UNIVERSITY OF NAIROBI

SCHOOL OF BUILT ENVIRONMENT

AN INVESTIGATION INTO ENVIRONMENTAL IMPACTS OF LAND USE CONFLICTS IN URBAN AREAS.

(CASE STUDY: ZIMMERMAN AREA)

BY

ODHIAMBO COLLINS OTIENO

B04/2676/04

A research project submitted in part fulfillment for the award of B.A. (LAND ECONOMICS) degree in the Department of Real Estate and Construction Management, School of the Built Environment.

JULY 2008

DECLARATION

I, **Odhiambo Collins Otieno**, do hereby declare that this research project is my original work and has never been presented for a degree in any other university

Signed..... Date 30/07/08
(Candidate)

Declaration of the supervisor

This research project paper has been submitted for examination with my approval as a university supervisor.

Signed..... Date 31st July 2008.
Catherine Kariuki (supervisor)
Lecturer in the Department of Real Estate and Construction Management, University of Nairobi

DEDICATION

This paperwork is dedicated to my parents and siblings. My dad's integrity and humility, my mum's love and compassion, and my siblings' unfailing loyalty to the bond of brotherhood. I will be eternally grateful to you all.

ACKNOWLEDGEMENT

I wish to earnestly thank my supervisor, Mrs. Catherine Kariuki for her invaluable guidance and insight throughout the study.

Gratitude to all my colleagues, especially Ken, Eddy, Sagi, Morris and Oscar- who provided moral support during the study and occasional trying moments over the four years in campus. Thanks to Nelly Masikonte; your patience, love and encouragements will forever remain appreciated.

I am also indebted to my aunt and uncle, Mr. and Mrs. Dwallow, on whose strong shoulders I continue to find support.

Finally, I sincerely value the contribution of various real estate actors, members of the public and my lecturers, especially Prof. Syagga, who took their time to respond to the inquiries of this research.

ABSTRACT

Several issues cause adverse impacts on the environment. Key among them is the improper use of land as a factor of production. This study is about the environmental impacts of land use conflicts in urban areas with special reference to Zimmerman area.

The methodology used is the review of relevant literature and field survey, including interviewing all the major stakeholders. The study investigates both the causes of land use conflicts and their environmental implications.

The study is organized into five chapters:
Chapter One has the introduction, problem statement, justification of study, hypothesis and research methodology. Chapter Two has literature review while Chapter Three gives the research methodology adopted. Chapter Four contains analysis of the data and presentation of the findings, and finally, Chapter Five gives recommendations and areas of further research.

TABLE OF CONTENTS

Page

Project title

Declaration.....i

Dedication.....ii

Acknowledgements.....iii

Abstract.....iv

Table of contents.....v

List of Tables.....vii

List of plates.....vii

List of Figures.....vii

List of Charts.....ix

Abbreviations and Acronyms.....xii

Chapter One: Introduction to The Study.....1

1.0 Introduction.....1

1.1 Problem Statement.....2

1.2 Objectives.....3

1.3 Hypothesis.....4

1.4 Significance Of The Study.....4

1.5 Scope Of The Study.....5

1.6 Methodology.....5

Chapter Two

2.0 Introduction.....7

2.1.1 Theories Of Urban Land Use.....8

2.1.2 Von Thunen's Regional Land Use Model.....9

2.1.3 The Burgess Concentric Model.....12

2.1.4 Sector And Multiple Nuclei Land Use Models.....15
2.1.5 Isard's Hybrid Model.....17
2.1.6 Land Rent Theory.....19
2.2 Classification Of Urban Land Uses.....20
2.2.1 Industrial Land Use.....21
2.2.2 Public Utilities Land Use.....21
2.2.3. Public Purpose Land Use.....2121
2.2.4 Commercial Land Use.....21
2.2.5 Transport Land Use.....22
2.2.6 Residential Land Use.....20

2.3 Forms Of Urban Land Use Conflicts.....22
2.3.1 Space Competition.....22
2.3.2 Encroachment.....23
2.3.3 Nuisance Or Interference.....24
2.4 Sustainable Development.....25
2.5 Environmental Planning.....27
2.6 Urban Ecosystems.....28
2.6.1 Goods And Services Provided By Urban Ecosystems.....28
2.6.2 Urban Ecosystem Pollution.....31
2.7 National Environmental Management Authority.....32
2.7.1 Formation And Key Functions.....33
2.7.2 Environmental Impact Assessment.....34
2.8 Case Law Involving Environmental Management.....35
2.9 Summary.....36

Chapter Three
Research Methodology.....388
3.1 Introduction.....388

3.2 Research Design 388
3.3 Background Of The Area Of Study 39
3.4 Investigation Methods 4141
3.5 The Population 41
3.6 Data Collection Instruments And Procedures 422
3.6.1 Observation 433
3.6.2 Questionnaires 433
3.6.3 Photography 433
3.7 Sampling Techniques 43
3.7.1 NEMA and NCC representatives 43
3.7.2 Residents and Businessmen 44
3.7.3 Developers 44

Chapter Four
4.1 Introduction 45
4.2 Land Uses Existing In Zimmerman 45
4.2.1 Residential Land Use 45
4.2.2 Commercial Land Use 46
4.2.3public Utility Land Use 46
4.2.4 Public Open Spaces 46
4.2.5 Institutions 46
4.2.6 Agricultural Land Use 47
4.3 Land Use Conflicts In Zimmerman 47
4.4 Response From Residents 52
4.5 Response From NCC Representative 57
4.6 Response From Developers 59
4.7 Response From Businessmen 59
4.8 Response From NEMA 60
4.9 Summary 62

Chapter Five

5.0 Conclusions And Recommendation.....64

5.1 Summary of Findings.....64

5.2 Recommendations.....65

5.3 Areas of Further Study.....65

Bibliography.....61

Appendices

Questionnaire to Residents.....70

Questionnaire to Businessmen.....72

Questionnaire to Developers.....73

Questionnaire to Nairobi City Council Planning Department.....75

Questionnaire to NEMA.....76

LIST OF FIGURES

Fig 1.Von Thunen's Regional Land Use Model.....10

Fig 2. The Burgess Concentric Model.....13

Fig 3. Sector And Nucleis.....16

Fig 4. Hybrid Land Use Representation.....18

Fig 5. land rent theory.....19

LIST OF PLATES

Plate 4.1; Garbage Disposal on Playground.....48

Plate 4.2; Solid Waste and Burst Sewer By The Roadside.....49

Plate 4.3; Agriculture in Residential Areas.....50

Plate 4.4 Example of Mixed Used Development.....51

LIST OF TABLES

Table 4.1: Response Rate.....52

Table 4.2 Ages of Residents.....52

Table 4.3; Length of Time the Resident Have Lived In the Area.....53

Table 4.4; What the Residents Think Should Be Done To Rectify the Environmental Problems.....55

Table 4.5: Provision of Services.....56

Table; 4.6 Penalties by NEMA.....61

LIST OF CHARTS

Chart 4.1; Environmental Problems Faced By the Residents.....54

Chart 4.2; Causes of Environmental Problems.....55

Chart 4.3; Reasons for Locating In Zimmerman.....50

MAP

Map 1: Location of Zimmerman.....40

ABBREVIATIONS AND ACRONYMS

NEMA National Environmental Management Authority

CBD Central Business District

NCC Nairobi City Council

EIA Environmental Impact Assessment

EA Environmental Audit

EMCA Environmental Management And Coordination Act

UNCHS United Nations Centre for Human Settlement

CHAPTER ONE

1.0 Introduction

Urban areas occupy only 1% of the earth's land surface area. However, urban expansion including land requirements for industry, transport, residential and leisure activities in all regions increases pressures on land resources (UNEP 2000)

Land degradation, river siltation and soil pollution from industrial wastes are some of the environmental concerns associated with urbanization and industrialization.

However, urbanization and industrialization alone, without the shortsightedness of man, do not cause the damage (Global Environment Outlook 3:2002). It is safe to conclude that if man properly plans his urban land use activities within the relevant frameworks, then environmental sustainability will be achieved.

According to Keeble (1964;1) and Mwangi (2003), town and country planning are the art and science of ordering the use of land and the character of siting buildings and communication routes so as to secure and maximize practicable degree of economy, convenience and beauty. If these are not achieved, then land use conflicts arise. Land use conflicts are always a consequence of planning and policy management failures.

Magura, (1990; 6), argues that land use conflict is the incompatibility and uncomplimentary of land uses which could therefore be thought of as conflicts of human endeavors during the process of development and utilization.

The adverse effects on the environment manifest itself thus: air, land and water pollution, excessive noise, pressures on public services such as drainage, sewer lines, access routes etc.

Even if not felt today, the effects of land use conflicts will emerge slowly and what will happen in the next 30 years has already been determined (UNCHS, 2001:b)

1.1 Problem Statement

A well planned neighborhood is self sufficient, ensures adequate provision of facilities and services to serve its population, proximity to working places, self recycling, environmental friendly etc. Zimmerman, like most urban areas, is undergoing a phenomenal increase in population. As far as urban development is concerned, there is physical expansion and functional changes. The former refers to the change in space (from non built-up to urban), the latter to the change in major land uses (Cheng et al, 2001).

Zimmerman was initially an agricultural cum residential area. However, the land use was changed to purely residential as per the 1991 base plan by the NCC Planning Department. This is contained in Minute 36/1991 of the Architecture and Planning committee meeting.

Mwangi (2003) citing Beerstein (1994) argues that in third world countries where cities are growing at unprecedented rates, distorted land markets and ineffective land management practices have resulted in the degradation of environmentally fragile resources, occupation of environmentally hazard-prone areas, loss of cultural resources, open spaces and excessive urban sprawl. According to Olima (1993), land use incompatibilities can arise due to

conflicting interests between indigenous owners of land and local authority, land owners who were and individuals who are formally allocated the land in accordance with the approved local subdivision plans, politicians and physical planners, town residents and various population groups.

In such a situation, proper planning must be undertaken to ensure that there are no land use conflicts. Sadly, as Rakodi (2001) points out, this has not been the case. A good evidence of this fact is the haphazardly built houses and narrow roads. In some cases, a building has two uses e.g. commercial and residential. Other manifestations of these mixed land uses include finding a church sharing a fence with a school and a petrol station, or a storeyed building with a health clinic on the upper floor and a pub on the ground floor. In other instances, public playgrounds are used as garbage dumping points while road reserves are illegally constructed on.

Zimmerman, like any other urban area, is likely to face land use conflicts as it grows. The aim of this study is, therefore, to investigate such land use conflicts in Zimmerman, and their environmental impacts.

1.2 Objectives

- To assess the planning and zoning requirements of land uses in Nairobi.
- To find out the environmental concerns that arises due to the failure of implementing the planning and zoning requirements.
- Recommend ways of addressing the environmental concerns.

1.3 Hypothesis

Land use conflicts are a major cause of environmental degradation.

1.4 Significance of the Study

Previous studies have focused more on the causes of land use conflicts, while the principal aim of this research is to investigate the relationship between land use conflicts and environmental pollution. This will provide a much needed documentation that would aid in formulation of effective new policies by different stakeholders.

