



Economic Commission for Africa

Economic and Social Conditions in Southern Africa 2002

Economic Impact of Environmental Degradation in Southern Africa



ECA Subregional Office for Southern Africa (SRO-SA)



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FOREWORD

Economic and Social Conditions in Southern Africa is a recurrent publication of the United Nations Economic Commission for Africa (UNECA) Sub-regional Office in Southern Africa (SRO-SA). The publication is intended to:

- Assist in identifying and disseminating best practices in the thematic areas of socio-economic development;
- Guide policy dialogue in Southern Africa between experts and policy makers and between governments and their development partners; and
- Be a source of information for decision-makers, planners and researchers.

This edition provides analytical information on the state of the Southern African economy in 2002 and presents prospects for 2003. It is divided into two parts. Part I analyses socio-economic performance during 2002 and considers the short- and medium- term prospects for the 11 member States served by SRO-SA.¹ The analysis is based on data and information for 2001 and preliminary data for 2002 that was available to us as of December 2002.

Part II contains a special study on the Economic Impact of Environmental Degradation in Southern Africa. This study was prepared upon the request of the Intergovernmental Committee of Experts (ICE) at its 7th Session, 3-4 April 2001 in Lusaka, Zambia.

This publication was produced by SRO-SA staff under the overall supervision of Robert M. Okello, Director. The team was led by Guillermo Mangué and comprised Dickson W. Mzumara, Ernest M. E. Dhliwayo, Zifa W. Kazeze, Irene B. Lomayani, Jean-Paul Gondje, Oludele A. Akimboade and Gladys Mutangadura, assisted by SRO-SA support staff.

A team of experts from Southern African countries reviewed the draft document at the 9th Session of the ICE meeting that was convened in Maseru, Lesotho, 24-26 February 2003. The comments and observations made by the experts contributed significantly to successful finalization of the document and are gratefully acknowledged.

It is my expectation that the data and information contained in this publication will prove valuable to decision-makers, planners and researchers.

Robert M. Okello

Director

¹ These are: Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

ACRONYMS

AGOA	African Growth and Opportunity Act of the USA
AMCEN	African Ministerial Conference on Environment
AU	African Union
BENEFIT	Benguela Environment Fisheries Interaction and Training program
BVC	Beach Village Committees
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CITES	Convention on International Trade in Endangered Species.
CDM	Clean Development Mechanism
CO ₂	Carbon Dioxide
COMESA	Common Market for Eastern and Southern Africa
COMESA-FTA	Common Market for Eastern and Southern Africa Free Trade Area
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DESA	United Nations Department of Economic and Social Affairs
DTC	Diamond Trading Company
DWAF	Department of Water Affairs and Forestry (South Africa)
ECA/SRO-SA	Economic Commission for Africa /Sub-regional Office for Southern Africa
ECOSOC	United Nations Economic and Social Council
EMP	Environmental Management Plan
ENDA	Environmental Development Action in the Third World
ENSO	El Niño Southern Oscillation
EPA	Economic Partnership Agreement
ESAP	Economic Structural Adjustment Programme

EU	European Union
EZC	Environmental Council of Zambia
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
GEAR	Growth, Employment and Redistribution
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOB	Government of Botswana
GOM	Government of Malawi
GOM	Government of Mauritius
GON	Government of Namibia
GRZ	Government of the Republic of Zambia
ICE	Intergovernmental Committee of Experts
ICLEI	International Council for Local Environmental Initiatives
ICZM	Integrated Coastal Zone Management
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPRSP	Interim Poverty Reduction Strategy Paper
ITZN	Inter-Tropical Convergence Zone
LEAP	Local Environmental Action Plan
LHWP	Lesotho Highlands Water Project
LRA	Lesotho Revenue Authority
MERP	Millennium Economic Recovery Programme
NEAP	National Environmental Action Plan
NEPAD	New Partnership for Africa's Development
N ₂ O	Di-nitrogen Oxide
NO	Nitrogen Oxide
NTB	Non-Tariff Barrier
OPEC	Organization of Petroleum Exporting Countries

PFMP	Participatory Fisheries Management Programme
PJTC	Permanent Joint Technical Committee
PPM	Parts Per Million
PPP	Public Private Partnership
PRGF	Poverty Reduction and Growth Facility
SACU	Southern African Customs Union
SADC	Southern African Development Community
SANP	South African National Parks
SAPPI	South African Paper and Pulp Industry
SARDC	Southern Africa Research and Documentation Centre
SRDC-SA	Sub-regional Development Centre for Southern Africa (now SRO-SA)
SRO-SA	Sub-regional Office for Southern Africa
UN	United Nations
UNCCD	United Nations Conference to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WDM	Water Demand Management
WHO	World Health Organization
WMO	World Maritime Organization
WRI	World Resource Institute
WSSA	Water Services South Africa
WUE	Plant's water use efficiency (carbon fixed per unit water transpired)
WWF	Worldwide Fund
WWF	World Water Forum
ZACPLAN	Zambezi River Action Plan

EXECUTIVE SUMMARY

In 2001, growth of the world economy was dragged down as a consequence of the slowdown in the USA and EU throughout the year, particularly during the last quarter. Latin America and East Asia were among the most affected by the slowdown.

African countries continued to be vulnerable to downturns in commodity prices. However, growth performance in Africa improved marginally in 2001 to 4.3 per cent from 3.3 per cent in 2000. Three major issues were at the centre of economic debate in Africa during the year 2001. These included:

- The need to eradicate poverty and place African countries on a path of sustainable growth and development;
- The fight against HIV/AIDS; and
- The entry-into-force of the Constitutive Act of the African Union (AU).

At the beginning of 2002, there was general optimism that the decline in the global economy was over. Trade and industrial production picked up worldwide. In addition, the better-than-expected output growth in the USA in the first quarter of 2002, coupled with positive economic developments in Europe. Signs of improvement in economic activity in Japan, also contributed to this optimistic view. Indeed, according to the World Bank estimates², world output increased by 2.8 per cent in 2002 compared to 2.2 per cent in 2001. World trade in goods and services was forecast to increase by 2.1 per cent in 2002 compared to a decline of 0.1 per cent in 2001.

Amid this optimism, towards mid-2002, while the global economy was still recovering from the recession, the situation deteriorated due to a string of corporate scandals in the USA pertaining to questionable accounting reports and practices, which spilled over to the international stock markets. By the end of the year, though the global economy was still recovering, the pace of expansion slowed markedly from that experienced at the start of the year and current sentiment is that world economic recovery continued throughout the year, but at a lower pace than was anticipated.

² World Bank, World Economic Outlook, September 2002

In apparent contrast to other regions of the world, Africa did not seem to have benefited from strengthened global economic activity in 2002. GDP growth rate was estimated at 3.4 per cent, slightly lower than the 4.3 per cent achieved in 2001. The drop in regional gross domestic product (GDP) growth rate was mainly due to lower oil revenues from oil-exporting countries, reflecting the lagged effect of earlier price decline and, in some cases, production cuts due to lower Organization of Petroleum Exporting Countries (OPEC) production quotas (the case of Nigeria).

In Southern Africa, contrary to the earlier forecast at the beginning of the year, aggregate GDP from the 11 member countries grew by 3.5 per cent in 2002, up from 2.4 in 2001, but below the 4.5 per cent initially estimated. Adverse weather conditions, which affected most countries in the sub-region, particularly Lesotho, Malawi, Mozambique, Swaziland, Zambia, Zimbabwe and to some extent, Namibia, made it impossible for most countries to achieve a higher GDP growth rate in 2002. The moderate increase in 2002 was due to the robust increase in oil production in Angola and a better-than-expected performance in South Africa.

GDP per capita growth rate was diverse across the countries. In some countries, such as Angola, Botswana, Mauritius, Mozambique and Swaziland, the real GDP growth rate stood above the population growth rate, thereby increasing real GDP per capita in 2002. In Swaziland, for example, real GDP per capita at constant 1995 prices increased from -0.7 per cent in 2001 to 4.5 per cent in 2002. In other countries, including Lesotho and Zambia, real GDP growth rate continued to lag behind the population growth rate.

Trade arrangements and market access continued to be a matter of concern to all member States in 2002, under the two regional economic blocks of the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC). The signing of the renegotiated Southern African Customs Union (SACU) agreement in October 2002 was a step forward in that direction. In addition, member States continued to deepen the implementation of trade liberalization programmes with a view to reducing and eliminating tariff and non-tariff barriers (NTBs) to intra-regional trade. Indeed, substantive progress was achieved in addressing NTBs, particularly with respect to customs documents and procedures.

The need to increase productivity in agriculture continued as a matter of concern to all member States in the sub-region to provide food to all. The food crisis in Southern Africa drew national, sub-regional, international and individual attention to assist countries in the sub-region with food aid and other forms of assistance. National and consolidated sub-regional appeals with the assistance of United Nations system, partners, non-governmental organizations (NGOs), etc. were made at the highest level of the United Nations Economic and Social

Council (ECOSOC). The appeals, in addition to providing immediate food relief and humanitarian aid for water, sanitation, health and nutrition, also focused on emergency provision of agricultural inputs to enable those affected by the food crisis to restart agricultural production during the 2002/2003 seasons.

Member States continued to direct efforts towards improving governance issues in the sub-region. Efforts were particularly addressed at deepening and accelerating reforms to constitutional, political and electoral systems to ensure that they are participatory, transparent, accountable, inclusive and predictable.

Prospects for 2003 in Southern Africa, as in the past, are optimistic, though climatic conditions have an important role to play. Average GDP growth rate is expected to pick up in late 2003 and most countries are expected to register positive growth rates. Notwithstanding, much will depend on the evolution of natural disasters such as drought, floods or cyclones. In addition, sustaining a better GDP growth rate will also be contingent on progress in addressing policy challenges in the sub-region. The optimistic view assumes that there will be recovery in agriculture, mining, tourism, manufacturing and retail. The pattern of rains during the last quarter of 2002, for example, indicated that the dry spell of 2002 would come to an end by the second quarter of 2003.

As a result, agricultural production is likely to increase and this may help ease the current upward pressure on consumer prices and restore consumer confidence. Other contributory factors include:

- The consolidation of the COMESA Free Trade Area (COMESA-FTA) in its move to becoming a Customs Union in 2004;
- Member States taking advantage of the economic opportunities being provided under the African Growth and Opportunity Act (AGOA); and
- Member States taking advantage of the negotiations under Economic Partnership Agreements (EPAs) with the European Union (EU), between COMESA and SADC on one hand, and the Asian, Caribbean and Pacific (ACP) and EU countries on the other.

The study on the *Economic Impact of Environmental Degradation in Southern Africa* looked at the environmental resources in the 11 member States covered by the SRO-SA and highlighted environmental concerns and economic and financial implications. It recognized the fact that member States of Southern Africa have committed themselves to various measures to protect the environment. Chapter 16 of the COMESA Treaty, for example, commits member States to awareness of the link between economic activity and environmental degradation, excessive depletion of resources and serious damage to natural heritage.

The study further recognized the fact that through the commitments made by SADC to the implementation of Agenda 21, member States believe that solving the basic needs of the poor, particularly food security and energy needs, will reduce problems such as deforestation and land degradation and will relieve pressure on water resources. Hence, they have resolved to strive to eradicate poverty as an indispensable condition for sustainable development.

The study also highlighted the relationships between population growth and the challenges associated with rural urban migration, the growth of cities and the socio-economic challenges of human settlements, health care delivery, poverty incidence and crime. The exploitation of natural resources, in the process of achieving economic growth and poverty alleviation, takes a toll on the quality of land, water availability, soil resources availability, increasing pollution, desertification, and exposing natural forest cover, which is aggravated by recurrent drought in many parts of the sub-region.

The data further indicated that profound economic stagnation experienced by many countries in the sub-region, combined with weakening environmental management, as evidenced by the lack of environmentally sound policies, caused harm to sensitive ecosystems and resulted in land degradation, lowered agricultural productivity and increased poverty. It also indicated that high population density is not necessarily the root cause of land degradation; it is what a population does to the land that determines the extent of degradation. People can be a major asset in reversing a trend towards degradation. However, they need to be healthy and politically and economically motivated to care for the land, as subsistence agriculture, poverty, and illiteracy can be important causes of land and environmental degradation.

While people have to exploit the environment and natural resources to alleviate poverty and raise their standard of living, such exploitation is not without cost. In addition, overexploitation and abuse of natural resources not only lead to environmental degradation but also exacerbate the very conditions of poverty that people seek to alleviate.

The study concluded that environmental exploitation and subsequent degradation are closely linked to sustainable development. Thus, sustainable development entails improving the standard of living of the current generation without compromising the standard of living of the future generation. Attainment of this objective needs awareness of the extent of natural resource exploitation, avenues of sustainable income generation, human resource development, management of human habitat, control of pollution, and so on. As such, changes in the status of environmental resources, either negatively or positively, affect sustainable development. It is therefore important to achieve stability between the environment and the economy, considering the extent of their mutual dependence.

The rate of deforestation is of particular interest to policy makers in Southern Africa because the cost of deforestation goes beyond the losses of forest products alone. It extends to such indirect costs as soil erosion, the substitution of animal and agricultural residues for cooking that would otherwise have been used for fertilizer, and there is the additional element of the contribution of deforestation to climate change.

In Southern Africa, some governments have prepared comprehensive contingency plans for mitigating the impact of a possible drought. Countries such as Botswana, Mozambique, Namibia, South Africa and Zimbabwe, for example, have initiated water-saving measures although major dams are currently about 91 per cent full. Others are preparing to meet the national demand either by producing more food or by importing it from abroad in order to meet the sub-regional food requirement of 26.85 million tons.

Efforts to address environmental degradation pose the following important challenges:

- Mobilization of the scientific community to mount an integrated programme for methods, standards, data collection, and research networks for assessment and monitoring of soil, water, land, forest and atmospheric degradation;
- Development of environment-use models that incorporate both natural and human-induced factors that contribute to degradation and that could be used for resource planning and management;
- Development of information systems that link environmental monitoring, accounting, and impact assessment to degradation;
- Implementation of policies that encourage sustainable environmental resource use and management, and assist in the greater use of environmental resource information for sustainable livelihoods; and
- Implementation of economic instruments for assessment of environmental degradation and encouragement of sustainable use of environmental resources.

Although a number of Southern African countries are signatory to various international conventions relating to environmental resource management, many are still not committing sufficient resources for tackling the problem. Efforts at privatizing public services within the framework of public private partnership are in top gear in many countries in the sub-region. This approach creates incentives for the bidders to identify areas where they can drive operating costs down, at the same time improving service quality.

