ZAMBIA

ATLAS OF OUR CHANGING ENVIRONMENT

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FOREWORD

Sustainable development is a critical component of today's international agenda. A number of multilateral agreements and conventions on the sustainable management of the environment have been formulated. These include the Rio Declaration on Environment and Development, Agenda 21, the Johannesburg Declaration on Sustainable Development, the Bali Plan for Technology Support and Capacity Building, and the United Nations Millennium Declaration.

The Government of the Republic of Zambia recognizes that there can be no long term economic and social development if the country's natural resources are not utilized in a sustainable manner. Government's commitment towards environmental management is demonstrated through various plans, programmes, policies and laws such as the National Conservation Strategy (NCS) of 1985, the National Environmental Action Plan (NEAP) of 1994, the Environmental Protection and Pollution Control Act (EPPCA) of 1990, the National Policy on Environment (NPE) of 2007, Vision 2030 and the Environmental Management Act (EMA) of 2011.

The Government further recognizes that in order to implement its plans, programmes and policies, provision of appropriate information to all actors is critical. This is necessary for ensuring sustainable utilization of natural resources and efficient service provision. Without doubt, the effects and magnitude of environmental change so far experienced indicate that the country needs to put in place adequate measures to safeguard its citizens from hazards; ensure secure livelihoods; alleviate poverty; protect public infrastructure; and promote economic growth.

Adverse climatic hazards have affected the country's development programmes by diverting much needed fiscal resources towards mitigation measures. For this reason, there is need to create opportunities to achieve sustainable development through economic growth and diversification, social development and environmental protection. To do this, wide public participation and access to environmental information are essential to the

promotion of sustainable development. Zambia has been producing State of Environment reports to provide information on environmental state and trends, and consequences to decision makers and the general public. The production of the Zambia Atlas of Our Changing Environment provides an opportunity for enhanced graphical and visual depiction of this important information.

The *Zambia Atlas of Our Changing Environment* is therefore, one way of increasing awareness on environmental trends and is a call to all for improved management of our natural resources.

The Atlas aims at providing scientifically-based and credible evidence of the changes occurring across Zambia, as well as their causes, and communicates the urgency of addressing them to policy- and decision-makers and the public. It has been produced through a broad participatory process involving many stakeholders.

This Atlas demonstrates the government's commitment to mainstreaming environment into planning so that economic and social development and the environment are fundamentally interdependent. In other words, the way we manage the economy and political and social institutions has critical impacts on the environment, while environmental quality and sustainability, in turn, are vital for the performance of the economy and social well-being. The government has and will continue to review the legal framework in the environment sector so as to ensure that they are in line and consistent with current macro economic reforms. Environmental issues in Zambia are no longer the responsibility of government alone. The private sector and local communities also play an important role in environment and natural resources management.

The Atlas exhibits that changes in the state of the environment have occurred in different parts of the country. The atlas is a useful resource, which must be used at all levels of development planning in the country.

The preparation of this atlas benefited from technical and financial support provided by many partners. In particular, I would like to recognize the collaboration involving the United Nations Environment Programme (UNEP), GRID-Arendal, GRID-Sioux Falls, the US Geological Survey, the Zambia Environmental Management Agency (ZEMA) and others in producing the Atlas. The Government of Zambia remains committed to such initiatives and other efforts that will contribute to improved management of our environment and natural resources.

Hon. Wylbur Simuusa, M.P

Minister of Lands, Natural Resources and Environmental Protection

August 2013

PREFACE

Zambia has abundant water resources, vast forests, huge mineral deposits, and large tracts of arable land. These natural resources are important for the country's economy, with copper and cobalt being the country's main exports. While mining brings into the country much needed foreign exchange, the extraction of the minerals also results in environmental damage, including land degradation, deforestation, water and air pollution, and solid waste. In addition to mining, other important threats to Zambia's environment are agriculture, urbanization and climate change.

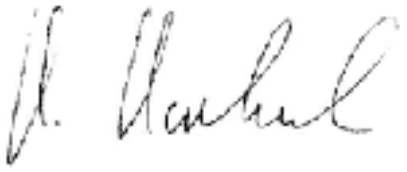
The *Zambia Atlas of Our Changing Environment* aims to visually illustrate environmental changes in the country over recent years, ranging from changes arising from the growing mining sector to changes brought about by agricultural expansion and growing settlements. By visually linking causes with the environmental changes, the atlas is expected to not only provide compelling evidence on the changing environment, but also to call for science-based solutions.

As Zambia aspires to become a prosperous middle-income country through its Vision 2030, it is important that the environment is safeguarded from degradation. Such protection from land degradation will not only ensure sustainable development, but also facilitate green growth and the attainment of socio-economic goals, including those related to health, education, sanitation and poverty reduction. Evidence-based assessments such as the Zambia Atlas of Our Changing Environment are important tools for decision-and policy-making.

Through its Africa Programme, GRID-Arendal, in partnership with the Zambia Environmental Management Agency, UNEP, GRID-Sioux Falls and the US Geological Survey, is pleased to have significantly played a part in the preparation the *Zambia Atlas of Our Changing Environment*. The process did not only entail raising financial resources, but also developing content and training. The acquired skills, especially in the collection, processing and presentation of satellite imagery, and in maps and graphics, will not only benefit Zambia but also the rest of Africa, given the growing demand for atlases in the region.

The spirit of partnership demonstrated by GRID-Arendal, the Zambia Environmental Management Agency, UNEP, GRID-Sioux Falls and the US Geological Survey in producing this atlas is greatly applauded. Through the partnership it was possible to leverage on each other's capacities, including technical competency, financial resources, political legitimacy, and technology. It is GRID-Arendal's wish that the publication of this atlas is not seen as an end, but as the beginning of an important process of reaching out to policy-makers, the media, academia and other important stakeholders. With an elaborate outreach process, it is possible, as we have experienced with other atlases, to generate some measurable outcomes on policies and programmes that will contribute towards the future we want.

Dr. Peter Prokosch



Managing Director, GRID-Arendal

August 2013

EXECUTIVE SUMMARY

The Zambia Environmental Management Agency (ZEMA), in collaboration with GRID-Arendal and the United Nations Environment Programme (UNEP), prepared the *Zambia Atlas of Our Changing Environment*. The main objective of the atlas is to provide science-based and credible evidence of the changes that have occurred in Zambia, as well as their causes, and to communicate the urgency of addressing them to policy and decision makers and the public. The specific objectives of the Atlas are to:

1. Identify environmental changes that have occurred in Zambia and propose appropriate measures to prevent, manage and/or mitigate their impacts; and

2. Strengthen Integrated Environmental Assessment and Reporting processes by linking the atlas to the Zambia Environment Outlook (ZEO) 4 report and environmental indicators.

The preparation of the Atlas was conducted through a participatory approach, which involved relevant stakeholders such as government departments, local authorities, the private sector, civil society and community leaders.

A comprehensive review of information and peer-reviewed reports was conducted to identify the salient environmental issues in Zambia. The Atlas brings to light stories of environmental change in Zambia through the use of satellite imagery, photographs and maps. Graphs and charts have also been used in addition to descriptive text to bring out the major issues in Zambia. The Atlas contains three Chapters.

Chapter 1 presents the physical and socio-economic features of Zambia. The country's population has been growing at an annual average rate of 2.8 per cent. In 2010, the population was about 13 million, and at current growth rates this may increase to 22.7 million by 2030. Population increase is higher in urban centres especially in the country's capital city, Lusaka, than it is in the rural areas. Historical and heritage sites such as the Ingombe Illede are also discussed as part of Zambia's rich culture. A synopsis of some of Zambia's traditional ceremonies is also given.

Chapter 2 describes the environmental changes that are taking place in various parts of Zambia. The changes include land degradation particularly in mining areas, surface and groundwater pollution, air pollution, deforestation, wildlife depletion, poor management of solid waste, and loss of biodiversity.

As mining continues to play a pivotal role in the economic development of the country, growth of the industry has not only resulted in the rapid development of urban centres, but also exposed the landscape to land degradation through open-pits, as well as forest losses.

Chapter 3 tracks environmental policy performance in Zambia. The Environmental Management Act No. 12 of 2011 is the principal law on the environment. Other pieces of legislation that have a bearing on management of the environment include those related to town and country planning; forestry; wildlife; mines and minerals; radiation; and water. A number of programmes, including the Copperbelt Environment Programme, Environmental Support Programme, Environment and Natural Resources Management and Mainstreaming Programme, and Integrated Land Use Assessment have also been implemented to strengthen environmental management in Zambia. .

The government of Zambia recognises the need to strengthen the capacities of various stakeholders to actively participate in environmental management. As a result knowledge, reflection and action about the environment have become necessary pre-conditions for thoughtful processes in dealing with issues of sustainable development.

ACKNOWLEDGEMENTS

The preparation of the Atlas started in 2010 with a stakeholder consultative meeting that defined thematic areas, and this was followed by the formation of a core team of representatives from key government departments. In collaboration with GRID-Arendal, ZEMA conducted a capacity building workshop for the core team. A validation workshop was held for the stakeholders to endorse the process and production of the Atlas.

The production of the *Zambia Atlas of Our Changing Environment* was undertaken with the support of many individuals and stakeholders.

ZEMA sincerely thanks Government Departments that provided datasets and expertise, and all the other stakeholders who contributed in the production of the Atlas. Special acknowledgments go to Anastasia Banda and Raynold Moyo from the Survey Department for providing aerial photographs used in the atlas, as well as for enabling access to the GIS laboratory.

ZEMA would also like to thank the United States Geological Survey team at the Earth Resources Observation and Science Center in Sioux Falls that provided the spatial data in this Atlas. Special thanks go to Bruce Pengra, who not only accessed the data, but also processed some of the data and facilitated two vital training sessions on the preparation of the atlas.

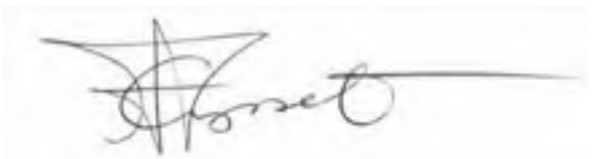
ZEMA is very grateful to GRID-Arendal in Norway for providing the financial and technical support for the preparation and production of this Atlas. Special thanks go to Clever Mafuta, the Africa Coordinator at GRID-Arendal, for overseeing and facilitating production of the Atlas.

Our gratitude is also extended to the United Nations Environment Programme (UNEP) office in Nairobi for also providing financial, technical support as well as satellite imagery for the Atlas. Special recognition goes to Ashbindu Singh, Frank Turyatunga and Charles Sebukeera for their contribution in making this atlas a success.

Finally, the efforts of all ZEMA staff are appreciated for their involvement in the technical preparation, review and production of this important and resourceful material. In particular, ZEMA thanks Irene G. Lungu-Chipili and Mwiche Kabwe for managing and supervising the Atlas development process; Gift Sikaundi and Joel S. Simwinga for the research and data compilation; Theresa Bowa and Bernardas Padegimas, a GRID-Arendal member of staff who was on exchange at ZEMA, for preparing change pairs based on satellite data; and Julius P. Daka for reviewing the publication.

This product should serve as a tool for sound environmental decision making processes in Zambia.

Joseph Sakala



Director General
Zambia Environmental Management Agency

ACRONYMS

AFCON	Africa Cup of Nations
BoZ	Bank of Zambia
CAF	Confederation of African Football
CEP	Copperbelt Environment Project
CSO	Central Statistics Office (of Zambia)
DRC	Democratic Republic of Congo
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMPs	Environmental Management Plans
ENRMMP	Environment and Natural Resources Management and Mainstreaming Programme
EPPCA	Environmental Protection and Pollution Control Act
ERB	Energy Regulation Board
ESP	Environment Support Programme
FAO	Food and Agricultural Organization
FAZ	Football Association of Zambia
FD	Forestry Department
FNDP	Fifth National Development Plan
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
IAS	Invasive Alien Species
IDA	International Development Association
IEF	Interim Environment Fund
ILUA	Integrated Land Use and Assessment
MDGs	Millennium Development Goals
MMC	Mazabuka Municipal Council
MLNREP	Ministry of Lands, Natural Resources and Environmental Protection
MMMD	Ministry of Mines and Minerals Development
MoFNP	Ministry of Finance and National Planning
MTENR	Ministry of Tourism, Environment and Natural Resources
NCS	National Conservation Strategy
NDF	Nordic Development Fund
NEAP	National Environmental Action Plan
NHCC	National Heritage Conservation Commission
NPE	National Policy on Environment
NWASCO	National Water Supply and Sanitation Council
SNDP	Sixth National Development Plan
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
WWF	World Wildlife Fund
ZAWA	Zambia Wildlife Authority
ZEMA	Zambia Environmental Management Agency
ZEO	Zambia Environment Outlook
ZMD	Zambia Meteorological Department
ZTB	Zambia Tourism Board

CHAPTER 1 OVERVIEW

Zambia is a landlocked country in Southern Africa surrounded by eight neighbouring countries: Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe. The country has a total area of 752,614 sq. kilometres of which 11,890 sq. kilometres is covered by rivers and lakes (ECZ 2008). It also has abundant natural resources such as wildlife, forestry and minerals, which are key drivers of the economy. The main pillars of Zambia's economic growth are mining, agriculture, construction, transport and trade. Most of the mining activities occur in the Copperbelt and North-Western Provinces. The Zambian economy grew at an average of 6.1 per cent annually between 2006 and 2009.

The country has a rich heritage and cultural diversity with different traditional ceremonies taking place. More than 20 annual traditional ceremonies are held to celebrate local customs, social life, history, natural cycles, past military glories and spiritual culture. Some of these include the *Bwilile*, *Kuomboka*, *Nc'wala*, *Lwiindi* and *Shimunenga* ceremonies.

BACKGROUND

The Republic of Zambia lies south of the equator, in the heart of Southern Africa and shares its borders with eight states: Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe (FAO, 2001). The country has a total area of 752,614 sq kilometres of which 11,890 sq kilometres is covered by rivers and lakes. Zambia is divided into ten administrative provinces: Central, Copperbelt, Lusaka, Western, Luapula, Muchinga, Northern, North-Western, Eastern and Southern as shown in Figure 1.2 (Central Statistics Office, 2012). The provinces are in turn subdivided into districts. Zambia's major cities are Lusaka, the country's capital, Ndola, Kitwe and Livingstone.

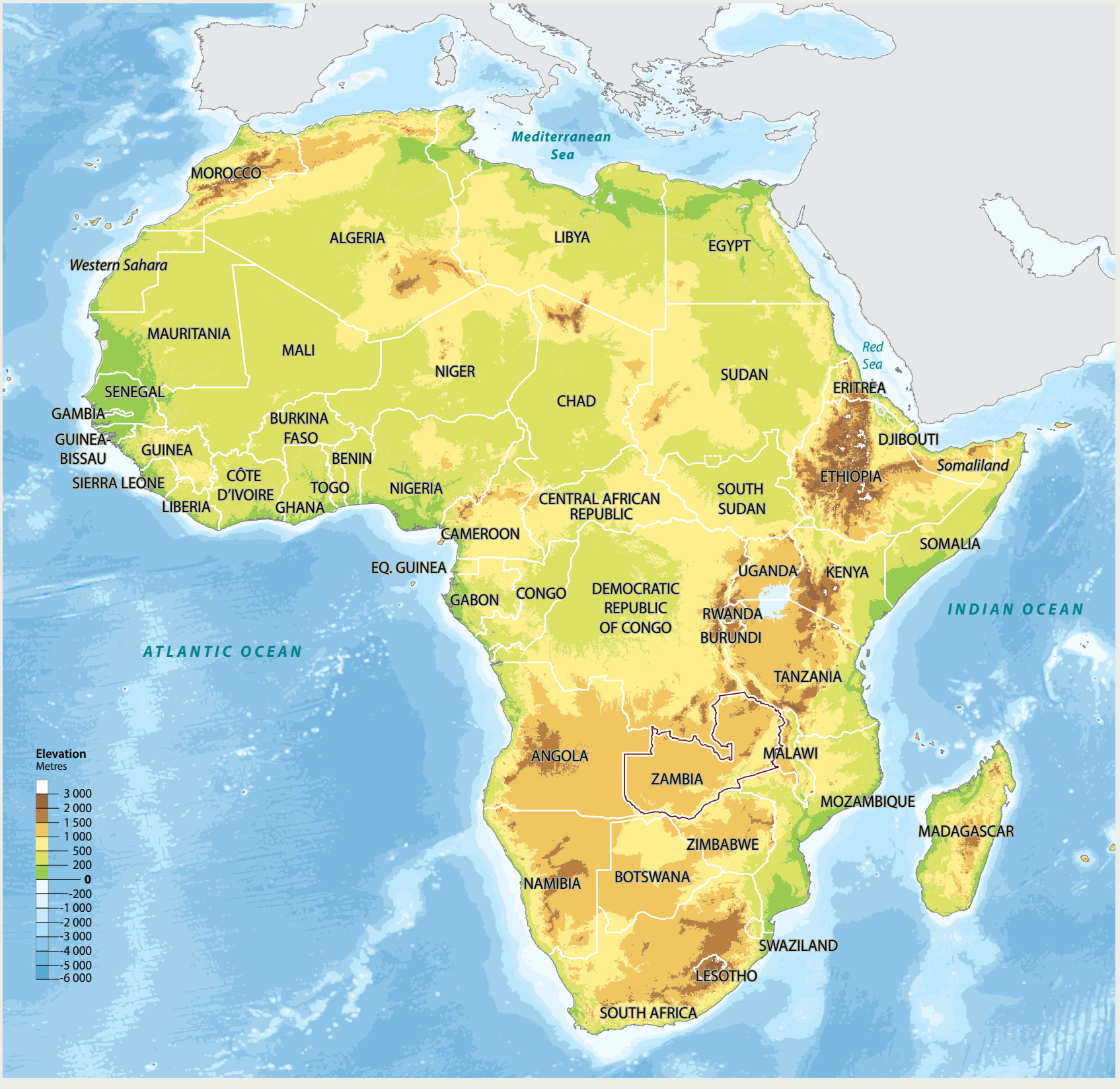


Figure 1.1 Location of Zambia in Africa

Natural Earth, 2011 accessed online

Figure 1.2 Zambia Districts
Central Statistics Office, 2012

POPULATION

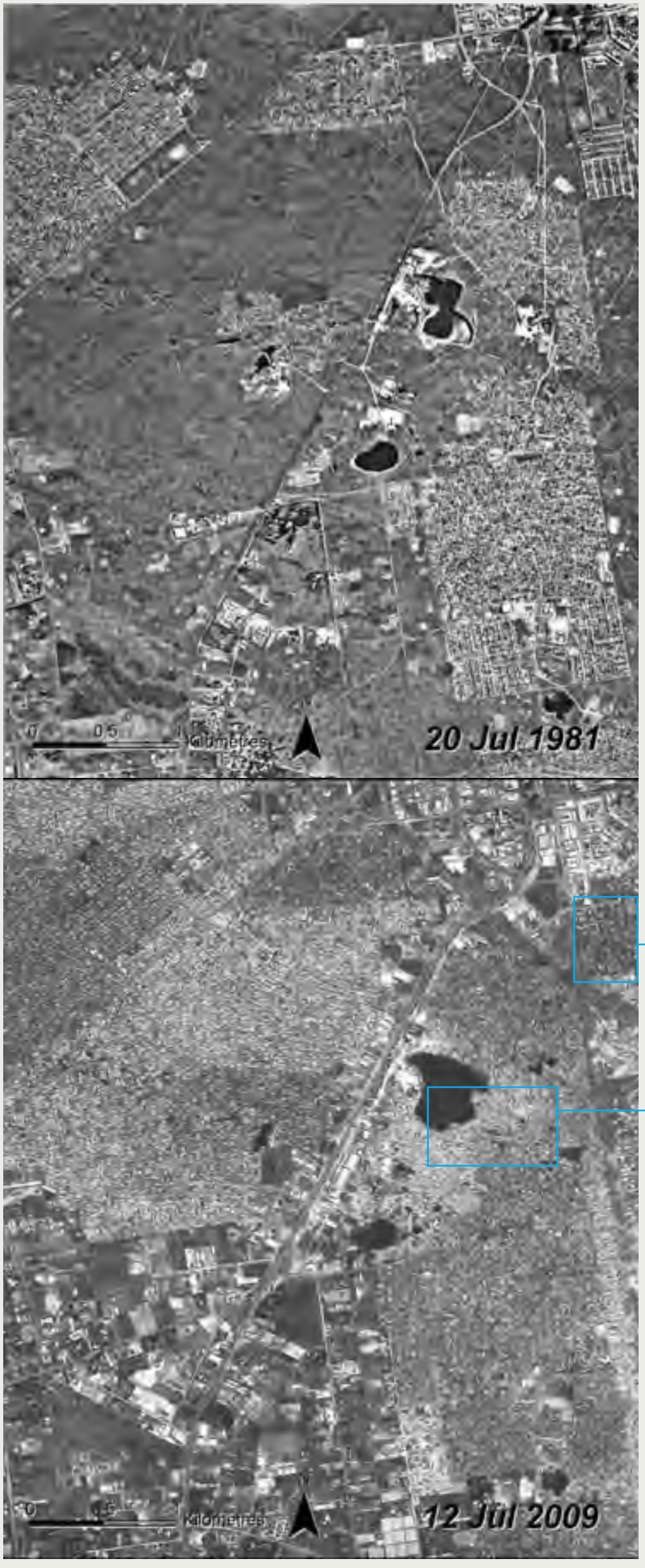
Zambia has a population of 13,092,666 of which 49 per cent are male and 51 per cent are female. The majority of the population, 61 per cent, resides in rural areas. At the provincial level, Lusaka, with a population of 2,191,225, is home to the largest proportion of Zambia's population, followed by the Copperbelt, which is home to 1,972,317 people (Central Statistics Office, 2012).

Zambia's average annual rate of population growth is approximately 2.8 per cent, and is said to be one of the fastest in sub-Saharan Africa. The country's population although still small compared to other African nations, grew from about 2.3 million in 1963 to 9.9 million in 2000, before reaching nearly 11.7 million in 2006 (Environmental Council of Zambia, 2008).