The study will help the planning authority i.e. Nairobi City Council planning department to understand the environmental impacts caused by land use conflicts in urban areas, especially Zimmerman. They will know the causes of such land use conflicts and the mitigating measures. This will then help them to decide on whether to review the existing legislation to suit changing situations.

The study will also help in understanding the challenges facing NEMA in its endeavour to conserve and protect the urban ecosystem. In this research, they will find a good base for action due to a better understanding of levels of environmental degradation. This is because, currently, the state of environmental degradation in Zimmerman has reached alarming rates due to factors which will also be explored.

The study will help explore the interactions of various stakeholders and suggest ideas on how they can jointly alleviate the problem of environmental degradation so as to uphold the concept of sustainable development.

1.5 Scope of the Study

The study delves into the issue of land use conflicts in urban areas and its adverse impacts on the environment. Due to time and financial constraint as well as other technicalities, the research will be limited to a manageable scope. The researcher concentrated his studies within Zimmerman area of Nairobi.

Zimmerman was chosen because of its tremendous population growth and high likelihood of mixed land use. Another factor is because of its accessibility from the researcher's residence. It is located approximately 20 kilometres from the city centre of Nairobi off the busy Thika road.

The theory to be reviewed will fall under physical planning of urban land uses, and environmental management policies and legislation.

1.6 Methodology

It involved data collection, presentation, interpretation and analysis of the findings to come up with this work. Data was collected from both the secondary and primary sources. Secondary sources of data included searching and surveying of the existing published and unpublished written materials. These helped form the foundation of this study so as to create an understanding of the theories of urban land use and general forms of urban land use conflicts.

Primary data included fieldwork that was undertaken within Zimmerman area of Nairobi. Undertaking this process encompassed administration of questionnaires, conducting interviews, and making observations. These research methods were employed to obtain both the qualitative and

quantitative information from a range of stakeholders. These parties included area residents, businessmen, developers, NEMA and Nairobi City Council. It is from these populations that samples were drawn.

The findings from the fieldwork were then analyzed, presented and conclusions and recommendations given.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

For society to continue developing in the way it has done in the past, we need to pay more attention to our environment. How this is best achieved is often a matter of opinion rather than fact, dependent upon different perspectives of the environment and views of nature. Recently, a concept has emerged that has attempted to bring together the best aspects of these different viewpoints, and to harmonize the development of mankind with the protection of nature. This is the concept of "Sustainable Development".

Sustainable development involves maintaining our current rate of development whilst leaving suitable resources behind for later generations to continue to develop. In this context then, environmental problems must be tackled by considering their relationship with the state of the economy and the wellbeing of society. In fact, the environment, the economy and society taken together, include everything that we need to consider for a healthy, prosperous and stable life.

Although sustainable development is about integrating the environment, society and economy, - the economy, and in turn society exist within the wider context of the environment. The economy exists entirely within society, because all parts of the human economy require interaction among people. However, society is much more than just the economy. Happiness, pleasure and well being do not stem solely from financial growth. Friends and families, culture, religion and ethics are important elements of society that are not primarily

based on exchanging goods and services, but contribute to the overall quality of life.

Society, in turn, exists entirely within the environment. Our basic requirements - air, food and water - come from the environment, as do the energy and natural resources for housing, transportation and the products we depend on. Protection of the environment, therefore, resides at the core of Sustainable Development.

In the 1980s, increasing concern about the effects of economic development on health, natural resources and the environment led the United Nations to release the Brundtland Report. This defines sustainable development as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs."

The environment is our life support system and includes everything that we rely on during our lifetime. It is important to remember that the state of our environment is influenced by our behaviour and that we have the opportunity to either nurture or mistreat it.

2.1 Theories of Urban Land Use

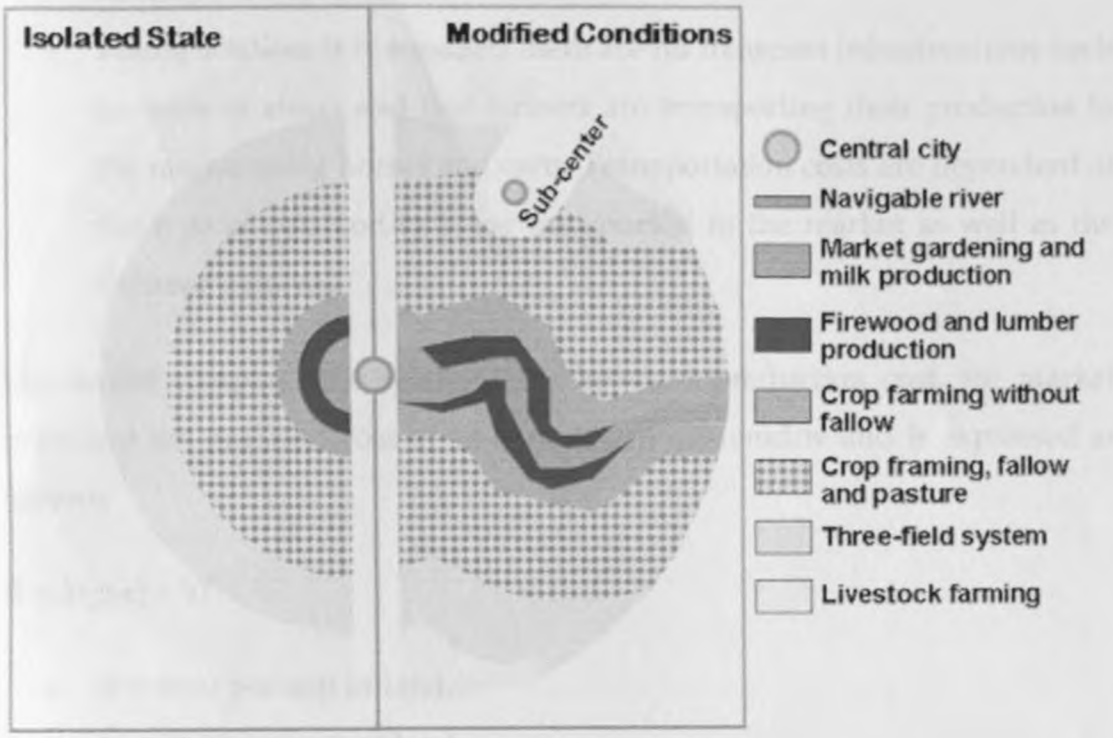
In order to understand why different land uses are located where they are, it is important to study the various theories. There are 2 broad traditions of urban planning. One, supplied by French, British and other European practice, grew out of concerns for public health and other urban concerns and involved an often centralized tradition of public urban intervention through strong land-use regulations and public sector investments, often with a strong emphasis on civic design. The other, arising from practice in North America, emphasized land use zoning and subdivision legislation, in keeping with a strong tradition of private property rights and values.

Several descriptive and analytical models of urban land use have been developed over time, with increased levels of complexity. All involve some consideration of transport in the explanations of urban land use structures (Carter, 1995)

2.1.1 Von Thunen's Regional Land Use Model

It is the oldest and was initially developed in the early 19th century (1826) for the analysis of agricultural land use patterns in Germany. It used the concept of economic rent to explain a spatial organization where different agricultural activities are competing for the usage of land. The underlying principles of this model have been the foundation of many others where economic considerations, namely land rent and distance-decay, are incorporated. The core assumption of the model is that agricultural land use is patterned in the form of concentric circles around a market (Krumme, 2002). Many concordances of this model with reality have been found, notably in North America.

Fig 1. Von Thunen's Regional Land Use Model



Source: wikipedia

If modern economics began with Adam Smith, modern location economics began with Von Thunen (1826). He was the first to develop a basic analytical model of the relationships between markets, production, and distance. For this purpose he looked upon the agricultural landscape. The relative costs of transporting different agricultural commodities to the central market determined the agricultural land use around a city. The most productive activities will thus compete for the closest land to the market and activities not productive enough will locate further away. The model has a set of basic assumptions which reflects agricultural conditions around a city in the early 19th century:

- **Isolation**. There is one isolated market in an isolated state having no interactions (trade) with the outside.

- **Ubiquitous land characteristics.** The land surrounding the market is entirely flat and its fertility uniform.
- **Transportation.** It is assumed there are no transport infrastructures such as roads or rivers and that farmers are transporting their production to the market using horses and carts. Transportation costs are dependent of the type of commodity being transported to the market as well as the distance involved.

The model compares the relationships between production cost, the market price and the transport cost of an agricultural commodity and is expressed as follows:

$R = Y(p-c) - Yf$

- R = Rent per unit of land.
- Y = Yield per unit of land.
- p = market price per unit of yield.
- c = Average production costs per unit of yield.
- m = Distance from market (in kilometers or miles).
- f = Freight rate per unit of yield and unit of distance.

All agricultural land uses are maximizing their productivity (rent), which in this case is dependent upon their location from the market (Central City). The role of farmer is to maximize his profit which is simply the market price minus the transport and production costs. The most productive activities (gardening or milk production) or activities having high transport costs (firewood) locate nearby the market. The above figure provides an overview of Von Thunen's agricultural land use model with the basic assumptions being applied (isolation, ubiquity, and transportation). It can be divided in two parts:

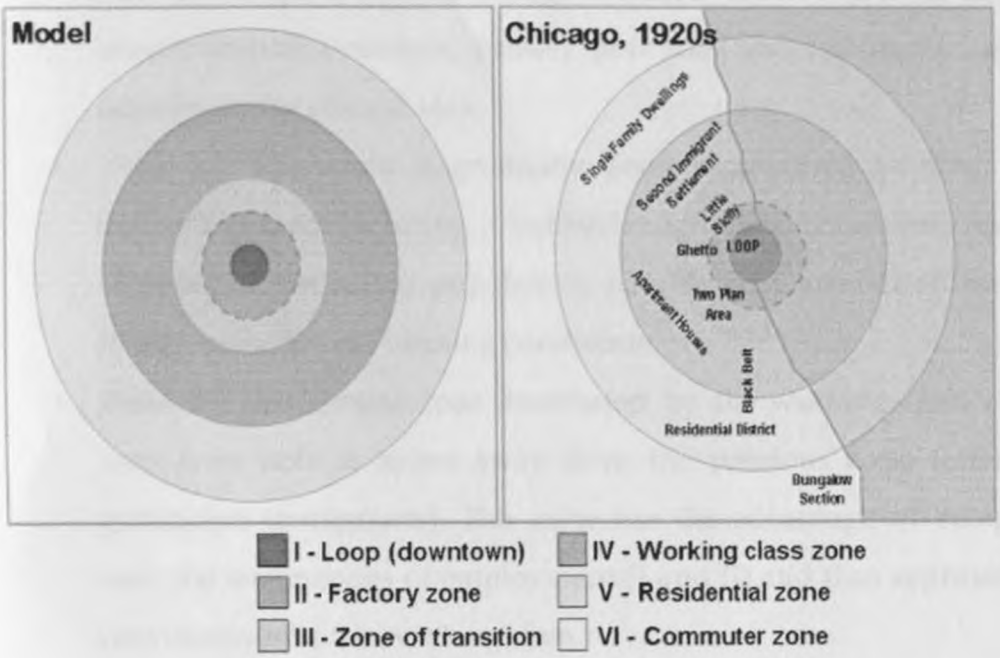
- The pure isolated state over an isotropic plain (left). In this case, the model takes a shape of perfect concentric circles.
- The potential impacts of modified transport costs (a navigable river) and the presence of a competing center (right).