Genetic improvement of food crops, using both conventional and biotechnology research tools is needed to shift the yield frontier higher and to increase stabil-

ity of yield. There is growing evidence that genetic variation exists within most cereal crop species for genotypes that are more efficient in the use of nitrogen, phosphorus and other plant nutrients than are currently available in the best varieties and hybrids.

Major recommendations of the study included the following:

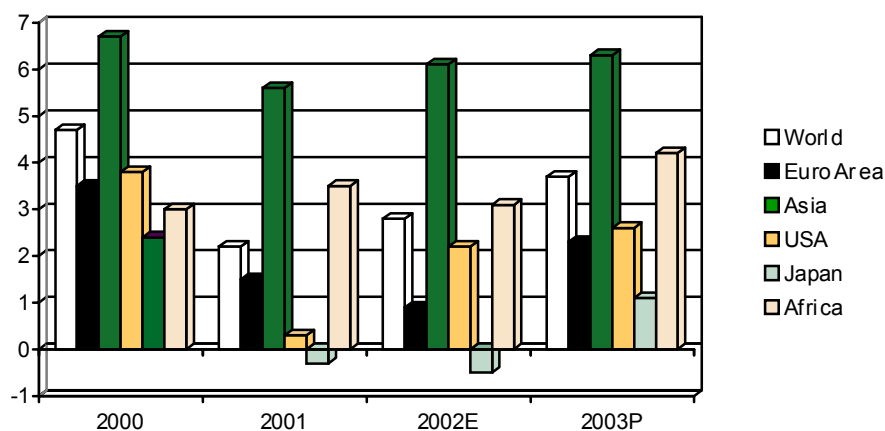
- Environmental management should receive higher priority in budgetary allocations.
- Efforts should be made to encourage agricultural production diversification into drought resistant, disease-resistant, non-traditional crops to ensure food security.
- There is scope for the adoption of “home-grown”, genetically modified crops that are resistant to drought, diseases and pests, and which are proved to be safe for human consumption.
- Providing rural households with electricity would, to some extent, diminish the direct impact on fuel wood consumption. The adoption of energy-efficient cooking stoves, for example, should be promoted in order to reduce household fuel wood consumption.
- Joint initiatives regarding environmental management, such as promotion of joint wildlife management in the sub-region, should be encouraged. It is important to implement compatible land use and resource management strategies along the lines proposed in the SADC Protocol on Wildlife Conservation and Law Enforcement.
- Regional co-operation is needed at all levels, in research, monitoring and management of coastal resources along the lines of the Benguela Environment Fisheries Interaction and Training programme (BENEFIT) established by Angola, Namibia and South Africa. The integrated coastal zone management initiative of Mozambique, Namibia and South Africa is also a welcome development that can be emulated.

PART I

SOCIO-ECONOMIC DEVELOPMENTS AND PROSPECTS

1. THE INTERNATIONAL CONTEXT

The systematic slowdown of the world's major economies in 2001, particularly during the last quarter of the year, dragged down growth of the world economy, which suffered its fastest slowdown since the oil shock of 1974. According to the UN Department of Economic and Social Affairs (DESA)¹, growth of the world output was estimated at 1.3 per cent in 2001, compared to 2.7 per cent in 2000. This depressing picture was the result of the virtual stagnation in international trade, which was the engine of growth in the preceding years. Although the slowdown was widespread, Latin America and East Asia were among the most affected, while most African countries continued to be vulnerable to downturns in commodity prices. (E = Estimates; P = Projections)



Africa's economic performance improved only marginally in 2001. According to ECA, regional output as measured by GDP growth rate was estimated at 4.3 per cent, compared to 3.5 per cent in 2000. With the exception of Southern Africa, all the other sub-regions recorded a similar GDP growth, which was above 3 per cent in 2001 (see table 1.1).

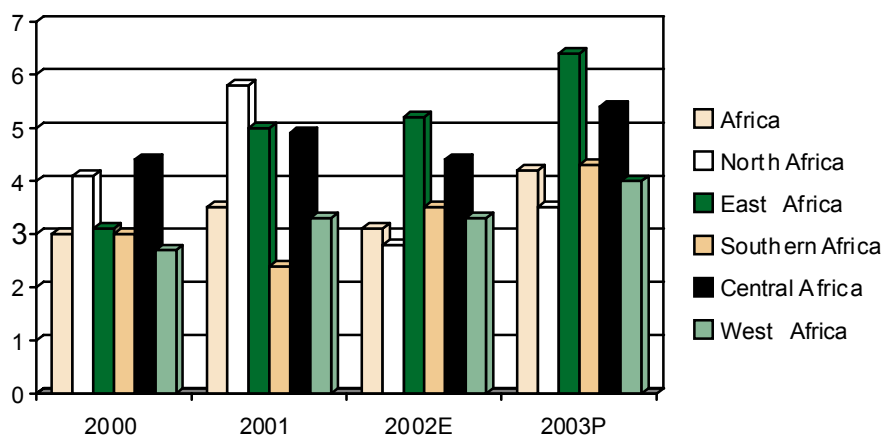
³ DESA/UNCTAD, World Economic Situation and Prospects 2002.

Table 1.1: World GDP Growth Rates by Regions, 2000-2003

REGION	2000	2001	2002E	2003P
World	4.7	2.2	2.8	3.7
Euro Area	3.5	1.5	0.9	2.3
Asia	6.7	5.6	6.1	6.3
USA	3.8	0.3	2.2	2.6
Japan	2.4	-0.3	-0.5	1.1
REGION	2000	2001	2002E	2003P
Africa	3.0	3.5	3.1	4.2
North Africa	4.1	5.8	2.8	3.5
East Africa	3.1	5.0	5.2	6.4
Southern Africa	3.0	2.4	3.5	4.3
Central Africa	4.4	4.9	4.4	5.4
West Africa	2.7	3.3	3.3	4.0

Source: IMF, World Economic Outlook, September 2002, and ECA database E = Estimates; P = Projections

The low performance of the African economy was mostly attributed to collapsing global demand that lowered international oil and base metal prices and the subsequent drop in the value of African exports. The price of Brent crude, for example, dropped from an average of \$US 28.00 per barrel (p/b) in 2000 to \$US 25.00 p/b in 2001, while gold prices dropped from \$US 280 per troy ounce in 2000 to \$US 260 per troy ounce in 2001. In addition, Africa remained a marginal recipient of Foreign Direct Investment (FDI) in 2001. Though aggregate FDI to Africa increased from \$US 9 billion in 2000 to \$US 17 billion in 2001, this increase was concentrated in a few large FDI projects, notably in Angola, Morocco, and South Africa.



In addition to specific measures that member States designed to encourage economic growth in their respective countries, macroeconomic policy in Africa as a region centred on three major policy-oriented issues:

- The debate on the need to eradicate poverty and place African countries on a path of sustainable growth and development;
- The commitment to intensify the fight against HIV/AIDS; and
- The entry-into-force of the Constitutive Act of the AU in July 2001.

The debate on the need to eradicate poverty in Africa continued with renewed vigour both at continental and international levels. The emphasis this time was on the establishment of a new relationship of partnership between Africa and the international community, especially the highly industrialized countries, to overcome the difference in development that has widened over centuries of unequal relations. Consequently, African leaders worked on a set of new continent-wide development strategies known as the New Partnership for Africa's Development (NEPAD).

NEPAD is a firm commitment by African leaders to take ownership and primary responsibility for sustainable economic development of the continent. It argues that Africa needs to involve itself much more closely in the global economy. To that end, a set of measures was highlighted, including external debt relief measures and improved trade access to the developed world. While none of the above is a new idea or concept, the central idea of NEPAD is that African governments would “own” these measures as the basic rules of the new global economy and not think of them as having been imposed by donor institutions and governments.

The fight against HIV/AIDS and other infectious diseases was a major concern for Africa's economic and social development, both internally and internationally, in the year 2001. On the international front, the UN Secretary-General proposed the launching of a Global Trust Fund to secure funds to fight the disease, while on the national fronts, African leaders vowed to give the struggle against HIV/AIDS top priority. More specifically, African leaders pledged to allocate at least 15 per cent of their national budgets to improvement of the health sector.⁴

In addition to economic ties, the creation of AU was a firm resolution by African leaders to materialize the dream of the founding fathers in creating a “United States of Africa”. The existence of AU requires formation of an African Central Bank, an African Monetary Fund, an African Investment Bank, an African Parliament, and an African Court of Justice among other centralized organs.

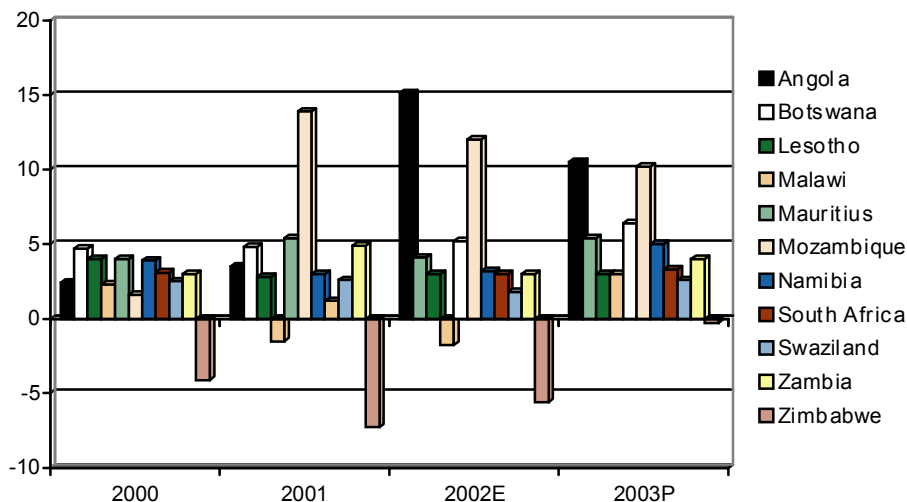
⁴ Abuja Declaration on HIV/AIDS, adopted by African leaders, 24-27 April 2001

In apparent contrast to other regions of the world, Africa did not benefit from strengthened global economic activity in 2002. GDP growth rate was estimated at 3.4 per cent, slightly lower than the 4.3 per cent achieved in 2001. The drop in regional GDP growth rate was mainly due to lower oil revenues from oil-exporting countries, reflecting the lagged effect of earlier price decline and, in some cases, production cuts due to lower OPEC production quotas, as in the case of Nigeria.

2. SOUTHERN AFRICAN ECONOMY IN 2001/2002

2.1 Overview

Economic performance in Southern Africa continued to improve in 2001, compared to 2000. However, good performance in some countries was eroded by the negative growth rate recorded in Zimbabwe, estimated at 6 per cent, which greatly affected the average GDP growth rate of the sub-region. Preliminary data for the 11 Southern African countries served by SRO-SA indicated that aggregate output grew by 2.4 per cent in 2001, compared to 3.0 per cent in 2000. Considering the overall goal of reducing poverty by half in the year 2015, the average GDP growth rate for Southern Africa still falls short of what is required to improve the living conditions of the people, and to sustain the sub-region's structural transformation. Only two countries, Mauritius and Mozambique, succeeded in surpassing the GDP growth requirement of 6 per cent for reducing poverty by half in 2015, the target which was agreed upon in 1995, at the World Summit for Social Development.



Economic performance as measured by per capita income was diverse across member States. Some countries, such as Botswana, Malawi, Mauritius, Mozambique, Namibia and Zambia, managed to achieve good economic performance for the second year in a row, giving hope of real economic recovery, with GDP per capita at current prices increasing significantly in some of them. In the island State of Mauritius, for example, GDP per capita, at current prices, increased from \$US 3,917 in 2000 to \$US 4,265 in 2001. The corresponding figures for Malawi are \$US 196 and \$US 201 respectively. Table 1.2 below gives GDP growth rates per country.

Table 1.2: Real GDP Growth Rates by Countries, 2000-2003

COUNTRY	2000	2001	2002E	2003P
Angola	2.4	3.5	15.1	10.5
Botswana	4.7	4.8	4.1	5.4
Lesotho	4.0	2.8	3.0	3.0
Malawi	2.3	-1.5	-1.8	3.0
Mauritius	4.0	5.4	5.2	6.4
Mozambique	1.6	13.9	12.0	10.2
Namibia	3.9	3.0	3.2	5.0
South Africa	3.1	1.2	3.0	3.3
Swaziland	2.5	2.6	1.8	2.6
Zambia	3.0	4.9	3.0	4.0
Zimbabwe	-4.1	-7.3	-5.6	-0.3

Source: EIU Country Reports and country sources. E = Preliminary Estimates P = Projections

In 2002, contrary to forecasts at the beginning of the year, aggregate GDP from the 11 SRO-SA member States grew by 3.5 per cent in 2002, up from 2.4 in 2001, but below the 4.5 per cent initially estimated. Adverse weather conditions, which affected most countries in the sub-region, particularly Lesotho, Malawi, Mozambique, Swaziland, Zambia, Zimbabwe and to some extent, Namibia, made it impossible for most countries to achieve a higher GDP growth rate in 2002. The moderate increase in 2002 was due to the robust increase in oil production in Angola and a better-than-expected performance in South Africa.

2.2 Policy Developments

Macroeconomic convergence to achieve and entrench macroeconomic stability and credibility continued to be a matter of concern to all Southern African countries. At the annual meeting of SADC Ministers responsible for Finance and Investment that took place in Pretoria, South Africa, on 8 August 2002, two memoranda of understanding (MoUs) were signed. The first was on Macroeconomic Convergence, and the second on Cooperation in Taxation and Related Matters. Work continues on developing MoUs in other areas, including Investment Promotion and Development of Finance Institutions.

Some of the constraints that have hindered effective implementation of sound macroeconomic policies, limited the extent of economic reforms and deterred the pace of economic growth are mostly those embedded within the structure and functioning of the macroeconomic institutional frameworks. In 2002, it was against this background that macroeconomic policies in most countries continued to emphasize structural, institutional and governance reforms in order to provide a conducive environment for private sector-led growth, and restricted monetary and fiscal policies to achieve internal and external balances.

Increasing government revenues remained a major policy issue in most countries. As in many developing economies, most Southern African countries continued to experience low levels of revenues due to weak tax collection systems, low compliance levels and widespread tax exemption. Most governments have tackled these problems through the establishment of autonomous national revenue authorities, simplifying tax systems and reducing exemptions.