Although the majority of Zambia's population resides in rural areas, migration to urban areas is an ongoing trend (Central Statistics Office, 2012). The primary drivers of migration include prospects for improved economic conditions and better opportunities for higher education and employment. Rapidly growing urban populations have resulted in the emergence of unplanned settlements, making the provision of basic social services such as housing, water and sanitation a challenge. This is particularly the case in Lusaka city where the population increased from 991,226 inhabitants in 1990 to 2,191,225 inhabitants in 2010. This represents a growth rate of 4.6 per cent, which was above the national average of 2.8 per cent (Central Statistics Office, 2012).

Lusaka is the capital and largest city of Zambia. It is the centre of commerce and government, and is one of the fastest developing cities in southern Africa. The city is connected to the rest of the country through four major highways heading north, south, east and

west. Due to rapid expansion, Lusaka faces challenges in the provision of housing and other forms of infrastructure, including roads. The delivery of social services in the areas of safe drinking water, adequate sanitation and health is also a challenge.



As is common with most rapidly expanding urban areas , Lusaka faces the challenge of unplanned settlements. These informal settlements tend to expand faster than the rest of the city, and they are characterized by inadequate shelter, lack of services and inadequate waste management.

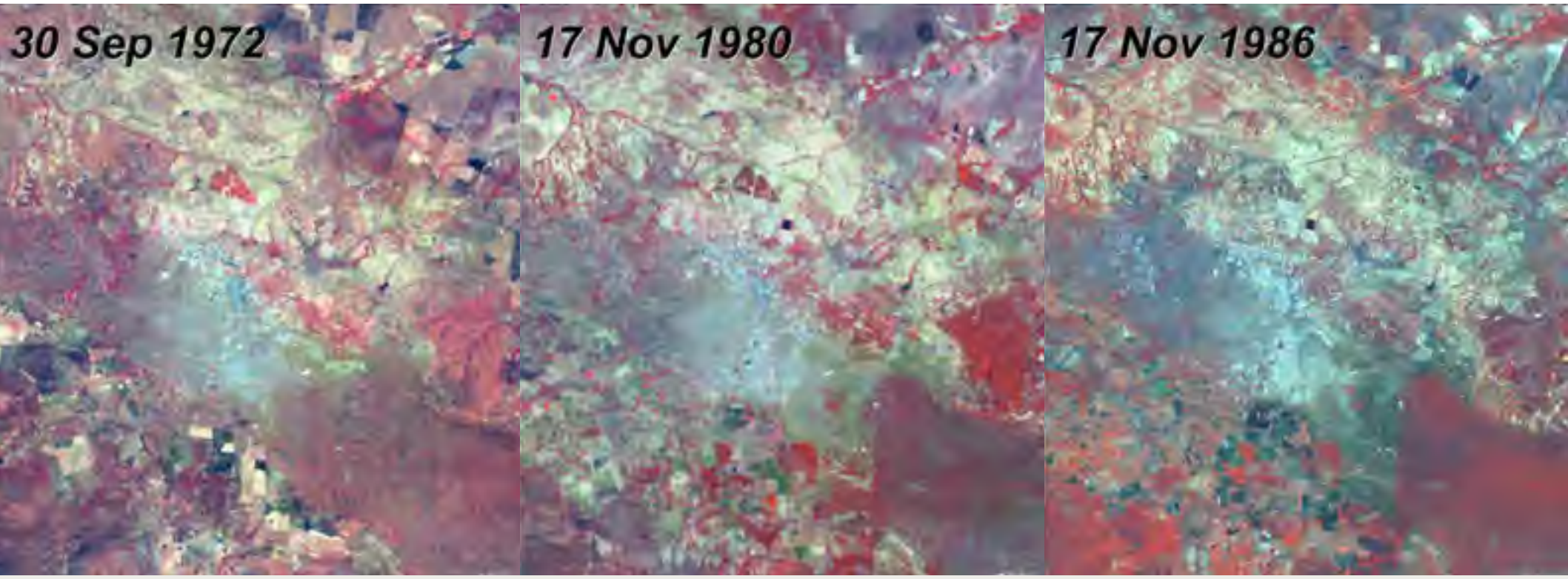
The rapid expansion of Lusaka began in 1935 when the capital of Zambia (then Northern Rhodesia) was moved from Livingstone to Lusaka. Lusaka is centrally located, enjoys a good climate, is easily accessible from the Copperbelt, the country's economic heartland, and has substantial ground water resources. Lusaka was conferred with city status in 1960 (UN-HABITAT, 2010).

Planned settlement – Kamwala township

Unplanned settlement - Kuku township

Typical low-cost housing
The Sisterhood of the Travelling Hammers, 2009

Typical rural village homes
Fritz_da_kat, 2007



Lusaka time series

Residents queuing up for water in George compound, Lusaka
NWASCO, 2006

Traffic jam in Lusaka
TravelBlog.org, 2008

Lilayi housing scheme
21stCenturyZambia.com, 2010

Heroes National Stadium
ZEMA, 2013

LUSAKA: THEN AND NOW

THEN

NOW

Retail Services

National Archives of Zambia (NAZ), 1925

ZEMA, 2012

Financial Services

NAZ, 1930

ZEMA, 2012

Central Park Shopping Area

NAZ, 1925

ZEMA, 2012

THEN

NOW

Infrastructure and Housing

NAZ, 1919

ZEMA, 2012

Financial Services

NAZ, 1926

ZEMA, 2012

CULTURE

Zambia is a country of wide cultural diversity. In addition to seven major local languages: Bemba, Chichewa, Kaonde, Lozi, Lunda, Luvale and Tonga, the country is home to over 73 language dialects. English is the country's official language.

Throughout the year, more than 20 annual traditional ceremonies are held in Zambia to celebrate local customs, social life, rituals, oral history, natural cycles, past military glories, and material and spiritual culture.

Some of these celebrations include Bwilile (Luapula), Kuomboka (Western Province), Nc'wala (Eastern Province), Lwiindi and Shimunenga (Southern Province), Likumbi Lyamize (North-Western Province) and Chibwela Kumushi (Central Province). Each ceremony provides valuable insights to a traditional culture that has been passed down from generation to generation (Zambia Tourism Board [ZTB], 2012).

BWILILE CEREMONY

The Bwilile ceremony celebrates the harvest season. It takes place in Chiengi district in Luapula Province each September and is observed by Senior Chief Puta and the Bwilile people (ZTB, 2012).

Bwilile Ceremony of Luapula Province
ZTB, 2005

KULAMBA CEREMONY

The Kulamba ceremony held annually in Katete, Eastern Province, celebrates the harvest in late August. Paramount Chief Kalonga Gawa Undi of the Chewa-speaking people of Zambia presides over the ceremony, which brings together chiefs from chiefdoms in Malawi, Mozambique and Zambia. A variety of dances such as Gule Wamukulu (Nyau dance), Gologolo, Makanja, Muganda, Chinamwali and Chimtali (the female dance) are performed during the ceremony (ZTB, 2012).

Nyau dancers at the Kulamba Ceremony
ZTB, 2007

KUOMBOKA CEREMONY

The Kuomboka ceremony takes place in Mongu district, Western Province, usually in April during the flooding of the Barotse Floodplains. The name 'Kuomboka' means "to get out of the water onto dry ground." Every year towards the end of the rainy season, as the water in the flood plain of the upper Zambezi valley rises, the Lozi people make a ceremonial move to higher ground. When the Litunga, the Lozi Paramount Chief, decides that it's time to leave, heavy drumming signals his departure and the Lozi people follow.

The Kuomboka ceremony may occur any time between February and May and it takes the chief about six hours to cover the distance between the dry season capital Lealui, and the wet season capital Limulunga. At Limulunga, the successful move is celebrated with traditional singing and dancing. This ceremony dates back more than 300 years when the Lozi people broke away from the great Lunda Empire to come and settle in the upper regions of the Zambezi River Basin (ZTB, 2012).

Drummers during the Kuomboka Ceremony
ZTB, 2008

Kuomboka Ceremony, the Litunga in his barge and a troop of traditionally dressed paddlers, in the lead
ZTB, 2008

LIKUMBI LYA MIZE CEREMONY

The Likumbi Lya Mize ceremony takes place annually in August at Mize, the official palace of Senior Chief Ndungu, in Zambezi district, North-Western Province.

People of the Luvale tribe gather to celebrate their cultural heritage, bringing displays of all types of handicrafts and joining in traditional singing and dancing. The dancers wear elaborate and colorful costumes popularly known as the 'Likishi'. Masked dancers, known as 'Makishi', carry out theatrical performances and share the meanings of the masks with onlookers (ZTB, 2012).

A mask displayed at the Likumbi Lya Mize Ceremony
Viotieno, 2008

Makishi dancer during the Likumbi Lya Mize Ceremony
Eco-livelihoods, 2010

NC'WALA CEREMONY

The Nc'wala is a thanksgiving ceremony observed each February by the Ngoni people at Mutenguleni Village, in Chipata district, Eastern Province. The celebration, marked by tribal dances and feasting celebrates the first fresh produce of the year. The Paramount Chief of the Ngoni, Chief Mpezeni, is the first to taste the produce. Throughout the ceremony, Chief Mpezeni is dressed in leopard skin re-enacting an old tradition which has roots in early Zulu culture (ZTB, 2012).

A young dancer at the Nc'wala Ceremony
Professional Media, 2012

Ngoni dancers during the Nc'wala Ceremony
ZTB, 2009

UMUTOMBOKO CEREMONY

The Umutomboko ceremony of the Lunda people is held annually in July in Mwansabombwe district, Luapula Province. The ceremony celebrates the "crossing of the river," the historic arrival of the Lunda from the Congo. The celebrations culminate in the performance of the umutomboko dance of victory by Chief Mwata Kazembe (ZTB, 2012).

Royal parade during the Umutomboko Ceremony
ZTB, 2006

Chief Mwata Kazembe performing the umutomboko dance
ZTB, 2011

FOOTBALL AND SPORTS

Sports play an important social and cultural role in Zambia. They cement communities and help to promote national symbols, emblems, colours, flora and fauna. Football is Zambia's favourite pass-time and has been played in the country for more than a hundred years. The Football Association of Zambia (FAZ) was established in 1929 to raise soccer standards in the country. It is one of the oldest football federations on the African continent and is a member of the world football governing body, International Federation of Association Football and Confederation of African Football (FAZ, 2012). Zambia's first taste of international football came on July 4, 1964, when the national team played and won a match against Tanzania in the newly independent Republic of Malawi. Since Zambia's independence in October 1964, football has grown to be the country's most popular sport. Zambians are proud of their national team commonly known as "Chipolopolo Boys" (Copper Bullet or Big Guns) (FAZ, 2011).

In 2012, Zambia won the Africa Cup of Nations, a tournament held every two years in January and February. It was a joyous and historical moment for Zambia (Confederation of African Football, 2012).

Chipolopolo lift their Africa Cup of Nations trophy and display their medals
AFP, 2012

2012 Africa Cup of Nations Chipolopolo first team
Lusaka Times, 2012

Zambia soccer fans welcome victorious team
Zambia Reports, 2012

HERITAGE SITES

The country has a total of 4,052 heritage sites of which 84 have been declared National Monuments. These are found across the country and include cultural, scenic, architectural, geological and archaeological sites. Some of these sites are Chirundu Fossil Forest, Luangwa Valley Fossil, Kalambo Falls, Ingombe Ilede, Mumbwa Caves, Zambezi River and the Victoria Falls (National Heritage Conservation Commission (NHCC), 2008).

Ingombe Ilede is located in the Southern Province of Zambia, on a hill near the confluence of the Zambezi and Lusitu rivers, near Siavonga, close to the Kariba dam. Ingombe Ilede means "the place where the cow lies down" and is so-named because the baobab trees on the site resemble a sleeping cow (Zambia Advisor, 2013).

Entrance to the Ingombe Ilede
Reichert, C., 2008

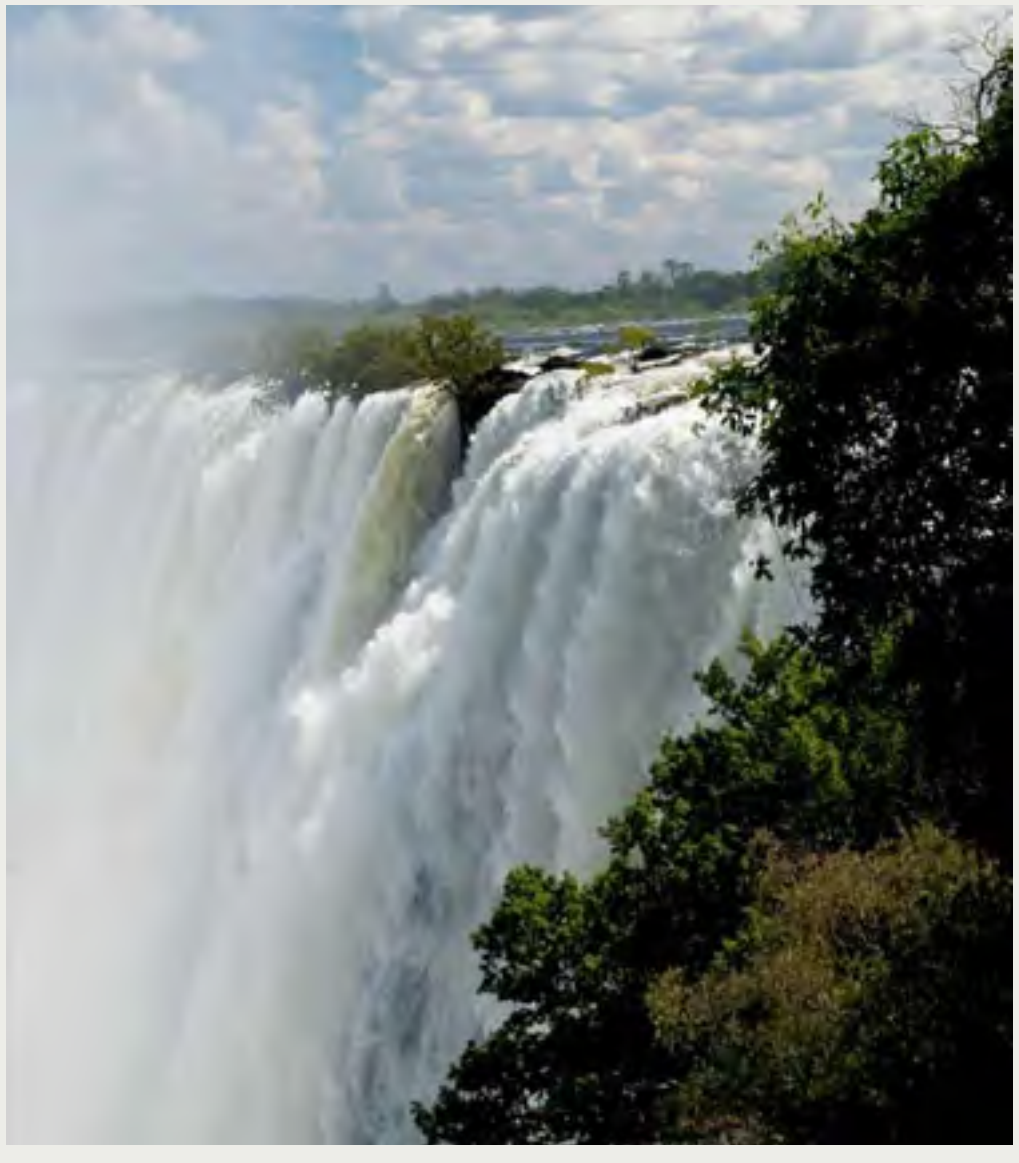
Fossilized wood dating back approximately 150 million years in Chirundu Fossil Forest
NHCC, 2008

A baobab tree near Ingombe Ilede, 'the place where the cow lies down'

Fotogaby/iStock

An aerial view of the beautiful Victoria Falls, Livingstone, Southern Province
NHCC, 2012

Kalambo Falls in Mbala, Northern Province
NHCC, 2012



Victoria Falls (left) Gorge of the Victoria Falls (right) in Livingstone, Southern Province
DavorLovincic/iStock

Padegimas, B., 2012

Victoria Falls
Ajansen/iStock

ECONOMY

The main pillars of Zambia's economic growth are mining, agriculture, construction, transport and trade. The Zambian economy has grown an average of 6.1 per cent per annum between 2006 and 2009 compared to 4.8 per cent between 2002 and 2005. Gross Domestic Product (GDP) growth rate was 7.6 per cent in 2010 and reduced to 6.6 per cent in 2011 as shown in Figure 1.3. The country's annual average growth remains below the envisaged target of 7.0 per cent according to the government's Vision 2030 (Ministry of Finance, 2012).

Zambia's poverty levels have reduced from 62.8 per cent in 2006 to 60.5 per cent in 2010. However, this is still far from attaining the Millennium Development Goal (MDG) of halving extreme poverty by 2015. Rural poverty levels have also remained high dropping from 80.3 per cent in 2006 to 77.9 per cent in 2010.

Zambia's economy is currently largely dependent on the mining industry however, efforts are being made to diversify the economy and to promote growth in key sectors such as agriculture and manufacturing.

Figure 1.3 GDP growth rate
World Bank, 2012

Tourism facilities along the Zambezi River near the Victoria Falls in Livingstone, Southern Province
McMorrow, B. J., 2005

Mining at Lumwana, Mwinilunga District, North-Western Province.
ZEMA, 2011

ZAMBIAN CURRENCY

The country's currency is known as the Zambian 'Kwacha' and is subdivided into 100 'Ngwee'. In January 2012, the Government approved the Bank of Zambia's recommendation to rebase the Zambian currency by dividing the existing banknotes by 1,000 (Bank of Zambia, 2012) as shown in Table 1.1.

In addition, four coins have also been introduced: the 1 Kwacha coin, and the 50, 10, and 5 Ngwee coins. The rebasing of the currency has not changed its value or its purchasing power.

Table 1.1: Old and New Currency

Old Currency	New Currency
-	K100
K50,000	K50
K20,000	K20
K10,000	K10
K5,000	K5
-	K2
K1,000	K1 (Coin)

Bank of Zambia, 2012

Old Bank Coins

Old Bank Notes

New Bank Notes

New Bank Coins

Bank of Zambia, 2012

Crocodile farming is a non-traditional farming activity, which is concentrated around Siavonga

Edward Westmacott/iStock

GEOLOGY

Zambia is underlain predominantly by Archean to Neoproterozoic age rocks. The Lufilian Arc, a large dome-like geological structure, dominates the geology of North-Western Zambia and extends into the southern part of the Democratic Republic of Congo (Figure 1.4). The most important of these is the Katanga rock formation, which yields the copper and cobalt ores exploited in the Copperbelt and North-Western Provinces.

The differential movement of the African plate and the buttressing effect of the rocks moving towards, over and under each other, have played an important role in the geological evolution of the country and in the genesis of the country's mineral and energy resources (Ministry of Mines and Minerals Development, 1996).

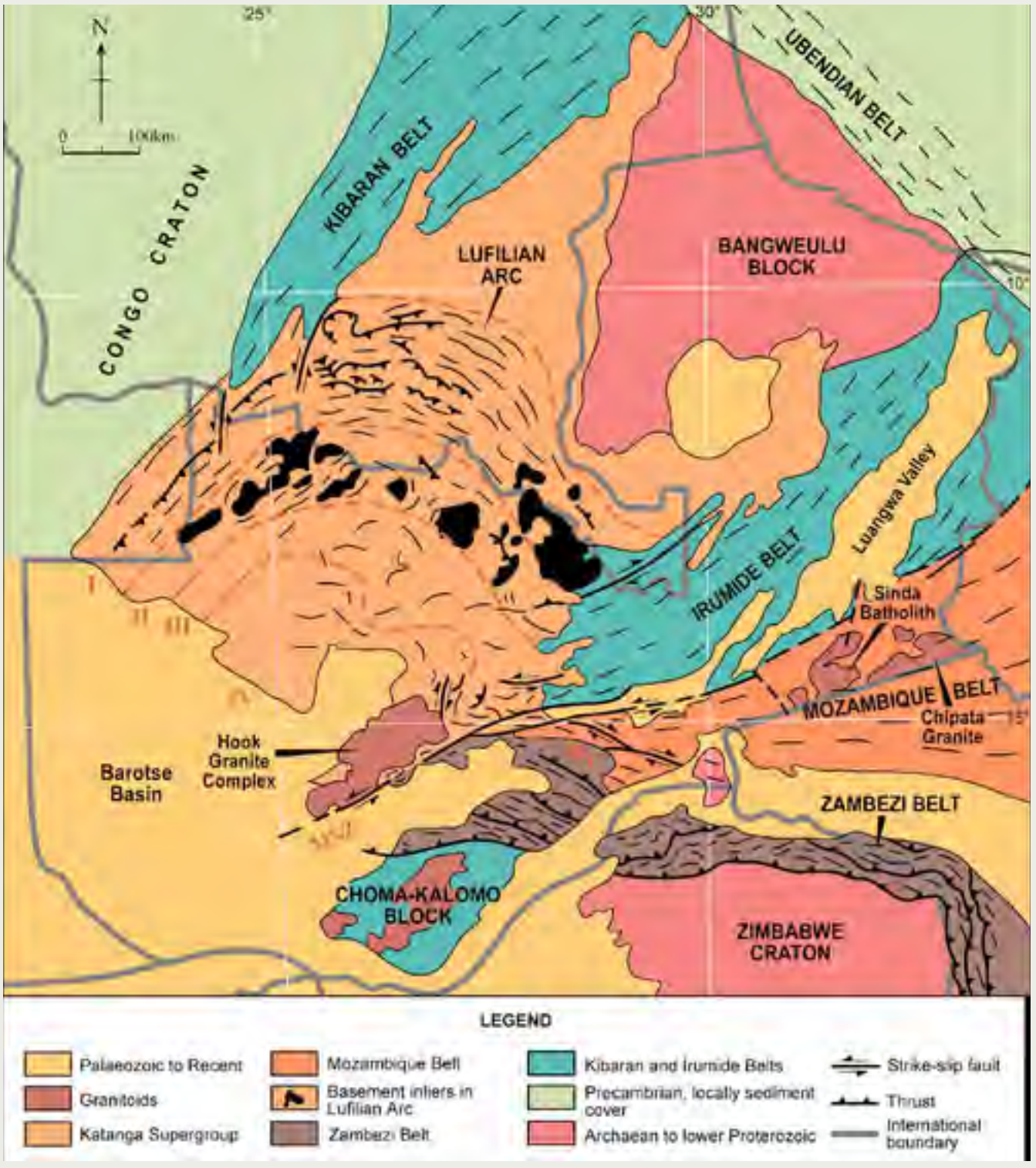


Figure 1.4 Zambia's geological terrain
Ministry of Mines and Minerals Development, 1996.