The relationships between agricultural land use and market distance are very difficult to establish in the contemporary context. However, a strong relationship between the transport system and regional agricultural land use patterns can be acknowledged at the continental level in North America.

2.1.2 The Burgess Concentric Model

It was among the first attempts to investigate spatial patterns at the urban level Burgess (1925). Although the purpose of the model was to analyze social classes, it recognized that transportation and mobility were important factors behind the spatial organization of urban areas. The formal land use representation of this model is derived from commuting distance from the CBD, creating concentric circles. Each circle represents a specific socioeconomic urban landscape. This model is conceptually a direct adaptation of the Von Thunen's model to urban land use since it deals with a concentric representation.

Fig 2. The Burgess Concentric Model



Source; wikipedia

In 1925, Burgess presented a descriptive urban land use model, which divided cities in a set of **concentric circles** expanding from the downtown to the suburbs. This representation was built from Burgess' observations of a number of American cities, notably Chicago, for which he provided empirical evidence. The model assumes a relationship between the socio-economic status (mainly income) of households and the distance from the CBD. The further from the CBD, the better the quality of housing, but the longer the commuting time. Thus, accessing better housing is done at the expense of longer commuting times (and costs). According to this monocentric model (see above figure), a large city is divided in six concentric zones:

1. **Zone I**: Central Business District (CBD) where most of the tertiary employment is located and where the urban transport infrastructure is converging, making this zone the most accessible.

2. **Zone II**: Immediately adjacent to the CBD a zone where many industrial activities locate to take advantage of nearby labor and markets. Further, most transport terminals, namely port sites and rail yards, are located adjacent to the central area.
3. **Zone III**: This zone is gradually been reconverted to other uses by expanding manufacturing / industrial activities. It contains the poorest segment of the urban population, notably first generation immigrants living, in the lowest housing conditions.
4. **Zone IV**: Residential zone dominated by the working class and those who were able to move away from the previous zone (often second generation immigrants). This zone has the advantage of being located near the major zones of employment (I and II) and thus represents a low cost location for the working class.
5. **Zone V**: Represents higher quality housing linked with longer commuting costs.
6. **Zone VI**: Mainly high class and expensive housing in a rural, suburbanized, setting.

According to Burgess, urban growth is a process of expansion and reconversion of land uses, with a tendency of each inner zone to expand in the outer zone. On the above figure, zone II (Factory zone) is expanding towards zone IV (Working class zone), creating a transition zone with reconversion of land use. Although the Burgess model is simple and elegant, it has drawn numerous criticisms:

- The model is too simple and limited in historical and cultural applications up to the 1950s. It is a product of its time.
- The model was developed when American cities were growing very fast in demographic terms and when motorized transportation was still uncommon as most people used public transit. Expansion thus involved

reconversion of existing land uses. This concept cannot be applied in a contemporary (from the second half to the 20th century) context where highways have enabled urban development to escape the reconversion process and to take place directly in the suburbs.

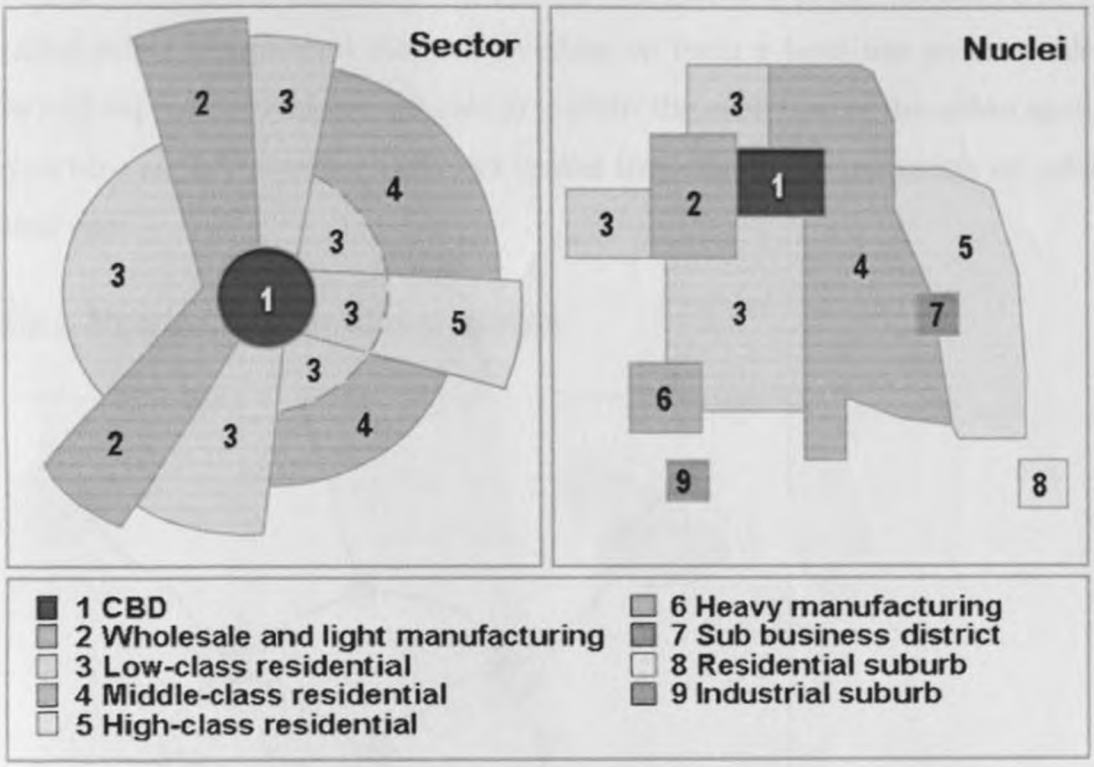
- The model was developed for American cities and has limited applicability elsewhere. It has been demonstrated that pre-industrial cities, notably in Europe, did not at all followed the concentric circles model. For instance, in most pre-industrial European cities, the center was much more important than the periphery, notably in terms of social status. The Burgess concentric model is consequently partially inverted.
- There were a lot of spatial differences in terms of ethnic, social and occupational status, while there were low occurrences of the functional differences in land use patterns. The concentric model assumed a spatial separation of place of work and place of residence, which was not generalized until the twentieth century.

However, the Burgess model remains useful as a concept explaining concentric urban development, as a way to introduce the complexity of urban land use and to explain urban growth in American cities in the early-mid 20th century.

2.1.3 Sector and Multiple Nuclei Land Use Models

They were developed to take into account numerous factors overlooked by concentric models, namely the influence of transport axis (Hoyt, 1939) and multiple nuclei (Harris and Ullman, 1945) on land use and growth. Both representations consider the emerging impacts of motorization on the urban spatial structure.

Fig 3. sector and nuclei models



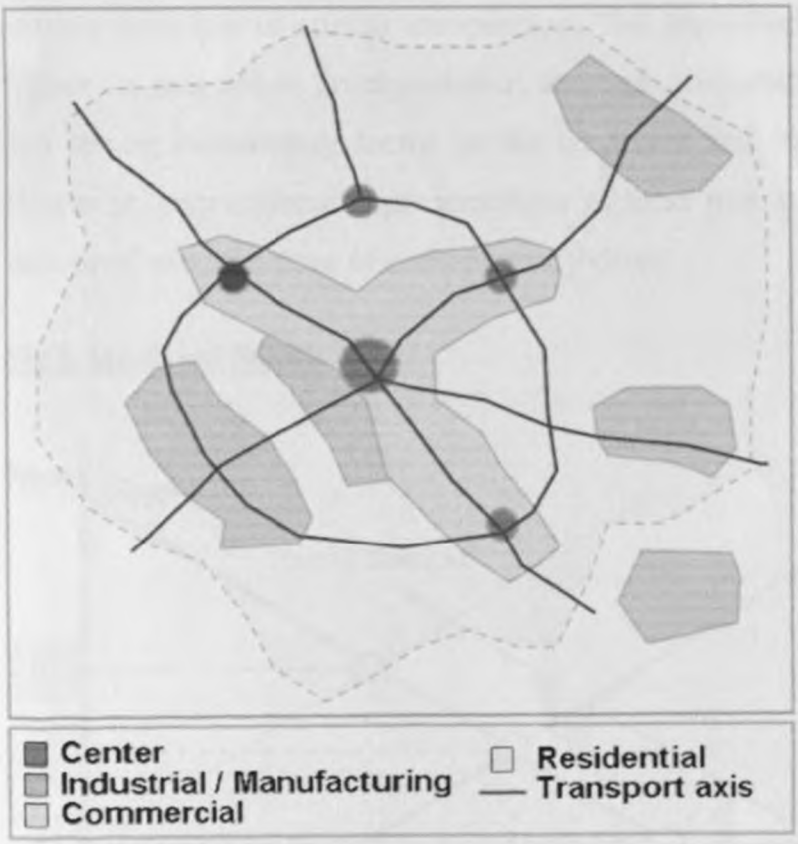
Source; wikipedia

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

Following Hoyt's development of a sectorial city, Harris and Ullman (1945) introduced a more effective generalization of urban land uses. It was brought

satisfactory explanation. Thus, hybrid models, such as that developed by Isard (1955), consider the concentric effect of nodes (CBDs and sub-centers) and the radial effect of transport axis, all overlain to form a land use pattern. Also, hybrid representations are suitable to explain the evolution of the urban spatial structure as they combine different spatial impacts of transportation on urban land use.

Fig 4. Hybrid Land Use Representation



Source; wikipedia

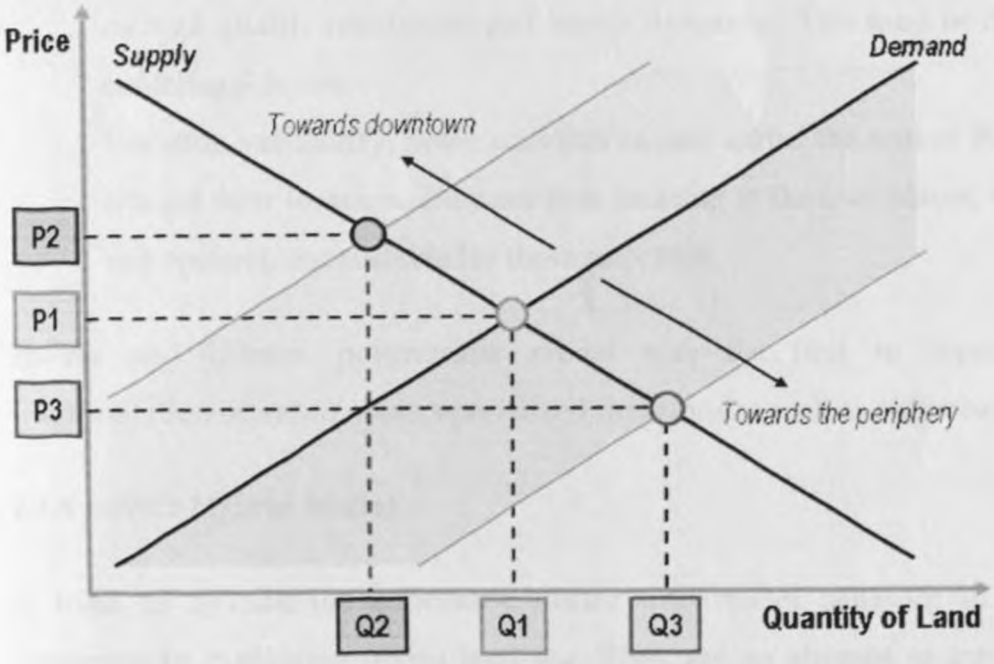
Since both the concentric, sectorial and zonal models had problems dealing with specific conditions, hybrid representations of urban land uses were developed. They try to include the strengths of each representation. One of the first to do so was W. Isard (1955). This model illustrates that some urban land

uses are oriented along major transport axis (sectors), while others, notably industrial and commercial, are located in nuclei where they reach both scale and agglomeration economies. The urban land use is thus an overlay of different transport effects; let them be sectorial, zonal or nuclear.

