LIVINGSTONE DISTRICT STATE OF ENVIRONMENT OUTLOOK REPORT

Livingstone City Council Logo

November, 2008

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A report by Livingstone City Council and Environmental Council of Zambia

ISBN: 978-9982-861-02-1

DISCLAIMER

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FOREWORD

There has been growing global concern and awareness on environmental issues since the first United Nations Conference on the Environment held in Stockholm in 1972. The focus has been on sustainable development as a process of change in which the exploitation of natural resources, direction of investments and orientation of technological development are made consistent with both the current and future potential to meet human needs.

Sustainable use of natural resources has become a cornerstone for economic development in Zambia. Government has established legal and institutional frameworks to guide environmental management in the country by enacting regulations, plans and programmes. These include; the National Conservation Strategy (NCS) of 1985, National Environmental Action Plan (NEAP) of 1994 and Environmental Protection and Pollution Control Act (EPPCA) in 1990 which led to the subsequent establishment of the Environmental Council of Zambia (ECZ). The NEAP was implemented on a pilot scale through the Environmental Support Programme (ESP), which was aimed at supporting public, private and community based approaches to environmental and natural resources management.

In order to achieve an integrated approach to the use and management of natural resources, Government has developed a National Policy on Environment (NPE). The main purpose of the policy is to ensure that socio-economic development will be achieved effectively without damaging the integrity of the environment or its resources. Further, Government policy on Decentralization is aimed at enhancing institutional and human resource capacity at all levels of Government. The policy aims to empower local authorities and local communities by devolving decision-making authority, functions and resources from the centre to the lowest level with matching resources in order to improve efficiency and effectiveness in the delivery of services.

In addition, the Fifth National Development Plan (FNDP), 2006-2011 is a guide to the country's development efforts over the medium and long-term period. The FNDP is an important vehicle towards the realization of the Vision 2030 in which Government has articulated long-term development objectives and identified a number of development goals. The FNDP has acknowledged the weak management capacity at provincial, district and sub-district levels and suggests the need for capacity building at these levels. Improved

environmental management at the local level will enhance the participation of those whose livelihoods are dependent upon the sustainable management of renewable natural resources.

Government further recognises that achieving sustainable development in Zambia requires access to data and information so that those involved in decision making can reach the level of knowledge and understanding needed for successful programme planning and service delivery.

The country has been engaged in periodic production of State of Environment (SoE) Outlook reports in order to provide for an assessment of the environment so as to raise awareness and understanding of environmental trends, their causes and consequences among stakeholders. In line with this, the country has gone a step further beyond regular production of national environment outlook reports to district SoE Outlook reporting to facilitate the measurement of progress made towards sustainable development at the local level. In view of this, district SoE Outlook reports were produced on a pilot basis for Chipata, Livingstone, Lusaka and Solwezi. The four districts were selected based on the priority economic areas for the country. Livingstone was selected in order to show the interactions between the tourism sector and the environment in order to bring about the required changes for urban planning and development.

The Livingstone district SoE Outlook Report is therefore important in strengthening management and monitoring of environmental issues at city level and is expected to have a significant impact on effectiveness and service delivery in Livingstone district.

Government is optimistic that through the environmental assessment and reporting process, there will be increased responsibility for environmental planning and management at all levels.

Honourable Catherine Namugala, M.P.
MINISTER
TOURISM, ENVIRONMENT AND NATURAL RESOURCES

PREFACE

Livingstone district covers 695 Km² with the population of 103,288 and a growth rate of 2.1 per cent. The fast growing population is increasingly putting a great demand on land, natural resources and social services. Therefore, environmental reporting has become essential for sustainable development to be achieved in the district.

The Livingstone district State of Environment (SoE) Outlook report was prepared by a group of technical experts from various institutions of the district. The purpose of the report is to improve upon knowledge on the state of environment for Livingstone and its change overtime. It provides for integration of environmental considerations in decision making as well as improving public awareness and information on the state of the environment in the district.

The Livingstone SoE Outlook report will therefore, increase knowledge about the interaction between society and the environment so as to bring about the needed changes for planning and management. The report focuses mainly on assessing the pressures the environment is facing and analyses actions aimed at enhancing environmental management at district level. It goes a step further to propose policy options for addressing environmental challenges. Some of the key issues covered in the report include; land degradation, depletion of biodiversity, socio economic issues such as the rapidly growing population, HIV/AIDS and poverty, provision of basic services such as education, health and housing. This report therefore, provides a baseline for environmental planning and monitoring in the district.

The challenge is for various stakeholders in the district to utilise the report for planning and decision making at all levels. We must therefore use this document as a tool in the management of the environment and to consider an integrated approach in the sustainable development of the district. We recognise limitations in available data from the district. It remains our challenge to strengthen data collection, analysis and monitoring of activities in the district such that subsequent environmental assessment reports will have improved data.

I wish to take this opportunity to thank members of the Technical Working Group for their commitment throughout this process. I am further indebted to ECZ and UNDP for their technical and financial support respectively during the preparation of this report.

Grace Shafik
LIVINGSTONE MAYOR

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ACKNOWLEDGMENTS

Preparation of the Livingstone State of Environment (SoE) report was a result of collaborative efforts by many individuals and institutions from the district. Livingstone City Council (LCC) commends the technical support provided by Environmental Council of Zambia (ECZ) in guiding the process of producing this report.

LCC further acknowledges the financial support from the United Nations Development Programme (UNDP) towards production of the report. Special thanks are extended to all the contributors:

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immuno Deficiency Syndrome
CSO	Central Statistical Office
DDCC	District Development Coordinating Committee
DDPRS	District Development Poverty Reduction Strategy
DHS	District Health Survey
DPSIR	Driving Force-Pressure-State-Impact and Response framework
DSA	District Situation Analysis
DWA	Department of Water Affairs
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EPPCA	Environmental Protection and Pollution Control
ERB	Energy Regulation Board
FNDP	Fifth National Development Plan
GNP	Gross National Product
GRZ	Government of the Republic of Zambia
NHCC	National Heritage and Conservation Commission
HIV	Human Immune Virus
IEAR	Integrated Environmental Assessment and Reporting
IUCN	International Union of the Conservation of Nature
LCC	Livingstone City Council
JICA	Japanese International Cooperation Agency
MACO	Ministry of Agriculture and Cooperatives
MCDSS	Ministry of Community Development and Social Services
MDG	Millennium Development Goal
MoFNP	Ministry of Finance and National Planning
MTENR	Ministry of Tourism, Environment, and Natural Resources
NAIS	National Agricultural Information Services
NEAP	National Environmental Action Plan
NSWMS	National Solid Waste Management Strategy
OECD	Organisation for Economic Cooperation and Development
PRSP	Poverty Reduction Strategy Paper
RHC	Rural Health Centre
SADC	Southern African Development Community
SAP	Structural Adjustment Programme
SoE	State of Environment
STI	Sexually Transmitted Infections
SWSC	Southern Water and Sewerage Company
UNCED	United Nations Conference on Environment and Development

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
ZAWA	Zambia Wildlife Authority
ZNTB	Zambia National Tourist Board

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EXECUTIVE SUMMARY

This report represents an Integrated Environmental Assessment (IEA) for Livingstone District. It provides measurement of progress on the effort by the district towards sustainable development. It further helps to create awareness and knowledge on the state of the local environment and its change over time in order to access the results of past actions and contribute to the development and harmonization various policies in the district.

The process of preparing this report started in August 2006, with the initiative from the Environmental Council of Zambia (ECZ). ECZ guided a team of district experts from Government departments, private sector and civil society to prepare the report.

The report is divided into six sections four of which are the main themes under which all the environmental issues are grouped:

i. Description of the geographical features
ii. Socio economic characteristics
iii. Land, Agriculture and settlement
iv. Water and sanitation
v. Biodiversity, Energy and Climate Change
vi. Scenarios and Policy Options

Geographical Features and Climate

Livingstone District is located at 25^0.30'-26^0.41'E and 18^0.00'-18^0.46'S in the Southern Province of Zambia. The District covers 695Km² and shares an international boundary with Zimbabwe. This boundary runs along the Zambezi River from the South to the South-East. Further, it shares district boundaries with Kazungula district to the West, North and North East. The elevation of Livingstone district is approximately 975masl. Temperatures vary considerately between the cool and hot season. They range from 0.0℃ in the cool season (May to June) to 40.0° Celsius in the hot season (S eptember to October). The annual rainfall averages approximately 600mm of which two-thirds fall in the three months December, January and February. Average rainfall from November to March is 780mm.

The predominant soil types in Livingstone District are the Ferralsols, followed by Cambisols and Acrisols. Gleysols and Leptosols are present in limited amounts. The district is covered by a number of vegetation types among them; Miombo, Grasslands and Dambos, Kalahari on sand Munga woodland, Riparian and Mopane woodland.

Socio Economics

The main Socio economic issues affecting the environment are listed as high rate of population growth, poverty, HIV/AIDS, unemployment, health, education, water supply, sanitation and energy. Livingstone district is the fifth most populous district in Southern

Province with a population of 103,288 of which 51,460 are males while 51,821 are females. The district population growth rate is recorded at 2.1 per cent. The population density is 148.6 Km^2 and growing. Much of the population is distributed in the urban area which is 97,488 of which 48,866 are males and 48,622 are females.

In general the population of the district is over 50per cent below the age of 14 years. Fertility rate of the population is 4.4. Life expectancy in the district is 42.7per cent for males and 43.2per cent for females and these figures are expected to increase over the years. Diseases most prevalent and with high morbidity values at all age levels are Malaria, Pneumonia, Diarrhoea and trauma while diseases causing most deaths are, Malaria, Tuberculosis, Diahorreoa and Pneumonia and HIV/AIDS.

Education in the District is considered below the expected targeted numbers. The drops out rates are fairly high in the district. Literacy levels are fairly high compared to other districts within the province 89.3 for people above 15 yeas. Poverty levels remain high in the district with over 60per cent of the people as being extremely poor. The report further makes linkages of socioeconomics with environment degradation. Tourism is discussed in detail in the report. The numbers of tourist arrivals are increasing. The socioeconomic impacts are discussed mainly focusing on population growth, deforestation, land shortage and depletion of biodiversity.

Land and Agriculture

The main issues discussed under this thematic area are land use, land degradation, agro chemicals, soil erosion, and deforestation. River bank cultivation, siltation, earth and sand mining are equally important factors.

The report points out poor population distribution and population growth as most significant on putting pressure on land. Agriculture is still important in the district, and the district is one of the producers of Maize, Groundnuts and vegetables. The production figures however vary with years for each crop. The report discusses agriculture as an important factor in land degradation, especially causing soil erosion, deforestation and introduction of agro-chemicals in the ecosystem. Current land under cultivation is known to be 634 ha (commercial) 372 (emergent) 637ha for small scale farmers.

Water and Sanitation

The main sources of water remain the surface water from the Zambezi River. Water through wells and boreholes is also significant. The Southern Water and Sewerage Company (SWSC) is the sole supplier of water in the urban and peri-urban areas. The report shows that a good population has access to safe and clean water and mainly this population is in the urban area.

The17 peri- urban areas studied by NWASCO shows a fairly large number of individuals (4,142) as having connections, and there are 16 Kiosks in the peri-urban.

Sanitation remains a serious issue in the district. A very large population still use pit latrines in the peri-urban areas while people in rural areas may use the bush for toilet. Although there are sewer treatment points, these are largely inadequate. Septic tanks remain the main sewer system. The district is severely limited in waste management. Collection of waste is done irregularly and there is no elaborate system of collection and dumping of garbage. Much of the waste is generated at markets, hotels and industrial areas. Studies conducted in the peri-urban areas on sanitation show much garbage being disposed indiscriminately. Water pollution, poor sanitation, limited water supply, lack of waste management are considered serious environmental issues in the district.

Biodiversity, Energy and Atmosphere

Among the main issues affecting biodiversity in the district as discussed in the report are deforestation, agricultural practices, population and increased demand for fuel wood and charcoal production. Although data is lacking on biodiversity, the district is depleted in wildlife, fisheries, and forest resources remain highly threatened through excessive cutting of trees. Whereas the District has over 172,615 ha of land under protection, most areas are severely threatened by encroachment and deforestation. The numbers of species within the region are 110 mammals, 432 birds, 65 reptile, 78 amphibians, 52 fresh water fishes and 324 woody species.

Energy is discussed in a form of biomass energy, electricity and petroleum. The distribution of electricity shows 18 per cent, as having access to electricity, of which 17,858 are in the urban areas and 998 are located in the rural area. The proportion of population with access to electricity is much less compared to those without electricity. Major sources of energy therefore remain fuel wood and charcoal. The report points out that lack of electricity will continue to put pressure on woodlands in the district. The environment is further threatened by lack of efficient methods in energy utilisation. The report gives proposals for energy conservation in the district.

The climate pattern of the district does not show clear trends other than those indicated in the annual cycles. The long term climatic change in the district can not be detected under the present data available, but the discussion in the report focuses on the potential input of climatic change. This includes threat to food production, biodiversity, water supply, and that poor people will be most vulnerable to any change in the climate.

Scenarios and Policy Reforms

The report gives a futuristic analysis of impacts (human and natural) on the environment. It draws scenarios on poverty reduction, population growth and distribution, agriculture and food

production, water supply and sanitation, biodiversity and energy. These are considered up to 2015. The current policies are considered as business as usual as they remain ineffective in environment management in the district. Therefore new policies are needed to drive indicators towards the needed goals.

Recommendations are suggested as new policies that could shift growth paths of most indicators. The report puts emphasis on the need for major environment transformations in the district, particularly in halting deforestation, regulating tourism development, improved agriculture farming practices, reducing HIV/AIDS, controlling population distribution and development of new sources of water supply. The report proposes creating awareness and public involvement in sanitation and solid waste management, afforestation and conservation farming. Effective future environment reporting will depend on good sources of data and therefore, the report recommends for a development of research and a plan for a comprehensive monitoring and evaluation system for the district.

1: INTRODUCTION

1.1 STATE OF ENVIRONMENT OUTLOOK REPORTING

The process of the preparation of this report started in August 2006, with the initiative from the Environmental Council of Zambia (ECZ). The process started with consultative meetings with stakeholders which included Government departments, private sector and civil society. These stakeholders formed the Technical Working Group in the preparation of the report. The process included, among other things, two workshops for training of TWG members on preparation of a district SoE outlook report and on writing the report.

The Government of Zambia attaches great importance to the SoE Outlook reporting because it provides some measurement of progress on our efforts towards attaining sustainable development. SoE outlook reports help to increase awareness and the general understanding of environmental trends and conditions by showing linkages between causes and consequences of environmental degradation as well as what action must be taken to mitigate or prevent adverse environmental effects.

Zambia has so far produced three SoE reports in 1990, 1994 and 2000. These reports have provided valuable environmental information to various sectors of our community.

The new approach in environmental reporting is Integrated Environmental Assessment (IEA) defined as a process of producing and communicating policy-relevant information on key interactions between the natural environment and society.

It answers four questions that are a key to effective decision making. These are:

1. What is happening to the environment?
2. Why is it happening?
3. What can we do, and what are we doing about it?
4. What will happen if we do not act now?

The Government is aware that over the years many lessons have been learnt regarding the process that must be followed in producing these reports. One of them is the need for wider stakeholder participation and collaboration in environmental reporting and assessment. An IEA must therefore, be participatory, build consensus, and engender a sense of ownership among all stakeholders at various levels. The co-operation and collaboration of various stakeholder institutions, including ministries, parastatal organizations, private sector, NGOs, academia, sub-regional and international partners is vital in ensuring that a credible and transparent environmental reporting process is undertaken

1.2 Environment Outlook Reporting in Livingstone District

Livingstone District remains to benefit greatly from the integrated environmental assessment and reporting. The Livingstone SoE Outlook report aims to:

i. improve upon knowledge on the state of our local environment and its change over time, in order to assess better, the results of past actions and contribute to development and harmonization of policies;
ii. fully integrate environmental considerations in decision making; and
iii. Improve public awareness and information on the state of the district environment.

Livingstone district is expanding in population and economic activities. Both economic and population expansion have environmental implications in the district. To achieve sustainable development, IEA reporting provides an important tool to track down progress, through monitoring environmental change, and provides means for effective measures of intervention.

1.2.1 Legal Framework for Integrated Environmental Assessment Reporting

The Fifth National Development Plan (FNDP), recognises environment as a cross cutting issue. The responsibility to manage environment lies in the Ministry of Tourism, Environment and Natural Resources (MTENR).

In 1990, Government established the ECZ, through the Environmental Protection and Pollution Control Act (EPPCA). The broad mandate of ECZ is to regulate and control pollution in support of sustainable development. Within the EPPCA, ECZ has a clear mandate to coordinate environmental information management for purposes of producing State of Environment (SoE) report and other products to the public. In doing this, ECZ undertakes environmental education and public awareness programmes to enlighten public opinion on environment, and thus promoting community action in environmental management. It has been recognized that some human actions that leads to environmental degradation result from lack of information. For example, the absence of information about the nature and extent of pollution caused by emissions from industrial activities may result in communities being unaware of potential hazards and what can be done to reduce the risks.

To increase awareness on environmental issues at international level, governments are required to report on the state of environment of their respective countries. At national level, SoE reporting has been undertaken and reports were produced in 1990, 1994, and 2000. The reports provided a framework through which other reports could be prepared at district, city or corporate levels.

In view of implementation of the Decentralisation Policy, SoE reporting is important to the Local Authorities to report on local environmental issues and identify an integrated approach

to environmental management. In future, a legal and policy framework will be important in ensuring that local government takes up responsibility in environmental reporting within their districts.

1.3 ENVIRONMENTAL GOVERNANCE

In the Poverty Reduction Strategy Paper (PRSP), governance refers to the process by which society manages its economic, social and political resources and institutions, not only for development but also for cohesion, integration and well being of its people (MoFNP 2004). Essentially, it goes beyond corruption, independence of judiciary and upholding the rule of law, public service institution linkages, capacity building and involvement of civil society in decision making process. Good governance demonstrates political will to address national issues. Good governance in poverty reduction refers to sharing of limited resources among the people of the district. Government still has a lot to do build capacity in order to achieve better environmental governance.

1.3.1 District Administration

(a) Constituencies and Wards

Livingstone District has one constituency. The constituency is represented by a Member of Parliament democratically elected by the people after 5 years (during General elections). The district is divided into 15 wards; each is represented by a councillor, who is elected democratically by local people during Local Government Elections, which take place also after 5 years.

The head of the district is the District Commissioner and the Council Secretary provides the secretariat of the Council. The Members of Parliament, Councilors and Chiefs Representatives together form the Council or local legislative body.

The district is managed at two levels. The political head of the District is the Mayor while the head of the Public Service is the District Commissioner. The two coexist to foster development in the District. The Mayor is the Chairperson or resides over the Council Meetings where the Town Clerk is the secretariat of the Council. The District Commissioner on the other hand chairs the District Development Coordinating Committees (DDCC) that is the technical advisory committee of the council. The DDCC presents recommendations to the Council for approval regarding development programmes in the District. The DDCC provides a forum for all stakeholders in development in the District including Non-Governmental Organizations (NGOs) and line ministries.

The local councilors are the links between the central government and the communities. The Council and other local institutions have the responsibility of providing services. The

establishment and the strengthening of the Sub-District structures, Area Development Committees, has given the local communities the necessary linkages and potentials of influencing policy and investment decisions within the local government system.

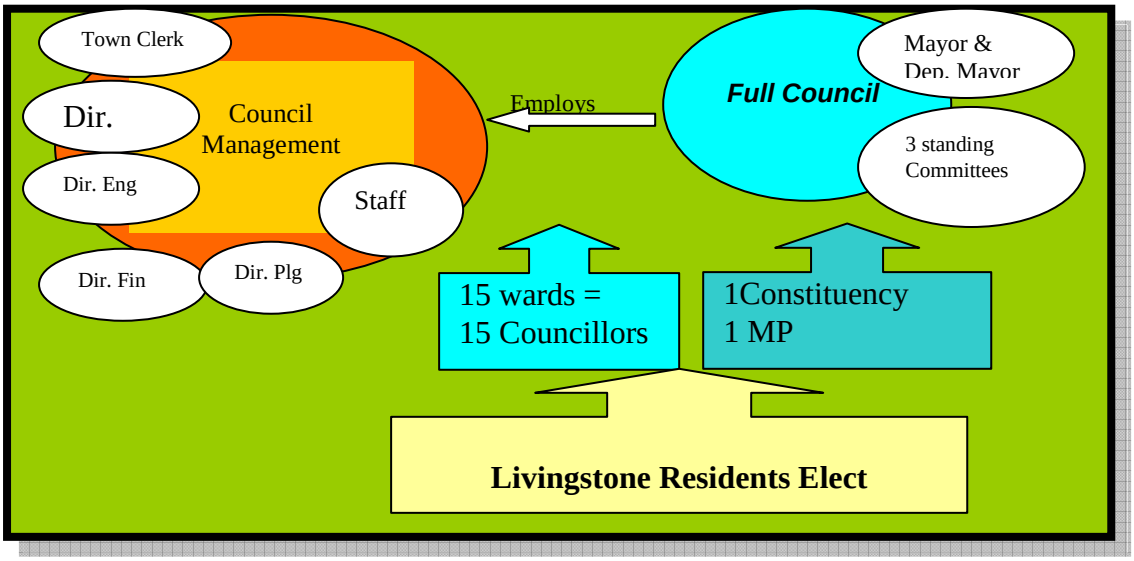
(b) Municipal Council

LCC is composed of 15 political wards and one parliamentary constituency. Each of these wards is represented by a councillor popularly elected by ward residents. Members of Parliament (MP) represent the constituencies. The councillors and the MPs together form the LCC. The major role of this body is to make local policies and by-laws that promote and guide development activities in the district. The Mayor heads the council in addition the council has 3 standing specific committees, namely;

- Finance, Commerce and General Purposes Committee
- Plans, Works, Water and sanitation Committee
- Staff Establishment Committee

LCC employs management staff in order to manage the district. Figure 1.1 shows a model arrangement of the administrative structure of the district. The council management staffs are responsible for executing council duties and all decisions made by the municipal council. The head of the council management staff is the Town Clerk who is assisted by the Director of Administration (Administration), Director of Finance (Finance), Director of Engineering and Services (Engineering), Director of Planning (Planning).

Figure 1.1: Administrative Set-up for Livingstone Municipal Council



Adapted from Chipata DSA, 2005

Both the private sector and civil society are involved in environmental governance and assist government in taking care of gaps in the management of the environment. The Ministries of Health and local government have sections of environmental health and inspection. The

sections are still small but are expected to expand in future to provide the needed environmental management function of the district.

1.4 METHODOLOGY AND APPROACHES

1.4.1 Consultations and Meetings

The process of district environment outlook reporting started with holding consulting meetings with stakeholders mainly the LCC, heads of Government institutions, representatives of the private sector and civil society. The meetings were organized as focus group discussions and in some cases, individual visits. The purpose of the meetings was to introduce the concept of district SoE Outlook reporting, and to introduce stakeholders to the process of preparing a district SoE Outlook reporting

1.4.2 Workshops

A workshop was organized for training stakeholders and introduction of preparing a district SoE Outlook report. The first workshop was conducted for three days and participants were drawn from various Government institutions, the private sector and civil society. The training workshop was carried out in modules on various aspects of SoE Outlook reporting. It included group discussions and exercises for each module. The second workshop was the compilation of the Livingstone SoE Outlook report. This was conducted for two days in which participants were to review the draft report and make comments on identified data gaps.

1.4.3 Indicators and Themes

Indicators were selected based on the environmental and socio-economic issues identified in the district. This was done using a known criterion which dictated requirements such as availability of data, relevance, easy to understand and objectivity. Indicators were selected according to the framework; drivers, pressure, impact and response indicators. Themes were constructed by clustering issues by their similarities as identified. Each theme consisted of similar or overlapping issues.

The main environmental issues which were identified in Livingstone district included tourism, deforestation, agriculture, mining, land degradation, depletion of biodiversity and socio economic issues such as the rapidly growing population, HIV/AIDS, poverty, health, education, sanitation and energy. From these issues, four themes were developed. These were:

i. Land and Agriculture
ii. Socio economics
iii. Water and Sanitation
iv. Biodiversity, Energy and Climate Change
v. Scenarios and Policy Options.

1.4.4 Literature Review

Literature reviews for this report were done throughout the reporting process. Most of the documents for review were provided by stakeholders and a number of documents were drawn from international organizations on the themes. The following documents were reviewed:

a) District Situation Analysis papers.
b) Policy documents and report of programmes carried out in the district.
c) Government reports.
d) Special consultancy reports

1.4.5 Sources of Data

The main sources of data were government institutions, NGOs and the private sector. The data covered various fields as indicated in the themes of the report. Maps reviewed were mainly Topographic 1:250,000; 1:50,000; Land use 1:500,000 for the district.

1.4.6 Reporting Framework

The reporting framework recommended for this report is the environmental process which stresses the DPSIR Analysis (Box 1.1).

Box1.1: Reporting Framework (UNDP, 2005)

Drivers are activities and processes that cause pressures such as agriculture, industries, Consumption, demographics and governance. **Drivers** are activities and processes that cause pressures such as agriculture, industries, Consumption, demographics and governance.

Pressures are often classified into underlying forces such as population growth consumption or poverty. The pressures on the environment are often considered from a policy perspective as the starting point for tackling environmental issues. Information on pressures tends to be the most readily available since they are derived from socio-economic databases.

State refers to the state of the environment resulting from the pressures outlined above; for example, the level of air pollution, land degradation or deforestation. The state of the environment will in turn affect human health and well-being as well as the socio-economic fabric of society, for example, increased land degradation will lead to one or a combination of the following; decreased food production, increased food imports, increased fertiliser use and malnutrition. Knowing both the state of environment and its indirect effects is critical for decision makers and the public.

