardised open-ended schedules were used (*Appendix IV*). The purpose of the schedule was to make sure that at the end of the interview all relevant issues have been discussed.

Using the schedule, some fifteen key informants were targeted. These were people particularly knowledgeable in the subjects of interest (professional architects & urban planners), and who also gave their opinions and suggestions on how to deal with some of the study's concerns.

3.4.2 Observations:

Observations bring a researcher into direct contact with the context for concrete experience. The researcher in this case used non-participant observations guided by a checklist (*Appendix III*) to make thorough observation of on-going activities within and about the case areas so as to explore space utilization in relation to designer's and planners expectations. Observation, interviews and archival material are mutually reinforcing techniques, hence presented an avenue for data triangulation. Some of the devices engaged to record observation's data includes the use of annotated diagrams/sketches, drawings, photographs, or a combination of these.

3.4.3 Photographs and Measurements:

Aerial photography and panoramic techniques for obtaining three-dimensional views of the landscape from the air or land provided necessary enablement to perform detailed studies of the aforementioned, especially through time series analysis and thus ease in drawing visual comparisons. This helped elaborate the character of channels, buildings, open spaces and activities thus the drawing of the requisite relationships. Photographs capture ingenious details that other methods may not record. Where necessary, measurements were carried out using tape or scaled-up drawings, to measure specific characteristics of buildings or circulation channels, to check scales and proportion.

3.4.4 Documentary analysis:

The most important use of documents is to increase and corroborate evidence from other sources by for example unveiling information given by others on

the same phenomenon. Yin cautions investigators when using documentary analysis “....as it was written for some specific purpose and audience other than those in the case-study being undertaken” (Yin, 2002).

3.4.5 Maps:

Analysis of several map records in the light of actual settings were relied on to help draw comparisons on growth characteristics of city form over the years, and to project likely future scenarios. Generally descriptive notes provided an easier way of capturing qualitative data in the field and during interviews especially on character and patterns evident in the study areas.

3.5 DATA ANALYSIS AND PRESENTATION

Data Analysis is the examination, categorization, tabulation and testing of data to address initial prepositions of the study (Yin, 2002, p. 109). Categorization of data collected was done through pattern matching to facilitate a non-empirical analysis. The variables in *Table 3.3* below were applied:

Table 3.3: Basic mode of analysis

Site layout	Building form
<ul style="list-style-type: none"> - Analysis of the immediate surroundings to establish relationships between buildings, circulation channels and any other site features which affect the site’s resources - Analysis of the placement of activities by way of visual observation and interviews to establish measures to deal with challenges 	<ul style="list-style-type: none"> - Analysis of the buildings geometry and massing - Analysis of the buildings orientation in relation to the circulation channels

Source: Author

Data presentation was done descriptively using maps, photos, sketches, tables and analytical diagrams that simplify the data for ease of understanding and interpretation.

CHAPTER FOUR: THE CONTEXT

"... if past functioning has produced today's structures, then those structures will produce today's functioning, which will produce tomorrows structures" -

Hirst & Lamba, 1994, p. 6

CHAPTER OUTLINE:

- 4.0 Introduction
- 4.1 The shifting city space
- 4.2 Development plans
- 4.3 Practice codes & guidelines
- 4.4 Overview to analysis
- 4.5 Conclusion

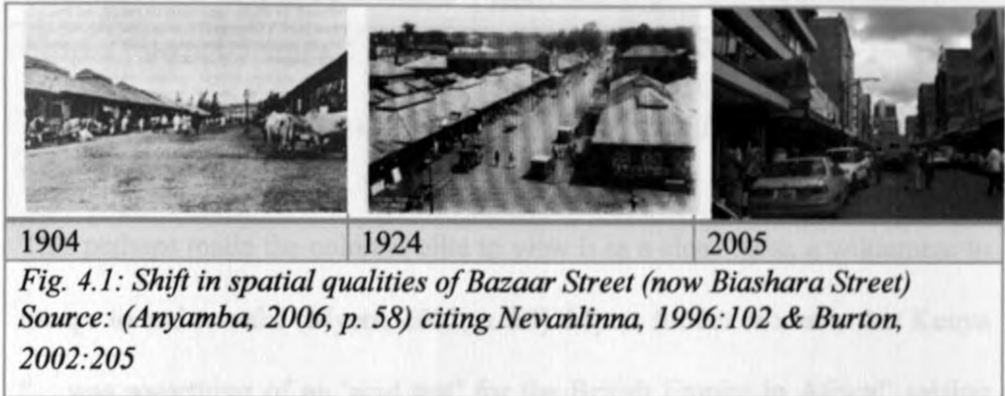
4.0 INTRODUCTION

Nairobi is the capital city of Kenya, a country located along the equator in the tropical region of East Africa. The city derives its name from a Maasai word, 'Enkare Nyrobi', meaning 'a place of cool waters' (Morgan, 1967, p. 130). Founded in 1899 (Tiwari, 1981) as a simple rail depot on the railway linking Mombasa to Uganda, the town quickly grew to become the capital. It is now estimated to have a population of 3,138,369 inhabitants (GoK, 2010).

Nairobi is largely a product of a process of invasion, occupation, colonization and annexation of African territory by European powers during the New Imperialism period between 1881 and 1914 (Wikimedia, 2011). As a consequence, Nairobi is often seen as a city that encapsulates colonial expression of urban order (Myers, 2003, p. 54). This chapter generally explores historical urban processes impacts on Nairobi's internal urban structure and character as pertains circulation arteries and urban form.

4.1 THE SHIFTING CITY SPACE

The history of Nairobi is not about one human settlement but rather that of a process of modernisation (Hirst & Lamba, 1994, p. 3), where from the beginning, settlements were at variance with local practices, *Fig. 4.1*.



4.1.1 Non-Motorized Phase:

a) Nairobi before foreigners; the era of the Caravan and the Manyatta

Long before the city of Nairobi, wild animals roamed freely where current streets and buildings stand. Three dominant cultures inhabited the region (Hirst & Lamba, 1994, pp. 18-20). These were the pastoralist Maasai, the Kikuyu crop farmers and the Kamba who practised both modes and were well known for their long distance trade. The area was 'a bleak swampy stretch of sippy landscape, devoid of human habitation and a resort of wild animals'. An old slave trade route skirted the bog leading to Uganda, *Fig. 4.2&4.3*.

Being a watering hole and part of a 'no man's land', the nomadic Maasai would from time to time build their *Manyattas* on the higher grounds. Their timing of building in terms of duration and season was of importance, with their unit being more like wooden caravan (Hirst & Lamba, 1994, p. 20). Shelters thus lacked permanence and were connected by transient paths.



Fig. 4.2: Maasai Manyatta

Source:

<http://www.saferworld.org.uk/images/galleries/ex2.jpg>



Fig. 4.3: Map of Nairobi area showing the Location of 'Enkare Nyrobi'

Source: Adapted from (Hirst & Lamba, 1994, p. 11)

This perhaps made the colonial elite to view it as a clean slate, a wilderness to escape to and remake (Myers, 2003, p. 53). Myers further recounts that Kenya “... was something of an ‘acid test’ for the British Empire in Africa”, raising the question as to whether there was any serious engagement as regard the planning of Nairobi from the very beginning.

b) The Era of the Palanquin, Rickshaws, Mule Carts and the ‘Tin-house’

Nairobi owes its birth to the Uganda Railway encampment that formed its pre-urban nucleus and its Chief Engineer, Sir George Whitehouse (Tiwari, 1981, p. 125). The railway was being constructed on the approved plan of the “Mombasa –Victoria Railway Survey of 1893”¹³. Kikuyu was the original site for the planned changing station, but Sir George Whitehouse found it unsatisfactory and moved it to Nairobi¹⁴, *Fig. 4.3*. The railhead from Mombasa reached Nairobi on 30th May 1899, which is considered the date of the founding of Nairobi (Tiwari, 1981, p. 125).

¹³ In *Mombasa-Victoria Lake Railway Survey, 1893* (London Colonial Office C-7025) as cited by (Tiwari, 1981, p. 125)

¹⁴ *Diaries of Sir G. Whitehouse* (Oxford: Rhodes House, MSS Afr. S. 1046(3) 1897 as cited by *ibid*.

With the coming of foreigners, building construction shifted from the mud and wattle walls with grass thatched roofing to timber and iron sheet construction (Loki, 2009, p. 34), *Fig. 4.4 & 4.5*.



Fig. 4.4: Rossenrode & Mac John's General Merchants & Bar in Nairobi, 1902
Source: Muthaiga, Stephen Mills 2006:33 cited in (Loki, 2009, p. xvii) - This shows a wood & iron sheet building of Nairobi's founding years



Fig. 4.5: View of the First DC's Office and Court House (Nairobi - 1900)
Source: A Jubilee History 1900-1950, N.C.C. cited in (Loki, 2009, p. 35)

The 1900 Circa, *Fig. 4.6*, shows city's arteries at the city founding as having been the railway line and a number of streams which cut through the landscape. Though it started as a mere campsite, by the time the railway reached Kisumu on Lake Victoria in 1901, most administrative functions in the protectorate had been transferred to it (Obudho 1981; Morgan 1967)¹⁵.

The township grew rapidly due to an influx of railway workers and the arrival of various groups of settlers in search of profit and adventure. These were Asians businessmen; Europeans seeking land and wealth; European big game hunters; and Africans from all over British East Africa. The Indians had followed the labour camps on the railway and brought small, temporary bazaars into existence in each of the major stops. Whitehouse himself

¹⁵ As cited in (Myers, 2003, p. 34)

remarked on 20th April, 1899 that: “Nairobi ... will in the course of the next two years become a large and flourishing place with hotels, shops and houses”¹⁶.

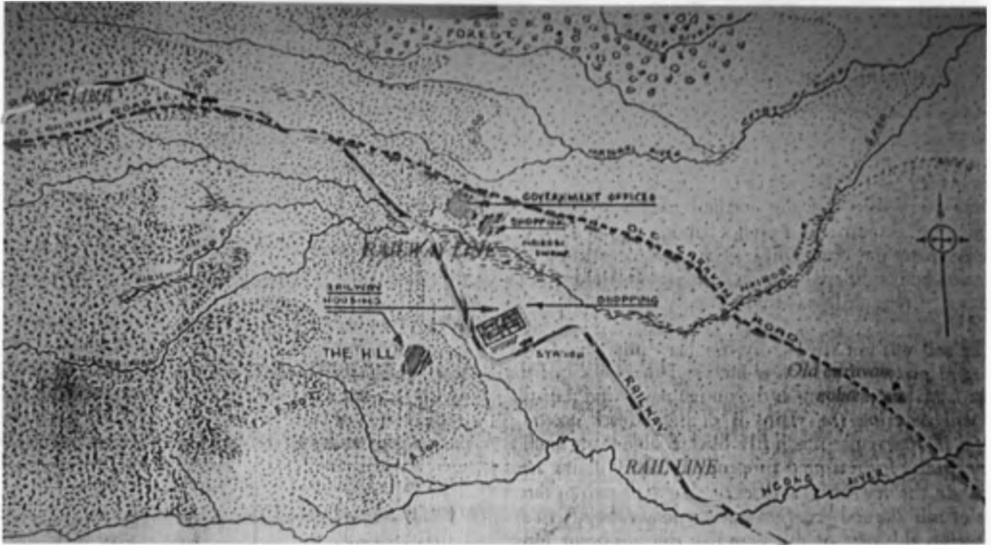


Fig. 4.6: Nairobi Circa, 1900

Source: Adapted from Thornton White et al, 1948, p. 11

Ali Khan, one of the colonial investors of Indian native arrived in Nairobi in 1904, with a string of horses bringing a new dimension in the urban regimes of Nairobi, Fig. 4.7. He opened Lively Stables on River Road and supplied most of transport in town - rickshaws, coaches, Mule Carts, Gigs and Landaus (Hirst & Lamba, 1994, p. 44)¹⁷. Prior to that, colonial masters were literally carried shoulder high by the natives. Eric Dutton, while commending on the movement of the then Governor Robert Thorne Coryndon said that while everybody else on staff walked, he “was carried, like a minor mandarin of the eighth grade, in a swaying palanquin” (Myers, 2003).

¹⁶ G. Whitehouse to O'Callaghan – “Further correspondence respecting the construction of Uganda Railway (Nairobi: The Railway Archives), April 20th 1899 as cited by *Ibid*.

¹⁷ These were non-motorized means of transport



Fig. 4.7: Transportation means and the urban street
Source: (Hirst & Lamba, 1994, p. 33) & (Loki, 2009, p. 34)

Five years after being founded, Nairobi still had no town plan or land-use control (Hirst & Lamba, 1994, p. 37). *Fig. 4.8*, shows settlements consisting mainly of railway buildings and two separate bazaars, one European, another Indian, hence the relationship that existed between urban forms and the channels that connected them amidst prevailing artificial compartmentalization. Hirst & Lamba however recount that from 1899-1908, the city experienced a magnitude of problems including granting to individuals large blocks of land with little thought as to the future development of the town (Hirst & Lamba, 1994, pp. 30-31)¹⁸ & (Morgan, 1967, p. 104). A noticeable feature of the Nairobi then was the physical disparity between the apparatus of government administration and that of the railway administration (Morgan, 1967, p. 100). Sir Winston Churchill in 1906 blamed the situation in Nairobi on lack of foresight (Hirst & Lamba, 1994, p. 40) & (Thornton White et al, 1948, p. 12).

¹⁸ Grogan alone had 120 acres from Museum Hills to Race-course road (Hirst & Lamba, 1994, p. 45)

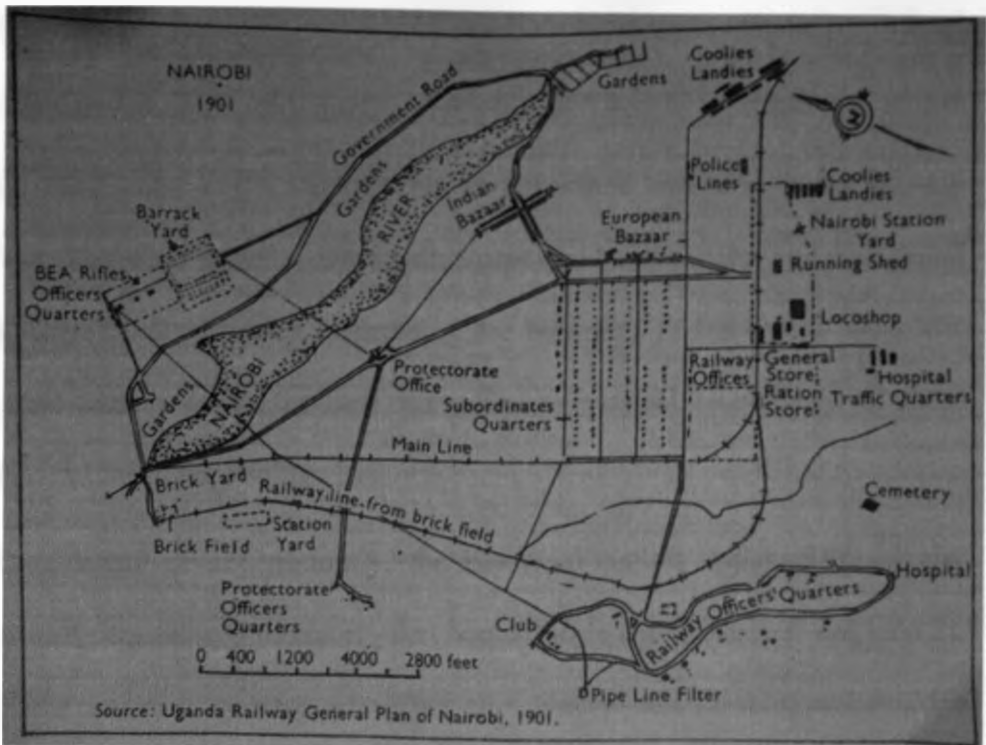


Fig. 4.8: The general plan of Nairobi, 1901 -the road as an artery had begun to define the landscape

Source: (Tiwari, 1981, p. 127)

From an open ground and transient paths, to the construction of tin houses and emergence of streets, the city's spatial structures were continually being defined.

4.1.2 Motorized Phase

a) The Era of the Motor Car and the Stone-Building

Another component of Nairobi's gradualism of urban space and which has had perhaps more serious consequences entailed the emergence of the automobile and creation of the government seat, ascribing the city to permanence. This is evidenced by the emergence of the first car in 1902 (Hirst & Lamba, 1994, p. 65) and construction of central sites of observation and surveillance epitomized in the 1920's by a new government house in Nairobi Hill, designed by Herbert Baker (Myers, 2003, pp. 34-35). This is further supported by

(Morgan, 1967, p. 104) who argues that Nairobi began to assume her 'urban' character due to the erection in local stone of many large buildings.

By 1909, much of the road network in the central area as we know it today was established with the railway alignment, the Nairobi River and the Nairobi trachyte bluff (the hill) determining the boundary of the central area. The street pattern herein resulted from the geometrical relationship of these features (Morgan, 1967, p. 104).

Consciously or unconsciously, the European settlers designed 'their' city around personalised transport –first horses, bikes and rickshaws' and then the motor car ruled. By 1928, with 5,000 cars, Nairobi was the most motor-ridden town in the world (Hirst & Lamba, 1994, p. 65), *Fig. 4.9 & 4.10*. By 1920 there was a regular bus service to the hill and parklands but Nairobi town bus service started in 1934 with two buses (Hirst & Lamba, 1994, p. 58 & 83).



Fig. 4.9: Nairobi, 1928
Source: Kenya Mountain by Eric Dutton (London: Jonathan Cape, 1929) as cited in (Myers, 2003, p. 47)



Fig. 4.10: Aerial view of Nairobi in 1940s
Source: (Loki, 2009, p. 41)

Unfortunately 80% of the city was reserved for 10% of the residents creating a garden city based upon income & social status (Hirst & Lamba, 1994, p. 50). The whole administrative and physical infrastructure was set-up to service

the needs of the ruling elite & their economy –not the needs of the majority. Nairobi had elite residential areas consisting of houses in gardens, served by a network of roads with different kind of social network based upon the telephone, the motor-car and the country club (Hirst & Lamba, 1994, p. 65).

Nevertheless, whatever development was going on in the centre of the city was actually causing underdevelopment all around it. Government road (Moi Avenue) is noted to have had parking problems from the start, linking as it did the main political, commercial and social networks (Hirst & Lamba, 1994, p. 52). Nonetheless, colonial towns all over the world were facing the problem of structure. This is attributed to the fact that they were alien concepts and presented new ideas, with an entirely different way of life (Hirst & Lamba, 1994, p. 49).

Blocked from agricultural enterprise, the Indians were confined to living behind and above their commercial and industrial ventures in the CBD, at first at the bazaar (Hirst & Lamba, 1994, p. 76). European businesses occupied plots along government road and a few original plots along Victoria Street. Indian bazaar was moved after the fire to the south of government road. It consisted of three streets and a cross street and was six acres in area (Morgan, 1967, p. 104). The single storied buildings had shops at the front and at the rear living quarters for families and a host of lodgers and sub-lessees.

On the other hand, since 1890 Africans had been building subsistence urbanization through informal developments. In 1919 Africans got an 'official location' but they still had to build the houses themselves on a rough street called Pumwani (Hirst & Lamba, 1994, p. 53), located close to the city so that

they could walk to their masters, thus the circulation arteries remained merely foot-paths, later to be taken over by the car.

Nairobi encapsulated colonial expression of urban order. It was highly compartmentalized in racial terms, and that compartmentalization was formalized into laws and plans in the 1920's (Myers, 2003, p. 52). During this period, production of space in the city was quite contested but African conceptions of space and utilization of the containerized new neighbourhoods ultimately transcended the enframing tactics of the colonial state (Myers, 2003, p. 54). The best lands were reserved for the whites; the worst for the Africans, and a middle-value buffer zone between became Asian (Myers, 2003, p. 36), and so were the nature of urban developments. Africans largely remained in the non-motorized epoch characterized by temporary mud and wattle shelters, Asians adopted the tin house, while the Europeans lived in stone buildings and moved about in the motor car.

b) Continuity: Permanence and Style

When Governor Sir Coryndon¹⁹ and Dutton his private secretary moved to Nairobi in 1922, urban questions became much more central to their activities (Myers, 2003, p. 44). Dutton not only wrote generally on urban issues, but he participated in development of some of them and in other instances shared his visions and aspirations. In his works, '*Kenya Mountain*' (1929, 1-2)²⁰ Dutton gives a clear picture of what he thought of "unlovely Nairobi" and what he

¹⁹ Kenya's Governor in the early 1920's

²⁰ Cited in (Myers, 2003, pp. 41-42)

thought it ought to be especially as pertains urban forms and circulation arteries:

"There may one day arise a citizen who will proclaim to the world his pride in Nairobi. in 1926it had the look of a mining camp . . .littered with refuse; the streets were cumbered with a jumble of architectural abusesthe roads were execrable. ... maybe one day Nairobi will be laid out with tarred roads, with avenues of flowering trees, flanked by noble spaces and stately squares; a cathedral worthy of faith and country; museums and galleries of art, theatres and public offices. He proceeded and saida town plan ambitious enough to turn Nairobi into a thing of beauty has been slowly worked out, and much has already been done. But until that plan has borne fruit, Nairobi must remain what it was then, a slatternly creature, unfit to queen it over so lovely a country."

Later Dutton admits that at least one avenue, the Delamere Avenue, "was laid with a thought or two, and some of the buildings which flank it have a pleasing design" (Myers, 2003, p. 42)²¹. (Thornton White et al, 1948, p. 14) supports this attributing it to leadership of Captain E.S. Grogan.