2.1.5 Land Rent Theory

Was also developed to explain land use as a market where different urban activities are competing for land usage at a location. It is strongly based in the market principle of spatial competition. The more desirable the location, the higher its rent value. Transportation, through accessibility and distance-decay, is a strong explanatory factor on the land rent and its impacts on land use. However, conventional representations of land rent are being challenged by structural modifications of contemporary cities.

Fig 5. land rent theory



Source; wikipedia

forward that many towns and nearly all large cities do not grow around one CBD, but are formed by the progressive integration of a number of separate *nuclei* in the urban pattern. These nodes become specialized and differentiated in the growth process and are not located in relation to any distance attribute, but are bound by a number of attributes:

- **Differential accessibility**. Some activities require specialized facilities such as port and rail terminals. For instance, the retailing sector demands maximum accessibility, which is often different from centrality offered in the CBD.
- **Land use compatibility**. Similar activities group together since proximity implies improved interactions through the process of economies of agglomeration. Service activities such as banks, insurance companies, shops and institutions are strongly interacting with each other. This can be defined as centripetal forces between activities.
- **Land use incompatibility**. Some activities are repelling each-other such as high quality residential and heavy industrial. This may be defined as centrifugal forces.
- **Location suitability**. Some activities cannot afford the rent of the optimal site for their location. They are thus locating at cheaper places, which are not optimal, but suitable for these activities.

Harris and Ullman polynuclear model was the first to represent the fragmentation of urban areas, specialized functions as well as suburbanization.

2.1.4 Isard's Hybrid Model

It tried to include the concentric, sector and nuclei behavior of different processes in explaining urban land use. They are an attempt to integrate the strengths of each approach since none of these appear to provide a completely

In a market economy, most of the urban land can be freely sold or purchased. Thus land economics are concerned about how the **price of urban land is fixed** and how this price will influence the nature, pattern and distribution of land uses. The above figure provides some basic relationships between the **quantity of land and its price**. This mechanism follows the standard market relationship between supply and demand, where an equilibrium price is reached. A quantity of land Q1 would be available at a price of P1. However, what is particular to cities is that the supply is fixed since there is a limited amount of land is available.

- When land is reasonably available (Q1), the price (P1) will be moderate.
- Moving towards the downtown the demand rises, land becomes scarcer (Q2) and the price goes up (P2).
- Moving towards the periphery, more land is available, demand drops (Q3), and so does the price (P3).

Obviously, not every type of activities is willing to pay a price P1. Some may even need a price lower than P3. High land values impose a more **intensive usage of space** so the highest number of activities can benefit from a central location. The logic behind the construction of skyscrapers is therefore obvious and take place at optimal locations of competition for land. Different types of activities, each having their own land use, are willing to pay different rents.

2.2 Classification of Urban Land Uses

Urban land use is referred to as the spatial distribution of city functions within the urban areas. Land is a platform for all economic activities while urban centres act as the engine for economic growth (UNCHS, 1984:71)

The main urban land uses are:-

2.2.1 Industrial Land Use

These include land uses in which both heavy and light manufacturing take place. Heavy industries require access to raw materials and distribution, and skilled and unskilled labour hence the need for accessibility. Periphery locations are the best for heavy industries to curb pollution of inhabited areas (Hooves, 1963:31)

Light industries produce less bulky product and hence produce less pollutants e.g. printing and welding services. They are mainly located at the edge of the CBD and suburban locations.

Jean-Paul Rodriguez (1999) classifies other land uses as follows:

2.2.2 Public Utilities

This land use is mainly reserved for public utilities like water pipes, sewer lines, and cemeteries. The utilities are used to guide development in urban areas and are required in all other urban land uses but differ in quantities.

2.2.3. Public Purpose Land Use

This refers to land held by public institutions both central and local government. It includes administrative buildings, hospitals, libraries, museums, parks and public open spaces. Such land use should be well serviced to allow easy access.

2.2.4 Commercial Land Use

Involves those activities where profit maximization is the motive. They are shops, bars, petrol stations, restaurants e.t.c.

2.2.5 Transportation Land Use

This is the land reserved for transportation lines. They include roads, railways, water canals, car parks, airports and bus stops.

2.2.6 Residential Land Use

It refers to the flats, maisonettes, bungalows and other forms of housing units that shelter man from the vagaries of weather. According to Mwangi, (2003) this incorporates the entire environment within which housing must function

It can be divided into three levels;

- High density, low cost residential areas
- Medium density, middle cost residential areas
- Low density, high cost residential areas

$$\text{Density} = \frac{\text{total area of a residential estate}}{\text{Total population}}$$

2.3 Forms of Urban Land Use Conflicts

2.3.1 Space Competition

Every economic activity requires space to locate itself. Space competition occurs where two land users compete economically for some space having different land use motives and economic production functions (Magura, 1990:24).

By a process of competition, young and small activities segregate themselves in an urban area in which their optimal conditions are to be found and by virtue which they are normally able to exclude all other activities (Wamathai, 1987:2).

The activities that can earn that can earn the highest and best use pushes out the rest from a particular space. They are then distributed according to their economic advantage.

The pattern of land use in any urban area is a reflection of competition for sites between various uses through the forces of demand and supply (Wamathai; 1987:2). Demand for land is a derived demand in that land is not demanded for its own sake but for the goods and services it produces. When demand for goods and services rises, demand for land rises too. However, supply of land is fixed.

Lean and Goodall (1996) recognized the problem of competition among different uses and stated that in a free and open market, the highest bidder buys the site depending on what satisfaction he gets from the site irrespective of other factors. Therefore, if a residential developer is the highest bidder for a piece of land next to an industrial area, then the quiet enjoyment of the property by its tenants will be interfered with by the noxious heavily polluted, noisy industrial atmosphere (Wamathai, 1981:6). In location guided by economic benefits, the two different uses might be advantageous to each other, or they might collide. In such a case, conflict arises due to non-complimentarity. The two uses might continue co-existing due to economic pressures among other factors. The pressures may include lack of a suitable piece of land to relocate, financial constraints and increase in population near industrial zones.

2.3.2 Encroachment

Nolo online dictionary defines encroachment as the building of a structure entirely or partly on a neighbor's property. Encroachment may occur due to faulty surveying or sheer obstreperousness on the part of the builder. Solutions

range from paying the rightful property owner for the use of the property to the court-ordered removal of the structure.

Kingoriah (1986) observes that sudden encroachment by an activity into one land use can cause conflict if the encroaching activity has accumulated in the neighbouring land in such quantities that the host land cannot contain. An urban area can encroach into adjoining agricultural land and in fact most suburban areas of Nairobi have been encroached. This occurs especially along transport routes e.g. along Thika Road (Kiama, 1999:46) It could also take the form of industrial area encroaching into residential area, encroachment into forest, open spaces and recreational areas.

The most documented case of encroachment is available in English law of tort as per the case of Rylands Vs Fletcher. In this case, a huge dam in Fletcher's land containing large quantities of water flowed downhill and caused substantial damage on Ryland's land. It was resolved that Fletcher was liable for the damages.

2.3.3 Nuisance or Interference

Merriam-Webster Dictionary defines nuisance as something that interferes with the use of property by being irritating, offensive, obstructive or dangerous. Nuisances include a wide range of conditions, everything from a chemical plant's noxious odors to a neighbor's dog barking. The former would be a "public nuisance," one affecting many people, while the other would be a "private nuisance," limited to making your life difficult, unless the dog was bothering others. Lawsuits may be brought to abate (remove or reduce) a nuisance.

Pollution causes nuisance and can either be gaseous, noise, water and solid waste (wikipedia). Examples of polluting activities include; damping burst or blocked sewers and drainage systems, noisy transport modes, noisy bars, music shops or industries.

Reduction of aesthetic value of a place is a form of nuisance. Interference occurs when an activity carried out in a neighbouring land or house restricts the existing use e.g. putting up a storey building whose balcony or stairs faces the neighbour's bedroom (interference with privacy), obstruction of light and of sights.

2.4 Sustainable Development

Martinez (2005), argues that "Sustainable Development" has become a buzzword in the planning industry, with the recognition that present ways of consumption and living have led to problems like the overuse of natural resources, ecosystem destruction, urban heat islands, pollution, growing inequality in cities, the degradation of human living conditions and human-induced climate change. Planners have, as a result, taken to advocating for the development of sustainable cities.

However, the notion of sustainable development can be considered as rather recent and evolving, with many questions surrounding this concept. That said, it is often not difficult to recognize what are 'unsustainable' forms of lifestyles, and urban planning is recognized to play a crucial position in the development of sustainable cities (wikipedia).

Wheeler (1998 article), suggests a definition for sustainable urban development to be as "development that improves the long-term social and ecological health of cities and towns." He goes on to suggest a framework that might help all to

better understand what a 'sustainable' city might look like. These include compact, efficient land use; less automobile use yet with better access; efficient resource use, less pollution and waste; the restoration of natural systems; good housing and living environments; a healthy social ecology; sustainable economics; community participation and involvement; and preservation of local culture and wisdom.

According to Grunkemeyer and Moss (1999) one of the key concepts of sustainable development is the interdependence of society, economy and the natural environment. Early human cultures were aware from the beginning of the carrying capacity of their environments, that their existence was dependent upon utilizing the environment for resources, but respecting that there are limits to what nature can provide without being damaged. More recently, biology and ecology has revealed that all living things, including humans, depend upon each other, and are interconnected through natural cycles and ecological systems. Such cycles and systems are naturally and continually subjected to change that can harm or enhance the ability of different species to survive and flourish. Unfortunately, mankind, through unsustainable patterns of resource consumption, seems now to be increasing the rate of change and consequently the levels of stress experienced within the environment.

Interdependence exists across both time as well as space. Past, present and future are inextricably connected. We are directly linked back in time by the oldest members of the community and forward nearly a century by those born today. It is important to appreciate that both continuity and change have fundamental influences during the courses of our lives. Understanding the concept of interdependence will assist us in recognizing our responsibilities for the future.

The difficult challenge facing planners comes with the implementation of sustainability visions, policy and programmes, and in the midst of doing so, the need to modify institutions to achieve these goals. This is still being worked out by urban planners.