Impacts are long term results of activities. They are the effects due to the changes in the state of the natural environment. This could include consequences on health, nutrition, economic loss, floods, siltation etc.

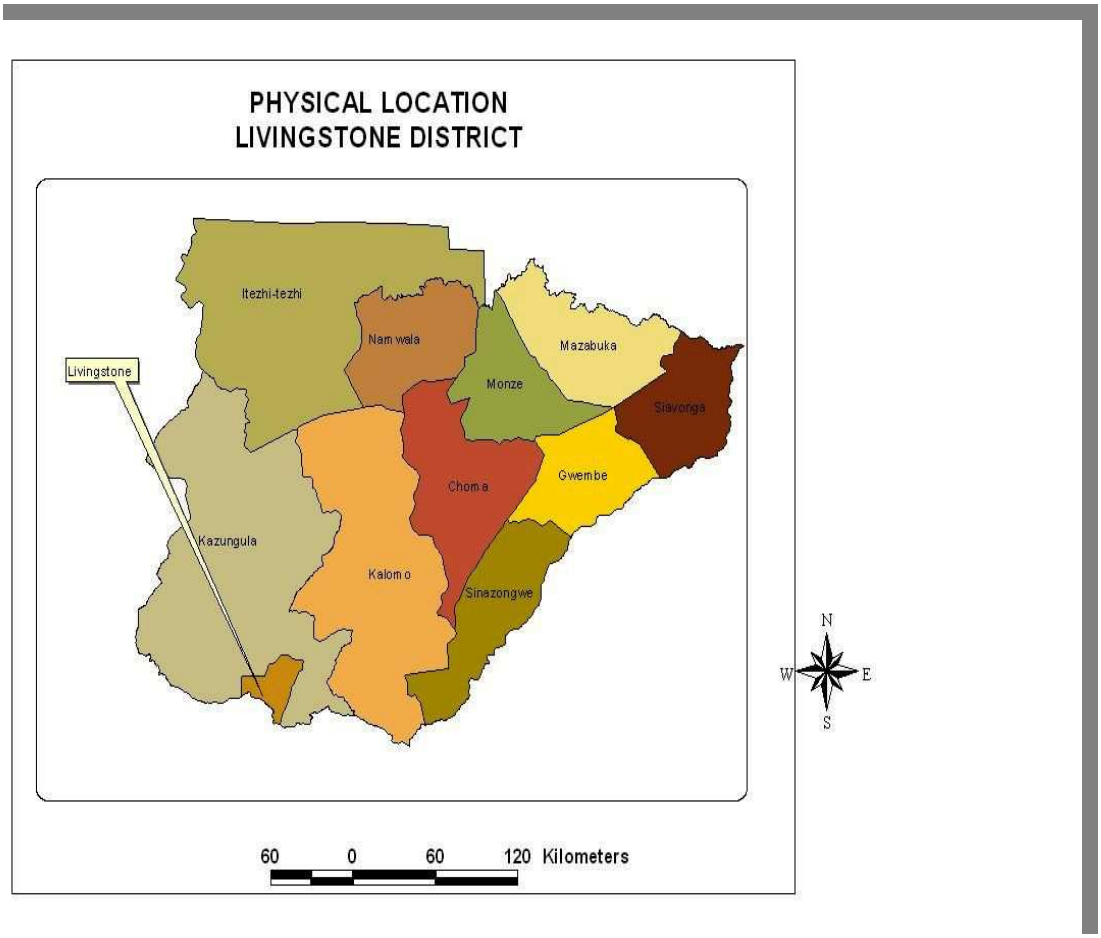
Response component of pressure-state- response model corresponds to societal actions taken collectively or individually to ease or prevent negative environmental impact, correct environmental damage, or conserve natural resources. Responses may include regulatory action, environmental or research expenditures, public opinion and consumer references, changes in management strategies and providing environmental information. Satisfactory indicators or measurements of societal response tend to be the most difficult to develop and interpret.

1.5 LOCATION

Livingstone district is 695km^2, and is situated in the Southern Province housing one of the Seven Wonders of the World the Mighty Victoria Falls. Livingstone district shares international boundary with Zimbabwe. This boundary runs along the Zambezi River from the South to the South-East. Further, it shares district boundaries with Kazungula district to the West, North and North East.

The elevation of Livingstone district is approximately 975 meters above mean sea level compared with the elevations of about 65 meters above the sea level eastwards to Lake Kariba. Its longitude is 25.50 degrees east of the Greenwich and latitude is 17.50 degrees south of the equator. Livingstone is approximately 500 kilometers south of Lusaka the capital city of Zambia. Livingstone is located on a number of trade routes and offers exceptional opportunities for links to Namibia, Botswana and Zimbabwe. It also exercises customs and immigration control.

Figure 1.2: Physical Location of Livingstone District



1.6 . Geology and Topography

Livingstone district is built on post-Karoo volcano rock known as Batoka basalt. The basalts are usually exposed along low lying and major rivers and streams and they form terraces, which are expression of different lava flow. The characteristics of basalt are fine grained highly quartzitic, highly solidified, reddish-brown in colour and cemented by iron oxide. The plateau parts of the area are covered by thick pile of the Kalahari sands. These are unconsolidated wind blown sands associated with consolidated gravels to the base cemented by chalcedony, iron oxide and in places lime. These sands are generally regarded as belonging to Kalahari systems of western Zambia (DSA, 2004).

1.7 Hydrology

Livingstone is situated in geological belt of Karoo lavas (basalt) with low permeability that is associated with joining. This geology resulted in the formation of Victoria Falls. Livingstone lies on a ground that is slightly higher than the rivers of Maramba and Nansanzu on the one side, and a small stream (Dambwa) that runs at the foot of the Airport hill on the other. To the south of the district, there are several small streams to the Zambezi River. There is a rapid surface run-off.

The main types of wetlands are the dambos which are the main sources of rivers, and the linear flood plains which occur along streams and springs.

Water obtained from the ground water resources is used mainly for domestic purposes. The water wells tend to vary in quality because they are close to settlements and are open and widely used. Civil society and the community look after the wells properly.

1.8 CLIMATIC FEATURES

The climate is characterized by two seasons, the wet and dry seasons. The wet season starts from November and ends in April and the dry season extend from May to October. The information given below on climate is taken from the Department of Meteorological (2006) for the Livingstone District.

1.8.1 Temperatures

Temperatures vary considerately between the cool and hot season. They range from 0.0℃ in the cool season (May to June) to 40.0° Celsius in the hot season (September to October (Figure 1.3). Mean minimum temperatures do exceed 19℃ in any month so nights are usually uncomfortable and very hot day time temperatures are so limited to a relatively short season.

A feature of the climate is that maximum temperatures average over 25℃ in June and July. Winter days are warm and pleasant even when the frost occurs at times.

Figure 1.3: Livingstone Mean Monthly Maximum Temperatures

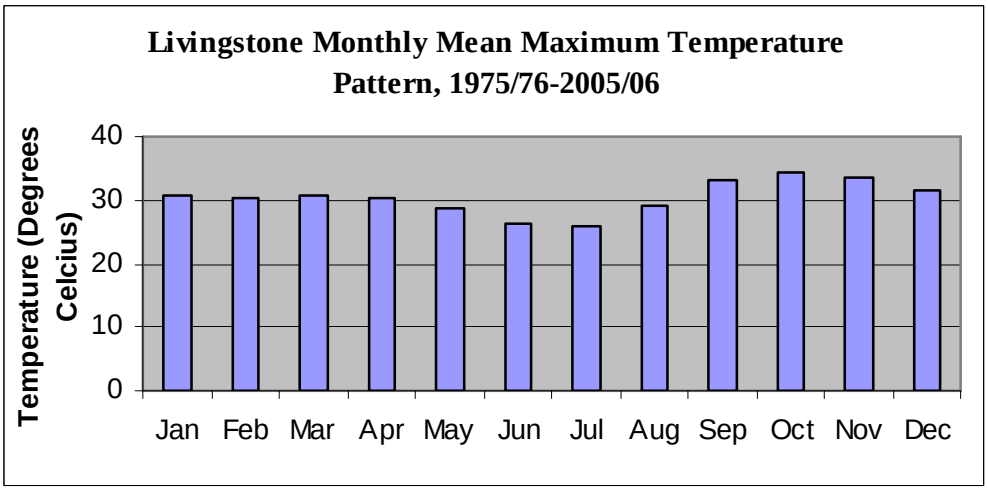
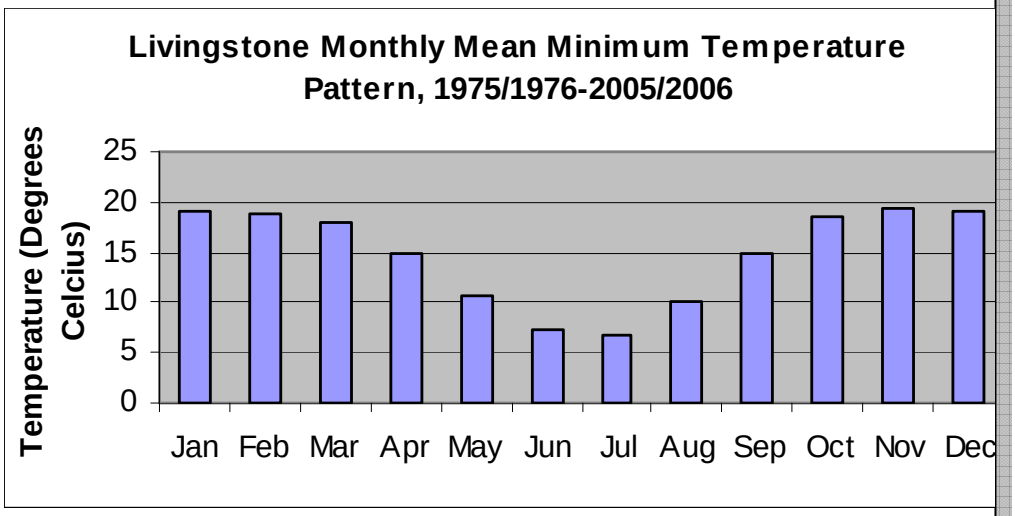


Figure 1.4: Livingstone Mean Monthly Minimum Temperature



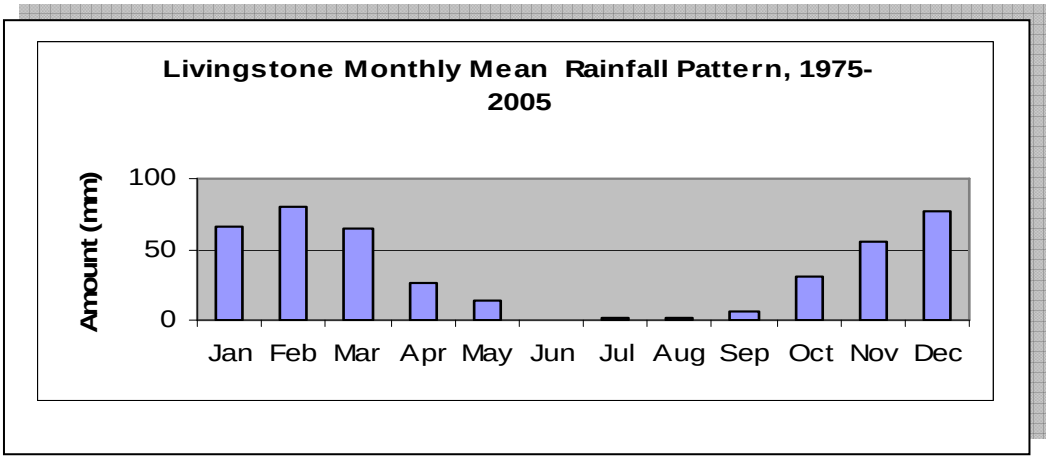
temperatures occur in October. The daily range of temperature is least during the cool season.

1.8.2 Rainfall

Livingstone has a continental climate. The annual rainfall averages approximately 600mm of which two-thirds fall in the three months December, January and February. Rainfall is more erratic and unevenly distributed. It is a drought prone area and over 80per cent of the average

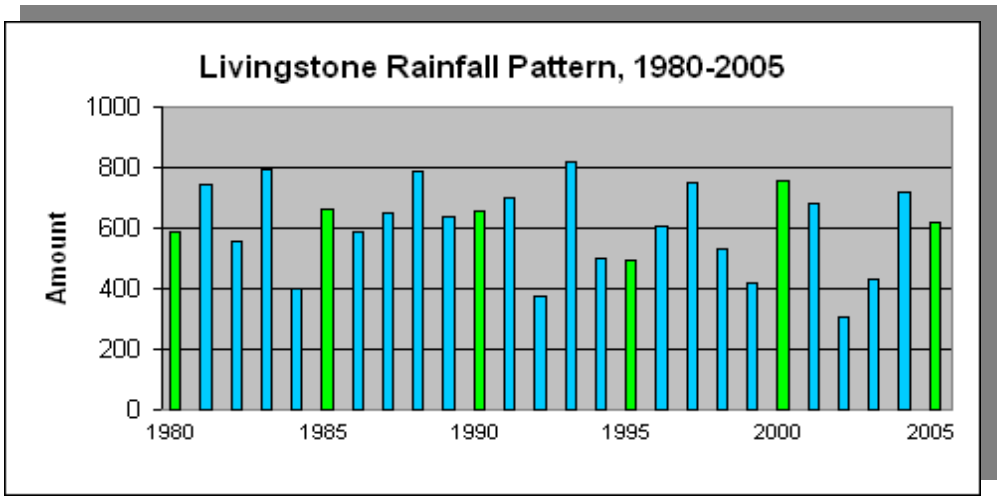
rainfall is likely to be recorded in two years out of three. Monthly rainfall distribution is given in Figure 1.5. The periodic rainfall patterns are given in Figure 1.6.

Figure 1.5: Livingstone Monthly Rainfall Pattern between1975-2005



Meteorological Dept., 2006

Figure 1.6: Livingstone Rainfall Pattern between 1980- 2005 (in mm)

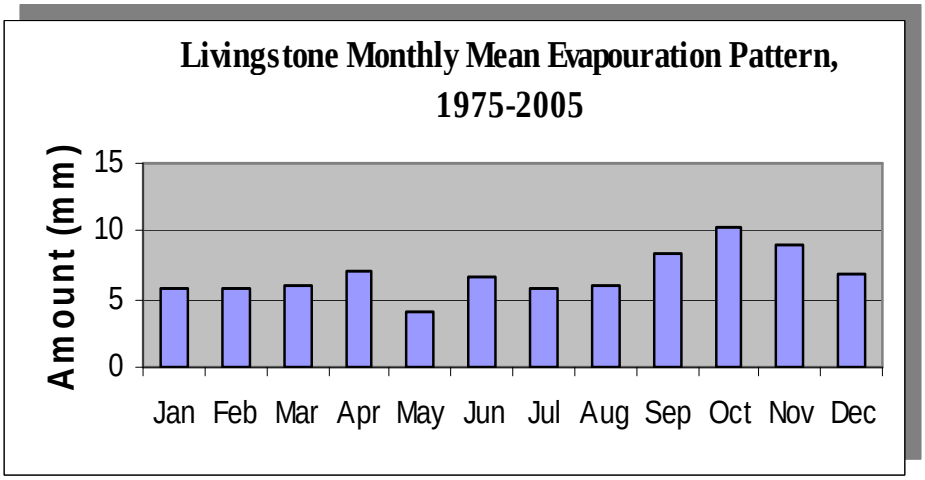


Meteorological Dept., 2006

1.8.3 Evaporation rates

The mean annual evaporation rate is recorded at 6.15. The highest values occur in September, October and August. The highest daily value was recorded in 1984 at 12.7, while the highest monthly value was recorded in 1981 at 11.3 (Meteorological Department, 2006). Variations in evaporation can be observed from the trend analysis provided in Figure 1.7.

Figure 1.7: Livingstone Mean Monthly Evaporation Rate Pattern, 1975-2005



Meteorological Department, 2006

1.8.4 Humidity

Livingstone has one of the highest temperatures in Southern Province during both the hot and cold season. The lowest value of the mean relative humidity is 77per cent in February. The climate in Livingstone is thus pleasant and ideally suited to a year round tourist industry. During the peak hot months, air conditioning is a significant benefit and the more expensive accommodation usually incorporates such a facility.

The mean annual humidity of Livingstone is recorded at 65per cent. Mean annual humidity levels are higher in the rainy season than the dry season. As shown in Figure 1.8, lowest humidity levels occur in September at 43.8per cent while highest value occurs in January at 81.1per cent. However, extremes occur and the highest daily humidity level was recorded in March 1993 and 1995 at 100per cent. However, highest monthly humidity level was recorded in 1995 at 86.5per cent (Meteorological Department; 2006).

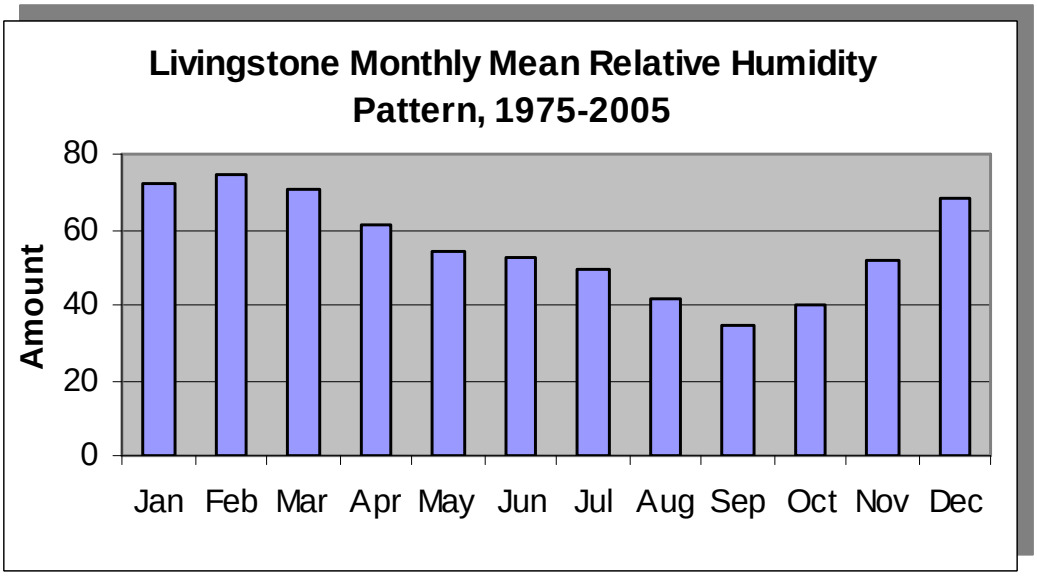


Figure 1.8: Livingstone Mean Monthly RH Pattern, 1975-2005 (in mm)

1.9 Wind

The prevailing average wind direction throughout the year is easterly and average speeds are relatively light. Wind direction are, however, more variable during the rain season when spells of north-westerly winds occasionally occur. Average wind speeds are highest during the rain season especially during thunderstorms when the strongest gusts are recorded.

Sunshine varies from 33per cent in September and October, but falls to about 6per cent per day during the rain season. There is a tendency for the weather to occur in spells i.e. a few cloudy days followed by the rainy days for the year as a whole, sunshine is recorded at 70per cent of the time between sunrise and sunset. (DSA, 2004)

1.10 SOIL TYPES

The predominant soil types in Livingstone district are the Ferralsols, followed by Cambisols and Acrisols. Gleysols and Leptosols are present in limited amount. Proportions of soil type coverage are also estimated:

Major soils and their features and susceptibility to land degradation in Livingstone district are summarised based on FAO/UNESCO classification system:

a) **Acrisols.** These have wide occurrence in the district. These cover much of Livingstone and Kalomo areas. These originate from acid rock weathering, mainly clays. They are generally thin, brown, ochric surface horizon, but may be dark in

waterlogged areas. This soil type is of low base status and strongly leached. One major characteristic is that it is very infertile, and becomes easily degraded chemically and organically when utilised. These soils may have weak microstructure. Under forest protection, they have porous surface, but if the forest is removed, they degrade to form a hard surface crust. The use of these soils requires good management of organic matter as they become very poor after forest clearing.

b) **Lithosols-Cambisol.** These occur around Livingstone and much of the eastern part of the district. These are the hilly or escarpment soils, often intermixed with rock outcrops. These soils are developed from granite, gneiss, schist and sandstone parent rock material. The soil of Livingstone area is characterized by the presence of various layers of sedimentary rocks (gravels, sands etc.) the thickness of these layers depends on the geological changes that took place during the various geological periods. Characteristics of the soil are important for agriculture and building purpose. The basaltic layer occurs in layer at heights of 1:5-15m, above the river level. Above the pipe sandstone there are two layers of gravels and sand (conglomerates) with different characteristics. The first layer occurs at heights between 3m and 4.5m above river levels and rests on a basaltic layer. This conglomerate has the property of being compact and well cemented by the iron oxide. The second layer occurs at heights between 12m and 15m above the river level and is obscured by the alluvial deposits. These older layers are also found below the Maramba River. (LDSA, 2004).

c) ***Gleysols*-*Vertsols*** These occur further west and also scattered in pockets in the district in the low lying areas with dry dambos. These are soils which are formed under waterlogged conditions produced by rising groundwater. They are generally deficient in iron, and thus assume the grey to blue colours. These soils usually occur in association with Cambisols and Ferrasols. They are cultivated for rice and water related plants. Gleysols are hydric soils due to wetland conditions. These soils are sticky, hard to work with.

d) ***Arenosols (Entisols)***. These soils have their origin from the Kalahari Sands. They occur as dominant soils on the western side of the district and extend westwards to Mulobezi. Arenosols consists of unconsolidated wind-blown or water-deposited sands. These are among the most inherently infertile soils of the tropics and subtropics with very low reserves of nutrients. Yet if chemical inputs are provided, they yield well. Arenosols have moderate resilience and low sensitivity. Arenosols are defined by their sand particle size and the absence of any significant soil profile. These soils are very permeable, low in mineral content and have poor water retention. These soils are however, preferred for agriculture because they are easy to till.

1.11 VEGETATION TYPES

Livingstone is said to have been heavily forested some 130 years ago, especially in the immediate vicinity of the Victoria Falls. It is believed the areas were mantled with vegetation and this was depicted on one of the early paintings by the first Europeans to visit the falls. The situation at present is rather different. The vegetation is scanty and of a secondary type. The open nature of vegetation in the area is without doubt a result of wide spread cutting down of trees to pave way for development in the district. The main vegetation types in the area are:

The vegetation description for Livingstone district is based on the vegetation map developed by the Department of Forestry (2004) at 1:1,500,000 (Fig.1.9), and on a number of other studies by UNFAO (1968), Fanshawe (1971), and Trapnell (1995). The general vegetation for Southern Province consists of about ten vegetation types. The district is covered by eight vegetation types.

Miombo woodland on plateau: The vegetation occurs on various soil types mainly on Arenalsols, Cambisols, Acrisols. It is dominant on the North-Eastern part of the district. Miombo plateau vegetation is typically characterized by predominantly *Brachystegia*sp. *Baikiaea plurijuga, Brachystegia sp. and Jubernadia globiflora, Parinari sp.Uapaca sp, Pterocarpus angolensis and Ricinondendron rautanenii,* under story cover is poorly developed.Miombo plateau vegetation is typically characterized by predominantly *Brachystegia boehmii, B. bussei, Isoberlina sp I. tomentosa, Julbernadia paninculata, J. globiflora, Parinari curatellifolia, Pterocarpus angolensis*. The vegetation main under storey is limited to species such as *Combretum elaeagnoides, Dalbergiella nyassae, Diospyros*, sp*., Diplorhynchus condylocarpon, Pseudolachnostylis macrouneifolia*. Both structure and species composition vary with soil type and slope. Fanshawe (1971) recorded that the total number of species is estimated to be 650 species in this vegetation type.

While Herbaceous layer is limited in most parts in this vegetation type, shrub species which are common may include *Cassia* sp*., Bauhinia petersiana, Baphia* sp*., Flacourtia indica, Xerophis obovata, Acalypha* sp*., Tristachya superba,* and *Loudetia* sp. are important in the vegetation type.

Grasslands and Dambos

This vegetation is equally dominant in the district. It occurs in low areas with high water table and form dambos. It is attributed to a high water table, and is thus present along drainage lines and head waters. Grasslands also occur on pans which appear as flats. Careful

observations of the grassland vegetation type will reveal several groups of grasslands (Vissey Gerald, 1963, UNFAO, 1968; Fanshawe, 1971; Chabwela, 1993). These are wetlands:

a) **Head water valley** grasslands (headwater dambos). Dambos in the district are wet dambos and occur mostly in areas of high water table or seepage zones (Perera, 1982). The dambos are associated with recent alluvial soils with pH slightly lower than 7.0.

b) **Riverine grasslands** (linear floodplain or swamp grasslands along the drainage line) which is dominant in the district
   - Flood plain grasslands (grassland as a result of sudden drop in elevation of the river channel). Important grasses are *Leersia* sp., *Acroceras*, *Chloris*, *Cynadon*, *Panicum, Imperata, Hyperrhenia* sp., and *Echinochloa* sp.
   - Swamps occur in vegetation with Riverine grasslands and flood plain grasslands. Swamps are a result of high rainfall and impeded water channel. Common plant species are *Cyperus papyrus, Phragmites mauritianus*, *Typha* sp.

c) **Pans.** These occur in Mopane vegetation or in areas with hard pan (impervious substratum) soils giving a characteristic of flats. These flood during rain storms and not as a result of underground seepage. Pans are identified by plant species dominated by *Setaria* sp., *Sporobolus marginatus*, *Eleocharis* sp.