Dutton's works are also seen in creation of spaces of observation with Baker, case of Government House where they used ideas from classical Greek and Roman architecture for the deliberate purpose of linking Britain's imperial Buildings symbolically to those of ancient empires, *Fig. 4.11*. Huge, indeed "monumental" government buildings Baker designed all over the world were

²¹ Citing (Dutton 1944 a, 10)

placed high on hills, in bright sunlight, for all to see the “ideals of law, order, and government” (Myers, 2003, p. 49). The Nairobi government House, with its colonnaded patio, tiled roof and loggias giving vistas across the city below from the slopes of Nairobi Hill incorporated these central features.



Fig. 4.11: Government House, Nairobi
Source: Architecture and Personalities by Herbert Baker (London: Country Life, Ltd., 1944) as cited by (Myers, 2003, p. 49)

Fig. 4.12: 'Huge building of the future'
Source: Architects sketch of Sadler house in Nairobi: A Jubilee History 1900-1950, a publication by the CCN as cited in (Loki, 2009, p. 70)

Around late 1950's the city grew very fast for city's structures to cope. The self-help city built much of the needed infrastructure and created new forms of urban social organisations independent of modern city's functioning (Hirst & Lamba, 1994, p. 122). Preferences never changed –cars were planned for more than people. “Professionals; many of them new in the job could only hold on to the guidelines of the master-plan. Many parents got a car, before a 'good' house, and so ferried children to school across the city. Bazaar Street for example evolved from a street of ox-drawn carts to a heavily motorised urban street. The urban morphology also changed from that dominated by tin-roofed constructions to stone/concrete construction. In 1964, the city increased its size ten-fold from 32 sq. miles to 266 sq. Miles, meaning more infrastructural needs (Hirst & Lamba, 1994, p. 138).

Almost from the beginning, Nairobi was developed as an energy intense city with much centralised services, and people commuting from both business and pleasure. To date people still criss-cross the city in search of better services, and disparities in service provision between the rich and the poor persists.

4.2 DEVELOPMENT PLANS

From 1907 when she was made the Capital of Kenya to 1950 when she was granted the charter to be a City, and up to date, Nairobi has had several development plans that have shaped its general physical layout. Perpetuated by sharp increase in population, changing socio-economic environments and political realignments, the boundaries of the city were consequently reviewed from time to time, *Fig. 4.13 & Table 4.1*. This section meditates the planning proposals and their impact as pertains to circulation arteries and the resultant urban form.

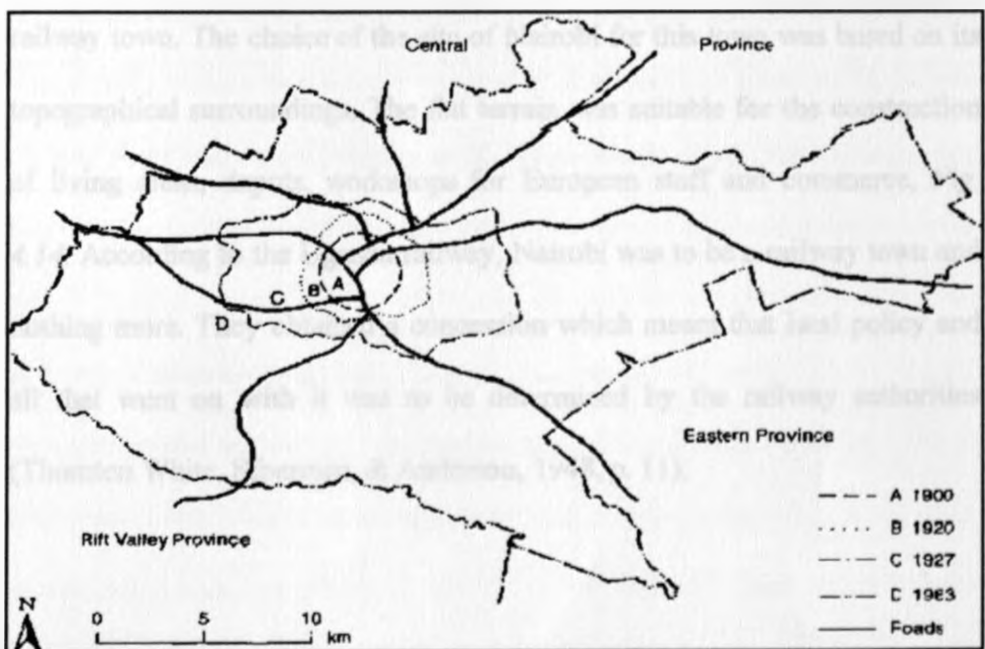


Fig. 4.13: Nairobi boundary changes from 1900 until 1963 after which they have not changed

Source: Obudho, R.A and G.O. Aduwo (1992:53), Cited by (Mitullah, 2003)

4.2.1 COLONIAL NAIROBI

Table 4.1: Population of Nairobi from 1906 to 1948 and the area covered

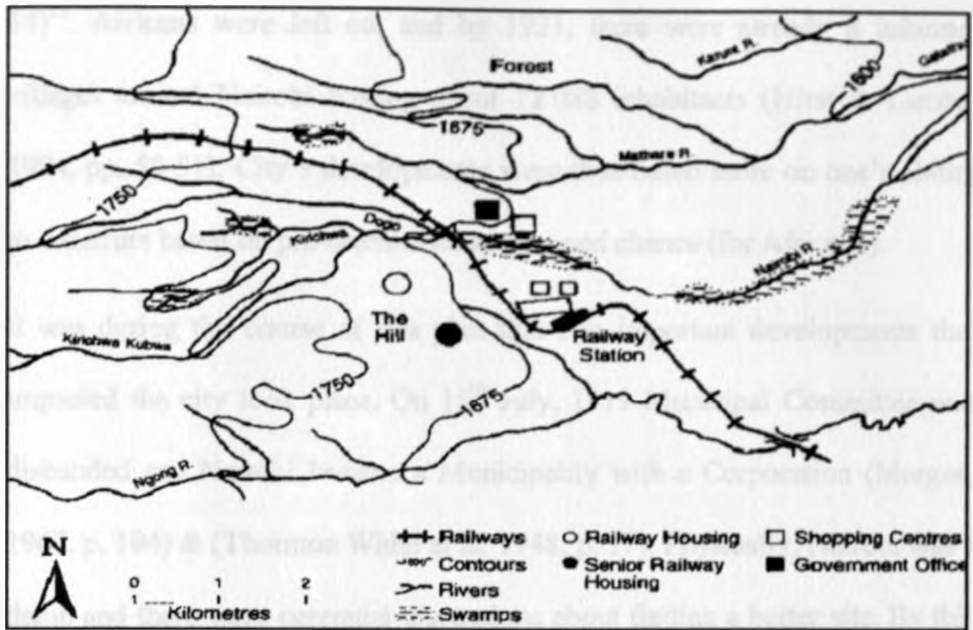
YEAR	AREA (ha)	POPULATION	% INCREASE IN POP.	DENSITY (persons Per ha)
1906	1,813	11,512	-	6
1928	2,537	29,864	159.4	12
1931	2,537	47,919	60.5	19
1936	2,537	49,600	3.5	20
1944	2,537	108,900	119.6	43
1948	8,315	118,976	9.3	14

Source: Adopted from (Olima, 2001, p. 3)

Prior to the 1906 plan, there was no clear town plan for Nairobi and developments were merely spontaneous (Hirst & Lamba, 1994, p. 37).

a) 1906 Plan for a Railway Town

Before the railway reached Nairobi in 1899, there was a need for a plan for a railway town. The choice of the site of Nairobi for this town was based on its topographical surroundings. The flat terrain was suitable for the construction of living areas, depots, workshops for European staff and commerce, *Fig. 4.14*. According to the Uganda railway, Nairobi was to be a railway town and nothing more. They obtained a concession which meant that land policy and all that went on with it was to be determined by the railway authorities (Thornton White, Siberman, & Anderson, 1948, p. 11).



*Fig. 4.14: The City of Nairobi C. 1906 –no evidently defined road networks
Source: (Thornton White, Siberman, & Anderson, 1948, p. 11)*

By 1906, definite land-zones had appeared, not through imposed planning but at the hand of chance and the choice of inhabitants, which still underlie the present day Nairobi (Morgan, 1967, p. 104). The plan only took into consideration the European employees of the railway and the European and Asian traders. The city boundary covered 18 Km² and was extended in 1920 to 25 Km². The plan completely ignored Asian labourers and the Africans and functionally created a commercial centre (CBD) and residential areas, so the town's functions were directly expressed by notions of segregation, by class and race. The government and European business centre consisted of one long struggling street which began at station road and continued after the bend as government road. Three streets and one cross streets on the other hand made up the Indian commercial area composed of one storied buildings –with shops in front and living quarters at the back, not only to traders but also to a host of sub-lessees and lodgers, (Thornton White, Siberman, & Anderson, 1948, p.

14)²². Africans were left out and by 1921, there were already 8 informal villages around Nairobi hosting about 12 088 inhabitants (Hirst & Lamba, 1994, pp. 50-51). City's developments were thus based more on one's ability to construct based on pre-determined zoning and chance (for Africans).

It was during the course of this plan that two important developments that impacted the city took place. On 15th July, 1919 Municipal Committee was disbanded and Nairobi became a Municipality with a Corporation (Morgan, 1967, p. 104) & (Thornton White et al, 1948, p. 17). Physically, Nairobi was a damp and there were perennial discussions about finding a better site. By this time settlements had advanced beyond the shanty town stage with an increase in stone built premises. The track linking the station directly with the Norfolk Hotel called the Government Road (now Moi Avenue) had become the principal artery from which a series of parallel streets, numbered consecutively from the station, supported by a growing commercial network (Moss, 1999, pp. 92-93). Roads however became the responsibility of the Municipality in 1922 (Thornton White et al, 1948, p. 18).

It was thereafter that racial segregation policy was challenged resulting in the 1923 Devonshire white paper prohibiting the separation of races in the township by legislation. Determined to secure their interests, the administrators disguised the racial strategy as zoning—so it was done without it. The government openly prevented non-Europeans from buying plots in certain parts of Nairobi (Hirst & Lamba, 1994, p. 51).

²² A majority of the Indian community was pushed into a small space of six acres. Contemporary accounts speak of dreadful overcrowding.

Although there were no cars at the time, the plan did lay out roads of about 70 feet (21.3 M) wide, that is, 30 feet (9.1M) roadway bordered on either side by 20 feet (6.1M) roadside with a drain and line of trees (Emig & Ismail, 1980, p. 10). Nevertheless, these arteries were more of boundaries between zones with the government road for example separating the bazaar from subordinate residential area. The Plan thus depicts an ideology of master attitude and strong-willed political control, the railway being key datum line.

b) 1927 Plan for a Settler Capital

This plan was drawn by *F. Walton Jameson* and planned by *Eric Dutton* (Thornton White et al, 1948, p. 18), proposing the extension of the boundary of Nairobi to cover 30 sq. miles (77 Km²)²³ as well as beautification of the town. From 1928 to 1963, this boundary remained the same with only minor additions and excisions. This plan proposed extensive traffic regularizations to access the increased land areas, drainage and swamp clearance, building and density regulation and the attempt to furnish Nairobi as a monumental administrative centre, but a greater part of it was never implemented.

During this period, Westlands and Kilimani areas were zoned for one house per acre, while the Upper Hill area was zoned for two houses per acre. It was at this point that the racial segregation turned into class segregation, which was in complete agreement with the interest of the settler class. 90% of the territory belonged to Europeans, 10% to Asians and for male Africans the only legal way to live was in unrecognized squatter settlements, *Fig. 4.15*.

²³ This was as a result mainly of rapid growth of the urban centre both in terms of population and infrastructure as cited in (Mitullah, 2003, p. 2)

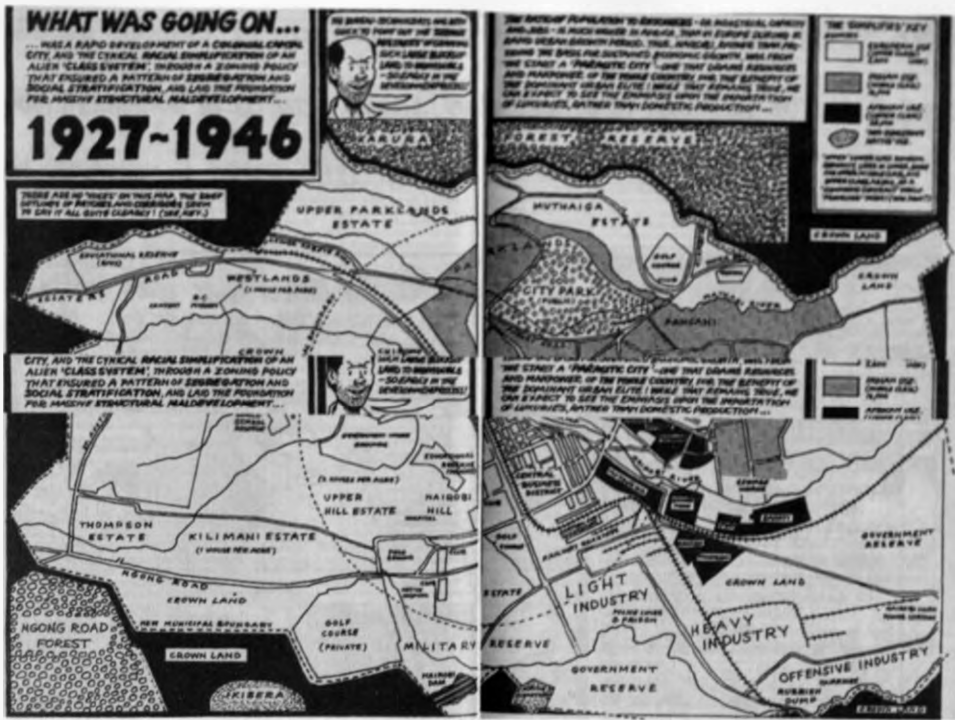


Fig. 4.15: Nairobi Municipal Area 1927

Source: Adapted from (Hirst & Lamba, 1994, pp. 86-87)

One of the fundamental changes that took place in the early 1930s was that the “unprofessional” period of civic management was over and civic authorities had to lean on professionals. The Town Clerk now had to be a lawyer and a Local Public Health Authority had to be established (Anyamba, 2006, p. 65). Around this period also, “Eastlands” an examples of “Grid Layout” East of Racecourse Road as per the 1901 ordinance, housed 80% of Nairobi’s population, and was to be a working class area for both Africans and Asians - each group living separately, Fig. 4.16.

This was a plan to make Nairobi a town of Europeans and Asians through use of zoning. The plan placed heavy emphasis on the layout of new roads showing that planners were far-sighted to accept the fact that the automobile had come to stay. However, it prioritised layout of roads for use by the upper class for example 2,235 Europeans occupying 2700 acres of land and were

allotted 33 Miles of road and 510 public lamps whereas 6,689 Asians occupying 300 acres were allotted only 5 miles of road and 30 public lamps (Emig & Ismail, 1980, p. 32).



Fig. 4.16: Grid Layout of Eastleigh
 Source: Adapted from (Hirst & Lamba, 1994, p. 100)

Towards the end of World War II, Leo Silberman, a sociologist with a reputation in South Africa came to Nairobi. He presented his new ideas in Town Planning to the municipal authorities resulting in the 1948 master plan.

c) The 1948 Master-Plan for a Colonial Capital

This was the first time Kenya made town planning history by experimenting with three academic planners: An Architect, an Engineer and a Sociologist²⁴. The master plan was funded by the Municipal Council of Nairobi and the Railway Authorities. The main aim of the master plan was to make Nairobi

²⁴ L.W.T. White was an architect, town planner and Head of Department of Architecture at the University of Cape Town, P.R. Anderson was a Civil Engineer & Senior Town Planning Engineer while L. Silberman was a Sociologist and lecturer in the Department of Social Studies at the University of Witwatersrand, Johannesburg.

more attractive for industrial investments. With functionalism as the main principle Nairobi was classified in zones; Kenya centre, official buildings, business and commerce, industry, railway, residential, official housing, open space, and also forest reserve and park zones, *Fig. 4.17*. This Master Plan proposed close proximity of government offices to the rest of the commercial activities area. The main spatial structure of the plan was to establish neighbourhoods units for the working class and segregation for purpose of surveillance and dominance.

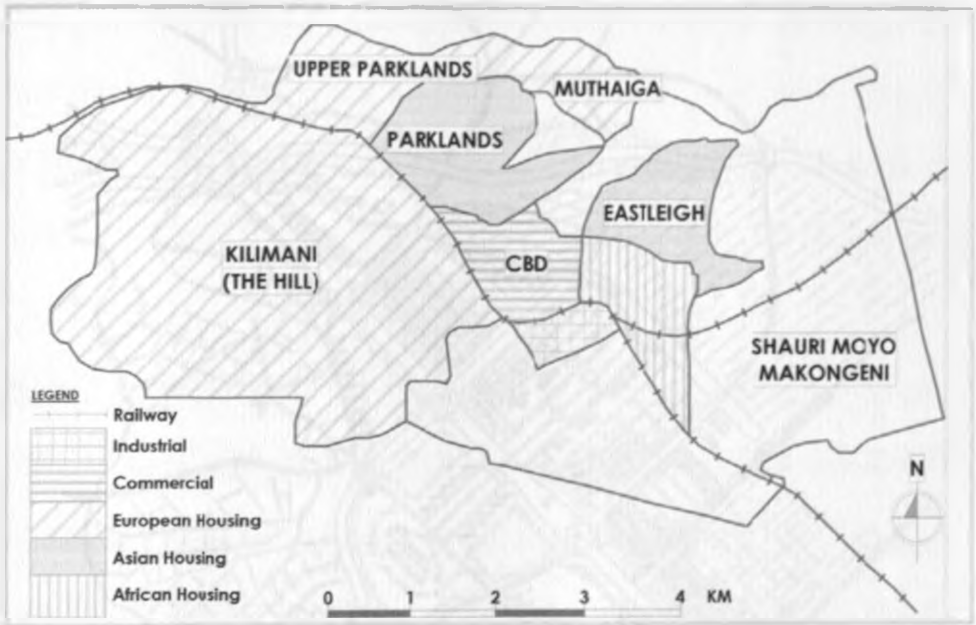


Fig. 4.17: 1948 Colonial Racial Residential Segregation and Functionalism
Source: (Karanja & Makau, 1998, p. 9) – redrawn by author (2012)

White proposed a desirable Nairobi as one with between 200,000 -300,000 inhabitants (Thornton White et al, 1948, p. 42). According to the team Nairobi by then had no so much intricate problems as sufficient land was still in the hands of authorities, hence they proposed for it a zoning plan which was meant to give form and assign functions to different areas, to which the new road system was to act as its firm skeleton (Thornton White et al, 1948, p. 4).

According to the plan 4.71% of the city had been reserved for major roads, that is trunk & circulatory (Thornton White et al, 1948, p. 57). Through it the city got big number of roundabouts which still exist today. What was seen as a sign of efficiency and fast handling traffic is today causing heavy traffic jams. The heart of the Master plan was a Civic centre depicted as an opened rectangle flanked by municipal and “cultural” offices with the present Law Courts at one end and a group of new Government buildings at the other; towards the hill, *Fig. 4.18*.



Fig. 4.18: The heart of the 1948 Master plan for a colonial capital depicting Nairobi as a civic centre

Source: (Thornton White et al, 1948, p. 56)

The Master Plan was aimed at reshaping Nairobi in order to create the conditions for the economic, social and political modernisation and development of the colony over 25 years (Thornton White et al, 1948, p. 1). It was also aimed at confining further growth within existing boundaries of the municipality. In other words, it was designing for containment rather than growth (Anyamba, 2006, p. 71).

Functionalism freed architecture from history. There was an influx of European architects setting up in the city leading to many great buildings (Loki, 2009, p. 50). The economy was booming –permitted building heights were raised, so that seven storied office blocks were very profitable investments. The 40's-50's saw almost frantic activity to consolidate the city centre with many dignified public buildings like City Hall (1956), Parliament (1954), the National Theatre (1952), and accelerated provision of expensive minority amenities happening.

The most far reaching effect of the 1948 master plan was that it took away the veto powers from the railway administration and bestowed the authority to City Hall (Tiwari, 1981, p. 129). Nairobi under Mayor Alderman Woodley was thus granted the City Charter on 13th March, 1950, by the Duke of Gloucester (Moss, 1999, p. 93). Another vital planning decision was the rerouting of the up-country railway out of town and its replacement with a 6-lane highway (Uhuru –opened in 1952) that saved the CBD from getting clogged further & protected the greenbelt below the hill (Moss, 1999, p. 93).

Very few of the Master Plan's proposals were implemented, in fact, none of the 50 neighbourhoods proposed for Nairobi were realised. It seemed that the

Master Plan was mostly used for political expediency, rather than as a tool for stimulating the urban process (Anyamba, 2006, p. 72). Creation of a CBD composed of administration and commerce increased the commuting of labour-force and transportation needs for goods, raising traffic chaos. The plan used road networks to implement class and race segregation. It also divided the road system into national/regional roads and main local roads based on existing plans with no provisions as regards cyclists for example (Emig & Ismail, 1980, p. 43). Nevertheless it saw increased use of industrial building materials like concrete, steel and glass and the principle of physical division and decomposition which however made planning to look conservative as much as it may have seemed liberal (Emig & Ismail, 1980).

4.2.2 POST-COLONIAL NAIROBI

At independence, Nairobi was situated within a vibrant economy and had a functioning city government. In fact, many of the housing estates and roads were built during the late sixties and the early seventies. The euphoria inspired by independence brought a new wave of construction activity resulting in many prestigious and bulky buildings. These filled spaces where hovels (shacks) and water filled holes had lurked for decades (Moss, 1999, p. 93).

