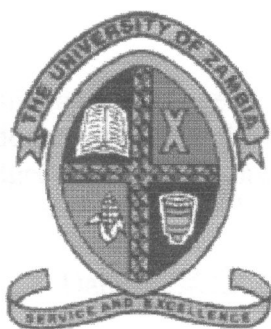


**THE EFFECTS OF ERRATIC WATER SUPPLY IN SQUATTER
SETTLEMENTS
(A CASE STUDY OF CHIPATA COMPOUND IN LUSAKA)**

SAKALA ADAMSON

**UNIVERSITY OF ZAMBIA
GEO 474**

OCTOBER 2004



THE UNIVERSITY OF ZAMBIA
SCHOOL OF NATURAL SCIENCES
DEPARTMENT OF GEOGRAPHY

**THE EFFECTS OF ERRETIC WATER SUPPLY IN SQUATTER
SETTLEMENTS**
(A CASE STUDY OF CHIPATA COMPOUND IN LUSAKA)

BY
SAKALA ADAMSON
99111055
SUPERVISOR: PROF. R.Y. SINGH

A GEO 474 PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF
GEOGRAPHY, SCHOOL OF NATURAL SCIENCES, UNIVERSITY OF ZAMBIA, IN
PARTIAL FULFILMENT OF THE BACHELOR OF SCIENCES DEGREE IN
NATURAL RESOURCES.

DECLARATION

"I, Sakala Adamson, declare that this report has been composed and compiled by me and that the work recorded has been done by me, that the sources of all materials referred to have been specifically acknowledged, and that the project report has not been accepted in any other previous application for academic award".

Signature: *Sakala* Date: *29/10/04*

DEDICATION

This report is dedicated to my Mum and Dad, who have given me all the support I needed from the time I started school until today.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Professor R. Y. Singh, the lecturer at the University of Zambia (UNZA), who had tirelessly supervised me from the beginning of my project up to its completion. I would like to extend my gratitude to Dr. G.P.A. Banda, the head of the geography department of the School Of Natural Science at the University Of Zambia who provided me with the necessary documents which enabled me to access information on the subject from various institutions.

I am greatly indebted to Mr. Mbuzi of CARE Zambia, Lusaka (Chipata compound) for giving me the information which has enabled me to write this paper. I am grateful to my Mum, Dad, brothers and sisters who rendered all the support that I needed at the time I was doing my project.

I would also like to thank my colleagues, Mr. T. Nyirenda, Mr. M. Malambo and Mr. D. Chanda for their kindness to allow me to type my report using their computers.

ABSTRACT

Zambia is bestowed with abundant water resources but the majority of her people do not have access to adequate and clean water.

Urban areas, particularly the squatter settlements, face a number of problems resulting from inadequate water supply. These problems are worsened by high levels of urbanization, rapid growth of population, an increase in agricultural production, an increase in the number of industries and unequal distribution of water.

With the increased levels of urbanization and rapid growth of population, expansion of the already existing squatter settlements and emergence of other squatter settlements should be expected. Erratic water supply is looked at as the cause of some forms of environmental degradation and the indirect consumer of women's time as they spend most of their time fetching for water. In addition, the occurrence of water borne diseases and accidents among children are attributed to erratic water supply. As such effects of erratic water supply must be identified in order to come up with solutions which would save our environment and human life. ^{which paper?} The paper has come up with recommendations which would help to minimize the impact of erratic water supply to the environment, and therefore, to improve the well being of the squatter population.

ABBREVIATIONS

C.S.O – Central Statistical Office

G.R.Z – Government Republic Of Zambia

IUCN – World Conservation Union

SADC – Southern Africa Development Community

SARDC – Southern Africa Research And Documentation Centre

UNEP – United Nations Environmental Programme

UNFPA - United Nations Population Fund

UNESCO – United Nations Education And Scientific Organisation

WWAP – World Water Assessment Programme

TABLE OF CONTENTS

	Page
CHAPTER ONE.....	1
Introduction.....	1
Back Ground Information.....	1
History Of Lusaka's water Supply.....	1
Water Supply In Chipata Compound.....	2
Development Of Squatter Settlements.....	2
Water And Sanitation.....	2
Statement Of Problem.....	4
Purpose Of ^{the} Study.....	4
Objectives.....	4
General Objective.....	4
Specific Objectives.....	4
Hypothesises.....	5
<u>Rational</u>	5
Preview Of The Organisation Of The Report.....	6
CHAPTER TWO.....	7
Literature Review.....	7
Nature And Availability Of Water On Earth.....	7
Water Availability And Distribution.....	7
Global Context.....	8
African Context.....	9