Cracked soil due to drought
Marc's pix, 2007

SOILS

The soils of Zambia can be classified using the three agro-ecological zones. The main soils are loamy-sand or sand Alfisols, interspersed with clay. Figure 1.5 shows soil types in Zambia.

Region I covers 20 per cent of the country and is the driest and most prone to drought. Its soils contain low levels of organic matter, nutrient reserves and high acidity levels. Region II covers 36 per cent of the country. Its soils are made up of the Kalahari sands which have little agricultural potential and are mainly covered in woodland. The soils in region III, which cover 44 per cent of the country, tend to be highly weathered and leached, and highly acidic.

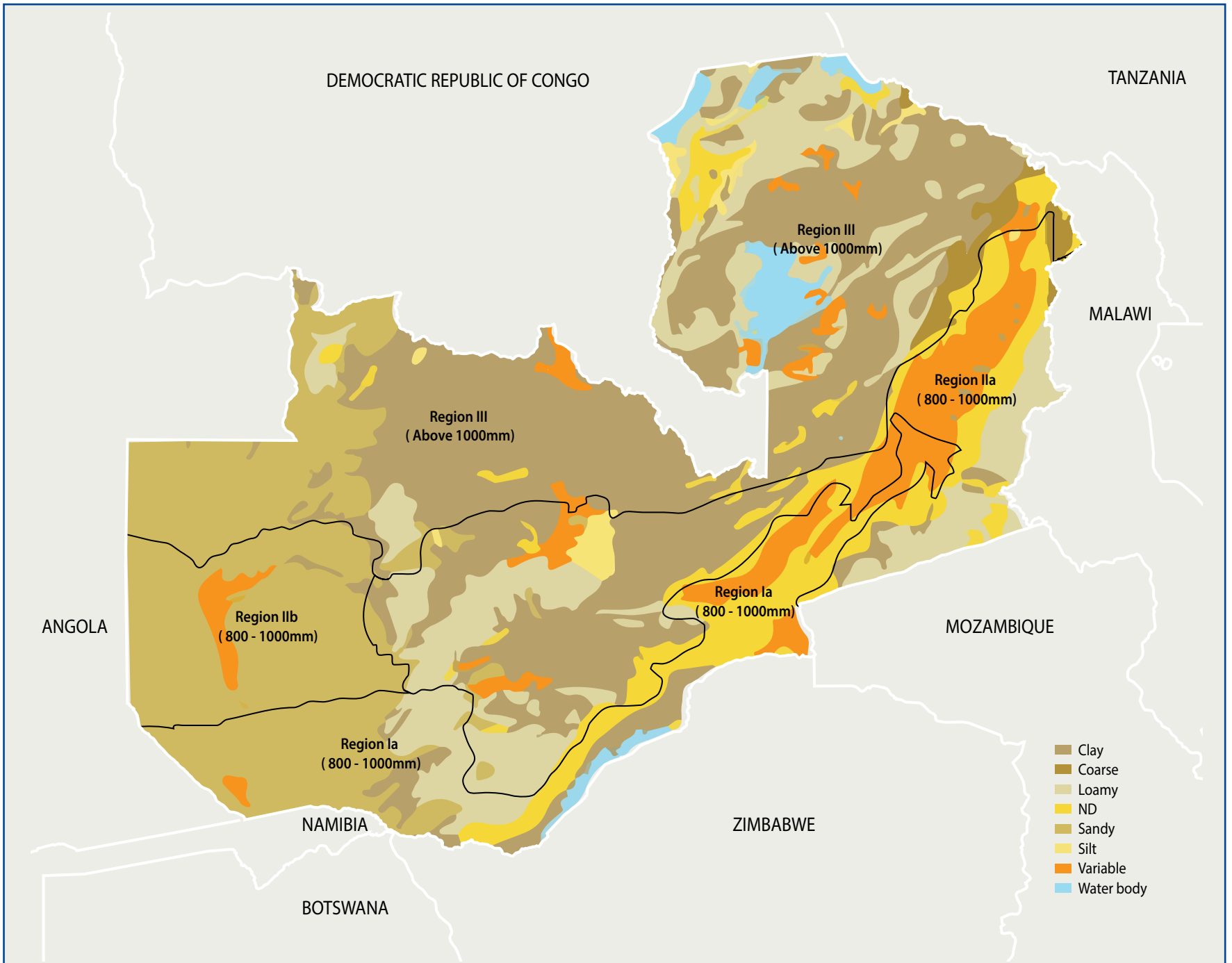


Figure 1.5 Soil types in Zambia
Environmental Council of Zambia, 2008

CHAPTER 2

ZAMBIA'S CHANGING ENVIRONMENT

In 2012 the country's population was 13,092,666 of which 51 per cent were female. Although 61 per cent of Zambia's population reside in rural areas, migration to urban areas is high (CSO 2012). Lusaka, Zambia's capital city has the largest population growth rate in the country.

Over the years, changes have occurred to the biodiversity, water-based ecosystems and the general landscape of the country due to a number of drivers among them population growth, economic, natural and anthropogenic activities.

Indigenous forests are estimated to account for 66 per cent of the total land cover (FAO 2008). The main source of energy is woodfuel, accounting for 80 per cent of domestic energy (ECZ 2008). Other sources of energy are electricity, biofuels and fossil fuels such as petroleum and coal. Zambia's energy consumption has risen over the last few years as a result of increasing activities in economic sectors among them mining, construction, manufacturing and agriculture.

TEMPERATURE

Zambia has three seasons: the wet season, which extends from November to April, the cold and dry season from May to July, and the hot season from August to October. The country's mean temperature ranges from 6°C in the cold and dry season to 35°C in the hot season. Table 2.1 presents mean daily temperatures per season (Zambia Meteorological Department (ZMD), 2011).

As Figure 2.1 shows, most of the country's high temperatures are recorded in the valleys, and in the western region, which is mainly sandy due to its proximity to the Kalahari Desert. The high temperatures in Mfuwe are attributed to its proximity to the Luano Valley. Parts of northern Zambia, particularly the Mbala district, experience lower maximum temperatures because they are at high altitudes (ZMD, 2011).

Table 2.1 Mean Daily Maximum and Minimum Temperatures per Season

Months	Season	Mean Daily Maximum °C	Mean Daily Minimum °C
May-July	Cold and Dry	21-26	6-12
August-October	Hot	28-35	17-22
November-April	Wet	25-30	14-19

Adapted, Zambia Meteorological Department, 2011.

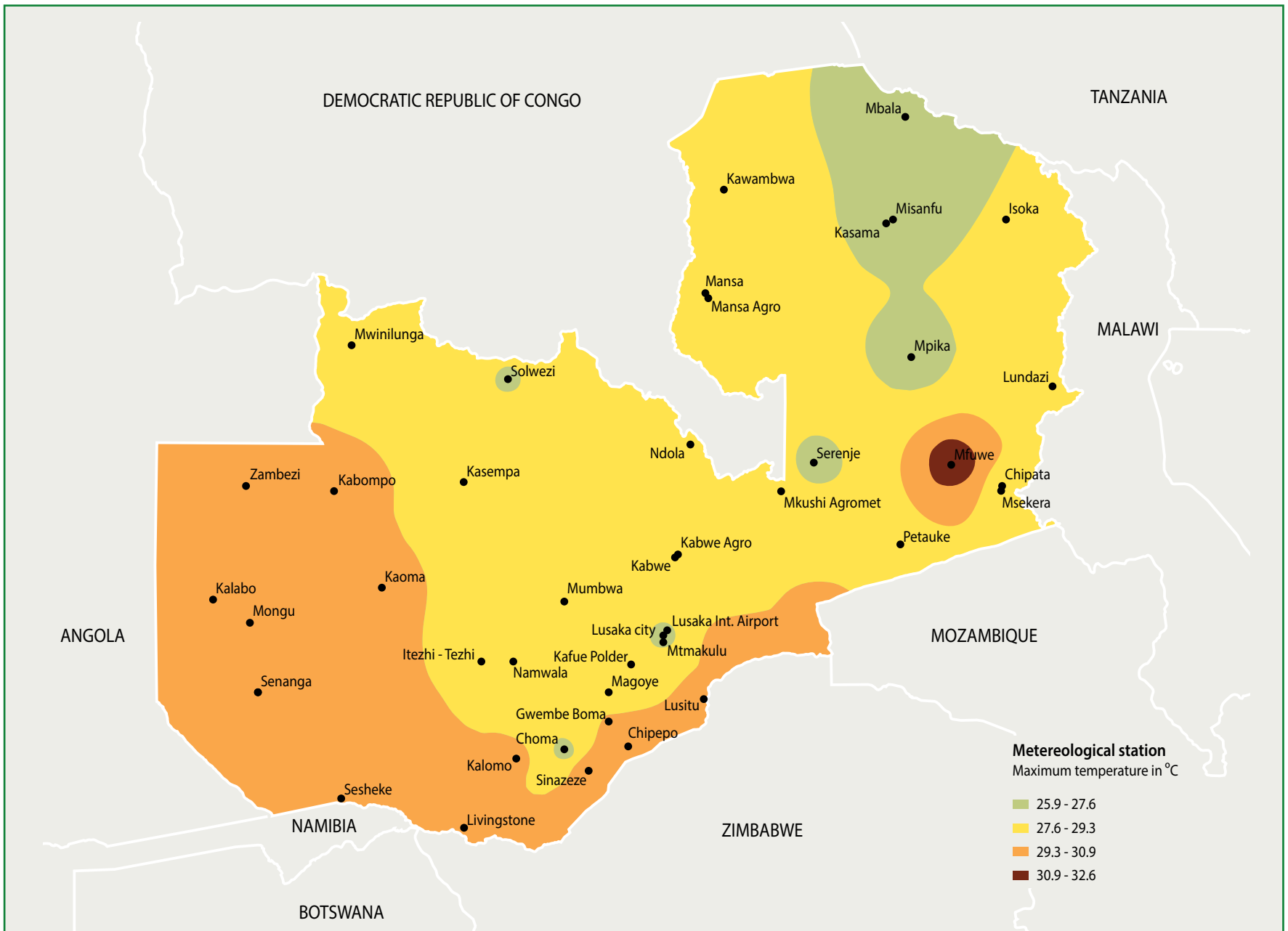


Figure 2.1 Average maximum temperature 1975 - 2010
Zambia Meteorological Department, 2011

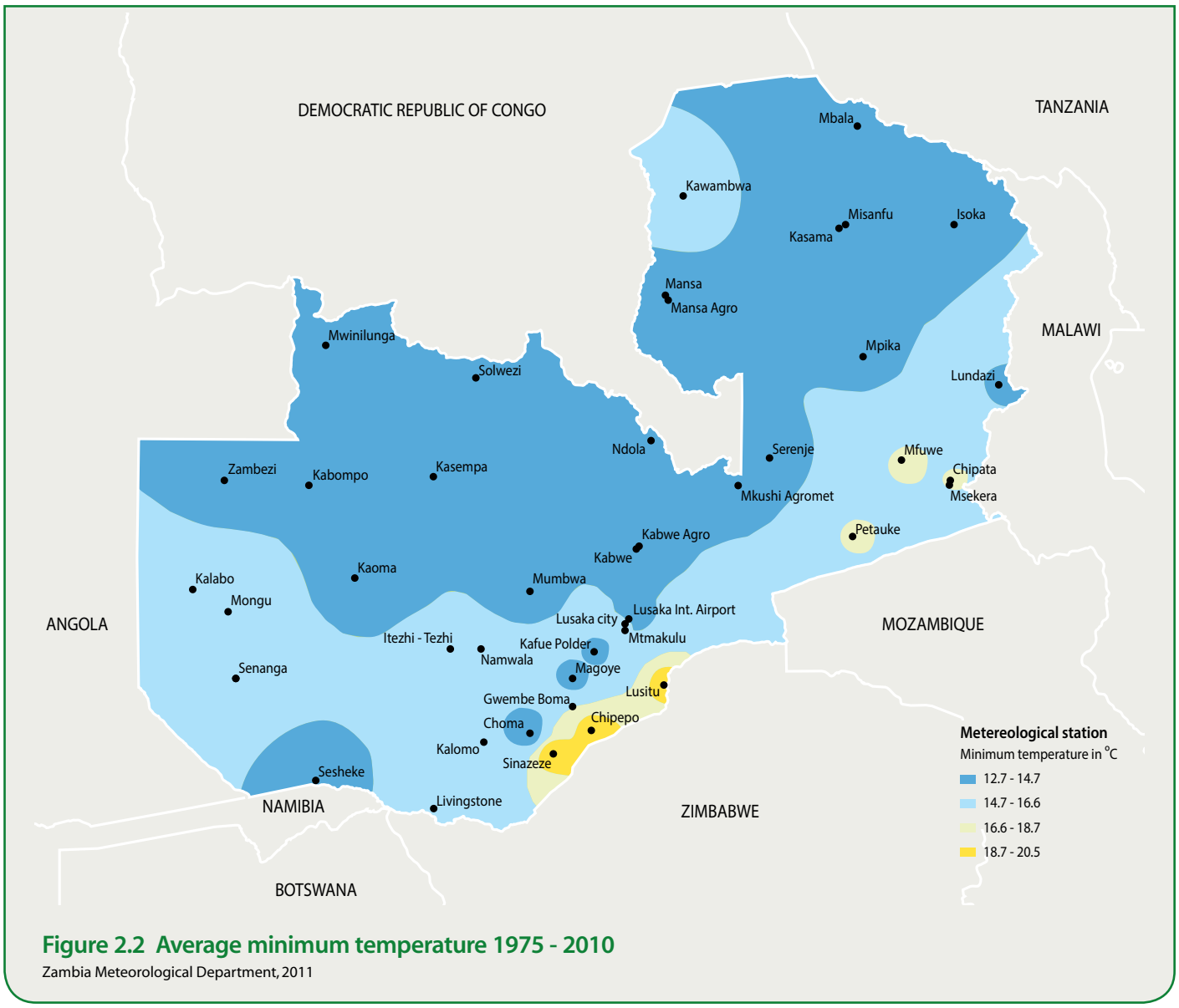


Figure 2.2 Average minimum temperature 1975 - 2010

Zambia Meteorological Department, 2011

Low average minimum temperatures were recorded in parts of North-Western, Copperbelt, Central, Luapula and Northern Provinces (Figure 2.2). The low average temperatures are attributed to the cooling effect of the Congo Basin breeze. These provinces receive more rainfall in comparison to the southern part of Zambia (ZMD, 2011).

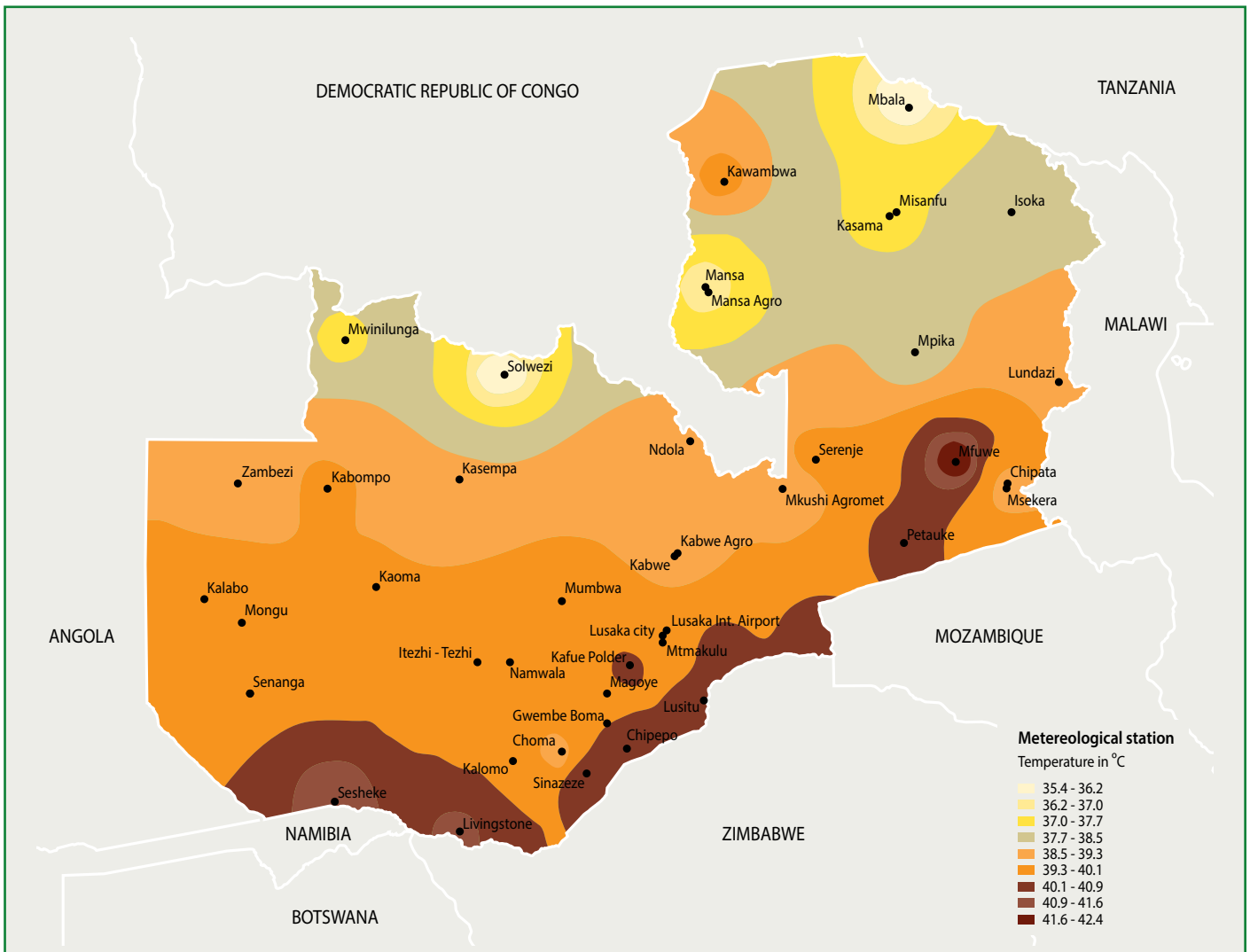


Figure 2.3 Extreme maximum temperature 1975-2010

Zambia Meteorological Department, 2011

Figure 2.3 shows that extremely high temperatures have been recorded in the Zambezi valley. For example, between 1975 and 2010, Livingstone, Sesheke and Mfuwe recorded temperature ranges as high as 41.6 °C to 42.4 °C (ZMD, 2011).

RAINFALL

Zambia's rainy season stretches from October to March. The average annual rainfall has fluctuated over the past 30 years. The lowest annual average rainfall ranged from 539.6 mm to 747.7 mm for the period between 1976 and 2005, whereas the highest was recorded in the period between 1950 and 1979 ranging from 1,291.9 mm to 1,425.4 mm.

Generally, the northern region of Zambia receives above average rainfall while the southern part receives below average rainfall. Figure 2.4 shows the average rainfall patterns based on the agro-ecological regions (ZMD, 2011), while in Figures 2.5 and 2.6 a trend is shown whereby rainfall amounts are progressively falling in the southern regions of the country.