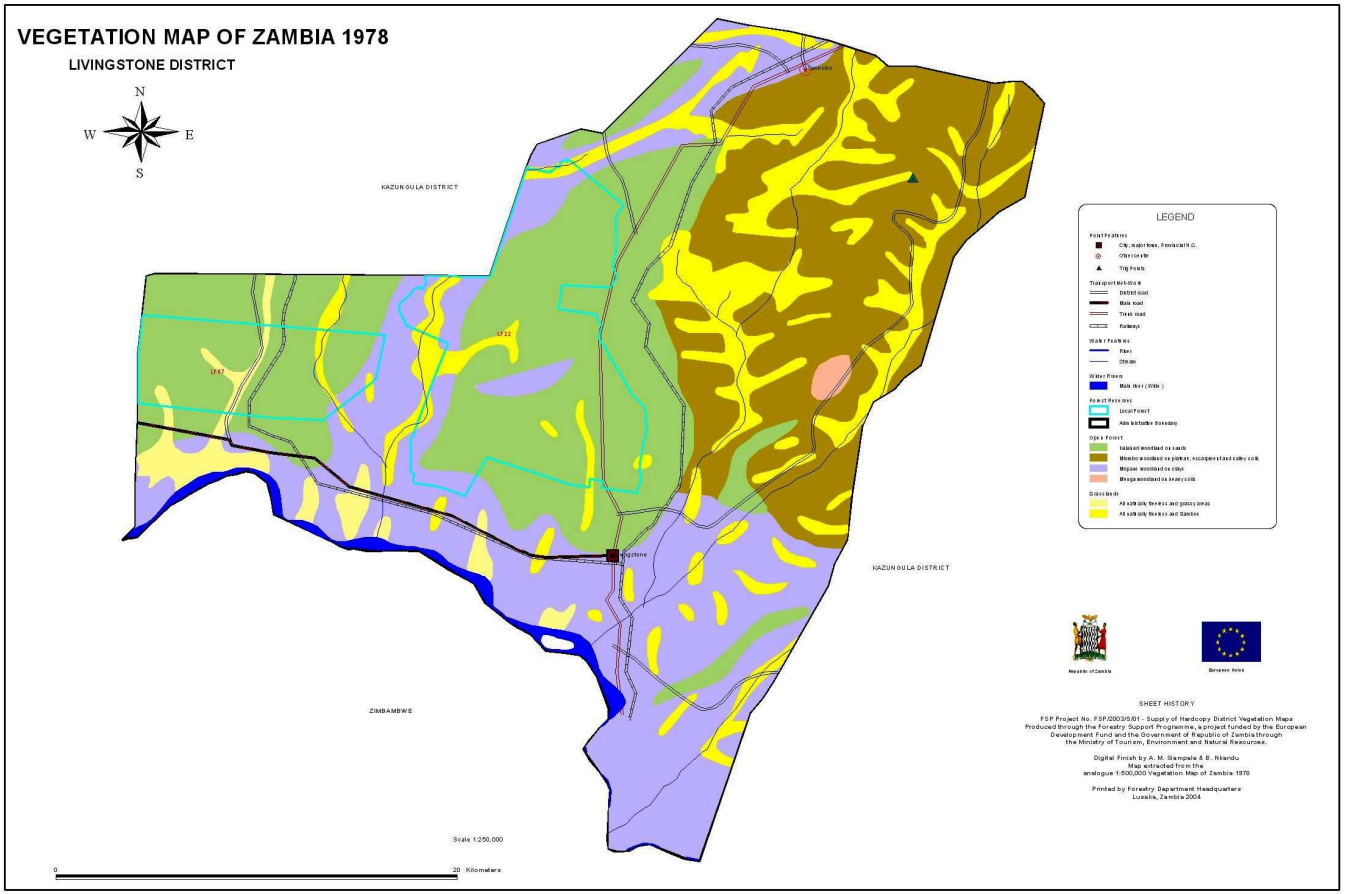
Kalahari on sand: This occurs in the western side of the district. This vegetation is known as the Kahari woodland because it is largely sitting on Kalakari sand soils (Arenalsols). The vegetation is characterized by these plant species: *Burkea Africana, Ricinodendron rautanenii, Guibortia coleosperma, Acacia goetzei, Combretum mechowianum, Erythrophleum africanum, Markhamia* sp*., Pterocarpus angolensis, Strychnos* sp*.,* and *Terminalia sericea*. Important species include *Diplorhynchus condylocarpon, Popowia obovata*, *Andropogon, Digitania, Hyparrhenia, Setaria* and *Tristachya* (Fanshawe, 1971).

Munga woodland: This is Savanna woodland, usually associated with flat topography, but may occur in patches or most commonly along streams. Soils are culluvial and alluvial of riverine origin with high base exchange capacity. These are usually sandy clays. This vegetation is identified by the wide presence of *Acacia polyacantha, A.seyal, A.nigrescens, A.gerrardi, A. sieberana, Albizia harvey, Combretum obovatum, Acacia tortolis, Piliostigma thorningii, Combretum ghasalence, Kirkia acuminate, Loncocarpus capassa, Zizipphus abyssinica, Ficus* sp., and *Lannea stuhlimannii*. Grass cover is mostly dominated by *Hyparrhenia* sp., *Andropogon* sp., *Panicum* sp., *Setaria* sp. and *Cymbopogon* sp.

Riparian vegetation. This vegetation usually occurs along, Zambezi River. It includes vegetation in flood plains along rivers and streams. This vegetation is associated with alluvial soils, and annual flooding. It is important vegetation for biodiversity in the region. The common plant species include *Trichilia emetica, Diospyros mespiliformis, Acacia albida, Garcinia Livingstoneii, Tamarindus indica, Ficus capensis, Ziziphus mucronata, Termitalia* sp*., Salix subserrate, Hyphaene ventricosa, Combretum imberbe, Xeroderris stuhlmanii, Oncoba spinosa, Ficus* spp*., Screnega virosa, Phyllanthus reticulatus* and *Ficus livingstonii.* Other plant species are most dominated by wetland species mainly*, Phragmites mauritanus, Pistea stratiotes, Echinochloa* sp*., Cyperus* sp*., Cynodon dactylon, Imperata sp., and Chloris* sp. This vegetation is important for conservation of wildlife in the area.

Mopane woodland on clay: This vegetation type occurs on clay in lowland areas of major river valleys. The vegetation is typically covered by indicator species mainly: *Colophospermum mopane, Commiphora* sp., *Garcinia livingstonii, Sterculia African, Kirkia accuminata, Ziziphus mycronata, Adonsonia digitata* and *Ximenia americana, Acacia nigrescens* and *Albizia amara, A. harvey*. The lower canopy is covered by *Bosica sp., Commiphora, Combretum imberbe, C. celaeognoides, Balanites aegyptiaca, Dalbergia melanoxylon, Popowia obovata and Sanseviera desertii*. Species such as *Capparis tomentosa*, *Cissus* sp., are equally important. *Sporobolus marginatus, Aristida, Tragus, Evagrostis, Heteropogon contortus* and *Digitania* are significant.

Figure 1. 9: Vegetation map of Livingstone District (DOF, 2004)



2.0 SOCIO ECONOMICS

Socio economics is considered in the environmental analysis because it has direct link with the environment through anthropogenic activities. As the population expands and the pace of development accelerates, more pressure is put on the natural systems, leading to exhaustion of resources and land degradation.

Southern Province as a whole is among the least populous provinces in the country. The district has the highest population in the province with growth rate of 2.1 per cent. This has serious implications on social services such as education, health, water and sanitation services as well as food security.

2.1 POPULATION CHARACTERISTICS

According to reports from CSO, (2000, 2004), the population in the district was 103,258 of which 51,460 were males and 51,828 were females. These figures represent 49.9per cent and 50.1per cent for males and females respectively. The population growth rate of Livingstone district is estimated at 2.1 per cent. The distribution of population by ward is shown in Table 2.1. The most populous ward is Mwalibonena (12,849) followed by Simonga (10,970) and Dambwa (10,005)

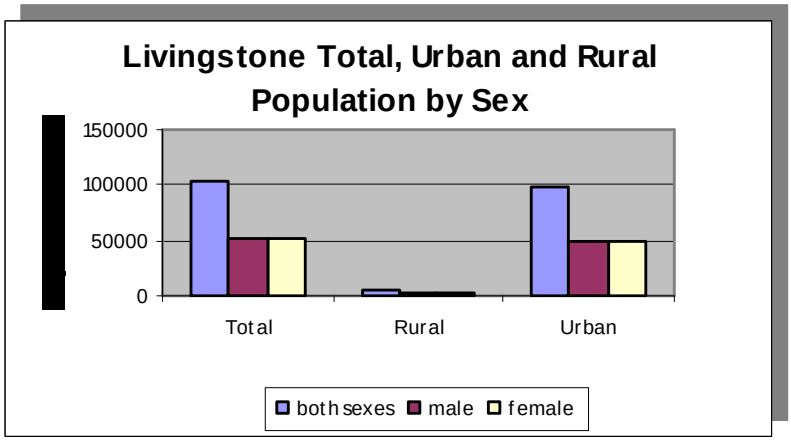
Much of the district population is distributed in the urban area (Table 2.1 and Figure 2.1). The current total population in rural area is 5,800 of which 2,962 are males while 2,838 are females. The urban population stands at 97,488 of which 48,866 are males and 48,622 are females.

Table 2.1: Livingstone District Population Distribution by Ward

Ward Name	Total Population	Total Male	Total Female
Freedom	6,866	3,476	3,390
Mosi-Oa-Tunya	7,798	3,845	3,953
Dr. Mubitana	2,557	1,239	1,318
Namatama	5,251	2,563	2,688
Libuyu	12,228	6,110	6,118
Mwalibonena	12,849	6,490	6,359
Maramba	8,883	4,504	4,379
Akapelwa	4,704	2,348	2,356
Lizuma	3,212	1,624	1,588
Simonga	10,970	5,511	5,459
Dambwa	10,055	5,018	5,037
Zambezi	4,641	2,293	2,348
Kariba	2,998	1,443	1,555
Nansanzu	6,425	3,115	3,310
Shungu	3,851	1,881	1,970
Total	**103,288**	**51,460**	**51,828**

CSO, 2000 Census of Population and Housing

Figure 2.1: Rural and Urban Population Distribution



CSO, 2000

The population structure by age classes of reproductive age classes' shows over 50per cent are below 14 years and less than half the total population is above 15 years. These figures indicate that the population in the district is young and will need increased provision of basic services.

2.2 Population Growth

The general trend of population growth in the district is among the lowest in the province as shown in Table 2.2, and has continued to decline; 3.5 per cent, (1969), 1.5 per cent (1980), 2.1 per cent (1990) which is below the provincial growth which by 1990 was recorded at 2.3 per cent.

Table 2.2: Trends Population growth in Southern Province

Res/distr	size ' 80	rate' 69-' 80	size ' 90	rate' 80-' 90	size ' 00	rate' 90-' 00
Southern	671923	2.8	965591	3	1212124	2.3
Rural	505368	1.4	745006	3.2	955268	2.5
Urban	166555	9.2	220585	2.6	256856	1.5
District						
Choma	130416	2.6	170687	2.3	204898	1.8
Gweembe	20666	-11.2	39785	5.5	34133	-1.5
Itezhi-tezhi			31424		43111	3.2
mo	76571	2.2	127762	5.3	169503	2.9
Kazungula			45157		67666	4.2
Livingstone	49063	3.5	83780	1.5	103288	2.1
Mazabuka	159376	-3.1	162321	3.3	203219	2.3
Monze			133671	1.3	163578	2
Namwala	36600	4	61848	4	82810	3
Siavonga			37497	1.6	58864	4.6
Sinazongwe			71659	3.8	80455	1.2

CSO, 2000

The population density for the district was 34.4 (1969), 50.1 (1980), 120.5(1990) and 148.6 (2000). This represents the highest in the province as shown in Table 2.3 (CSO; 2004)

Table 2.3: Population density/Census Year (population per sq.km)

Districts	Area sq.km	1969	1980	1990	2000
Southern	85283	5.8	7.9	11.3	14.2
Districts					
Choma	7296	13.4	17.9	23.4	28.1
Gweembe	3879	6.1	4.1	10.3	8.8
Itezhi-tezhi	16064			2	2.7
Kalomo	15000	3.5	3.1	8.5	11.3
Kazungula	16835			2.7	4.1
Livingstone	695	34.4	50.1	120.5	148.6
Mazabuka	6242	23.3	16.4	26	32.6
Monze	4854		22.8	27.5	33.7
Namwala	5687	1.7	2.6	10.9	14.6
Siavonga	3871		11.3	9.7	15.2
Sinazongwe	4860		8.8	14.7	16.6

2.3 Population Fertility

The Total Fertility Rate (TFR) was 4.4per cent as shown in Table 2.4. Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR) were 2.1 per cent and 1.8 per cent respectively. The current mean age of child bearing is 28.8 while average ratio is 0.8 per cent. (CSO, 2003) and (DSA, 2004),

Table 2.4: Fertility Rates

	2000	2001	2002	2003	2004	2005	2006	2007	2008
TFR	4.4	4.3	4.2	4.1	4.0	3.9	3.8	3.7	3.6
GRR	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8
NRR	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6
Mean Age of Child Bearing	28.8	28.7	28.7	28.6	28.6	28.5	28.5	28.4	28.4
Child Woman ratio	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6

2.4 Deaths, Births and Mortality rate and life expectancy

As shown in Table 2.5, over 4,000 children are born each year, and at the same time nearly 900 people die each year in the district. Table 2.6 gives estimates of life expectancy of the people in the district to be 42.7 per cent for males and 43.2 per cent for females. Mortality is

higher at the under 5 levels than at infant level. Infant mortality is 93 while the Under 5 mortality rate is recorded at 183 for the district.

Table 2.5: Annual Births and Deaths

	2000	2001	2002	2003	2004	2005	2006
Births	3971	4044	4106	4158	4198	4226	4240
Deaths	818	833	849	859	869	876	883

Table 2.6: District Mortality Rates at present and as projected (CSO, 2003)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Male life expectancy	42.7	45.0	47.2	50.7	52.7	53.8	52.1	50.4	50.2
Female life expectancy	43.2	45.5	47.8	51.4	53.2	53.6	50.8	47.9	45.9
Total life expectancy	43.0	45.3	47.5	51.0	53.0	53.7	51.5	49.1	48.0
Infant Mortality Rate (IMR)	93	84	79	77	75	73	71	70	68
Under Five Mortality Rate (U5MR)	183	200	147	127	116	111	108	105	102

2.5 Migration

Migration is the movement of people from one area to another for permanent residence. Migrations are important to address as movements cause pressure on land, resources and social services. Table 2.7 indicates that in 2000, Livingstone was fourth as regards the number of immigrants (94,404) followed by Mazabuka at (195,223).

Table 2.7: Inter-District Lifetime Migration Rates and Efficiency Ratios

District	2000 Population	In Migr.	Out Migr.	Net Migr.	In-Migr. Rate	Out-Migr. Rate	Net-Migr. Rate	Gross Migr.
Choma	193,246	36,567	88,399	-51832	19.9	-25.8	45.7	124,966
Gwembe	31,373	4,181	13,563	-9382	14.3	-28.9	43.2	17,744
Itezhi Tezhi	41,013	18,933	2,892	16,041.0	47.2	40.1	7.1	21,825
Kalomo	155,900	36,926	20,075	6,851.0	24.7	5.4	19.8	67,001
Kazungula	62,971	21,380	3,662	17,718.0	35.0	29.1	5.8	25,042
Livingstone	94,404	46,108	45,974	134.0	49.8	1.1	48.7	92,082
Mazabuka	195,223	51,478	54,281	-2803	27.4	-0.4	27.8	105,759
Monze	155,154	27,505	76,547	-49042	18.7	-30.6	49.3	104,052
Namwala	76,896	20,233	15,825	4,408.0	27.3	6.7	20.6	36,058
Siavonga	53,580	12,469	10,810	1,659.0	24.3	4.1	20.2	23,279
Sinazongwe	73,050	11,262	10,696	566.0	16.4	1.8	14.6	21,958

CSO, 2000

People migrate for various among them a search for employment opportunities and agricultural land.

2.6 Employment

The economically active population or the labour force is defined as all persons aged 12 years and over of either sex whose main economic activity status is to supply their labour force to the production of economic goods and services (CSO, 2004). It is composed of the employed and the non employed persons. It includes all those who are working, those who are unemployed but seeking employment and those not seeking work but are available for work. Included also are those that are unpaid on family business. Despite the high number of immigrants, Livingstone was among the least employing districts at 8.6per cent.

Table 2.8: Distribution of labour force by district, Southern Province, 2000 (Per cent)

District	Total	Male	Female
Southern	100.0	100.0	100.0
Choma	15.3	14.9	16.0
Gweembe	2.1	2.3	1.7
Itezhi-tezhi	4.1	4.3	3.7
Kalomo	14.8	13.5	17.0
Kazungula	4.8	5.3	4.0
Livingstone	8.6	9.2	7.6
Mazabuka	18.5	20.0	16.1
Monze	15.3	13.0	19.3
Namwala	6.9	6.6	7.4
Siavonga	6.8	4.7	3.5
Sinazongwe	5.2	6.1	3.7

Table 2.9: Trends in Unemployment Rates by District and Sex, Southern Province, 1990 and 2000

	1990			2000		
District	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
Zambia	15.0	14.1	16.7	12.9	14.1	11.3
Southern Province	10.9	10.4	11.7	16.1	16.8	14.9
Districts	9.6	9.2	10.1	15.6	16.4	14.4
Choma	14.3	13.8	15.3	26.4	27.1	24.8
Gweembe	-	-		9.5	8.2	11.9
Itezhi-tezhi	8.0	8.2	7.7	9.5	10.8	7.6
Kalomo	-	-	-	23.6	24.1	22.7
Kazungula	16.5	12.7	26.6	30.7	28.5	35.2
Livingstone	10.4	9.4	12.9	17.5	17.7	17.3
Mazabuka	14.2	14.2	14.3	6.5	7.0	5.9
Monze	10.0	9.7	10.5	6.9	7.3	6.5
Namwala;	8.6	9.7	7.0	32	31.3	33.5
Siavonga	12.4	12.8	11.9	29.4	27.1	35.6
Sinazongwe						

The total unemployment rate for Livingstone district was 30.7per cent and is higher than that of the province (16.1per cent) as well as that of the national unemployment rate of 12.9per cent. The unemployment rate increased from 16.5.per cent in 1990 to 30.7 per cent in 2000. The unemployment rate for males and females equally increased from 12.7per cent to 28.5per cent (male) and 26.6 per cent and 35.2 (female).

2.7 POVERTY

Poverty is measured as the amount of monthly income required to purchase basic needs to meet the minimum caloric requirement for a family of six. This approach lives out a number of factors such as shelter, education, health care, lighting, clothing, footwear and transport. Southern Province is marked sixth poorest province in the country with overall poverty of 76per cent and extreme poverty of 60per cent. Livingstone has a poverty of 66per cent

Box 2.1: Poverty and its linkages

"Poverty" affects "population" through:

- Limited access to water supply, fuel and labour service devices increases the need for children to help in fields and homes
- Low asset base increases the need for children as insurance against illness and old age
- Low level of education means less awareness of family planning methods particularly for women
- Low status for women means that they have limited power to control fertility

"Population" affects "poverty" through

- Increasing landlessness- inherited plots divided and sub-divided among many children
- Overstretching available social services, schools, health centres, family planning clinics, water and sanitation services

"Population" affects "environment" through

- Increasing pressure on marginal lands, overexploiting of soils and forests.
- Soil erosion, silting and flooding
- Migration to overcrowded slums, problems of water supply and sanitation, industrial waste dangers, indoor air pollution, mud slides

2.8 URBANIZATION

Livingstone city grew as an administrative centre. Urbanisation in general is defined as the shift from a rural to an urban society and involves an increase in the number of people in urban areas. It is the outcome of social economic and political developments that lead to urban concentrations and growth of large cities, changes in land use and transformation to metropolitan pattern of organization and governance. Market forces result in employment, urban agriculture and peri urban production systems.

Drivers of urbanisation in Livingstone are viewed through the rapid growing population, limited land space for building, limited accommodation, limited water supply in urban areas whilst in rural areas there are inadequate water points. One very important pressure indicator is population density. The surge of urbanisation in Livingstone district is basically for employment, social services and economical factors. Even in the situation where accessibility to electricity, water and sanitation services are poor, people hope that things could change and are still motivated to migrate into the town.

The growth of Livingstone is evidenced by the creation of new planned townships. Table 10 lists the current settlements in Livingstone town. The average density in Livingstone has increased from 40 persons per hectare in 1969 to 80 persons per hectare in 2004, which results in a doubling of density in 35 years.

The average household has 4 to 5 persons. The population in Livingstone required 18 856 residential units in 2000. 11per cent were in formal units and indicates a demand of more than 2000 units. The main residential areas are contained in Table 2.10:

Table 2.10: Planned and Unplanned Settlements around Livingstone in

Residential Areas

Area	Type Formal/informal	(High/Medium/Low)
Livingstone Central	Formal	High
Libuyu	Formal	Low
Linda	Formal	Low
Zambia Railways Compound	Formal	Low
Dambwa North	Formal	Low
Zambezi Saw Mills	Formal	Low
Airport	Formal	Low
Dambwa Central	Formal	Low
Maramba	Formal	Low
Nakatindi	Informal	Low
Mwandi	Informal	Low
Kashitu	Informal	Low
Malota I and II	Informal	Low
Ngwenya	Informal	Low

The major impact of urbanisation is from the growing demand for social services. It also has considerable impact on health of population as well as on water supply, sanitation, sewage and solid waste disposal, food security and poverty reduction. In addition, Solid waste disposal have been a major problem in Livingstone town. The town is failing to cope with solid waste removal as population continues to grow. Urbanisation promotes the spread of diseases such as HIV/AIDS, Malaria and Cholera.

An important response in curbing urbanisation problems would require a deliberate policy to improve living conditions in the rural areas, increase land area allocated to the development of the town and adequate service provision in the residential areas.

2.9 Education

The district is mostly urban with 23 GRZ Basic Schools, 16 community schools, 7 Private Basic Schools, 2 Grant Aided Secondary Schools, 3 GRZ High Schools and 1 Private High School and 2 Colleges of education. The district has both District and Provincial Resource Centres and a Zonal Resource Centre at Shungu Basic School.

The Formal education is provided at three sub sector levels, namely; basic school level (Grades 1 to 9), High School Level (Grades 10 to 12) and Tertiary level. The basic and high school levels cater for regular, open learning and evening classes. The education board is

also offering classes in community schools where learning is by use of radio programs such as learning at ‘Taonga Market’.

While there has been a remarkable progress in access to and coverage of primary education, the quality of education on the other hand has gone down. This decline is mainly due to shortage and poor quality of inputs like teachers, physical facilities and learning materials. The district still has to receive teachers to fill the established positions.

2.9.1 Staffing and Enrolments

The district has continued to have more female teachers than males. This trend is attributed to issues of marriages and few female teachers willing to work in rural districts. The staffing in community schools for qualified teachers increased from 8 in 2006 to 29 in 2007.