	Page
Southern African Context.....	9
Zambian Context.....	10
Environmental Degradation.....	10
Sources Of Water For Domestic Use.....	11
Surface Water Sources.....	11
Ground Water Sources.....	11
Uses Of Water In Urban Areas.....	12
CHAPTER THREE.....	13
Description Of Study Area.....	13
Location.....	13
Relief And Drainage.....	13
Geology Of The Lusaka Area.....	16
Climate.....	16
CHAPTER FOUR.....	19
Methodology.....	19
Data Sources.....	19
Primary Sources.....	19
Secondary Sources.....	19
<u>Sampling Size And Procedure</u>	20
Problems Encountered In The Field.....	20
CHAPTER FIVE.....	22

Results..... 22

CHAPTER SIX..... 26

Discussion..... 26

CHAPTER SEVEN..... 29

Conclusion And Recommendations..... 29

References..... 32

Appendices..... 34

LIST OF TABLES

	Page
Table 1: Levels Of Education.....	21
Table 2: Solution To Full Toilet.....	22
Table 3: Type Of Toilet.....	22
Table 4: Status Of Experiencing Water Borne Diseases.....	23
Table 5: Status Of Accidents Among Children.....	24
Table 6: Access To Time For Other Things.....	24
Table 7: Activities Done.....	25

LISTOF FIGURES

	Page
Figure 1: Location Of Lusaka In Zambia.....	14
Figure 2: Location Of Study Area.....	15
Figure 3: The Drainage Of Lusaka.....	17
Figure 4: The Geology Of Lusaka.....	18

LIST OF FIGURES

	Page
Figure 1: Location Of Lusaka In Zambia.....	7
Figure 2: Location Of Study Area.....	9
Figure 3: The Drainage Of Lusaka.....	11
Figure 4: The Geology Of Lusaka.....	12

CHAPTER ONE

INTRODUCTION

Water is among the major elements that support life. Its shortage is the most urgent and big environmental problem faced by most nations especially ^{those in} the developing countries.

The shortage or inadequate water supply is caused by a number of factors, some of which are: rapidly increasing population, an increase in agriculture production, increasing number of industries, unequal distribution of water, pollution and high levels of urbanisation.

The erratic supply of water gives rise to a number of environmental problems. It is also considered to be the cause of water related diseases. In addition, ^{it} makes women spend most of their time fetching this scarce life supporting liquid.

1.1 BACK GROUND

1.1.1 History Of Lusaka's Water Supply

When Lusaka was designated a township in 1915 under the authority of the British south Africa company, the perennial Ngwerere stream to the north of the town provided the necessary water. As the town grow supply from this source soon become insufficient. In 1917, the British South Africa Company paid for a 20 metre deep well near the town centre. Further wells and a series of small diameter boreholes were drilled as the need arose, particularly with the growth of urban area. In the 1950s two larger diameter boreholes were drilled and ^{the} supply was increased to approximately 2,288 square metres per day (Geoffrey, 1980). Although the borehole drilling programme was continued, it was realised in ^{the} early sixties that groundwater supplies alone would be unable to meet the ever increasing water demand (Lambert, 1964).

As the rate of consumption increased in subsequent years, it was decided to supply water to the Lusaka population from the Kafue river. As such, in 1968, work was started to work on the scheme to pump water to Lusaka from the Kafue river (Hoyer, 1978). In 1970, at

the Jolanda plant in Kafue district, phase 1 scheme was commissioned to supply water to Lusaka. After seven years, flow was further increased under phase 2. The is carried to Stewart park reservoir in Woodlands on the north side of independence avenue near the Wood lands roundabout. From there it is distributed to various residential areas of Lusaka.

1.1.2 Water Supply In Chipata Compound

The residents of Chipata compound depend on communal standpipes for their water. Standpipes were initially introduced to the area way back in the mid 1970s. These were vandalised and pipes were stolen. The residents depended largely on water from the neighbouring compounds uncovered wells and the nearby stream. In 1997, CARE Zambia, started providing water services to the residents using standpipes. The water is not available most of time. It flows only from 06:00hours to 11:00hours in the morning and from 16:00hours to 18:00 hours in the afternoon. The amount of water ranges from 554,000 to about 700,000 litres per day. (Sources?)

1.1.3 Development Of Squatter Settlements In Zambia

The development of squatter settlements is not a peculiar phenomenon to Zambia. The major cause of the development of squatter settlements in Zambia is rural urban migration as well the rapid growth of population.