In 1963 the boundary of Nairobi was extended to cover an area of approximately 266 square miles (686 Km²), *Fig. 4.13*. There have not been any major boundary changes since then but the city's functions have developed and expanded beyond. By this time Africans who formed a major part of the population lived in the Eastern parts, while Europeans and Asians lived in the Western suburbs. This position is reflected today not so much in

terms of race, but rather in terms of incomes as well as population densities. The people living in the western suburbs are generally the more affluent while the lower and middle-income groups of society dominate the eastern suburbs, consequently meaning better circulation arteries to the West compared to the East of Nairobi.

Table 4.2: Population of Nairobi from 1963 to 2009

YEAR	AREA (ha)	POPULATION	% INCREASE IN POP.	DENSITY (persons per ha)
1963	68,945	342,764	188.1	5
1969	68,945	509,286	48.6	7
1979	68,945	827,755	62.5	12
1989	68,945	1,324,570	60.0	19
1999	68,945	2,143,254	61.8	31
2009	68,945	3,138,369	146.4	46

Source: Adopted from (Olima, 2001, p. 3) & (GoK, 2010)

As the capital city of the newly independent state, the city council was now expected to serve all its 330,000 inhabitants with good roads, water (Hirst & Lamba, 1994, p. 143). It was now time for the new African ruling elite to deliver urban goods and services to the residents of Nairobi.

a) 1973 Metropolitan Growth Strategy (MGS)

This was crafted by the Nairobi Urban Study Group (NUSG), funded by the Nairobi City Council (NCC), the Kenyan Government, the World Bank and the United Nations and was expected to provide direction for the city's growth up to the year 2000. It had elements of Master Planning, Structured Planning and Action Planning but to date it remains largely unimplemented as there were no real statutory or legal enactments in its support.

The Strategy was towards consequent decentralization and the development of alternative service centres within the different districts of the city to reduce the high densities in the Central Area. The outlying secondary centres were anticipated to develop as major settlements independent of the city centre, having their own industrial, residential, commercial and administrative sub zones. Service centres would be located in relation to their potential catchment areas and near main roads and bus routes, which would also allow for the attraction of passing trade. The fact that almost 25% of the total trips were to be made on foot or bicycle showed the importance of having employment areas not far away from the residential areas.

The NUSG also developed the city's by-passes and link-roads concept as part of the MGS. They established the Northern, Eastern and Southern by-passes with a proposed link road between the Northern and Southern by-passes. The road corridor reserved for this purpose was 60M wide, but has since been the source of major contentions.

Under Appendix III, MGS set options for a growth strategy in order of preference (Emig & Ismail, 1980, p. 60). These were:

- (i) Lineal development linking Nairobi and Thika
- (ii) A new city at Thika
- (iii) Eastern Extensions to Nairobi
- (iv) Eastern Extensions to Nairobi and the development of Athi-River
- (v) Extension of Nairobi to the North-East and minimally West
- (vi) North and North-East Extensions to Nairobi
- (vii) A new city at Athi-River

Through a population forecasts by the Ministry of Lands and Settlements a continuation of growth was estimated, which brought up the eventuality that Thika and Nairobi could fall in the same metropolitan area, *Fig. 4.19*. Nevertheless, plans implementation was on an *ad-hoc* basis and lacked budgetary support from the city council and/or Government – thus never made significant impact on development in the city then.

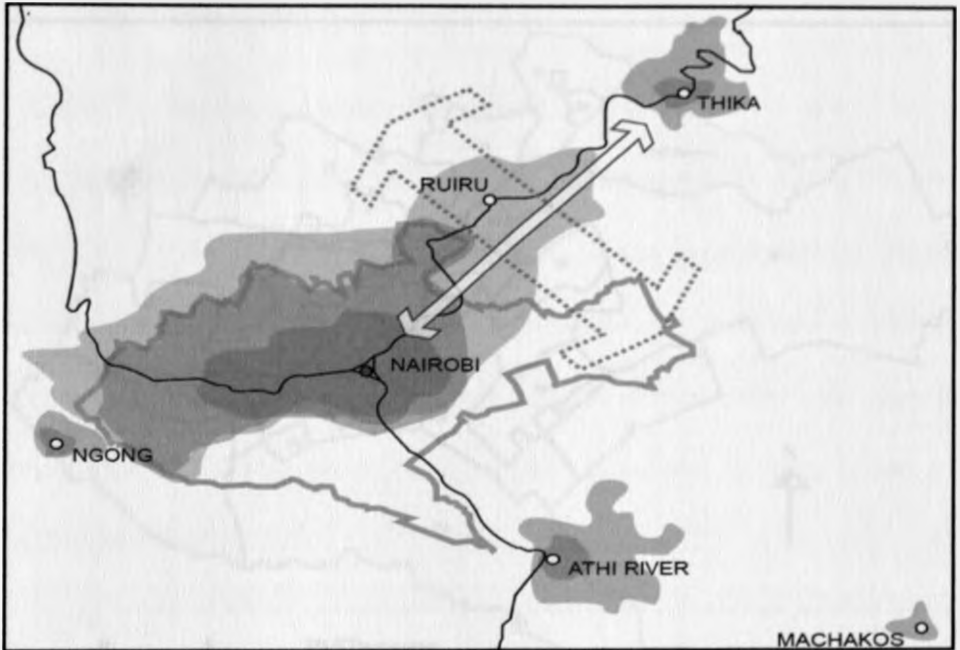
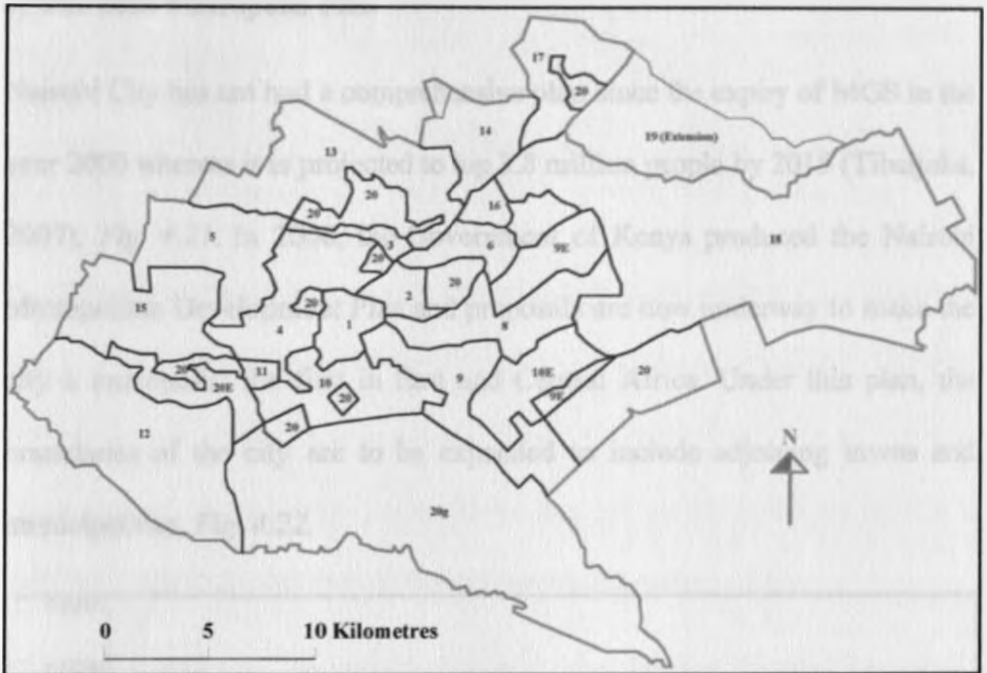


Fig. 4.19: Major transport axes of the city in the MGS decentralization plan
Source: *EthBasel files, 2008*

NUSG devoted considerable effort in laying out a traffic strategy proposing up to 18 lane roads in some areas. However, it has been observed that this do not necessarily solve the issues of traffic congestion, rather, they generate (Emig & Ismail, 1980, p. 67). The recommended hierarchy where key roads led to the centre introduced just a modified grid. The spreading of various urban functions in the ‘Decentralization Strategy’ did not bring integration, rather it extended urban problems to a larger scale and multiplied functional and social segregation (Emig & Ismail, 1980, p. 80).

b) The 1979 Rezoning Strategy

Under this plan, the city was classified into 20 zones with specified development densities, coverage's, and lot sizes, *Fig. 4.20*. Spatial development plans were evolved to cover all extended areas of the city proposed under MGS. This arrangement, meant development in the unserved areas could take place as long as there was alternative infrastructure provision.



*Fig. 4.20: Rezoning Strategy Plan -See Appendix I for zoning interpretation
Source: EthBasel files, 2008 (redrawn by author)*

This plan seemingly was not analyzed technically and went against some of the fundamental recommendations of the MGS. While the MGS had sought decentralised urban development, the 1979 rezoning strategy sought to intensify development within Nairobi and consequently advocated for more concentrated CBD redevelopment. The strategy allowed for higher densities and taller buildings within the city centre and its peripheries without an attempt to evaluate and or improve the urban infrastructure.

Restrictions became untenable and resulted to encroachment into areas designed for infrastructure and services - creating a future problem of getting infrastructure corridors. To date inadequate water supplies, technologically inadequate fire fighting services, relatively narrow and congested circulation channels, inadequate parking & recreational facilities and other urban inconveniences appear to be the obvious results of this plan²⁵.

e) The 2008 Metropolis Plan

Nairobi City has not had a comprehensive plan since the expiry of MGS in the year 2000 whereas it is projected to top 3.8 million people by 2015 (Tibaijuka, 2007), *Fig. 4.21*. In 2008, the Government of Kenya produced the Nairobi Metropolitan Development Plan and proposals are now underway to make the city a metropolis: the first in East and Central Africa. Under this plan, the boundaries of the city are to be expanded to include adjoining towns and municipalities, *Fig. 4.22*.

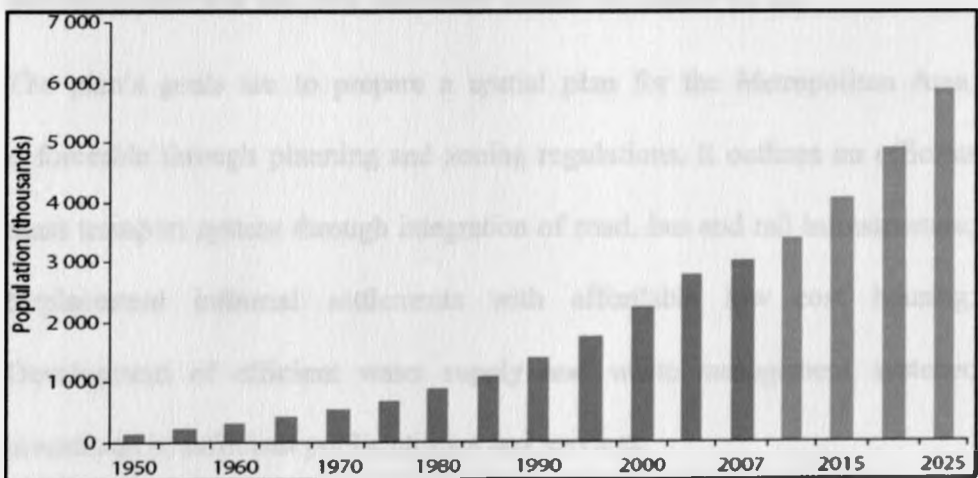


Fig. 4.21: Nairobi's historical and projected population, 1950-2025

Source: Source: KNBS 2008, as cited by (Tibaijuka, 2007, p. 148)

²⁵ A Reappraisal of Urban Planning Processes as an instrument of Sustainable Urban Development and Management (Nairobi Oct. 1994), United Nations Centre for Human Settlements, Edited by A.C. Mosha, University of Botswana, pg. 45

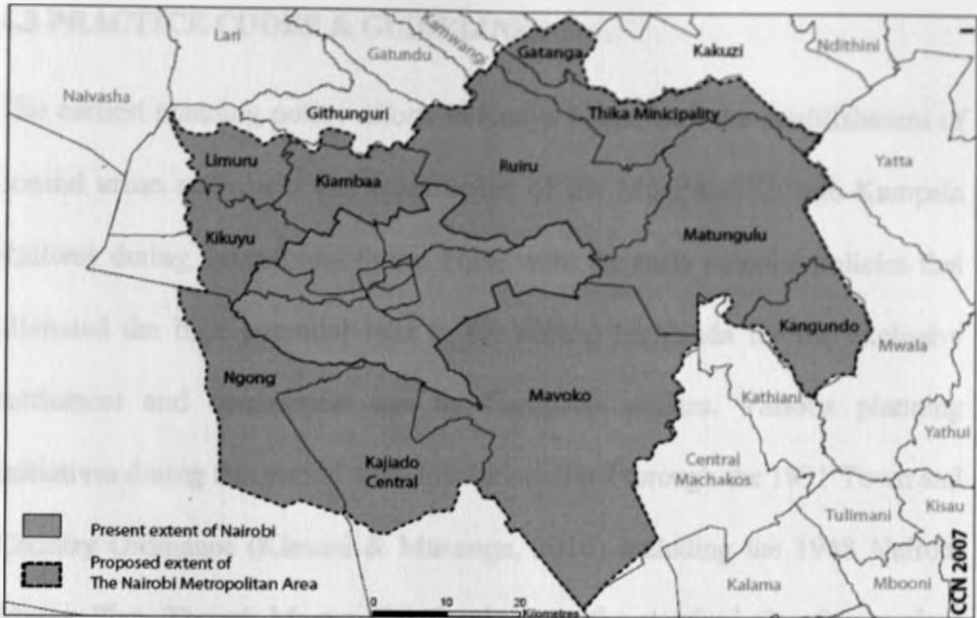


Fig. 4.22: Present and proposed extent of the Nairobi Metropolitan Area
 Source: (Tibaijuka, 2007, p. 157)

The footprint of the city’s growth has been with time defined in at least two ways — the official boundaries and the actual changes in settlement. Much of Nairobi’s urban footprint is unplanned driven by rapid population growth and urban poverty, among other things. Sprawling settlements handicap the city’s delivery of services and thus negatively impact the quality of life.

The plan’s goals are to prepare a spatial plan for the Metropolitan Area, enforceable through planning and zoning regulations. It outlines an efficient mass transport system through integration of road, bus and rail infrastructure; Replacement informal settlements with affordable low cost housing; Development of efficient water supply and waste management systems; investment in sufficient public utilities and services.

This plan is still at the initial stages and thus has only been embraced through the creation of the Ministry of Nairobi Metropolitan. Its actual blue-print is yet to come out and currently there are many different proposals in public domain.

4.3 PRACTICE CODES & GUIDELINES

The earliest planning policy efforts in Kenya began with the establishment of coastal urban settlement and construction of the Mombasa-Kisumu-Kampala Railway during the colonial times. There were the early colonial policies that alienated the high potential land in the central highlands for the exclusive settlement and commercial use by European settlers. Various planning initiatives during this period were institutionalized through the 1931 Town and Country Ordinance (Kimani & Musungu, 2010) including the 1948 Nairobi Master-Plan. Though Master Planning became the standard planning method in major townships and municipalities, it was found to be rigid, time consuming and lacked an implementation framework.

The post colonial era on the other hand witnessed largely the development of urban and regional planning through deliberate development of policy documents. Kenya was a British Colony; hence most of the spatial planning concepts, land use planning tools, instruments and practises are related. This, it is argued has practically failed to appreciably influence land development patterns in the rapidly urbanising city with most of the urban planning tools turning out to be inefficient or inappropriate to local conditions especially due to institutional, social and economic reasons. In addition, planning institutions have generally been powerless to influence town growth and development activities (Olima, 1993).

4.3.1 Planning Structure

The planning structure in Kenya is a two-tier system reflected in its functioning between the Central Government and the Local Government. The

local government is manifested in various cadres of local authorities, town, municipal and county councils but in most cases the central government has the final say in various aspects of policy especially land-use. Fig. 4.23 below shows administrative planning hierarchy at the CCN.

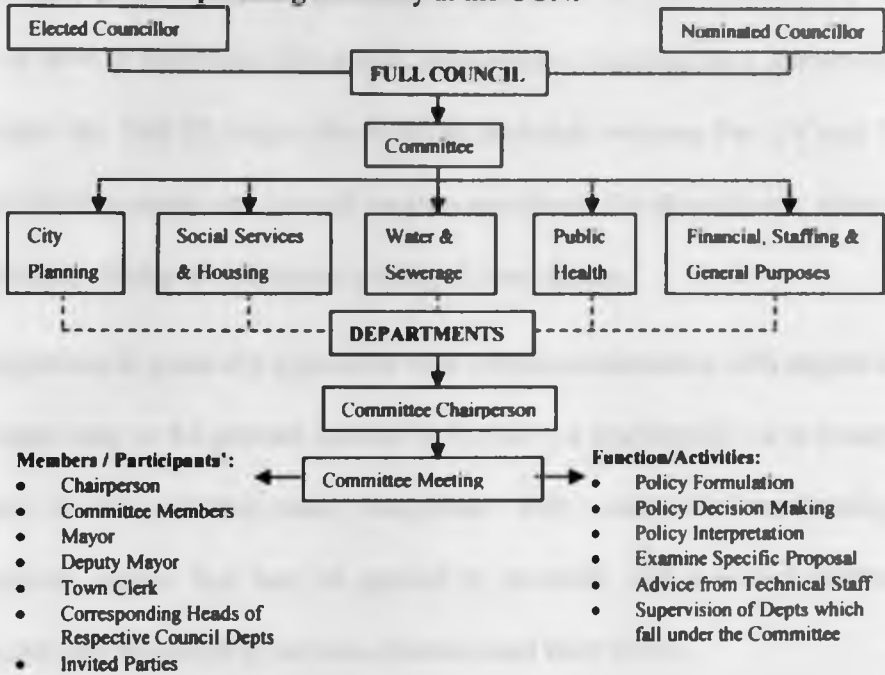


Fig. 4.23: CCN Council and Committee Structure
Source: (Olima 1993)

4.3.2 Tools for Development Control

Initially, the Master Plan and the Building Code were the main development control tools until after the preparation of the MGS where it was found necessary to examine the city's development with a view of determining the implementation of the said strategy, thus the zoning plan that is in place today.

a) The Building Code

The Building Code also referred to as the '*Local Government (Building) By-Laws 1968*' as set in the Local Government Regulation 210 of 1963 was lastly revised in 1997. The Code is meant to be the adoptive building by-laws which any municipality or county council in Kenya may adopt (GoK, 1997, p. 9).

The code has several sections each targeting a particular issue for example; Part I which is the introduction stipulates the citation and the code of interpretation regarding application of By-laws –Plans, notices and fees. Part II sets out regulation regarding the siting and space about buildings, that is: space in front of buildings, side spaces, accessibility, building lines, waivers as to heights etc. Part III targets the building materials whereas Part IV and V targets advertisements and general issues respectively like demolitions, extend of canopies, closing of streets and paving of open spaces.

The regulation is generally applicable with undue consideration with regard to population size or the general context be it a city, a municipality or a county council. It also creates many loop-holes with many sections bearing '*exemptions clause*' that may be granted by councils, and does not address adequately the relationship between channels and built-forms.

b) Zoning Regulations

This is a product of the Department of City Planning as a guide to Nairobi City Development Ordinances and Zones as per the 1979 rezoning strategy. It acts as a guide to aspects of the development ordinances that every development in the City is required to uphold – be it residential, commercial, industrial, institutional or religious. Its establishment was meant to ensure that development is allowed only where it is needed, while ensuring that the character and amenities of the area are not adversely affected in the midst of continued high rate of urbanization. It classifies the city into 20 zones (CCN, p. 2) based on geographical areas with relevant departmental reference maps; *see Fig 4.20 and Appendix II*. It also shows the percentages of permitted

Ground Coverage (GC), Plot Ratios (PR) and the type(s) of developments allowed. A general minimum zone plot size is also stipulated and the general policy issues elaborated.

Issues pertaining to circulation channels have been conspicuously left out. Nevertheless, this is the closest that planning has come into addressing the relationships between building heights and plot coverage. The intention of these regulations was to curtail inappropriate illegal developments but they are rarely enforced if not marginally (Kimani & Musungu, 2010). Their effectiveness is hampered by among others, the lack of capacity to inspect and implement plans, lack of relevant supportive systems for effective enforcement and general lack of resources.

Some of the other statutes that have a bearing on the thesis subject matter include the Government Land Act, Public Health Act, Environment Management and Coordination Act (EMCA), Roads Act and Way-leaves Act among others. The design of the street is therefore governed by different standards implemented by different agencies causing it to lack overall design objectives.

c) Circulation Channels

Currently, road transport is the predominant mode of transport and carries about 93% of all cargo and passenger traffic in the country, which is a replica of what is experienced in the city (Media, 2011). Roads in Kenya are classified according to size and purpose for ease in planning, design, administration and usage as shown in *Table 4.3*. Currently, almost all urban roads fall under the unclassified category 'U'.

Table 4.3: Cadres of road classes in Kenya

ROAD CLASS	NAME, TYPE OR NATURE/EXAMPLE
International Trunk Roads (Class A)	Links centres of international importance <i>A2: Nairobi-Thika and A104: Mombasa – Malaba Border</i>
National Trunk Roads (Class B)	Link nationally important centres <i>JKIA Spur (4 km)</i>
Primary Roads (Class C)	Link provincially important centres <i>Juja-Gatundu-Karinga-Fly Over Road</i>
Secondary Roads (Class D)	Link locally important centres – <i>Peponi Rd. D 478</i>
Minor Roads (Class E)	Any link to a minor centre – <i>Lower Kabete Rd. E 422</i>
U (Unclassified)	All other public roads and urban streets – <i>Moi Avenue</i>

Source: (Media, 2011)-Table constructed by author

There is an on-going review on road classification based on quantifiable parameters i.e. traffic quantity, population served and road width. The proposed System sees Kenya's road network as composed of the Rural Roads (outside cities and municipalities) and the Urban Roads (within cities and municipalities) for all public roads with 9m or more road reserves. The system also proposes the introduction of super highways class 'S' roads to accommodate future motorways and express-ways re-orientating classification system towards functional concepts of relative mobility and access inherent in the standard arterial/collector/local groups (Wakori, Davey, & Robin, 2008).