The number of girls participating in education has remained low as compared to boys. The table below provides staffing and enrolment levels for the regular basic schools, private basic schools, community schools and high school

Table 2.11: Enrolment and Staff levels in Schools

		ENROLMENT													STAFFING					
	Regular	Regular 1-7		Regular 8-9		Total	APU 8-9		APU 10-12		Total	Open Learning / Night School		Total	Teaching		Total	Non Teaching		Total
S/N	Name of school	M	F	M	F		M	F	M	F		M	F		M	F		M	F	
1	CHABA	196	191			**387**									3	3	**6**			
2	CHRIST THE KING	431	499	110	97	**1,137**									8	33	**41**			
3	DAMBWA	910	944	108	82	**2,044**									11	49	**60**			
4	HOLYCROSS	395	384	151	132	**1,062**									11	25	**36**	3	0	**3**
5	LIBALA	484	526			**1,010**									5	29	**34**			
6	LIBUYU	293	309	111	112	**825**	3	10			**13**				15	22	**37**	2	0	**2**
7	LINDA EAST	478	503			**981**									3	20	**23**			
8	LINDA WEST	392	358	150	140	**1,040**	66	83			**149**				7	35	**42**			
9	LIVINGSTONE	279	265			**544**									4	5	**9**			
10	MAHULULO	132	83	40	36	**291**									7	3	**10**			
11	MARAMBA	370	322	102	103	**897**									11	18	**29**			
12	MARIA ASUMPTA	392	474	107	133	**1,106**			77	81	**158**	80	73	**153**	9	25	**34**	2	1	**3**
13	MUJALA DEMO	470	632	50	65	**1,217**						43	104	**147**	11	19	**30**			
14	MUKAMUSABA	170	183			**353**									6	9	**15**			
15	MULWANI	763	760	85	81	**1,689**	49	47			**96**	8	16	**24**	14	52	**66**			

		Regular 1-7	Regular 8-9	Total	APU 8-9	APU 10-12	Total	Open Learning / Night School	Total	Teaching	Total	Non Teaching	Total							
S/N	**Name of school**	**M**	**F**	**M**	**F**		**M**	**F**	**M**	**F**		**M**	**F**		M	**F**		**M**	**F**	
17	NAMATAMA	499	542	133	87	**1,261**	14	28			**42**	8	8	**16**	11	20	**31**			
18	NANSANZU	381	415	112	109	**1,017**						22	24	**46**	16	22	**38**			
19	PALGROVE	108	117	32	37	**294**									4	12	**16**	2	0	**2**
20	SHUNGU	678	733	134	145	**1,690**	16	26			**42**				15	39	**54**			
21	SIMOONGA	56	152	53	37	**298**									6	4	**10**			
22	SYANALUMBA	553	583	114	113	**1,363**						40	48	**88**	13	28	**41**	1	0	**1**
23	ZAMBEZI	401	388	126	184	**1,099**	136	185			**321**	115	153	**268**	10	27	**37**	2	0	**2**
TOTAL		**9,375**	**10,214**	**1,949**	**1,966**	**23,504**	**284**	**379**	**77**	**81**	**821**	**451**	**596**	**1,047**	**219**	**537**	**756**	**12**	**3**	**15**

Table 2.12: Regular High schools

		ENROLMENT													STAFFING					
		Regular 8-9		Regular 10-12		Total	APU 8-9		APU 10-12		Total	Open Learning / Night School		Total	Teaching		Total	Non Teaching		Total
S/N	Name of school	M	F	M	F		M	F	M	F		M	F		M	F		M	F	
1	DAVID LVINGSTONE			347	304	**651**	23	31	167	156	**377**				20	17	**37**	1	1	**2**
2	LINDA			505	417	**922**			323	297	**620**	42	63	**105**	33	14	**47**	5	6	**11**
3	ST. MARY'S		309		324	**633**									19	15	**34**	3	3	**6**
4	ST.RAPHAEL'S	260		253		**513**									17	4	**21**	5	1	**6**
5	HILLCREST			401	160	**561**			220	161	**381**				32	19	**51**	5	2	**7**
TOTAL		**260**	**309**	**1,506**	**1,205**	**3,280**	**23**	**31**	**710**	**614**	**1,378**	**42**	**63**	**105**	**121**	**69**	**190**	**19**	**13**	**32**

Table 2.13: Private Secondary School

		ENROLMENT													STAFFING					
		Regular 8-9		Regular 10-12		Total	APU 8-9		APU 10-12		Total	Open Learning / Night School		Total	Teaching		Total	Non Teaching		Total
S/N	Name of school	M	F	M	F		M	F	M	F		M	F		M	F		M	F	
1	BUSONGO	16	16	34	22	**88**									5	2	**7**	2	1	**3**
2	ELAINE BRITEL	18	16	54	52	**140**									6	2	**8**	2	1	**3**
TOTAL		**34**	**32**	**88**	**74**	**228**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**11**	**4**	**15**	**4**	**2**	**6**

Table 2.14: Orphans in Basic Schools

LIVINGSTONE											
		GRD 1	**GRD 2**	**GRD 3**	**GRD 4**	**GRD 5**	**GRD 5**	**GRD 7**	**GRD 8**	**GRD 9**	**TOTAL**
Lost Both Parents	**Male**	78	110	114	127	168	121	160	125	98	1101
	Female	88	121	120	145	154	137	149	108	129	1151
	Total	**166**	**231**	**234**	**272**	**322**	**258**	**309**	**233**	**227**	**2252**
Lost Father only	**Male**	160	161	199	184	223	207	266	160	167	1727
	Female	147	201	196	191	242	264	237	175	206	1859
	Total	**307**	**362**	**395**	**375**	**465**	**471**	**503**	**335**	**373**	**3586**
Lost Mother only	**Male**	108	127	138	131	144	171	178	80	106	1183
	Female	110	116	170	159	157	139	158	123	198	1330
	Total	**218**	**243**	**308**	**290**	**301**	**310**	**336**	**203**	**304**	**2513**
Totals	**Male**	346	398	451	442	535	499	604	365	371	4011
	Female	345	438	486	495	553	540	544	406	533	4340
	Total	**691**	**836**	**937**	**937**	**1,088**	**1,039**	**1,148**	**771**	**904**	**8351**

Source: Ed* Assist 2006.

Tables 2.11 to 2.14 give total enrolment levels in education institutions in the district. The number of children enrolled is higher in males than in females at most levels of education. It gives details of the population of children enrolled from Grades 1 to 7. On the average, the district has higher number of male children than the females.

Table 2.15: Basic School Enrolment by Age and Sex

Years	Boys	Girls	Total
Below 7	190	269	459
7	1047	1122	2169
8	1182	1287	2469
9	1466	1582	3049
10	1349	1306	2655
11	1231	2554	3785
12	1359	1424	2783
13	1047	1026	2073
14	509	489	998
Over 14	351	270	621
Total	**9731**	**11,329**	**21,060**

Table 2.16 provides information on the number of pupils dropping out of school and reasons in the previous year 2004 at primary school level. It shows trends in pupils dropping out of school in the previous year (DSA 2004). It can be observed that dropping out of school can be as early as Grade 1. There were more female dropouts (147) than male (131). The main reasons for dropping out of school were listed as illness, deaths, pregnancies, expulsion and early marriages.

Table 2.96: Number of pupils dropping out and reasons, previous year (2002)

REASONS FOR DROPPING OUT	Grade														Total	
	1		2		3		4		5		6		7			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Failure to progress	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-
Illness	6	1	4	2	4	4	3	2	5	-	4	-	4	1	30	10
Death	-	-	2	1	2	1	11	-	2	2	-	-	-	-	17	4
Marriage/Pregnancy	-	-	-	-	-	-	-	-	-	-	-	1	-	6	-	7
Cannot Afford to pay	6	11	14	14	16	19	11	8	15	13	16	18	21	27	99	110
Expelled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**12**	**12**	**20**	**17**	**22**	**24**	**25**	**10**	**22**	**15**	**20**	**19**	**26**	**34**	**147**	**131**

2.10 Literacy levels

Table 2.17 shows the proportion of the population aged 5 years and above who were able to read and write in Southern Province. A comparison of 2000 literacy rates for districts in Southern Province for population above 5 years reveals high rates in Livingstone at 89.5per cent.

Table 2.17: Literacy Rates by Age Group, Sex and District, Southern Province

District	5+	15-24	15+	Population
Choma	57.9	76.2	72.6	157198
Gweembe	38.2	53.2	48.9	25182
Itezhi-tezhi	50.5	63.9	64.5	33.379
Kalomo	51.9	69.9	67.3	124.195
Livingstone	80.2	91.8	89.3	81.430
Kazungula	51.7	68.6	65.2	51.016
Mazabuka	57.0	73.7	70.5	15.631
Monze	59.9	80.8	77.0	125.269
Namwala	55.2	72.8	72.9	61.272
Siavonga	40.4	55.7	50.9	43.757
Sinazongwe	44.4	58.9	54.3	58.780

CSO, 1990-2000

2.11 HEALTH

2.11.1 Institution and medical staff

There are about 49 health posts/ under-five clinics in the district. There are a total of 12 health centres in the district. These health facilities provide curative services, prenatal and postnatal care and alls services provided by health posts and under-five clinics. Other services include nutrition clinics, for under weight children, nutrition education, food preparation demonstrations and provision of food supplements.

The district has two referral hospitals (General Hospital and Batoka Hospital) and twelve surgeries. These hospitals and surgeries offer a range of medical services curative, preventive, promotive, rehabilitative and support services (both medical and non medical) to peripheral units and districts. The district has a total of 82 beds in all its facilities excluding the

two hospitals. The current stock of beds in health facilities is quite inadequate given the high morbidity rate and population to bed ratio of over 2,262 persons per bed (Table 19)

Table 2.18: Health facilities in Livingstone

Type of facility	Government		Private		Private	
	No. of clinics	No. of beds	No. of Surgeries	No. of beds	No. of Hospitals	No. of Beds
Stage I	9	64	12	-	2	-
Stage II	3	20		-	-	-
Health posts	1	2		-	-	-
CHW	37	-		-	-	-
NHC	50	-		-	-	-
HCC	12	-		-	-	-

Table 2.19: Top Ten Causes of Morbidity (All Ages) by year

2003		2004		2005	
DISEASE	**Incidence Rate**	**DISEASE**	**Incidence Rate**	**DISEASE**	**Incidence Rate**
Malaria	373/1000	Malaria	343/1000	Malaria	318/1000
Resp. Inf. (non Pnuemonia)	133/1000	Resp. Inf. (non Pnuemonia)	134/1000	Respiratory Infection – Non Pneumonia	124/1000
Diarrhoea (non Bloody)	74/1000	Trauma, Accidents, Injuries, Wounds & Burns	79/1000	Trauma, Accidents, Wounds & Burns	81/1000
Trauma, Accidents, Wounds & Burns	73/1000	Diarrhoea (non Bloody)	133.5/1000	Diarrhoea Non Bloody	58/1000
Resp. Inf. Pnuemonia	45/1000	Resp. Inf. Pnuemonia	45/1000	Respiratory Infection-Pneumonia	58/1000
STDs	25/1000	Skin Infections	33/1000	Skin Infections	32/1000
Skin Inections	24/1000	Dental Diseases	30/1000	Eye Infection	28/1000
Ear, Nose & Throat	19/1000	Eye Infections	27/1000	Digestive System (Not Infectious)	23/1000
Eye Infections	18/1000	Sexually Transmitted Diseases	22/1000	Sexually Transmitted Diseases	22/1000
Dental Diseases	17/`1000	Tuberculosis (Suspected & Confirmed	17/1000	Ear, Nose and Throat	19/1000

District Health Office- HIA1 2003-

The district main cause of death is Malaria. Tuberculosis and Diarrhoea were equally important during the period. (Table 2.19)

Table 2.20: Top Ten Causes of Mortality by year for all ages

2003			**2004**			**2005**		
Disease	No Dead	per cent	**Disease**	**No Dead**	**per cent**	**Disease**	**No Dead**	**per cent**
Protein Energy Malnutrition	79	16per cent	PEM	74	21per cent	Meningitis	27	17per cent
Tuberculosis	116	6per cent	Meningitis	42	2per cent	PEM	67	15
Respiratory Infection-Pneumonia	2per cent		Ear, Nose & Throat	13	0.7per cent	AIDS	177	12
Meningitis	10	7per cent	Tuberculosis	174	9&	Diarrhoea Non Bloody	153	2per cent
AIDS (Suspected & Confirmed)	40	9per cent	Diarrhoea Non Bloody	153	2per cent	Anaemia	22	2per cent
Complications of Delivery	4	5per cent	Respiratory Infection (Non Pneumonia)	84	0.5per cent	TB	79	5per cent
Diarrhoea – Non Bloody	125	2per cent	Anaemia	32	2per cent	Respiratory Infection-Pneumonia	56	1per cent
Anaemia	34	2per cent	Malaria	200	0.5per cent	Malaria	47	0.1per cent
Respiratory Infection- Non Pneumonia	65	0.4per cent	Eye Infection	2	0.06 per cent	Respiratory Infection-Non Pneumonia	20	0.1per cent
Malaria	213	2per cent	Complications of Delivery	9	6per cent	Complications of Delivery	15	5per cent

District Health Office- HIA1 2003-2005**.**

2.11.3 Nutrition status of under five

According to Table 2.21, the total number of children weighed for three years, 8per cent were under weight (2003) 7per cent (2004) and 5 per cent(2005). These values are a good indication in the nutrition sector for the children in the district.

Table 2.21: Proportion of children below the lower line by year

Description	**2003**	**2004**	**2005**
Total No. of children weighed	30,348	29,930	46,006
Total No. of children below the lower line	2,428	2.095	2,106
per cent of children below the lower line	8	7	5

District health Office- HIA 1 2003-2005

The District Health Board has identified five priority health problems which are main causes of all morbidity and mortality rates in the district and these are Malaria, Pneumonia, Diarrhoea, Tuberculosis and STIs/HIV/AIDS (DSA, 2005). The increase in the number of TB cases could be attributed to an increase in the number of HIV/AIDS cases and overcrowding especially in the peri urban areas.

Table 2.22: HIV/AIDS Prevalence for Southern Province by District

District	HIV Prevalence (15-49)	HIV+Total (15-49)	HIV+ Urban (15-49)	HIV+ Rural (15-49)	HIV+ Total (50+)	HIV+ (15 and older)
Province:	15.60per cent	82,651	44,299	38,352	7,026	89,677
Choma	15.70per cent	13,106	7,199	5,907	1,092	14,198
Gwembe	15.60per cent	2,754	595	2,159	332	3,086
Kalomo	11.50per cent	9,808	2,121	7,687	971	10,779
Kazungula	11.50per cent	3,446	745	2,701	341	3,787
Livingstone	31.00per cent	13,741	13,437	303	922	14,663
Mazabuka	17.20per cent	15,877	9,746	6,130	1,194	17,071
Monze	14.00per cent	8,156	3,682	4,473	772	8,928
Namwala	12.80per cent	4,520	1,575	2,944	443	4,963
Itezhi Tezhi	12.80per cent	2,328	811	1,517	228	2,556
Siavonga	16.30per cent	2,635	1,447	1,187	270	2,905
Sinazongwe	15.00per cent	6,282	2,940	3,341	462	6,744

2.11.4 HIV/AIDS

Livingstone district has made considerable progress in addressing the HIV/AIDS epidemic. For example, the number of people being counselled and tested for HIV infection has been growing**.** The district recorded a reduction in HIV/AIDS prevalence from 32.3per cent in 1994, 30.7per cent in 1998 and 31.6per cent in 2002.

Figure 2.2: Population with AIDS by sex and age classes at 2000

(CBH, 1999)

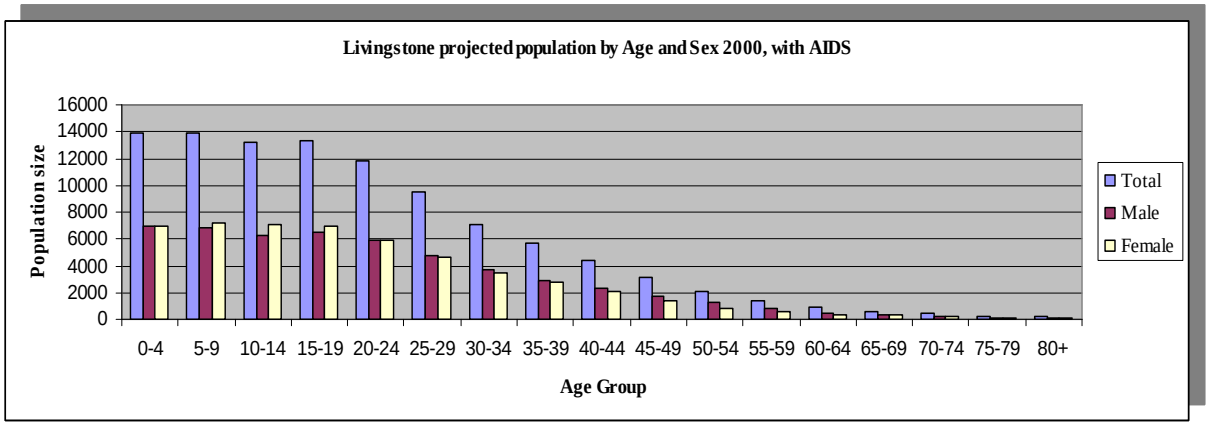
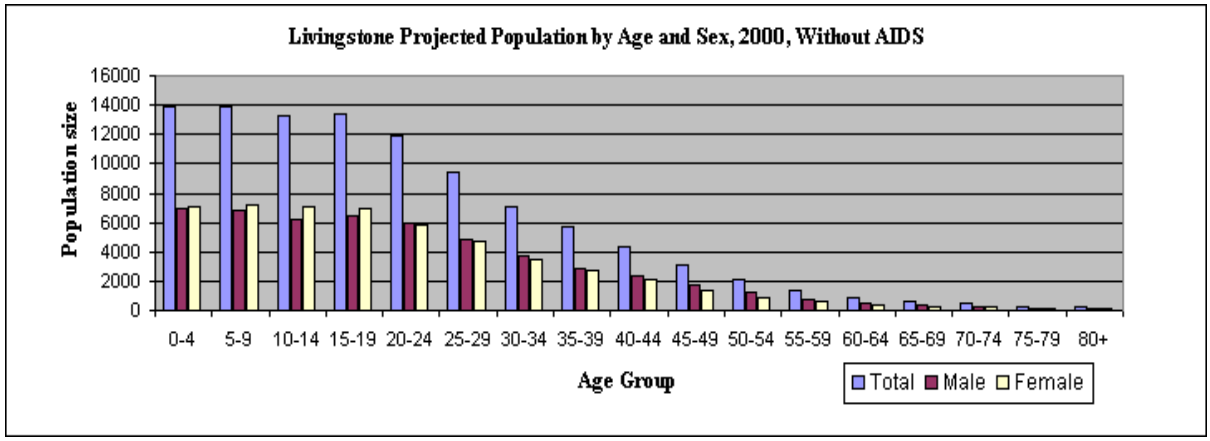


Figure 2.3: Population with AIDS by sex and age classes, 2005.



3.4 EDUCATION

Formal education in Livingstone District is based on three-tier system which starts with primary education grade 1- 7 followed by secondary education from 8 -12. The last level is tertiary education which is college education. For the last decade the District has seen the growing of pre schools mainly in the urban areas. The primary and secondary school education has also been supported by the development of community schools which mainly cater for the less privileged or vulnerable children among them being the dropouts and orphans. Community schools are located in community areas and are not demanding on entry requirements and resources.

The reduction in the HIV/AIDS prevalence could be attributed to the increased sensitization activities in the district by various players including Government and civil society. The HIV/AIDS epidemic has negatively impacted the social and economic spheres of Livingstone.

HIV/AIDS not only affects the numbers of population but also composition, growth rate, mortality rate and birth rate. Furthermore, HIV/AIDS is responsible in many ways for loss of productivity in the economic and agriculture sectors through disruption and loss of time as well as a drain in human resources.

Another development is the emergence of child-headed households. The rapid increase in the number of orphans continues to put tremendous strain on extended families and the social system to provide them with the needed care, resources and social guidance. In addition, the unequal distribution of resources at the household level, lack of gender sensitive social security schemes and limited access to health services raises women's susceptibility to HIV infection. Women also bear the biggest burden of providing care and support to the chronically ill and to orphans.

Table 2.23: Community Public Welfare Assistance Scheme

Categories	Sex		Assisted		Not Assisted	
	M	F	M	F	M	F
Adoption/Foster Care	5	3	-	-	5	3
Juveniles	29	3	14	2	15	1
Health	18	13	5	7	13	6
Repatriation	68	24	21	18	47	6
Rations	28	34	4	9	24	25
Education (Secondary) Bessip Zecab	89 7 3	67 5 9	24 - -	28 - -	65 7 3	39 5 9

2.12 Disability

People with disability are one of the disadvantaged social groups in the district. They encounter problems, such as, being by-passed by services, discrimination in a number of practices and lack of resources. The department has 43 (25 males and 18 female) registered persons with disability in 2003. To integrate these disabled persons into the society, a number of services like medical rehabilitation were extended. Other services provided include bursaries scheme, health care cost scheme, home for the aged. The department also gives grants to institutions caring for vulnerable children the aged and the disabled persons and facilitates adoption and foster cares.

2.13 TOURISM

The Zambian Government reclassified the tourism sector from a social to an economic category in 1996. This was in recognition of the sector's potential to contribute to economic development in terms of foreign exchange earnings, employment and income generation,

contribution to Government revenues, and promotion of rural development as well as to perform the role of sustainable development catalyst (DSA, 2004)

Government policy on tourism is a key driver to the growth of the tourism sector. The government long-term vision for tourism is to ensure that Zambia becomes a major tourist destination of choice with unique features, which contributes to sustainable economic growth and poverty reduction.

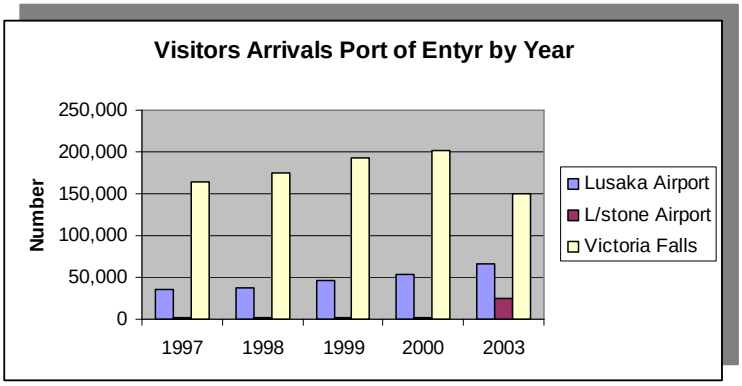
Livingstone is a leading tourist destination in Zambia, and attracts a large number of tourists each year. The main areas of attraction include the Victoria Falls, Mosi-oa-Tunya National Park, and historical sites. Tourists are attracted to activities such as white water rafting, canoeing, bungee jumping, and tours using high aircrafts, helicopter, micro light, and horse riding. Therefore, investing in tourism in Livingstone has become profitable for most people in

the face of the decline experienced by the city's manufacturing economy. The core challenge in Livingstone is to ensure that tourism becomes an important long-term focus for job generation as well as poverty alleviation. Tourism has been successful in providing a replacement industry for many small towns around the world where mining, agriculture, manufacturing or light industry were previously the major economic base.

The main pressures of tourism on environment include the limitation of land for tourism development. The tourism most valuable area lies between the Zambezi River and the city along the riverine vegetation. The area is prime land for tourism and developments in this area are responsible for driving the economy of Livingstone. Zambia tourism policy puts more emphasis on the development of industry, and making Zambia one of the major tourist destinations.

As shown in Figure 2.4, there was a general growth of numbers of tourists arriving in the country from 1997 to 2003. The highest number of visitors coming to Zambia entered Victoria Falls and Livingstone Airport Ports.

Figure 2.4: Visitors Arrivals at Port of Entry between 1997 and 2003



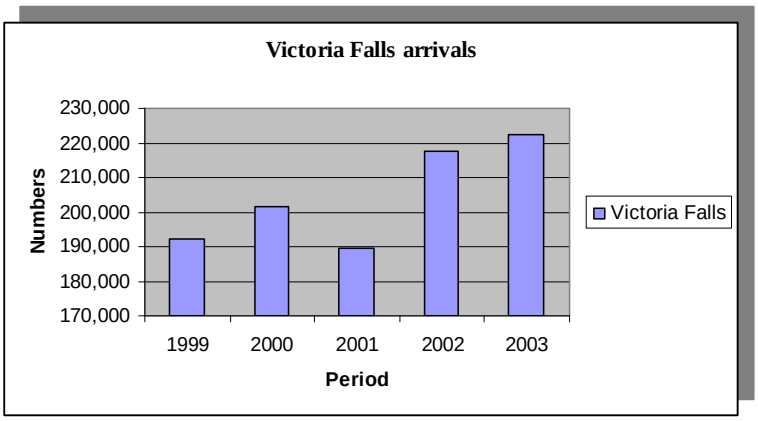
As can be observed, there has been considerable growth in tourism in Livingstone from 1999 to 2003

Table 2.24: City Of Livingstone Annual Visitor Arrivals by Port of Entry

Port of Entry	1999	2000	2001	2002	2003
Victoria Falls	192,083	201,556	189,529	217,685	222,479
Livingstone Airport	2,656	2,678	5,349	6,144	6,279
Kazungula	9,769	13,702	13,352	15,336	15,674
Katima Mulilo	9,9222	10,807	14,412	16,653	16,918
TOTAL	**214,430**	**228,743**	**222,642**	**255,718**	**261,350**

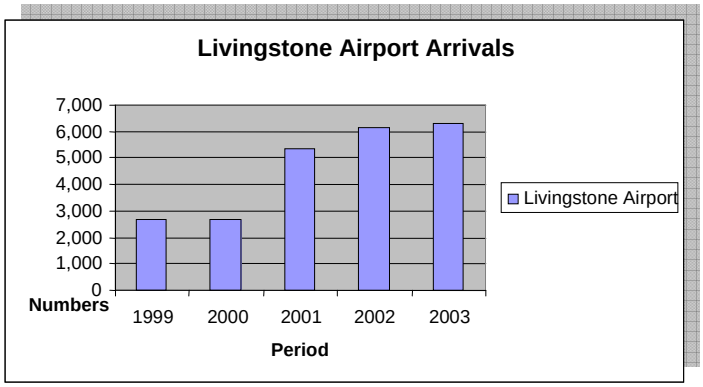
It is clear that the greatest flow of visitors to Livingstone currently arrive from the Zimbabwean side of the Falls, mainly coming on a day trip. A critical challenge is to draw visitors into town, to get them to stay longer and spend more in the city.

Figure 2.5: Victoria Falls Visitor Arrivals between 1999 and 2003



DSA,2004

Figure 2.6: **Livingstone Airport Visitor Arrivals**



Trends of tourism on environment are reflected on the development of infrastructure in the areas zoned completely for tourism and conservation. Development of Livingstone, towns and business sector can well be linked to the growth of tourism.

Box 2.2 gives an indication of tourism development pressure on the environment. There are over 25 camps, lodges and hotels that have been constructed in the tourist zone. Plans by investors to construct hotels and villas are an indication of the growth of the tourism industry in Livingstone. As a result, there has been an increasing concern of the impact of this growth on the environment.

The tourism sector has had positive impacts on the economy of the city. Tourism is labor intensive and thus provides an opportunity for employment to a large group of people. After the collapse of industries in Livingstone, tourism sector is now the largest and perhaps single employer. In essence tourism covers employees in various institutions including:

- transport industry (airlines, railways, road transport)
- food industry (restaurants, agricultural supplies)
- accommodation industry (hotels, lodges)
- financial industries (such as banks, bureaus)
- retail sector

Box 2.2: Tourism Facilities

Name	Number
Airchaters	3
Airlines	2
Backpackers & Campsites	5
Boat Cruise	4
Bungi Jumping	1
Canoeing	4
Car Hires & Rentals	8
Casinos	2
Elephant Riding	1
Fishing	3
Gorge Swing	1
Guest Houses	27
Helicopiter Flights	2
High Wiring	1
Horse Riding	1
Hotels	4
Jet Boating	1
Kayaking	1
Lodges	23
Micro Lighting	1
Pubs, Clubs & Bars	11
Restaurants & Takeaways	16
River Boarding	3
Tours, Transfers & Safaris	16
Travel Agents b	4
White Water Rafting	4

While tourism industry creates entrepreneurial opportunities, it is also one of the leading businesses in the rural areas. It also has a potential for both multiplier effect as well as providing linkages to other areas of business. The impact of tourism in LCC has not been assessed, however, it can be concluded that the economy of Livingstone is largely supported by tourism.