Which Gov?
Government gave priority to developing a modern industrial economy and in doing so neglected agriculture and rural development especially in Lusaka which had a population of 1.3 million by 1990. Insufficient social infrastructure was provided to support this population leading to proliferation of unplanned shantytowns which have created a lot of social problems. Further, the government policies during the Second Republic encouraged people to move from rural areas to urban areas for employment. The increasing rate of urbanisation led to the increase in population in urban areas which in turn created a high demand for housing. The demand for housing could not be met, as a result people started

settling illegally on unoccupied pieces of land. In 1963, roughly 20% of Zambia's population lived in urban areas. By 1990, this population had risen to 42%, making Zambia the second ^{most} urbanised country in sub-Saharan Africa (Duncan T, 1996). C.S.O ^{meaning?} ^{when?} shows that about 86% of Lusaka province live in urban areas.

After independence, the former quarry and contractors' compounds continued to grow and to accommodate residents unconnected with the contractors' labour force. The existing unauthorised housing areas expanded on to state land, and new unauthorised housing areas were established. None of the residents in such areas had formal titles to the land, planning or building permission, and as such were officially regarded as illegal residents (Geoffrey, 1980).

1.1.4 Water And Sanitation

Safe and adequate water supply, basic sanitation and hygiene are essential requirements for a healthy community. In the early seventies, there was an official policy of no supply to the shanty compounds to discourage settlements. After this policy was implemented, there was a series of outbreaks of water related disease (Williams, 1986). Nyau (1980), reports that each standpipe in squatter compounds serves 25 households. This is a clear indicator that people need some improvement in water supply especially that today squatter settlements are expanding rapidly.

Tests carried out in 1974 by the City council on water from hand dug wells in various compounds around Lusaka revealed that all the water tested was bacteriologically polluted (Hoyer, 1978). This type of pollution is perhaps caused by untreated sewerage which seeps through from pit latrines. Today, this type of pollution must be on the increase as a result of already existing shanty compounds and the emergence of new ones. Duncan (1996), reports that since 1990, there have been repeated serious urban epidemics of cholera and dysentery during the rain season. Over 20,000 cases of dysentery have been reported since 1990 mainly in shantytowns in Lusaka and Copperbelt provinces.

1.2 Statement Of Problem

Zambia, like many other countries in the world especially the developing nations, face problems of water shortages despite her having many water resources. This erratic supply of water is ^{at} looked as the cause of diseases and of various forms of accidents among children. Women rarely have time for other things other than fetching for water. There are also considerable amounts of environmental degradation.

Why are these being used interchangeably?
Is this specific to chipata compound only — A weak problem statement.

1.3 Purpose of study

The research ^{is} concerned with effects of erratic water supply on human life with respect to squatters. It intends to investigate if erratic water supply is really the cause of diseases, both directly and indirectly certain forms of accidents among children and some forms environmental degradation. It further intends to find out if erratic water supply is the indirect consumer of women's time.

1.4 OBJECTIVES

1.4.1 General Objective

- Should be in sentence form!*
• To investigate the effects of erratic water supply on the squatter population.

1.4.2 Specific Objectives

- To find out if erratic water supply is the cause of certain forms of environmental degradation,
- To investigate if inadequate if inadequate water supply is the cause of diseases both directly and indirectly,
- To find out if erratic water supply is the indirect cause of accidents among children *and*

- To investigate if inadequate water supply is the indirect consumer of women's time.

1.5 HYPOTHESES

- Erratic water supply is the cause of certain forms of environmental degradation,
- Inadequate water supply is the cause of diseases, both directly and indirectly,
- Erratic water supply is the indirect cause of accidents among children *and*
- Inadequate water supply makes women spend much of their time for fetching water. *instead of doing what?*

1.6 RATIONAL

Water, being a basic requirement for human life must be suitable and adequate in supply for human consumption. According to Hoyer et al, (1978), the natural purification factor of the Lusaka dolomite is thought to be very limited due to shallow depth of the maximum circulation zone. Once the pollutants reach the water table only a small amount of subsequent can occur. One of the pollutants is sewerage.

Long walking distances and waiting times to draw water represent a major demand on women's time, as such women choose to use contaminated water close to their homes. For African children under five, the health burden that arises from diarrhoeal diseases linked to inadequate water, sanitation and hygiene is up to 240 times higher than in high-income nations (UNESCO/WWAP, 2002).

Meaning?