In 2002, the overall framework for economic policy continued to be the implementation of poverty reduction strategies in order to achieve macroeconomic equilibrium and recover balanced growth, economic competitiveness and a more equitable income distribution. The underlying premise of this new approach remained the liberalization, greater openness and more rapid and closer integration into the world economy as the key to growth and development.

Many countries continued to pursue inflation control policies and managed to keep inflation rates within the numeric targets (6-9 per cent) set by SADC. In countries such as Angola, Malawi, Mozambique, and Zambia, there were significant reductions in inflationary pressures between 2001 and 2002. In Angola, for example, although the inflation rate was estimated at 85 per cent in 2002, this marked a major improvement on the 2001 figure of 116 per cent. In Mozambique, tight monetary policy reduced broad money growth from 35 per cent in 2001 to 16 per cent in 2002, thereby curbing the inflation rate from 21.9 per cent in 2001 to 9 per cent in 2002 (see table 1.3).

Table 1.3: Consumption Price Index, 2000-2003

COUNTRY	2000	2001	2002E	2003F
Angola	268.0	116.0	85.0	50.0
Botswana	6.7	6.6	7.8	4.3
Lesotho	8.6	6.9	8.6	6.0
Malawi	29.5	27.5	20.9	12.5
Mauritius	4.5	5.4	6.0	6.0
Mozambique	12.7	9.1	8.0	5.0
Namibia	9.3	9.2	8.5	7.8
South Africa	5.3	5.7	6.0	6.0
Swaziland	6.7	7.5	8.8	7.8
Zambia	30.10	18.7	16.0	16.8
Zimbabwe	60.0	74.5	119.0	100.6

Source: ECA database E = Estimates; F = Forecast

2.3 Country Highlights

Angola: In 2002, the Government continued its wide-ranging reform programme under the staff-monitored programme (SMP), which aims to promote macroeconomic stability and fiscal transparency, reduce poverty and put an end to the state-control distortions that have enabled corruption and inefficiency to flourish. Fiscal policy continued to focus on increasing budgetary transparency and reducing the fiscal deficit. Overall economic growth continued to have a strong correlation with the changes in the volume and prices of crude oil. In 2002, the GDP growth rate was estimated at 15.1 per cent compared with 3.5 per cent in 2001.

The signing of the ceasefire agreement and the peace process that was embarked upon following the new era of post-Savimbi politics were favourable contributory factors for better economic performance in 2002. In addition, increased oil production particularly from smaller producers such as TotalFinaElf's Girasol fields and the North Nemba platform in Cabinda, were also major contributory factors.

Botswana: The Government continued to pursue prudent economic policies during the year. Particular attention was given to curbing the HIV/AIDS pandemic, lowering unemployment, reducing poverty, diversifying the economy, reforming the public sector, improving government expenditure control, economically empowering citizens and conserving the environment. Conditions in the world diamond market were central to determining Botswana's economic development in 2002. Lower diamond exports, resulting from the imposition of quotas by the De-Beers Trading Company (DTC) in 2001, resulted in a drop in GDP growth rate from 4.8 per cent in 2001 to 4.1 per cent in 2002. Inflation increased slightly from an annual average of 6.6 per cent in 2001 to 7.8 per cent in 2002. This was a clear reflection of higher food prices.

Lesotho: Economic policy continued to be anchored on the three-year reform programme agreed with the IMF and supported by funds from a Poverty Reduction and Growth Facility (PRGF). In 2001, the programme achieved some success with the start of the treasury-bill auction in August 2001 (for monetary control) and the passage of legislation for establishment of an autonomous Lesotho Revenue Authority (LRA). In 2002, GDP growth rate was estimated at 3 per cent, up from 2.8 per cent in 2001. Average inflation rate increased slightly from 6.9 per cent in 2001 to 8.6 per cent in 2002, reflecting price increase, particularly food, beverages and tobacco, items that represent 43.5 per cent weight in the consumer price index. Increase in the price of fuel and consequently transport, also increased the inflation rate during the period.

Malawi: The Interim Poverty Reduction Strategy Paper (I-PRSP), which was published in August 2000, continued to be the basis of Government policies in 2001 and 2002. Agriculture remained the main economic sector of the country but in spite of the increase in tobacco production in 2001, GDP growth rate slowed to 1.5 per cent in 2001 and was estimated to have further declined by 1.8 per cent in 2002. The slump in GDP was due to poor economic performance, particularly in the agricultural sector. Lack of farming inputs and high interest rates forced many companies to close down or downsize operations. In addition to lower tobacco prices, the sector was also affected by a lack of inputs since 2001, coupled with the scaling down of the targeted input programme under which farmers received inputs such as fertilizers from the Government.

Mauritius: After the successful passage of the financial bill, which aims to develop the country into the leading regional hub for business and financial services, the Government launched a set of economic policies designed to move the economy increasingly into the high-value services. Though the rate of GDP growth declined slightly in 2002 as compared to 2001, growth across all sectors of the economy remained positive. Preliminary figures indicated a growth rate of 5.2 per cent in 2002 compared to 5.4 per cent in 2001. The global economic slowdown is estimated to have had an impact on tourism activities, foreign investment and financial services.

Mozambique: Economic performance remained favourable in 2002. However, GDP growth was estimated at 12 per cent compared to 13.9 per cent in 2001. GDP growth was underpinned by high FDI, including two large-scale projects: the expansion of the Mozal aluminium smelter and the construction of a gas export pipeline to South Africa. Economic policy continued to be anchored on poverty reduction and strengthening of the banking sector. Structural reforms were also given priority, particularly liberalization of the transport and telecommunication sectors. Other policy emphasis was on reform of customs and tax collection, strengthening budget execution mechanisms and accelerating efforts to strengthen the judiciary.

Namibia: Lower commodity prices, especially for diamond and base metals, coupled with poor performance of the primary sector, reduced Namibia's GDP growth rate in 2001 to 3 per cent compared to 3.3 per cent in 2000. Diamond outputs in 2001 are estimated to have fallen from 1.6 million carats in 2000 to 1.5 million carats as De Beers' affiliates decided to cut production in line with quotas on purchases imposed by the Diamond Trading Company (DTC). The downward performance was also due to lower outputs in the fishing sector. However, GDP is expected to rise in 2002 by 3.5 per cent, owing to improved fishing and the increase in copper mining output, following the resumption of production by the Tsumeb Corporation. Higher electricity, water and construction output also

contributed to improved economic performance in 2002. Economic policy in 2001-2002 had focused on accelerating economic growth, reducing poverty and unemployment, empowering those on low incomes, and implementing measures to tackle HIV/AIDS. Central to these goals was stimulation of activity in the private sector, particularly manufacturing, in order to diversify the economy away from agriculture, mining and fishing.

South Africa: Economic policy in South Africa, the most advanced economy in Southern Africa, continued to be guided by Growth, Employment and Redistribution (GEAR), the Government's macroeconomic strategy. In 2001, economic activity slowed and GDP grew by only 1.2 per cent. This was largely due to a fall of 4.2 per cent in agricultural output, coupled with sluggish growth in the manufacturing and mining sectors, whose combined growth rate was estimated at only 1 per cent. In addition, the drop in the demand for diamonds also contributed to sluggish growth in 2001. In 2002, GDP growth rate was estimated at 3 per cent, more than double that of 2001. This was supported by continued Government efforts to reduce the budget deficit, improve tax collection and reduce expenditures in some Ministries. Stronger demand for exports of goods and services within the sub-region and higher domestic demand due to improved consumer and business confidence also helped to boost the economy.

Swaziland: Although the country has not yet joined COMESA-FTA, the Government relaxed import controls as part of its policy of trade liberalization. Preliminary estimates indicated a GDP growth rate of 1.2 per cent in 2001, compared to 2.5 per cent in 2000. This reduced output growth was mainly attributed to lower sugar production for the 2001-2002 (April-March) crops, which is estimated to have dropped from 524,000 tons to 501,000 tons. Production of maize and cotton are also reported to be equally disappointing due to drought. However, the manufacturing industry, particularly textiles, was expected to grow significantly from 2002, as new investments took place under AGOA.

Zambia: The Poverty Reduction Strategy Paper (PRSP) that was officially released in May 2002 is the Government framework for economic policy. Economic growth accelerated to 4.9 per cent in 2001 from 3.0 per cent in the previous year. The improving trend was mainly a result of higher mining activity following privatization, which brought about fresh investment, new technology and improved management in the copper mines. Copper production was estimated to have increased from 256 thousand tons in 2000 to 353 thousand tons in 2001. Total exports of goods and services was estimated at \$US 1,050 million in 2001 compared to \$US 0.8 million in 2000. However, poor rains in the latter part of the year 2001 resulted in a maize deficit estimated at 150,000 tons. This situation forced the Government to declare a national food emergency in October 2001 and a national disaster in May 2002. In addition, poor harvests in 2001-2002

and Anglo-American's decision in January 2002 to withdraw its investment from the country's copper sector are likely to have adverse effects on the economy in 2002-2003. This might bring the GDP growth rate to 3.6 per cent.

Zimbabwe: The country continues to face the worst economic crisis in its history. The economy contracted significantly in 2001 with GDP estimated to have fallen by 7.5 per cent after a fall of 5.5 per cent in 2000. To reverse this negative economic trend, the Government adopted the Millennium Economic Recovery Programme (MERP), whose major aim is to stabilize the economy by speeding up the land resettlement programme, lowering production and capital costs and accelerating privatization. In 2002, drought compounded the already difficult domestic, political and economic situation of sanctions imposed on the country. The drought phenomenon aggravated the economic performance that had already been on the decline for the last three years. In 2001, the GDP growth rate was down to -7.3 per cent. Acute foreign currency shortages, coupled with high inflation rates, resulted in higher production costs and supply bottlenecks. In 2002, the Government continued to implement its new economic policy, introducing inflation-control measures to restore consumer confidence. As a result, the economy witnessed some improvement and the average GDP growth rate is currently estimated at -5.6 per cent.

2.4 Regional Co-operation and Integration

After decades of limited progress in building closer economic and political ties among African countries, there is now a renewed impetus for regional integration to help spur the continent's development and improve the lives of its people. In Southern Africa, governments acknowledged the fact that, for the sub-region to successfully integrate into the global economy, meaningful reforms (both political and economic) must be fully implemented. In this regard, most countries heeded the call from continental and multilateral organizations for the pursuit and continuation of regional cooperation and integration programmes.

In 2001 and 2002, economic integration continued to be an imperative for Southern African countries to achieve accelerated development. Three important issues dominated the debate on regional cooperation and integration during the reporting period. The first issue was the operationalization of COMESA-FTA. The second issue was the entry into force of the SADC Protocol on Trade in January 2000 and the corresponding arrangements made to launch a SADC-FTA by the year 2012, while the third issue was the signing of the renegotiated Southern African Customs Union (SACU) in October 2002.

The declaration of FTA in October 2000 was received with mixed feelings by member States and by different elements within individual States. Some argued

that they were not ready for the FTA. Some were optimistic that it would bring about economic growth. Yet others feared that only larger and more advanced economies within the FTA would benefit. Although one year after the launch of COMESA-FTA is a relatively short time to justly analyse a subject matter as wide-ranging and encompassing as this, there are still clearly differing views among countries and among different elements within individual countries. Indeed, the enhanced integration of the sub-region would result in some transitional costs on the part of member States in terms of loss of government revenue, injury to domestic industry, loss of employment and balance of payments. In this respect, the COMESA Council adopted trade remedies in November 2001, which member States can invoke in the event that they encounter such transitional problems. These trade remedies are safeguards, anti-dumping and counter-vailing duties.

The SADC Trade Protocol was developed to liberalize intra-regional trade in goods and services within the region on the basis of fair, mutually equitable and beneficial trade arrangements. The Trade Protocol was complemented by protocols in other areas and aims at ensuring efficient production within SADC, to reflect the dynamic comparative advantage of its members. It will contribute significantly towards improvement of the climate for domestic, cross-border and foreign investment.

Member States of SADC also made considerable progress towards achieving the SADC-FTA in 2012. SADC-FTA is poised to usher in a new dawn for the sub-region as new forms of competitive production, trade and marketing are set up. This is expected to significantly improve formal and non-formal trade activities and attract domestic, regional and foreign investment.

COMESA, SADC and SACU made significant progress with respect to regional cooperation and integration in Southern Africa, particularly in the area of tariff and non-tariff barriers to trade. However, intra-regional trade continues to be constrained by such non-trade barriers as inadequate transport and communication infrastructure, official inconvertibility of national currencies, inadequate trade information across countries and visa requirements for travelers.

The removal of all the above obstacles and impediments to meaningful regional cooperation calls for more concerted efforts among sub-regional stakeholders, to harmonize policies and programmes in support of formal and non-formal trade activities. In addition, this calls for policies, laws and regulations that are not biased against the non-formal sector. This sector not only contributes to poverty alleviation, intra-regional trade and political stability but can also lead to deeper regional integration.

2.5 Trade and Investment

In 2002, member States continued to undertake bold steps towards realization of market integration in Southern Africa under the two regional economic blocks of COMESA and SADC and with the signing of the renegotiated SACU Agreement in October 2002. In this regard, member States continued to deepen the implementation of trade liberalization programmes with a view to reducing and eventually eliminating tariff and non-tariff barriers to intra-regional trade. Indeed, substantive progress has been achieved in addressing non-tariff barriers pertaining to custom documents and procedures.

While aggregate intra-regional trade data are not available, there are indications that this trade is taking place and would have increased to higher proportions particularly following the launching of COMESA-FTA, and the entry-into-effect of the SADC Protocol on Trade in October and January 2000 respectively. Comparable exports figures for Zimbabwe indicate that exports increased from \$ Z 40,304 in November 2000 to \$ Z 80,608 in January 2001 and to \$ Z 105, 365 in May 2001.

Against this background of achievements, the adverse impact of transport costs on trade efficiency and competitiveness continue to affect both operators and investors alike. According to recent studies, 12.7 per cent of the total value of imports in Southern Africa relates to transport costs.⁵ On the export side, many countries in Southern Africa spend about 20 per cent of their earnings on transport-related expenses. In Malawi, for example, these expenses amount to 55.5 per cent of the country's total earnings on exports.⁶ It is clear, therefore, that reductions in transport costs can significantly improve the region's domestic and external competitiveness, thereby enhancing the success of economic integration.