In general, the expected environmental impact of tourism can be considered at several levels. However, uncontrolled conventional tourism poses potential threats, and can put enormous pressure on the environment, communities and facilities. It often puts considerable strain on water resources and it can force the local population to compete for the use of available basic services and resources. LCC has limited land which has to be distributed for various land uses including conservation, settlements, agriculture and tourism infrastructure development. Increased construction of tourism and recreational facilities has increased pressure on land.

The main impacts of tourism on biodiversity include; habitat destruction, visual intrusion and direct attack on the species. Habitat destruction is due to development of infrastructure within Mosi-oa-Tunya National Park. Unfortunately, wildlife habitats in Mosi-oa-Tunya National Park are not greatly diverse. The area is largely dominated by Mopane Woodland which is sensitive to human disturbance and does not easily regenerate. Vegetation is removed through deforestation resulting from increased human population, clearing for development, wood fuel collection and cutting poles for shelter building.

Noise pollution from aircrafts, cars and buses is quite apparent in Livingstone. The expansion of the Livingstone airport and its subsequent upgrading clearly confirms the fear of noise pollution in the areas. In addition, number of micro light, helicopters and light aircrafts both from Zimbabwe and Zambia are likely to increase.

Victoria Falls area is known as a riverine wetland or riparian habitat for wildlife, most important for wildlife species because it provides adequate food, shelter and cover. The habitat if characterized by key browsing species and has very high diversity of flora and fauna. The typical soil type is Mopane clay, which is shallow but sticky. This ecosystem is sensitive and fragile, but has been severely degraded for several reasons among them the expansion and development of city infrastructure and construction of tourism lodges, camps and hotels within the National Park.

Tourism can cause change or loss of local identity and values, brought about by several closely related influences. Cultural clashes can take place as a result of differences in cultures, ethnic and religious groups, values and lifestyles, languages, and levels of prosperity.

2.14 Responses

In order to strengthen the Livingstone tourism industry, efforts have included:

- Encouraging and strengthening private sector investment in the tourism sector.
- Improved environmental management particularly in the national park and game management areas.

- Formulation and enforcement of relevant pieces of legislation and policies that the regulate tourism. These include the EPPCA, Wildlife Act, National Heritage Act, Forestry and others.
- Promotion of initiatives for regional tourism co-operation;
- Improved tourist infrastructure such as roads, railways, airports, telecommunications and other support facilities;
- Improved the national tourism administration to help the tourism industry be competitive and viable.

3: LAND AND AGRICULTURE

Livingstone district covers up to 695km^2 and much of the land is distributed as land for settlement (rural and urban statuses), agriculture, conservation, and development. Figure 3.1 and Table 3.1 shows approximately land use coverage and land distribution. There are about 12 main land uses in the district with most dominant being the area covered with woody vegetation. Out of the total land area, 1,643 ha is under cultivation as follows;

- Commercial farms 634 ha.
- Emergent 372 ha.
- Small scale 637 ha.
- Institutional 50 ha.

15,066 ha is under indigenous forest reserves while the remaining area of 125,991ha is covered by grassland, wetland and human settlement. It is worth noting that Livingstone agricultural land may include some commercial farms under Kazungula District.

Table 3.1: Land use rankings by land cover in Livingstone District

Land use	Rank
Urban settlements/villages	8
Protected forest areas	3
Farms for vegetables	7
Wetlands, dambos	8
Plateau system	6
Hills and escarpments with no or marginal potential for cropping	2
Block *shifting cultivation* system, maize, sorghum	5
Ranches and dairy farms	4
National park	9
Woody area not cropped within the last 10-20 years other than similar land uses	1
Maize, Sorghum cultivation	5

3.1 Land use for settlements

Figures 3.1 and 3.2 are an indication of settlement patterns in the district. The maps represent a historical population distribution and land use in 1970s, but the land use/land cover use at present has fairly changed:

a) Much of the municipal land is covered by Peri urban settlements and these settlements have drastically expanded.
b) Farmland still covers a fairly large area in land around Livingstone municipal area
c) Tourism developments cover considerable large amount of land.

Figure 3.1: Land use Map of parts of Livingstone District (extracted from Land use map of Zambia, 1975)

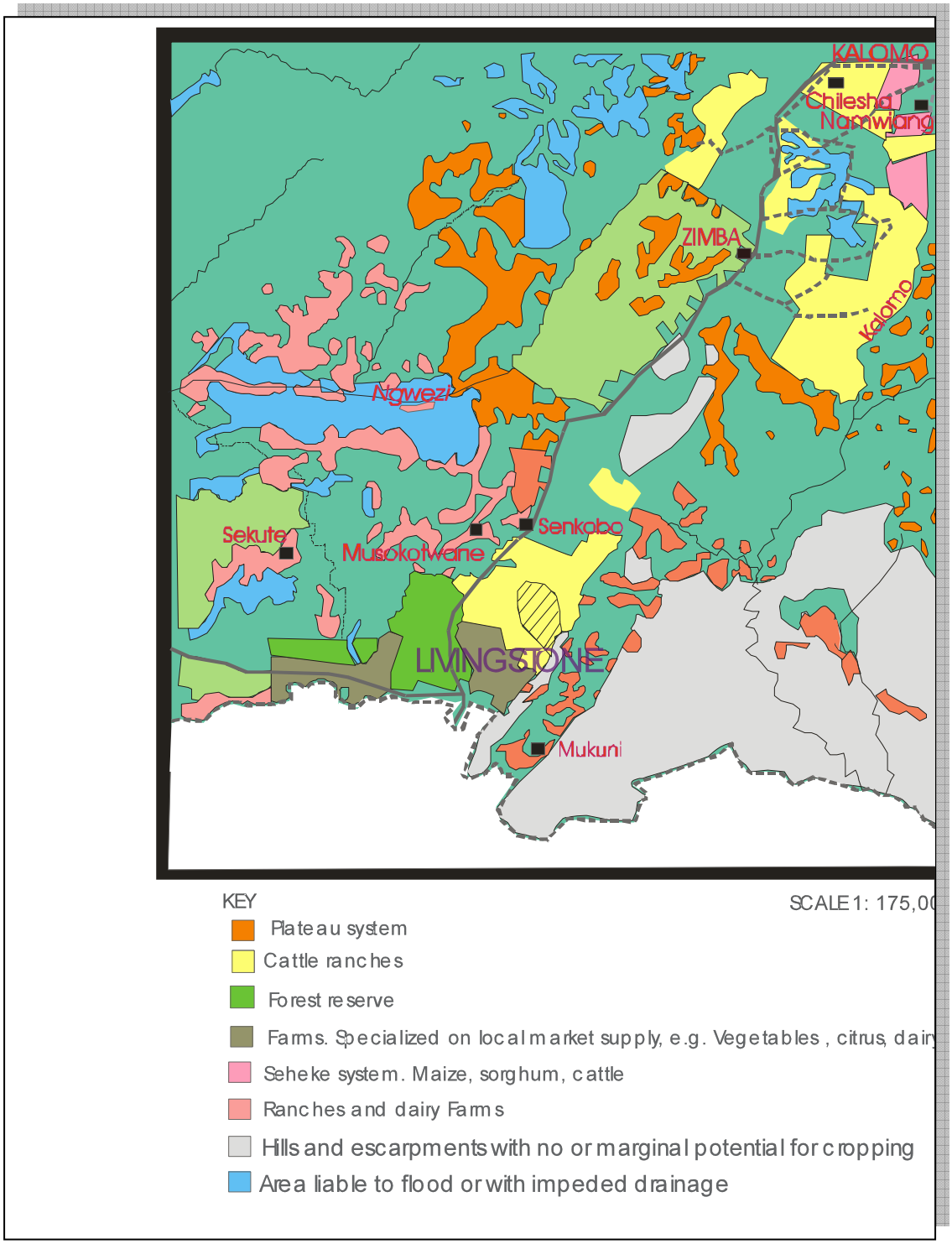
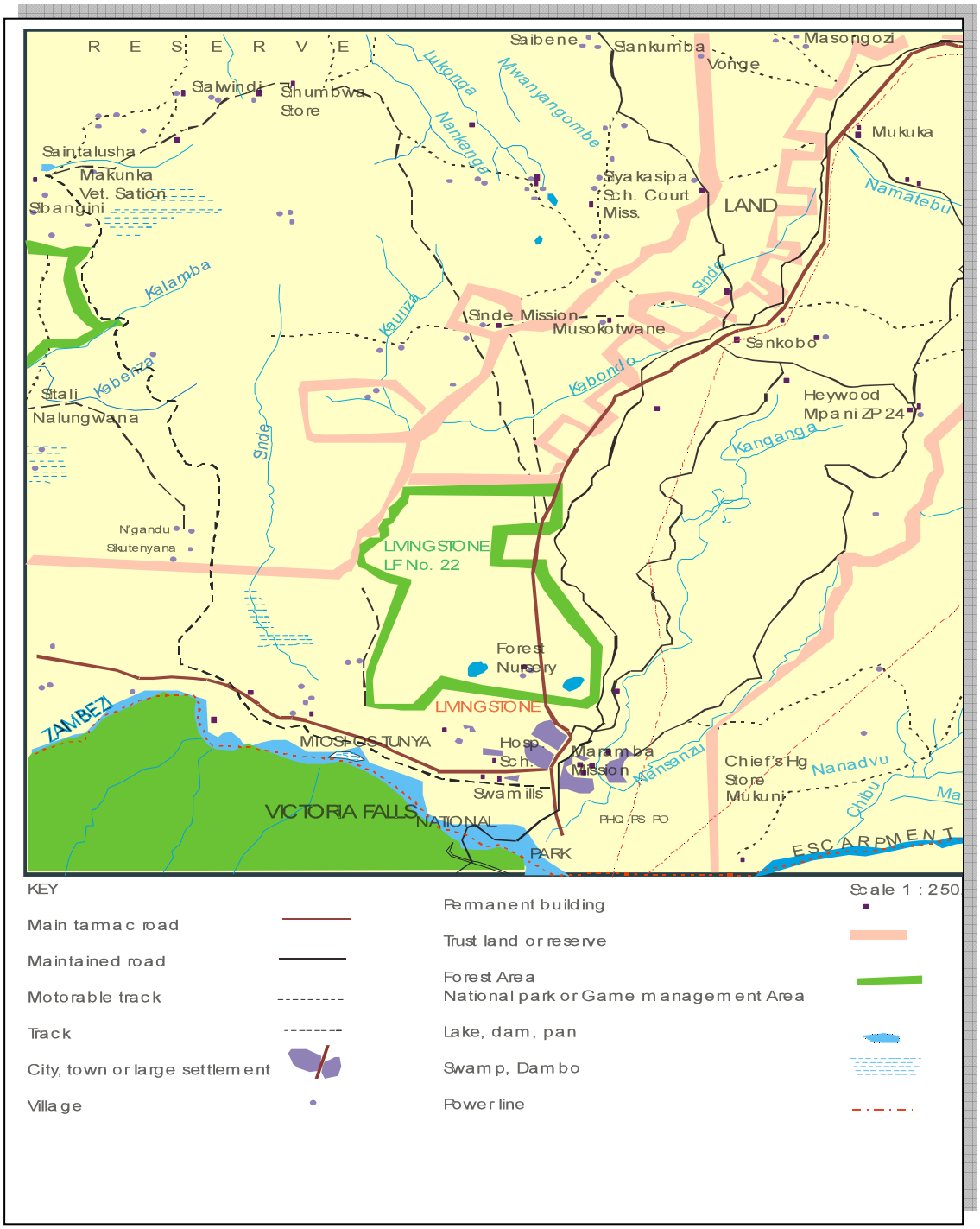


Figure 3.2: Settlement patterns in part of Livingstone District (extracted from SD 36-6 Topographic map of Zambia, 1974)



There are two types of land tenure system in the district:

a) State land

This category of land includes urban settlements, mining, power generation and commercial farming areas. LCC through the Commissioner of Lands in Lusaka administers this land. The council is responsible for recommending land applications to successful applicants. The Commissioner of lands approves the recommendations from the council before the land can be developed. Three kinds of leasehold exist under state land. These are:

- 14 year lease: is given for un-surveyed land upon production of a sketch plan which, must be renewed at expiration of the period.
- Private Leasehold Land (99 year lease): is given on surveyed properties for both urban and agricultural development upon production of a survey diagram.

Both leases are referred to as Title Deeds and cover the effective “ownership” of land as well as improvements made on the land.

- Occupancy license: confers temporary access and use rights (30 years) and is generally used in unplanned settlements.

For the township, at least 50per cent of the land is under the 99 year leaseholds whereas about 20per cent is under the 14 year leaseholds while the Occupancy License accounts for approximately 30per cent.

b) Traditional Land

Most of the land in Southern Province is held under the traditional tenure system with occupancy and user rights allocated by the Chiefs. Tenure and ownership of a piece of land under the traditional system and is sustained through cultivation and maybe inherited. Land, forest and unprotected wildlife resources in uncultivated areas are communally utilized.

The Commissioner of Lands does not and cannot allocate any land held under customary tenure without consulting the Chief and the local authority. To convert customary land to form leasehold tenure, the relevant authorities obtain consent from the Chief. Authority over land applications for leasehold under the traditional land tenure is also subject to the recommendation of the council and approval of the commissioner of lands.

Because land is a symbol of authority and source of political power chiefs resist land alienation in their territories as they fear loss of control over land and their subjects. The continued enforcement of orders in council which insist that customary authorities be consulted before any land grants and dispositions in their territories are made has therefore,

afforded these leaders a legalized means for effectively resisting alienation of their customary lands. As a result, the rate of alienation of customary lands has remained very low.

Environmental issues originate through the lack of land management. For example, state land is managed by LCC and other government agencies as mandated by law. Privately owned land is managed by the leaseholder but may also be managed indirectly through government agencies. Land management done in the traditional land tenure system is inadequate. In a traditional land system, there are numerous activities which lead to land degradation. These include deforestation and uncontrolled fires. Land degradation due to excessive vegetation removal caused by deforestation which leads to a whole cycle of environmental problems particularly erosion, sedimentation and flooding. The current trend on land use in the district has resulted in increased land demand, earth and sand mining, deforestation and construction on marginal land.

3.2 Mining

Mining is not a very active sector in the district. It has been considered because of the small scale mining activities. Small-scale mining in the district is mainly confined to sand and earth mining and quarrying. The material is used for construction of roads and bridges, buildings and housing. Earth mining is significant in the district and has become a major environmental concern. Mining is done on anthills for brick making. Excavations for sand and rock for stones are recorded to be a threat in the district as demand for sand and crushed stones are increasing.

3.3 Agriculture

The economy of Southern Province is largely dominated by agriculture. Livingstone is equally important for agriculture production in the country, and much of the population in peri-urban and the entire population in the rural area are actively involved in agriculture. The main pressures on the environment are from the methods of farming which require land clearing leading to deforestation; heavy input of nutrients (fertilizers) and pesticides, types of crops grown and poor land cultivation. Some agriculture practices encourage bush fires and stream bank cultivation.

Government's policy on agriculture is a key driver of the agriculture sector. Land is continuously cultivated, loosening the soil and exposing it to erosion. One other factor causing pressure through agriculture comes from increased income and readily available markets for sale of produce. This coupled with unemployment in the district, increases the number of people engaged in farming. In addition, the growing urbanization and the expanding urban sprawl are significant sources of pressure on land for agriculture. Food production in these areas is pushing urban population into cultivating areas of high risk as well as promoting urban agriculture.

Agriculture is dominated by crop production, and emphasis in each crop varies with locality.

3.3.1 Farming systems

For the past three years, land that has been cultivated for various major crops was about 102,000 ha. Livingstone district farming systems practised are the following:

a) **Subsistence Farming**. This is characterized by the slash and burn cultivation and shifting farming practices. Factors determining these farming systems are: (i) high rainfall; (ii) Soil type ; iii) Topography; (iv) Hydrology which is a factor through frequent flooding and high water table and; (v) Pest and animal crop damage. The traditional crops grown in this region are sorghum and millet.

b) **Improved or Emergent Farming**. This is common on the plateau where soils are largely Acrisol and Lithosol-Cambisol. Basically this farming system is encouraged by the presence of cattle which are a source of oxen for ploughing. Generally, the farms are fairly large, and the main crops are maize, groundnuts. This farming system is generally distributed on semi traditional land and private land.

c) **Improved or Emergent: ox- and tractor plough cultivation**. This group includes farmers referred to as small scale farmers. It calls for agricultural inputs, and may be located in settlement areas, private land or traditional land. This is a mixed farming system which produces food largely for both subsistence and commercial; and the size of land cultivated ranges from 5 hectares, or less (DSA, 2004). The dominant crops grown are maize, groundnuts, and soybeans. The system also rears Cattle,

Sheep, Goats, Pigs, Poultry, and carries out Fish Farming.

d) **Medium scale farming systems**. This farming system involves intensive farming and its main features include:

- Partial mechanization
- Extensive use of draft power
- Mixed farming
- Relies more on casual hired labour
- Cultivates up to 20 hectares or more land

Land tenure of this farming system is usually that of private land holder, but may occur in the resettlement areas.

3.3.2 Crop Production

Area covered by farming and crops grown are given in Table 3.2. The major crops grown in Livingstone district include cotton, tobacco, wheat, sunflower, maize, sweet potatoes, groundnuts, sorghum, cow peas, millet and a lot of vegetables, which include cabbage, onion, rape and tomato.

Table 3.2: Crop production of all farmers in Livingstone

Major Crops	00/01	01/02	02/03	Constraints	Opportunities
	Ha	Ha	Ha		
Maize	1,082	840	726	Low rainfall & droughts, infertile soil, inadequate organic manure, fertilizers & maize seeds are expensive, lack of good market	Has a wide market being the main staple crop in the region. can be grown under irrigation throughout the year
Sorghum	145	97	82	Infertile soil, droughts (at times), poor market in the district	Presence of good market in Botswana and Namibia when it is one of the staple crops
Pearl millet	115	91	111	Infertile soil, droughts (at times), poor market in the district	Has a good market in Botswana and Namibia where it is one of the staple foods
Cow peas	130	154	132	Infertile soil, droughts	Has a good market in Botswana

Crops in Livingstone are predominantly grown under rain fed conditions. Due to inadequate rain, single cropping is practiced in all parts of the district. In some parts Natebe, Kasiya Resettlements and some villages in areas like Mahululo, Jack Mwanampapa and Simonga, residual moisture is adequate for growing a second crop, especially vegetables. In addition, wherever there are perennial rivers, streams and shallow wells, farmers grow various types of

crops under irrigation. Cultivation practices are very traditional and are done mainly through manual labour using simple farm implements like hand hoes.

3.3.3 Agricultural Extension Services

The ratio of the agricultural extension worker to farmer stands at 1:500. The shortage of personnel severely affects the effective provision of agricultural extension services thereby contributing to the low yield and the continued adoption of inefficient farming methods. The situation is made more difficult by the lack of transport hampering the mobility of agriculture extension workers to reach out as many farmers as possible, inadequate technical know-how of extension workers, and lack of input for the implementation of agricultural projects has severely affected crop and animal health production.

The district has one agricultural block divided into two agricultural camps (Table 3.3). The two Agricultural Camps are Livingstone West (Simonga Camp) and Livingstone East.

Table 3.3: Agricultural Camps and Staff

Block name	No. Camps	No. staff	No. of farmers	Activities – NGO, CFU, MACO
Livingstone	2	2	1 000	Agricultural extension

3.3.4 Livestock production

The livestock sector is important to Agriculture industry in Livingstone. It provides a flow of essential food products, sustains the employment and income of rural areas, contributes to drought power and manure for crop production and the main food and cash security to most people in livestock keeping areas of the Livingstone. The sale of livestock and their products often constitutes the major source of income among the rural subsistence farmers for the purchase of consumer goods, improved seeds, fertilizer and other inputs for crop production.

The livestock sector consists of the extensive communal grazing traditional and few intensive commercial sectors. The livestock is distributed more in rural and the commonest livestock being reared are cattle, sheep, pigs, goats, poultry and donkeys. Cattle are relatively considered the most important type of livestock in Livingstone (Table 3.4).

Table 3.4: Livestock production (population) and use

Type of Livestock	Population (average over 3 years	use of Livestock
Cattle	7,126	Milk, meat, draught power and transport
Sheep	506	Milk, Meat, economic Security
Goats	944	Milk, Meat, Economic Security
Pigs	322	Meat, Economic Security
Poultry	10,262	Meat, Economic Security, eggs
Donkey	32	Draft poser

3.3.5 Extensive pasture management

This refers to management of natural pastures. The question of long-term stability and productivity is important. Management systems that fail to achieve these aims result in deterioration of the natural pasture, a reduction in ground cover and productivity and, if carried on for a long time, the creation of desert or semi-desert conditions. There is much evidence of this happening in Livingstone. Numbers of Farmers and extension staff are provided in Table 3.5

Table 3.5: **Extension and Research Activities**

Trained staff	Commercial farmer	Traditional farmers	Camps & research site
5	220	47,220	Simonga
			Livingstone east
			Livingstone central
			Livingstone west

Livestock production constraints include:

1) The incidence of epidemic disease, like heart, water, anaplasmos and corridor particularly tick-borne disease.
2) Poor livestock management levels in the traditional sector as a result of socio economic factors and lack of animal husbandry and animal health knowledge.
3) Lack of well organized livestock marketing systems has contributed to higher costs are reduced efficiency of operations at all levels in the marketing chain;
4) Land tenure systems, which mitigate against individual responsibility for communal lands, resulting in localized areas of overstocking, land degradation and low herd productivity;
5) Lack of access to an efficient credit facilities;
6) Lack of adequate rainfall.

Livingstone has three main Farmers Associations which represent interests of farmers in the district (Table 3.6)

Table 3.6: Cooperatives and Associations

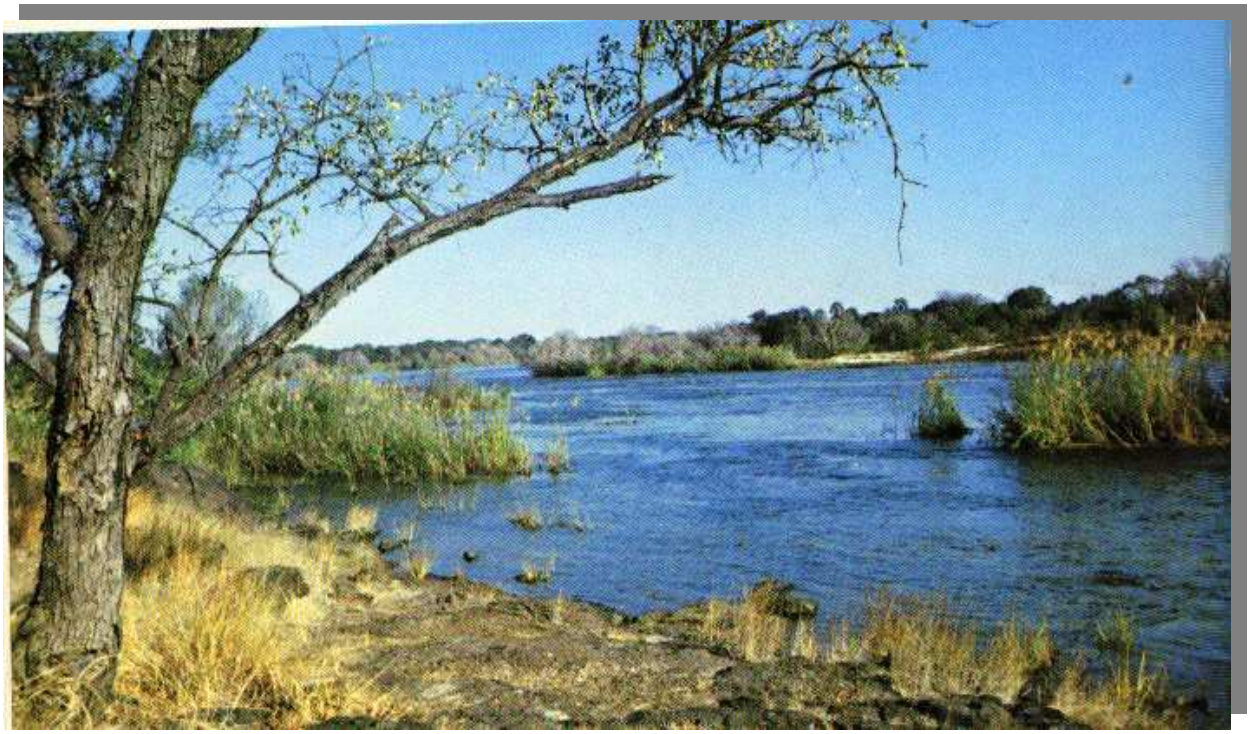
Name	**Registration Number**	**Date of registration**	**Location**	**Activities**
Natebe (M.P.C.) multi purpose co-operative Society	3980	16/07/99	Natebe & Kasiya Resettlements	Small-scale crop and animal production
Kasiya Lusumpuko agricultural co-operative	4215	09/08/99	Kasiya Resettlement and Mahululo	Small-scale crop and animal production
Livingstone farmers cooperative	11350	Natebe and Kasiya Resettlement, Linda and Hamucha farms	Small-scale and emergent crop and animal production	Small-scale and emergent crop and animal production

The agricultural sector objectives are aimed at increasing crop and livestock production and enhancing district food security. In order to achieve the objectives, recourse will be made available to implement the following programmes: crop development, livestock development, fisheries development, soil conservation and agro forestry, infrastructure development and institutional strengthening.