As a squatter settlement, Chipata compound is representative of other squatter settlements in Zambia with respect to water supply. The effects of erratic water supply in these areas must be identified because in the years to come we should expect further development or expansion of the already existing squatter settlements due to ^{the} rapid growth of population and high levels of urbanisation. If the effects can be established now, then the remedies to

the effects can be found before ^{the} development of other squatter settlements. This would therefore help to improve the well being of the squatters and the environment,

1.7 Preview Of The Organisation Of The Report

which one?

The report consists of seven chapters. ~~The first chapter is the introductory part of the report, and comprises the back ground to the study, objectives of the study, the hypotheses and the rational.~~ Chapter two deals with the literature review while the third chapter describes the study area. Chapter four covers the research methods used, the research findings are laid down in the fifth chapter. The sixth chapter deals with the discussion while the seventh and final chapter looks at the conclusions and recommendations. The appendices and references close the report.

strong enough but unedited

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter is concerned with reviewing the literature related to the effects of erratic water supply to human life. This literature includes the experience of women as they try to fetch water for domestic use. It is further looking at inadequate water supply as the contributor of environmental degradation, and as the source of water related diseases.

2.2 Nature And Availability Of Water On Earth

Our planet is abundantly bestowed with water resources. Approximately 73% of its surface area is covered with seas and oceans. Unfortunately this water contains salt and cannot be used for human consumption, neither for agriculture or animal husbandry. Current estimates indicate that the total volume of water on earth is $1.4 \times 10^9 \text{ Km}^3$, 97.35 of which is ocean the rest 2.7% fresh water, 77.2% is stored in glaciers, 22.4% as ground water and soil moisture, 0.35% in lakes and swamps, 0.04% in atmosphere and less than 0.01% in streams (Kapoor B.S, 2001).

2.3 Water Availability And Distribution

The availability and distribution of water varies greatly among and within continents and nations. Water availability, distribution and the associated problems will be looked at from the Global, African, Southern African levels up to the Zambian context.

2.3.1 Global Context

Water, the colourless and odourless liquid, is an important resource, which sustains life. The world has vast water resources although the majority of its people, especially in developing countries experience water shortages. Humans and their environment are greatly threatened with problems arising from inadequate water supply. The widely affected are ^{the} urban poor, especially those in squatter settlements.

General population growth and changing demographics ^{are affecting how} water resources are managed. During this century the demand for water has increased with rapid growth of population ^{and} agriculture, urbanization and industrialization. Since 1950, global water use has more than tripled while per capita use has increased by 50% (Kay, 1990). In 2000 1.1 billion people were without sanitation. It is also estimated that each year, about 1.7 billion deaths are recorded due deficient water, sanitation and hygiene (UNESCO/WWAP, 2002). UNEP (1999), reports that about 20% of the world population lacks access to safe drinking water and about 50% lacks sanitation.

Different world organizations have been working hard to improve on the supply of water. For example the United Nation General Assembly declared the 1980s ^{as} the international drinking water supply and sanitation decade. It provided some 1,348 million people in developing countries with safe water supplies and some 748 million people with sanitation services. But at the end of the decade, there were still about 1,232 million people without safe water and about 1,600million people with sanitation (UNEP, 1992). Per capita water supplies decreased by a third between 1970 and 1990, and there is little doubt that the population growth has been and will continue to be one of the main drivers of changes to patterns of water resource use ^{write this in full first.} (UNESCO/WWAP, 2002). The most alarming projection suggests that nearly 7 billion people in sixty countries will live water – scarce lives by 2050 (Gardner and Engelman, 1997). ^{Link} The urban population rose greatly through out the twentieth century and is projected to reach 58% of the world population by 2050 (UNFPA, 2002) this projected increase in population means that the demand of water will increase even more. Some to thirds of the world population is without clean

water and as a result diarrhea kills 4,600,000 children under five every year. At present, many developing countries have difficulties in supplying the minimum annual per capita water requirements of 1700 cubic meters of drinking ^{which is} necessary for active and health life for their people (UNESCO/WWAP, 2002).

2.3.2 African Context

Johns (1998), states that Africa is one of the two regions in the world facing serious water shortages. Africa has abundant fresh water in large rivers and lakes. However, there are great disparities in water availability and use between and within African countries because the water resources are unevenly distributed. Africa 's share of water on per capita basis is estimated to have declined by as much as 50 % since 1950 (Bryant, 1994).