While most countries continue to suffer from lack of capacity to take full advantage of the opportunities provided under AGOA and the EPAs between EU and ACP countries, some countries have managed to explore and use the benefits provided in both initiatives. Countries like South Africa, Lesotho, Mauritius and Swaziland, for example, have obtained visas to export textiles, clothing and apparel under the AGOA initiative. Available figures from some member States indicate that exports from Southern Africa to the USA increased from \$US 4,215.7 million in 1999 to \$US 5,586.8 million in 2000. In addition, since the introduction of AGOA in 2000, there has been significant inward foreign investment in such countries as Lesotho and Namibia, with over 20,000 jobs created in the two countries.

⁵ The United Nations Conference and Trade Development (UNCTAD). Policies and actions taken by individual countries and by international organizations to improve transit transport systems, UN, New York, 1999.

⁶ Ibid.

The expansion of international production is driven by a combination of factors that plays out differently for various industries and countries. Three forces are the main drivers, namely: policy liberalization, rapid technological change and increased competition. While these driving forces are long-term in nature, the investment behaviour of firms is also strongly influenced by short-term changes in business cycles, testified by recent trends in FDI. After the record high level of 2000, global FDI flows declined in 2001 (for the first time in a decade).

In an effort to overcome this situation, Southern African countries continued to adopt new measures, including laws and regulations aimed at improving the investment climate in the sub-region. Measures ranged from a reduction in tax rates, controlling inflation, and monetary reforms. Reforms were also made in the areas of infrastructure development, privatization of state enterprises and joint management of natural resources. An example of the latter is the first trans-frontier game park in Africa, which combined Gemsbok National Park in Botswana and the Kalahari Gemsbok National Park in South Africa. There are similar initiatives between Mozambique, South Africa and Zimbabwe.

Notwithstanding this progress, there were still a number of factors that continued to impact negatively on the sub-region's trade and investment sectors. These ranged from high petroleum prices, which impact on transport and raises the production cost of manufacturing firms, to high cost of capital for investment.

As a consequence, the overall response to government policies to attract investment has not been concomitant to the efforts made. This can also be linked to the perception held outside the sub-region that investments are not safe in the sub-region, citing conflicts in Angola and the land issue in Zimbabwe as examples.

3. MAIN ECONOMIC SECTORS

3.1 Agriculture and Food Security

The World Summit on Sustainable Development (WSSD) in 2002 underlined the need to achieve sustainable agricultural productivity and food security in furtherance of the agreed MDGs, including halving the proportions of people who suffer from hunger by 2015. Agriculture is the mainstay of Africa's development. Indeed, agriculture has continued to dominate most Southern African economies (Mauritius and South Africa being the major exceptions), in terms of food security and poverty reduction, since the majority of the sub-region's poor live in rural areas.

In 2001-2002, agricultural performance in Southern Africa, as in previous years, continued to suffer from a combination of mitigating factors such as high dependence on rain-fed farming and limited use of fertilizers and modern inputs. Production varied across countries and by commodities. Cereal production, for example, was normal in a number of countries, notwithstanding the damage caused by droughts in some others. Countries that recorded significant gains in 2000/2001 compared to the average of the last five years included Malawi, Namibia, South Africa and Zambia. Those that produced less than average production included Angola, Botswana, Lesotho, Mozambique, Swaziland and Zimbabwe. In Angola, the food situation was precarious for some 2.6 million internally displaced persons, while in Zimbabwe food production was constrained by political instability. For the year 2001/2002, shortages of maize and wheat were reported in Zambia and Zimbabwe. For the sub-region as a whole, the output of 22.8 million tons represented a 114 per cent increase over the average production of the last five years.

The consequence of continued poor agricultural performance, especially with regard to food production, is food insecurity. The proportion of undernourished in the total population is an indicator of food insecurity. These proportions for the period 1997 - 1999 in Southern African countries, according to the Food and Agricultural Organization (FAO) 2001 *State of Food Insecurity in the World*, were as follows: Angola 51 per cent; Botswana 23 per cent; Lesotho 25 per cent; Malawi 35 per cent; Mauritius 6 per cent; Mozambique 54 per cent; Namibia

33 per cent; Swaziland 12 per cent; Zambia 47 per cent; and Zimbabwe 39 per cent. Serious cases of undernourishment impact negatively on the health of the population, especially the young and the elderly.

3.2 The Food Security Crisis in Southern Africa

An assessment by FAO in February 2002 showed that nearly four million people in Southern Africa faced severe food shortages⁷. The most affected countries were Malawi, Zambia and Zimbabwe. Other affected countries were Lesotho, Mozambique and Swaziland. However, by June 2002, estimates by FAO and the World Food Programme (WFP) put the number of those affected by food insecurity in Southern Africa at almost 13 million. These figures had risen to over 14 million by September 2002 and were to increase further till the next harvest season. Many factors contributed to the food crisis in Southern Africa in 2002. These included weather conditions, government policies and the impact of HIV/AIDS, which reduced food production. Given the seriousness of food insecurity in the affected countries, a brief country situation is presented below.

It may be noted in passing that the food crisis led to school dropout in countries such as Malawi, Swaziland, Zambia and Zimbabwe. Following the end of the war, Angola is also facing food shortages and international assistance is required in providing food and humanitarian support to resettle those who were displaced. A donors' conference for social reintegration, reconstruction and development of Angola was to be held under UN auspices to appeal for international community aid. The situation in the six most affected countries of Southern Africa is analysed as follows:

Lesotho: Heavy rain in 2001 delayed planting; and in March 2002, frost damaged crops at the end of the growing season. The Government declared a state of emergency in April 2002. Cereal production at harvest in 2002 was a third lower than that of the 2001 harvest. In September 2002, it was estimated that some 650,000 people would require emergency food aid at the height of the crisis, many of them up to a full year.

Malawi: The food insecurity in Malawi in the 2002 harvest is considered the worst since 1949. The 2002 harvest made it the second consecutive year of low food production. The rains for the 2001/2002 planting season started late, a situation that was made worse by flooding in several districts and a dry spell early in 2002. Mismanagement of grain stocks was also blamed for worsening the food crisis in the country. The Government declared a national disaster at the end of February 2002. As about 65 per cent of the population in Malawi live below the

⁷ FAO Special Alert No. 320. "Nearly 4 million people in Southern Africa face severe food shortages", 19 February 2002. See also <http://www.fao.org/giews>

poverty line and cannot afford to buy food on the open market, families have sold off their livestock at give-away prices to raise cash for food and other basic necessities. In the 2003 harvest, it is estimated that Malawi may face a food deficit of more than 200,000 tons.

Mozambique: A long dry spell in southern and central parts of the country, lasting half the growing season, during 2001-2002, resulted in poor harvest in 2002. With the same areas affected by the worst floods in 2000, the World Food Programme (WFP) estimates that 180,000 farmers in Mozambique have not had a full harvest in three years. Although there was a surplus of about 100,000 tons of maize from the northern areas of Mozambique, this surplus could not be transported to the southern part of Mozambique due to high transport costs. It is estimated that the 2002-2003 harvests will result in a food deficit of about 642,000 tons.

Swaziland experienced the second successive year of erratic weather in 2001-2002, including a dry spell just when the maize crop was flowering. WFP estimates at the end of September indicated that about 270,000 people spread across Lowveld, Middleveld and Lubombo plateau would require food aid up to the next harvest. It was estimated that some 50 per cent of the farmers in the Lowveld would harvest nothing during the 2003 harvest and the country might have a food deficit of about 111,000 tons at the 2003 harvest.

Box 1: The UN and GM Foods

The UN released a statement regarding the use of genetically modified (GM) foods as food aid. FAO, WHO and WFP concur that these foods are fully certified as safe for human consumption. While there are no existing international agreements yet in force with regard to trade in food, or food aid that deals specifically with food containing GMO, the UN policy is that the decision with regard to the acceptance of GM commodities rests with the recipient countries. However, the UN believes that in the current crisis, governments in Southern Africa must carefully consider the severe and immediate consequences of limiting the food aid available for millions so desperately in need.

Zambia: The 2001-2002 maize production was estimated at 24 per cent below that of the 2000-2001 harvest and 42 per cent lower than that of the 1999-2000 harvest. The 2000-2001 harvest of maize fell by a quarter, after severe flooding affected southern and eastern parts of the country. Five of the nine provinces were affected by the prolonged dry spells and erratic rains in 2001-2002. The southern province was the worst affected, with about 60 per cent of the population requiring food aid. The maize crop was almost a total failure. WFP estimates at the end of September 2002 indicated that close to 3 million people in Zambia would need emergency food aid after suffering the second successive bad harvest. The Government declared the food crisis a national disaster in May 2002. Food deficit in the 2003 harvest is projected at 630,000 tons.

Zimbabwe: Between January and March 2002, the country experienced the longest drought in 20 years, contributing significantly to the food crisis affecting over 6 million people. The worst affected were poor rural communities in the south, west and extreme north. Most of the urban poor and commercial farm workers lost their livelihoods. The Government declared the food crisis a national disaster in April 2002. Land reform activities affected large-scale commercial farming, thereby contributing significantly to the food crisis. Exceptionally high rainfall in 2000-2001 undermined the harvest in 2001, thereby reducing stocks that should have been carried over to 2002. Food deficit in the 2003 harvest could reach 1.9 million tons. Table 1.4 provides a summary of the situation for affected countries.

Table 1.4: Population in Need of Food Aid and Food Requirements September 2002 - March 2003 (selected countries)

COUNTRY	NUMBER OF PEOPLE IN NEED OF FOOD	PERCENTAGE OF TOTAL POPULATION	TOTAL FOOD REQUIREMENT TO MARCH 2003 (MT)
Lesotho	650,000	30	36,000
Malawi	3,300,000	29	237,000
Mozambique	590,000	3	48,000
Swaziland	270,000	24	20
Zambia	2,700,000	26	224,000
Zimbabwe	6,700,000	49	486,000
TOTAL	14,400,000	26	1,000,000

Source: SADC-FANR, Regional Emergency Food Security Assessment Report, Harare, September 2002

3.3 Response to the Food Crisis in Southern Africa

The need to increase productivity in agriculture continued as a matter of concern to all member States in the sub-region to provide food to all. The food crisis in Southern Africa drew national, sub-regional, international and individual attention to assist with food aid and other forms of assistance.

National and consolidated sub-regional appeals with the assistance of UN systems, donor partners, and NGOs were made at the highest level of ECOSOC. SADC was at the centre of all these activities. The appeals, in addition to providing immediate food relief and humanitarian aid for water, sanitation, health and nutrition also focused on emergency provision of agricultural inputs to enable those affected by the food crisis to restart agricultural production during 2002-2003.

At the initial launch of the international appeal by ECOSOC in July 2002, the six Southern African countries most affected needed over \$US 600 million to meet the urgent food and non-food needs over the next twelve months. By end

of August 2002, about 22 per cent of the money was contributed by several donor countries and organizations to help with the food and non-food needs in the six affected countries. By end of September, there were pledges amounting to 36 per cent of the needed resources while WFP was confident in securing a further 30 per cent, leaving a gap of 34 per cent. The SADC Summit held in Luanda, Angola, from 1-3 October 2002, noted with appreciation the efforts made by WFP to address the food crisis and humanitarian situation in Southern Africa. The Summit urged member States and the SADC Secretariat to continue to take concerted measures to tackle the medium- and long-term challenges posed by the food crisis.

In addressing the issues of food shortages in Africa, Michael Abu Sakara Foster and Abel Lufafa argue that if productivity could be increased substantively among those food crops that many poor people grow, poverty would diminish and Africa can achieve food security.¹ Agricultural intensification is one of the components for addressing food security. They correctly indicate that measures needed to ensure future food security go beyond issues of agricultural intensification alone. Foster and Lufafa put emphasis on agricultural development to encompass much broader objectives for rural development and address the full scope of rural livelihood opportunities.

There have been some success stories on small-scale agriculture that go unnoticed, but would go a long way to improve food security, as well as increase income generation. An example here would be the Machobane Farming System (MFS) in Lesotho. MFS promotes self-sufficiency and income generation. Through MFS, a farmer can harvest up to six crops from a small plot. MFS also encourages diversification of income-generating activities including poultry farming.

Many countries have come to realize the impact of HIV/AIDS on agriculture and food security. In February 2002, the Minister of Agriculture and Irrigation in Malawi observed that farmers and farm workers were dying from infections and this reduced crop production and resulted in food shortages. He noted that the greatest loss was felt amongst agricultural field assistants whose numbers had significantly reduced. Crash courses to train more farm assistants have been introduced. HIV/AIDS education programmes in rural areas are reported to have intensified. In Zambia, the National Farmers Union (NFU), in collaboration with FAO and the National AIDS Council (NAC), has embarked on a communication strategy targeting small-scale farmers in order to bring about behavioural change regarding HIV/AIDS, through workshops and dramas.

¹ Michael Abu Sakara Foster and Abel Lufafa, "Agriculture Intensification: Feeding Ourselves and Sustaining Africa's Land Resources in the New Millennium". Paper presented at the ECA Second Meeting of the Committee on Sustainable Development (CSD), Addis Ababa, Ethiopia, 26 – 29 November 2001.

Some specific lessons aimed at addressing the issue of food insecurity in Southern Africa emphasize, *inter alia*, the following needs:

- a) To improve and strengthen the capacity of the SADC Disaster Management mechanism and National Disaster Management Unit;
- b) To strengthen early warning systems on disaster by providing information for timely decision making to farmers and other stakeholders;
- c) To address medium- to long-term policy issues on farm inputs, pricing and rehabilitation of infrastructure, marketing, and ensuring strategic grain reserves by member States;
- d) Concrete action by member States to expand irrigation in order to ensure food security. Some countries, including Malawi and Zambia, have started taking such action;
- e) To implement the SADC Food Security Policy and other similar policy frameworks developed to improve food security in the sub-region;
- f) To address HIV/AIDS as an integral component for addressing poverty and food security; and
- g) To encourage crop diversification from maize to other crops; and
- h) To promote the growing of drought-tolerant and low-input crops (cassava and sweet potato) in order to change eating habits and to avoid relying on only one staple crop.

3.4 Industry

Industrial development is the key to effective utilization of natural resources. The main thrust of the industry sector is to develop industrial capacity while fully using local natural resources.