Issues of deforestation, soil erosion, agricultural need to address the following:

- Introduce and promote ecological zoning in which the district is zoned into areas of various categories so that sensitive areas are protected.
- Conservation farming should be introduced, improved and applied. This requires capacity building in extension practices and public education.
- Current efforts to re-plan resettlements should provide sufficient opportunities to emphasize sustainable agriculture.
- Government needs to have a deliberate policy on soil conservation and agro-forestry extension and other conservation measure aimed at reducing the process of soil erosion and land deforestation, such as crop rotation, intercropping and contour ridging
- Regulating the introduction of new species of fish used in aquaculture
- Continued implementation of the Government policy on the restocking of livestock that may suit the climate conditions of Livingstone district. In addition, improved livestock extension and disease control should be strengthened.

4: WATER AND SANITATION



The status of water resources in Livingstone is not fully known considering that very limited studies have been done. However, studies by JICA (1995) on water resources in general, and NWASCO (2006) on peri-urban provide reasonable source of information on which this report can be based. Given the issues of rapid growing population, changing climatic conditions, expanding industries, growing urbanisation and expanding agriculture, the district will need to address these issues and develop a system that will make water accessible to all.

The main sources of water in Livingstone are the streams and dambos or lakes, wells (protected and unprotected) borehole, and taps, (CSO, 2004).

Driving forces include growing population, urbanization, industrial expansion, safe and clean water, sanitation, limited technology, poor settlement patterns, and water pollution.

4.1 Surface Water

The issues regarding water supply dwells on accessibility to clean and safe water as well as distance to the water source. Livingstone urban pumps water from Zambezi River. In peri-urban areas, water is fetched directly from streams, rivers, and shallow wells.

The Southern Water and Sewerage Company (SWSC) has three pumping station of different sizes at the same location. Raw water is pumped through two parallel and interconnected

steel rising main pipelines to the treatment works in town, about 5.7 Km away. The City has two treatment streams operating parallel with flows distributed to each stream by a splitting tower. The distribution system is presently subdivided into two zones, the high level zone supplied from a water tower or by direct pumping and the gravity zone supplied from the ground reservoirs.

The Livingstone Sewerage system is divided into four zones, each serviced by gravity sewers, which discharge the waste water to four pumping stations. The pumping station pumps the waster materials oxidation ponds, where the waste matter is treated through a natural process. In addition some individual houses have their own septic tanks especially in high cost areas or pit latrines in peri-urban areas.

4.2 Rural Water Supply

Rural Water Supply Programme includes Village Wells Construction, improving traditional sources of water in small communities, rehabilitation of existing shallow wells as well as maintenance and operation of hand pumps and training of the village (Community) Maintenance Teams. There are 18 water sources in the district. Of these 3 are jetted wells, 3 protected traditional shallow wells and 12 boreholes.

The district has inadequate/poor access to portable water for about 104,378 people in rural areas. This has adverse effect on the well being of the rural people. The presence of high morbidity and mortality due to diarrhea diseases are as a result of poor water and sanitation and unfavorable hygiene practices. The district portable water problems include the following:

- Scarcity of water during the dry season leads to over concentration of livestock and humans around the few watering points, causing land degradation. This concentration of livestock encourages the spread of contagious diseases amongst the animals and human
- Few people have access to a toilet or pit latrine both in the rural and urban areas. The effect of inadequate sanitary facilities coupled with poor drainage system and poor solid waste management in peri-urban areas has resulted in the contamination of surface water.

4.3 Urban water supply

Tables 4.1, 4.2 and 4.3 give details of water supply to 17 townships in the city. The daily volume of water supply for the townships at peak demand is 28,732m^3. Studies on water supply in peri-urban areas in the district provide a fairly good analysis of water supply situation. Therefore, out of the population of 67,288 only 4,142 have individual connections and most of these occur in Maramba, Ngwenya, Libuyu, and Malota townships (Table 4.3). There are 16 kiosks, 46 communal pumps and 7 hand pumps in the whole City. Descriptions of water supply status for selected peri-urban areas are given in Boxes 4.1 and 4.2.

Table 4.1: Peak Water Demand of Existing Primary Mains

Main pipe	Flow		Areas supplied
	M^3/h *	M^3/d	
Libuyu main	589	8.835	Libuyu and site and service
Maramba main	342	5.130	Maramba, Police
Linda main	151	2.265	Linda
Dambwa central	175	2.265	Dambwa Central / industrial
Dambwa north	187	2.805	Dambwa North
Town/Victoria falls	475	7.125	Town center / Victoria Falls / industrial
Total	**1,611**	**28,732**	**Measured at outlets plant**

* day flows during 15 hours supply

Table 4.2: Source of Water for Households

	Level of service	**Rural**	**Urban**	**Total**
Piped water inside house	More than basic	24	4467	4488
Piped water outside house	More than basic	197	7757	7954
Communal tap	Basic	108	4517	4635
Protected well	Basic	25	18	43
Protected borehole	Basic	257	270	527
Unprotected well	Less than basic	12	33	45
Unprotected borehole	Less than basic	10	26	36
River/Dam/Stream	Less than basic	362	167	529
Rain water tank	Basic	1	1	2
Other	Less than basic	2	605	607
Totals		**998**	**17858**	**18856**

The district lacks the infrastructure to meet the demand for water supply. A fairly large population has no access to safe and adequate water in Livingstone district.

Table 4.3: Water Supply Status in Livingstone Peri Urban Areas

Area	Population	No. of H/holds	Individual Connections	Communal Taps	Public Taps	Kiosk	Hand Pumps
Maramba	10,505	2,473	1,531	0	0	0	0
Libuyu	9.567	1,491	522	14	0	0	2
Dambwa Extension	3,965	1,779	164	0	0	0	0
Zecco/Burton	6,667	1,357	25	0	1	12	0
Malota	6,103	1,438	518	0	0	0	0
Nakatindi	2,472	492	18	0	3	0	1
Zambia Railways	6,051	2,148	11	7	0	0	0
Sakubita	1,664	282	0	2	0	1	0
Libuyu Extension	3,118	510	17	3	0	1	1
Namatama Extension	2,303	316	0	1	0	0	0
Mwandi	644	176	4	7	0	0	0
Zambia Saw Mills	2,958	490	10	0	0	1	1
Ngwenya	6,987	985	14	8	0	1	1
Linda	7,900	1,666	1,072	0	0	0	0
Kashitu	1,484	294	234	0	0	0	0
Mundolobela	890	130	2	0	0	0	1
Col storage Compound	476	68	0	4	0	0	0
Total	**67,288**	**15,095**	**4,142**	**46**	**4**	**16**	**7**

4.4 SANITATION

A toilet in a peri-urban area (NWASCO, 2006)

Sanitation varies considerably with the area. In the rural area, the issue of sanitation is not emphasized as over 90per cent of the population uses the bush. Furthermore, sanitation depends upon availability of water. Much of the peri-urban areas are not exposed to modern toilet system but uses VIP or traditional toilets (Pit latrines) or may use the bush.

The following services show the distribution of facilities (Tables 4.4 and 4.5) for both rural and urban areas.

Table 4.4: **Sanitation Facilities**

	Levels of services	Rural	Urban	Total
Flush (private)	More than basic	68	8863	8931
Flush (communal)	More than basic	156	1855	2011
Pit latrine	Below basic	194	3625	3819
VIP	Basic	8	367	375
Bucket	Below basic	0	22	22
Other	Below basic	239	127	366
No toilet facility	Below basic	333	2999	3332
Total		998	17858	18856

Source: Republic of Zambia, 2000 census of population and housing.

Table 4.5: Sanitation Services Levels

	Rural	per cent	Urban	per cent	Total	per cent
More than basic	224	22.4per cent	10718	60.0per cent	10942	58.0per cent
Basic	8	0.8per cent	367	2.1per cent	375	20.per cent
Below basic	766	76.8per cent	6773	37.9per cent	7539	40.0per cent
Total	998	100.00per cent	17858		18856	100.0per cent

In the urban areas, households dispose the sewer waste into septic tanks. Livingstone District peri-urban has no well developed sanitation system. Boxes 4.2 and 4.3 provide descriptions on sanitation situation of some of the areas in the Peri-urban of Livingstone town (NWASCO, 2006).

Box 4.1: Description of the existing Sanitation Situation, Dambwa Extension

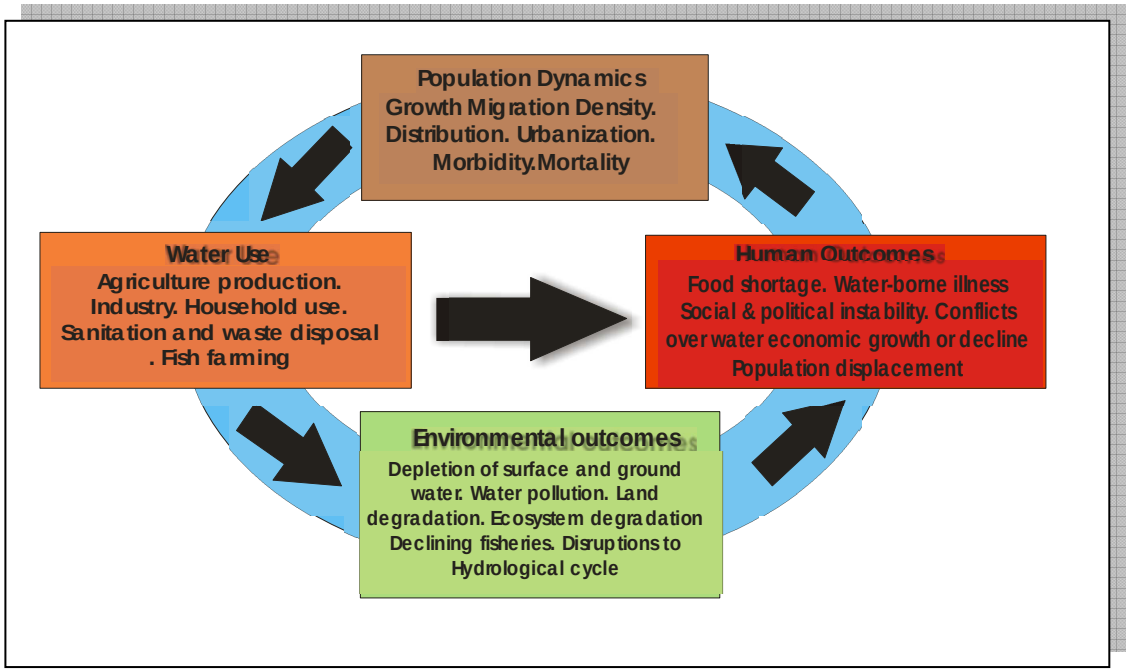
Some residents use the traditional pit latrines which are in poor condition. Additionally, there are few VIP toilets as well as flush toilets which are connected to septic tanks within the area. But according to the HH sample about 70per cent of the household do not have their own sanitation facility. They use the bush as sharing of the toilet is not common. According to the residents reasons for not having a toilet are the high water table in the area which makes it difficult to dig. Residents complain that it is difficult to build pit latrines because of the rocky soil, lack of sufficient materials and problems finding a proper site for the construction of a pit latrine. Pit emptying is not carried out but residents do not dig a new pit either when the toilet is filled up as the area is water logged and it is very difficult to dig a pit. There are no public or communal toilets found within the area. According to the residents the main problems they have when it comes to sanitation are that latrines collapse frequently, cause diseases, overflow during the rainy season, pollute water wells and it is difficult to dig.

Box 4.2: Description of the existing water supply situation, Malota

The licensed service provider is the Southern Water and Sewerage Company (SWSC). Residents are supplied by yard taps and indoor connections which are in fair condition and taps at ablution blocks which are in poor condition. Many residents have been disconnected. Only about half of the households pay for their water. The infrastructure is old in poor condition. Some of the taps are damaged. The quality of the piped water is fair. At the moment, that water supply is erratic due to the replacement of the water pipes that is being undertaken by JR. The pressure is low. Residents do not receive water due to the low pressure and they fetch water from other peoples' connections were they pay a varying amount of money, in neibouring areas such as Maramba or Notebroad or at the water kiosk in Zesco/Burton compound. Other residents use the connection at an institution where they have to pay ZMK 200 per 20 liter container. Some residents fetch additional water directly from a nearby water tank where the water is of fair quality. Only few households treat their water used for drinking and cooking (boiling, chlorination). Residents would like to improve the water supply distribution network and the sanitation. They consider the water quantity available, the distance between the dwellings and the water sources and the price of the water as their major problems as far as water supply is concerned.

In order to understand the linkages of population, water and environment, Figure 4.1 displays a model of linkages as may apply to Livingstone district. The model shows that the population and its variables are linked to water use. These in turn are linked to environmental outcomes. Human outcomes are attributed to environmental outcomes as well as to water use. This model is simplified but can be quite complex.

Figure 4.1: Population and its Variables Model



4.5 Water Pollution

Many factors cause water to be polluted, and the generic ones which also may apply to Livingstone District are:

Agriculture is the main source of eutrophication. Most water flows through agricultural land and residential areas, where effective feeding is done. The problem of eutrophication is intensified due to poor management agricultural practices that enhance erosion and nutrient losses.

Sewage and oxygen depleting substances contribute considerably to water pollution. Anything organic in the water causes an increase in the BOD, and thus a decline in the oxygen as these organic substances decompose. Streams (such as Maramba) passing though settlement areas is eutrophic because of sewage and other waste dumping.

Floods have been a major problem in most areas as they destroy infrastructure such as bridges, crops and human settlements. Most streams in Livingstone District are prune to quick flow flooding.

Urban floods are due to poor or undeveloped infrastructure of the sanitary sewers. Efficiency of sewer will depend on adequate pipes which would collect storm water. Street flooding leads directly into sanitary water without any treatment, meaning that the run off of pollutants from streets and yards into the storm sewers contain oils, from vehicle wastes; and pesticides and other pathogenic microorganism from animal wastes.

Responses for water and sanitation for Livingstone district have been identified to cover the following:

- Public Health law enforcement.
- Environmental education and public awareness.
- Improving sanitation facilities.
- Promoting provision of water services.
- Improve ground water extraction.

Availability of and access to clean water and sanitation are among the most important determinants of health of individual human beings. The aim is to sustain this and to commit the district to a number of challenges among them improving quality, monitoring and infrastructure development so as to improve provision of water supply and sanitation services.

4.6 SOLID WASTE

Solid waste is defined as garbage, refuse, sludge, and other discarded substances resulting from industrial and commercial operations and from domestic and communities activities (ECZ, 2004). This includes such classes of waste as hazards including waste oils, and wastes arising from mining activities excluding gaseous waste ad waste water. Municipal Solid Waste (MSW) refers, for the most part, to materials discarded in urban areas for which municipalities are usually led responsible for collection, transport and final disposal.

Table 4.6 gives a classification of solid waste which is applicable to the district. MSW encompasses household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris. In Livingstone MSW also contains varying amounts of industrial wastes from small industries, as well as dead animals, and faecal matter. Agricultural and mineral extraction activities constitute also solid waste. The insufficient collection and inappropriate disposal of solid waste represents a source of water, land and air pollution and pose considerable risks to human health and the environment.

Table 4.6: Classification and characterization of wastes

Class	Constituents/Characteristics	Activities/location of waste generation
Domestic waste	Paper, glass, metals, rags, plastics, dust, litter	Schools, households, shops
Commercial waste	Paper, wooden articles, glass plastic	Shops, barber shops
Non-hazardous industrial waste	Ash, scrap metal, leather shavings and cuttings, rubber, textile off cuts, plastics, glass, office waste	Manufacturing industries
Institutional industrial waste	Paper, electronic appliances	Schools, churches, offices
Hazardous waste	Pesticides, cyanides, heavy metals, acids, caustics, clinical wastes – sharps syringes, soiled bandages, expired drugs	Hospital, laboratories, manufacturing industries, schools
Inert waste	Builder rubble, material from desilting of drains, excavation spoil	Construction sites

The primary driving forces impacting solid waste management is the unsustainable consumption patterns together with rapid population growth, expansion of the tourism industry, culture and life style. Much of the pressure on solid waste management comes from a number of obvious factors: lack of waste collection services; unplanned settlements; undeveloped land fill for disposal and lack of adequate disposal methods.

A significant amount of the solid waste generated in the district is uncollected apart from the main markets, and it is either burned in streets or end up in streams, river, or empty lots. Urbanization have drastically increased generation rates of waste, and the LCC now has to cover a wider area in an attempt to collect waste but has limited capacity to collect waste.

4.6.1 Waste Generation in Livingstone

The current waste collection unit in Livingstone City Council was established in April 2006. It has three charge hands, two drivers and 20 casual workers (LCC, 2006). Much of the waste in the city is uncollected. The city generates up to 83.3 tons per year of waste and much of this is generated in the low income area (28.3 tons). Table 4.7 gives approximate figures of waste generation. 24 tons of waste is generated by the commercial enterprises sector. Both low and medium density areas generate approximately 5.7 tones and 5.4 tons respectively. The daily generation rate of waste is estimated at 0.45 kg. The highest single waste generation source is the Sun International which generates 8 tons per year, which 15tonnes daily. (LCC;2007)

Table 4.7: Waste Generation in Livingstone

Population	2000	2005	2010	2020
Waste kg/day	102 796	128 102	159 640	247 916
Waste in Ton/year	37 520	46 757	58 268	90 489

4.6.2 Waste Collection

It is clear from the Table 4.7 that there is a problem with refuse and waste disposal. The extent of household at lower than basic service, is a serious threat to public health and the environment. This matter is addressed by a World Bank funded project currently in implementation (V3, 2006). Current services provided by the council are outlined in Table 4.8.

Table 4.8: Refuse Removal Service

	Levels of service	Rural	Urban	Total
Regularly collected	More than basic	103	414	517
Irregularly collected	Basic	49	251	300
Burnt	Below basic	131	989	1,120
Roadside dumping	Below basic	193	4,679	4,872
Burying/Pit	Below basic	356	11,063	11,419
Other	Below basic	166	462	628
Total		**998**	**17,858**	**18,856**

LCC has targeted 105 places in the commercial areas for waste collection, and these are hotels, lodges, shops, malls, bars, restaurants and night clubs. The residential area is only on pilot scale. Waste is collected from the low income and in high density areas such as in

Maramba, Dambwa, Libuyu residential areas is not collected. Illegal dumping of waste occurs in many parts of the municipal area (Box 4.3).

Box 4.3: Description of the existing Solid situation in Town Center and other important areas

The town centre is kept fairly clean with a service being rendered on a daily basis. Each premise is serviced at least once a week.

Due to lack of containers/receptacles, waste is placed at designated areas to be collected by city council. Municipal personnel then load the vehicles by means of shovelling waste on to a canvas sheet and then on to tractor trailer combinations, REls or tipper trucks. Certain areas are not serviced at all and the waste is either dumped in open areas or disposed of in self made pits in the backyards of residents.

The Sun Hotel's waste is collected and disposed of by a private contractor, namely, Enviroserv, at a very well run site. The Airport also has its own arrangement as far as disposal is concerned. The Airport waste is burnet on a regular basis at a designated site on the Airport property.

It is evident from the above that there is lack of receptacles and that only the town centre is serviced by the city council. The City Council is currently addressing the backlog as far as dumping on open spaces in the residential area is concerned. This operation could only recently commence since the City Council received their new vehicles in December 2002 and January 2003.

(V3,2006)

4.6.3 Waste Disposal

The first of the sites is located North-East of the town approximately 500m from the closest residential and commercial buildings. The area was previously used as a barrow pit for the building sand and during visits on area adjacent to the site was also excavated for the same purposes. This site is operated exclusively for the Southern Sun International Hotels. The site is however not considered as a suitable site for long term use because it has very limited space, is earmarked for future extensions of Livingstone and is located in an area with very deep Kalahari sands which has a very high permeability.

LCC does not provide services for Hazardous Wastes nor Health Care Waste (HCW). This means generators of such wastes have to find their own means of disposal. The general hospital has a facility for incinerating HCW.

A second site in operation is the operated by LCC. The site is situated north of the town and the West of the road to Lusaka. Waste is dumped at random over a fairly large area in an uncontrolled manner along a valley line that makes it unacceptable site for a landfill. The site is also very close to a natural water source. Quite a few scavengers are present on the site reclaiming recyclable material from the waste.

As a result of lack of waste collection system, individual land owners and tenants have resorted to developing 'land fill' method and back yard burning. Both of these methods have

serious environmental implications and cause air and ground water pollution and are serious health hazard.

Scavenging is common in many parts of cities. Scavengers collect food, scraps metal and plastic containers which may be sold to the informal sector traders as recyclable packaging materials.

In areas that lack refuse collection such as in the low income areas, residents tend either to dump their garbage at the nearest vacant plot, public space, stream, river, or simply burn or burying it in their back yard (see boxes 3-6). Uncollected waste may accumulate on the streets and clog drains which may eventually cause flooding. If solid wastes are not collected or managed properly, the following are the negative impacts that may result:

- Mosquitoes breed in blocked drains and in rain water if retained in discarded cans, bottles, tyres, and other objectives. Mosquitoes spread disease, including malaria and dengue
- Flies breed in some constituents of solid wastes, and flies are effective vectors that spread diseases such as cholera
- Uncollected waste degrades the urban environment, discouraging efforts to keep streets and open spaces in a clean and attractive condition
- Dangerous items, such as broken glass, razor blades, hyperdermic needles and other healthcare wastes, and chemicals from industries may pose injury or poisoning, particularly to children and people who scavenge through waste
- Waste that is treated or disposed of in unsatisfactory ways can cause severe aesthetic nuisance items of smell and appearance
- Fires on disposal sites can cause major air pollution, causing illness and reducing visibility, making disposal sites dangerously unstable
- Biological and chemical processes which go on in open dumps produce strong leachates, which pollute surface and ground water.

4.7 Responses

Improving existing practices in LCC, requires effective public information on the impact of solid waste on environment and human health. Public education on such issues should create deeper understanding among residents of their responsibility and role in carrying out improving waste management.

ECZ has put in place a comprehensive National Solid Waste Management Strategy (NSWMS) whose main goal is to improve the environmental quality of Zambian environment through the development and implement of an efficient and sustainable waste management system. The strategy makes reference to a number of legal instruments relevant to the waste management:

- Environment Protection and Pollution Control Act (EPPCA) Cap 204 of 1999

- Public Health Act of 1978
- Local Government Act of 1991
- Ionizing Radiation Act of 1975
- Mines and Minerals Act of 1995.

These legal instruments provide the framework through which activities to manage solid waste could be done and complied with. Furthermore, the Ministry of Tourism, MTENR has also put in place a policy on environment in Zambia. Thus, the management of the environment within the municipal area has a well structured legal and policy framework for a successful solid waste management.

LCC established the Solid Waste Management unit in 2006. However, it is small and has severe funding and human limitations to effectively manage waste.

5: BIODIVERSITY, ENERGY AND CLIMATE CHANGE

5.1 BIODIVERSITY

Biodiversity is the totality of genes, species and ecosystems in a region. Biodiversity is defined at several levels:

a) ***Genetic diversity*** – variety of genes within species or genetic variation within a population

b) ***Species diversity*** – which refers to variety of species within a region, through the number of species within a region or species richness

c) ***Ecosystem diversity*** which refers to relative abundance of species, population structures, communities and structure and function of communities over time. Distinct to measure as it is large and boundary demarcations are not clear

d) ***Cultural diversity*** – can also be considered under biodiversity. This calls for human cultures liken to genetic or species diversity, some attributes of human cultures e.g., nomadism, shifting cultivation, rituals and ceremonies (WRI, et al 1992)

The values of biodiversity have been fully described elsewhere (WRI et al 1992; Prescott-Allen and Prescott-Allen 1985; Saumer, R.E, 1995).The values are manifest in genetic and species richness, ecological balance, recreational, commercial and research opportunities, consumption benefits, and provision of non-consumptive benefits such as aesthetic values. In specific terms, values of biodiversity are expressed in the variation of genes; species and ecosystem provide assurance of perpetuation of and quality of life. Thus biodiversity is a major source of variation and important genetic reserves or gene banks for life in the region. Table 5.2 summarizes biodiversity values and items.

The prevailing economy, poverty, land shortage and increasing population, are major factors determining the course of biodiversity decline in the district. The relationship between poverty and environment is characterised as a 'vicious circle'. The poor often rely directly on the environment for their livelihood. At the same time, they are affected by the way others use environmental resources. Major factors on biodiversity degradation include agriculture, settlements, lack of protection of wildlife species, deforestation and fires.

Table 5.1 shows the uses and pressures on biodiversity in the district. Biodiversity is important as a food source as well as for medicinal, timber and poles, fiber and energy. The major threats are overexploitation of natural resources, land clearing, fires, and poaching.

Table 5.1: Uses and Pressures of Biodiversity

Pressure/Use	Explanation and Examples
Food source	Much of the rural population depends on fruits, bush meat, crops, roots and tubers. Mice, small mammals. Demand on the use of such materials has not been assessed.
Medicinal purposes	Both urban and rural populations use wild plants and animals for medicinal purposes. Among animals used for medicines include: Pangolins, Porcupine, Genets, Snakes and lizards. Plant species are used for healing and love portions
Timber and poles	Trees are harvested for construction of houses, carvings or curios and poles for construction of shelters. Most important plant species for timber include *Pterocarpus angolensis, Pericorpsis angolensis, Afzelia quazensis, Khaya nyassica*
Energy - Wood fuel - Charcoal production	A large number of people in Livingstone do not have access to electricity. They use charcoal and firewood for energy
Poaching, bush meat collection	Much of the population in Livingstone is deficient in meat protein. Poaching is important for meat and ivory, horns and hides
Fires	Fires are used for bush clearing for agriculture, hunting, honey collection
Land clearing	Land for settlement, agriculture and tourism development

5.2 Vegetation and Plant Species

Table 5.2 shows tree species most important for timber, wood fuel, honey production and medicinal purposes. Trees are mostly cut for charcoal production and wood fuel. *Phragmites* is mostly used for making baskets, granaries and for shelters.