2.3.3 Southern African Context

Southern Africa, which has a population of 136 million, has about 360,000 flow units (1 mcm/yr) available. The overall ratio of a population to flow units in southern Africa is about 360 not a problem but, with the population doubling in just under 24 years, the ratio will be 720 by 2016 and over 1000 ^{meaning?} by 2030. In other words, at the current population growth rate this region will experience chronic water shortages by 2030 (Andrea b et al, 1994). The demands on water in southern Africa are constantly growing with rapid increase in population with an average of 3% annual growth rate. ^{the} the population the SADC region is expected to double in less than 25 years, from about 145 million in 1995 (Munyaradzi c, et al, 1996). Water demand is projected to rise by at least 3% annually until the year 2020 (SARD, IUCN and SADC, 1994).

It has been estimated that by 2025 up to 16% of Africa 's population (230 million people) will be living in countries facing water scarcity and 32% (another 460 million people) in water stressed countries (John H, 1998). Today, more than half of 145 million people in the region have no access to safe water and sanitation (Munyaradzi, et al, 1996).

Urbanisation is yet another factor contributing to an increase in water demand. Although the number of urban residents ^{7.7.1.1.1} Sub-Saharan Africa provide with satisfactory sanitation is expected to double by 82 million people during the 1990s “there will be more than twice as many residents without access to sanitation by the year 2000 as there are today (Munyaradzi, et al, 1996).” It is amazing that a good number of people in southern Africa lack access to water when the region is bestowed with water resources. For example UNEP (1990) reports that ^{7.7.1.1.1} Zambia, Zimbabwe, Angola, Namibia, Tanzania, Malawi, Mozambique and Botswana ^{7.7.1.1.1} but only a third of their population share the Zambezi river have access to safe drinking water. Sentence structure!

2.3.4 Zambian Context

In urban areas, the level of access to safe drinking water and adequate sanitation facilities are 70% and 30% respectively. This implies that slightly more than 50% of the urban population is susceptible to some water borne diseases due to poor sanitation (GRZ, 1994). The population of Zambia is increasing at a faster rate. This is putting much pressure on water resources. Over the past three decades, Zambia’s population has more than doubled in size (GRZ, 1996). Urbanisation is yet another factor that has imposed pressure on urban water supply. ^{For example} About 86% of Lusaka province’s people live in urban areas (CSO, 1990). Link

2.4 Environmental Degradation

A number of forms of environmental degradation are known to occur due to inadequate supply of water. Sewerage pollution is common in many countries. For example, ground water in Meridia, Mexico has been severely affected by the influx of storm water and sewerage, and there is a risk that the contamination will spread to the wells which supply the city. Similar problems have occurred in Srilanka and many Indian cities and are expected in Jakarta and Manila, which have 900,000 and 600000 septic tanks respectively (UNEP, 1996). Ground water pollution in Botswana is caused by sewerage and bacteria, usually via leakages from pit latrines and cattle concentrations near boreholes

(Munyaradzi, et al, 1996). In shantytowns there has been virtually no public provision of sewerage infrastructure. Sanitation facilities have to be provided by the residents, and are only limited to pit latrines, buckets or a hole in the ground (World bank, 1994). The unlined pit latrines pollute the aquifer as well as the soil. About 40% of water supply of Lusaka is from underground sources. Out 900,000 of Lusaka 's 1.2 million (by 1995) inhabitants live in areas with no sewer and are serviced either by septic tanks or latrines, with effluent finally percolating into water sources (Mpundu M. and Chisupak, 1995).

2.5 Sources Of Water For Domestic Use

In Zambia the primary source of water is rain. The mean annual rainfall varies from 1,400mm in the north to 700 in the south. *(Source?)*

After rain falls, a percentage of the water flows to the rivers, lakes, streams, dams etc- while the other fraction percolates through the ground to the water table. Some portion of it evaporates. This can be used to describe the main categories of water sources.

2.5.1 Surface Water Sources

Surface water sources include rivers, lakes, ponds and wet lands. The run-off generated in Zambia is 100,000mcm annually. There are five river basins: the Zambezi, Kafue, Alluvial, Luangwa, Chambeshi/Luapula and Tanganyika. *In* all, the surface water resources are estimated to cover 45,000 Km³ (6%) of total land area (GRZ, 1994).

2.5.2 Ground Water Sources

Ground water sources include wells, springs and infiltration wells. Zambia enjoys favorable ground water conditions compared to most countries in the southern African region with regards to depth, storage capacity, available yields and exploitation potential. The total ground water storage is estimated at 1,740,340 mcm per year and ground water recharge of 160,080 mcm per annum (GRZ, 1994).

2.6 Uses Of Water In Urban Areas

In the urban set up, water has a wider range of uses. A good quantity of the water is used in industries and urban agriculture. The other portion of the water is used for domestic purposes.