In Southern Africa, the manufacturing industry continued to face challenges from foreign competition and limited financial resources. However, some countries secured industrial growth in 2000-2001, notably Lesotho (11.8 per cent), Mozambique (7.8 per cent), Angola (7.9 per cent) and Botswana (5.7 per cent). In South Africa, overall industrial production of the country stood at 7 per cent in 2001, from 5 per cent recorded in 2000. This was a clear reflection of the advanced and diversified technology in the South African industrial sector, including the mining sub-sector.

The manufacturing industry in Southern Africa, as in most other sub-regions, continued to be dominated by textile and food and beverage processing industries. These sub-sectors are directly and indirectly dependent on the agricultural sector. The direct effect of agriculture on industry is through the availability of agricultural raw materials for industrial processing, while the indirect effect is the availability of

foreign exchange for the import of inputs and new investments. With the agricultural sector performance remaining stagnant in most Southern African countries in 2001, the two sub-sectors reflected this stagnation. In Zimbabwe, for instance, the crisis in the agricultural sector significantly constrained industrial production, which has been on the decline for the last three years or so. In 2001, industrial production dropped by 10 per cent after a decline of 6 per cent in 2000.

In addition, high interest rates for borrowers continued to impact negatively on both working and investment capital, thereby increasing production costs of the manufacturing industry. This situation has rendered local manufacturers in some countries unable to compete effectively with respect to the production of goods and services.

In mineral-rich countries, performance of the mining industry is closely related to international fluctuation of mineral prices. In 2001, the mining industry was hurt by the decline in commodity prices of the country's exports, which constrained imports of raw material, spare parts and new machinery for investment. Current programmes of the industry sector in Southern Africa are focused on the preparation of a regional industrial policy and strategies that would best promote industrial development in the sub-region. Some of the main concerns being addressed by the regional industrial policy framework include those related to the effects of trade liberalization on local industries.

3.5 Transport and Communications

The road transport industry has always been dominated by the private sector. However, the provision of road infrastructure is still dominated by Government and supported by the cooperating partners. The participation of the private sector in the provision of road infrastructure has been particularly positive with respect to the N4 toll road, the section between Maputo in Mozambique and Witbank in South Africa.

In 2001-2002, institutional reforms continued in some of the member States. These were consistent with regional agreements and mainly related to enacting new legislation to incorporate regional standards as well as strengthen institutions established in previous reforms. A significant milestone was reached in Zimbabwe where the old Roads Act was repealed and replaced by a new Roads Act, which recognizes several categories of road authorities. In addition a Road Fund was also established, as was the Zimbabwe National Road Administration (ZiNaRa), which is responsible for the entire road network and the administration of the Road Fund. ZiNaRa has a majority of its members coming from the private sector as is recommended in the regional model. Other reforms continued in Botswana and Swaziland.

The Association of Southern African National Road Agencies (ASANRA), established in March 2001, has completed the definition of the terms of reference of its standing committees. ASANRA intends to take a proactive role in infrastructure delivery and maintenance in the region. In this regard, the work to be eventually taken over by ASANRA has continued to be reviewed by the SATCC Standard Specifications for Roads and Bridges, which is in the process of developing guidelines for low-volume sealed roads.

3.5.1 Road traffic

The process of harmonizing road traffic signs that started in the late 1980s, moved towards finalization with the formal adoption by the Roads SCOM and COSO of the volumes that were developed. The importance of the safety of standardized traffic regulations as well as signage in all the member States cannot be overemphasized. The adoption of the SADC Road Traffic Signs Manual would be an efficient way to harmonize road user behaviour and to contribute towards improved road safety in the region. Also significant in the period under review was the impending project intended in part to improve road safety and provide road information along the Beira Corridor. The corridor will serve as a pilot project. If the results are positive, the project will be replicated in other corridors.

3.5.2 Road transport

The facilitation of intra-regional trade remains a key challenge for the road transport sector. Delays at border posts and the multiplicity of documents intended to serve the same purpose increases the costs of transport, goods and services in the SADC region. The period under review saw the continuation of discussions to reach convergence on several strategies to minimize the costs of trade facilitation. Such work was centred mainly on monitoring the measures being implemented on the TransKalahari Corridor. This is the second of two pilot corridors, the first one being the Gauteng - Maputo Corridor, from which successful strategies can be replicated elsewhere in the region. In other measures relating to trade facilitation, SADC and COMESA formed a Task Team to develop modalities for harmonizing Motor Vehicle Third Party Insurance schemes across Eastern and Southern Africa.

3.5.3 Railways

In the railway sector, private sector involvement is moving at a satisfactory pace, following the concessioning of Malawi Railways, CFM (North and South of Mozambique), and the Beitbridge - Bulawayo line of Zimbabwe. SATCC-TU had higher hopes for this sector because of prospects of concessioning of several rail enterprises. The process is ongoing.

The Zambia Privatization Agency is spearheading the concessioning process of Zambia Railways. Concessioning is also being considered for Tanzania Railways Corporation, Tanzania-Zambia Railway Authority, Swaziland Railway, South African Railways (Spoornet) and National Railways of Zimbabwe. There are no plans to concession Botswana Railways and the TransNamib Railway. In Botswana, it is hoped that the newly established privatization agency, the Public Enterprise Evaluation and Privatization Agency (PEEPA) will initiate the privatization process in the foreseeable future. TransNamib is planning to involve the private sector in the development of a dry port in Windhoek as well as trans-shipment terminals at railheads to increase multimodal operations.

Plans for undertaking comprehensive policy reviews for harmonization at the regional level and ensuring that the policies and legislation satisfy the international best practices are at an advanced stage. These will entail developing implementation strategies with respect to legal and institutional reforms; increasing private sector involvement in railway investment; ensure adequate, permanent way and rolling stock; develop and implement compatible technical standards; promote data information exchange; develop, harmonize and simplify procedures and documents; adopt common safety rules and regulations; and pool railway resources.

Priority will be given to the restructuring of the railway industry with the aim of attracting private investors to the railway industry. On this front, the railway sub-sector approved the following Model Legislative Provisions: Railway Restructuring and Regulation; Model Freight Contract; and Model Railway Passenger Service Concession. Member States are encouraged to establish independent railway regulators.

The SADC Regional Railways are now organized on corridors coordinated by Corridor Management Groups. It was recently agreed to expand the Corridor Management Groups to include other stakeholders from customs, port operators, freight forwarding and clearing agents, immigration, and police. In the long run, the intention is to form Corridor Planning Committees.

The performance of corridors is measured through an agreed number of performance indicators. The Southern Africa Railways Association (SARA) has been mandated to compile trends so that performance of the corridors over time can be measured.

3.5.4 Inland waterways

During the period under review, two main issues affecting inland waterways emerged and generated a lot of regional discussions. The first was the lack of

security for services operating on Lake Tanganyika. The war in the Democratic Republic of Congo (DRC) has resulted in disruptions to shipping operations over the lake. The second issue was the need for proper environmental management surrounding inland waterways. Most of the waterways have large and expanding settlements on their shores. This has led to increasing siltation and a flow of wastes into the lakes, reducing the navigability of the waterways.

Poor safety on the inland waterways continued to be of concern. During the period under review, the International Maritime Organization (IMO) convened a seminar on drafting safety regulations for inland waterways vessels and non-convention size craft, including fishing vessels. It is hoped that the regulations will reduce the number of casualties experienced from such vessels in Africa. The final version of the Regulations has been circulated to all SADC member States for their consideration and possible implementation.

3.5.5 Maritime Ports and Shipping

The ports sector has been leading in terms of private sector involvement as evidenced by the concessioning of port terminals of Maputo, Beira and Nacala in Mozambique, Dar es Salaam in Tanzania, and Luanda in Angola.

The SADC region has a fairly developed system of seaports to cater for existing demands for international movements. Reforms where port ownership and regulation is being separated from port operations continued in some member States. The reforms have already started to make significant impact on productivity and efficiencies, notably in Namibia, where investment in additional infrastructure and aggressive marketing of the port of Walvis Bay is realizing growth in traffic handled. The amount of traffic handled at the various ports reflects the economic performance of the region and political stability is important to economic growth and the realization of the full potential in the region's seaport infrastructure. Hope of a peaceful climate in the future, especially in DRC and Angola, is likely to generate increased seaborne traffic flows.

While some of the regional ports are either close to or are operating beyond their rated capacities, planned developments across all coastal States, especially in South Africa, should ensure the availability of adequate capacity for some time to come.

The area of shipping has undergone several historic landmarks. The first was the introduction of the steam engine, then the containers. But the third most dramatic change, which has amounted to a 'revolution', is computerization, electronic commerce and the change from paper documentation to electronic documentation of the carriage of goods by sea. During the period under review, several SADC member States, especially Mauritius, South Africa and Namibia, continued to develop port e-commerce systems. A session to exchange informa-

tion and ensure harmonization will be held during the International Association of Ports and Harbours (IAPH) Conference in Durban in 2003.

In the area of maritime safety, Southern African countries continued to ratify the various IMO conventions that were agreed on as part of the SADC Safety Development Programme and those required under Port State Control. The member States also kept abreast of the new safety and security requirements that are under discussion internationally as a result of increased awareness of terrorist threats.

3.5.6 Civil Aviation

Private sector participation in the civil aviation sub-sector over the last few years has been encouraging. This is evidenced by private sector management of airport terminals and facilities, as is the case in Malawi, Mozambique, South Africa, Tanzania and Zambia.

In the airline industry, public sector ownership and management is slowly decreasing. Zambia Airways and Lesotho Airways are no longer in operation. Swazi Airways formed a joint venture with SA Airlink, with the Swazi Government the majority shareholder, holding 60 per cent and SA Airlink holding 40 per cent. South African Airways, Air Namibia and other airlines in the region have taken measures to secure strategic partners.

In 2001-2002, efforts in the sub sector concentrated on finalizing the preparations for implementation of major projects and strategies, and involving neighboring sub-regions of COMESA and the East African Community (EAC) in that endeavour. The Yamoussoukro Decision is one such strategy aimed at liberalizing the air transport market of the region and of the whole continent. To facilitate its implementation, promotional seminars were held and competition rules drafted. These rules are currently undergoing unification with those of COMESA and EAC to merge them into one set of rules for the three sub-regions and may constitute the greater part of the rules for Africa. Work is also being done to establish a joint SADC/COMESA/EAC monitoring unit for implementing the decision.

The detailed feasibility study for the SADC Upper Airspace Control Centre (UACC) was accomplished. This paved the way for establishment of the centre, scheduled to commence in October 2002, with drawing up of the detailed implementation plan. Other communication, navigation, surveillance/air traffic management (CNS/ATM) activities continued to be implemented in earnest. As the first life cycle of the very small aperture terminal (VSAT) network approaches the end, alternative arrangements were developed to ensure its continuity and modernization. The global navigation satellite system (GNSS) design procedures were accomplished in 28 international airports covering all the SADC member States. Arrangements to get the region involved in both the European Geostationary

Navigation Overlay Service (EGNOS) and the Wide Area Augmentation System (WAAS) test beds have been co-ordinated with the rest of Africa.

Aviation Safety and Security continued to dominate the work of the sub-sector both at regional and national levels. This was particularly emphasized after the events of September 11. The sub-region participated in formulating new security guidelines and standards during both the International Civil Aviation Organization (ICAO) Assembly of October 2001 and the Aviation Security Conference of 2002 and helped to set out regional guidelines to improve the situation. Every ICAO contracting State has agreed to undertake global security audits. Such audits have been going on in the case of aviation safety. In this regard, all SADC member States have been audited and common shortfalls listed to be addressed jointly through an ICAO championed COSCAP-SADC project. This project is being finalized.

4. SOCIAL SITUATIONS

4.1 Health and HIV/AIDS

In August/September 2002, WSSD discussed health and sustainable development as one of the areas warranting priority. The summit called for strengthening the capacity of health systems in order to deliver basic health services to all in an efficient, accessible and affordable manner. The aim was preventing, controlling and treating diseases and reducing environmental health threats. To this end, the WSSD Plan of Implementation included specific actions to address health and sustainable development issues.

Health is also one of the priority areas of NEPAD. African leaders in NEPAD have indicated that they will take joint responsibility for health services, with high priority given to tackling HIV/AIDS, malaria and other communicable diseases. Infant mortality, life expectancy at birth and the incidence of HIV/AIDS are among the indicators of health.

Table 1.5: Infant Mortality Rates (per 1000)

REGION	1995-2000
Africa	91
Asia	59
Europe	10
Latin America & the Caribbean	36
North America	7
Oceania	26

Source: 2000 World Population Prospects

Complete statistical data for 2001 are not yet available, but table 1.5 shows high infant mortality level for Africa, at 91 per 1000 births during 1995-2000. The comparable figures for other major world regions are: Asia 59, Europe 10, Latin America and the Caribbean 36, North America 7, and Oceania 26. Thus, Africa's infant mortality rate is thirteen times that of North America, and nine times that of Europe. Infant mortality for Southern Africa, from the same source, is 63 per 1000 compared to 103 for Eastern Africa, 98 for Central Africa, 58 for North

Africa and 96 for Western Africa. The corresponding life expectancy at birth for the sub-regions for 1995-2000 are as follows: Southern Africa 58, Eastern Africa 47, Central Africa 50, North Africa 66, and Western Africa 51. For Africa as a whole, life expectancy is about 52. The corresponding figures for life expectancy for other major areas of the world are: Asia 67, Europe 77, Latin America and the Caribbean 73, North America 77 and Oceania 76. These figures show that life expectancy in Southern Africa is 19 years lower than that in Europe and North Africa.

Infectious and parasitic diseases, malnutrition, HIV/AIDS and poverty all contribute to high mortality and morbidity in African countries. Recent research by Professor Ganapati Bhat at the University Teaching Hospital in Lusaka, Zambia, links high child mortality rates (between 20 – 25 per cent) to serious malnutrition due to poverty.⁹ Professor Geoffrey Sachs, an economist at Harvard University, while addressing the SADC Extraordinary Summit on 14 January 2002 in Blantyre, Malawi, deplored the fact that 25,000 people die every day in Africa due to curable and preventable diseases. The overall impact of high mortality and morbidity is reduced life expectancy at birth and a population that is less productive. The 2000 SADC Regional Human Development Report indicates that the introduction of cost-sharing as part of the adjustment efforts has reduced access to public health provision for most of the poor in SADC. Moreover, shortages of drugs, poor management of public health systems, crowding in hospitals, clinics and dispensaries, all contribute to the ineffectiveness of the health systems.