2.5 Environmental Planning

Environmental planning is a field of study that aims to merge the practice of urban planning with the concerns of environmentalism. Essentially speaking, while urban planners have traditionally factored in economic development, transportation, sanitation, and other services into their decisions, environmental planners add sustainable (social, ecological & economic) outcomes as important factors in the decision-making process. What exactly constitutes the "Environment", however, is somewhat open to debate among these practitioners, as is the exact scope of the intended environmental benefits. Chief concerns among environmental planners include the encouragement of sustainable development, green building technologies, and the preservation of environmentally sensitive areas.

In most countries, for any project, environmental planners deal with a full range of environmental regulations from federal to state and city levels. A rigorous environmental process has to be undertaken to examine the impacts and possible mitigation of any construction project. The environmental assessments encompass areas such as land use, socioeconomics, transportation, economic and housing characteristics, air, noise, wetlands, endangered species, flood zones, coastal zones, and visual studies among others (wikipedia).

2.6 Urban Ecosystems

Forest (1974) says the concept of urban ecosystems is relatively new and controversial. There is no agreed upon definition of an urban ecosystem but the simplest and most useful one may be "a biological community where humans represent the dominant or keystone species and the built environment is the dominant element controlling the physical structure of the ecosystem."

According to Berkowitz (2002), the physical extent of urban ecosystems is determined by the densities of both the population and infrastructure. Administrative boundaries are often not reliable indicators of urban ecosystems boundaries because of the following reasons;

- Urban areas are not sharply delineated but blend into suburbs and then rural areas.
- Urban systems, unlike natural ecosystems, are highly modified, with buildings, streets, roads, parking lots, and other artificial construction forming a largely impenetrable covering of the soil.
- Urban area is defined as "an area where population density is at least 1000 people per square mile or 621 people per square kilometer" (US Census Bureau), but no definition is given of a minimum structural density.

2.6.1 Goods and Services Provided By Urban Ecosystems

The human element of an urban area-its man-made infrastructure and economy- provide goods and services of enormous value, including human habitat, transportation networks, and a wide variety of income opportunities. But green spaces, which often form the vital heart of urban ecosystems, also

contribute a wide range of goods and services. Just a few of these are focused on here:-

Air Quality Enhancement and temperature Regulation

Temperatures in heavily urbanized areas may be 0.6 to 1.3 degrees Celsius warmer than in rural areas (Goudie 2000; 350). This "heat island effect" is the result of heat-absorbing surfaces, like asphalt, combined with a city's building density and high energy use. Air pollution levels within in mega cities like Beijing , Delhi, Jakarta and Mexico City sometimes exceed WHO health standards by a factor of three or more (WRI et al. 1998:63)

Green space within cities significantly lowers overall temperatures and thus reduces energy consumption and air pollution (Lyle and Quinn 1991:106, citing Bryson and Ross 1972:106). A single tree can transpire as much as 450 litres of water per day, consuming 1,000 mega joules of heat energy to drive the evaporation process (Bolund and Hunhammar1999:296).urban lakes and streams also help moderate seasonal temperature variations. Urban trees and forests remove nitrogen dioxide, sulphur dioxide, carbon monoxide, ozone, and particulate matter.

Biodiversity and Wildlife Habitat

Cities support a relatively wide variety of plants and animals-both the native species that have specifically adapted to the urban landscape and its extreme ecological conditions and the numerous nonnative species humans have introduced.

Many of the animals, birds and fish that inhabit urban areas are valuable for the excitement and pleasure they bring to many urbanites. Some urban wildlife is

also valuable from the perspective of conservation and biodiversity. Urban parks and other green spaces are critical to migratory species and provide wildlife corridors, even though these corridors are often too fragmented to afford animals sufficient area to maintain diverse populations.

Many urban streams are so polluted, littered, or canalized, or their riparian zone so substantially reduced and cleared of vegetation, that only the most pollutant tolerant species survive (wikipedia).

Storm-Water Control

Urban forests, wetlands, and streamside vegetation buffer storm water runoff, control pollution, help recharge natural groundwater reservoirs, and minimize flooding in urban areas. In contrast, buildings and roads cover urban land with impervious surfaces and eliminate vegetation that provides natural water storage capacity (wikipedia).

Food and Fiber Production

Many urban areas contribute substantially to their food supply. Urban agriculture includes aquaculture, orchards, and livestock and crops raised in backyards and vacant lots, on rooftops and roadsides, and on small suburban farms (UNCHS 1990:410).

Urban and peri-urban agriculture is estimated to involve (over) 800 million urban residents worldwide (FAO 1999). In Kenya 2 of 3 urban families are engaged in farming (Smit and Nasr 1992:142; Charpolowe 1998:47)

Urban agriculture also provides subsistence opportunities and income enhancement for the poor and offers and offers a way to recycle the high volume of wastewater organic solid wastes that cities produce.

Recreational Opportunities and Aesthetics

Trees provide visual relief, privacy, shade, and windbreaks. Trees and shrubs can also reduce cities' typically high noise levels; a 30-m belt of tall dense trees combined with soft ground surfaces can reduce noise by 50 percent (Nowak and Dwyer 1996:471). Parks provide urban dwellers with easy access to recreational opportunities and places to relax. Some urban parks, lakes, and rivers are also tourist attractions and enhance values of downtown areas.

2.6.2 Urban Ecosystem Pollution

Wikipedia gives the following major forms of pollution along with the particular pollutants relevant to each of them:

Air pollution, the release of chemicals and particulates into the atmosphere. Common air pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight.

Water pollution, by the release of waste products and contaminants into surface runoff into river drainage systems, leaching into groundwater, liquid spills, wastewater discharges, eutrophication and littering.

Soil contamination occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are

hydrocarbons, heavy metals, herbicides, pesticides and chlorinated hydrocarbons.

Radioactive contamination, resulting from activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment.

Noise pollution, which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.

Light pollution, includes light trespass, over-illumination and astronomical interference.

Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash or municipal solid waste.

Thermal pollution is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.

The above aspects of urban ecosystem pollution can be controlled or eradicated though. This is through various agencies, and in Kenya the National Environmental Management Authority was established for the sole purpose of environmental conservation.

2.7 National Environmental Management Authority

NEMA is charged with the duty of monitoring and evaluating all aspects of environmental management and conservation in Kenya. The occurrence of different types of pollution within urban ecosystems, and beyond, is minimized

or even totally prevented by the provisions of the Environmental Management and Coordination Act (1999) under which NEMA was formed.

2.7.1 Formation and Key Functions

It was formed and constituted under the Environmental Management and Coordination Act of 1999. NEMA recognizes that urban environment management is a key factor in the sustainable development of urban settlements that support the lives of its resident and provide them with the basic requirement of food, shelter and water.

As the of urbanization in Kenya rapidly increases, this aspect will require even greater importance as conflicting human activities compete for less and less space in the urban areas.

NEMA has several key functions, but the two most important ones as regards environmental sustainability are;

- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities. Management objectives must be adhered to and adequate early warning on impending environmental emergencies is given.
- Promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya (EMCA, 1999).

2.7.2 Environmental Impact Assessment

This is a process of auditing and examining projects to determine their impact on the quality and quantity of natural environment and inhabitants, and to propose mitigation measures. It was established through a legal notice in 2003 and is carried out by qualified EIA experts who are registered with NEMA.

Due to growing public concern at the manner in which Environmental Impact Assessment and Audit Reports are prepared, processed and reviewed by EIA/EA experts and NEMA respectively, the Board of Management of NEMA established a Taskforce to address these concerns. The ultimate objective of the exercise is to make recommendations with a view to revising the Legal Notice No. 101 on Environmental Impact Assessment and Audit Regulations, 2003.

The following issues, among others, were identified as of immense importance:

- Enforcement of environmental regulations
- Role of Kenya Institute of Environmental Assessors (KIEA)
- Clarity on Project Report vs. EIA Study Report
- Code of Practice/Conduct for EIA experts
- Public Consultation Process

The EIA experts have been accused of incompetence and lack of professionalism in their duties. This has mainly been occasioned by lack of professional benchmarks instituted by NEMA to guide their operations. Also of doubt is the experts' independence due to what is observed as their close relationship to project owners who also fund their studies (Report, 2008).

2.8 Case Law Involving Environmental Management

Civil case 313 of 2000 in the high court of Kenya at Nairobi- Peter Kinuthia Mwaniki and two others (plaintiffs) versus Peter Njuguna Gicheha and three others (defendants)

The plaintiffs sued the defendants, jointly and severally, seeking "a permanent injunction to restrain the defendants, their agents and servants from constructing or continuing to construct a slaughter house in the parcel of 1 and known as plot No. Zone 6 within Limuru Township..."

The plaintiffs further said that the construction of the slaughterhouse is in contravention of sections 58 and 75 of the Environmental Management and Coordination Act "...as they have neither sought and/or obtained a license to discharge effluent, nor have they undertaken an environmental impact assessment, or obtained an environmental impact assessment license..."

The complaint in their evidence was that the slaughterhouse will affect people's lives negatively when it starts to operate. That there will be blood flowing from there which will obviously mix with sand and mud and spill onto their homes and farmland. All the plaintiffs share a fence with the slaughterhouse which also borders a church and children's home.

The first plaintiff complained that the smell and effluent from the slaughterhouse will be too much for him as his house is very close to the slaughter house. The plaintiffs also gave proof and a witness that their written complains to NEMA was not responded to.

The presiding judge made the following judgment and conclusions;

- Any further construction of the slaughterhouse to stop...until they(project owners) obtain approval of their building plans as required under the Physical Planning Act
- The project owners to prevent, stop or discontinue any act or omission deleterious to the environment
- The judge further stated that "...in this case I am satisfied that the plaintiffs have locus to file this suit in the High Court because their entitlement to a clean environment is likely to be contravened if the defendants starts their operations of the slaughterhouse"

The above case law is a clear example of urban land use conflicts and its adverse impacts on the environment. The defendants are in the process of constructing a slaughterhouse in a residential area, which might cause foul odour and effluence to pollute the neighbourhood. The fact that the slaughterhouse shares a fence with a church and children's home is also a manifestation of poor planning.

Further, the defendants did not apply for any license to discharge effluent contrary to 58 of EMCA. They also failed to do an Environmental Impact Assessment of the project before commencing its construction.

2.9 Summary

This chapter has looked at the different theories of urban land use, the types of urban land uses, and the urban land use conflicts. Three major types of urban land use conflicts arise: space competition, encroachment and nuisance.

The chapter also explains the concepts of sustainable development and environmental planning, and how important the two are in urban ecosystem management. The role of NEMA in environmental management is explained.

Finally, the case law involving NEMA illustrates how urban land use conflicts have negative impacts on the environment.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the procedures that were followed in conducting the study. It discusses the study area, the population, sampling techniques and how the researcher derived the sample (sampling procedure), as well as data collection methods used by the researcher.

3.2 Research design

Kothari (2004:31) citing Selltiz, et al. (1962:50) defines research design as the arrangement of conditions for collection and analysis of data; in a manner that aims to combine relevance to the research purpose with economy in procedure. It is the conceptual structure in which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. Research design can be classified by the approach used to gather primary data into two broad categories: observation and communication approaches.

Observation includes the full range of monitoring behavioral and non-behavioral activities and conditions such as listening, reading, visual data collection, smelling and touching. In other words, information is sought by way of the investigator's own direct observation without asking from the respondent (Ibid).