- Strong enough and well organised
- Good sewerage structures in some parts.

CHAPTER THREE

3.0 DESCRIPTION OF STUDY AREA

3.1 Introduction

This chapter is concerned with the description of the study area. Only aspects relevant to the study are included.

3.2 Location

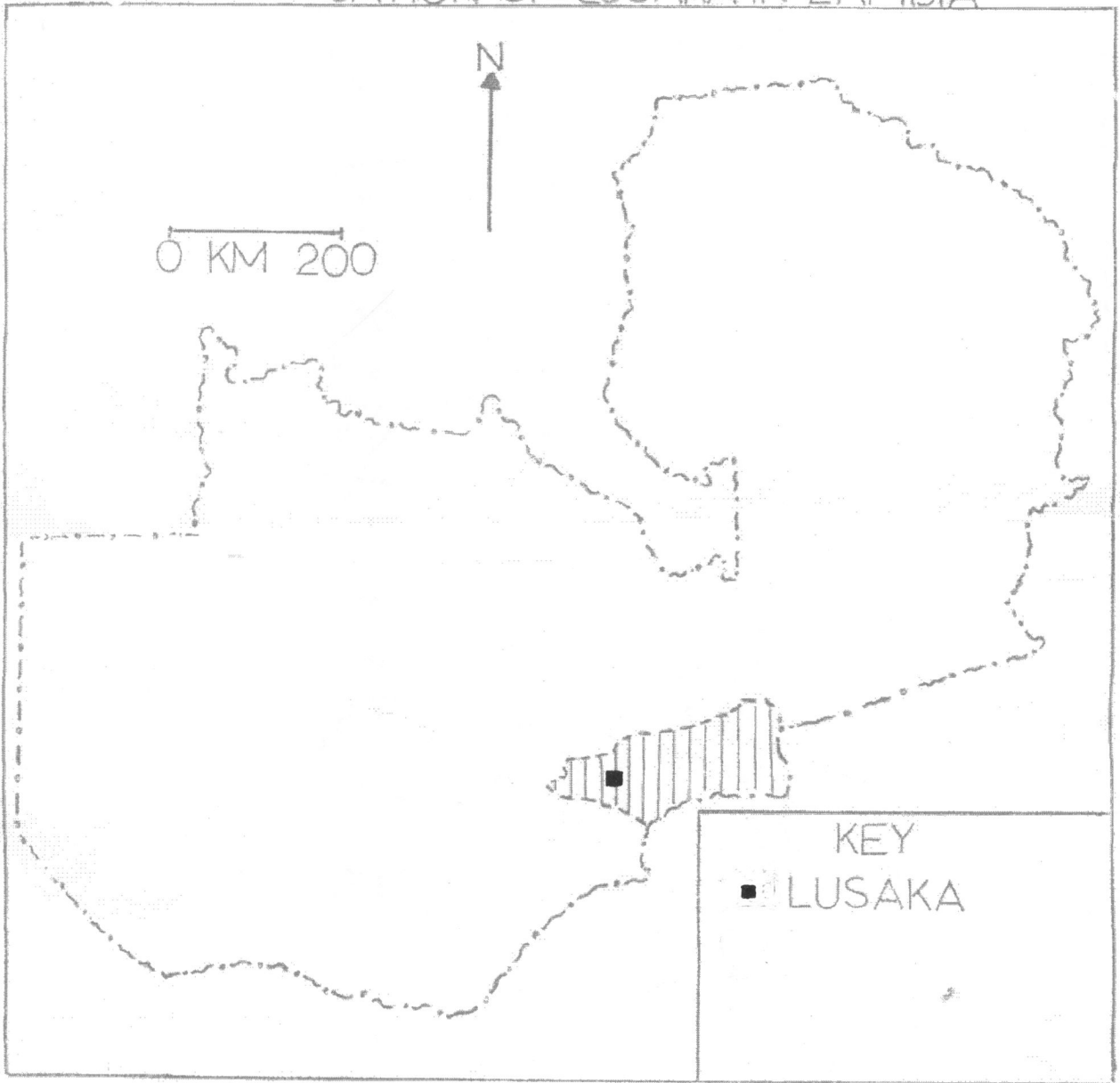
The research was done in Lusaka city, particularly in Chipata compound. Chipata compound is situated about 5 Km northeast of city centre. It has a population of about 61,060 people and has the annual growth rate of 6%. The location of Lusaka city and Chipata compound are shown in figures 1 and 2 respectively.