Residents have expressed profound concern that the developments in the city are being carried out without commensurate upgrading of the existing level of infrastructure (Mwaura, 2006, p. 3). According to Department of Resource Surveys and Remote Sensing (DRSRS 1994)²⁶, the following *Table 4.4* represents city's land uses.

²⁶ See (CCN, 2006, p. 24)

Table 4.4: Land Use of Nairobi Metropolitan Area, 1994

LAND USE TYPE	AREA (KM ²)	COVER (%)
Residential areas	175.6	25.22
Industrial/commercial/service centres	31.8	4.57
Administration & Commercial (or CBD)	2.8	0.40
Infrastructure (Roads, railways, airports, sewage plants)	15.9	2.28
Recreation	12	1.72
Water Bodies and Riverine Areas	11.8	1.69
Urban Agriculture	96.8	13.90
Open Lands	198.8	28.55
Others	153.6	22.06

Source: DRSRS

Table 4.4 shows patterns of land uses by the year 1994 where 2.28% of land remained in use by all infrastructure networks; note that according to the 1948 master plan 4.71% of urban land had been dedicated only to major road infrastructure networks to serve a population of 300,000 people, Fig. 4.24.

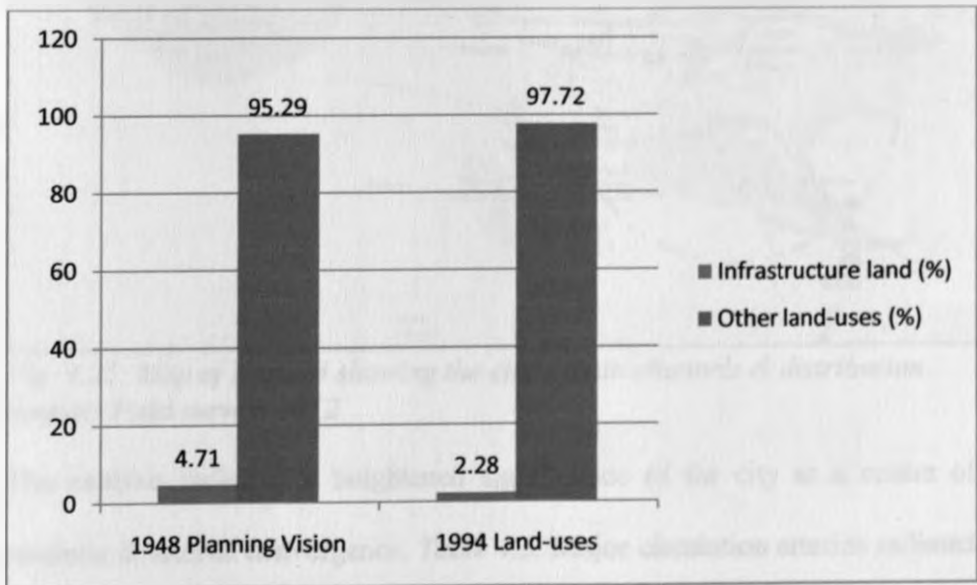


Fig. 4.24: Infrastructure and general land uses

Source: Author, 2012

4.4 OVERVIEW TO ANALYSIS

4.4.1. City-Scale Analysis

Since her foundation, Nairobi's growth has never been limited to the railway but has significantly been contributed to by an array of conditions, especially the strong road links she developed with other neighbouring 'satellite' towns through interconnecting principal channels. Some of these links are: Nairobi – Nakuru Road (A 104), Nairobi - Mombasa Road (A 104) and Nairobi – Thika Road (A 2), *Fig. 5.1 & 5.2*. At city scale and regional levels, Nairobi acts as the central point where journeys begin to destinations all round the country and is itself the country's primary destination.

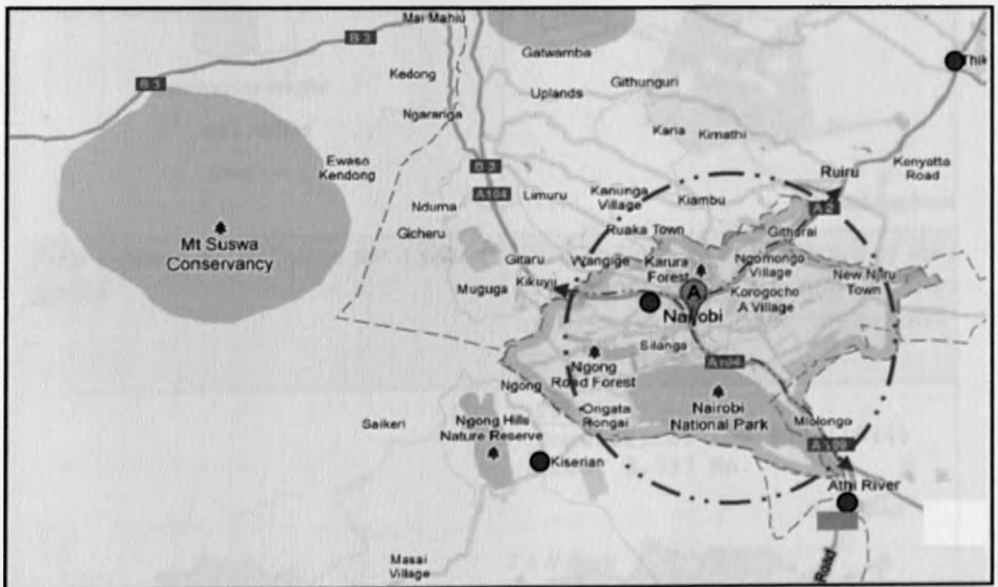

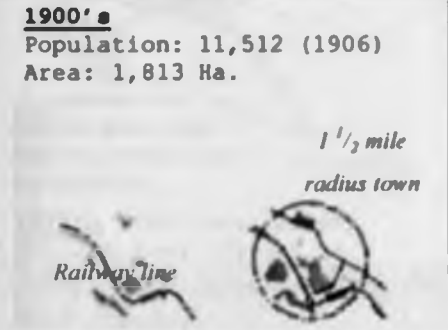

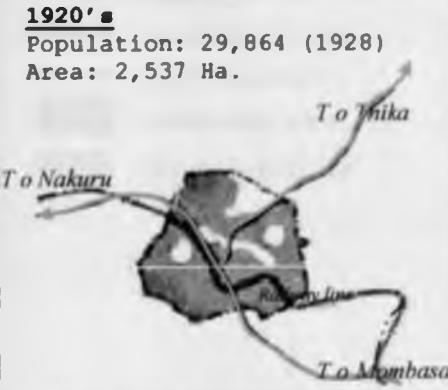
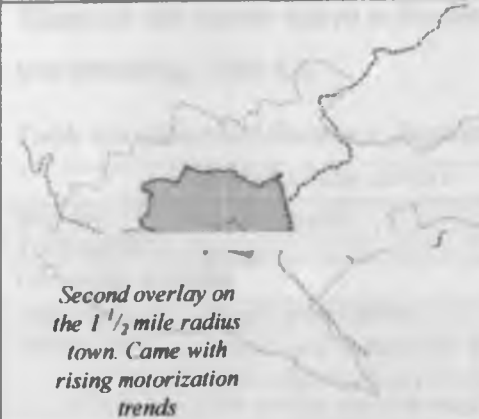
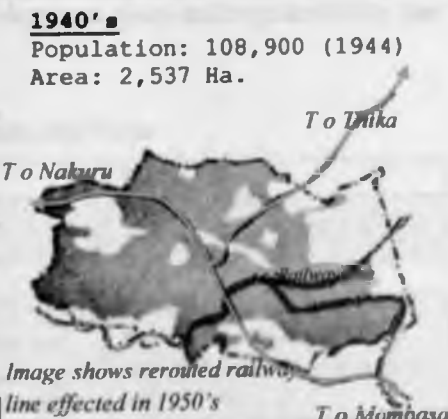
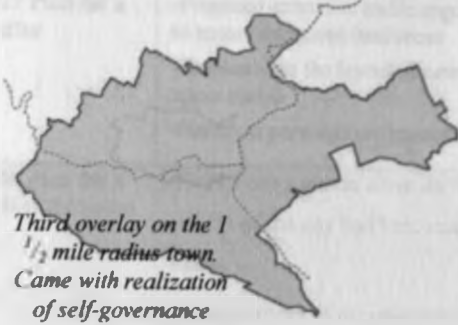









Fig. 4.25: Map of Nairobi showing the city's main channels & distribution
Source: Field survey, 2012

The analysis indicates a heightened significance of the city as a centre of modular & arterial convergence, *Table 4.5*. Major circulation arteries radiated from the central core i.e. the original 1¹/₂ Mile radius centre attracting developments which with time consolidated to a major urban quarter.

Table 4.5: City-scale impact of circulation arteries on the urban form

GENERAL URBANIZATION AND REVIEW OF BOUNDARIES	URBANIZATION ALONG CIRCULATION ARTERIES
<p><i>To Nakuru</i></p>  <p><i>1 1/2 mile radius town</i></p> <p><i>To Mombasa</i></p>	<p>1900' s Population: 11,512 (1906) Area: 1,813 Ha.</p>  <p><i>1 1/2 mile radius town</i></p> <p><i>Railway line</i></p>
<p><i>1899 Foundation –KUR reaches Nairobi: 'old city' of 1 1/2 mile radius</i></p>	<p><i>1900's: Relationship between arteries & build areas begin to show</i></p>
 <p><i>First overlay on the 1 1/2 mile radius town</i></p>	<p>1920' s Population: 29,864 (1928) Area: 2,537 Ha.</p>  <p><i>To Thika</i></p> <p><i>To Nakuru</i></p> <p><i>Railway line</i></p> <p><i>To Mombasa</i></p>
<p><i>First expansion: 1927 plan for a settler capital</i></p>	<p><i>1920's: Note the convergence of the three main roads, the railway, the towns emerging build areas and city's expansion</i></p>
 <p><i>Second overlay on the 1 1/2 mile radius town. Came with rising motorization trends</i></p>	<p>1940' s Population: 108,900 (1944) Area: 2,537 Ha.</p>  <p><i>To Thika</i></p> <p><i>To Nakuru</i></p> <p><i>Railway line</i></p> <p><i>To Mombasa</i></p> <p><i>Image shows rerouted railway line effected in 1950's</i></p>
<p><i>1948 Master Plan for a colonial capital</i></p>	<p><i>1940's: Expansion of the city</i></p>

 <p>Third overlay on the 1 1/2 mile radius town. Came with realization of self-governance</p>	 <p>The expansion was extensive hence large packets of unbuilt areas To Mombasa are noticeable</p> <p>1970' (1969) Population: 509,286 Area: 68,945 Ha.</p>
<p>1963 Boundary expansion: Post-independence plan</p>	<p>1970s: More expansion along the N&W channels</p>
 <p>Fourth overlay on the 1 1/2 mile radius town. Proposes a metropolis and Nairobi - Thika linear growth</p>	<p>KEY :</p> <ul style="list-style-type: none">  Railway  Principal roads  City boundary  Urbanised area  City's overlays
<p>1973MGS: link roads and by-passes were proposed under this plan</p>	

Source: Based on (EthBasel files, 2008) & (Gattoni & Patel, May 1973, p. 5)

These are also closely linked to the development plans and regularisation that was prevailing, Table 4.6.

Table 4.6: Historical Summary: Regulation and Form

	CIRCULATION ARTERY	FORM
BEFORE FOREIGNERS	-Transient paths	-Manyatta
COLONIAL NAIROBI		
1906 Plan for a Railway Town	<ul style="list-style-type: none"> -Largely non-motorized -Main circulation channel was govt road -Laid 21.3M wide roads (9.1M carriage, 6.1M on either side for drainage/line of trees) -Municipality took over roads role in 1921 -Used as boundaries 	<ul style="list-style-type: none"> -Wooden/ corrugated iron-sheet structures -Zoning happened by chance/choice (segregation) -Characterized by Indian shops with living quarters behind

1927 Plan for a Settler	-Proposed extensive traffic regularizations to access increased land areas -Emphasis on the layout of new roads (for upper class) -Based on personalised transport	-Advocated for town beautification, building and density regulation
1948 Plan for a Colonial Capital	-Road system was to act as its firm skeleton (4.71% of the city had been reserved for roads) -Saw rerouting of the up-country railway and its replacement with a 6-lane highway	-Based on Functionalism/zoning, neighbourhoods units - Raised permitted building heights -Saw use of Industrial building materials: concrete, steel, glass -Targeted industrial investments
POST-COLONIAL NAIROBI		
1973 Metropolitan Growth Strategy	- 25% of the total trips were to be made on foot/bicycle -Proposed city's 60M wide by-passes and link-roads, and up to 18 lane roads in some areas	-Decentralization plan -Proposed lineal development
1979 Rezoning Strategy	-No clear proposal to improve the urban infrastructure	-City was classified into 20 zones with specified development densities -Allowed for higher densities and taller buildings within the city centre
2008 Proposed Metro Plan	-Outlines an efficient mass transport system	-To be enforced through planning and zoning regulations
OTHER LIGISLATIONS		
<ul style="list-style-type: none"> ▪ Government Land Act, ▪ Public Health Act ▪ Physical Planning Act ▪ Environment Management and Coordination Act (EMCA), ▪ Roads Act ▪ Way-leaves Act ▪ Electric Power Act 		

Source: Author

4.4.2 Street-Scale Analysis

This section previews the local case-areas identified based on the criteria established under the research methodology. It offers contextual insights, thus acts as a spring-board into the analysis section. These are:

- (i) Moi Avenue -CBD
- (ii) Mumias South Road -Buru Buru

a) Moi Avenue -CBD

The CBD of Nairobi City is defined by four major circulation channels i.e. Uhuru Highway, University Way, Moi Avenue and Haille Sellasie Avenue as shown in *Fig. 4.26*. From the outset, a grid street was laid out, following the orientation of the railway line, *Table. 4.7*. The crossing of the northern part of Government Road (Moi Avenue) and Delamere Street (Kenyatta Avenue) later became the economic centre of the small town.



Fig. 4.26: Location of Moi Avenue

Source: (Kinuthia, 2011, p. 53) - Edited by author, 2012

This centre was slowly densified and the structures became permanent, with many small two or three storey Art Déco buildings. Many buildings along Moi Avenue still present colonnaded facades, especially in the northern section up to Khoja Mosque, which proudly bear their names and dates (Moss, 1999, p. 104) retaining a character evocative of the 1930's (Moss, 1999, p. 95).

Table 4.7: Railway authorities and train station as an urban engine

<p><i>1900: Station Road (later Government Road, today Moi Avenue) was the first connection between the railway station and the Protectorate Offices (British administration)</i></p>	<p><i>The crossing of the northern part of Government Road (Moi Avenue) and Delamere Road (Kenyatta Avenue) formed the economic centre of the small town</i></p>

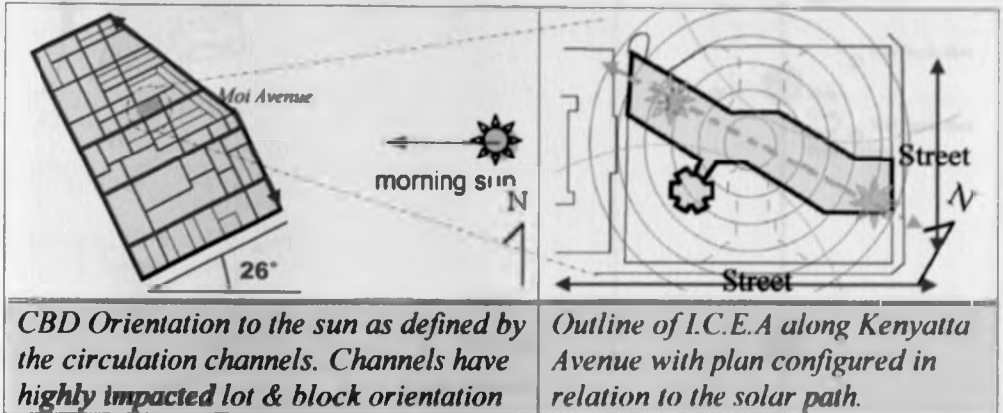
Source: EthBasel files, 2008 (Modified by author 2012)

Due to the nearly complete densification of the quarter around Government Road (Moi Avenue), the town expanded towards the west, *Table 4.7*. As a major East West connection, Delamere Avenue (Kenyatta Avenue) became the commercial and cultural centre of the city, with banks, hotels cinema halls and retail outlets. The new plots were much larger, laid out for high rise buildings and circulation arteries fit for motorized transport.

In almost all town planning schemes in tropical countries, attention has to be paid to orientation. It is obvious that for Nairobi correct orientation of roads and of the building sites themselves should have been the basis of correct architectural orientation. Originally, the orientation features of the city were the railway, the hill and the Nairobi River, putting CBD's orientation is at about 26° off the E-W orientation. Designers have now to grapple to protect facades against the direct impact of the sun through intelligent orientation or application of sun shading devices, which eventually impact on the urban

form, *Table 4.8*. Under solar conditions of Nairobi, streets running E-W or N-S would have provided simple and economical conditions to deal with.

Table 4.8: Urban Orientation: Channels impact on lot & block orientation



Source: Field survey, 2012

b) Mumias South Road -Buru Buru

Located approximately 7 KM east of the CBD, Buru Buru was designed by Colin Buchanan, Mutiso Menezes International and Paviz Agepour as part of Nairobi's Eastern extension proposed under the 1973 MGS plan (Anyamba, 2006). This project was a joint venture between the NCC, the GoK and the Commonwealth Development Corporation and was to be implemented in five phases from 1973-1984 as owner occupied middle income scheme.

The Mumias South Road corridor was designed as the Central Spine of Buru Buru neighbourhoods, *Fig. 4.27*. While the first developments (phase one and two) were designed without a building setback, phase four and five had a 9M building setback to the Mumias South Road corridor. The general organizing principle of the whole neighbourhood was to create introverted courtyards from which all houses were to be accessed via foot-paths, *Fig. 4.28*.

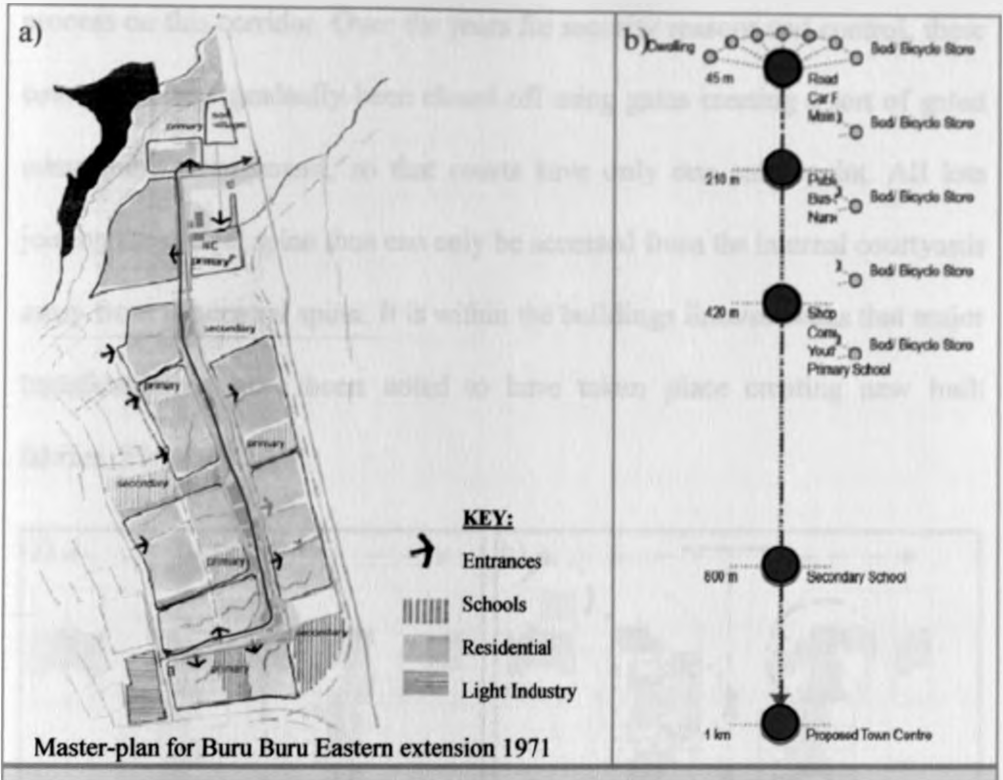


Fig. 4.27: Layout concept of Buru Buru with a Buru Buru services concept
 Source: Adapted from EthBasel files, 2008

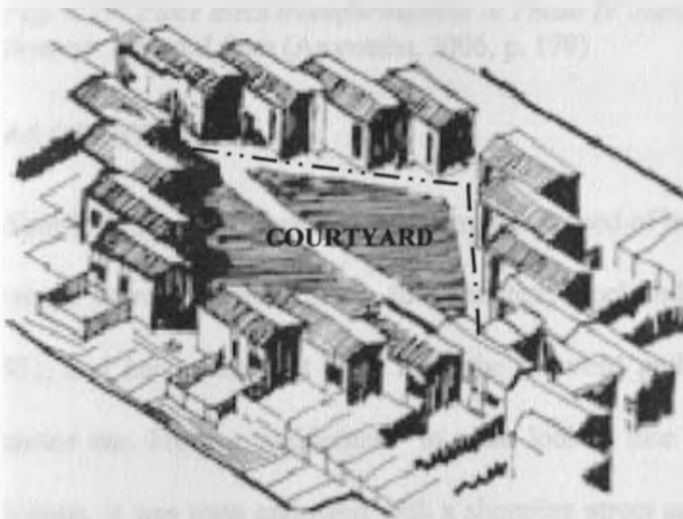


Fig. 4.28: Proposal for Buru Buru Phase II 1971
 Source: Adopted from EthBasel files, 2008

The courts were linked to the central spine via foot-paths, which were also meant to have commercial facilities and community amenities along it but were never realized. This omission advocated for an ad-hoc development

process on this corridor. Over the years for security reasons and control, these courtyards have gradually been closed off using gates creating a sort of gated community arrangement, so that courts have only one entry point. All lots joining the central spine thus can only be accessed from the internal courtyards away from the central spine. It is within the buildings lines/setbacks that major transformations have been noted to have taken place creating new built fabrics, *Fig. 4.29*.