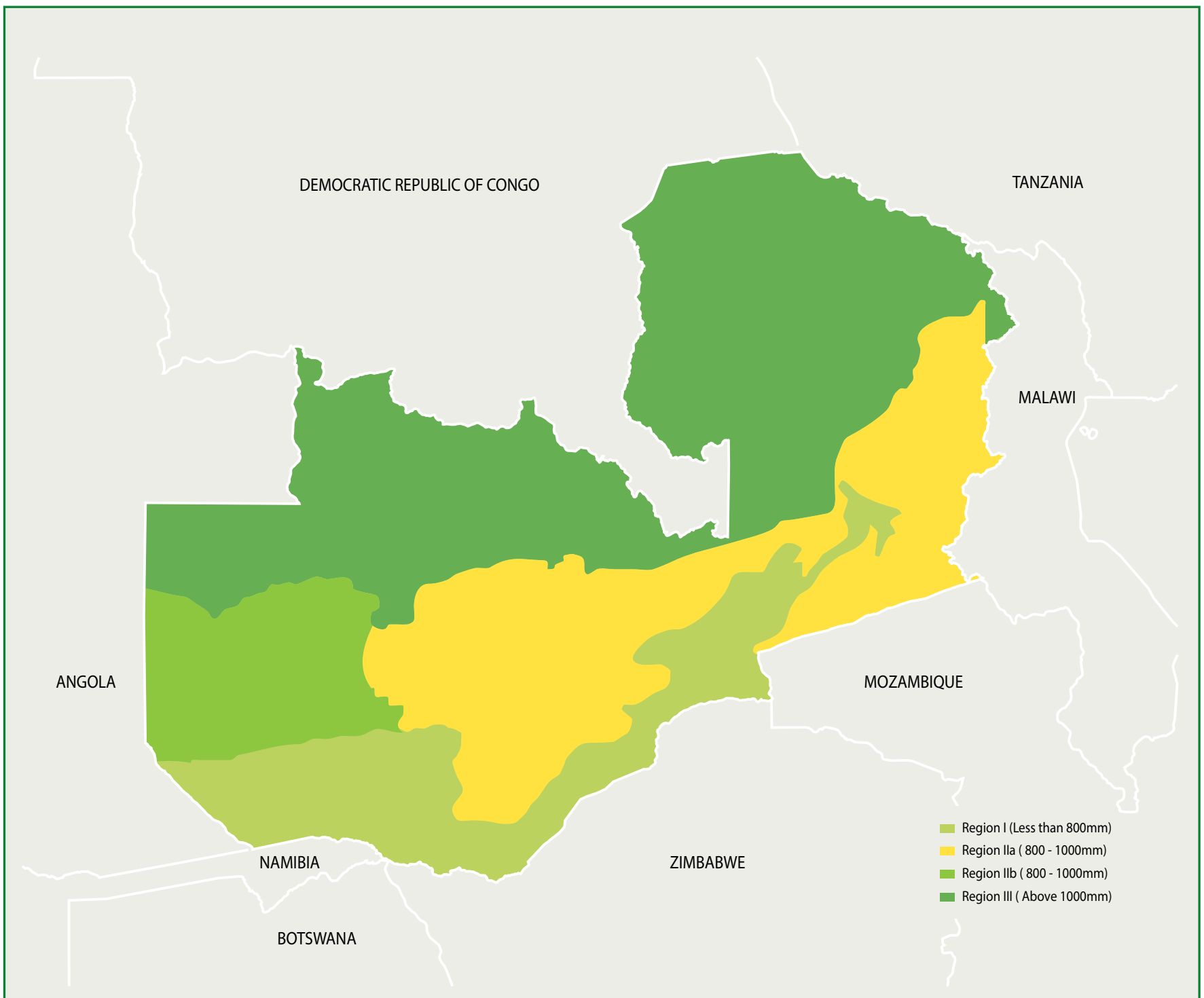


Figure 2.4 Rainfall patterns by agro-ecological region
Environmental Council of Zambia, 2008

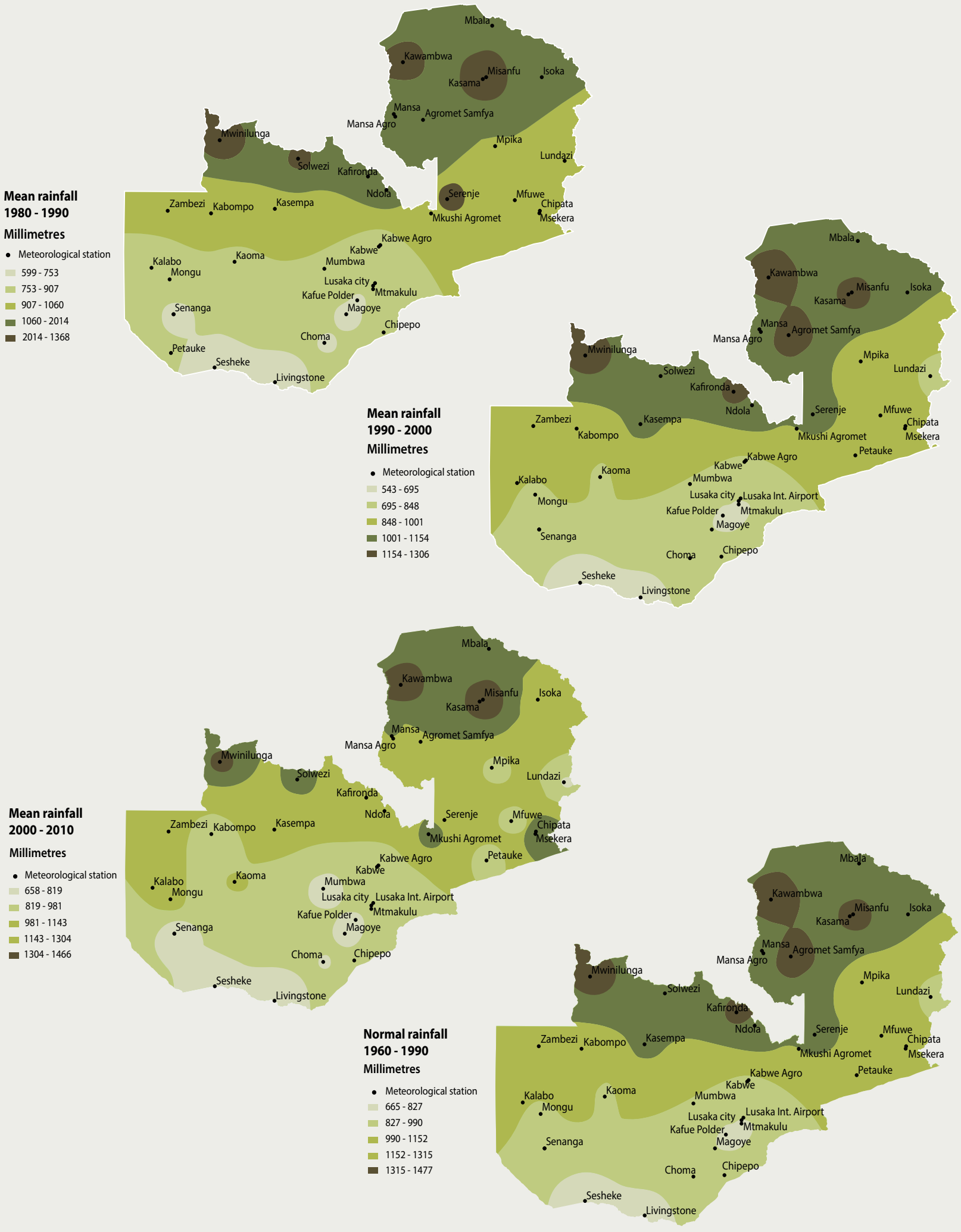
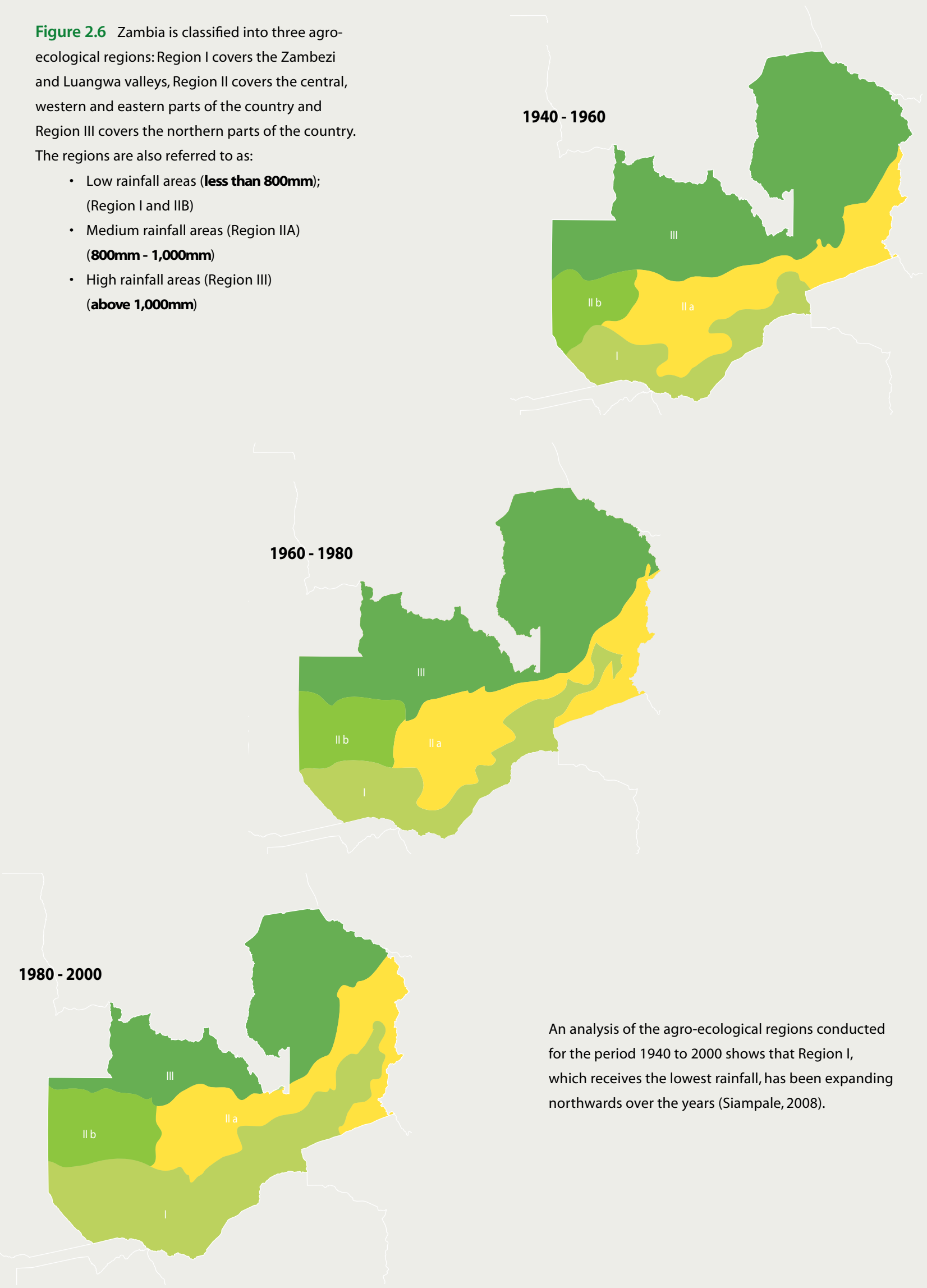


Figure 2.5 An analysis of mean rainfall for the period 1960 to 2010 shows that Zambia's rainfall regime has largely remained the same with the Northern Province receiving the highest rainfall amount, while the Southern Province receives the least amount (Zambia Meteorological Department, 2011). However, the southern part of the country is generally thought to be getting dryer than before.

Figure 2.6 Zambia is classified into three agro-ecological regions: Region I covers the Zambezi and Luangwa valleys, Region II covers the central, western and eastern parts of the country and Region III covers the northern parts of the country. The regions are also referred to as:

- Low rainfall areas (**less than 800mm**); (Region I and IIB)
- Medium rainfall areas (Region IIA) (**800mm - 1,000mm**)
- High rainfall areas (Region III) (**above 1,000mm**)



An analysis of the agro-ecological regions conducted for the period 1940 to 2000 shows that Region I, which receives the lowest rainfall, has been expanding northwards over the years (Siampale, 2008).

Heavy rainfall episodes can make some roads impassable.
Robwildlife2, 2012

Rains are brought by the Inter Tropical Convergence Zone, and are characterized by thunderstorms.
Enoch, J.W., 2005

ENERGY

The main source of energy in Zambia is woodfuel, accounting for 80 percent of domestic energy (Environmental Council of Zambia, 2008). Other sources of energy are electricity, fossil fuels such as petroleum and coal, and biofuels.

Zambia's energy consumption has risen over the last few years as a result of increasing activities in economic sectors such as mining, construction, manufacturing and agriculture as shown in Figure 2.7. This has resulted in increased demand for both electricity and petroleum products (Environmental Council of Zambia, 2008).

The use of environmentally unfriendly technologies such as old braziers and mud kilns has also caused the increase in the use of firewood. Inadequate implementation of energy sector regulations has further compounded the problem. Efforts to promote improved braziers have been taking place in Zambia on a small scale.

Box 2.1 Kafue Gorge Hydro-Power Station

The Kafue Gorge Upper hydropower station is the largest hydropower facility in Zambia. Located on the Kafue River, the station has a generation capacity of 990 megawatt (MW). It was constructed in two phases from 1967 to 1972 (600 MW) and from 1976 to 1978 (300 MW). The station has a reservoir area of about 805 sq kilometres with a maximum retention of 977 metres above sea level (masl), representing 770 million cubic metres of live storage. Through a power rehabilitation project, the power plant was later upgraded to 990 MW.

Charcoal on sale in Chirundu

Mukundi, M., 2009

Box 2.2 Kariba Dam Hydro-Power Station

The Kariba Dam was constructed between 1956 and 1960 and created one of the largest artificial lakes in the world, Lake Kariba.

The double curvature concrete arch dam wall stands at a height of 128 metres above the Zambezi river bed and spans 617 metres across the Kariba gorge. The lake stretches for 280 kilometres, covering an area of over 5,500 sq kilometres. The dam can hold back 180 cubic kilometres of water.

The dam wall is shared by the Kariba North Bank Power Station on the Zambian side and the Kariba South Bank Power Station on the Zimbabwe side. These two powers stations generate a total of 1,320 MW of electricity.

The electricity output at Kariba will increase by 600 MW once the expansion on both the South Bank and North Bank is completed.

Siavonga Tourism and Business Development Association, 2012

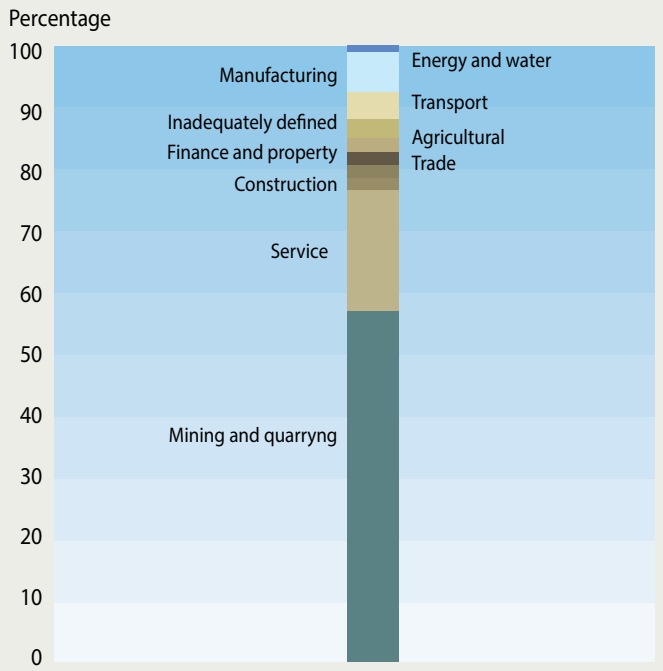


Figure 2.7 Sectoral power consumption

ERB, 2006

Kariba Dam in Siavonga, Southern Province

Padegimas, B., 2012

Kafue Gorge Dam

GeoEye, 2012

Kafue Gorge Upper Dam is a hydropower facility with a generating capacity of 900 MW. The dam is on the Kafue River, a major sub-catchment of the Zambezi River. The sub-catchment lies entirely within Zambia covering 20 per cent of the country's land

area and is home to almost half of Zambia's population . The Kafue Basin has a large concentration of mining, industrial and agricultural activities.

VEGETATION

Zambia's vegetation is categorized into four main types: deciduous forests, woodlands, savannas and grasslands as shown in Figure 2.8

Zambia has many exotic plantations including Chichele, Chati, Choma, Chisamba and Samfya plantations which are both government- and privately owned. The plant species grown on these plantations are conifers, pine, gmelia, and eucalyptus (Zambia Forestry Department, 2009). A total of 3,774 known plant species are found in the country, with woody plants making up the bulk as shown in Figure 2.9 (ECZ, 2008).

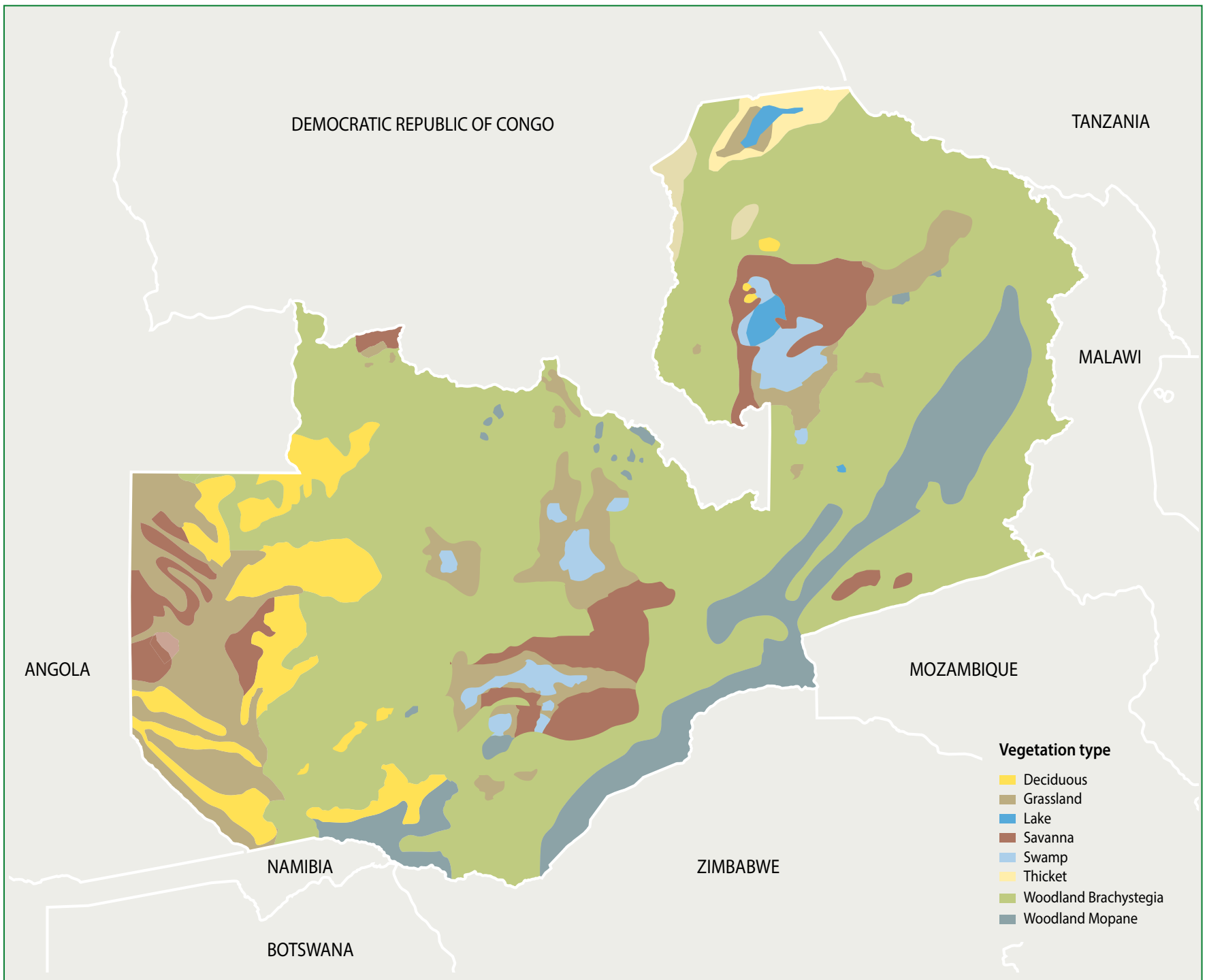


Figure 2.8 Vegetation types of Zambia
Environmental Council of Zambia, 2008

Bush fires cause severe destruction to vegetation
Ponyo, 2011

Box 2.3: Vegetation types in Zambia

Closed forests are dominated by trees whose crowns touch or overlap completely preventing the sun from reaching the forest floor. This vegetation type is sub-divided into five categories: dry evergreen, dry deciduous, montane, swamp and riparian forests. Closed forests cover area of about 31 million hectares in Zambia.

In woodlands (open forests), the canopy is not continuous and sufficient light reaches the ground to support vigorous grass growth. Miombo, Kalahari, Mopane and Munga tree species are all types of open forest vegetation.

The Miombo woodland is the most extensive and economically important vegetation type in Zambia. It is used in urban areas for the supply of timber, poles, firewood and charcoal. It is also the source of many non-wood forest products such as honey, medicines, mushrooms, caterpillars and other edible insects. Miombo woodlands cover an area of about 352 million hectares, about 47 per cent of the country's total land area.

Termitaria are scattered throughout Zambia wherever the soil is not sandy. They occur more frequently on dambos, which are shallow wetlands comprising of grasses, brushes and sedges, and in Munga and Mopane woodlands. They are scarce in dry evergreen forests.

Grasslands cannot support trees due to the fact that they are found in places that have a permanently high water table. Types of grasslands include dambos, flood plains, swamps and lakes.

Zambia Forestry Department, 2009, McCartney *et al.*, 2010

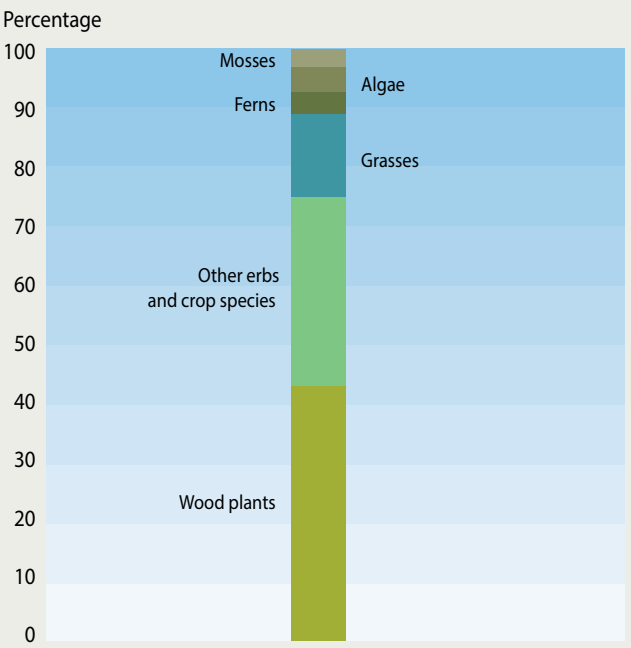


Figure 2.9 Inventories of plant species
Environmental Council of Zambia, 2008

FORESTS

Indigenous forest is estimated to make up 66 per cent (49.9 million hectares) of the total land cover of Zambia. The total growing stock, that is the total volume of forest, across all land uses for Zambia is approximately 2.9 billion cubic metres of which the majority, 2.1 billion cubic metres, is semi-evergreen miombo-dominated forests. Over 65 per cent of the forests in Zambia are secondary growth forests with active growth potential (Food and Agriculture Organization, 2008).

Of the total amount of land covered by forest, about 31 million hectares (63 per cent) are located on customary land, 12 million hectares on state land, and 5 million hectares are privately owned forests with legal land titles. However, 61 per cent of the forest and other wooded land which comprise bushes, shrubs, wooded grasslands and thickets are disturbed in one way or another by human activities (ILUA, 2008; Food and Agriculture Organisation, 2008).

Forests are an important habitat for wildlife.