3.3 Relief And Drainage

Lusaka occupies one of the higher parts of the central African plateau. Towards the south there is a rapid loss of height. The plateau occupying the central section rises above 1,370 metres (Geoffrey, 1980).

The drainage of the Lusaka city takes a radial pattern. The area has many streams although many streams do not drain the central part. In the northwest quarter of the city there is the Chunga stream. The Mwembeshi, Chongolo, Chowa and Mungu streams drain the southwest quarter. Chilongolo is the only known stream of significance which flows through the surface of the limestone plateau south of Lusaka. Chalimbana and Ngwerere, the only tributaries of Chongwe stream flow in the northeast quarter while the Funswe's tributaries cross the southeast of the city. Munchito stream crosses the western

FIG. 1 THE LOCATION OF LUSAKA IN ZAMBIA



SOURCE: Siddle(1971)

- You mean you could not find a more recent source?
- What are the coordinates?

FIG 2 : LOCATION OF STUDY AREA

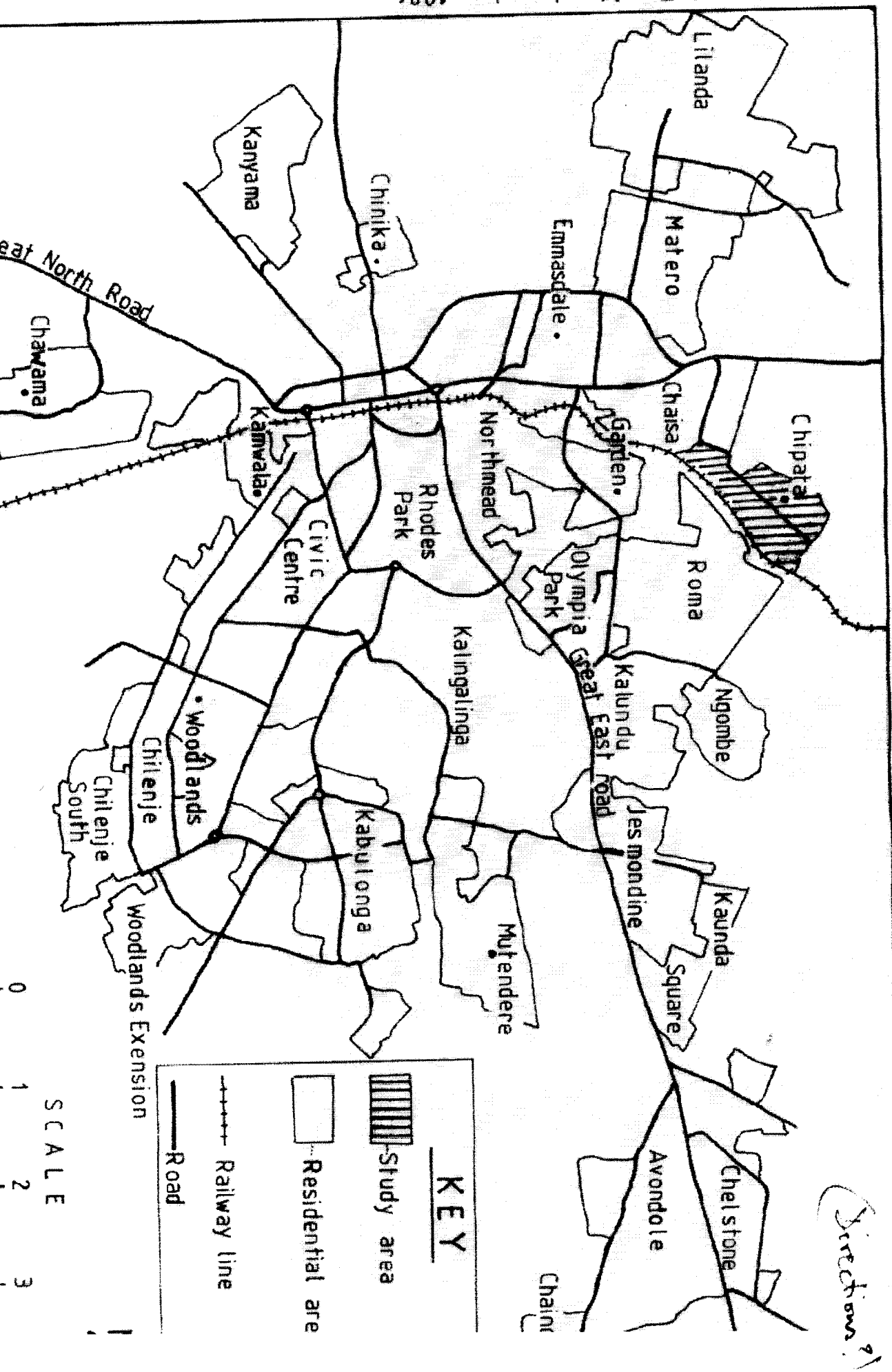
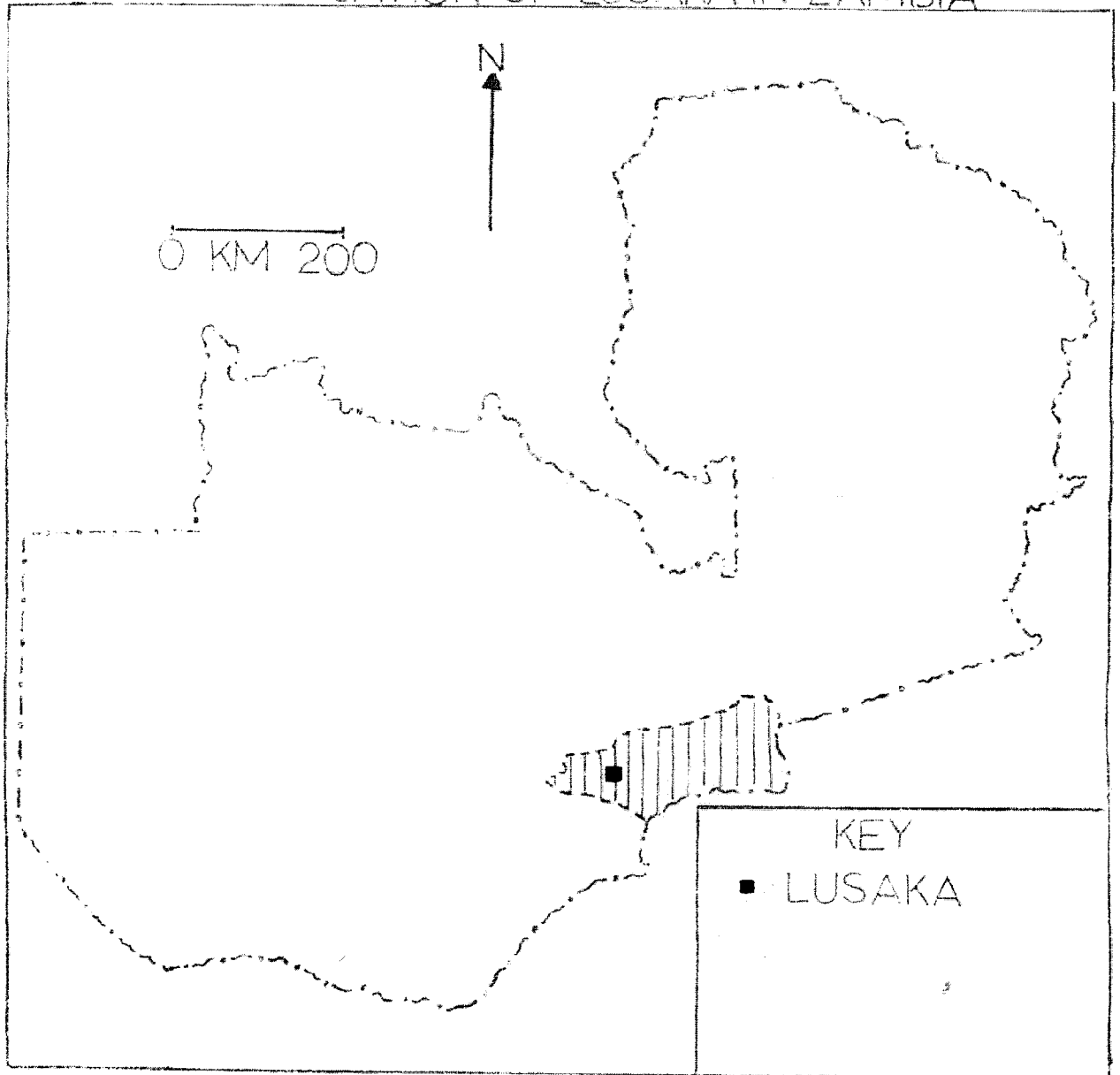


FIG. 1 THE LOCATION OF LUSAKA IN ZAMBIA



SOURCE: Siddle(1971)

- "You mean you could not find a more recent source?"
- "What are the alternatives?"