HIV/AIDS continued to be a major development problem in Africa in general and to Southern Africa in particular. According to UNAIDS, some 28.1 million people in Africa have been infected with HIV and 13 million children have been orphaned because of parental deaths from AIDS. UNAIDS and WHO data reveal that there were 3.4 million new HIV infections in Africa in 2001, representing about 70 per cent of the global total for the year. In the same year, some 2.3 million Africans were estimated to have died due to AIDS.

Southern Africa is reported to be the sub-region most seriously affected by HIV/AIDS in Africa. Some of the current estimates of the prevalence rates of HIV infections in the sub-region are as follows: Botswana: 36 per cent; Zimbabwe: 25 per cent; Swaziland: 22 per cent; South Africa and Zambia: 20 per cent each; and Mozambique: 16 per cent. The impact of HIV/AIDS on the health system is seen from the number of beds occupied by those affected by the pandemic. In Swaziland, for example, it is reported that more than half of the beds in some health centres are occupied by those suffering from HIV/AIDS. Another major impact of HIV/AIDS is the number of children orphaned due to this disease. In Zambia, some 520,000 children are estimated to have been orphaned due to AIDS. This number is projected to increase to 895,000 by 2009. In Zimbabwe, there are about 600,000 AIDS orphans.

⁹ The Post, 18 January 2002.

Mother-to-child transmission of HIV/AIDS was a major concern. Data at the Queen Elizabeth Central Hospital, the largest referral hospital in Malawi, show that 30 per cent of the women who go for antenatal services are HIV-positive. The Western Cape provincial government in South Africa is working on a programme to prevent mother-to-child transmission of HIV, and hopes to achieve a target of total elimination by 2004. This is a mammoth task. The programme involves single doses of an anti-retroviral to the infected mother and child at birth.

HIV/AIDS has a negative impact on every economic sector and on the overall economy of each country. The following examples illustrate the nature of the problem.

(a) *Labour Force and Employment*

Data from ILO and the United Nations Population Fund (UNFPA) project that 10-35 per cent of the labour force in identified high-prevalence countries will be lost during the next 15 years. Table 1.6 below gives details of the situation in selected Southern African countries.

Table 1.6: Labour Losses to HIV/AIDS in Selected Countries (%)

Country	By 2005	By 2020
Botswana	17.2	30.8
Lesotho	4.8	10.6
Malawi	10.7	16.0
Mozambique	9.0	24.9
Namibia	12.8	35.1
South Africa	10.8	24.9
Zimbabwe	19.7	29.4

Source: State of the Art: AIDS and Economics, International AIDS and Economics Network, July 2002, page 92

(a) *Education*

Data from a World Bank report indicates that HIV/AIDS is killing teachers faster than nations can train them, thereby undermining efforts to enroll all children in school by 2015.¹⁰ The same report states that, in parts of Malawi, nearly one-third of all teachers are HIV-positive. It further states that in Zambia, teacher deaths nearly doubled, from 680 in 1996 to 1,300 in the first ten months of 1998.

(b) *Health*

Some estimates based on different stages of HIV/AIDS suggest that a country with a stable 15 per cent prevalence rate of HIV/AIDS can expect between 1.6 and 3.3 per cent of its health care personnel to die each year from AIDS.¹¹ The

¹⁰ State of the Art: AIDS and Economics, International AIDS and Economics Network, July 2002..

¹¹ Tawfik, Linda; Kinoti, Stephen. The Impact of HIV/AIDS on the Health Sector in Sub-Saharan Africa: The Issue of Human Resources. The Academy for Educational Development, USAID Bureau for Africa, October 2001.

implication of this for Southern Africa is grave, given the high prevalence rates of the pandemic.

(c) *Mining*

About 25 per cent of miners in South Africa, according to the country's Medical Research Council, are living with HIV/AIDS. This is expected to increase to 30 per cent by 2005.¹²

(d) *National Level Impact*

Southern African economies could be devastated by a projected 10 million AIDS deaths in the next 15 years. The most vulnerable are those in the 15 – 29 age group, and women. This has serious implications on productivity and provision of services. The impact includes reduced GDP. The SADC 2000 Human Development Report indicated that Zambian GDP had fallen by an estimated 9 per cent in 2000 as a direct result of HIV/AIDS. Estimates by UNAIDS indicate that when HIV-prevalence rates rise to more than 20 per cent, GDP in the affected countries can be reduced by as much as 2 per cent per year. A study conducted in South Africa indicates that by the end of the current decade, AIDS could reduce South Africa's GDP by 17 per cent – an equivalent of \$US 22 billion.¹³

A major global development success was the convening of a special session on HIV/AIDS by the United Nations General Assembly in June 2001. The outcomes were the globally agreed goals on HIV/AIDS. The convening of the 12th International Conference on AIDS and STDs in Africa (ICASA) in Burkina Faso, 9-13 December 2001, was another contribution to the fight against HIV/AIDS. That conference underscored the need to involve communities in all HIV/AIDS interventions.

Nearly all countries in Southern Africa are involved in some programmes, strategies and institutional frameworks responding to health and HIV/AIDS problems. These include: (a) the SADC Health Policy Framework and the Priority Programme approved in September 1998, whose priorities include:

- a) HIV/AIDS and communicable diseases, especially TB and malaria;
- b) The SADC Health Protocol, signed at the Heads of State Summit in Maputo in 1999; and
- c) The SADC HIV/AIDS Strategic Framework and Programme of Action, 2000-2004.

The case of Ford South Africa, which received the 2001 Award for Corporate Excellence for innovative HIV/AIDS programmes, is worth noting. Established

¹² HIV/AIDS in Africa: The Impact on the World of Work. ILO, Geneva; African Development Forum, December 2000.

¹³ Dienger, K.; Garcia, M. Subbarao, K. AIDS- induced Orphans as a Systemic Shock: Magnitude, Impact, and Programme Interventions in Africa, October 2001.

in 1999, it has an extensive education component, voluntary on-site testing and counselling, upgraded treatment and insurance coverage and sponsorship of community-outreach programmes. The programme is reported to have had a dramatic impact on the employees and community. In Lesotho, UNDP, in collaboration with the media, is supporting national efforts to influence change in behaviour among the people in the fight against HIV/AIDS.

Box 2: Agricultural Sector Responses to HIV/AIDS: Malawi and Zambia

Many Southern African countries have come to realize the impact of HIV/AIDS on agriculture and food security. In February 2002, the Minister of Agriculture and Irrigation in Malawi observed that farmers and farm workers were dying, thereby reducing production and creating food shortages. He noted that the greatest loss was felt amongst agricultural field assistants whose numbers had significantly reduced. Crash courses to train more farm assistants have been introduced. Programmes on HIV/AIDS and education programmes in rural areas are reported to have been intensified.

In Zambia, the National Farmers Union (NFU), in collaboration with FAO and NAC, has embarked on a communication strategy targeting small-scale farmers to bring about behavioural change regarding HIV/AIDS, through workshops and dramas.

Limited financial resources, weak institutional mechanisms and human resource constraints hinder effective implementation of programmes in most African countries. Consequently, partnership between African countries and developed countries need to be strengthened to help reverse deteriorating health situations and combat HIV/AIDS on the continent.

4.2 Education

Member States continued to make efforts to improve the quality and expansion of education at all levels in 2001/2002. In Lesotho, for instance, 69 new schools have been built since 2000 and an additional 351 classrooms have been erected in existing schools. However, maintenance of education standards, infrastructure, and payment of reasonable salaries to education personnel has been hampered by limited budgetary allocation. Consequently, teachers either leave the sector or the country for better employment opportunities elsewhere.

Problems of crowding in schools have been reported in a number of countries. In Namibia, for example, most schools experienced problems of increased numbers requiring admission at primary and secondary levels during the 2002 school year. The problem was most serious at schools on the coast and in the capital, Windhoek. This resulted in overstretching the maximum number of 35 pupils per class to 40 and over, in order to accommodate more children. However, large classes affect the quality of education. Similar problems were reported in South Africa at the beginning of the 2002 school year.

In order to increase access to education, the Government of Zambia intends to introduce free primary education up to grade 7. In addition, in the Copperbelt Province of Zambia, a campaign was mounted to sensitize parents and traditional rulers on the importance of education, particularly of girls in rural areas.

Considerable efforts were made to improve the quality of education throughout the sub-region in 2001. In South Africa, for example, a matrix pass rate of 61.7 per cent was achieved in 2001 compared to 57.9 per cent in 2000, 48.9 per cent in 1999 and 49.3 in 1998. Thus the 2001 pass rate was a significant improvement. The improvement was reported to be throughout the education system, particularly between township and rural schools that were historically neglected and apparently condemned to underperformance. The South African National Assembly discussed education, development and poverty reduction issues on 15 August 2002 in preparation for the 2002 WSSD. Professor Kader Asmal, MP and Minister of Education in South Africa presented a paper on education development and poverty reduction to the National Assembly. The Minister underscored the need to improve education at all levels – primary, secondary and higher education.

In Namibia, the Ministry of Education has indicated that the 2001 results in grade 10 were the best since the introduction of the Cambridge education system in the country in 1993. However, less than half of those who wrote the examination achieved the required marks to gain admission to grade 11 in 2002.

In Malawi, the 2001 Primary School Leaving Certificate results pass rate at 71.8 per cent was lower than that of 2000, at 78.4 per cent. The pass rates in 2001 regarding the Malawi Junior Certificate of Education results at 51.2 per cent and Malawi School Certificate of Education results at 18 per cent were lower than the pass rates in 2000 by 14.5 per cent and 1.6 per cent, respectively.

One of the major challenges facing the education system in Southern Africa was the fact that information and communication technology (ICT) is not yet adequately covered in most curricula. With the growing importance of ICT in development, member States should ensure that it is adequately reflected in school curricula, from primary to higher levels.

Other challenges reflected in the SADC Human Resources Development Annual Report for the period June 2001 to June 2002 include:

- a) Low enrolment rates at secondary and higher levels;
- b) Limited access to vocational education and training;
- c) Mismatch between supply and demand for vocational education and training and higher education and training;
- d) Inadequate education and training facilities and equipment;

- e) Shortage of teaching and learning materials;
- f) Shortage of qualified teachers especially in the scientific and technological fields;
- g) Inequitable access to education by girls and women; and
- h) Lack of comparable standards and qualification across all training provisions in the SADC countries.

At higher learning institutions, some countries have experienced a significant loss of staff due to brain drain. In Zambia for example, it has been reported that the University of Zambia lost 340 lecturers through brain drain in three years. Of these, 60 per cent were doctors and professors.¹⁴ Poor conditions of service are responsible for the resultant brain drain to neighbouring or other countries with better conditions of service.

The SADC Protocol on Education and Training was ratified and entered-into-force in July 2000. It intends to address the education and development challenges cited above by complementing the efforts of member States through regional collaboration and cooperation, to improve education in the sub-region. The protocol promotes cooperation in the areas of policy, basic education, intermediate education and training, higher education, research and development, life long education and training, and publishing and library resources. Its impact should be felt if it is effectively implemented by member States and partners.

4.3 Employment

Increased employment is one of the strategies toward the attainment of economic growth and sustainable development and hence, poverty reduction. It should be recalled here that one of the MDGs is to reduce the proportion of people living in extreme poverty by half by the year 2015. Thus employment expansion should be central to poverty-reduction programmes, with which most countries are currently involved.

Some indication of poverty levels in selected Southern African countries are: Lesotho: 80 per cent; Malawi: about 67 per cent; Mozambique: about 70 per cent; Namibia: 38 per cent; Swaziland: 65.5 per cent; Zambia: about 80 per cent and Zimbabwe over 60 per cent. Complete data on employment levels is not readily available for some countries as shown in table 1.7. Moreover, data are not very reliable. Where data exist, they have shown that most countries have experienced marginal increase in employment levels with a lot of fluctuations between years.

¹⁴ The Post. Zambia. 30 September 2002, p3.

The 2000 SADC Regional Human Development Report observed generally slow growth in formal sector wage employment, meaning that a large proportion of the new labour entrants would have to be absorbed in agriculture or the informal sector. The informal sector has a tendency to disguise the magnitude of the unemployment levels.

Table 1.7: Data on Number of Those in Employment, 1994-2000 ('000)

COUNTRY	1994	1995	1996	1997	1998	1999	2000
Angola							
Botswana	230.6	233.5	234.1	226	391.4	441.2	
Lesotho							
Malawi							
Mauritius	454.8	460.5	466.	475.2	487.2	495.8	499.8
Mozambique							
Namibia	350.3			356.9			
South Africa	7,971	8,063	7,590.	7,548	9,390	10,369	11,712
Swaziland	109.6	111	111.6	112.7			
Zambia	496	485	479.4	475.1	467.2	477.5	
Zimbabwe	1,263.3	1,239.6	1,273.7	1,323.7			

Source: SADC Employment and Labour Sector, ILO and Country sources.

Statistics on unemployment levels also remain scanty and unreliable. There is need to improve data collection and analysis through regular labour force surveys and by establishing a labour market information system. Available data on unemployment in some countries give the following situation: Botswana – 1999: 20.8 per cent; Lesotho – 1998: 30 – 35 per cent; Mauritius – 1998: 5.9 per cent, 1999: 6.7 per cent, 2000: 8 per cent; Namibia – 1997: 35 per cent; South Africa – 1998: 25.2 per cent, 1999: 23.3, 2000: 25.8 per cent, 2001: 26.4 per cent; Zimbabwe – 1998: over 30 per cent, although currently some estimates indicate unemployment rate of over 50 per cent given the prevailing economic and social situation in the country.

Efforts by member States to address expansion of employment and reduce unemployment are yet to yield the expected results. This has been compounded by weak economic growth rates, which are much lower than the 7 per cent target for the next 15 years set in NEPAD to generate employment and reduce poverty. Demographic factors of youthful population without adequate preparation for employment further contributed to difficulties of high unemployment levels. Most youths, women and other unemployed continued to face limited and dwindling employment opportunities in the labour market. Programmes to improve conditions of informal sector employment continued to lack strong partnership support.

5. GENDER AND DEVELOPMENT

The SADC Heads of State and Government Declaration on Gender and Development of 1997 provided broad guidelines for engendering of development and democratic processes in the SADC region. Attainment of gender equality is the goal and the strategy to achieve this goal is gender mainstreaming. Thus, assessing progress in Southern Africa in this regard is the degree to which gender has been mainstreamed into development policies, programmes and democratic processes in the sub-region.