Pexi from Helsinki Rock City/flickr.com, 2008

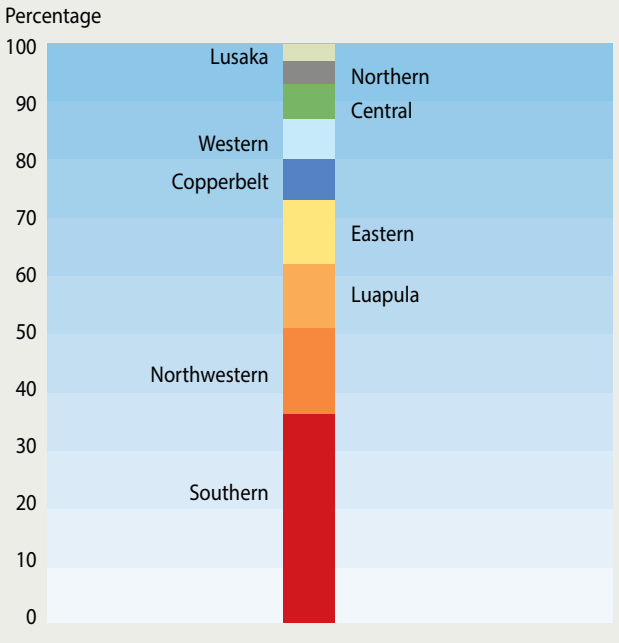


Figure 2.10 Percentage forest estate by province

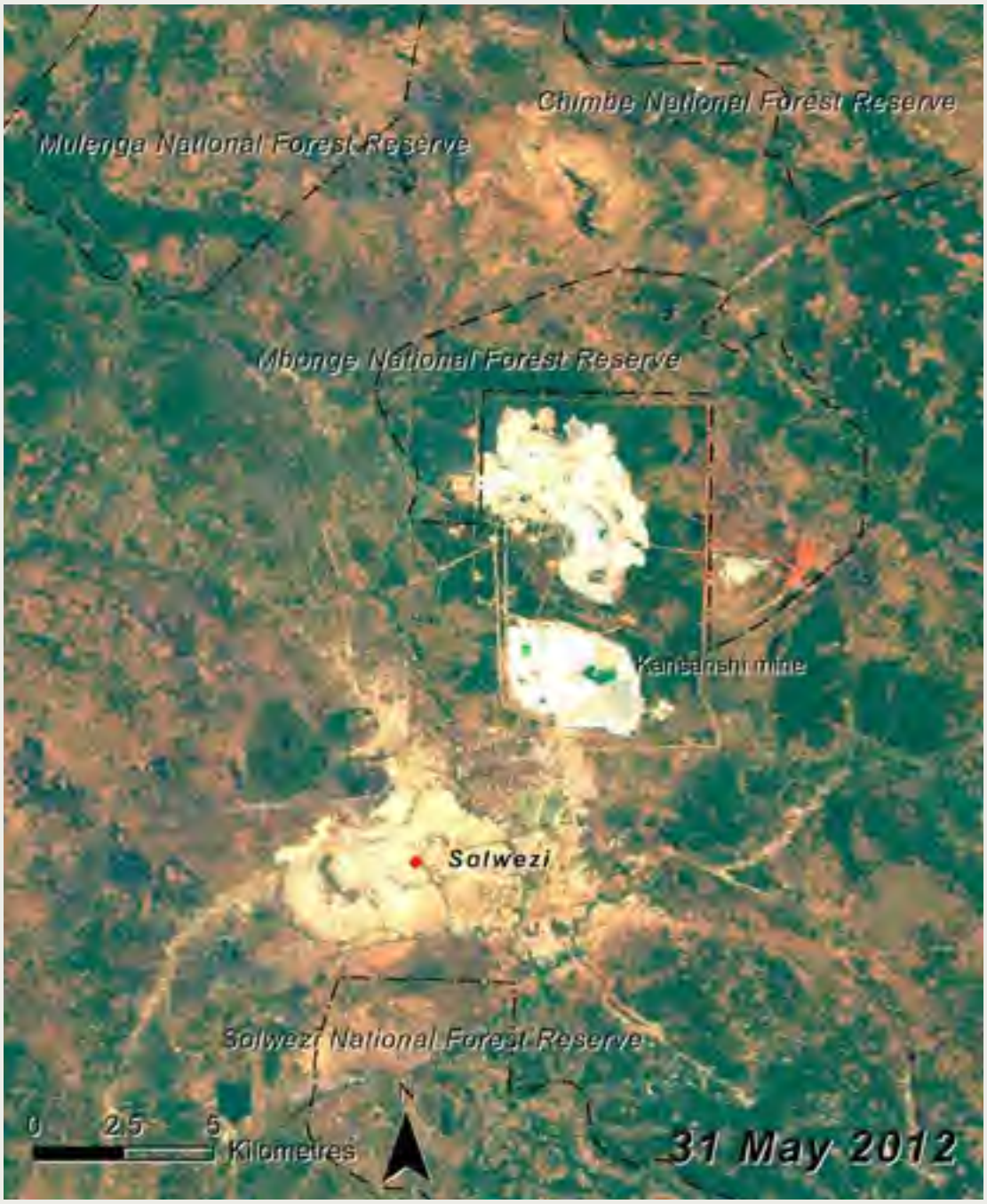
Food and Agriculture Organisation, 2008)

Exotic forest nursery

FD, 2008

Savanna woodlands are characterized by scattered trees and tall grass
Sisoje/iStock

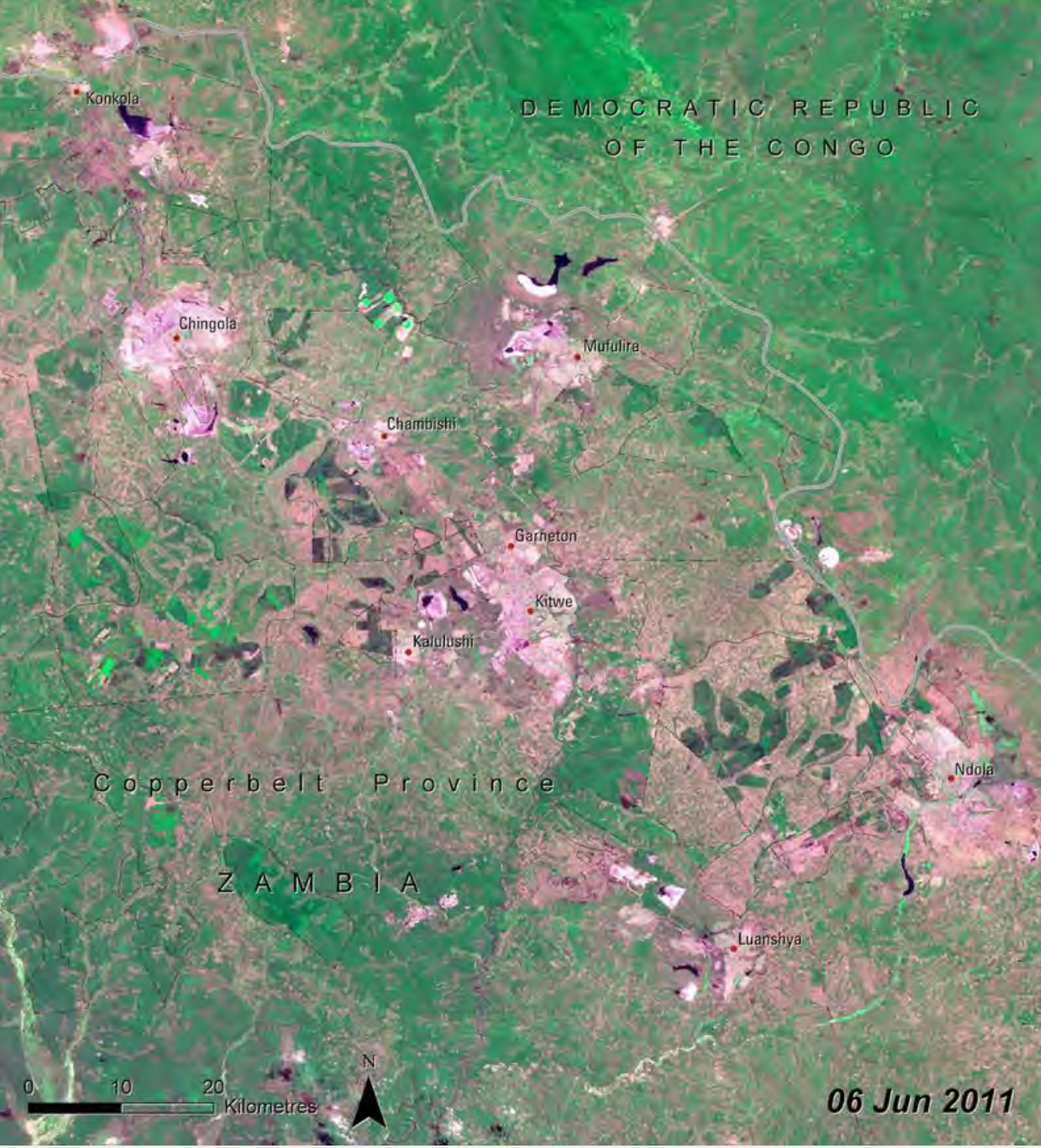
The opening up of new mines, including the Kansanshi Mine in Solwezi, has led to an influx of people coming in search of employment and other economic opportunities. This emphasizes the role of mining as a key economic sector in the country. As can be observed from the satellite images, there has been a drastic reduction in forest cover and an increase in built-up areas. The mines have however,



undergone an Environmental Impact Assessment, a process which ensures that environmental impacts arising from mining activities are identified and that mitigation measures are put in place. This will ensure compliance with Zambia's environmental legislation and is expected to result in sustainable environmental management practices in the mining sector.

Padegimas, B., 2012

The mining industry continues to play a pivotal role in Zambia's economic development. The largest and most important mines are the base metal mines, particularly copper and cobalt, whose mining history spans more than 90 years. Copper production increased from about 300,000 tonnes per year in 2005 to 819,574 tonnes in 2011 (Environmental Council of Zambia, 2008; GRZ, 2012).



Large-scale copper mining has resulted in the development of large towns. Until the 1960s, the mining industry used wood from the areas surrounding the mines to generate power for copper smelting.
Large urban centres open-pit mines and areas of forest degradation can be observed in the 2011 image.

Mining

The Kansanshi mine is located 10 kilometres north of Solwezi in North-Western Province and 180 kilometres to the northwest of Chingola in the Copperbelt Province.

Mining is carried out in two open pits, Main and Northwest, using conventional open pit methods and hydraulic excavators and a fleet of haul trucks. Copper production at the mine in 2011 was 230,000 tonnes and is expected to increase to 400,000 tonnes by 2015. As of December 31, 2011, Kansanshi had an estimated mine life of 11 years. (First Quantum, 2011)

One of the open pits at Kansanshi Mine
First Quantum, 2011

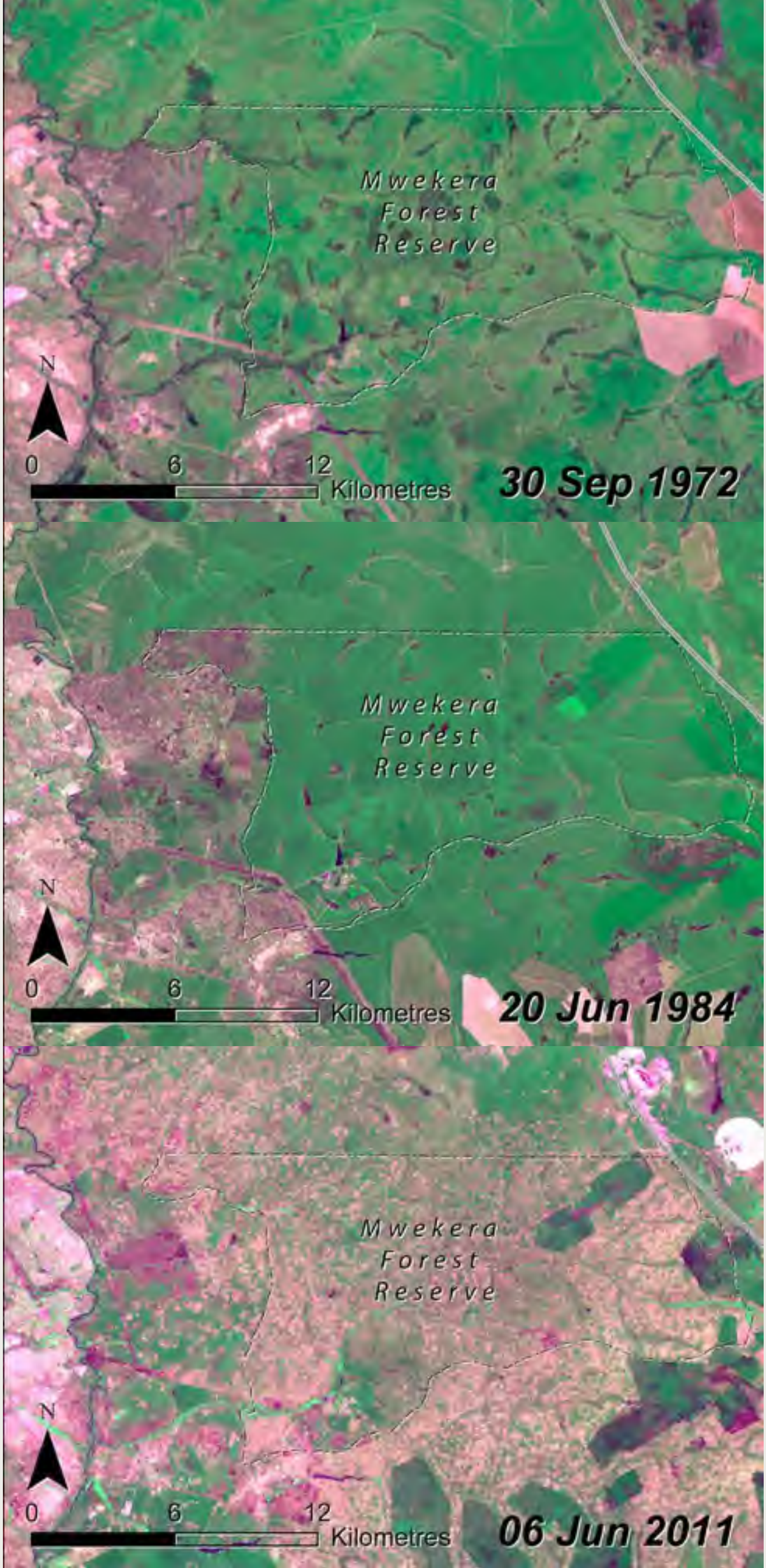
Tailing Dam
First Quantum, 2011

Smelter works
Utenriksdept, 2011

Processing Plant
First Quantum, 2011

Ikelenge district is located in the North-Western Province of Zambia and borders the Democratic Republic of Congo and Angola. The region is rich in plant and animal biodiversity, and local livelihoods are dependent on the harvesting of both wood and non-wood products such as honey and mushrooms. The dramatic changes in forest cover, visible in the satellite images, can be attributed to

human migration, demand for land, and woodfuel and timber harvesting. For Zambia and its neighbouring countries to continue deriving economic benefit from the forests, there is a need to minimize biodiversity loss. This will require conservation planning and management based on scientific knowledge of both biodiversity and human impacts.


Mwekera
Forest
Reserve
N
0
6
12
Kilometres
30 Sep 1972
Mwekera
Forest
Reserve
N
0
6
12
Kilometres
20 Jun 1984
Mwekera
Forest
Reserve
N
0
6
12
Kilometres
06 Jun 2011

Forest Loss - Mwekera Forest

Mwekera National Forest is located in Kitwe, in the Copperbelt Province. Established in 1958, the forest reserve is home to a forestry college, its staff and their families, as well as staff of the Aquaculture Centre. Due to an increase in the population within the college, Fisheries Department and the surrounding areas, the forest area has declined from an estimated 17,887 hectares in 1957 to less than 10,000 hectares in 2005 (Shitima, 2005). From 2005 to 2011, the forest continued experiencing degradation and another 10,000 hectares were lost (KCC and ECZ, 2010). Demand for charcoal, land for cultivation, woodfuel, timber for construction, and sand mining have exerted pressure on the forest.

Tree cutting for energy
The Post, 2010

Forest cleared due to encraochment
Justin Qian/flickr.com, 2007

Mushroom in the forest
greenstone.org, 1990


Lobéké
Kabompo
0 10 20 Kilometres
Ndenda
Forest Reserve
05 Aug 1973


Lobéké
Kabompo
0 10 20 Kilometres
Ndenda
Forest Reserve
01 Jun - 09 Jun 1984


Lobéké
Kabompo
0 10 20 Kilometres
Ndenda
Forest Reserve
18 Apr - 25 Apr 2011

Women fetching water
Haijden, M.C., 2008

Forest loss - Kabompo District

Kabompo district is located in the North-Western Province of Zambia, and is home to a population of 92,321. The district recorded a population growth rate of 2.6 per cent between 2000 and 2010, which was higher than the provincial population growth rate of 2.2 per cent (Central Statistics Office, 2012).

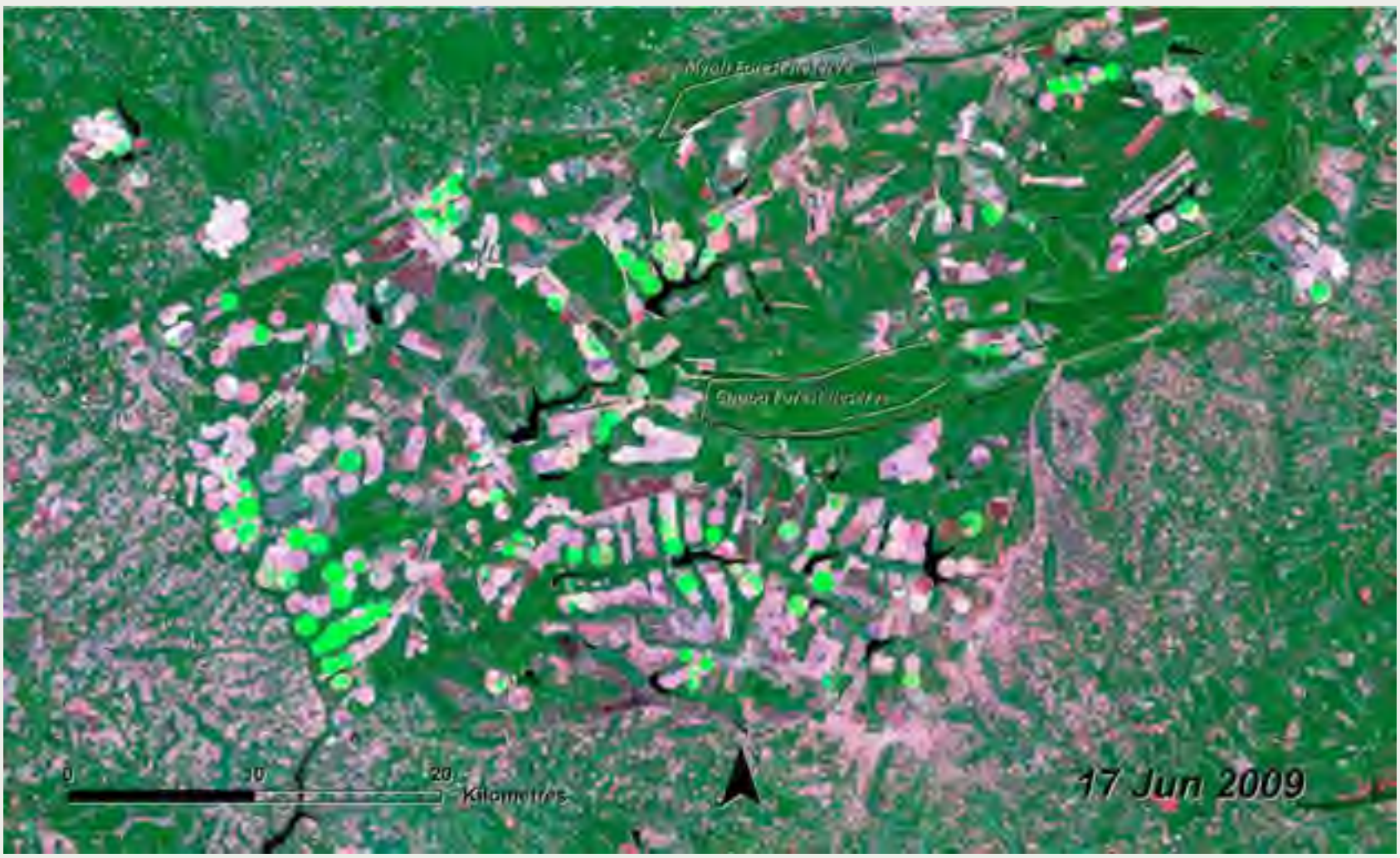
Increase in the development of the mining activities in the upper Kabompo basin, has resulted in population growth and changes in land use. The encroachment of agriculture into the Ndenda Forest Reserve has contributed to the loss of forest cover as seen in the satellite images.

Village in the forest
Haijden, M.C., 2008

Forest loss in Kabompo
Haijden, M.C., 2008

Vegetation along the Kabompo river
hypeverlag.de/flickr.com, 2008

A comparison between the 1984 and 2009 images show drastic changes in land use from forest to agriculture around the Mkushi farming block in Central Province. These changes are mainly due to the increase in crop production in the area. It can be observed



that the forest cover in Chaba Forest Reserve has remained largely undisturbed. This is because the area is being partly utilized for ranching (Bwalya, 2004.)