According to Cooper and Schindler (2003:319), the communication approach involves surveying people and recording their responses for analysis. It is the

most reliable method of learning about opinions, attitudes, motivations, intentions and expectations. These attributes can be effectively harnessed using the questionnaire, being the most effective instrument for collecting survey data. The communication approach is the most effective method for collecting the survey data. The communication approach is also an effective method for eliciting issues that are exclusively internal to the respondent, as the most qualified person to provide such information (Cooper and Schindler, 2003:322).

3.3 Background of the area of study

Nairobi is the capital city of Kenya. It has the highest urban population in East Africa, with a population of over 3.5 million. The city centre has an area of over 700 square kilometers and stands at an altitude of 1,675 meters above sea level. It is 140 kilometers south of the equator and some 480 kilometers west of the Indian Ocean (Wikipedia, 2008).

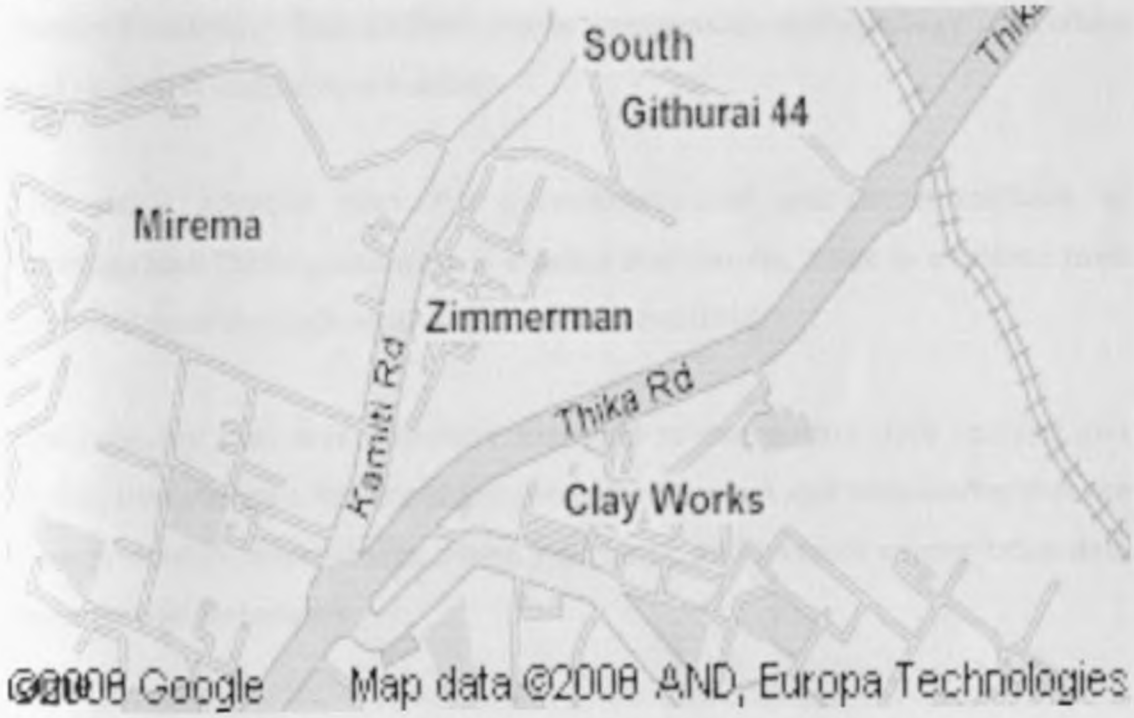
Nairobi was founded in 1899 as a supply depot for the Uganda railway, which was being constructed between Mombasa and Uganda. It was named after a water hole known in Maasai as *Ewaso Nyirobi,* meaning, "cool waters". It was totally rebuilt in the early 1900s after an outbreak of plague and the burning of the original town. Nairobi replaced Mombasa as the capital of the British East Africa Protectorate in 1905.The railway brought wealth into the city, which made it grow dramatically. In 1919, Nairobi was declared a municipality, and in 1954, was granted city status (Wikipedia, 2006).

After Kenya got its independence in 1963, Nairobi grew rapidly. This rapid growth put pressure on the existing real estate resources. The once "green city in the sun" is slowly losing its former shine.

Zimmerman Area is within Nairobi Province, about 20 kilometers to the North East of the Central Business District of Nairobi. It is sandwiched between Kamiti and Thika roads, and boarders Kasarani, Kahawa, Roysambu and Githurai. It has mixed soils with a relatively flat terrain.

It falls within zone 17 with minimum plot size of 0.4 hectares and plot coverage of 0.75. This according to the 1991 NCC base plan, and was initially meant for residential purposes only. However, it now boasts many other important land uses including: transportation, commercial, education, religion, as well as recreation.

Map 1: location of Zimmerman



Source: Google Maps

3.4 Investigation Methods

The two major methods of investigation are as follows: quantitative and qualitative. The qualitative method is concerned with obtaining an in-depth understanding of a subject. It includes designs, techniques and measures that do not produce continuous numerical data; the data is mostly in the form of words often grouped into categories (Abwunza, 2006). Such data is generally captured from a smaller number of respondents using open-ended questions.

The quantitative method is used to measure things discreetly and numerically and is based on a representative sample of the population, within estimated levels of accuracy. This method places emphasis on methodology, procedure and statistical measures of validity.

The study adopted both the quantitative and qualitative methods of investigation. While perception is a subjective concept, there is evidence from past studies of its application and measurement (Ibid).

The collected data was thereafter subjected to exploratory data analysis and descriptive statistics that included percentages, mean and frequencies that are then presented in bar charts, tables, pie charts, and pictures among other data presentation techniques.

3.5 The Population

The populations that were selected for this study are; residents, business owners, developers, representative of Nairobi City Council Planning

Department and representative of National Environmental Management Authority.

Residents were chosen for the simple fact that they are the ones who experience different environmental issues within Zimmerman Area. Being the users of the infrastructure and amenities within the study area, the residents make a very critical sample population.

The Nairobi City Council (NCC) Department of Planning was chosen because they deal with development plans and zoning regulations.

Businessmen were sampled to enable the research know the types of commercial activities within Zimmerman area and the environmental problems faced by the business premises.

NEMA representative was to give more insight into the Environmental Impact Assessment process. The representative also explained the role of NEMA in environmental conservation in urban areas.

Developers being the project owners/landlords gave reasons for developing in Zimmerman. They also explained the environmental conservation steps they took before and after the developments.

The above five populations were sampled to a manageable size for investigation and the research instruments administered.

3.6 Data Collection Instruments and Procedures

Primary data was collected by use of the following instruments:

3.6.1 Observation

The researcher made a tour of Zimmerman area and observed first hand and recorded data that would aid in the study.

3.6.2 Questionnaires

This was the main method of data collection that was used. The questionnaires were self-administered and researcher administered to the following people:

- NEMA representative
- The NCC Planning Department representative
- Residents
- Developers
- Businessmen

Interviews were also conducted with NEMA and NCC Planning Department representatives.

3.7.3 Photography

According to Kothari (2004), photography is an indirect way of data collection. It was used to capture the existing conditions of development and land use conflicts at Zimmerman.

3.7 Sampling Techniques

3.7.1 NEMA and NCC representatives

1 No. (One) representative was each from NEMA and NCC. This is because the information the researcher needed from the two organizations is standard and could be given by the above number of interviewees.

3.7.2 Residents and Businessmen

The technique was both stratified and random. .The study location was divided into four geographical areas.

In the case of residents, questionnaires administered were 40 in number, 10 questionnaires administered randomly to each area. For Businessmen, 16 questionnaires were administered, four for each area.

3.7.3 Developers

Because of the difficulty in identifying building owners and project developers, only three were examined by the researcher. Ten buildings were randomly chosen and the researcher set to locate the owners/developers. The first three to be located were then taken as the sample.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The field study set out to study environmental impacts of urban land use conflicts-case study Zimmerman Area of Nairobi. Its prime aim was to establish the link between land use conflicts and environmental degradation, and who/what is culpable.

4.2 Land Uses Existing In Zimmerman

4.2.1 Residential Land Use

The largest land use in Zimmerman is for residential purposes. Different types and designs of buildings exist, e.g. flats, maisonettes, bungalows and shanties.

There are slums, low cost and high cost residential units. For example Wa Maina slums, low cost residential units next to the Ruaraka Sub-station and the high cost Lynn Estate.

The slum consists of structures made of old metal sheets and polythene materials. They are further from the major transportation routes than the other classes of housing.

The middle income residential houses are mostly blocks of flats. They are bed-sitters, one-bedroom, two- bedroom and three-bedroom units. The high income

residential units are mostly maisonettes and bungalows of up to four bedrooms a unit.

4.2.2 Commercial Land Use

Commercial uses range from small scale vendors, kiosks along the roads, retail and wholesale shops, petrol stations, hotels and bars. They are mostly near or along the roads. Some like the kiosks take up road reserve space.

4.2.3 Public Utility Land

Space for public utilities include the Ruaraka electric power sub-station, road reserves and public parking places along Kamiti Road.

4.2.4 Public Open Spaces

These are spaces that are open for use by the general public. The researcher was able to observe two playgrounds within Zimmerman.

4.2.5 Institutions

These include institutions that are either privately or publicly owned like schools, religious centres and colleges. Schools e.g. Lite Academy, church, health facilities were also observed.

4.2.6 Agricultural Land Use

The researcher observed agricultural activities in the study area. Though of limited quantity, the effects of agricultural activity in residential estates manifested itself.

4.3 Land Use Conflicts Existing In Zimmerman

Residential uses have been located together with commercial users and institutional users. Along Kamiti Road, for example, Lite Academy shares a fence with a petrol station and a residential home. In another instance, a health clinic is located in the same building as a bar and residential flats.

There is a myriad of commercial activities along the estate roads, for example, shops, bars, hotels, kiosks and illegal stalls. This increases competition for space. Most of these activities are unauthorized and occupy road reserves.

The bars are too many and located too close to, or even within, residential units and emit a lot of noise especially at night. Though the researcher could not quantify how many they were, it was observed that on average there was a bar or restaurant approximately 40 metres of every residential block.

There is also a lot of light industry and construction work by the informal *jua kali* sector. The welding works and carpentry is located right within residential blocks. Together with the noisy public modes of transport, they produce the utmost amount of noise in Zimmerman.

Agricultural activities within purely residential estates are also an example of incompatibility of users. Agriculture was practiced in certain areas within the area.

The play grounds and other open spaces in Zimmerman have been turned into a garbage disposal points. Mounds of solid waste also litter roadsides and storm-water drainage trenches, creating foul odour and visual discomfort.

Plate 4.1; garbage disposal on playground

Source; field survey, 2008

Plate 4.2; solid waste and burst sewer by the roadside

Source: Field survey, 2008

Plate 4.3; Agriculture in residential areas

Source; Field survey, 2008

Plate 4.4 example of mixed used development

Source: field survey, 2008

Table 4.1: Response rate

Respondent	Total number posted	Response	Percentage response
Residents	40	27	67
Businessmen	16	10	62
Developers	3	2	66
NCC representative	1	1	100
NEMA representative	1	1	100

Source: Field survey, 2008.