At the policy level, all the countries in the Southern African sub-region have a national gender policy (Angola, Botswana, Malawi, Mauritius, Namibia and Zambia) or are at some stage of developing one. A national gender machinery in the form of a fully-fledged Ministry, department or unit exists in all the countries of the sub-region. A few member States have designed a national gender-mainstreaming programme, thus providing them with guidelines for addressing existing gender gaps in striving to achieve gender equality.

All 12 critical areas of the Beijing Platform for Action have been addressed by member States in Southern Africa. But not all have been selected for implementation. Each country has selected its own areas to focus on, depending on their own specific needs. Among the most critical areas have been women and poverty, women and politics, and women in decision-making.

5.1 Women and Poverty Alleviation

A number of positive interventions have been initiated to lessen the poverty burden on women who constitute the majority of the poor. "Some key interventions have been in the area of trade and investment, aimed at engendering mainstream trade processes, with specific reference to empowering women."¹⁵ Spearheaded by the Women in Business SADC Network, two Women's Trade Fair and Investment Forums were held in Harare and Namibia.

¹⁴ SADC Secretariat Paper on Gender Policy Brief, June 2002

Another women empowerment initiative in Southern Africa is the SADC Women in Mining Trust. Membership includes several countries in the sub-region such as: Angola, Botswana, Lesotho, Mozambique, Zambia and Zimbabwe. Joining together as a Trust facilitated collective support such as capacity building through workshops in upgrading of technical and managerial skills and sponsorship to participate in trade fairs for marketing of their products.

The majority of women are also involved in income-generating activities in the informal sector to supplement family income. Yet the prevalence, impact and effects of HIV/AIDS on women and children in particular, has greatly curtailed the would-be positive economic gains in the women's efforts for economic empowerment.

Recognizing that the pandemic impacts on women and men differently, SADC initiated a process of incorporating gender and human rights in the SADC HIV/AIDS Strategic Framework and Programme for 2000-2004 in May 2000. This is being done with the assistance of ECA and collaborating partners.

5.2 Women in Politics and Decision Making

Achievement of gender equality is a necessary prerequisite for economic transformation of society. This, in turn, calls for influencing policies to make them conducive and accommodating to gender concerns. For this to happen, both women and men need to work towards a goal of ensuring meaningful representation of women at higher levels of decision-making. That achievement of this goal is still a long way off is demonstrated by the low level of women representation in parliament, the cabinet and high-ranking managerial positions in the sub-region.

Several countries still fall short of achieving the 30 per cent set target for representation of women in political and decision-making structures by 2005. SADC Secretariat data reveal that 50 per cent of SADC member States have at least 15 per cent women in their parliament. A few are working towards achieving the set target. These include South Africa (29 per cent) and Mozambique (28.4 per cent). The percentages for the rest range between 5.9 and 10 per cent. There is a lot more work to be done in this direction. Table 1.8 below provides the picture of women in parliament and cabinet in the SADC sub-region.

Table 1.8: Women in Parliament and Cabinet in the SADC Region

Country	Electoral System	Women in Parliament	% Women in Parliament	Women in Cabinet	% Women in Cabinet	Women Deputy Minister	% Women in Minist.
Angola	PR	34/224	15.1	4/28	14.3	5/43	11.6
Botswana	Const	8/44	18.0	3/15	20	1/4	50
Lesotho*	Const	14/97	10.3	4/21	8.3	2/3	0.0
Malawi	Const	16/192	8.3	2/22	9.0	2/9	12.9
Mauritius	Const	4/68	5.9	1/25	4.0		
Mozambique	PR	71/250	28.4	3/21	14.2	4/33**	12.1
Namibia*	PR-nat/C/Reg PR/local	19/99	19/	3/21	14.2	5/22	22.7
S Africa*	PR/Nat; PR and C/local	120/400	29.9	8/27	29.6	8/13	61.5
Swaziland	Const	7/95	7.3	2/15	13.3		
Zambia	Const	19/158	10.1	5/22	8.3	3/28	7.1
Zimbabwe	Const	15/150	10	1/21	5	2/7	28.5

Source: SADC Secretariat and member States

Key:

* Upper and Lower house;

** New figures not available;

CABINET: Ministers only; changes after February 2001 not included.

PR - Proportional Representation

const- Constituency

PR/Nat- Proportional Representation National Level

The table is indicative that a lot more needs to be done to equitably integrate women into meaningful positions in politics and decision-making. There is a ray of hope in this area because the AU has become the first continental organization in the world to commit at the level of Heads of State and Government to achieve 50 per cent women representation as the starting point in its staffing/personnel.

6. PROSPECTS FOR 2003

Prospects for 2003 suggest stagnant economic growth. Climatic conditions coupled with international responses to the current humanitarian and food crises in the sub-region are major determinants of growth in 2003. At best, average GDP growth rate is expected to be 4.3 per cent. GDP growth rate will also be contingent on progress with addressing policy challenges in the sub-region.

The expected recovery of GDP assumes that there will be a recovery in agriculture, mining, tourism, manufacturing and retail. The reported rains during the last quarter of 2002 and the prompt distribution of fertilizers in some countries indicated that the dry spell of 2002 would come to an end by the second quarter of 2003 and that agricultural production would come back to normal. This will help ease the current upward pressure on consumer prices and restore consumer confidence. Other contributory factors include the consolidation of COMESA-FTA into a Custom Union in 2004, and member State use of AGOA economic opportunities and the EPA negotiations.

At the country level, strong growth is expected in Angola, due to the return to peace and the expected resumption of full economic activity in the country, coupled with the expected increase in oil production from the new Girasol field, which will help the rising GDP growth rate in 2003. In Mozambique, improved business environment and expected growth in mineral and hydrocarbon exports to South Africa will boost the economy. Botswana is expected to have a robust growth rate in 2003 mainly from the mining sector. In Zimbabwe, the decline in output is expected to continue in 2003, but at a lower pace than in 2002, as the country will continue to adjust itself to the internal and external economic challenges. However, international donor support will remain essential to securing political and economic stability.

On the social front, HIV/AIDS would continue to be a contributing factor to food, nutrition and livelihood insecurity, hence to poverty in the sub-region. Policies addressing the pandemic should be regarded in the same way as other shocks that befall rural households, such as drought. Ministries concerned with food and agriculture have to be fully involved in the efforts to prevent and miti-

gate the effects of the epidemic on food security. Linking HIV/AIDS and food security initiatives can most effectively be accomplished by the incorporation of HIV/AIDS considerations into agricultural and food-security initiatives.

At the policy level, achieving sustained economic growth and an increase in employment will require higher levels of investment, both domestic and foreign. Implementation of far-reaching structural and economic reforms will continue to be a precondition to attracting investment in the sub-region. In this respect, policy convergence to achieve and entrench macroeconomic stability and credibility in the sub-region will need to be addressed as a matter of priority for all member States, to match the international confidence on the sub-region as an emerging economic block. SADC Ministers responsible for Finance and Investment signed two Memoranda of Understanding (MoUs) at their annual meeting on macroeconomic convergence and tax harmonization, and on other related sectors, to strengthen regional cooperation and integration in the sub-region. This was a significant step towards that end.

In addition, member States will need to adopt policies and maintain realistic exchange rates. Such policies are expected to encourage investment and growth while enhancing international competitiveness. Restricted monetary and fiscal policies should also continue in order to achieve internal and external balances. Structural, institutional and governance reforms and strong linkages between the public and the private sector will need to be deepened in order to provide a conducive environment for private sector-led growth.

Many countries have come to realize the relationship between HIV/AIDS, agriculture and food security in the sub-region. The adverse impacts of HIV/AIDS on smallholder agriculture and food security demand attention at policy level to identify and implement policy and institutional strategies to prevent and alleviate the impact of the epidemic on household food security. While specific strategies may vary according to the magnitude of the problem, the resources available and the socio-cultural context found in each country, the following should be considered as key elements of responses by Ministries of Agriculture and Rural Development:

- Promotion of HIV/AIDS prevention in the agricultural sector to prevent further loss of skilled agricultural personnel and household labour;
- Promotion of extension messages that focus on disseminating relevant labour-saving technologies such as intercropping to reduce weeding time, zero or minimum tillage to minimize labour requirements, and natural pest management to reduce the need for expensive chemical inputs such as pesticides; and

- Promotion of ways of reducing women's work burden, for example, labour-saving methods of food preparation, water supply and fuel supply.

Some specific lessons aimed at addressing the issue of food insecurity in Southern Africa emphasize, *inter alia*, the following:

- Improve and strengthen the capacity of the SADC Disaster Management mechanism and National Disaster Management Unit;
- Strengthen early warning systems on disaster by providing information for timely decision making to farmers and other stakeholders; and
- Address medium- to long-term policy issues on farm inputs, pricing and rehabilitation of infrastructure, marketing, and ensuring strategic grain reserves by member States.

7. REFERENCES

COMESA Annual Report, 2000

COMESA. Review of Intra-COMESA Trade and Macroeconomic Developments, COM/TCM/CT/XI/6(a), September 2002

ECA. Economic Report on Africa, 2002

IMF. World Economic Outlook, September 2002

Republic of Botswana. Budget Speech 2002: website: <http://www.gov.bw>, February 2002

Republic of Mauritius. Budget Speech, 2002/2003

Republic of Zambia. 2000 Census of Population and Housing

SADC. Progress Report on the Implementation of SADC Industry and Trade Programs, 2002

SADC Statistics, SADC/CM/3/2002/7.10

SADC Annual Report, 1999/2000

SADC. Employment and Labour Sector Annual Progress Report, 2001-2002

The Economist Intelligence Unit 2002, Country Reports

UN. World Population Prospects, the 1998 Revision.

UNCTAD. Economic Development in Africa: From Adjustment to Poverty Reduction: What is New? Geneva, 2002

UNCTAD. Trade and Development Report 2002

UNCTAD. World Investment Report 2002

UNDP. Angola Economic Development in 2001, Luanda

UNDP. National Human Development Report 2000, Maputo

UNDP. National Human Development Report 1999/2000, Lusaka

World Bank. African Development Indicators, 2002

PART II

ECONOMIC IMPACT OF ENVIRONMENTAL DEGRADATION

1. INTRODUCTION

1.1 Overview

Concerns about environmental degradation and sustainable development have grown steadily over the last few decades. Africa, particularly Southern Africa, is concerned about environmental degradation, especially as national economic growth and increasing population become ever more dependent on the exploitation of natural/biological resources.

It is for the above reason that the Intergovernmental Committee of Experts (ICE), during its Seventh Session held in Lusaka, Zambia, 3-4 April 2001, requested SRO-SA to consider including a special study on the *Impact of Environmental Degradation on the Economy of Southern African countries* in the next issue of its publication on Economic and Social Conditions in Southern Africa.

Concerns about environmental degradation stem from the fact that it is a global problem, even though the magnitude of the problem differs from region to region and from country to country. The effects of environmental degradation are also unevenly distributed across sub-regions and across countries. In the Southern Africa sub-region, the effects of environmental degradation are quite pronounced. This is partly due to the fact that the majority of the population depends on environmental resources for their survival, as is the case with other parts of Africa. This is not applicable to countries in the Northern Hemisphere. In addition, the profound economic stagnation experienced and the weakening environmental governance, as evidenced by the lack of environmentally sound policies, have caused harm to sensitive ecosystems and resulted in degradation, lowered agricultural productivity and increased poverty.

Land degradation, a decline in land quality caused by human activity, has been a major global issue in the 20th century and will remain high on the international agenda in many more decades to come. The importance of

land degradation in global issues is buttressed by its impact on world food security and the quality of the environment. High population density is not necessarily the root cause of land degradation; it is what a population does to the land that determines the extent of degradation. People can be a major asset in reversing the trend towards degradation. However, they need to be healthy, and to be politically and economically motivated to care for the land. Subsistence agriculture, poverty, and illiteracy can be important causes of land and environmental degradation.

Similarly, soil erosion, loss of biodiversity, desertification, and deforestation have been drawing particular attention from public policymakers, NGOs, civil society and producers throughout the developed and developing countries. Concerns have been expressed regarding the unsustainability of economic development models based on exploitation of non-renewable resources, with the potential implications for future generations.

Accelerating population growth also posed new challenges associated with rural-urban migration, the growth of cities and the socio-economic challenges of human settlements, health care delivery, poverty incidence and crime. That there is a high level of poverty in Southern African countries is undeniable. The exploitation of natural resources in the process of achieving economic growth and poverty alleviation takes a toll on the quality of land, water availability and quality and soil resources availability. Exploitation can increase pollution, desertification, exposure of natural forest cover and combines adversely with recurrent drought in many countries. In effect, such economic development paradigms are being increasingly questioned and concerns are being expressed regarding their sustainability for long-term development in the countries concerned.

Environmental degradation in the form of climate change is receiving considerable attention in recent international and regional policy discussions. The climate of an area is defined as the statistical aggregation of local weather records, including information about extreme events [World Meteorological Organization (WMO) 2001a]. Climate shapes human cultures, location of settlements and all landscapes. It largely determines food production and its variability can cause famine. The combined effects of climate change and population growth can be devastating to agriculture in many developing countries. According to the United Nations Environment Programme (UNEP), global warming might reduce harvests in the next few decades by between 10 and 15 per cent in Africa, tropical Latin America and in other regions where food security is already threatened.

Sustainable development entails improving the standard of living of the current generation without compromising the standard of living of future generations. The attainment of this objective necessitates the awareness of the extent of natural resource exploitation, avenues of sustainable income generation, human resource development, management of human habitat, control of pollution, and so on. As such, environmental exploitation and subsequent degradation have a close link with sustainable development. Changes in the status of environmental resources either negatively or positively affect sustainable development. It is important to achieve stability between the environment and the economy, considering the extent of their mutual dependence.

Sustainable development is increasingly understood to encompass economic, environmental and social elements. The key concepts are quality of life and survivability. Loss of biodiversity may reduce the options for economic growth and development available to future generations (Prugh, et al 1995), impacting on the functioning and resilience of ecosystems by threatening their ability to handle stress and adapt to change. This could lead to increased costs caused by flood damage, mudslides, fire and pests. In addition, loss of services such as water provision, nutrient cycling and pollination may impact on human welfare (Perrings et al 1995). Loss of ecosystem functions and resilience is of particular concern in light of predicted global warming and the anticipated but largely unknown impact this will have on climate, local weather conditions, sea level and human health. Biological diversity can be thought of as an insurance cover. Given the possibly significant impact that environmental degradation has on human welfare and the economy, it is prudent to exercise caution when development decisions that impact on biodiversity are made.