S-McCaffrey/iStock

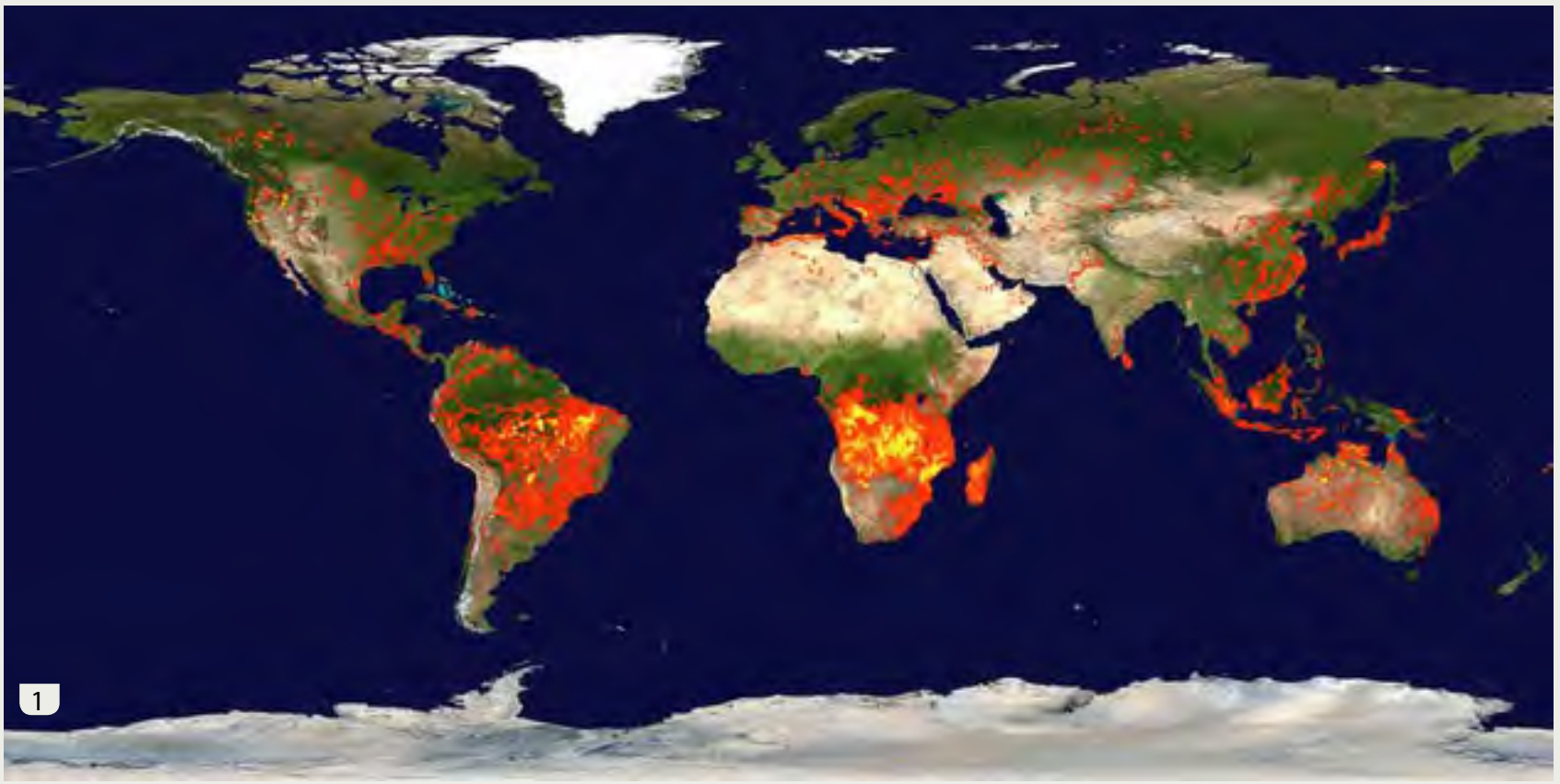
Mazabuka district, in the Southern Province, covers an estimated total land area of 670,000 hectares of which 66 per cent is arable land. Farming is the district's major economic activity.

Agricultural activities have been expanding since the year 2000. This can be attributed to growth in commercial agriculture, particularly sugarcane, wheat, and coffee production, as well as ranching. Of great significance is the increase in irrigation activities that have occurred alongside the expansion of Zambia Sugar cane plantations, which are shown in the satellite images. Sugar cane is one of the major crops

grown in the district, covering an estimated area of 28,785 hectares. Other important crops include maize, groundnuts, cotton, cowpeas, sweet potatoes, soya beans and mbambara nuts.

Economic growth in the district has increased demand for housing and auxiliary services. Land management has become an issue as practices such as the removal of vegetation for crop production, charcoal production and construction purposes contribute to land degradation (MMC, 2012).

Sisoje/iStock

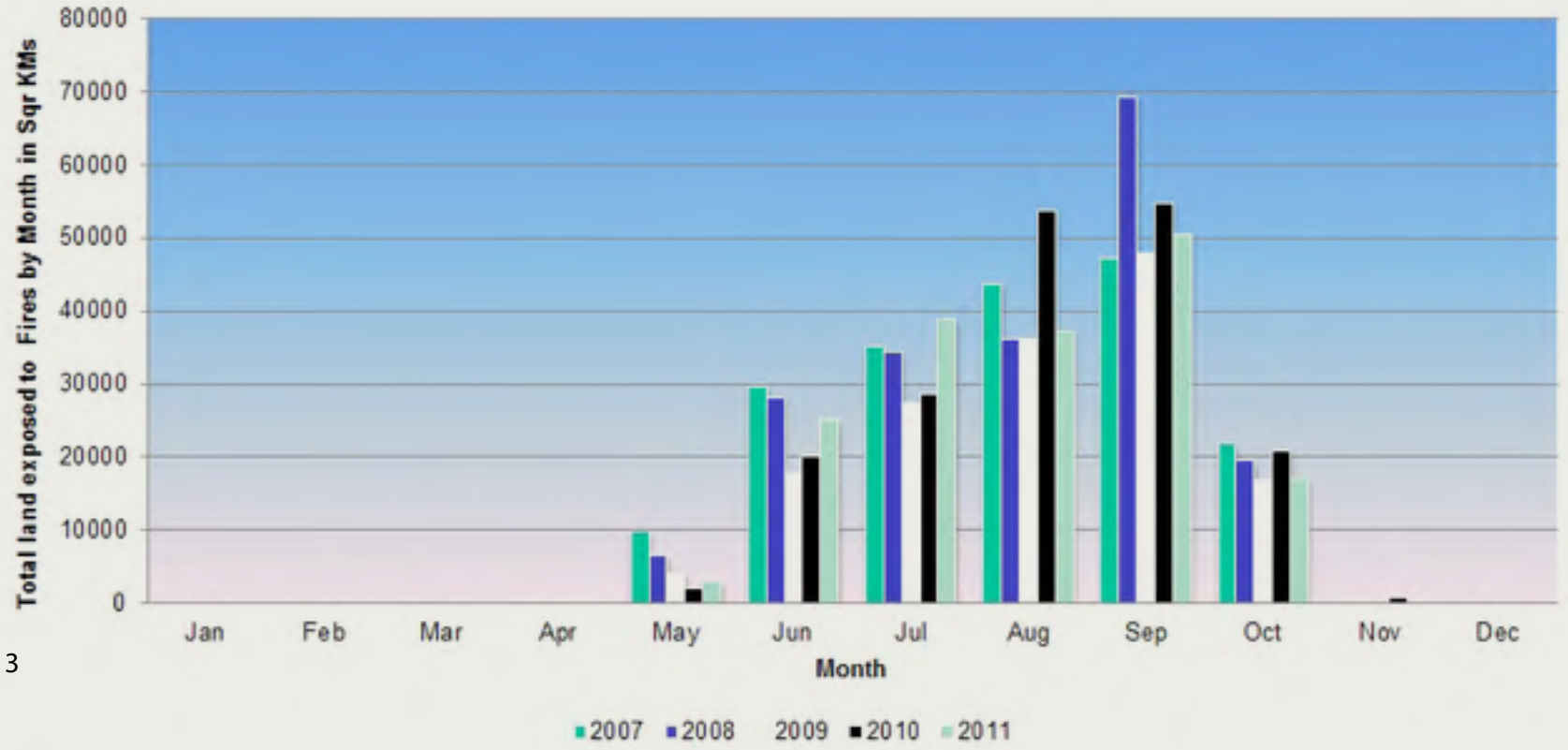


10 Day Global Fire Map, 18-27 Aug, 2012
Global Fire Mapper

McMorrow, B.J., 2010

Large swathes of forests and grasslands are lost every year to wild fires.

1. Central and Southern Africa had the largest number of wild fires in 2012.
2. Savannah grasslands as those prominent in the Kafue National Park are highly susceptible to bush fires.
3. The fire season in Zambia starts in May and ends in October, with September as the peak fire month
4. Deciduous woodlands and shrublands are the most affected landcover types in Zambia.
5. Burn scars in 2007 and 2011



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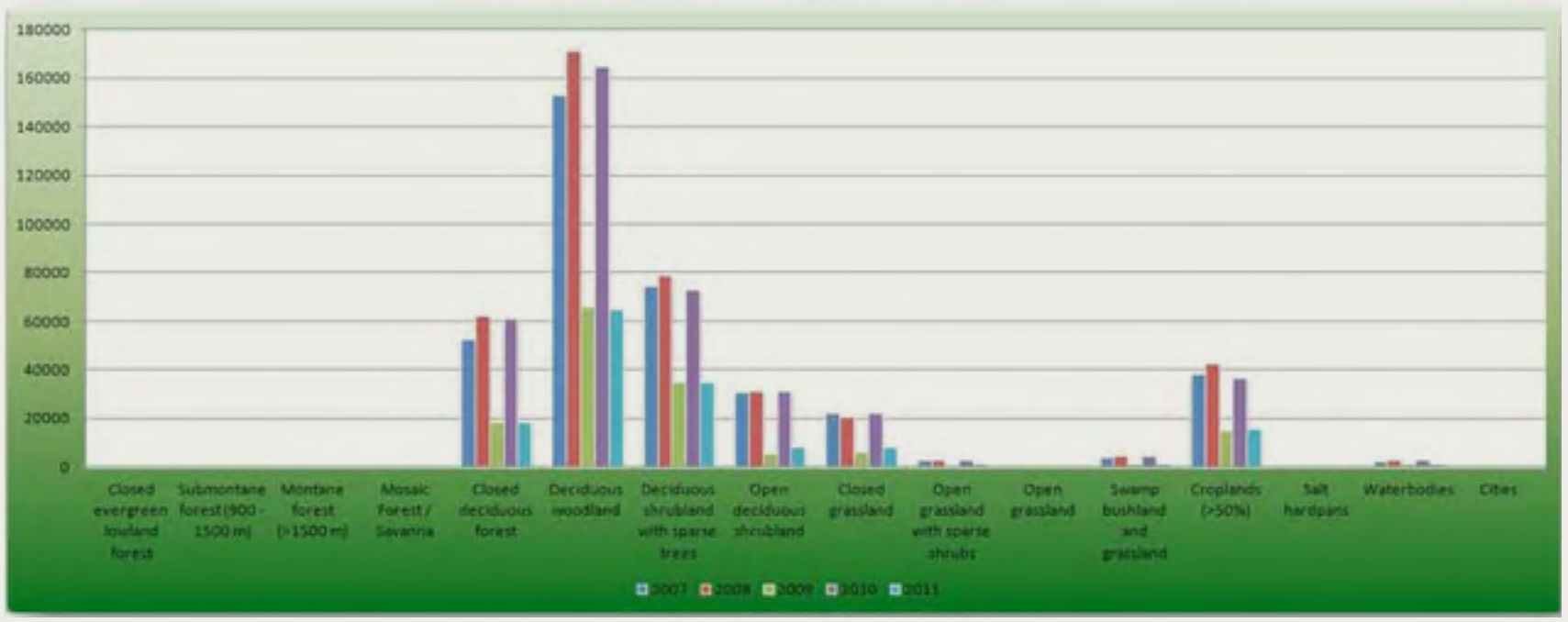

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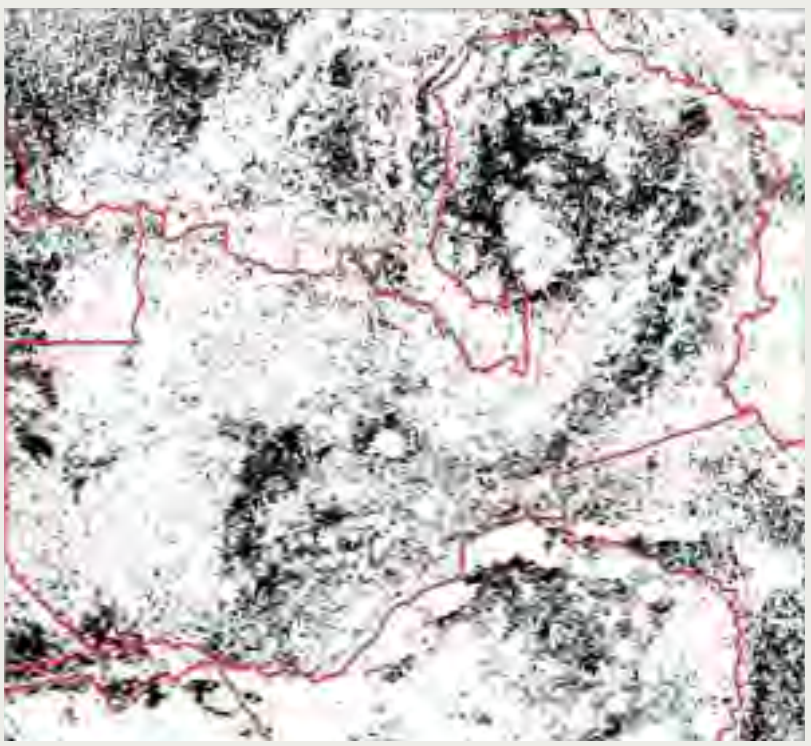
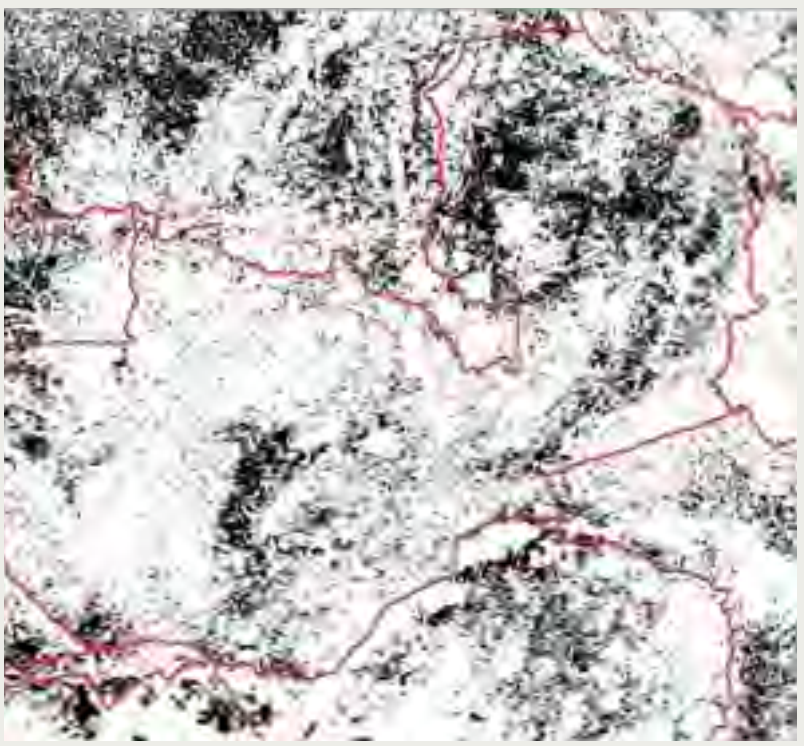


2007



2011

5

ZEMA, 2012

WILDLIFE

Approximately 225,000 sq kilometres, that is 30 per cent of the total land cover in Zambia have been designated as protected areas. This is one of the largest amounts of protected land in Southern Africa. National Parks make up 8 per cent of the country's land cover and Game Management Areas (GMAs) make up 22 per cent (MTENR, 2006). The country has 20 national parks and 34 GMAs as shown in Figure 2.11. The GMAs serve as buffer zones around the National Parks and are host to 224 known mammalian species of which about 12 per cent are endangered (ECZ, 2008).

Expanding human settlements, cultivation, livestock grazing and deforestation, as well as road construction and mining have resulted in the fragmentation of ecosystems and obstruct wildlife migratory routes to breeding, watering and feeding grounds (ECZ, 2008).

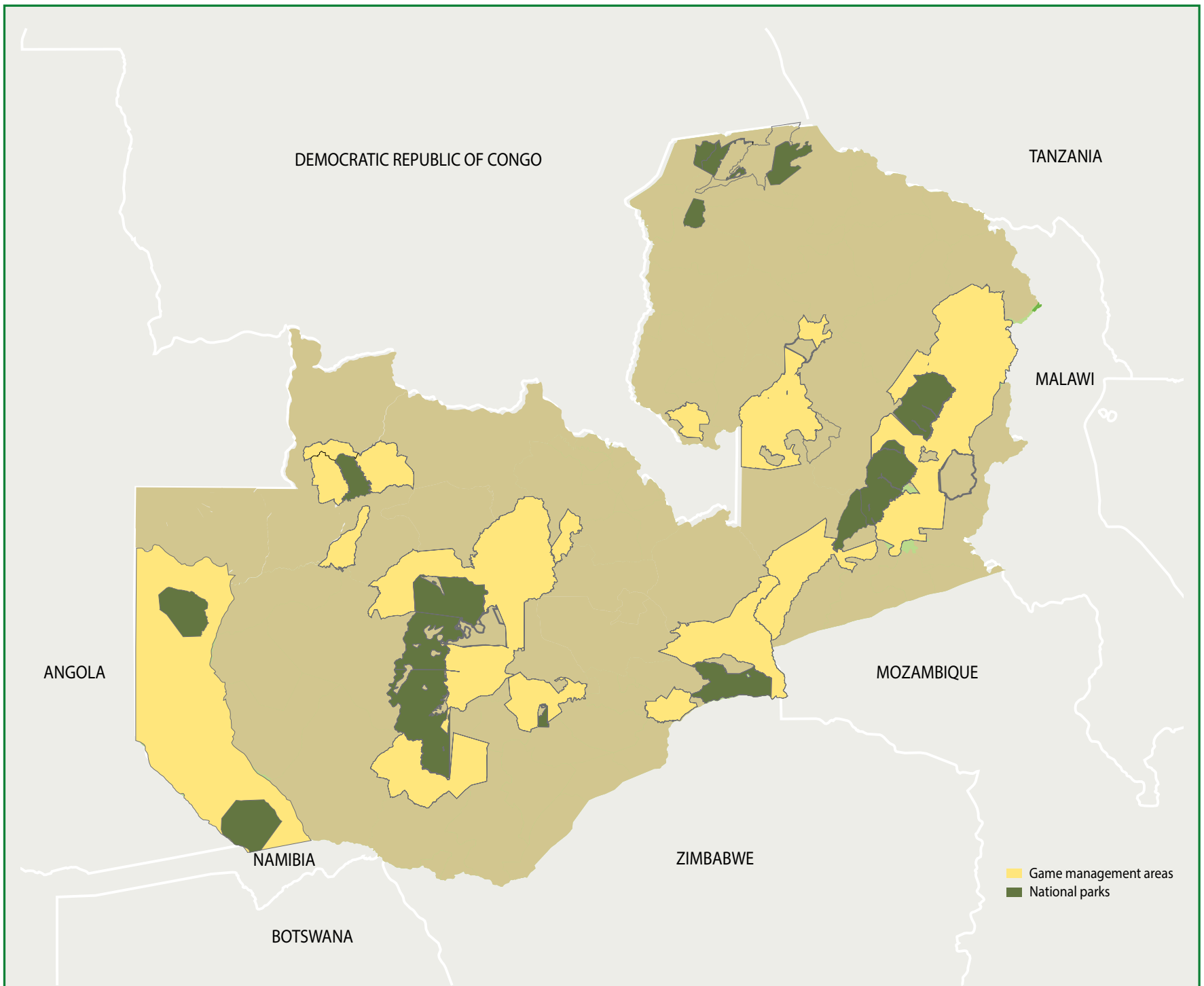


Figure 2.11 National parks and GMAs
Environmental Council of Zambia, 2008

Giraffes in Mosi oa Tunya National Park
Padegimas, B., 2012

Birds in Lower Zambezi National Park
Padegimas, B., 2012

A Monkey in Lower Zambezi National Park
Padegimas, B., 2012

Elephants in Lower Zambezi National Park
Padegimas, B., 2012

Crocodiles at a farm in Livingstone

Padegimas, B., 2012

Birds in Mosi oa Tunya National Park
Padegimas, B., 2012

Warthog in Kafue National Park
Padegimas, B., 2012

Bilili Game Management Area (GMA) covers parts of Itezhi-Tezhi, Kalomo and Namwala districts of Southern Province. This location presents administrative challenges in the management of the GMA. Over the years, people have migrated into the area in search

of agricultural land, growing crops such as cotton and maize. There has been loss of forest cover due to the clearing of land. The resultant deforestation has significantly changed the habitat for wildlife in the Bilili GMA.

WATER RESOURCES

Water sustains life and plays an important role in Zambia's socio-economic development. Many economic activities including agriculture, mining and tourism are dependent on the availability of water.

Out of country's total area of 752,614 sq kilometres, water covers an estimated area of 11,890 sq. kilometres (Environmental Council of Zambia, 2008). This constitutes rivers and lakes such as Mweru, Bangweulu, Kariba and Itezhi-tezhi as shown in Figure 2.12. The country's major river catchments include Chambeshi, Kafue, Luangwa, Luapula, Tanganyika and Zambezi (ECZ, 2008) as shown in Table 2.2.

The country's expanding urban population, industrial and agricultural growth, and the changing climate have all affected water availability to Zambia's overall population. In 2011, the total domestic water supply coverage in urban areas was 77.5 per cent. Lusaka city had the highest percentage of residents (82 per cent) with access to water services. That same year, only 15 per cent of the residents of Luapula had access to water services (NWASCO, 2012).