Fig. 4.29: Piece meal transformations at Phase IV Junction
Source: Adopted from (Anyamba, 2006, p. 179)

4.5 CONCLUSION

Nairobi at present offers almost a complete record of her over 100 years life in wood, corrugated iron, brick, tile, concrete, steel and glass (Moss, 1999, p. 95), and her subsequent shift from the transient path to dominance by the motor car. From a 'wilderness' to what looked like an assortment of farm houses, it was soon endowed with a shopping street and a 'down town' area. Nairobi's internal spatial form however demonstrates the intentions of its builders first for a small town and secondly that it be a segmented city where the colonial elite interests came first. This formed the basis upon which a

skewed system of distribution of land, infrastructure (channels) and other resources was build.

In post-colonial Nairobi, urban form and for that matter her production and consumption of space remained basically colonial (Anyamba, 2006, p. 85) with increasing mismatch between the needs of the ever increasing population and the provision of public services and infrastructure. Proposed development plans have been observed to be prescriptive, deterministic, antiquated and without political and budgetary support. Prerequisite infrastructure such as roads widening and extensions for example in rezoned areas are generally never implemented to accommodate growth, with character of developments being demand-led instead of infrastructure-led. With passage of time, ratios of land areas under infrastructure to other land uses have been be reducing.

Planning in Kenya today still retains several similarities to historical British practice in as much as development is controlled by zoning maps. It is noted that much as Britain has sought services of CABE to beef-up her code, Kenyan code remains outdated and bears inherited, inappropriate provisions that are susceptible to multiple interpretations. Currently, there are many legislations governing the build-environment, and for that matter the street causing it to lack overall design objectives.

CHAPTER FIVE: FINDINGS & ANALYSIS

CHAPTER OUTLINE:

5.1 City scale analysis

- City's Planning and Growth Patterns
- Impacts of the Changing Character of Arteries on Urban Form
- Circulation Arteries and Informality

5.2 Street- scale analysis

- Moi Avenue
- Mumias South Road

5.1 CITY SCALE ANALYSIS

5.1.0 Introduction

Circulation arteries within the city present varied character reminiscent of their histories. There are sections for example where roads act as urban edges delineating two different zones, whereas in others they cut through delineated zones hence varied levels of enclosures. *Fig. 5.1 & 5.2* shows resultant character on sections along Thika road, Mombasa road and Lang'ata road.

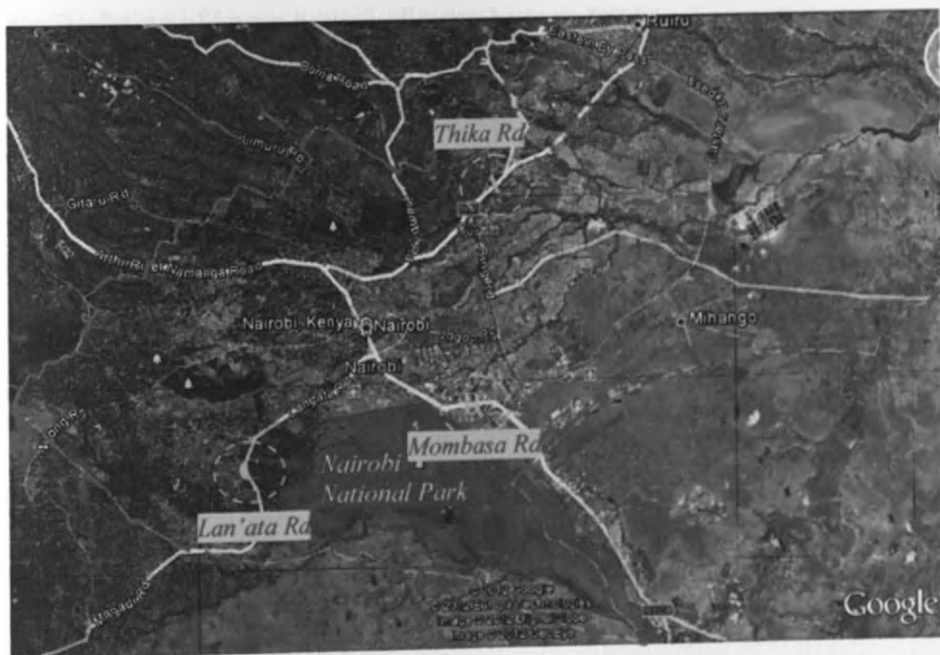


Fig. 5.1: Circulation channels and urban character, sections A,B & C
Source: Field survey, 2012 adapted from (Google, 2012)

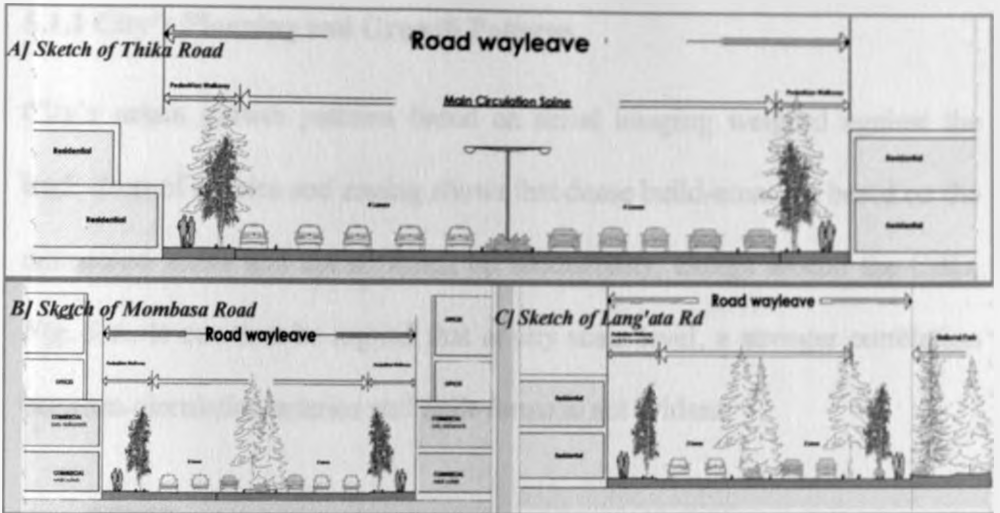


Fig. 5.2: Character of City's enclosures along main circulation channels
Source: Field Survey, 2012

Major circulations arteries radiate from Nairobi's central core and are observed to exit the city's boundaries at close proximity to places where we have the longest extrusions in the city's boundaries, *Fig. 5.3*. This is typically assumed to mean that greater extensions of the city's boundaries were motivated by increased accessibility. Historical urban regimes also present incremental accumulation of layers typical of many historic towns.

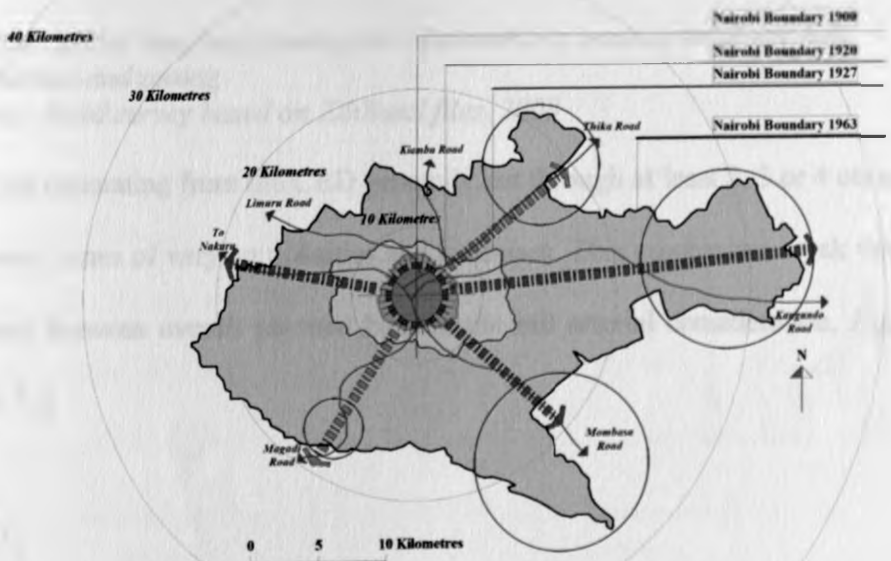


Fig. 5.3: Relationship of main arterial network and urban growth
Source: Field Survey, 2012

5.1.1 City's Planning and Growth Patterns

City's urban growth patterns based on aerial imaging weighed against the back-drop of arteries and zoning shows that dense build-areas are based on the delineated zones and not so much on accessibility, except around the CBD, *Fig. 5.4.* It can thus be argued that at city scale level, a stronger correlation between circulation arteries and built-forms is not evident.

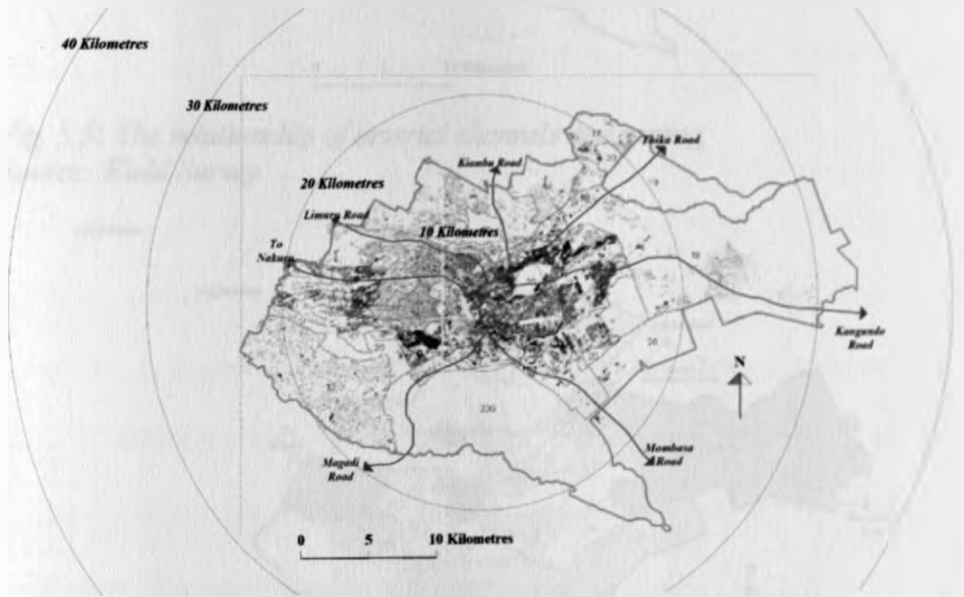


Fig. 5.4: Aerial imaging showing the relationship of main arterial network, build areas and zoning
Source: Field survey based on EthBasel files, 2008

Arteries emanating from the CBD generally cut through at least 2, 3 or 4 other different zones of varying densities and land-uses. This emphasizes weak ties existing between overall planned built-forms and arterial consideration, *Fig. 5.5 & 5.6.*

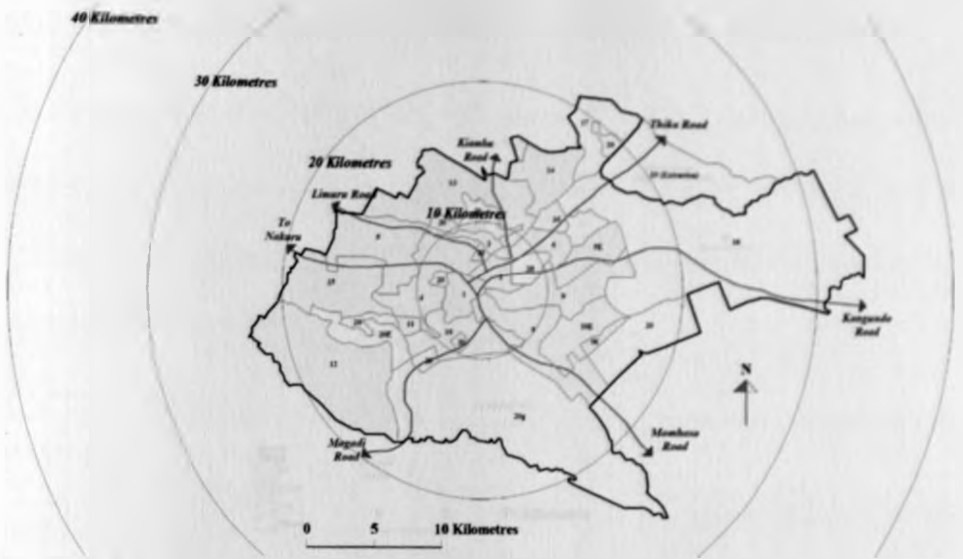


Fig. 5.5: The relationship of arterial channels and zoning
 Source: Field Survey

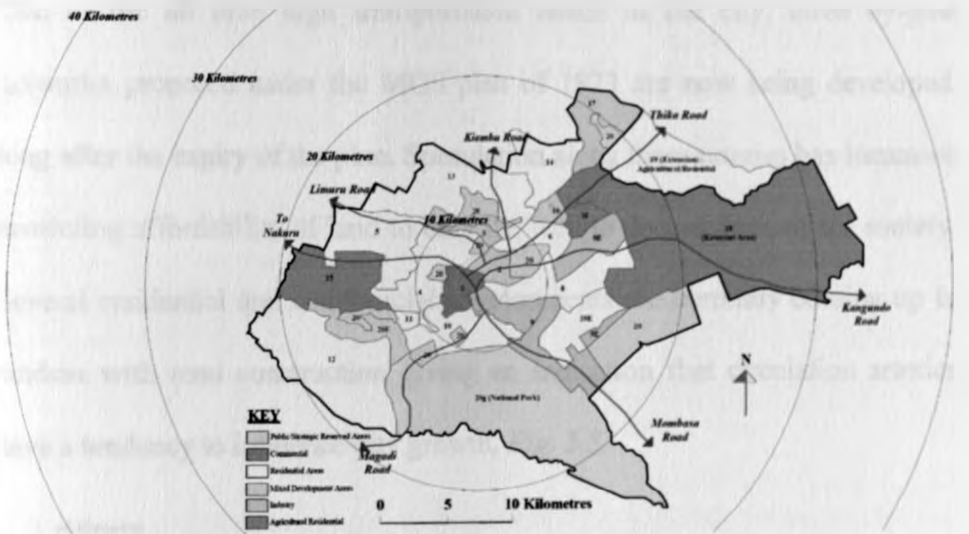


Fig. 5.6: Land-use and arterial channels
 Source: Field Survey, 2012

According to the zoning plan, lot sizes are based on zoning and just like the previous cases, it emerges that incompatibility exists where a channel for example cuts through zones where we have $\frac{1}{2}$ acre plots through areas where we have $\frac{1}{8}$ acre plots, Fig. 5.7. The effect of this is that the lot owner may not be able to adequately make use of the lot due set-back effects, especially where change of user policy demands surrender of part of the land.

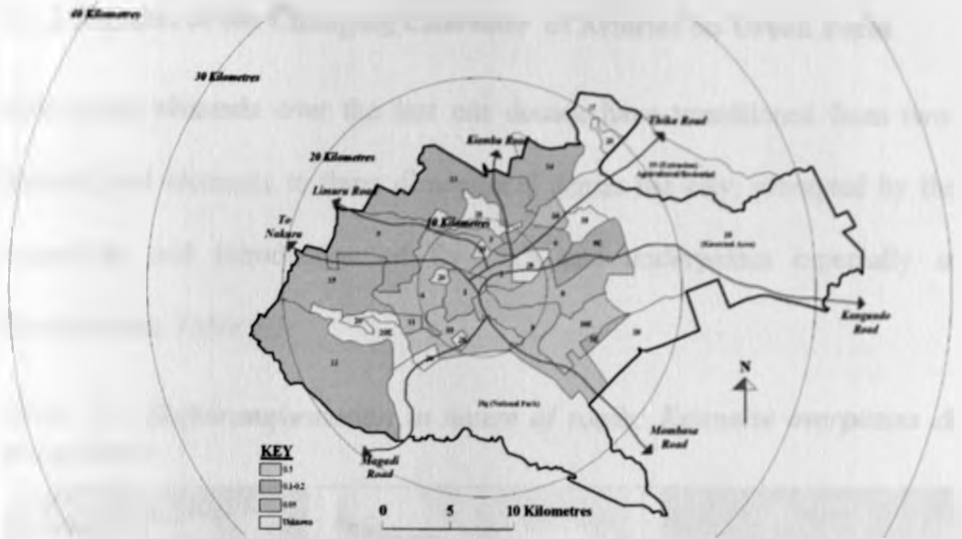


Fig. 5.7: Lot sizes and arterial networks
Source: Author

Due to the all time high transportation needs in the city, three by-pass networks proposed under the MGS plan of 1973 are now being developed, long after the expiry of the plan. Speculation along these arteries has increased restricting affordability of land to only the well to do members of the society. Several residential and commercial developments are currently coming up in tandem with road construction giving an indication that circulation arteries have a tendency to influence city growth, *Fig. 5.8*.

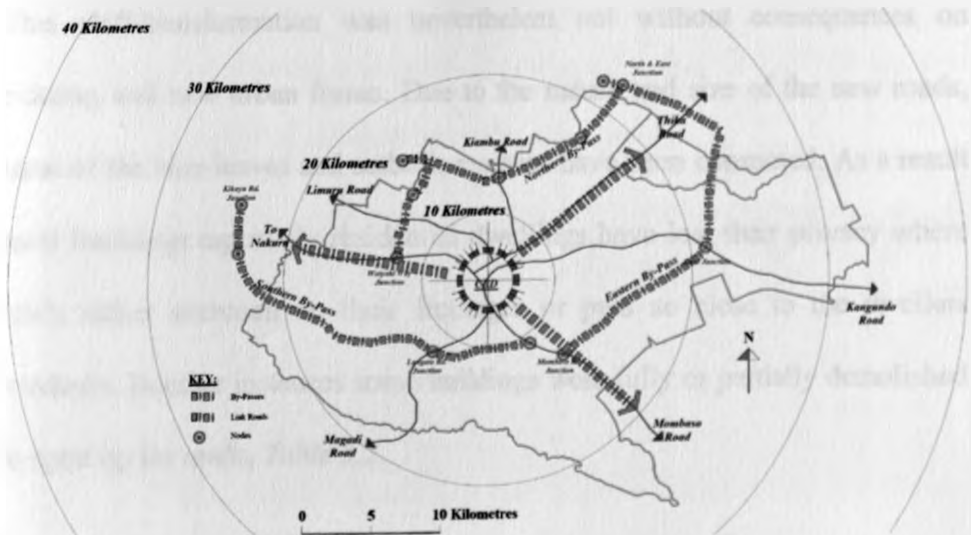








Fig. 5.8: Plan for City's By-passes and Link roads
Source: Author redrawn

5.1.2 Impacts of the Changing Character of Arteries on Urban Form

Circulation channels over the last one decade have transitioned from two-dimensional elements to three dimensional across the city, prompted by the expansion and introduction of fly-over's and underpasses especially at intersections, *Table 5.1.*










Table 5.1: Shift/transformation in nature of roads: Extensive overpasses & underpasses

		
<i>Murang'a rd. Junction</i>	<i>CBD Globe</i>	<i>Airport North rd.</i>
		
<i>Different sections of Thika road</i>		

Source: Field survey, 2012

This shift/transformation was nevertheless not without consequences on existing and new urban forms. Due to the nature and size of the new roads, most of the way-leaves and setback reserves have been consumed. As a result most buildings especially residential dwellings have lost their privacy where roads either encroach on their frontages or pass so close to the dwellers windows. In other instances some buildings were fully or partially demolished to open up for roads, *Table 5.2.*

Table 5.2: Encroachment and demolitions

a) Encroachment on privacy		
		
<i>Forest road fly-over's</i>		
b) Encroachment on Frontages		
		
<i>Museum Centre</i>	<i>Thika Road (Pangani)</i>	<i>Murang'a Road</i>
c) Demolitions		
		
<i>Forest road</i>	<i>Thika road (Pangani)</i>	<i>Thika road (Roosters)</i>

Source: Field survey, 2012

The developments, demolitions and encroachments along forest road can also be observed from aerial photos time series, *Fig. 5.9*.