Out of the questionnaires administered, there was a response rate of 67% for residents, 62% for businessmen, 66% for developers, and 100% each for the NCC and NEMA representatives. While administering questionnaires, a response rate of 50 percent is adequate for analysis and reporting, 60 percent is a good response while 70 percent is very good. Mugenda (1999). This study had an average response rate of 67% which is good and acceptable.

4.4 Response from Residents

Table 4.2 ages of residents

18- 24	2
25- 30	3
31-36	3
37- 42	11
43-48	6
50 +	2

Source; field survey, 2008

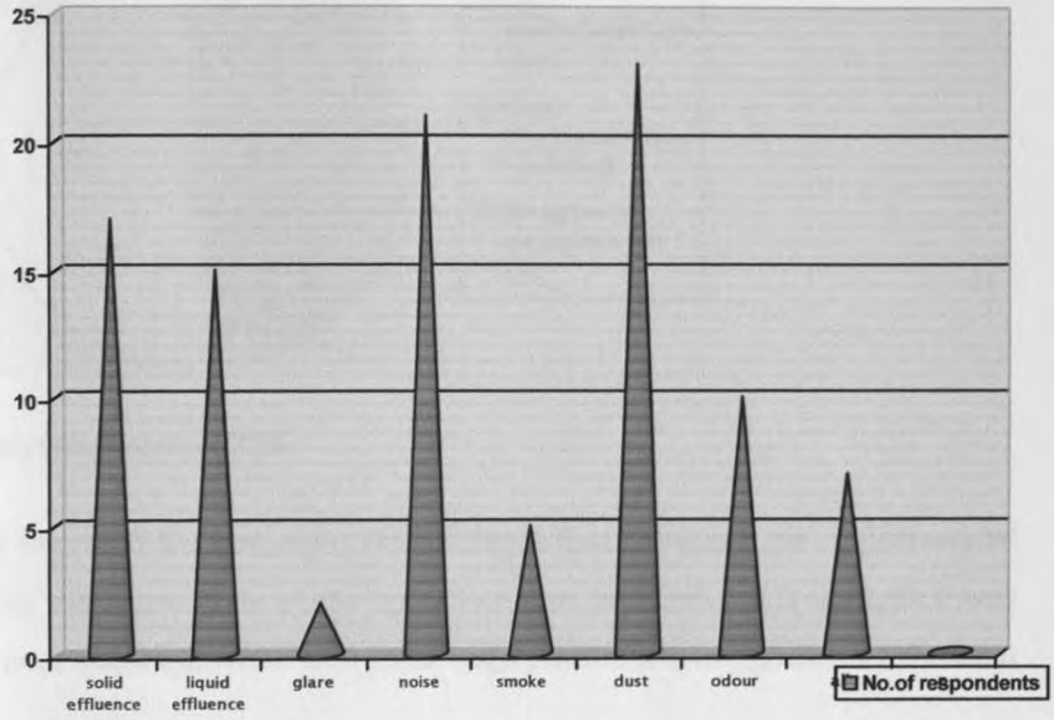
This was done in an effort to find out whether one was old enough to understand the long term effects of environmental problems in the area or not.

Table 4.3; length of time the resident have lived in the area

years	respondents
1-5 years	6
6-10 years	11
11-15 years	6
16-20 years	4

21 of the respondents have been living in the area for between 6 and 10 years. This represents 78% of the respondents. They have therefore been able to experience development and environmental changes in the area over the last 5 years.

Chart 4.1; environmental problems faced by the residents

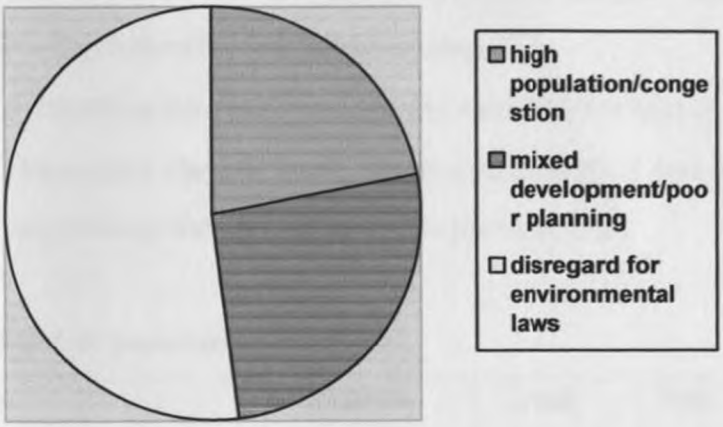


Source; field survey, 2008

The residents pointed out dust, at 23%, as the biggest environmental problem they encounter followed by noise at 21%. These they said is due to the all-weather type of roads serving the estates, and the many number of informal craftsmen and uncontrolled public means of transportation.

Solid and liquid effluents follow at 17% and 15% respectively. Only 2% picked glare as a problem with 5% picking smoke. A further 7% said they faced all the above environmental problems.

Chart 4.2; causes of environmental problems



Source; field survey, 2008

Slightly over half the residents (52%) thought that disregard for environmental laws was the main cause of the environmental problems. 26% thought it was due to poor planning while 22% chose high population/congestion as the main cause.

Table 4.4; what the residents think should be done to rectify the environmental problems

solution	percentage
suing the polluting party	21
relocating the commercial activities	22
strengthening the existing laws on pollution	40
others please specify	15

Source; field survey, 2008

Majority of the residents (40%) think that strengthening the existing laws will solve the problems. 22% want the commercial activities relocated while 21% of the respondents see suing the polluting party as the solution. The remaining 15% gave the following probable solutions;

- Educating the public on issues of environmental conservation.
- Relocating the bus terminus to eradicate dust and loud noise
- Improving the state of roads to prevent dust

Table 4.5: provision of services

service	Excellent	Good	Fair	Poor
Water	0	30	41	29
Access roads	0	7	67	26
Sewer/drainage	0	11	30	59
Garbage collection	3	5	48	44

Source; Field survey, 2008

- **water**

Most residents (41%) said that the provision of water service is fair. They got water from the Nairobi Water and Sewerage Company mains

- **Access roads**

More than half the residents (67%) said that the provision of access roads was fair. Some (26%) said that it was poor. They suggested that more access roads should be built and the existing ones tarmacked.

- **Sewer/drainage**

Slightly over half the residents (59%) said that provision of sewer/drainage services was poor with 30% saying that it was fair. The rest (11%) think it was good. Approximately 60% of the residents orally interviewed said the foul drainage was into the main trunk sewer, about 30% said they used septic tanks built by the developers/landlords while the rest did not know.

- **Garbage collection**

Majority of the residents (48%) agreed that garbage collection was fair; with an almost equal number (44%) saying it was poor. Garbage is collected by private groups after either one or two weeks depending on prior arrangements. The residents pay for the garbage collection.

4.5 Response from NCC Representative

The researcher also interviewed an official at the Nairobi City Council Planning Department so as to get a clear view regarding planning regulations governing Zimmerman area, and the environmental problems faced. He cited the following problems;

- Overcrowding of developments/ congestion.
- Poor road network in the area
- Poor waste management practices

To the above problems, he cited the following as probable causes;

- Increase of human population in the area which has lead to a strain on the infrastructural facilities available. Some blocks of flats are six storeys high
- Inadequate funds and qualified personnel to handle planning issues. The service roads are classified as murram but in real sense they are earth type.

- Lack of a Master Plan and poor enforcement of the existing base plan. The existing base plan clearly proposes that Zimmerman be a purely residential area.
- Poor environmental policy framework. The NCC representative pointed out that environmental audits are not done in existing facilities within Zimmerman.
- Lack of adherence to planning regulations. He further claimed that most developers construct new buildings and extensions to existing structures without approval.

After further oral interview, the NCC representative admitted that he is aware of the EMCA of 1999 and the EIA process as well as their functions but did not know that environmental audits should be carried out on already existing projects so as to determine their effects on the environment. He had all along thought that environmental assessment is done before a project commences.

The EMCA of 1999 is incorporated into council's activities during approval of new developments. A copy an application approved by NEMA as well as an EIA report have to be submitted to the council before granting planning approval.

Among the factors he cited as determining the land uses in this area include zoning and town planning regulations, special applications and population dynamics. There are however cases where people violate the planning regulations and build illegal structures. Penalties available for violating planning regulations comprise of;

- charging fines
- demolition of illegal structures
- imprisonment

In conclusion the NCC representative agreed that there are serious cases of land use conflicts in Zimmerman. One specific problem being the lack of a specified area for different activities.

4.6 Response from Developers

The field study also involved administering questionnaires to the developers in the area. Due to logistical difficulties, it was hard to determine how many developers own properties within Zimmerman. The researcher therefore interviewed only three. Two of them own blocks of flats, while a third owns commercial buildings.

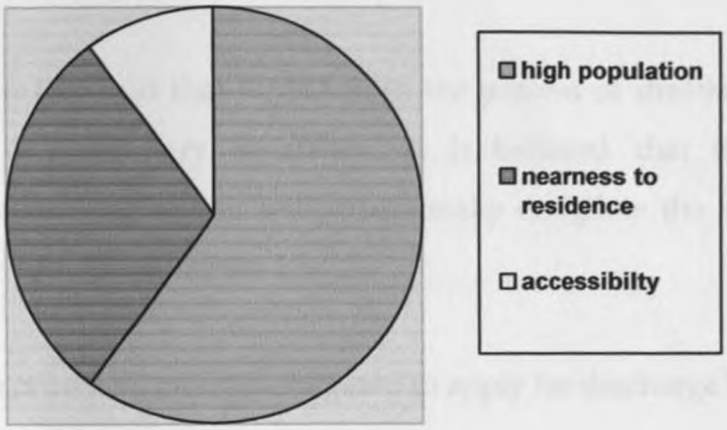
It is important to note that all the developers claim to be aware of the EMCA 1999 as well as its provisions and the EIA process. Further, they say that they follow all the regulations of NEMA.

Further, they all said they adhere to all planning regulations as per the provisions of the Planning Department at the City Council of Nairobi. With regard to their opinion on the location of different land uses in Zimmerman, they all thought that the area is over- congested with lack of expansion space. They suggested that the small scale commercial activities should be relocated to an area with adequate space. This they said would reduce problems of congestion e.g. accumulation of solid waste, dust and noise.

4.7 Response from Businessmen;

Out of the 10 businessmen who returned the questionnaires, 4 run retail outlets, 2 run restaurants, another 2 have hardware shops while the rest are jua kali artisans.

Chart 4.3; Reasons for locating in Zimmerman



Source; survey, 2008

Problems they face when carrying out their business in Zimmerman

- Pollution especially noise and dust
- insecurity in the area
- Deterioration of infrastructure e.g. roads.
- obstruction by other informal businessmen

4.8. Response from NEMA

So as to know the role of NEMA in environmental conservation, the researcher interviewed a representative. The NEMA representative was put to task to explain what the organization was doing as regards environmental degradation in Zimmerman

He explained that EIA experts are registered by Environmental Impact Assessors and Auditors Association of Kenya. He said the professional body

has made strides to streamline the registration process and curriculumn of EIA experts.

He further said that NEMA is in the process of drafting air quality and noise quality subsidiary legislation. It is believed that the completion of this subsidiary legislation will substantially complete the instruments required to fully operationalize the EMCA.