Table 2.2: Zambia's Major River Catchments

River Catchment	Total Catchment Area (km2) *(Area Outside Zambia)*	% Contribution to Surface Water Potential	Annual Run-off (km3)
Lake Tanganyika	15 856 *(233 244)*	1.73	1.99
Kafue River	156 995	8.4	9.88
Chambeshi River	*44 427*	7.62	8.75
Luangwa River	144 358 *(3 264)*	19.44	22.32
Luapula River	173 396	26.25	30.14
Zambezi River	268 235 *(418 814)*	36.36	41.75
Total	803 267 *(422 078)*	99.8	114.83

Ministry of Energy and Water Development, 2010

Luapula River
McMorrow, B.J., 2010

Kafue River
McMorrow, B.J., 2010

Zambezi River
Padegimas, B., 2011

Confluence of the Zambezi and Chobe Rivers at the Zambia, Botswana, Namibia and Zimbabwe border
McMorrow, B.J., 2005

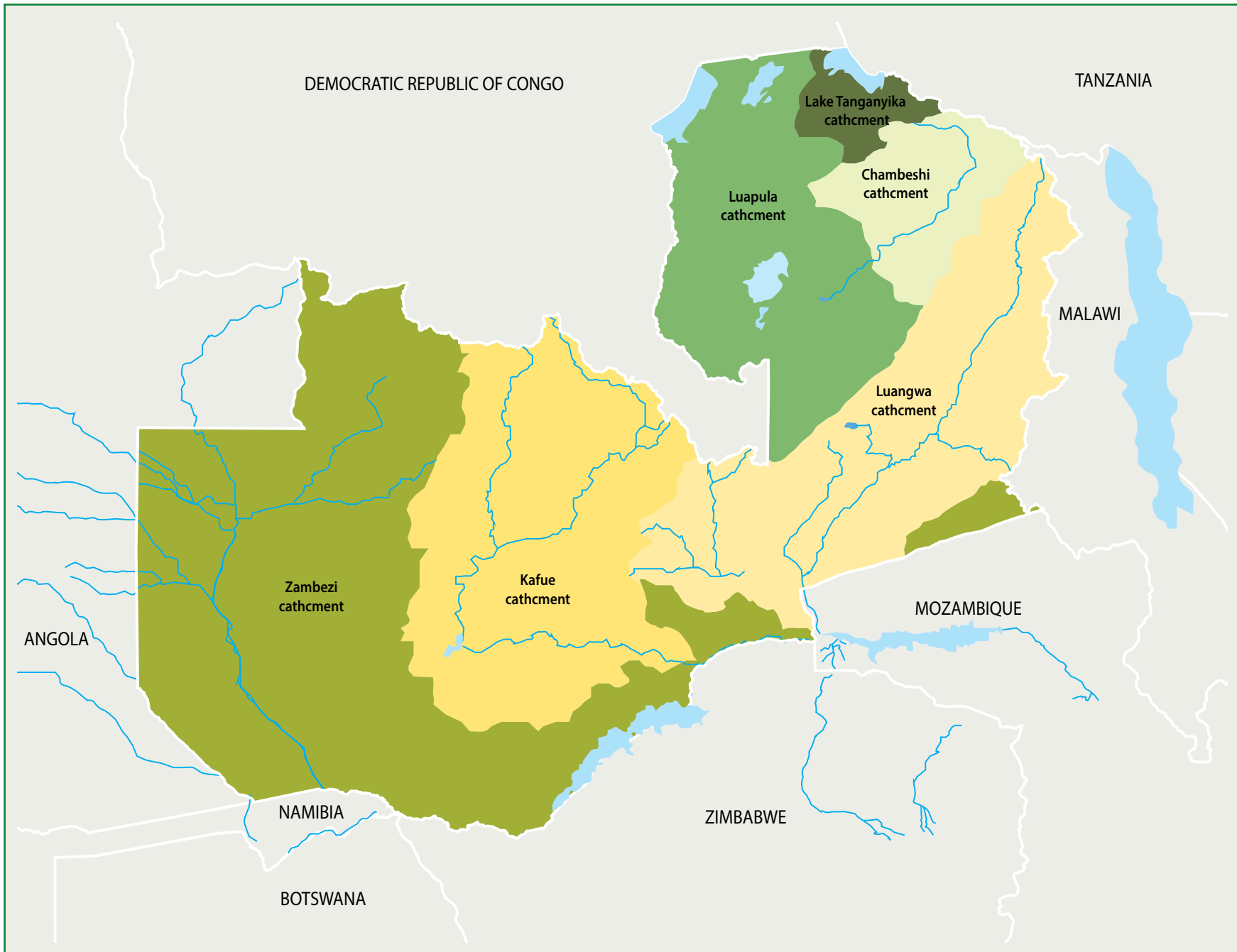


Figure 2.12 Major water bodies in Zambia
Zambezi River Authority, 2000

Satellite images show Lake Mweru Wantipa and its surrounding swamp areas in Northern Province. Its water is muddy and at times appears reddish and slightly oily. In the local dialect (Bemba) "wa ntipa" means "with mud", hence "Mweru Wantipa" distinguishes it from its bigger neighbour Mweru, which has clearer water. As can be observed in the 2011 image, the lake has been shrinking. This change can be attributed to siltation and the food preservation practice of smoking fish (The Best of Zambia, 2011).

Much of the surrounding forests are cut down to provide woodfuel for curing fish. The lake's varying water levels is also a result of inconsistent rainfall patterns. Severe droughts have caused the lake to completely dry up in the past. The above average rainfall received between 1964 and 1980 caused the lake to fill up an area of about 1 600 sq kilometres. The lake has decreased both in area and depth partly due to recent episodes of drought.

WETLANDS

Zambia is home to several types of wetlands, the most common of which are riverine wetlands, floodplains like the Barotse, Kafue flats, Luangwa, and dambos. Dambos are a type of wetland particular to Central, Southern and Eastern Africa, particularly Zambia and Zimbabwe and are characterized by grasses, rushes and sedges. Dambos are very common in Zambia. Nearly 18 per cent of the country is covered by wetlands, of which 12.5 per cent are dambos.

Wetlands are water resources that are used for agriculture, livestock, fisheries, and domestic water supplies. They also improve the quality of water by acting as a filter for pollutants and sediments. The Bangweulu swamps, the Zambezi Flood Plain, the Kafue flats, Luapula-Mweru, Mweru-Wantipa, Busanga Plain and Lukanga swamps are Zambia's major wetlands. Figure 2.13 shows the wetlands of Zambia (McCartney, 2010).

Busanga Plains in Kafue National Park
Madama, S., 2009

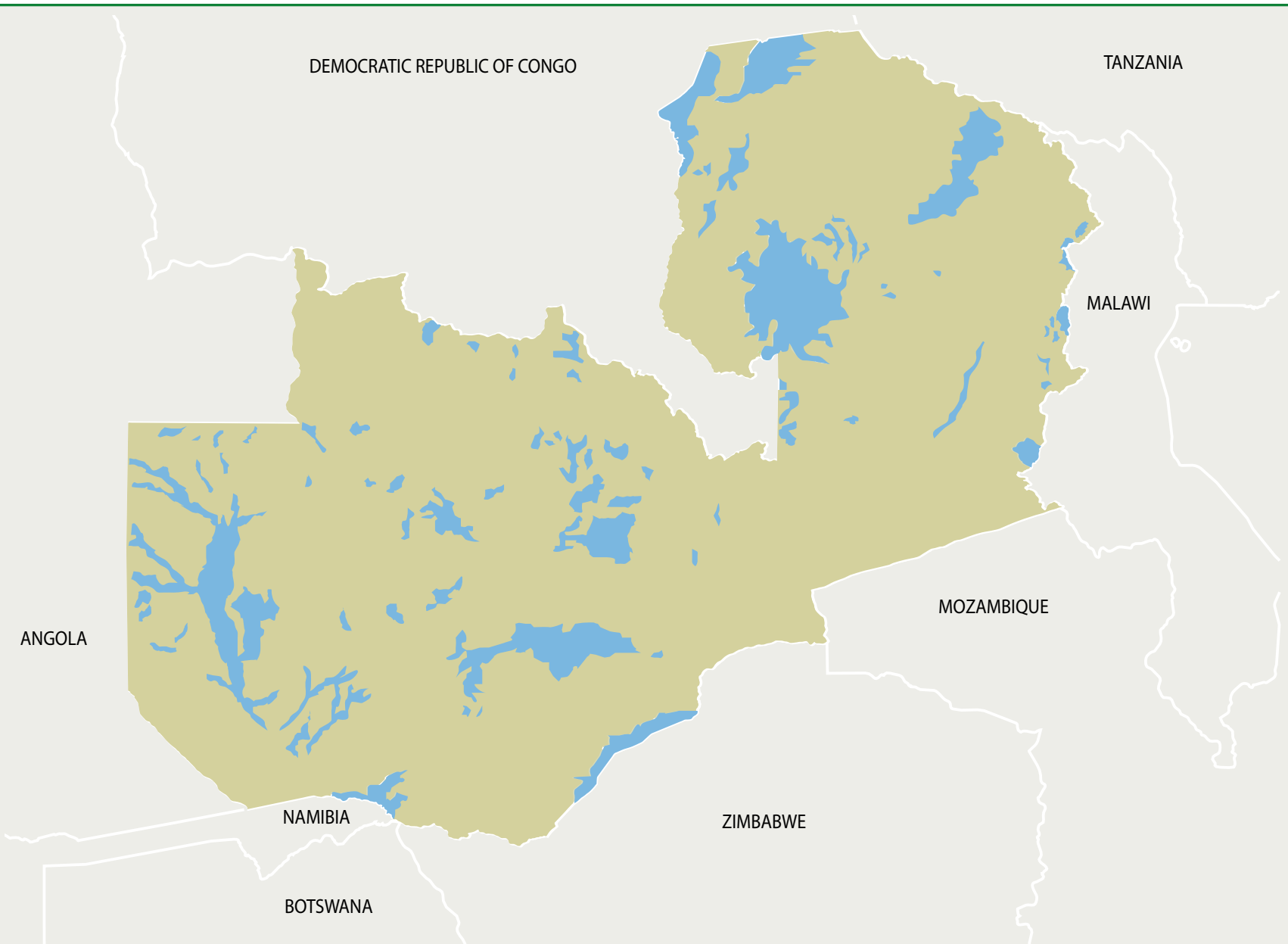


Figure 2.13 Location of wetlands in Zambia
Environmental Council of Zambia, 2008

Fish traders in the Kafue flats
The WorldFish Center, 2001

Eight of Zambia's wetlands are Ramsar sites. Ramsar sites are wetland areas of international significance whose conservation and wise use are promoted under the Convention on Wetlands, which was agreed upon in Ramsar, Iran, in 1971. According to the convention, the wise use of wetlands entails "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development" (Ramsar Convention Secretariat, 2008). In Zambia, Ramsar sites are areas of wildlife and biodiversity conservation, particularly the conservation of birdlife and aquatic creatures (World Conservation Monitoring Centre, 2010).

Box 1.1 Location of Wetlands in Zambia

The Kafue Flats are the vast, open floodplains of the Kafue River, which makes up part of the Zambezi River basin. They are one of Zambia's most commercially important and agriculturally productive areas, providing both economic and ecological benefits to the country. Kafue Flats are an extensive area of wetlands and floodplains 255 kilometres long and 60 kilometres wide, covering an area of approximately 6,500 sq kilometres and home to about 6 million people (Mumba and Thompson, 2005; Chabwela, 1994; Williams, 1997).

The wetlands also host Zambia's largest bird sanctuary. More than 450 bird species can be found in the Kafue Flats, some throughout the year and others passing through during migration. The Kafue flats are especially important for the wattled crane, which has been classified a threatened species by the International Union for Conservation of Nature (Nyambe, 2003).

Bangweulu Swamps
McMorrow, B.J., 2010

The Barotse floodplain is a designated Ramsar site. Covering an area of 1.2 million hectares, it is the second largest wetland in Zambia after the Lake Bangweulu system. The floodplain is mainly comprised of grasslands and a number of small wooded areas on higher ground (Van Gils, 1998). It is flanked by a plateau of Kalahari sand covered in semi-evergreen woodland, and is interspersed with low-lying dambos (Timberlake, 1998).

During the dry season, agricultural production, economic activities and local settlements are focused on the floodplain area. As the plain becomes inundated during the rainy season, people move to the uplands and plain fringes. This annual relocation of people and cattle includes the movement of the Litunga in the traditional ceremony, called the Kuomboka (Nkhata and Kalumiana, 1997). The Barotse floodplain differs from other plains because it is home to a large permanent lake as well as to swamps and smaller lakes that dry out each year. The construction of the Mongu-Kalabo road currently underway is intended to improve accessibility to the area.

Barotse Floodplains
World Fish, 2012

Lukanga swamp is one of Zambia's 8 Ramsar sites. Charcoal production and slash-and-burn agriculture have been a major threat to the Lukanga swamp ecosystem, resulting in soil erosion, the turbidity of the water and siltation. Kawena, Kembe, Lukulaisha,

Lunjofwa, Mushingashi and Sanje all show drastic changes in forest cover between 1991 and 2011. (Mwakikagile, 2010).

CHAPTER 3

TRACKING ZAMBIA'S ENVIRONMENTAL PERFORMANCE

The Government of the Republic of Zambia recognizes the need for a coherent and deliberate approach towards sustainable management of natural resources. In line with this, policy and institutional frameworks to guide the environment sector have been put in place. These include the development of the National Conservation Strategy in 1985, which was followed by several economic sector policies that incorporated environmental matters. Others are the Environmental Protection and Pollution Control Act of 1990, National Environmental Action Plan of 1994, National Policy on Environment of 2007 and Environmental Management Act of 2011.

A number of programmes have also been implemented to strengthen environmental management in Zambia. Among these are the Copperbelt Environment Project, Environment Support Fund, Environment and Natural Resources Management and Mainstreaming Programme, Lake Tanyanyika Integrated Management Programme and Integrated Land Use and Assessment.

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK IN THE ENVIRONMENT SECTOR

As early as the 1980's, the Government of the Republic of Zambia recognized the need for a coherent and deliberate approach towards the sustainable management of its natural resources. Zambia faces a number of environmental challenges such as surface and groundwater pollution, air pollution, deforestation, wildlife depletion, solid waste management, loss of biodiversity and land degradation, particularly in mining areas.

These challenges can be attributed to:

- High levels of poverty and a growing population;
- Economic growth and its associated pressures on regulatory systems particularly in the mining, manufacturing and agricultural sectors;
- Inadequate implementation of policies, legislation and regulatory frameworks; and,
- Inadequate information on the environment resulting in limited knowledge about environmental management.

To respond to these environmental concerns, a National Conservation Strategy was developed in 1985. This was followed by several economic sector policies, some of which incorporated environmental matters (GRZ, 1985). In 1990, CAP 204 of Zambia's Environmental Protection and Pollution Control Act, was approved as the principal law relating to environmental issues. This subsequently led to the establishment of the Environmental Council of Zambia (ECZ) in 1992 (GRZ, 1990). This was supported in 1994 by the National Environmental Action Plan (NEAP), which was intended to support the implementation of environmental conservation and development plans. The NEAP recommended that legal and institutional frameworks be established in order to better manage environment issues in the country. In addition, a National Policy on Environment was formulated in 2007, aimed at creating a comprehensive framework for effective natural resource utilization and environmental conservation that is sensitive to the demands of sustainable development (GRZ, 2007).

Over the years however, new environmental issues such as climate change have emerged both locally and globally and have necessitated changes to Zambia's existing environmental legislation. As a consequence, the Environmental Management Act No. 12 of 2011 was enacted and repealed the Environmental Protection and Pollution Control Act, and thereby renaming ECZ the Zambia Environmental Management Agency, also known as ZEMA (GRZ, 2011).

The Environmental Management Act, among other things, provides for:

- Integrated environmental management through Strategic Environmental Assessments, Environmental Impact Assessments, and environmental and management strategies;
- Conservation and protection of natural resources;
- Access to environmental information;
- Public participation in environmental decision-making;
- Creation of an environment fund;
- Enforcement measures with increased penalties;
- Review and appeals procedure; and,
- Provision for domestication of multilateral environmental agreements (GRZ, 2011).

There are other pieces of legislation that have a bearing on environmental management. Among these are laws related to town and country planning, forestry, wildlife, mines, radiation and water. ZEMA is the principal environmental regulator in Zambia. Other government departments and agencies addressing environmental issues include the:

- Ministry of Lands, Natural Resources and Environmental Protection;
- Ministry of Local Government and Housing;
- Ministry of Mines, Energy and Water Development;
- Ministry of Agriculture;
- Energy Regulatory Board;
- Radiation Protection Authority; and,
- Zambia Wildlife Authority.

Indiscriminate disposal of waste in Lusaka
ZEMA, 2012

Emissions from a copper smelting plant in Mkushi
ZEMA, 2009

Water Pollution
ZEMA, 2007

SOME PROGRAMMES IMPLEMENTED IN THE ENVIRONMENTAL SECTOR

A number of programmes have been implemented to strengthen environmental management in Zambia. These include the Copperbelt Environment Project, Environment Support Fund, Environment and Natural Resources Management and Mainstreaming Programme, Lake Tanganyika Integrated Management Programme, Integrated Land Use and Assessment, and Millennium Development Goals.

COPPERBELT ENVIRONMENT PROJECT

Following the privatization of the majority of the copper mines on the Copperbelt, the Government of the Republic of Zambia inherited some of the mine's liabilities that the new mine owners were not willing to take. In order to address these environmental liabilities, the Copperbelt Environment Project (CEP) was launched. The project was supported by the World Bank, the Nordic Development Fund and the Internal Development Association.

The project comprised two components: the establishment of the Environmental Management Facility (EMF) and the strengthening of the environmental regulatory framework.

The EMF was established to finance the costs of priority environmental and social mitigation measures required as a result of Zambia Consolidated Copper Mines' (ZCCM) past operations, as well as ongoing activities on properties that remained with ZCCM-Investment Holdings. This was in addition to funding mitigation measures agreed upon with the investors who bought the ZCCM mining assets.

The Environmental Regulatory Framework was designed to strengthen the institutional framework that requires the Mine Safety Department (MSD), ZEMA and ZCCM to monitor the Environmental Management Plans agreed upon by the various private investors as well as by ZCCM. The framework also assisted in building capacity within national institutions to monitor the implementation of the environmental mitigation commitments made by the investors and ZCCM.

The CEP offered an opportunity for a concerted and more holistic approach to addressing historical environmental problems, particularly the environmental liabilities that arose as a result of mining sector reform. During the implementation of the project, the environmental regulatory framework was reviewed and environmental management plans were prepared by individual mining units. Other achievements of the project include:

- Establishment of a monitoring system for the implementation of environmental management plans and their compliance with environmental regulations;
- Regular monitoring of pollution flows and loads resulting from mining operations;
- Improvement of the MSD and ZEMA's capacity to enforce regulations and performance;
- Enhancement of civil society capacity for active participation in environmental management;
- Enhanced co-ordination and partnership among authorising agencies and collaborating institutions so that they effectively participate in the regulatory framework; and,
- Increased environmental awareness and public participation (ECZ, 2009).

ENVIRONMENT SUPPORT PROGRAMME

The Environment Support Programme was established by Zambian government in 1998 to encourage community participation in environmental and natural resource management and in supporting key government policies of poverty reduction, public service reform, and decentralisation. It was also intended to strengthen local government and privatisation initiatives.

The programme was operated through a number of ministries and agencies and was coordinated by the Ministry of Environment and Natural Resources. It had four main components:

- Institutional Strengthening and Legal Framework;
- Environmental Education and Public Awareness;
- Pilot Environmental Fund; and,
- Environmental Information Network and Monitoring System.

The programme addressed environmental concerns as identified by the National Environment Action Plan. The project enabled Zambia to develop its initial instruments to monitor environmental issues and helped the country build its legislative framework and capacity for environmental safeguarding (UN, 2013).

INDUSTRIAL POLLUTION PREVENTION PROGRAMME

The Industrial Pollution Prevention Programme, implemented between 1997 and 2003, arose from the regulations and standards, which were set under the Environmental Protection and Pollution Control Act. It was aimed at preventing pollution and at attaining sustainable development. The programme developed ZEMA's capacity to enforce regulations through the strict monitoring and licensing of industrial operations in the country. It also promoted cleaner industrial production through the Zambia Chamber of Commerce and Industry (UN, 2013).

LAKE TANGANYIKA INTEGRATED MANAGEMENT PROGRAMME

Lake Tanganyika, located in southern-central Africa, is the second largest lake by volume in the world and the largest in Africa. The lake basin covers about 231,000 sq kilometres, and extends into parts of Burundi, Democratic Republic of Congo, Rwanda, Tanzania and Zambia. Lake Tanganyika boasts over 350 species of fish most of which are endemic (Curtis, 2013).

The Lake Tanganyika Integrated Management Programme aims to promote the protection of biodiversity and the sustainable management of the natural resources in the Lake Tanganyika basin. The project began in 1995 and is expected to be implemented until 2013. It focuses on sedimentation control by placing emphasis on institutional strengthening and supporting community participation in agriculture, forestry and soil erosion prevention (GRZ, 2013).

Some of the major results of the programme include:

- Sustainable natural resource use through tree planting and the implementation of community-level natural resources management plans;
- Development of alternative income-generating activities through a community revolving fund;
- Raising awareness among stakeholders, including government and community members, on the importance of sustainable natural resource management. The awareness raising to date has focused on invasive species; and,
- Enhancing the capacity of local governance structures to manage their natural resources sustainably.

In addition, the government has pursued appropriate policies and programmes relating to natural resources management and environmental protection. The project has facilitated the enforcement of by-laws in target areas. In some situations this has been undertaken in collaboration with the countries that share the lake. (GRZ, 2013)

Lake Tanganyika
ZEMA, 2007

Fish is a source of protein for fishing communities

Donvanstaden/iStock

BARRIERS TO REMOVING INVASIVE ALIEN SPECIES IN ZAMBIA

Zambia's biodiversity is threatened by the spread of invasive alien species. Invasive alien species are defined as species "introduced deliberately or unintentionally outside their natural habitat where they have the ability to establish themselves, invade, outcompete natives and take up the new environment" (Environmental Council of Zambia, 2008). The spread of invasive alien species is now recognized as one of the greatest threats to the conservation of biodiversity (Matthews and Brand, 2004). They adversely affect local biodiversity and threaten agricultural production and food security, which continues to be the main priority for many African governments.

During the implementation of the project on Removing Barriers to Invasive Plant Management in Africa between 2005 and 2010, 15 invasive plant species - six aquatic and nine terrestrial - were identified.