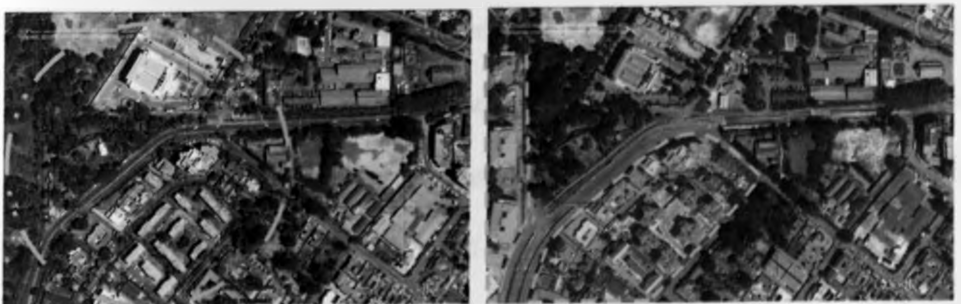


Fig. 5.9: Forest Road transformations and developments 2002&2011
Source: Field Survey, adapted from (Google, 2012)

Initially Mobil plaza shopping centre was located off Thika road, but the current expansion of Thika road has seen it encroached to after demolition of buildings that fronted it to pave way for road expansion. This shopping centre its bound to grow as it taps into the new opportunities, *Fig. 5.10.*

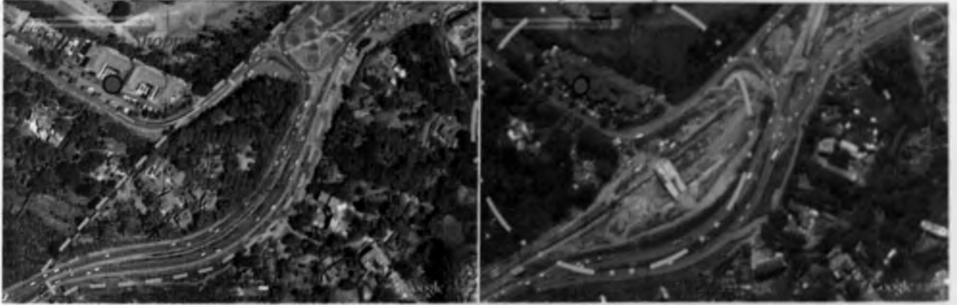


Fig. 5.10: Mobil Plaza Shopping Centre 2002&2011

Source: Field Survey, adapted from (Google, 2012)

The elimination of the round-about at Githurai is also beginning to transform her outlook from that of a node to a linear establishment, *Fig. 5.11.*



Fig. 5.11: Githurai round about in 2003 and in 2011 respectively

Source: Field survey, adapted from (Google, 2012)

Further, the expansion of Mombasa road seemed to have triggered opportunities that saw commercial and office block buildings thrive along it. The same is beginning to happen along Waiyaki Way with large companies like Safaricom and Deloitte setting base. The expansion of Thika road should be anticipated to follow the same trend or at least bear semblance, *Table 5.3.*




Table 5.3: Buildings Lining Circulation Channels

		
Buildings forms on different Sections of Mombasa Road		
		
Buildings forms on different sections along Thika Road		
		
Buildings forms on different sections along Ngong Road		

Source: Field Survey, 2012

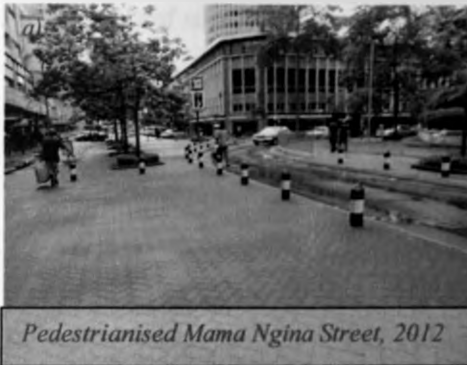
With modernity came globalisation that has seen massive bill-boards erected/displayed along the major circulation channels, either as stand-alone boards, mounted on buildings facades or on roof-tops, *Table 5.4.*

Table 5.4: Effects of globalisation

		
<i>Forest Road</i>	<i>Thika Road</i>	

Source: Field Survey, 2012

At more localised levels, population pressures and need for space for example in the CBD, has caused some of its streets to be pedestrianised and others converted from two-way to one way. This has been done to create more space for parking and walk-ways for pedestrians as in the case of Mama Ngina street and Biashara street respectively, *Fig. 5.12*.



Pedestrianised Mama Ngina Street, 2012



One-way Biashara Street, 2012

Fig. 5.12: Pedestrianisation & conversion of streets from two-way to one-way
Source: Field survey, 2012

5.1.3 Circulation Arteries and Informality

Over time, people have taken advantage of the available circulation reserves or way-leaves to put up informal structures. This comes in the form of informal markets, housing or even dumpsites. New structures quickly attract informality as in the case of Githurai overpass where underneath it is used as a makeshift market, *Table 5.5*.

Table 5.5: Circulation channels and informality



Road-side dumping along Juja road



Source: Field survey, 2012

5.2 STREET-SCALE ANALYSIS



1) –Moi Avenue in the CBD

Figure 5.13 shows the location of the two case areas and their disposition with reference to the different circulation channels



2) –Mumias South Road in Buru Buru

Fig. 5.13: Nairobi's road networks

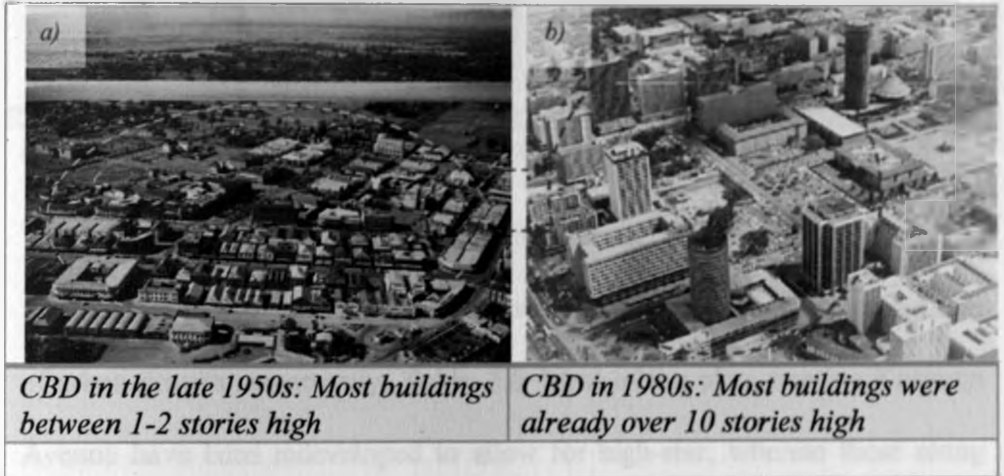
Source: Adapted from spatial information design lab Columbia

5.2.1 Moi Avenue - CBD Nairobi

City Planning has always ascribed importance to the CBD. From the outset, circulation channels defined the CBD, with the initial streets having been laid out following the orientation of the railway line, Fig. 4.26. The city's building process has been continuous, with the CBD having transitioned from a 1-2

storey urban precinct to high-rise over the last 50 years. Nevertheless there is observed constancy in the sizes of circulation channels through the different regimes, *Table 5.6.*

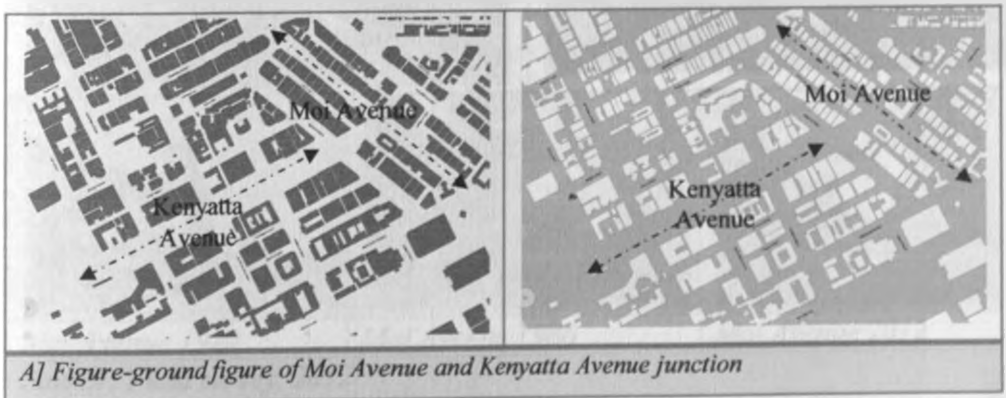
Table 5.6: Transforming urban developments in the CBD

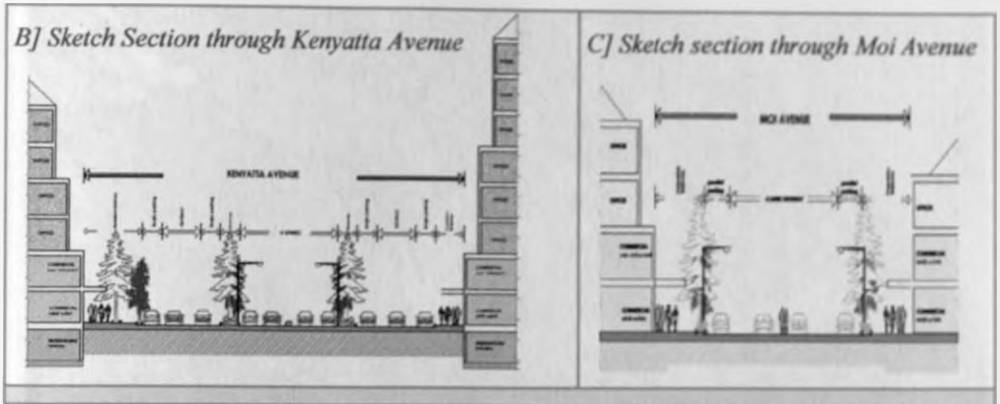


Source: Field Survey, 2012

Along Moi Avenue, there is a noticeable presence of hierarchic systems with the main streets and back streets. New plots to the West of Moi Avenue are also much larger and the circulation channels wider, *Table 5.7.*

Table 5.7: A comparison character of Moi Avenue and Kenyatta Avenue

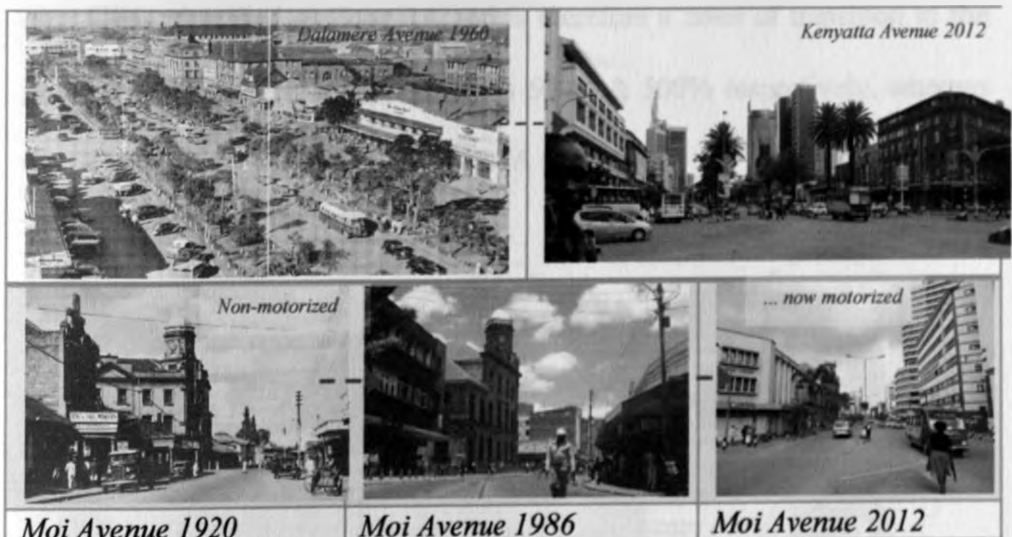




Source: Field Survey, (Maps adapted from JICA files)

This perhaps explains the disparities in channel widths between Kenyatta Avenue and Moi Avenue i.e. as products of motorized and non-motorized eras of urban growth respectively, *Table 5.8*. Most of the plots fronting Kenyatta Avenue have been redeveloped to allow for high-rise, whereas those along Moi Avenue have largely maintained their original character.

Table 5.8: Streets as products of motorized & non-motorized eras



Source: Field survey, 2012

Permitted land uses around this artery are mixed, that is commercial, residential and light industry. Just like the street itself, most of the plots fronting the street were developed during the non-motorized era of Nairobi and are therefore narrow with back-streets and a series of alleys, *Fig. 5.14*.



Fig. 5.14: Oblique view of Moi Avenue
Source: Field Survey, 2012

The 22M wide Moi Avenue is one of the circulation arteries that defines the core CBD identified as Zone 1A and is therefore a zone of transition to the peri-CBD. The current allowable PR is 600% & 500% respectively, whereas the GC is 80% for both, *Fig. 5.15 & 5.16*.

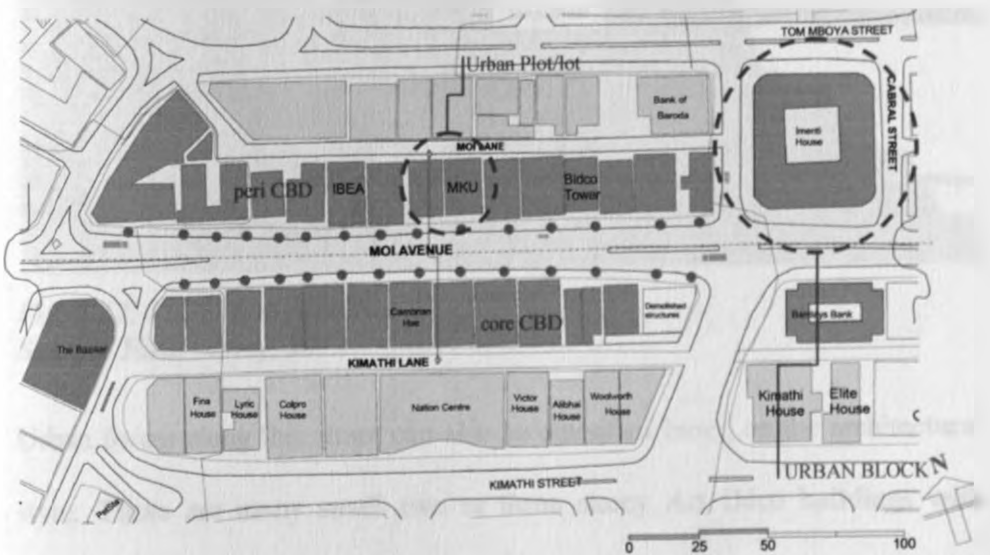
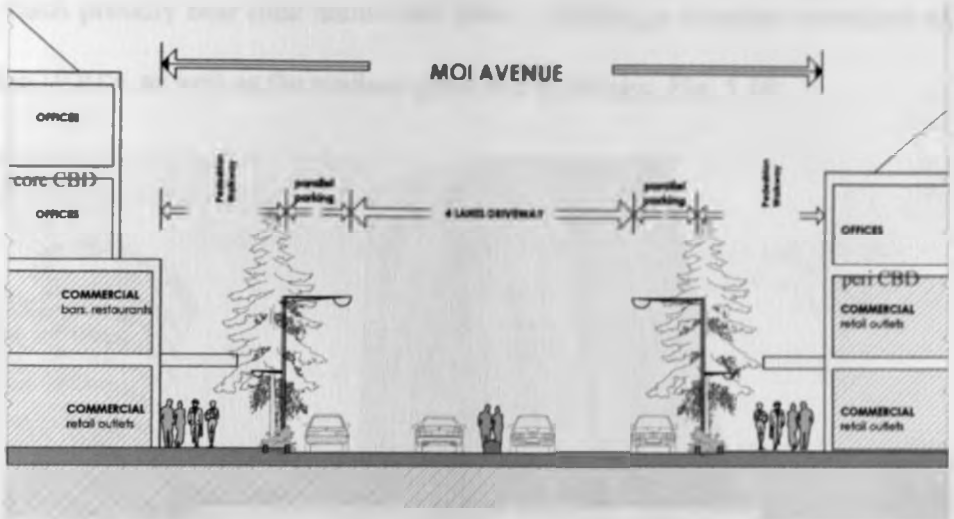
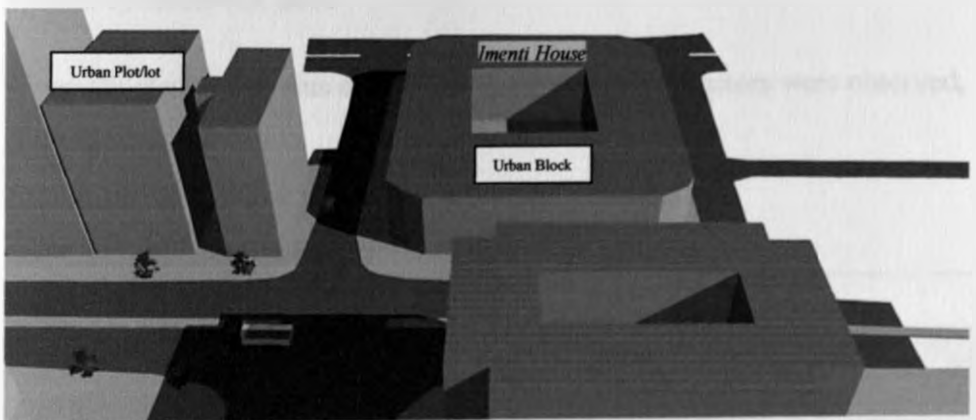


Fig. 5.15: A Section of Moi Avenue
Source: Field Survey, 2012



*Fig. 5.16: Schematic section S-01 through Moi Avenue
Source: Field Survey 2012*

Urban forms observable along this street can be clustered distinctly. Imenti House is morphologically an example of an urban block organized around a court while others like the Mount Kenya University Towers and IBEA building are basically organized in plots/lots, *Fig. 5.15 & 5.17.*



*Fig. 5.17: The Urban Block/lot
Source: Field survey, 2012*

Urban forms along this street can also be classified based on the architectural style. There are many small two or three storey Art Déco buildings with colonnaded facades, especially in the northern section up to Khoja Mosque,

which proudly bear their names and dates, retaining a character evocative of the 1930's, as well as the modern glass-clad buildings, *Fig. 5.18.*



Fig. 5.18: The 1930's Art-Deco buildings and the Modern glass-clad
Source: Field Survey, 2012

Along the stretch that was chosen for analysis, several factors were observed,

Table 5.9.

Table 5.9: Moi Avenue street-form relationships

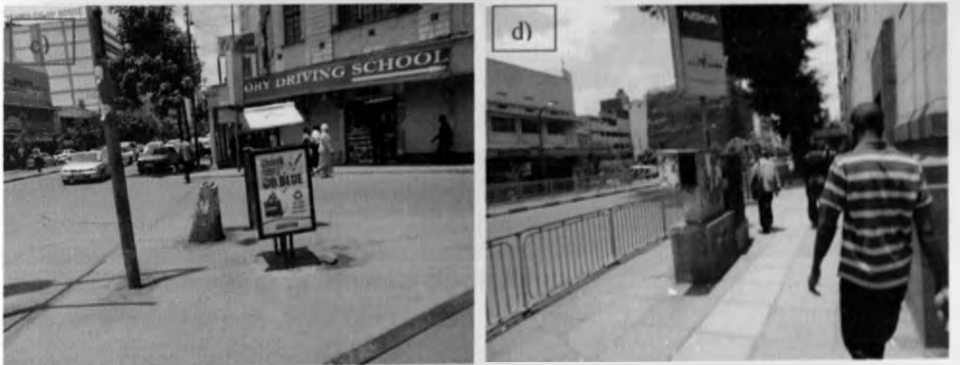
Street-Form Analysis	
	<p>A. Imenti House (Block) GC 81.2%, PR -243.5%</p> <p>B. Cambrian House (Lot) GC -95.1%, PR -285%</p> <p>C. MKU Towers (Lot) GC -80.9%, PR -1294.5%</p>
<p>Group forms typical of many historic towns is evident. Aesthetically, the rhythm, scale, proportions and harmony created by the historic structures in terms of architectural articulation is interesting except where modern buildings</p>	

have been erected, dwarfing the original structures, (a). The enclosure levels are adequate organized to small urban blocks, however the street is narrow and defined by narrow alleys and back streets often not in use as they are associated with insecurity. Accesses to buildings is thus majorly one-sided fronting the main street as well as facade articulation. Because of zoning, there is no gradual transition in the built environment (b).

Response to building regulations varies from building to building with many of the new modern buildings going beyond the provisions of zoning and the historic blocks being within the provisions of zoning.



The street is motorized with parking. Pedestrian walkways are provided but are narrow since its shared with planters and city's utilities, Vendors & Accessories, (c) & (d). There is no provision for cycling.



There is a prevalence of adverts or signages along the street deminishing legibility of urban forms as viewed from the streets, (e), (f) & (g).



5.4.2 Planned Settlement –the case of Buru Buru

Buru Buru falls within Zone 8 of the CCN zoning map where Plot Ratios (PR) of 2.5, Ground Coverage (GC) of 50% are allowed. Residential/mixed-use development are permitted in different areas. The Mumias South Road corridor was designed as the Central Spine of the Buru Buru neighbourhoods from Phase I-V, Fig. 5.19.