Project owners are also obligated to apply for discharge licenses if they are to go on with the projects. These include,

- effluent discharge license
- waste disposal license etc

Among the types of action that can be taken against industries which pollute the environment include;

- Closure or revocation of license
- Measures according to EMCA (1999) e.g. a fine of up to 1 million
- Arresting the proprietor and suing them in a court of law.
- Give notice for improvement

Environmental offences usually attract the following action as given by the EMCA.

Table; 4.6 Penalties by NEMA

Offence	Penalty fine (in Ksh)	Jail term
Inspections	500,000	24 months
Pollution	500,000 + clean-up cost	-
Hazardous wastes	1,000,000	24 months

Source; EMCA 1999

4.9. Summary

Zimmerman area has several types of land uses, and most of them are mixed. This is a significant issue especially as it leads to environmental degradation.

The causes and effects of the land use conflicts on the environment have been researched in this chapter. Most of the conflcts are as a result of man's failure to observe existing legislation e.g. EMCA, Nairobi City Council by-Laws and others.

The planning framework is also weak as evidenced by lack of an updated Master Plan. From the response of residents on what needs to be done to eradicate environmental pollution, a big majority chose strengthening of existing laws. This is a clear indication that they perceive the existing planning and environmental legislation as too weak. It is no wonder that a majority also thought disregard for the laws is the cause of environmental problems in the area.

The relationship between NEMA and NCC is not what is expected. The two institutions, by virtue of being major stakeholders, should work in harmony as regards planning and environment. However, the opposite is true. The representative of the planning department within the City Council does not even know the need for environmental audits.

The increased population growth in Zimmerman has attracted businessmen whose motive is only to make more profit. The inadequate space makes them construct substandard buildings along road reserves for their businesses. These businesses are also of varied nature and most are located within the residential areas. Coupled with acute shortage of housing and emergence of slum dwellings, they lead to congestion which makes service provision even harder.

The road network is very poor, sewer system not well developed, water provision wanting and garbage disposal mechanism not good.

5.0 RESEARCH CONCLUSIONS AND RECOMMENDATION

5.1 Summary of findings

The environmental problems in Zimmerman have been caused by a combination of several factors. Critical to these causes is the role of land use conflicts due to incompatibility of different users. A number of variant factors acted to bring about the said land use conflicts in the area. The study found out that:

1. Lack of control by the City Council of Nairobi and lack of adherence to the physical planning regulations have led to random growth. This has seen residential plots being used for commercial and agricultural activity without any consideration for adverse effects.
2. The natural flora and fauna is barely existent and its place taken by buildings. The area has undergone a rapid growth in population which comes with demand for more residential and commercial space. Many entrepreneurs have taken advantage of the increased need for services, goods and utilities to introduce new activities which were non existent. Haphazard construction without preserving the ecosystem has been the order of the day.
3. Transport routes have not been well developed in the area. Most service roads are all weather earth types and produce a lot of dust when used by motor vehicles. Accessibility into some areas within Zimmerman can only be on foot as the roads are too narrow and not motorable. The development of bus termini is poor, thus, public service vehicles use private parking slots or shop frontages and road shoulders to pick and drop passengers. Road reserves are also illegally occupied by both permanent buildings and temporary stalls.

4. NEMA has failed in its duty of requiring developers to carry out occasional environmental audits on their premises. It has also failed to carry out regular inspections to ascertain whether existing land uses/developments are environmentally conscious.

5.2 Recommendations

After analyzing the data collected, the researcher came up with the following recommendations;

1. Both the central government and local authority should rethink environmental institutions because they need to adapt to new roles and partnerships to fulfill present obligations and confront emerging environmental challenges. NEMA and the NCC should carry out joint inspections of all developments within Zimmerman, especially as regards compliance with planning regulations and environmental pollution.
2. Some land use activities e.g. small scale jua kali artisans, bars, kiosks and open air vendors should be relocated to designated areas from the residential houses. The transport network should also be improved..
3. The stakeholders should recognize that as Zimmerman grows, there will be need for additional space for more activities. The 1991 base plan should therefore reviewed when need arises. This can then be used to transform Zimmerman into a well planned mixed land use area.

5.3. Areas of further study

The study has opened up other interesting areas of further research and this includes:

- An investigation into the factors influencing the growth of Zimmerman.
- A study into the efficiency of service provision in Zimmerman.

BIBLIOGRAPHY

Breese, G. (1966) *Urbanization in Newly Developing Countries,* Prentice-Hall Inc. Englewood Cliffs, N. J

Lean, B., (1966) *Aspects of Land Economics,* Walker And Co. (Printers) Ltd London

Gerhardt, B. (1972). *Rural Development and Urban Growth,* Ford Foundation, New York.

Koll, Michael (1967) African Urban Development, Unpublished.

Bowden, M. (1974) *The Urban Ecosystem: A Holistic Approach,* Hutchinson & Loss, N.J

Berkowitz, A (2002) *Understanding Urban Ecosystems,* Springer.

World Commission on Environment and Development (1987). *Our Common Future.* New York: Oxford University Press.

Rakesh, S. (1994) *Understanding the Developing Metropolis,* Oxford University Press, New York.

Stackhouse, M.L. (1972). Ethics And The Urban Ethos: *An Essay In Social Theory And Theological Reconstruction.* Boston: Beacon Press

Republic Of Kenya, Government Printers, *Environmental Management And Coordination Act* (1999)

Roseland, M. (1992). *Toward Sustainable Communities: A Resource Book For Municipal And Local Governments.* Ottawa, Ontario: National Round Table On The Environment And The Economy.

Undergraduate Research Projects UON

Mutuma J. M., (1998) Poor Plan Implementation: An Impediment To Town Development, Case Study Of Maua Town. Unpublished B.A (Land Economics) Project Paper, University Of Nairobi.

Kingoria, G.K., (1986) Land Use Conflicts in Peripheral Nairobi, Unpublished B.A (Land Economics) Project Paper, University Of Nairobi.

Magura, J.W., (1990) The Conflict Between Commercial cum Industrial Activities and Residential Land Use In Nairobi, Unpublished B.A (Land Economics) Project Paper, University Of Nairobi.

Oundo, W.O., (1995) Land Use Patterns In Emerging Urban Centre: Case Study Of Busia Town. Unpublished B.A (Land Economics) Project Paper, University Of Nairobi.

Mwangi, E.K., (2003) Land Use Conflicts: Case Study Embakasi Area. Unpublished B.A (Land Economics) Project Paper, University Of Nairobi.

Internet

Wikipedia (2008) *History Of Nairobi* [Internet] Http://Www.Nairobicity.Org/

Wikipedia (2008) Pollution, *Http://Www.En.Wikipedia.Com/Pollution*

Unchs, Www.Habitat.Org

Solow, R. M. "*Sustainability: Our Debt To The Future.*" *Usa Today*, September 1992. Http://Ww.Usatoday.Com/News_Archives

Nolo Online Resource (2008) Http://Www.Nolo.Com

Peterson, M. (No Date Given). *Harnessing The Power Of Vision: Ten Steps To Creating A Strategic Vision And Action Plan For Your Community*. Little Rock, University Of Arkansas Cooperative Extension Service. Http://Ciip.Org

APPENDIX

QUESTIONNAIRE TO RESIDENTS

Declaration: This information is confidential and will be used for academic purposes only.

Age.....

1. How long have you lived here?

1-5 years	
6-10 years	
11-15 years	
16-20 years	

2. What problems do you face by living in this area?

Solid effluent	
Liquid effluent	
Glare	
Noise	
Smoke	
Dust	
Odour	
Others, please specify	

3. In your opinion, what causes the above environmental problems?

cause	
High population/ congestion	
Mixed development/ poor planning	
Disregard for environmental laws	

4. what do you think should be done to reduce the problems

suing the polluting party	
relocating the commercial activities	
strengthening the existing laws on pollution	
others please specify	

5. Do you know of any environmental conservation programmes in the area (if yes, specify).....

.....

6. how is the provision of the following services;

Services	excellent	good	fair	poor	very poor
Water	[ ]	[ ]	[ ]	[ ]	[ ]
Access roads	[ ]	[ ]	[ ]	[ ]	[ ]
Sewer/drainage	[ ]	[ ]	[ ]	[ ]	[ ]
Garbage collection	[ ]	[ ]	[ ]	[ ]	[ ]

APPENDIX

QUESTIONNAIRE TO BUSINESSMEN

DECLARATION: This information is confidential and will be used for academic purposes only.

Date of interview.....

Name of businessman .....

1. How long have you operated your business in the town?

.....

2. Type of business

   Retail outlet [ ]

   Butchery [ ]

   Chemist [ ]

   Restaurant [ ]

   Hardware [ ]

   Jua kali [ ]

   Other [ ]

3. Is it registered? Yes [ ] No [ ]

4. What motivated you to choose Zimmerman as the location of your business?

   High population [ ]

   Nearness to residence [ ]

   Accessibility [ ]

5. What problems do you face when carrying out your business in the town.....

   .....

   .....

   ..

APPENDIX
QUESTIONNAIRE TO DEVELOPERS

Date of interview..... Questionnaire Number.....

1. What type of property development do you undertake?

Residential [ ]

Commercial [ ]

Industrial [ ]

Others, please specify [ ].....

2. Was your development approved by Nairobi City Council?

.....

.....

.....

3. How long have you operated in this area?

1 - 5yrs [ ]

6 - 10yrs [ ]

11- 15yrs [ ]

16- 20+ [ ]

4. What is your opinion on mixed use development in Zimmerman?

.....

6. What problems do you encounter as a result of the presence of other users?

.....

.....

.....
.....

7. In your opinion, does your property have any adverse effects on the environment?

Please explain.....
.....
...
.....
...

9. Do you know of EMCA and the EIA process?
.....
.....
.....

10. Do you follow its regulations and provisions?
.....
.....
.....
.....

APPENDIX
QUESTIONNAIRE TO NAIROBI CITY COUNCIL PLANNING DEPARTMENT

DECLARATION: This information is confidential and will be used for academic purposes only.

Date of interview.....

1. What environmental challenges arise due to poor planning in this area?

.....

.....

.....

.....

2. What in your opinion are the causes to the above challenges?

.....

.....

.....

...

3. What recommendations can you make pertaining to the above situation?

.....

.....

.....

4. Are you aware of EMCA 1999? If yes, briefly explain the level of interaction between NEMA and NCC?

.....

.....

5. Are you aware of any land use conflicts in Zimmerman? If yes, what are the possible solutions to the land use conflicts?

.....

APPENDIX
QUESTIONNAIRE TO NEMA

Declaration: This information is confidential and will be used for academic purposes only.

Date of interview.....

Questionnaire Number.....

Respondent's information (please tick where applicable)

Name of respondent [optional].....

1. What is your job description?

   .....

2. Briefly describe the EIA process?

   .....

   .....

   .....

3. What are the qualifications of an EIA expert?

   .....

   .....

   .....

   .....

4. What professional body/bodies register and regulate the codes and conduct of EIA experts?

   .....

   .....

.....

.....

5. Describe the scope of NEMA as regards enforcement of environmental legislation?

.....

.....

.....

6. In your opinion, what hinders efforts to reduce environmental degradation in urban centres?

.....

.....

.....

.....

.....

.....

7. What should be done to counter the above?

.....

.....

.....

.....