Table 5.2: Forest Plant Species and their Uses

SPECIES	USES
Afzelia quanzensis	Timber, relish (leaves)
Albizia harveyi	Firewood and medicine and caterpillars
Brachystegia species	Timber medicine and fibre
Burkea Africana	Timber, firewood, medicine
Cassia abbreviata	Firewood, medicine and bee forage
Dalbergia melanoxylon	Curving (curios)
Erythrina abyssinica	non durable, used for drums
Faurea saligna	quite durable and easy to work with ,good honey bee tree
Hexalobus monopetalus	Medicine
Julbenadia paniculata	Firewood, caterpillars, posts and medicine
Julbernadia globiflora	Firewood,
Khaya Nyasica	Timber
Kirkia acuminata	Firewood and medicine
Lannea discolour	soft an light timber, used mainly for mortars, stools and hut poles
Markhamia obtusifolia	timber is heavy and strong, bark used for tying fish traps
Marquis micrograms	hard and durable, excellent for charcoal, used for making bark hives
Monotes africanus	strong and moderately durable, used for tool handle making and joinery timber
Oxtenanthra abbysinica (bamboo)	Baskets and construction work
Parinari curatellifolia	timber is hard and difficult to work, splits easily, making canoes and mortars, fruits and leaves browsed by cattle and game, used for local bee hives
Parinari curetilifolia	Mpundu fruit, timber
Pericopsis angolensis	Firewood, timber and posts
Pseudolachnostylis maprounifolia	moderately heavy, works easily and saw well, used for turnery and for door and window frames, fruit yields a dye, roots used for treatment of diarrhoea
Pterocarpu angolensis	Timber medicine, posts
Strychnos cichloid	Edible fruits
Swartzia madagascariensis	Mortars pounding sticks, termite repellent
Swartzia madagascariensis	hard and heavy, used for turnery, used for making cooking sticks, tool's handles, leaves used for relief of head aches roots for high blood pressure
Syzygium guineese	moderately heavy, used for furniture and building, presence of tree is a sign of abundant underground water for the locals
Terminalia sericea	Timber, firewood, medicine
Uapaca kirkiana	Masuku fruit, timber
Vitex doniana	moderately durable good plank, fruits contains vitamin values

A comprehensive vegetation map for Livingstone district is given in Figure 1.9. Livingstone district has 7 Forest Reserves (Table 5.3), which are Local Forests and cover a total area of about 172,615ha. The forest resources are in abundant and generally in good condition in some places of the district, but have been heavily harvested near the township. People encroaching the reserve are either cultivating or carrying out some illegal mining. The following species are listed as endangered tree species:

- *Pterocapus angoleni*s(mukwa)
- *Erythrophleum africanum*(kayimbi)
- *Guibortia coleosperma* (rosewood)
- *Afzelia quanzesis* (mupapa)

- *Brachystegia spp* (musamba mubombo)
- *Diplorynchus candilicarpan*(mwenge)

Table 5.3: Forest Protected Areas

Name of Forest	Forest No.	Area (Ha)
Katombora Local Forest	P23	4,766
Katombora Ext. L. Forest	P30	4,617
Malanda Local Forest	P20	19,622
Bovu local Forest	P19	26,507
Malavwe Nachitwe	P24	63,455
Martin Tunga L Forest	P37	51,395
Bombwe L. Forest	P25	2,153
Total Area		**172,615**

5.3 Vertebrate and Invertebrate Species

Ansell, (1978) has listed over 200 species of mammals in Zambia, and good number of species occurs in the Livingstone region. Populations of most large mammals have declined due to human pressure and habitat destruction. Outside the fenced area large mammals such as elephant and hippo are present. Elephants come and go across the river from neighboring countries namely Zimbabwe and Botswana. It is speculated that they may use the area as part of a migratory route between Hwange/Chobe and Kafue NP; the (AWF) four corners project have documented evidence to support this.

Inside the Zoological Park, it is easy to see several species in addition to the above including Impala, Wildebeest, Zebra, Warthog, Giraffe, Buffalo and Bushbuck. Giraffe are significant because this is almost the only area in Zambia apart from the Sioma-Ngwezi National Park in the southwest, where they occur. In the Luangwa Valley, only a different subspecies, Thorncroft occurs. Tables 44, 45, and 46 provide details of wildlife in the Game Park.

It is widely accepted that the biomass of grazing species in the Park is too high in relation to the productivity of the habitat due to poor rainfall during the recent past years. This results in seasonal depletion of food resources and so there is need to provide supplementary food during the dry season.

5.3.1 Birds; Livingstone area has a large number of Bird species which also visit much of the Southern Africa. Wetlands birds are most dominant and some species inhabit manmade structures. However human encroachment and disturbances have driven most common birds out of the area.

The checklist for birds for the Victoria Falls area contains 415 species (Pollard, 1989). In MNP the islands and gorges are of special ornithological interest. The islands and riverine swamps, especially Siloka are very important refuges and breeding sites for the birds. They contain species similar to the Okavango Delta in Botswana e.g. coppery tailed coucal, lesser jacana, breeding populations of night herons and Pel's fishing owl.(ZAWA, 2006)

The gorges are especially important for raptors, with 36 recorded species of which 13 breed there and 16 are specially protected (Hartely, 1993). There is concern over the security of the Taita Falcon and black eagle sites in the gorges.

5.3.2 Reptiles and Amphibians: Large reptiles which can easily be seen in the area include Nile Crocodile *(Crocodylus niloticus*), Monitor lizard(*Veranus niloticus*) and *Geochelone* sp

In all, 69 reptiles and 23 amphibians are recorded in the Park. There are 5 critical species for reptile species and these include the Leopard Tortise (*Geochelone pardalis*), Nile crocodile (*Crocodylus niloticus*), Nile/Water Monitor (*Varanus niloticus*), Rock/White-throated Monitor (*Varanus albigularis*) and African Python (*Python sebae*). Obviously the most prominent reptile is the Nile crocodile, which occurs above the Falls and in the gorges. The swampy areas on islands and in the Zoological Park are important refuge for the latter.

Table 5.4: Common Large Mammal Species Occurring in Livingstone District and the surrounding region

Scientific Name	Common Name
Aanyx capensis	Clawless Otter
Aepyceros melampus	Impala
Alcelaphus muselaphus	Hartebeest
Canis adustus	Side Striped Jackal
Canis mesomelas	Black Backed Jackal
Cecopithecus aethiops	Monkeys, Vervet
Civettictis civetta	Civet
Connochaetus taurinus	Wildebeest
Crocuta crocuta	Spotted Hyena
Equus burchelli	Zebra
Felis serval	Serval Cat
Galaso senagalensis	Bush Baby
Genetta genetta	Small Spotted Genet
Hippopotamus amphibious	Hippopotamus
Hippotragus equines	Roan Antelope
Hippotragus niger	Sable Antelope
Hystrix africaeaustrralis	Porcupine
Kobus ellipsiprymnus	Water Buck
Kobus vardoni	Puku
Lepus capensis	Hare
Loxodonta African	African Elephant
Lycaon pictus	Wild Dog
Mannis temminckii	Pangolin
Melirora capensis	Honey Badger
Mungos sp.	Mongoose
Orycteropus ater	Aardvark
Ourebia ourebi	Oribi
Panthera leo	Lion
Panthera pardus	Leopard
Papio ursinus	Baboon
Potamochoerus porcus	Bush Pig
Phacochoerus aethiopicus	Warthog
Philantomba monticola	Blue Duiker
Redunca arundinum	Reed Buck
Silvicapra grimmia	Common Duiker
Syncerus catter	Buffalo
Tragelaphus scriptus	Bush Buck
Tragelaphus spekei	Siatunga
Tragelaphus strepsiceros	Kudu

Ansell, 1978; ZAWA, 2006;

Table 5.5: Status of wildlife species in MNP

Scientific name	Local name	Status
Loxodonta Africana	Elephant	Migratory
Syncerus caffer	Buffalo	Confined to the zoo
Equus burchelii	Zebra	Confined to the zoo
Crocuta crocuta	Hyena	Extinct
Diceros bicornis	Rhino	Extinct
Panthera leo	Lion	Extinct
Tragelaphus oryx	Eland	Confined to the zoo
Hippopotamus amphibious	Hippo	Present
Panthera pardus	Leopard	Extinct
Gifaffa camelopardalis	Giraffe	Confined to the zoo
Tragelaphus strepsiceros	Kudu	Confined to the zoo
Connochaetes taurinus	Wilde beast	Confined to the zoo
Aepyceros melampus	Impala	Confined to the zoo
Phacochoenis aethiopicus	Warthog	Confined to the zoo

Table 5.6: Trends in Wildlife Numbers

Species	Chabwela 1975-1977	NCC 1987	IUCN, 1996	EDF/NPWS, 1997	Warden 1997	Warden 2005	Hopeson I Simwanza 2006
Elephant			30-84	9			63
Buffalo	19	19	50-80	66	150	+/-200	265
Giraffe	21	21	50	10	70	+50	64
Zebra	124	124	40	41	200	6	8
Wildebeest	213	213	22	14	50	4	4
Impala	982	982		67	800	+1000	1031
Kudu	14	14			5	+5	22
Warthog	82	82		9	50	+50	22
Eland	8	8					
Bushpig	8	8					
Sable	7	7		1	2		
Waterbuck	7	7			20	+50	39
White Rhino	3	1		4	5	2	2
Baboon						+1000	213
Vervet monkey						+200	79
Common duiker						+10	25
Bushbuck							
Hare							2
Bushbuck							12
Hippo							11

ZAWA, 2006

5.4 Invertebrates

A total of 908 invertebrates species have been recorded as occurring in the Park and the surrounding areas (Chidumayo et al 2003). These species belong to six phyla with the majority belonging to the Phylum Arthropoda and Class Insecta (782 species or 86.12per cent of recorded invertebrates occurring in the National Park). Twenty one species belonging to Mollusca (snails and slugs) and Anthropoda (crabs, scorpions, spiders, ticks, mites, millipedes, centipedes and insects) were identified as having critical functions in ecosystems and in human and animal health. In addition there are several other species of miombo weevils, longhorn beetles, butterflies, moths and honeybees.

5.5 Fisheries

Fish populations above and below the Falls are distinctly different, with only about 30 species common to both. 84 *spp* are known from the upper Zambezi system and 64 in the middle Zambezi/Kariba region. Many fish species that are potentially present in the district (Table 5.7) are economically important either as subsistence fishery resources or as tourism subjects. Among those in MNP, *Hydrocynus vittatus, Hepsetus odoe, Serranochromus angusticeps, Serranochromis robustus, Tilapia rendalli* and *Oreochromis andersonii* are valuable angling species. *Barbus spp* and their relatives are valuable aquarium and/or pond species. Little information is available specific to MNP, but there is concern over illegal fishing with nets. Angling is permitted at a fee.

Table 5.7: Common Scientific and Family names of Fish Species found in Capture fisheries Livingstone District, mainly from the Zambezi River

Scientific name	Common Name	Family name
Alestes lateralis	Strip Tail Robber	*Characidae*
Auchnoglanis ngamensis	Grunter	*Bagridae*
Barbus annecens		
Barbus brevipinnis		
Barbus multilineatus	Many Stripped Barbel	*Cyprinidae*
Barbus poechii		
Claria stappersii		
Clarias ngamensis	Blunt Toothed Barbel	*Claridae*
Clarias theodorae		
Gnathonemus macropidotis	Bull Dog	*Mrmyridae*
Haplochromis philander	Dwaft Bream	*Cichlidae*
Marcensiseinos macrolepidotus		
Marcusenius castelnaui	Stone Basher	*Mormyridae*
Mastacembalus mellandi	Spiny Eel	*Mastacembelidae*
Nannocharax multifaciatus	Many Banded Citharinid	*citharinidae*
Oreochnomis undersonii		
Oreochromis macrochir		
Pseudocreinlabrus species:		
Pseudocrenilabrus philander		
Schilbe mystus	Silver Barbel	*Schitbeidae*
Serranochromis Macrocephalus		
Serranochromis robustus		
Serranochromis thumbergi		
Synodontis nigromaculatus	Spotted Squeaker	*Mochokidae*
Tilapia rendalii		
Tilapia uparrmaini		

5.6 Threats to Biodiversity

The major threat to these species in the Park and surrounding areas are poaching, habitat degradation, diseases and road accidents especially in mammals. Poaching is a persistence problem in the area. The proximity of the park to an urban area and the current high unemployment rate might be the causes of this scourge. It has led to the decline of many species which once thrived as free ranging populations in the area. Some wildlife species in the Park are threatened by genetic dilution through inbreeding caused by small population sizes and low genetic diversity. Translocation of animal species from elsewhere to the Park is viewed as a strategy for reversing this loss of genetic diversity.

Fire in general is used as a traditional tool, in converting forests to woodlands and grasslands as well as changing the landscape, but of most critical has been the use of fires against protected vegetation which has led to unprecedented ecological and environmental problems. Although fires are extensively used in the district, their impact has never been assessed.

Whereas fires may be significant in the maintenance of eco-systems such as climax ecosystem, the effects of fires can be very excessive. Bush fires are recommended for cool months of May to July but frequent fires are late and subsequently very hot fires. These are destructive on soil macro organisms, reptiles, and breeding birds and expose land to erosion and to poor hydrological function such as reduction in interception and infiltration of water in the soil. They contribute considerably to smoke plums as they send a large amount of atmospheric pollutants including CO2, CO, NOx, N2O and CH4, non methane, hydrocarbons and aerosols (Goldammer, 1997).

While CO2 is known to be dominant in the emissions to bush fires, many products of incomplete combustion are mobilised in the atmosphere and cause serious pollution. The intervention measures and policy direction should therefore focus on promoting early burning and public education. The district should engage in bush fire management, bush fire reduction and prescribed fire systems.

Furthermore, most large vertebrate species are not able to find sufficient protection areas for feeding and breeding. Agriculture and settlements have reduced animal habitats such that only species capable of inhabiting disturbed environments can survive.

5.8 ENERGY

Energy is one of the most important driving forces behind development of the economy. It cuts across most economic and social activities. Energy is important for industries, agriculture and domestic use. The main forms of energy in Livingstone district are:

- **Biomass** (charcoal and wood fuel). In Southern Province, over 80per cent of households use fire wood and charcoal for heating. (CSO, 2000).
- **Electricity**. This is transmitted from the Victoria Falls Hydropower Station.
- **Petroleum products**. The major source of petroleum products is INDENI in Ndola. These are supplied to the four service stations in Livingstone.
- **Solar power**. While the use of this is limited, but it is very important in remote areas.

It is widely accepted that population growth has a direct impact on energy by increasing demand. Access to the adequate energy services can increase life expectancy and reduce child mortality; however acceleration of demographic formation in this case would depend on a number of development tasks including improving environment and really reducing poverty. These are directly linked to availability of energy services.

Firewood is the dominant fuel. However, at high incomes, commercial fuel and electricity replace biomass energy. Accessibility to good and less expensive energy sources is largely limited. Both population and economic growths are greatly significant in energy consumption. Growth in the economic growth, more industries will be established and thus commercial businesses are developed which will result in increasing energy consumption.

The growing population through migrations and urbanization will cause a rise in the demand for domestic electricity supply and biomass fuel supply. According to data from ZESCO, there are at least eight sources of energy in the area (Table 5.8)

Table 5.8: **Source of Energy for Lighting**

	Levels of service	**Rural**	**Urban**	**Total**
Electricity	Basic	128	9331	9459
Gas	Basic	3	19	22
Wood	Below basic	17	145	162
Candle	Below basic	90	3139	3229
Paraffin	Below basic	738	5165	5903
Solar	More than basic	5	14	19
Other	Below basic	17	45	62
TOTAL		**998**	**17858**	**18856**

ZESCO is the bulk electricity supplier and distributor for the area. The primary source of power is the Victoria Falls Hydro Power Station. From the power station, electricity is transmitted at 33Kv to Linda intake substation, located to the south of Livingstone (Table 80) At Linda, the voltage is stepped down to 11 kV and transmitted to 156 pole mounted and indoor substations distributed throughout the town. ZESCO is responsible for the distribution of electricity to various sub-stations in the grater Livingstone area, at 33 kV and 11 kV. where energy sources can be utilized most economically and meeting the needs of consumers at 400/230Votts. Limited supply is also provided to neigbouring countries for local use, as and

when available. The services provided to the city are summarised in Table 5.10. The single source of supply for the Livingstone area is shown in 5.9:

Table 5.9: Sources of Supply

Power Station Name	Classification	System Voltage	Installed Firm Generation Capacity
Victoria Falls Power Station	Main Generation Station	33kV	Station A 2 x 1 MW 3.3 kV 2 x 3 MW 3.3 Kv Station B 6 x 10MW 11 Kv Station C 4 x 10MW 11 kV

Table 5.10: **Levels of Services for Electricity**

	Rural	per cent	Urban	per cent	Total	per cent
More than basic	133	13.3per cent	9345	52.3per cent	9478	50.3per cent
Basic		0.0per cent		0.0per cent	0	0.0per cent
Below Basic	865	85.7per cent	8513	47.7per cent	9378	49.7per cent
Total	998	100per cent	17858	100per cent	18856	100.0per cent

The environmental impacts of energy use have been widely discussed and biomass harvesting has contributed to the deforestation of many areas. Whereas energy's potential for enhancing human well being is unquestionable, conventional energy production and consumption are closely linked to environmental degradation that threatens human health and quality of life and affects ecosystems balances and biodiversity.

Combustion conditions in small cooking fires and stoves may emit significant amount of unburned hydrocarbons, which may enter into atmosphere, thereby to be part of greenhouse gases which have become a world problem.

Fossil fuel (petroleum products) combustion is problematic in several ways. While data are not available in this area, elsewhere the main pollutants emitted in the combustion of these fuels are sulphur and nitrogen oxides, carbon dioxide and suspended particulate matter. The combustion of petroleum products has been responsible for some of the air pollution.

5.9 Responses

The country has put in place an Energy Policy which focuses on energy regulation, supply and development. The EPPCA regulates all development projects though EIAs.

The Energy Regulation Board (ERB) which imposes standards on how electricity is distributed, and regulates prices on all petroleum products. It assists in the regulation of energy on the environment. This is possible through monitoring tariffs which would reduce domestic and industrial use.

The main recommendations in LCC energy development is on several main areas:

(a) Making energy accessible to poor people in urban areas. Households should be supplied with electricity for such uses as lighting to reduce reliance on biomass energy.
(b) Implement the Rural Electrification Programme to improve access to electricity.
(c) Promote research in technologies for efficient energy use. Technologies should be developed which will reduce current poor methods of energy use by making improvements in energy conservation and renewable energy.
(d) Promote research and monitoring in energy consumption and development.
(e) Expand the energy transmission and distribution network and improve supply to the rural areas of potential development. In response to the growing commercial sector, expansion of the transmission capacity should be taken as a priority area of the district.

5.10 CLIMATE CHANGE

Climate change refers to the variation in the earth's global climate or in the regional climates overtime. These changes may come from processes internal to the earth, be driven by external forces (variations in sunlight intensity), and human activities. Our contribution to climate change appears in a form of land use, and the largest impact is likely to be a result of deforestation through agriculture, fires and other land uses. Studies providing linkages between land use and climate change are generally limited.

Anthropogenic activities in Livingstone of great concern include biomass harvesting, agriculture, bush fires and fossil fuel emissions. The main pressures come from our desires to convert natural resources into use and eventually change land cover. Pressure is also coming from the transport sector which supports industries and agriculture. Lack of cultural change in setting bush fires is also a source of pressure on climate, as fires are a source of carbon dioxide and other particulate matter that would enter the atmosphere.

5.10.1 Climatic trends

The most obvious impact indicators were considered to be low crop yield, crop failure, increased relief food, unpredictable rainfall. Climate is measured through weather instruments on rainfall, temperature, humidity, pressure and other values. Climate change can not easily be detected at local scale, and what are usually reflected are the local variations. Figures 34, 35, 36, 37, and 38 on weather measurements are given below; and these measurements are merely an indication of the dynamics of local and regional climate.

From these values, we can easily conclude how variable our weather can be both at monthly or annual levels. Monthly trends can easily be printed out; however variations among years do not show a specific pattern. Drought and floods occur at a much greater interval and their occurrence cannot be easily predicted.

Figures 5.1, 5.2, 5.3, 5.4 and 5.5 shows the month and year in which that event occurred for that month.

(a) Temperature Variation Trends

Figure 5.1: Highest daily maximum temperature pattern

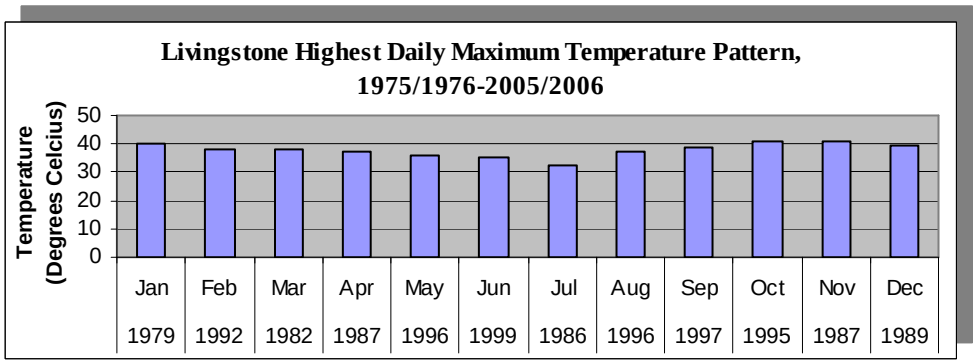
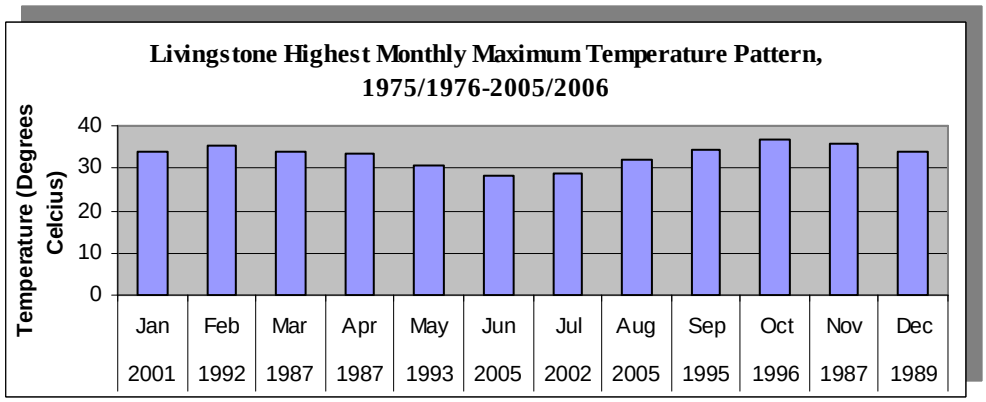
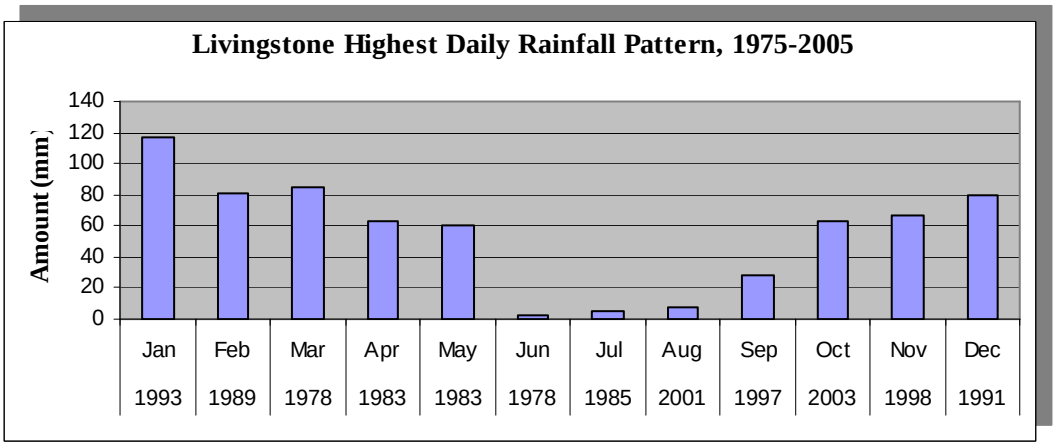


Figure 5.2: Highest monthly maximum temperature pattern



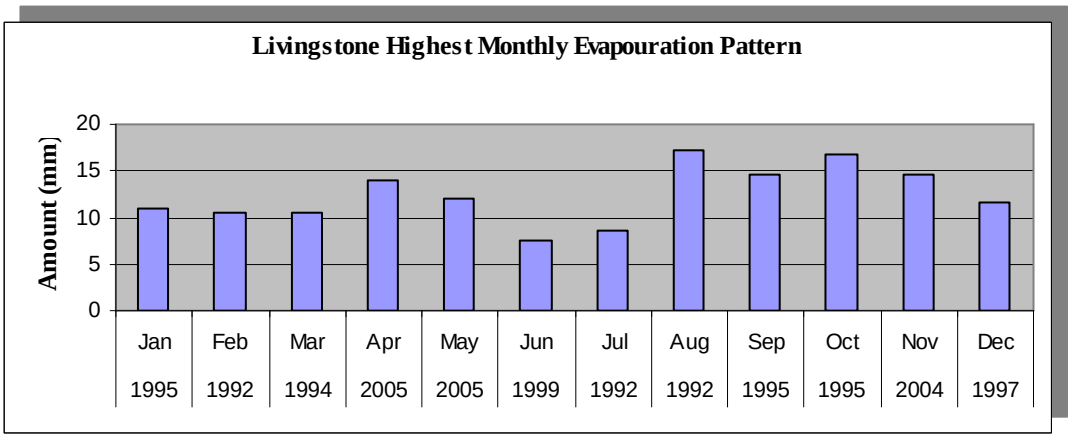
(b) Rainfall variation trends

Figure 5.3: Highest monthly rainfall pattern and year of occurrence of highest monthly rainfall (mm)



(c) Evaporation variation trends

Figure 5.4: Highest monthly evaporation pattern and year of occurrence of highest



monthly evaporation rate

(d) Relative Humidity variation trends

Figure 5.5: Highest monthly relative humidity and year of occurrence of highest monthly Relative

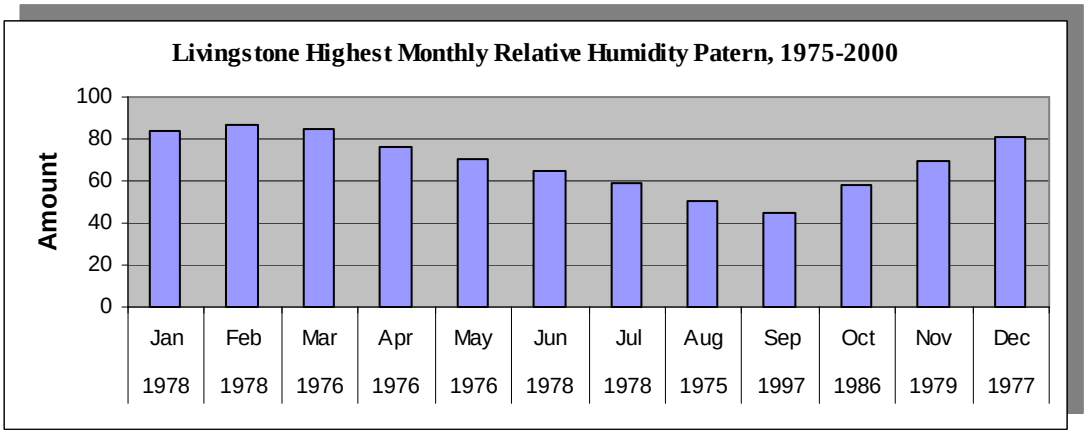


Figure 5.2 reveals the highest maximum temperatures occurring within each month. In this case, in the month of October, maximum temperature occurred in 1996 at 36.6^0C between 1975 and 2006. The lowest monthly maximum temperature in the month of October occurred in 1978 during the period in 1975 to 2006. When we examine temperatures, rainfall, evaporation and Relative Humidity, we see no specific pattern or trends. Clearly, climatic pattern is that of erratic nature and unpredictable. That means we cannot make conclusions on which way the climate was going.