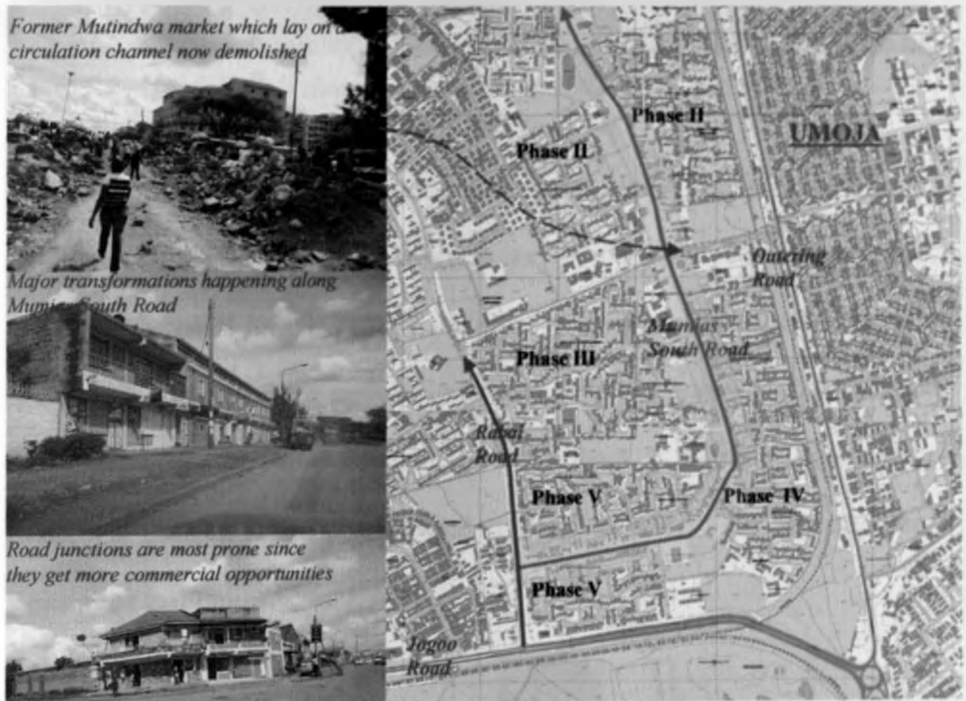


Fig. 5.19: Prominence of Mumias South Road
Source: Field Survey, 2012

The spine was meant to have commercial facilities and community amenities along it but were never realized. This omission advocated for an ad-hoc development process along this corridor where individual plot owners used them to develop additional space, opening into the spine to maximize on economic potentials of lots. Originally, all lots joining the Central Spine could only be accessed from the internal courtyards away from the central spine.

Most spaces initially left vacant along the main spine are now being redeveloped with private and community facilities taking over, hence reshaping Buru Buru's image, *Fig. 5.20*.



Fig. 5.20: Buru Buru's changing image from 2002 -2011 respectively
Source: Field survey, adapted from (Google, 2012)

Apart from the national library, new ventures along the spine have been commercialized (many informally) so as to maximize on the economic potential inspired by the lack of sufficient space to ensure a self-sustaining community amidst rising population pressures. It was however observed that transformations in Phase I where the 9M setback is inexistent are largely happening within the loop, compared to Phase V, where they are happening along the main spine, *Fig. 5.21*.



Fig. 5.21: (a) Mumias South road Phase V & (b) Loop Road, Phase I
Source: Field survey, 2012

For analysis, the portion of Mumias South road cutting through Phase V was chosen to show-case the impacts of circulation arteries on urban form. *Fig. 5.22.*

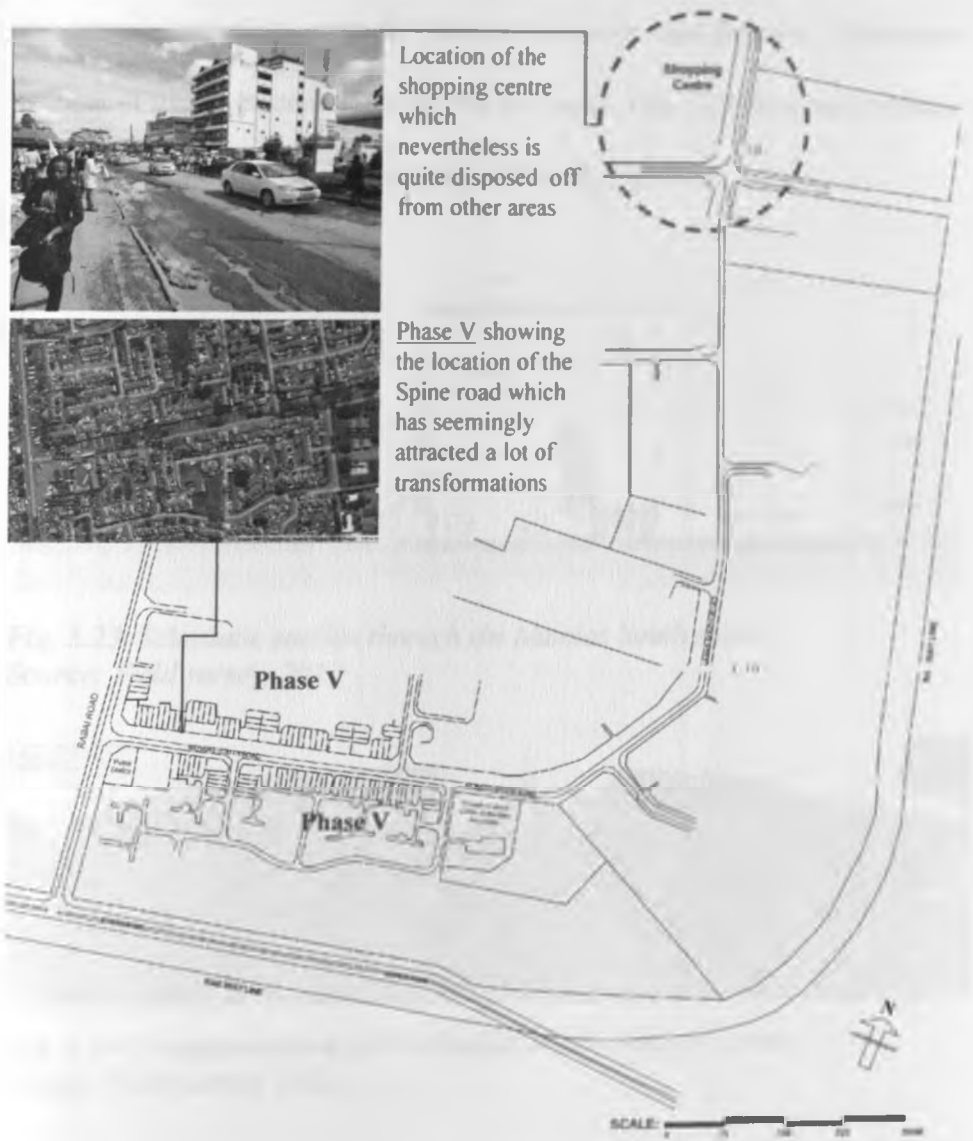


Fig. 5.22: Buru Buru's Main Circulation Spine
Source: Field Survey, 2012

The emergence of ribbon developments along primary and secondary streets led to proliferation of business centres and informal economic activities beyond areas designated as commercial zones.

Salient feature of emerging informal shopping/business spaces is the association between urban fabric and social structure. The shopping spaces are dislocated towards the new shopping complexes, a bit further from residents encouraging growth of secondary shopping areas to meet the need. This occurs in form of illegal extensions to the 9M set-backs, Fig. 5.23, in some instances with balconies overlooking Mumias-South road, Fig. 5.24.



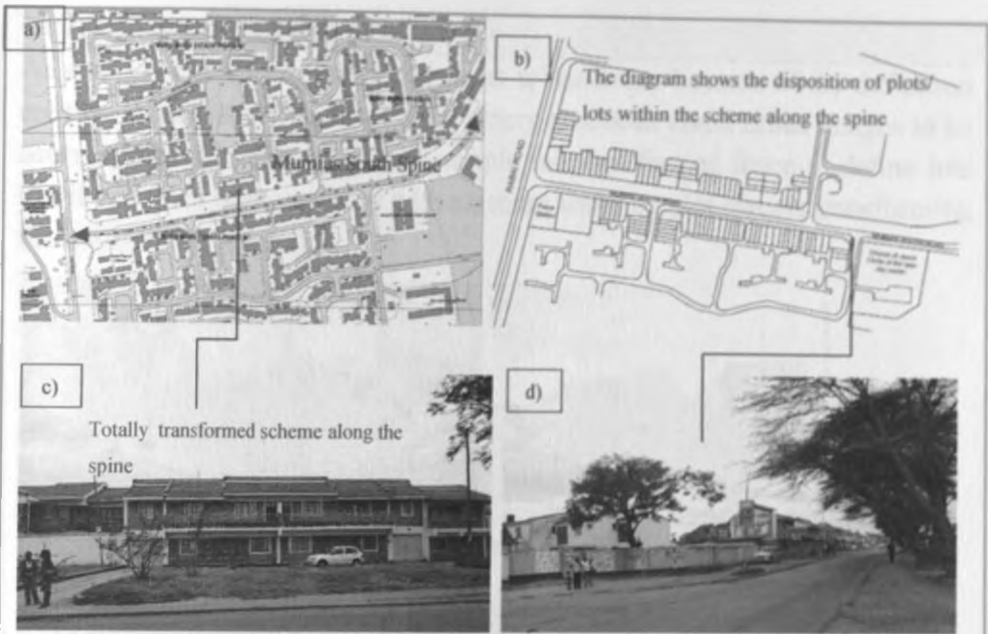
Fig. 5.23: Schematic section through the Mumias South spine
Source: Field survey, 2012



Fig. 5.24: Transformations with balconies overlooking the spine
Source: Field survey, 2012

Table 5.10: Mumias South Street-form relationship

Analysis
<p>The general layout organisation was around the loop where houses could be accessed through introverted courtyards. The spine was therefore more 'exclusive' to housing. There were also the walk-through thoroughfares that linked the courts to the central spine, which have since been closed-off, (a) & (b). The requirement for car parking was one car per plot and half a car park off plot; houses were to be developed on ground and first floor only.</p>
<p>GC -50%, PR -75%</p>



As it is now, several changes have been made to the original plan as noted above visually and functionally transforming the urban character, (c) & (d). What was initially more of a motor thoroughfare is now being adapted to other functions like parking. Cycling paths are non-existent and pedestrian circulation and accessories poorly coordinated, in other places non-existent.

Transformations

In areas that were entirely residential along the spine, several building typologies have emerged and can broadly be grouped functionally as commercial (e), residential (f) or mixed-use. These take place on lot basis depending on the ability and preferences of the plot owner. There is an intensity of built form transformation at road junctions within the corridor.



As much as the new forms have retained scale by not going beyond first-floor, the visual harmony and architectural imprint of the original designs has been totally interfered with.

The spine is slowly transforming into a mixed-use corridor and getting more and more motorized.

Urban Frame Definition

As a major circulation artery and an an urban frame because of the definition created by neighbouring houses, the artery produces visual urban images to its users. Originally, designers used simple wooden framed fence to define lots but it has since been replaced with masonry walls by plot owners transforming the streetscape, (g) & (h).



The wall largely doubles up as an edge to the 'outside' and as wall to the internal of the transformed unit. The introduction of balconies embraces the street defying intentions of original designs.

It is however important to note that the 2-level structures along the wide spine offer inadequate definition of space, hence difficulties in its identification as a positive urban space.

Table 5.11 presents a summary of findings and analysis

Table 5.11: Summary of findings and analysis

PARAMETERS	FINDINGS
I. CITY-SCALE ANALYSIS	
Characteristics of the fabric:	Most of the urban fabric presents a more regular tissue meaning the variety of interactions it offers are few, and that channels are used more for movement.
Scheme form:	Compositional form is typical of functionalist urban design approaches, of which Nairobi is a case. Group form is also evident as a result of incremental accumulation of elements in space, typical of the spatial organisation of many historic towns. This means the city including characteristic constituent forms and channels can be classified into historical layers. Existing city channels are however barely gradual in size except in use.

Channels enclosure levels:	Levels of enclosures vary across the city. As much as high level of enclosure means spatial definition, narrow channels enhances faster flow. Inadequate levels of enclosure results in difficulties in their perception as positive urban spaces e.g. in Buru Buru
Figure-ground relationship:	Definition of urban spaces in the city is an intermediary between organic and linear which blurs legibility of space
Spatial hierarchy:	There are no clear hierarchies/rank ordered spatial changes in urban form by size, shape or placement with reference to circulation channels meaning depressed legibility.
2. STREET-SCALE ANALYSIS	
<ul style="list-style-type: none"> • Distribution of channels • Functionality • Provision of Urban Services 	<p>- Planar distribution channels show the existence of multi-directional and optional spatial order and this is particularly evident in Moi Avenue. This organization favours rich pedestrian movements associated with shopping/commerce which it serves. The size of the street however impairs its accessorization and provision of urban services</p> <p>-Mumias South Spine is more linear hence more monotonous, enforcing and insistent since all loops often lead back to the axis. Commercial activities are thus attracted to the axis and more at its intersections with loop channels. Inadequacy of functional diversity and visual richness makes the perception of this axis continuity much more difficult.</p>
<ul style="list-style-type: none"> • Orientations and angles of paths: 	-Circulation channels are oriented mainly for vehicular traffic. Pedestrian flow in the study areas are impaired via vehicular traffic arrangements. Except for abundance of path intersections along Moi Avenue paths are generally linear.
<ul style="list-style-type: none"> • Characteristics of urban blocks • Imageability: 	<p>-Small urban blocks and mix of activities identified along Moi Avenue typologically allow maximization for commercial benefit by generating more street life. Failure by legislation to protect the historic core is slowly causing loss of visual harmony.</p> <p>-Loop sizes in Buru Buru cannot be appreciated individually because of access and organization. The introduction of commerce along Mumias-South road creates and enhances social attributes lacking in originally vehicular oriented axis. Imageability is however poor.</p>

Source: Author

CHAPTER SIX: CONCLUSIONS & RECOMMENDATIONS

CHAPTER OUTLINE:

6.1 Conclusions

6.2 Recommendations

Areas for further research

6.1 CONCLUSIONS

Nairobi's current profile of urbanization has been shaped by a multiplicity of historical/contemporary and functionalist influences within a vibrant capital system giving it the characteristic group and compositional form as argued by (Birol, 2004), and as such there is no one way to determine its overall form. The character of her constituent parts have varied considerably and are still in the process of change and readjustment according to the level of prevailing social segregation, legal interventions and the geographical imprints. Even though the circulation channels and green-space network are still present in the city, their function, nature and intensity of use continues to change through either formal or 'informal urbanization', or both. This study was guided by three main objectives:

The first objective was to investigate if there are any design-based urban planning strategies considered in the determination of the nature and location of circulation channels. As pertains determination of the nature of circulation arteries, it emerged that the design of the circulation arteries is governed by different standards implemented by different state agencies causing them to lack clear and inclusive design objectives. These agencies largely targets

utility services ignoring the socio-economic and functional life of circulation arteries especially in relation to urban form, hence the visible mutations of erstwhile implemented concepts. The existing locations of circulation arteries on the other hand were noted to have occurred through three main circumstances: As products of Planning, as products of history based on chance and as a result of political influence. Despite the fact that the dual function of circulation arteries is to carry through traffic and to afford access to the fronting land, the closest that planning or urban design has intervened is in ensuring set-backs and way-leaves are respected. Sizes of plots fronting different circulation channels are however non-responsive in terms of size and character. It is important to note that developments often preceded the laying out of proper circulation channels, hence the noticeable plot-by-plot developments.

The second objective was to inquire into the relationship between the size of circulation channel's and the resultant urban forms/uses. It was concluded that circulation channels attract different kinds of developments with main circulation arteries mainly attracting commercial and mixed-use developments. Informal developments which are normally mainly less-permanent were noted to thrive on road reserves and way-leaves for economic benefits. It was also concluded that when roads are expanded or opened up, the city tended to sprawls in the particular direction of accessibility. Through further review of literature and field surveys it was also realized that Railways transport tended to encourage nodal growth whereas roads encourage linear developments presenting an important tool for guiding urban growth.

At street-level, transformations related to commerce were noted to begin along circulation arteries where their use-capacities had changed as in the case of ribbon developments along Mumias South Road, in which case it would seem prudent to suggest options of design typologies that allow for small enterprises to evolve along the corridor. This would make it more inclusive and commercial in outlook. Large bill-boards were also found at strategic points along arteries including on the crest of major buildings, continually concealing or redefining Architectural and planning ensembles.

The third and last objective was to explore how circulation channels have/may be used to structure urban precincts. From the different references and findings of the study, it was concluded that circulation Channels, especially the main arterials as in the case of Curitiba are prime locations that present significant opportunities to intensify and enhance development in a manner that creates attractive pedestrian environments; contribute to vibrant neighbourhoods; and create transit-friendly places. This is because transportation planning emphasizes the need of sound physical layout considering it the primary determinant of subsequent commitment of land, administration, maintenance as well as the overall performance of schemes.

It was observed that the desire to coordinate planning of land-use and transit investment is a growing trend world-over. This is principally because the layout of any urban development is an initial determinant of its efficiency in terms of cost and functional viability. Nairobi embodies a city with a strong centre, that is, her key circulation arteries emanate from its dense centre, and as such the evolution of its urban form has been path dependent meaning

circulation arteries can be used to structure it. However, despite all this relationships, urban forms have been guided by the general zoning regulations which do not factor in the size of circulation channels connecting zones to the overall systems. Geddes argues that towns must cease to spread like expanding ink-stains and grease spots, but must grow botanically like green leaves set in alternation with its golden rays. Geddes thus advocates for external forces to check on sprawl and channels to encourage growth, *Fig. 6.1*.

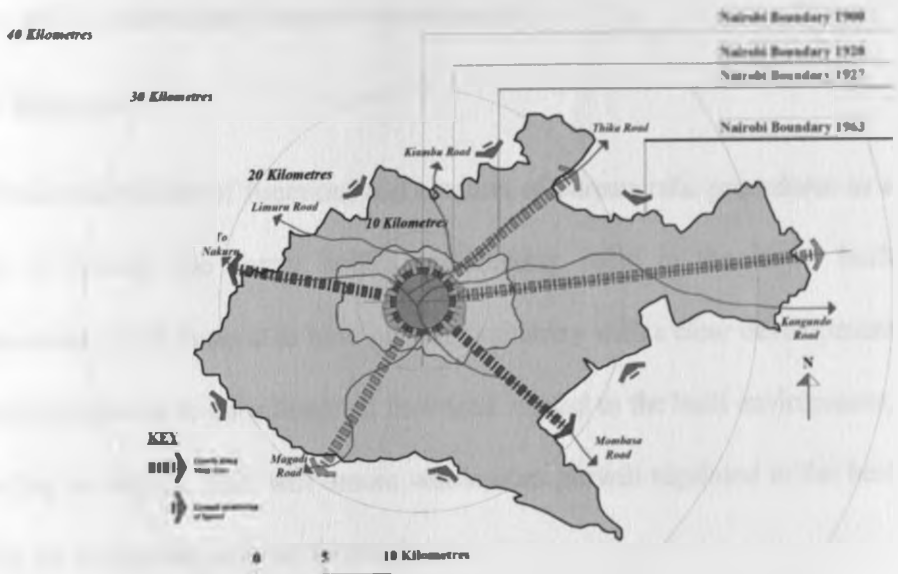


Fig. 6.1: Managing sprawl
 Source: Author

It is also observed that commercial developments coupled with wider channels often drive buildings up and the height zoning must therefore be sufficiently generous to permit vertical expansion. High buildings permit land to be used to the maximum capacity and their size ensures that their architectural quality is attended to and modern services included. Kenyan built-environment standards however, have remained Eurocentric with little appreciation of local contexts.

6.2 RECOMMENDATIONS

Spaces are products of planning and designing that reflect functional, symbolic and aesthetic considerations and as such can be changed both by modifications to its structures and/or to its activities. Current planning decisions should involve trade-offs between mobility and accessibility. This study thus makes the following recommendations in an attempt to ensure that urban forms are safeguarded, and more so, that the relationships of urban forms and the circulation channels are enhanced.

6.2.1 Mandate

To avoid multiplicity of functions and creation of bureaucratic procedures as a result of having too many bodies undertaking roles in the city's built environment, there is need to have one city authority with a clear development control framework to coordinate all functions related to the built environment, including its budget. This will ensure wholesome growth regulated in the best interest of the present and the future.

6.2.2 Planning Strategies and Implementation

It is unlikely to deal effectively with issues pertaining to the relationship of urban forms and circulation arteries without a comprehensive plan. The Master Plan however should only be a catalyst for further intervention. This thesis proposes a move away from the concept of centrality proposed by the previous master plans and instead focus on structured plans and sectorial urban design. It should be noted that circulation channels constitutes the core of the urban fabric and should be given the emphasis it deserves. The strong flows and access by traffic, and their relationship to

residential/office/commercial developments indicate need for arterial oriented developments in terms of density and mix of uses. The implications of higher density development along main circulation arteries include:

- infill development in existing neighbourhoods;
- increased viability of public transit;
- more efficient provision of utilities;

Plots fronting the main channels should also be larger and supported with incentives/bonuses that ensures rewarding of persons who contribute highly to the enhancement of the built environments.