Sample of Invasive Species found in Zambia

***Mimosa pigra* thicket**
ZEMA, 2007

Argemone mexicana
ZEMA, 2007

Cardiospermum grandiflorum
ZEMA, 2007

Eichhornia crassipes
ZEMA, 2007

Sample of Invasive Species found in Zambia

Salvinia molesta
ZEMA, 2007

Tithonia diversifolia
ZEMA, 2007

Pistia stratiotes
Morad, A. F., 2011

Lantana camara
ZEMA, 2007

Tithonia rotundifolia
ZEMA, 2007

Blanket of *Salvinia molesta* covering a stream of water
ZEMA, 2007

ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT AND MAINSTREAMING PROGRAMME

The Environment and Natural Resources Management and Mainstreaming Programme (ENRMMP) is a government initiative that aims to improve the coordination and implementation capacity of the environment and natural resources sector. The programme is based on the principles, priorities and objectives of Zambia's Fifth National Development Plan. The implementation of the ENRMMP began in 2009.

The programme was formulated under the guidance of a joint task force led by the Ministry of Tourism, Environment and Natural Resources, statutory bodies and co-operating partners. The main objective of the ENRMMP is to contribute to reversing environmental damage. It also aims to maintain essential environmental and biological processes and achieve sustainability in natural resource utilization for the benefit of the Zambian people. These objectives are pursued through the development of an environment fund that will finance key investments and initiatives in the environment and natural resource sector. The programme also focuses on building the internal capacity of the ministry to lead policy development in the environment and natural resource sector and to support the mainstreaming of environment and natural resource issues in other government bodies.

The programme has been designed to:

- Build the capacity of the Ministry of Tourism, Environment and Natural Resources to coordinate national policy-making and to provide information needed for environmentally-conscious policy development;
- Assist sector ministries and local governments (district authorities) to use the information and tools available to mainstream environmental issues into their planning and operations; and,
- Support the establishment of an environment fund for investments in the environment and natural resources sector to complement the policy shift towards sustainability. In line with this, an Interim Environment Fund has been set up, and is managed by ZEMA (GRZ, 2008).

CIVIL SOCIETY ENVIRONMENT FUND

Combating environmental threats and improving environmental sustainability requires action and engagement from all levels of society, including the private sector and civil society. Studies undertaken have identified four problems or challenges faced by civil society organisations (CSOs) engaged in environmental issues. The challenges are:

- Limited access to funding, particularly for institutional support;
- Inadequate technical and institutional capacity in some CSOs working on environmental and natural resource management;
- Lack of coordinating mechanism for CSOs working in this field; and,
- Inadequate consideration of cross-cutting issues in these activities.

In order to address these challenges, the Civil Society Environment Fund was established in 2010 to strengthen the ability of civil society organizations to participate in the promotion of sustainable environment and natural resources management, thus contributing to Zambia's development efforts.

The purpose of the fund is to develop the capacity of Zambian civil society organizations to be able to work for environmentally sustainable development. The project will be completed in 2013.

Some of the civil society organizations supported through the fund include the Community Based Natural Resources Management Forum, Conservation Lower Zambezi, Citizens for a Better Environment, Green Living Movement, African Wildlife Foundation, and Livingstone Green Initiative. Support is provided to these organisations in many areas, including organizational structure, innovative projects and capacity building (Civil Society Environment Fund, 2013).

INTEGRATED LAND USE ASSESSMENT

The Integrated Land Use Assessment initiative is aimed at improving the monitoring and management of land resources, and contributing to poverty alleviation, food security and sustainable economic growth. The initiative has been implemented in order to:

- Assist land use institutions in developing and strengthening their capacity to collect, compile, process and disseminate reliable up-to-date information to policy makers;
- Plan and carry out national land use assessments;
- Develop up-to-date integrated land use information systems; and,
- Set up a long term land use monitoring system.

The collected data is used to inform national policies and action plans related to agriculture and forestry (Zambia Forestry Department, 2009).

Integrated Land Use Assessment Project vehicle handover
UN-REDD Programme, 2012

SIXTH NATIONAL DEVELOPMENT PLAN

The theme of Zambia's Sixth National Development Plan (2011-2015) is 'Sustained Economic Growth and Poverty Reduction'. The plan focuses on policies, strategies and programmes that will contribute significantly to the realization of broad-based pro-poor growth, employment creation and human development.

The plan's objectives within the environment sector are to:

- Strengthen the existing policy and legal framework for effective environmental management;
- Strengthen environmental protection and management; and,
- Promote effective management of the environment and Zambia's natural resources in key sectors (GRZ, 2010).

The environment sector has implemented various programmes in line with the Sixth National Development Plan. Key among these is the strengthening of existing policy and legal frameworks through the Environmental Management Act No. 12 (2011). The Water Resources Management Act and the National Water Policy were also enacted to ensure that water resources are efficiently managed and regulated.

The Sixth National Development Plan strengthens environmental protection and management. Such practices include the control of bush fires in forest areas.

REDD+, 2012

MILLENNIUM DEVELOPMENT GOALS

Figure 3.1 Millennium Development Goals
www.sdpi.tv, Development beyond MDGs

The Millennium Development Goals (MDGs) are eight international development goals that all United Nations member states and more than 23 international organizations have agreed to achieve by the year 2015 (Save the Children, 2012).

Figure 3.2 Poverty
www.sdpi.tv, Development beyond MDGs

The goals are:

www.mdginafrica.wordpress.com

Target: Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day (UN, 2010)

Zambia's extreme poverty declined from 58 per cent in 1991 to 51 percent in 2006. Although this trend can be considered a positive one, the rate of change is still too slow to meet the target of reducing extreme poverty to 29 per cent by 2015 (UNDP, 2012).

Some key policy and investment choices have been identified to accelerate Zambia's progress towards this goal, including:

- The commercialization of small scale agriculture and diversification of the rural economy;
- The implementation of climate change adaptation and mitigation strategies;
- An institutionalized social security system to protect the most vulnerable; and
- More accessible and efficient service delivery that reaches the poorest (UNDP, 2012).

Table 3.1 MDG Goal No. 1 and set Targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 1: Eradicating extreme poverty and hunger	Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	Proportion of population in extreme poverty (%)	51	29	Significant reforms and investments needed
			34	31.1	Yes
	Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Prevalence of underweight children U-5 (5%)	14.6	12.5	Acceleration required

UNDP, 2012

www.bathandwells.org.uk

Target: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

The target has already been attained in Zambia. The government has constructed new schools, removed school fees and adopted a policy of free basic education. A policy permitting children who had previously left primary school to return to complete their studies was also introduced, which helped to raise the primary school completion rate by 27.7 per cent from 64 per cent in 1990 to 91.7 per cent in 2009. The net enrolment rate of children in primary education also increased from 80 per cent in 1990 to 100 per cent in 2009 (UNDP, 2012).

Education is life
Zambia Online, 2010

Striving to provide quality education for all
Zambia Online, 2010

www.bathandwells.org.uk

The harvest of a good crop
Lyell, J., 2008

Empowering women through adult education
Diocese of Bath and Wells, 2011

An entrepreneur selling Mopani worms
CIFOR, 2008

Mushroom sorting before sale
CIFOR, 2008

Empowering women through agriculture
Lyell, J., 2008

www.newtimes.dk

Target: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate

Zambia's mortality rate for children under the age of five declined from 190.7 to 119 deaths per 1,000 live births between 1992 and 2007.
The infant mortality rate has also declined from 107.2 to 70 deaths per 1,000 live births between 1992 and 2007. The MDG target is to reduce the child mortality rate to 63.6 deaths per live births by 2015 (UNDP, 2012).

Striving to provide quality health care for all
Lyell, J., 2008

Table 3.2 MDG Goal No.4 and set Targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 4: Reducing child mortality	Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	U-5 mortality rate (deaths per 1,000 live births)	119	63.6	Acceleration required
		Infant mortality rate (deaths per 1,000 live births)	70	35.7	Acceleration required
		One year olds immunized against measles (%)	84.9	100	Acceleration required

UNDP, 2012

bathandwells.org.uk

Target: Reduce by three quarters the maternal mortality ratio and achieve universal access to reproductive health

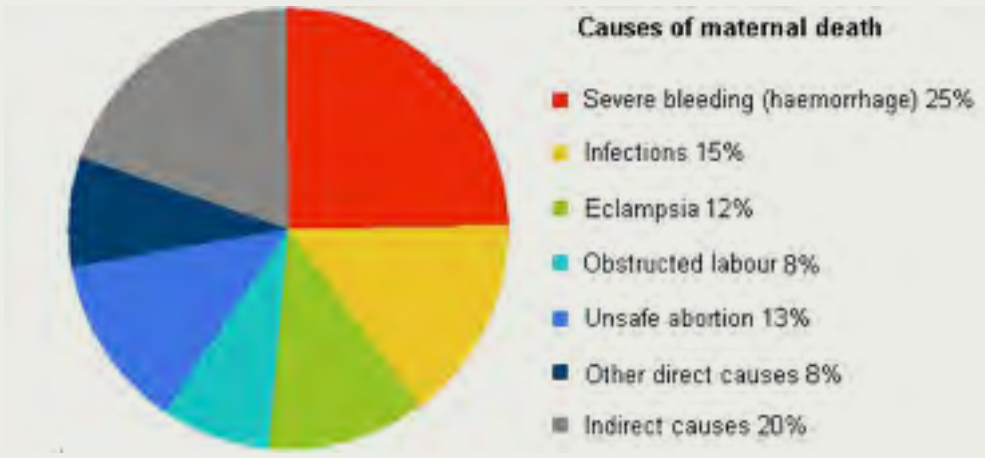


Figure 3.3 Maternal Health
World Health Organazation, 2005

Hospital staff with a patient in Zambia
Lungu, I.G., The LifeWrap, 2009

The maternal mortality ratio has decreased from 649 to 591 deaths per 100,000 live births between 1996 and 2007. However, this decrease is far from being a reduction of three quarters.

In order for Zambia to achieve this goal, the number of women dying due to complications during pregnancy and child birth needs to reduce significantly. The presence of trained midwives at birth sites would help achieve this goal. There is also a need to improve rural feeder roads and transport systems so that pregnant women have better access to health centres and their services (UNDP, 2012).

Table 3.3 Zambia's MDG-5 targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 5: Improving maternal health	Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	Maternal mortality ratio per 100,000 live births	591.2	162.3	Significant reforms and investments needed
		Births attended by skilled personnel	46.5		
	Target 5.B: Achieve, by 2015, universal access to reproductive health	Contraceptive prevalence rate (%)	24.6		

UNDP, 2012

bathandwells.org.uk

Target: To halt by 2015 and reverse the spread of HIV/AIDS, and to have universal access to treatment for HIV/AIDS; To have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

Zambia met its national target to keep HIV prevalence rates below 15.6 per cent. The national HIV prevalence rate among adults (15-49 years) was reduced from 15.6 per cent to 14.3 per cent between 2002 and 2007. This reduction is the result of effective strategies for the provision of antiretroviral drugs, which not only lowered the prevalence rates but significantly reduced the rates of mother-to-child transmissions of HIV/AIDS.

Progress has also been made in combating malaria. The number of children under-five sleeping under a treated net rose from 6.5 per cent in 2001-2002 to 41.1 per cent in 2008 (UNDP, 2012).

World Malaria Day awareness raising, 2009
National Malaria Control Centre , 2009

Creating awareness on World Malaria Day
Christian Aid, 2011

Malaria Control Agents distributing mosquito nets
Christian Aid, 2011

Table 3.4 Zambia's MDG-6 targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 6: Combating HIV/AIDS, malaria and other diseases	Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	HIV prevalence rate (%)	14.3	<15.6	Yes
		Proportion of population (15-24 years) with comprehensive, correct knowledge of HIV/AIDS (%)	48		
		Ratio of school attendance of orphans to non-orphans (10-24 years)	97	100	Yes
	Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	Proportion of population with advanced HIV infection with access to ARVs	79	80	Yes
	Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	New malaria cases per 1,000 population	252	≤255	Acceleration required
		Malaria mortality fatality rate per 1,000 population	39	11	Acceleration required
		Households with ITNs (%)	64.3		

UNDP, 2012

enviroafrica.com

Target: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources; reduce biodiversity loss, achieving by 2010 a significant reduction in the rate of loss; halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation, and by 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.

The percentage of land covered by forests in Zambia decreased from 66 per cent in 1990 to 55.9 per cent in 2007, and this has been a serious cause of concern.

High priority efforts to curb deforestation and to regenerate forest cover are needed in order to protect and enable more sustainable use of the country's rich natural resource base and to improve resilience to the impacts of climate change.

With regards to sustainable access to drinking water and sanitation, the proportion of households without access to a clean water source was reduced from 51 per cent in 1990 to 40 per cent in 2006. However, this number grew from 26 per cent in 1991 to 36.1 per cent in 2006. More work is needed in order to reduce the proportion of households without access to clean water to 25.5 per cent. This can be done through improved access to boreholes, replacing old wells in rural settings and increasing access to treated municipal water in peri-urban areas (UNDP, 2012).

Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

WaterAid, 2000

Target 11: Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers.

IPS Inter Press Service, 2011

Target 9: Integrate the principles of sustainable development into country policies and programme and reverse the loss of environmental resources.

kshampongo, 2007

Table 3.5 Zambia's MDG-7 targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 7: Ensuring environmental sustainability	Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	Land covered by forests (%)	45	63.6	
		Land protected to maintain biological diversity (%)	41	35.7	
		Carbon dioxide emissions (MT per capita)	022	100	
		Proportion of population using solid fuels (%)	83.8		
	Target 7.C: Halve by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	Proportion of population without access to an improved drinking water source (%)	40	25.5	Acceleration required
		Proportion of population without access to improved sanitation facilities	36.1	13	Significant reforms and investments needed

UNDP, 2012

bathandwells.org.uk

Target: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system, address the special needs of least developed countries, address the special needs of landlocked developing countries and small island developing States, deal comprehensively with the debt problems of developing countries, in cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries and in cooperation with the private sector, make available benefits of new technologies, especially information and communications.

Zambia has regained and sustained an impressive record of macroeconomic stability. Over the past five years, Zambia has achieved single-digit inflation and has consistently had growth rates of over 5 per cent.

Official Development Assistance (ODA) to Zambia increased from USD 754 million in 2002 to USD 918 million in 2009, and the Highly Indebted Poor Country Initiative and Multilateral Debt Relief Initiative reduced the country's debt servicing obligations. The stock of external public debt dropped from USD 6,005 million in 1999 to USD 934 million in 2006. In spite of this however, external public debt increased to USD 1,521 million in 2009.

In 2010, Zambia was considered the sixth best country in Africa to do business. This context has attracted significant foreign direct investments. From 1995 to 2005, the country received an annual average of USD 211 million in foreign direct investments, and from 2006 to 2009, the figure rose to USD 960 million annually. The area of focus must now be on improving competitiveness. Zambia is ranked 115th out of 139 countries in terms of competitiveness. Policies should be targeted at easing supply-side constraints to transportation, storage, communications and local entrepreneurs' easy access to open markets, particularly for agricultural produce. The domestic revenue base must be expanded through an effective taxation policy, as ODA shows greater volatility and possibly in the coming years. The use of the fiscal space for an increase in investments in human development is a strategy used effectively by countries that show significant progress on human development. The easing of regional and global trade barriers through common agreements will be key to a more robust and open trading regime that spurs balanced growth. At the same time, cooperating partners must also meet the ODA target of 0.7 per cent of their GDP as agreed at the Gleneagles Summit to support the achievement of the MDGs by 2015.

UNDP, 2012

Table 3.6 Zambia's MDG-8 targets

Goal	Target	Indicator	Latest Figure	2015 Target	Will Target be Achieved under the Present Trend
MDG 8: Developing a global partnership for development	Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. Includes a commitment to good governance, development and poverty reduction – both nationally and internationally Target 8.B: Address the special needs of the least developed countries.	Overseas Development Assistance (US$m)	918.6		
		Access to markets in developed countries			
		Foreign direct investment (US$m)	699.15		
	Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communication	Fixed telephone lines per 1,000 people	7		
		Cellular subscribers per 1,000 people	322.8		

UNDP, 2012

KEY FINDINGS

- Zambia still faces many environmental challenges including surface and groundwater pollution, air pollution, deforestation, loss of wildlife, poor solid waste management, loss of biodiversity, and land degradation, particularly in mining areas.

- Zambia has a fairly strong environmental policy, and has instituted environmental legal and institutional frameworks. This includes the Environmental Management Act, the principal piece of environmental legislation. Other pieces of legislation that have a bearing on environmental management relate to urban and rural planning, forestry, wildlife, mines, radiation and water.

- Inadequate implementation of existing environmental legislation has compounded some of the country's environmental challenges.

- A number of programmes have been implemented to strengthen environmental management in Zambia. These include the Copperbelt Environment Project, Environment Support Programme, Environment and Natural Resources Management and Mainstreaming Programme, Lake Tanganyika Integrated Management Programme and Integrated Land Use Assessment.

- The population of Zambia has grown at an average annual rate of 2.8 per cent. In 2010, the population was 13,092,666 and may increase to 22,745,000 by 2030. Zambia's growing population puts pressure on the natural environment.

- The main source of energy in Zambia is woodfuel, which accounts for 80 per cent of domestic energy. Energy consumption has risen over the last few years as a result of increasing activities in mining, construction, manufacturing and agriculture. This has resulted in an increased demand for electricity and petroleum products.

- The mining industry continues to play a central role in Zambia's economic development. Large-scale mining has resulted in the development of settlements and open-pit mines, which have contributed to forest degradation.

- Indigenous forest covers an estimated 66 per cent (49.9 million hectares) of Zambia's total land cover. However, 61 per cent of the forest and other wooded land, comprising bushes, shrubs, wooded grasslands and thickets, are disturbed in one way or another by human activities. The Mwekera National Forest is a perfect example of forest loss in Zambia. The forest is located in Kitwe, Copperbelt Province, and was established in 1958 as a unique forest reserve with legal human settlements. The extent of the forest has declined from an estimated 17,887 hectares in 1957 to less than 10,000 hectares in 2011.

- Agricultural activities are a major driver of deforestation in Zambia. Agriculture has been growing exponentially in the country, especially in the Mazabuka district where irrigation activities have increased due to the expansion of sugarcane plantations, which now cover an estimated 28,785 hectares.

- Zambia's protected areas make up about 30 per cent of the country's total land area. Expanding human settlements, agricultural activities, deforestation and mining have resulted in the fragmentation of ecosystems and wildlife resources.

- Zambia's expanding urban population, industrial and agricultural growth, and climate change have affected water availability. In 2011, access to water in urban areas was 77.5 per cent.

- Zambia has several types of wetlands, the most common of which are riverine wetlands such as Barotse, Kafue flats and Luangwa. Eight of the country's wetlands are designated as Ramsar sites.

- Charcoal production and slash-and-burn farming practices have been a major threat to wetlands and have resulted in soil erosion, turbidity of water and siltation.

- Zambia's rainfall pattern has largely remained the same with Northern Province receiving more and Southern Province receiving less rainfall.

- The country is classified into three agro-ecological regions. An analysis of rainfall patterns conducted in these regions showed that significant change had occurred in Region I, which receives the lowest rainfall. Additionally, the area of Region I has been expanding over the years.

- Zambia's highest temperatures are recorded in the valleys. Average minimum temperatures have been recorded in parts of North-Western, Copperbelt, Central, Luapula and Northern Provinces. Parts of northern Zambia, particularly Mbala district, experience lower maximum temperatures due to their high altitude.

- Zambia is far from attaining MDG 7 on environmental sustainability. More work is needed in all target areas, particularly in reducing the proportion of households without access to clean water.

CONCLUSION

Sustainable natural resource management is important as it contributes positively to national economic development and environmental protection. The development and implementation of sector programmes as discussed in Chapter 3 indicates that efforts are already underway at various levels of government to improve national environmental management. In promoting environmental management, it is important to:

- Provide a human face to environmental issues;
- Empower people to become active agents of sustainable and equitable development;
- Promote the understanding that communities are pivotal to changing attitudes towards environmental issues; and,
- Advocate for partnerships that ensure that all enjoy a clean and healthy environment and a more prosperous future.

The Zambian government recognises the need to strengthen the capacities of various stakeholders to participate actively in environmental management. Therefore, knowledge, reflection and action about the environment have become necessary pre-conditions for thoughtful action in dealing with issues of sustainable development.

The Atlas of Zambia's Changing Environment has addressed these needs by providing documented environmental changes that have occurred across Zambia as well as identifying their causes. The Atlas has attempted to convey the urgency of addressing these issues and has provided a list of key findings and recommendations to help guide these efforts.

RECOMMENDATIONS

- Improve national implementation of the Environmental Management Act and other regulations that have a bearing on environmental management.
- Continue to strengthen the co-ordination between agencies mandated to protect the environment.
- Implement more programmes to supplement government efforts to ensure environmental management.
- Improve the provision of basic social services particularly in rapidly growing urban areas.
- Implement infrastructure development programmes for the provision of basic social services.
- Reduce dependence on natural resource, particularly on woodfuel, by developing renewable energy technologies.
- Identify priority sectors and technologies needed to integrate climate change adaptation measures into development policies.
- Improve the institutional and legal framework for the mining sector and monitor and enforce such laws through Environmental Impact Assessments and Environmental Management Plans and Audits.
- Strengthen tree-planting programmes especially in areas affected by charcoal production and timber harvesting.
- Implement measures to promote sustainable farming practices.
- Increase community participation in managing natural resources in order to raise awareness about the importance of the environment.
- Invest in infrastructure to improve water supply and sanitation.
- Strongly enforce legislation in order to safeguard protected areas, natural heritage sites and wetlands.
- Create and enforce deterrent penalties against bushfires.
- Raise awareness about environmental issues through regular education and information dissemination activities.
- Continuously develop the capacity of institutions mandated to protect the environment and natural resources such as the Zambia Environmental Management Agency, Forestry and Fisheries Department, and Zambia Wildlife Authority .
- Make sustainable land use practices central to agriculture, mining, forestry and wildlife.
- Bring the spread of invasive alien species under control in order to protect the country's biodiversity, food security, health and economic development.

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Zambia Atlas of Our Changing Environment **aims to visually illustrate environmental changes in the country over recent years, ranging from changes arising from the growing mining sector to changes brought about by agricultural expansion and growing settlements. By visually linking causes with the environmental changes, the atlas is expected to not only provide compelling evidence on the changing environment, but also to call for science-based solutions.**