Climate change is likely to impact more on poor nations like us and more especially in this region. Increased intensity of droughts, floods and changes to growing seasons may have significant implications for soil productivity, water supply, food security and human welfare and poverty as well as biological diversity. Furthermore, climate change has direct impact on developments through changes in precipitation, evaporation and hydrology.

An assessment report of the Intergovernmental Panel on Climate Change (IPCC) highlighted a number of impacts of climate change (Desanker, 2003). Poor nations like Zambia are more vulnerable to climate change. Specifically, climate change will be felt in the following areas:

5.10.2 Biodiversity: Most communities in the district have high dependence on natural capital (Forests, soils, water, and wildlife) for livelihood. Climate change has already an impact on ecosystems such as wetlands because of changes in hydrology. Drought will have a serious impact on domestic and wild plants in the district. A loss of plant diversity through plant death will decline in plant species composition and ultimately result in limited number of browsing and grazing species. However, limited studies have been carried out on the impact of climate change on biodiversity, but the potential is high.

Migrations of both birds and large mammals could be significantly affected by drought. Migrations involve regular movement between dry and wet season, and wet season, grazing areas, and species following such pattern are very sensitive to climate change. However, on the absence of data, the impact of climate change on the ecosystems remains largely unknown.

5.10.3 Agriculture: Livingstone district depends on rainfed agriculture. As a result, much of the district is vulnerable to changes in climate variability, seasonal shifts, and precipitation patterns. Zambia is already a food deficit country and the risk of crop failure is very high. Similarly, increased droughts could seriously impact the availability of food. Crop production and livestock husbandry account for about half of household income. Most communities in this country are poor and it is these communities that are most dependent on agriculture for employment and income.

5.10.4 Water supply: the district has a high proportion of population that has no access to safe water. Sanitation and water supply are also inadequate and water supply. The fact that so many rely on shallow wells and boreholes, and that so many have subsistence livelihoods means that prolonged drought would represent a serious climate related hazard for the area.

6: SCENARIOS AND OPTIONS FOR ACTION

Forward looking policy studies and scenario analysis help us to consider where different policy options could lead us. Scenarios are an outline of a natural or an expected course of events. Scenarios are an internal consistent view of what the future might turn out to be, but one possible outcome. As defined by Chenje and Johnson (1994), a scenario is an imagined sequence of future events based on current trends and selected variables. To manage a scenario, a judgement must be made whether or not the overall effect on a particular variable is positive, negative or neutral, considering the effects of all the components together (Chenje and Johnson, 1994).

In this report, scenarios were identified, and in doing so, we had to answer a number of questions:

i. What is happening now that might affect the environment in the long-term in Livingstone district?
ii. What are we doing to monitor the status and urgency of the issue?
iii. What are we neglecting that could turn the issue into a crisis?

6.1 APPROACHES TO CONSTRUCTING SCENARIOS

The working groups studied the trends of environmental issues, and each group had to select the most important variable on which a scenario would be constructed. The groups used two main scenarios of the selected variable:

i) Baseline scenarios or business as usual: this was considered to establish a benchmark or a non-intervention scenario. Baseline scenarios present the future state of the environment in which environmental policies either do not exist or do not have discernable influence on the environment. The current trends and outcomes and existing policies provide a reference for new policy interventions.
ii) Policy scenarios are used to move from the baseline to a prescribed goal. These scenarios in the environmental analysis depict the future effects of the environmental protection policies such as a pollution control policy, and/or mitigation or intervention measures. Policy scenarios assume several features by identifying policies that attain specific environmental goals and examining the economic and environmental impacts of specific environmental policies.

Socio Economics

The population composition shows that there are more females than males. In addition, there are more young people under the age of 14 years than those over 50years. The indication is that life expectancy has been increasing and by 2015, there will be more elderly people living

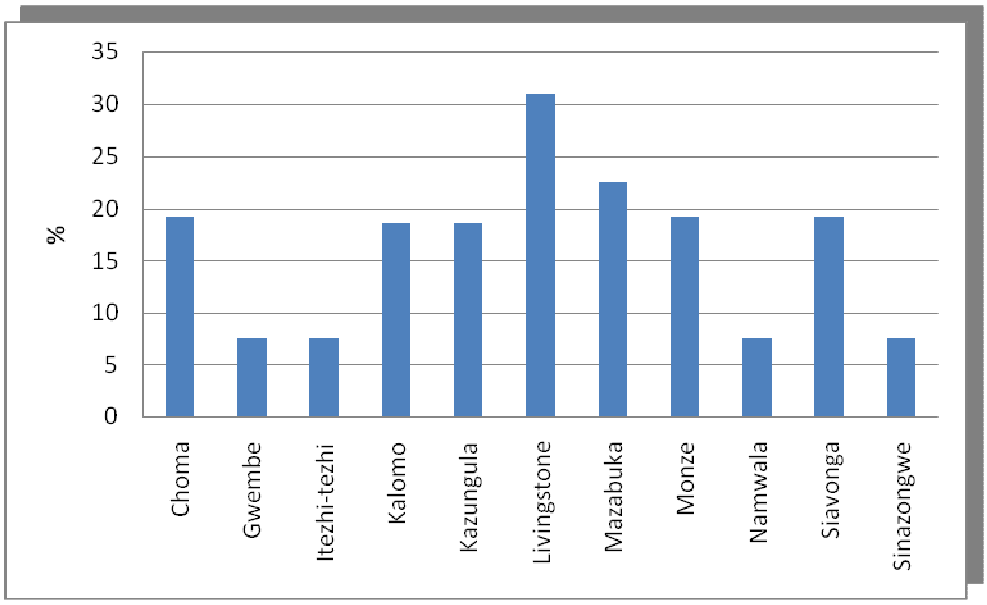
in the population than the proportions indicate at present. An expanding population will demand more basic facilities such as education, health, water supply as well as improved food security. More energy will be required to sustain the growing population and other economic activities.

The population growth rate for the district was 2.1 per cent representing 203 792 in 2000. However, at the current growth rate, the population in the district should double by 2017 and reach 407,584. Rural population is likely to remain high despite increasing urbanisation in Livingstone. According to these figures, Livingstone will require twice as many resources for the population as well as for social services such as health, education, food security, water supply and sanitation, land and accommodation by 2017.

The emerging economic issues likely to cause rapid population are industrial development and economic opportunities such as continued growth of the agriculture and tourism sectors. The expansion of agriculture to meet the demand will lead further to deforestation and land degradation. Further, population density is likely to increase as his is based on availability of arable land.

The MDGs and FNDP have set a national target to reduce poverty from 70per cent to 60 per cent. The implication is that a reduction in poverty would lead to improvement in environmental management through a decline in deforestation and sustainable development of the tourism sector. However, the current poverty levels may not significantly change in the next ten years if appropriate policies to alleviate poverty are not implemented.

HIV/AIDS prevalence in Southern province has been reducing. Figure 6.1 shows HIV prevalence in the province in 2005. Livingstone district recorded the highest HIV prevalence at 30.9per cent. This can be attributed to the economic activities in the district among them tourism and trade. In addition, the status of Livingstone as a border town, tourist destination as well as key administrative centre for the province increases the number of people transiting through the district.



Figures 6.1: HIV prevalence in 2005 by Province, UNDP;2007.

HIV/AIDS prevalence for Livingstone district declined from 32.3per cent in 1994 to 30.5per cent in 2005 as shown in Figure 6.2.

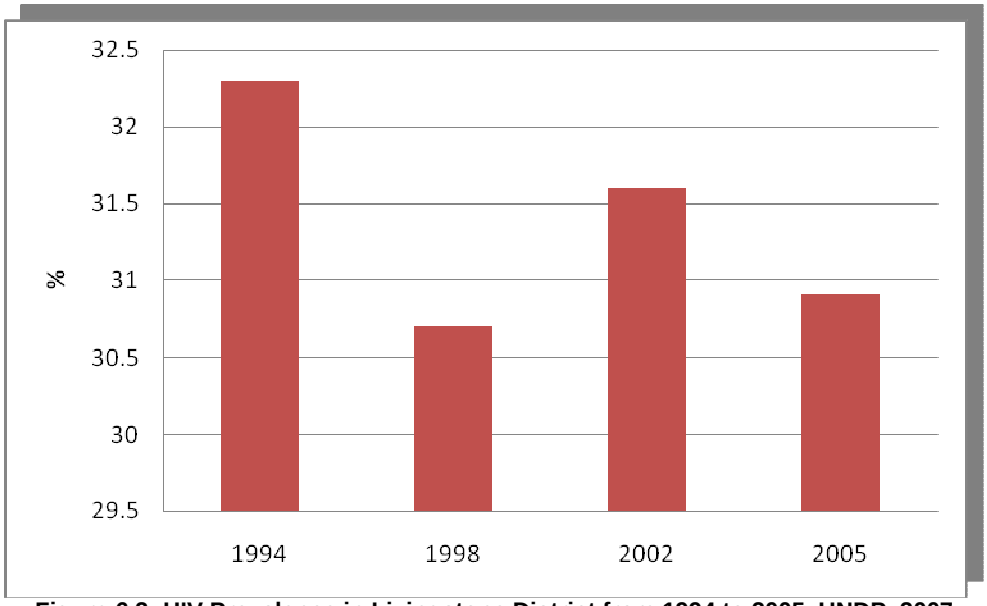


Figure 6.2: HIV Prevalence in Livingstone District from 1994 to 2005, UNDP, 2007

The decline could be attributed to the increased HIV/AIDS programmes in the district by various players including Government and civil society. Sensitization and other supportive activities such as provision Voluntary Counselling and Testing (VCT) should continue being undertaken. However, the HIV/AIDS epidemic has negatively impacted on the social and

economic spheres of the district. It affects the population composition, growth rate and mortality rate among others. Furthermore, HIV/AIDS contributes to the loss of productivity in the economic sectors through disruption, loss of time and human resource.

However, there is need to strengthen implementation of HIV/AIDS awareness and other supportive activities in order to reduce the prevalence rate. This is key in attaining the MDG and other national targets of reducing HIV/AIDS prevalence by 2015.

Land and Agriculture

The current land use system in the district has greatly changed, with more land cover on settlements. Other land uses remain undefined in the district. Land is expected to remain in short supply particularly in the municipal area and along the Zambezi River. The land for the expansion of Livingstone is likely to remain limited. Land distribution for housing, industrial development, cemeteries, government buildings, churches, roads, railways, etc. may severely decline in the next 10 to 15 years. Agricultural land per individual will be reduced and land pressure is likely to affect neighbouring districts like Kazungula.

Land degradation, deforestation and wildlife species decline are likely to worsen. Government forest protected areas are likely to be severely encroached and a number of forest areas may be degazzetted to allow for human settlements. Expansion in tourism, charcoal production and wood fuel production will increase thereby depleting plant and animal species in the area.

Livingstone district is an agriculture district and this is reflected in the numbers of those who are employed under the sector, and the growth in the number of farmers in the district. However, these numbers do not represent complete commitment of farmers as there is a great deficit in these numbers since some farmers may have shifted to other crops. The impact of agriculture on environment occurs through deforestation, soil erosion and chemical pollution. The use of pesticides and herbicides may increase as more land is cleared for farming. Livingstone imports food from other districts to meet the demand of the expanding population. Although food production may increase, per capita food production and food security may drastically decline, and the district will continue to import food.

Surface water is the main source of water for domestic and livestock consumption. Rapid population growth, urbanisation, and limited infrastructure will reduce accessibility to water particularly in the rural areas. Access to clean and safe water will continue to be limited due to lack of adequate infrastructure. While the kiosk system may expand, this will not be adequate for the rapid growing population and urbanisation. The peri-urban areas such as Sakubita, Namatama Extension, Mwandi and Nakatindi may have piped water, but the proportion of people having access to safe and clean water is likely to decline. The current initiative to

improve water supply in rural areas through wells and boreholes should be therefore be strengthened.

Water and Sanitation

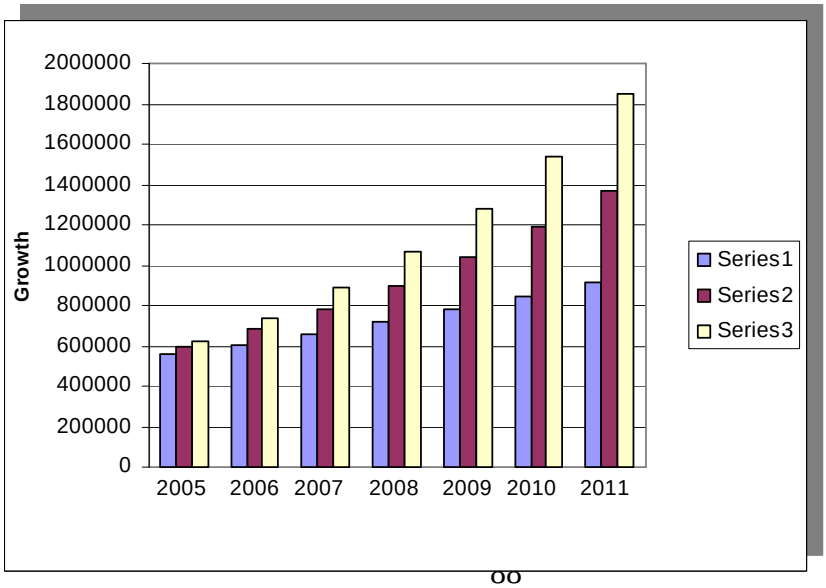
Sanitation and solid waste management will remain challenges for the district. The use of pit latrines and bush for sanitation may remain the general trend in both rural and peri-urban areas. With the increasing population, urbanisation and limited access to running water, the sanitation situation is likely to worsen. Current trends in solid waste management indicate limited capacity to collect and dispose waste. Solid waste generation will increase with the increase in economic activities in the district. The generation of waste in trading areas will also increase and domestic waste will equally raise problems as home made landfill system is likely to remain an option for the households.

In terms of energy provision, over 80per cent of the population has no access to electricity. The Rural Electrification Programme is expected to increase access to electricity in the district. However, should electricity continue to be severely limited, it will bring implications in deforestation, as already charcoal production and wood fuel collection have become a major cause of deforestation in the district.

Tourism

Tourism in Zambia is expected to increase from 559,290 in 2005 to 917 523 in 2011. However, as Figure 6.3 indicates, projections at 15per cent and 20per cent will show visitor arrivals of nearly 2million. Since Livingstone is the main tourist destination in Zambia, it is assumed that over 50per cent of the tourists will visit the Victoria Falls. The increase will therefore cause considerable pressure on the environment, infrastructure and social. This scenario is likely to occur especially with the hosting of the World Cup by in South Africa in 2010.

Figure 6.3: Projected Visitor arrivals in Zambia



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The current climate pattern in the district remains undefined. Annual events follow monthly distribution of temperatures, rainfall, evaporation and relative humidity and the patterns are predictable. However, variations overtime are uncertain. Drought and floods are likely to be common events in the district, and most vulnerable people are those distributed in marginal lands away from social services. Rural communities are expected to be mostly affected by natural events of drought and floods. Drought and floods significantly affect livestock and agriculture, as crop failure is likely to be common.

7.1 POLICY OPTIONS

Policy changes are driven by a complex set of conditions and these depend on local, political, and social economic conditions. Zambia has no population policy as yet and the policies listed in Table 7.1 show the effort the country has put in place to conserve the environment and natural resources. Policy changes depend on the following conditions;

- The strength of the political administrative structure
- Involvement commitment to economic development
- Government commitment to population management

Good governance, strong administrative system will result in strong policies and a good economic system which will foster economic development, planning and implementation.

One example of policy impact in conservation was the Structural Adjustment Program (SAP) which was demonstrated by Reed (1996) in a case study for Zambia. These economic reforms led to the decline of the elephant population and extinction of the rhino species. Elephant and rhino populations were hunted for trophies (Ivory). The study also showed excessive deforestation and decline of water supply.

Chabwela and Wanga (1998) provided an analysis of the Water Policy of the Kafue flats environment. The study showed the policy implications of serious decline in wildlife species, limited grazing land and possible water shortages as well as hydropower generation, domestic and industrial use.

Policies are important in involving indicators to designed goals but this is only possible if political commitment and governance are fully established and that economic transition is in place. Livingstone district should consider these factors in managing population and the environment in the district. The discussion in policy assessment in this report provides policy recommendations which the district should consider for sustainable development of the district

The policies as outlined in Table 7.1 will form the policies for Livingstone SoE Outlook report. These will provide baseline and the standard on monitoring of the policies which will be compared against the desired future conditions, goals and objectives.

Table 7.1: Existing Government Policies significant to the Environment

Policy	Year	Institution	Relevance to Environment
National Agriculture Policy	2003	Ministry of Agriculture and Cooperatives	Direct relevance, but needs harmonization
National Forestry Policy	1998	Ministry of Tourism, Environment and Natural Resources	Direct relevance
Policy for National Parks and Wildlife in Zambia	1998	Ministry of Tourism, Environment and Natural Resources	Direct relevance
National Water Policy	1993	Ministry of Energy and Water Development	Direct relevance, but needs strengthening
The National Decentralization Policy "Towards empowering people"	2004	Ministry of Local Government	Important through governance, but needs harmonization
Natural Energy Policy	1994	Ministry of Energy and Water Development	Direct relevance, but needs harmonization
Industrial Commercial and Trade	1994	Ministry of Commerce, Trade and Industry	Important through governance, but needs harmonization
Ministry of Legal Affairs Policy Document	1997	Ministry of Legal Affairs	Important through governance, but needs harmonization
National HIV/AIDS STI / TB Policy	2002	Ministry of Health	Direct relevance, but needs strengthening
Tourism Policy	-	Ministry of Tourism, Environment and Natural Resources	Direct relevance, but needs harmonization
National Wetlands Policy	1998	Ministry of Tourism, Environment and Natural Resources	Direct relevance, but needs harmonization

7.1.1 Governance and policies

Although the Decentralisation Policy is being implemented, more work needs to be done in strengthening the role of local authorities in environmental management. The environment sub-committee in the DDCC provides guidance but implementation is difficult due to limited resources.

Policy options from the issues discussed in the thematic and scenarios chapters of the Livingstone SoE Outlook report have been discussed. The options demand stakeholder participation in the development of the district. These include government ministries and departments, private sector, civil society, academic and research institutions as well as communities.

Mainstreaming District Environmental Management

Environmental management in the district should involve various stakeholders, in particular, traditional rulers, private sector, government institutions, civil society and local communities. The top-down approach is no longer favourable in management of systems. Issues on solid waste management, deforestation, sanitation and water use require community participation and involvement. The following are the policy options by theme:

Socio Economics

The following are the major socio economic issues affecting Livingstone district; access to basic services such as, health, education and clean and safe water. Others are poverty, and population growth, employment and food security. Policy requirements include the following:

a. Implementation of deliberate measures in all sectors to mainstream gender and ensure equal participation of males and females.
b. Youth empowerment programmes should be introduced and implemented to address the concerns of the growing youthful population.
c. Programmes aimed at addressing HIV/AIDS and gender equality should be strengthened.
d. Population policy should regulate settlements, migrations and exploitations of resources in the district.
e. Development of the social services such as housing, education and health sectors to cope with the increasing population should be embarked on. This can be achieved by providing incentives for the private sector to invest in these services.
f. Implementation of the Decentralisation Policy so as to mainstream environmental management of the district to among other interventions, strengthening district and city specific data collection and reporting mechanisms to ensure activities at the said levels are measured against defined targets.

Land and Agriculture

The main policy issues to be addressed are the following:

a) Strengthening the regulatory mechanisms for implementing urban development and environmental policy such as the Town and Country Planning Act, Public Health Act, Land Act, Environmental Protection and Pollution Control Act and all relevant acts related to provision of utility services.
b) Sourcing of suitable land from neighbouring districts, Kazungula and Kalomo to facilitate further development of Livingstone district.
c) Building capacity for the agricultural extension workers to work with farmers in conservation farming.
d) Controlling and limiting all cultivation on water catchment areas and along river banks.

e) Introducing and managing cash crop growing such as tobacco and cotton and avoid pollution and deforestation.
f) Increasing public awareness campaigns in environmental protection.

Water and Sanitation

Important policy direction should focus on the following measures:

a) Create future reservoir for regulation of water for both power generation and Victoria Falls.
b) Develop a legal framework to introduce measures in controlling poor sanitary conditions of the urban and peri-urban areas.
c) Develop a modern landfill to improve waste management in the district.
d) Conduct water resources inventories in the district.
e) Improve institutional capacity of LCC to effectively manage waste in the district by increasing support to the Waste Management Unit.
f) Protect all catchments areas in the district from adverse land use practices that lead to deforestation, soil erosion and siltation.
g) Introduce community participation in management and water resources conservation.
h) Develop infrastructure and expand water supply to respond to the growing demand for clean and safe water
i) Support investment programs that aim at increasing access to adequate sanitation to the urban and peri urban population.
j) Introduce public participation in solid waste management and implement regulatory measures to control waste generation, collection and disposal.

Biodiversity, Energy and Climate Change

Policy direction on issues affecting Livingstone District in Biodiversity energy and climate change should focus on the following:

Biodiversity

a) Promote natural resource management in order to sustain the growing tourism industry in the district.
b) Carry out an inventory of forest protected areas to determine available resources and diversity.
c) Build capacity for the Forestry Department and LCC to manage protected areas and reduce the current destruction of forests in the district.
d) Review degazetting of protected areas for settlement with caution as most protected areas were established to protect water resources and further reduce decline in forest cover. In addition, there is need to promote afforestation in rural and urban areas.
e) Promote Joint Forest Management system which will enable participation of stakeholders in the district including traditional leaders.

Energy

a) Strengthen implementation of the Rural Electrification Programme (REA) in the district so as to increase access to electricity.
b) Develop methods for efficient energy use such as promotion of a more efficient stove or brazier that could use wood or charcoal efficiently.
c) Promote the use of alternative fuels such as bio-diesel and ethanol as part of government policy which has phased out unleaded fuel.
d) Provide incentives for the private sector to invest in the development of energy sector in the district.
e) Create awareness in energy conservation and encourage community involvement in planning and conservation of energy.

Climate Change

The future scenario for the district is that the current unpredictable climate may continue to cause problems mainly in the areas of water supply and food security. Policy intervention in climate change should continue to focus on seed improvement particularly to shorten the maturity period and promote drought resistant crops.

Research and Monitoring

Environmental planning, research and monitoring in the district are essential for sustainable development and this report should provide the basis for doing so. In preparing this report, data has been difficult to collect as much of it remains in various sectors of Government and private sector. In some cases, data was not available at district level to allow for trend analysis. Future SoE outlook reports should therefore, be organised along improved information management systems in order to provide appropriate environmental information to support decision making in the district. Indicators identified in this report require tracking for the purpose of establishing performance and awareness within the district in all sectors directly and indirectly affecting people in the district.

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