Urban design guidelines for development along circulation channels especially main arterials which can be organized into among others: Streetscapes, Built Form, Landscape and Environment, Signage (combined with building façades to minimize free-standing signs), Servicing and Utilities should be constituted. This should also aid the design of street sections with a ratio of building height to road corridor width factored in to create a transition in the scale and density of the built forms. When undertaken, this should allow higher density zoning along wide channels to be adopted simultaneously with arterial planning, *Fig.*

6.2.

	the nature and location of circulation channels	<p>developments.</p> <p>Location of circulation channels are either historical, based on chance or politically instigated</p> <p>Sizes of plots fronting the main circulation channels are non-responsive and are like any other in terms of size</p>	The urban environment is dynamic, building regulations and development plans need to be reviewed and updated more frequently.
2.	To inquire into the relationship between the size of Circulation Channel's and the resultant urban forms/uses	<p>Different types of circulation channels attract different kinds of developments i.e. main arterials attract commercial developments.</p> <p>Railways are noted to encourage nodal growth whereas roads encourage linear developments</p> <p>When roads are expanded or opened up, the city sprawls due to reduced travel hours</p> <p>Informal developments which are normally temporary or permanent in nature thrive on road reserves and way-leaves for economic benefits.</p>	<p>There is need to constitute urban design guidelines for development along circulation channels especially main arterials.</p> <p>Mix of activities should be encouraged supported by contextual/situational strategic plans that forecasts about 50 years and focused on paths of least destruction of investment.</p> <p>Form which is more permanent should be given preference over function</p>
3.	To establish how circulation channels may be used to structure urban precincts.	<p>Planning should emphasize the need for sound physical layout because it is the primary determinant of subsequent commitment of land, administration, maintenance as well as the overall performance of schemes.</p> <p>Circulation Channels, are prime locations that present significant opportunities to intensify and enhance development in a manner that creates attractive pedestrian environments; contribute to vibrant neighbourhoods; and create transit-friendly places.</p> <p>By allowing it to act as an urban edge and articulating possibilities for morphological transformations can happen in a more harmonious way</p> <p>Urban design guidelines for development along circulation channels especially main arterials organized into among others: Streetscapes and Built-Form, with a ratio of building height to road corridor width factored should be constituted.</p>	

Source: Author

AREAS FOR FURTHER RESEARCH

This study has been on the impact of circulation arteries on the urban form. However, the spaces that lie between buildings even though they are the most important elements of the city do not exist in a vacuum but are created by the built fabric as recounted by Jan Gehl. This they do by creating physical and psychological boundaries which in essence define edges of open spaces, resulting in definition of spaces in the form of streets, side-walks, alleys and urban parks. The relationship of the city's built forms and the spaces which they create thus becomes virtually important as part of a continuous dynamic process in terms of the quality of enclosures they create, *Fig.6.3*. To tap wholesomely into the mutual built-forms arterial relationship, this thesis recommends a further research on the counter impacts of urban form on circulation arteries.



*Fig. 6.3: Glare emanating from building's facade
Source: Field survey, 2012 -KEMU Towers glare in CBD Nairobi creating discomfort to pedestrian using side walks*

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APPENDICES

APPENDIX I: ZONING

ZONE	AREAS COVERED	GC %	FR %	Dept Ref. Map	TYPE (S) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
1A	Central Business District (CBD):			XXXI/014	Commercial Residential Light Industry	0.05	
	• Core CBD	80	400				
	• Peri-CBD	80	200				
	• West of Tom Mboya St	80	400				
	• East Of Tom Mboya St	80	400				
• Urban N/W/University Way K. panele Rd	80	300					
1E	Upper Hill Area			XXV/014	Commercial Offices Residential	0.05	
	• Block 1 - Offices (Continuity)	80	200				
	• Block 2 - Comm. Off	80	200				
	• Block 3 - Offices	80	200				
	• Block 4 - Residential	80	150				
• Block 5 - Institutional (K.N.H.)							
• Block 5 - (Mixed Inst./Hts. Offs)							
1	Eastleigh			XXV/014	Commercial Residential (High-rise Flats)	0.05	
	• Eastleigh District Centre	80	250				
	• Eastleigh Comm. Residential	60	240				
	• Pumwani/Calabarua	60	240				
	• Ziwani/ Starehe	80	150				
• Residential	35	75					
ZONE	AREAS COVERED	GC %	FR %	Dept Ref. Map	TYPE (S) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
3	Paritlands			XXV/014	Commercial Residential (High-rise Flats)	0.05	
	• Commercial	50	100				
	• Residential	35	75				
	City Park Estate /Upper Paritlands	35	75				
	Westlands						
• Westlands CBD	80	240	XXX/014	Commercial Offices Residential (High Rise Flats) - Four Storeys Max.	0.05		
• Westlands/Museum Hill							
• Block 1 Commercial	80	200					
• Block 2&3 Offices & Highrise Residential	35	80					
• Block 4 Offices	80	200					
• Block 5 Commercial Residential Hotels							
4	Spring Valley			XXV/014	Residential (Apartments allowed on sewer only) - Four Storeys Max.	0.05	• Policy Under Review
	Riverside Drive						
	Kileleshwa	35(1)	75(1)				
	Kilimani	25(1)	75(1)				
	Thompson Wycliffe						
5	Upper Spring Valley			XXX/014	Low-Density Residential One-Family House	0.2(0) 0.1(8)	• Minimum Allowed On Sewer and Areas Of Leveering
	Kyuna	25	25				
	Lorche						
	Livingston /Bernard Estate						
	• On sewer	25	25				
• Unsewered	25	25					
6	Ninthage	25	25	CPT/014	Low-Density Residential	0.2	Single Family Dwelling
	New Methuga						
ZONE	AREAS COVERED	GC %	FR %	Dept Ref. Map	TYPE (S) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
7	Ninthage Valley			XXV/014	• High-Density Residential (Flats) • Informal Settlements (Shums)	0.05 Lower in some schemes	Special Scheduled High-Density Informal Development
	Ninthage North						
	Lower Huruma	50	75				
	Kariakangi						
	Korogochi Dandora						
8	Old Eastlands			XXV/014	Residential - • Mixed Development • Flats • Minimum 4 • Single Storey • Site-and-service Schemes • Combinations (Single Row)	0.05	• Special Scheduled Areas • NCC Site-and-service Schemes as Low-Income Housing • Comprehensive Subdivision allowed • Minimum to fit a House on Type Plan design
	• Shauri Moyo						
	• Maringo						
	• Buhari						
	• Kaloleni						
	• Makongeni						
	• Mbotela						
	• Jericho						
	• Jerusalem						
	• Mikusini	75	100				
	Dominion Neighbourhood (Block B2)	50	75				
	Uhuru (1-3)	50	75				
	Bura Bura (1-6) (Blocks 72-79)	50	75				
	Ujuzi (1-3)	50	75				
	Ujuzi Interscore	50	100				
Komarak							
• Commercial	80	100					
• Residential	50	75					
Kusile							
• Commercial	80	100					
• Residential	50	75					

ZONE	AREAS COVERED	GC	PR	Dept Ref Map	TYPE (5) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
9	Main Industrial Area	10	100	CPPP-ALL	Industrial/Industrial	0.25	Continuing Urban Development
	Dandora Industrial Zone	30 (10) 2500	1000	CPPP-XX	Light Industrial/Industrial • 1000	0.15 if not an estate	Estate EPZ covered
	Karobangi I Industrial	30(1) 1000	CPPP-XX				
	Muthare North L Industrial	30(1) 1000	CPPP-XX				
	Karobangi L Industrial	30 (10) 2500	CPPP-XX				
10	Nairobi West	11	75	CPPP-XX	High Density Residential Development Mixed Residential Development • 1000 • Mansions • Bungalows	0.5	Comprehensive subdivisions allowed with lower rates on type plan Development density up to 30 units per hectare
	Mindanjo	11	75	CPPP-XX			
	South "B"	11	75	CPPP-XX			
	South "C"	11	75	CPPP-XX			
	Nairobi East	11	75	CPPP-XX			
	Ngummo	14	75	CPPP-XX			
	Highview						
	Mogwaa						
	Coif Cause						
	Langata Estates						
10E	• Southlands	16	75	XXXXXX	Residential Mixed Development	0.5	Area not fully covered Comprehensive subdivisions allowed with lower rates on type plan (max 37 units/ha.)
	• Othmanya						
	• Ngai I & 2						
	• Onyanga						
	• Masi						
	• Uthman Gardens						
	• Jonathan Ngeno						
Village Forest	30 (10) 2500	1000	CPPP-XX				
Imara District							
Jayda	50	75	XXXXXX				
Verdha							
Avenue							
Lumbasi Village	30	150	XXXXXX				
• Commercial	50	75	XXXXXX				
• Residential							
ZONE	AREAS COVERED	GC	PR	Dept Ref Map	TYPE (5) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
11	Special Scheduled Area (Kibera Slums)			CPPP-XX	Industrial Mixed Residential Comprehensive Residential Schemes	0.05	NCC Plan Lacking in Social Infrastructure e.g. Schools Clinics, Recreation and Commercial Zones Comprehensive subdivisions allowed with lower rates on type plan
	National Housing Corporation (NHC) Estates			XXXXXX			
	• Aynny						
	• Olympic						
	• Fort James						
• Kamukia Road							
12	Karen/Langata			XX-XXXX	Low Density Residential Developments (One Family Dwelling House)	0.2 0.4	Local Re-Development Plan Under Review/Preparation
	Karen						
13	Gatiri	12	25	CPPP-XX	Low-Density Residential (One Family Dwelling House)	0.2	From next implementation only portions of intensity of developments e.g. Village Market & Amenities Diplomatic Housing
	Kileleshwa	12	25	CPPP-XX			
	Ridgeway	12	25	CPPP-XX			
	Garden Estate	12	25	CPPP-XX			
14	Subsidiary Residential Housing	12	25	CPPP-XX	Low-Density Residential (One Family Dwelling House)	0.2	Intensive Development in Mararid & Kileleshwa
	Thome	12	25	CPPP-XX			
15	Mararid	12	25	CPPP-XX	Agricultural/Residential Mixed • Gap Fills • Mansions • Bungalows	0.1 0.05 on secondary areas	Area Maintains Agricultural Character High-rise flats develop becoming popular
	Dagoretti	15	75	CPPP-XX			
16	Rirua	15	75	CPPP-XX	Industrial Zone Residential (Mixed) Residential Development	0.05 lower if comprehensive	High Density Residential
	• Industrial	30(1) 1000	1000	CPPP-XX			
	• Residential	15(1) 750	1000	CPPP-XX			
	• Residential	25(1) 25(1)	1000	CPPP-XX			
	• Residential	10(1) 2000	1000	CPPP-XX			
	Nyumba/Ruaraka/Githurai 44 & 45	10(1) 2000	1000	CPPP-XX			
	Zimmerman	50	100	CPPP-XX			
17	Kahawa West	50	100	CPPP-XX	Industrial Zone Residential (Mixed) Residential Development	0.05	Replete with unplanned developments hence "Dumbet approval" vide TP resolution of 18/7/97
	• Commercial	50	100	CPPP-XX			
	• Residential	50	75	CPPP-XX			
	• Industrial	50	100	CPPP-XX			
18	Kaunundi			XXXXXX	Agricultural Residential Mixed Development	2.0 0.05 on urban 0.1 ha. if not on urban lower min. size if land buying company	Area has potential for residential developments (invasion by land buying companies and land speculation) Industrial not attractive here
	• Clayworks	50	100	CPPP-XX			
	• Clay City						
	• Sports View						
	• Muri	50	200	CPPP-XX			
• Njiru							
• Ruu	25	25	CPPP-XX				
19	Special Scheduled Area Outside Nairobi Boundary			XXXX-XXXX	Agricultural Residential (Mixed) Development	0.05	Area fully influenced by city dynamics NCC not in control of developments Overwhelmingly dependent on services of the city
	• Githurai Kimbo						
	• Wundani						
• Kahawa Sakari							

ZONE	AREAS COVERED	GC No	PR No	Dept Ref. Map	TYPE (S) OF DEVELOPMENT ALLOWED	MIN. AREA (Ha.)	REMARKS/POLICY ISSUES
20	Public Strategic Reserved Areas (Gazetted) <ul style="list-style-type: none"> • State House • JKIA Airport • Wilson Airport • Military Sites <ul style="list-style-type: none"> o Military Airbase Eastleigh o DoD Headquarters o Kahawa Barracks o Langata Barracks o Defence College, Karen o Forces Memorial Hospital 			REVISED	Special strategic facilities and developments		Boundaries require to be clearly defined
20g	Recreational And Forests <ul style="list-style-type: none"> • City Park • Arboretum • Ngungu Forest • Karuri Forest National Game Park Stadiums <ul style="list-style-type: none"> • Moi Sports Complex, Kasarani • City Stadium • Nyayo Stadium Uhuru Park Central Park Uhuru Gardens			EXISTING	Public Open Spaces, Reserves and Recreational Facilities		

Section of the zoning ordinance Source: (CCN, pp. 4-10)

APPENDIX II: ESSENTIAL ATTRIBUTES OF FORM-BASED CODES

This summary is adapted and extended from definitions and commentary by Paul Crawford, in *Form based Codes: Implementing Smart Growth*, [California] Local Government Commission (www.lgc.org) and Craig Lewis, *Design-Based Codes* (2003) as cited in (Walters, 2007, pp. 245-246).

Form-based zoning codes must possess the following 12 essential characteristics:

- 1) Codes must focus on form, not use. Form-based codes de-emphasize the regulation of density and use in favour of rules for building form. They recognize that uses change over time but that buildings endure.
- 2) Form-based codes are organized around spatially defined districts, neighbourhoods and corridors that manifest particular urban characteristics.
- 3) Form-based codes recognize the importance of well-defined and well-designed public spaces. This generally means that buildings in urban areas must be built close to the street to achieve this definition and help create a sense of place. Great attention must be paid to the design of the streetscape and the role of buildings in shaping that public realm.
- 4) As part of this definition of space and place, street level activity must be stimulated by mixing uses to create different rhythms of pedestrian activity during the day, the night and the week, and this ambience must be supported by pedestrian-friendly design of the lower stories of buildings. Building façades are very important, and the normative three-part design composition of base, middle and top can provide a

useful design vocabulary. Where a contemporary design language is used for a building, care must still be taken to provide a safe, attractive and meaningful pedestrian experience at street level with clearly observable windows and doorways while safeguarding the privacy of occupants.

- 5) Streets must be safe, convenient and attractive for pedestrians, cars, transit and bicyclists.
- 6) Parking lots must be concealed behind buildings and on-street parking provided for short-term use and for protecting pedestrian activity on the sidewalk from fast-moving traffic.
- 7) Neighbourhoods should be compact, pedestrian-friendly, mixed-use, and provide a range of housing types. This brings workplaces, shops, schools, churches and parks into close proximity to housing and provides housing choices within a community that can meet the needs of many individuals at different times of their lives, especially with regard to older adults 'aging in place' and maintaining viable lives as part of the community.
- 8) Form-based codes are style neutral.
- 9) Codes must be written in clear and concise language. Design standards should be tied to measurable purposes and outcomes. For example, ensuring infill buildings are compatible with their context facilitates the creation of a convenient, attractive and harmonious community, and thus draws the 'essential nexus' between the regulations and a valid public purpose.

- 10) The codes must be presented in an easy to read format. Standards should be clear in their narrative, as they will likely be tested in court by the interpretation of the text. Graphics, photos and illustrations should be included in generous quantities, but they should only supplement the text; they should not supplant it.
- 11) The codes are produced through a design-focused process of public participation that assures discussion of urban form and land use issues.
- 12) The most important tool in successful implementation of a form-based code is the facilitation of permits. In general, developers are much more willing to abide by design standard and guidelines if they know that compliance will ensure a permit. Well-written design regulations ensure a sense of predictability for both developers and the public.

Despite the details of the form-based code, planning staff and elected officials continually muddle the process and keep adding subjective requirements to projects that already meet the code and should be quickly approved. Behaviour like this brings smart growth and form-based zoning into disrepute.

APPENDIX III: GENERAL OBSERVATION CHECKLIST

(Scanned copy)

FIELD WORK 2011/12: THE IMPACT OF CIRCULATION ARTERIES ON NAIROBI'S URBAN FORM

AREA: EVU/ BURU/Muiruri South) ZONE: 8
 Ground Coverage: 50% Plot Ratio: 2.5

URBAN DESIGN FACTOR OBSERVATIONS

Arterial Widths, Nature and Scale of Use

Nature of Surrounding Urban Forms (As built)

- Building Heights
- Setbacks
- Signages/Adverts

Noticeable Physical Traces

Physical Transformations (consider areas prevalent against locations of main arterials)

General Observations on Application of Planning Regulations (mixity)

Data Recording Tools:

The 30m open design ^{Point spine} as are more along it than I didn't have the gm collect clear of one job to phase II. Currently the mixed density of buildings along it is increasing as structures extend on setbacks especially in phase II.

- Different typologies noticeable i.e. the original monotonous (like-cases) and new additions (especially on the gm collect). Prevalent especially in phase II containing the urban edge in the form of ribbon developments.
- There is an increase use of balconies/vents to bring in morning traffic.

↑ Comparing Phase I & II against Phase II & III, transformations are prevalent in the later, notably because of a gm collect created.

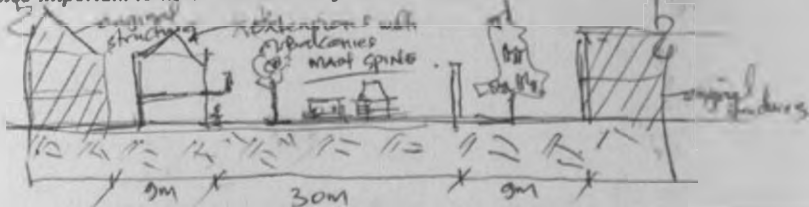
- Transformations are in form of houses prominent/hauling
- Planning regulations tend to be relaxed to allow new densities from 35%-50%.
- Shopping now a bit further from residents encouraging growth of secondary shopping areas to meet the need.
- Balconies are now being used to overlook the open.

Annotated sketches, Drawings, Photographs, Pre-coded counting lists

N.B Important physical elements to take note of will include the following

- By-products of use ⇒ Building typology (original vs. extensions)
- Public messages ⇒ Emergent typology (Loop being converted to gated communities/houses, removal of the edge)
- Displays of self
- What has been done to the setting? ⇒ Extensively transparent

(It is also important to note the location of the traces against the backdrop of main arterials)



APPENDIX IV: INTERVIEWEE'S SCHEDULE

(Scanned copy)

KEY RESPONDENTS: BUILDING PROFESSIONALS (ARCHITECTS, URBAN PLANNERS, URBAN DESIGNERS, TRANSPORT PLANNERS, SURVEYORS _____)

DECLARATION: The information given will be treated with utmost confidentiality and used for academic purposes only.

RESEARCHER: DAVID KIPCHIRCHIR LAGAT

RESEARCH TITLE: The Impact of Circulation Arteries on Nairobi's Urban Form

Note: Circulation Channels/Arteries refers to the roads, streets and the general paths of movement within the city's

INTERVIEWEE'S DETAILS

Name: ~~XXXXXXXXXXXX~~

Location: UON Date: 16-06-2017

Profession: Transport Planner Sex: M

Age bracket: (< 20), (20-30), (31-40), (41-50), (~~51-60~~), (61-70), (70 >)

CONSIDERED QUESTIONS:

THE CHALLENGE

Over the years Nairobi has suffered many challenges attributable to her planning, key being the nature of her growth whose consequences range from proliferation of informal settlement to frequent clogging of her circulation channels (traffic congestion).

CCN MANDATE

The Local Government Act and the Physical Planning Act mandates the CCN to prohibit and control the development of land and use of land and buildings in the interest of the proper and orderly development within its area of jurisdiction. There are also many institutions mandated by the central

to provide back

= Policies encourage growth of suburbs
 x Roads → limited growth
 government to undertake several responsibilities e.g. K.I.R.A., Ministry of
 Nairobi Metropolitan, Ministry of Public Health and Sanitation etc.
 → How can regulatory body (as per the approach)
 a) Can this result in conflict of interest? (Ministry of City and Country
 Planners/Urban Development/Local Government/Ministry of Education)
 b) CMC has many responsibilities with regard to the growth of the city
 Comment on her capacity: had various responsibilities → what
 Manpower → Initiatives

PLANNING TOOLS

Urban plan
 ↓
 technical
 plans
 ↓
 infrastructure
 network
 ↓
 transport
 ↓
 public

Several development control tools have since shaped the growth of Nairobi.
 Although the 1948 Master Plan had recommended road infrastructure as the
 backbone to planning, it was hardly implemented. The 1973 MGS aimed
 towards consequent decentralization, the 1979 Rezoning Strategy and the 2008
 Metropolis plan also gives some emphasis to development of proper
 circulation channels.

- How are the legal structures supporting the city building processes?
 How is it that with such good planning concepts proposed for Nairobi,
 they haven't resulted in a well planned structure? — they support but hardly
 get implemented → lack of political support, stakeholder participation,
 lack of funding
- How are design issues related to density, setback height restrictions,
 aesthetics, technology and use of materials and road carrying capacities
 determined and by whom? — lack of
 vision / corruption

PLANNING TOOL	DETERMINATION/COMMENTS
Density and zoning	Population / access to services
Setbacks/height restrictions	Neighbourhood character/zoning
Technology, choice of materials and aesthetics	Neighbourhood / local sentiment
Infrastructure and carrying capacities	How issues were done — current road classification is based on connectivity to regional/international destinations
	c) We've seen Britain introduce C&A to support their planning tools What is your take on the current building regulations and what would you prefer? — Code in use in Kenya has remained conventional / conservative — have more flexible plans

- d) Does movement along circulation channels have any influence on the growth of the city? Comment on the use of circulation arteries as planning elements - *It should and should be considered*
- e) How should the sizes of plots and nature of developments along a Circulation Arteries be determined? *Plot fronting, enough should be kept, offering buildings setbacks*
- f) Plans have always advocated for zoning, but should mixity of uses in the different zones be encouraged? - *M.C.*

INVESTMENT ON ROAD INFRASTRUCTURE

*Impic
at (many)*

For a about a decade now the government has invested heavily on expansion of roads leading in and out of the city including opening up of by-passes

*Then
Allocate
↓
Develop*

- a) What are the short term consequences and or impediments to this move with regard to the growth of the city? *speculations, speculation*
- b) Do you think this will have an impact on the way the city will grow now and in the future? *people franchise, institutions likely to*
- c) In your own opinion, what approaches should have been undertaken to make it more successful?

X WAY FORWARD

Several planners including professional associations like AAK have on several instances proposed the moving of growth out of Nairobi through encouragement of growth of other towns and or decentralisation of administrative headquarters. Comment

but the market lead to the city's dynamic in the current
GENERAL

What can you say is the main reason for the current state in the city?
policy, ignorance, not the future

Which parts of the city do you visit most and what is your experience?

- c) Do you think both the vehicular and pedestrian traffic should be incorporated together? *separate (conflict)*



more planners travelled Curitiba as the 1973 MGS