The International Council for Local Environmental Initiatives (ICLEI, 1996) reconstituted the concept of sustainable development to give emphasis to service delivery at the local level. Sustainable development is hence defined as development that delivers basic environmental, economic and social services to all without threatening the viability of the natural, built, and social systems upon which these services depend.

Member States of Southern Africa belong to a number of international and regional organizations and have committed themselves to various measures to protect the environment. Chapter 16 of the COMESA Treaty, for example, commits member States to awareness of:

- The link between economic activity and environmental degradation;

- Excessive depletion of resources; and
- Serious damage to natural heritage.

A clean and attractive environment is a prerequisite for long-term economic growth. Member States should strive to cooperate through a regional conservation strategy, to better coordinate strategies for environmental protection and preservation, against all forms of pollution, including atmospheric and industrial pollution, pollution of water resources and pollution from urban development. Through co-operation, member States can adopt common policies for the control of hazardous waste, nuclear materials, radioactive materials and any other materials used in the development or exploitation of nuclear energy.

Also as part of the commitments made by SADC to the implementation of Agenda 21, member States believe that solving the basic needs of the poor, particularly food security and energy needs, will reduce problems of deforestation and land degradation and relieve pressure on water resources. The consensus is eradication of poverty as an indispensable condition for sustainable development. They urged that the country-specific situations and needs be given special priority, affirming the importance of pursuing sustainable development policies for managing the natural resource base. Member States have further called upon the developed countries to address the environmental degradation caused by unsustainable production and consumption patterns on an urgent basis.

Policymakers, academics and international experts in Africa are increasingly acknowledging that environmental degradation is a major factor constraining socio-economic development on the continent. Reversing this trend is essential for poverty alleviation. Consequently, many African countries are beginning to take action to mainstream the environment in the context of both sustainable development and poverty reduction. Most countries have opted to implement their strategies through National Environmental Action Plans (NEAPs) or equivalents.

The overall objective of NEAP is to elicit an environmental policy and investment strategy for a country. A NEAP or equivalent describes a country's environmental problems, identifies its principal causes, and formulates policies and concrete actions. One of the key aspects of NEAPs is their recognition of the importance of decentralized environmental management and of encouraging development of Local Environmental Action Plans (LEAPs) for rapid impact at the grassroots level through public-private partnerships.

1.2 Objective of the Study

The objective of Part II of this study is to discuss selected economic issues in connection with environmental degradation and environmental resource management in Southern Africa, with a view to assisting member States to develop strategies, plans and programmes for reversing environmental degradation trends and mitigating the greenhouse effect through land, water, air and general ecosystem restoration at national and sub-regional levels.

The study looks at the environmental resources shared by the 11 member States covered by SRO-SA: namely Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. It highlights the environmental concerns and the economic/financial implications in those countries. Where possible, comparisons are made with other African countries where relevant data are available.

As land resources are essentially non-renewable, it is necessary to adopt a positive approach to sustainable management of these finite resources. This study therefore:

- Addresses the socio-economic impacts of environmental degradation in the sub-region;
- Discusses the economic advantage of adequate environmental resource management; and Highlights the importance of environmental protection in the sub-region with a view to influencing policy debate on the subject and guide policy decision-making.

1.3 Methodology

The data used and presented were gathered from various secondary sources. These include FAO, IMF, World Bank, ECA, World Resource Institute (WRI), among others. National environmental agencies were also sources for data sets on country-specific environmental issues. Other data were obtained from published works by a number of authors who have been accordingly acknowledged in this study.

1.4 Organization of the Study

The study comprises six chapters. The first chapter is introductory and discusses the concerns and levels of awareness of environmental resource management and concerns about environmental degradation at national,

sub-regional and global levels. Chapter two discusses the extent and nature of environmental degradation, while the financial and economic costs of environmental resource management are discussed in chapter three. The costs of climate change are highlighted in chapter four. Trends in environmental resource management in the sub-region are discussed in chapter five, with specific examples on projects and achievements. Chapter six concludes the study and makes recommendations.

2. ENVIRONMENTAL DEGRADATION

2.1 Nature and Extent of Environmental Degradation

Environmental degradation or change can be natural or human-induced, local or global. Table 2.1 below summarizes some of the environmental and development issues facing the Southern Africa sub-region (Sandford, 1976. distinguished between four main schools of thought concerning the main cause of dry land degradation:

- a) The structuralist school that identifies social and economic structures as being responsible;
- b) The natural events school where the blame is largely on uncontrollable climatic events;
- c) The human fallibility argument where the short sightedness of pastoralists, governments, donors and others are responsible for environmental degradation; and finally
- d) Arguments concerning population growth, which blame both human and animal population growth as the source of degradation.

Historically, Africa's natural environment is identified by the extensiveness of its tropical forests and the wide variety of its endowment of various species of forest and coastal wildlife. Prior to the appearance of farming communities in Southern Africa, the sub-region was occupied by people commonly referred to as hunter-gatherers who depended entirely on natural resources for their survival. Archaeological evidence from Botswana and Zimbabwe suggests that they did not cause any significant changes to the environment. From long experience, Southern African peoples apparently developed locally appropriate and sustainable systems for cultivation and grazing. They were similarly able to deal with environmental limitations such as unreliable rainfall. The environment that they lived in was beautiful.

This natural beauty faces increasing pressure from a combination of forces and events. The manifestations of natural and man-induced pressures are:

- Accelerating deforestation;
- Causing significant losses in plant and animal stocks; and
- Causing periodic drought and famine, under conditions of relatively low levels of per capita income and weak rates of economic growth.

Table 2.1: Key Environmental and Development Issues

Development Goal	Associated Environmental Issues				
	Land	Water	Air	Flora/Fauna	Marine
Agricultural development	Declining soil productivity; Soil Erosion; Rangeland Degradation; Bush encroachment; Salinization; Desertification	Agro-chemical pollution; Siltation; Water supply and shortages; Salt water Intrusion; Salinization; Flooding; Drought	Micro-climate change	Loss of habitats and biodiversity; Overexploited forests and veld products	Agro-chemical pollution; Loss of coastal habitats and biodiversity; Coastal erosion; Siltation impact on marine ecosystems and resources
Industrial development	Loss of arable land; Disposal of solid and hazardous wastes	Surface and groundwater pollution from chemicals; Water supply and shortages	Local and regional air pollution; Noise pollution; Global ozone layer depletion	Loss of habitats and biodiversity to construction and pollution; Illegal hunting.	Marine pollution
Mining sector development	Loss of arable land through access-road construction, clearing for drill sites, trenching, and pitting; Land waterlogging; Soil contamination; Soil erosion;	Plant and mine noise pollution; Diversion of water courses; Water pollution and contamination from seepage; Intoxication of water-based wild life; Solid waste discharge	Air-borne pollution	Habitat destruction; Bio-diversity loss	Marine pollution; Intoxication of wildlife resources
Energy development and use	Degradation from coal mining. Acidification of soils. Loss of arable land to dam and power lines	Pollution from coal mines Acidification of water	Local and regional air pollution from fossil fuel use Global climate change from Greenhouse gas emissions	Deforestation from rising demand for fuel- wood Loss of habitats and biodiversity	Oil pollution from ships
Forestry	Loss of forest cover. Soil erosion	Pollution from pulp mills Siltation Flooding Lower flows from reforestation	Pollution from pulp mills. Deforest-ation impact on local and global climate	Loss of habitats and biodiversity	Loss of coastal habitats and biodiversity Siltation of ecosystems
Fisheries	-----	Wastes from fish processing	-----	Over-exploited fisheries	Over-exploited fisheries
Tourism	Loss of arable land to parks	Pollution from lodges	-----	Overuse of parks. Demand for wildlife products	Marine pollution from hotel; Damage to coral reefs
Transport	Loss of arable land. Soil erosion	Pollution from waste oil	Air and noise pollution from vehicles	-----	Oil pollution from ships
Human settlements development	Loss of arable land; Disposal of municipal garbage	Garbage and sewerage pollution; Lack of clean water and sanitation especially in slums; Water supply and shortages	Air and Noise pollution; Pollution from domestic use of coal and fuel wood	Loss of habitats and biodiversity	Loss of coastal habitats and biodiversity Coastal erosion

2.2 Natural Environmental Degradation

Natural environmental degradation includes situations that arise from local influences such as extremes of weather, local infectious agents, physical disasters and local micro-nutrient deficiencies reflecting soil composition. It is more common to understand natural environmental degradation as resulting from the occurrence of extremes of weather such as storms and floods. Storms of all scales absorb and convert huge amounts of energy and moisture, with significant consequences in some cases. Beneficial consequences include the delivery of rainfall to end an incidence of drought or the removal of highly polluted air. Storms are looked at, in this case, in terms of the detrimental consequences they exert on the society, leading to environmental degradation. Floods are caused by various factors, including topographic and hydrological ones. In some cases, anthropogenic changes to the environment such as deforestation, the building of dams and dikes, or the strengthening of rivers aggravate the effect of floods. There are times when flooding is induced by storm surges from seas that are extremely destructive when entering low-lying coastal regions. This is especially true when such regions are already densely populated (UNECA, 2001).

In South Africa, it is estimated that water erosion affects 6.1 million hectares of cultivated soil. Of this, 15 per cent is seriously affected, 37 per cent moderately and the rest slightly. Wind erosion affects even more land, an estimated 10.9 million hectares of cultivated soil. Of this, 7 per cent is seriously affected, 29 per cent moderately and 64 per cent slightly (Landcare Supplement, 1998). The estimated mean annual soil loss of 2.5 tons per hectare per year is severe, with the highest losses of up to 60 tons per hectare per year reported from unprotected pineapple fields (Schoeman and Scotney, 1987).

Another example of natural environmental degradation is one attributable to brown locust infestation. The brown locust, *Locustana pardalina*, is perhaps the most destructive agricultural pest in much of Southern Africa south of about 20°S, causing substantial environmental damage. It could severely affect agricultural production and reduce food availability. Brown locust population fluctuations can be dramatic, with plagues occurring periodically. The source sub-region where locust eggs are laid is often in the Karoo region of South Africa from where swarms may spread into neighbouring Namibia, Botswana and Zimbabwe. Brown locust swarms peak in late summer (January to March).

Currently, there are no definite predictions sufficiently far in advance to plan anti-locust campaigns. Often, locust control measures are only implemented after a swarm has been reported. This has resulted in the application of insecticides over large areas during outbreaks of the swarming phase.

Brown locust egg hatching is stimulated by rainfall, such that locust populations are likely to respond to climate variability from year to year. It has long

been recognized that locust populations are high when early winter rainfall is plentiful (Nailand & Hanrahan, 1993). Aside from the brown locusts, other migratory pests such as red-billed *quelea* also devastate crops and other vegetation throughout Southern Africa. Control measures, especially poisons, used against such pests cause environmental damage as they are not target-species specific, and have devastating effects on local populations of wildlife.

In addition, the climate of much of Southern Africa is known to respond to the El Niño/ Southern Oscillation (ENSO) phenomena. *El Niño* years tend to be dry and *La Niña* years tend to be wet (Nicholson & Kim, 1997, Mason and Jury, 1997). Southern Africa's environment has also been affected by a host of other natural factors. Many countries have experienced prolonged series of droughts over the past decades. Concerns have been expressed on the impact of drought on the greenhouse effect. The greenhouse effect stems from rising levels of carbon dioxide in the atmosphere, blocking re-radiation of heat from the earth and raising average temperatures. It is generally believed that this is a contributing factor to shifts observed in historic rainfall cycles around the globe. The increase in carbon dioxide emissions is caused largely by industrial, household and transport emissions. During the periods of drought, the pressure to extend the range of grazing land and of the search for fuel wood for household energy use increases.

Another natural environmental degradation is due to the effect of climatic factors that result in periodic floods. In addition, when lightning causes wildfires, they result in the destruction of natural resources and properties, very often leading to significant loss of income and biological diversity in the process. These natural environmental degradations result in natural/physical disasters causing untold hardships and serious economic and ecological damage in affected countries. Land, water and atmospheric degradation can result from such natural causes with implications for the loss of actual or potential land and water productivity, and decline in air quality.

2.3 Human-induced Environmental Degradation

Human-induced environmental degradation is traceable to the effect of human activities for agricultural and industrial development, mining activities, rural settlement or urban development, human health and nutrition activities, or in pursuit of income-generating activities. These human activities very often lead to deforestation, land and water degradation and air pollution. These views of human-induced environmental degradation have also been challenged in relation to sub-Saharan Africa and South Asia.

For a long time, the scientific consensus was that the local peoples' ignorance of proper land management was to be blamed. Leach and Mearns (1996) have shown that, in West Africa, indigenous rural land users, rather than being destroyers of the

environment, have been able to maintain and increase environmental productivity. This has been achieved through maintaining a balance between the amount and constituents of forest and grassland cover, using traditional land management techniques that respond to changing socio-economic environments.

In East Africa, Tiffen et al (1994) investigated the processes leading to the recovery of the landscape of Machakos District in Kenya. The Machakos experience is significant in the debate regarding the causes of environmental degradation and economic development for several reasons:

- Over a period of sixty years, landscape degradation was followed by improvement of the same landscape, despite a six-fold rise in human population;
- The recovery of landscape has been accompanied by and linked to strong improvements in human welfare;
- The improvements in physical and human environments have been achieved through a complex blend of externally generated technical innovations and economic changes, but their successful adoption has been due to indigenous initiatives; and finally
- The Machakos miracle was created by ordinary people adapting to livelihood opportunities (Toulmin 1995).

2.4 Poverty and Environmental Degradation

Poverty, as a social phenomenon, can be seen as a great threat to the environment. The intertwined relationship of environment, population, poverty and health is often described as a vicious cycle. Poor health conditions limit peoples' capacity to produce and earn. Poverty makes them vulnerable to exploitation of their labour and environmental resources. Most poor people tend to have larger families, which, coupled with poor health services, increase poverty levels and environmental pressures. Poor farmers cannot undertake intensive agriculture requiring significant inputs or investments in soil improvements. Their only alternative is to mine soils until they become completely degraded. Poverty also makes rural people dependent on fuel wood for energy. Land degradation results when there is no afforestation to mitigate the over-exploitation.

Thus, poor people are both the agents and the victims of environmental change. Most of the poor in Africa live in rural areas where they lack resources and technology and do not have access to the infrastructure that provides economic opportunities and that safeguards health. The urgent short-term needs of the poor prompt them to cultivate erosion-prone hillsides, clear natural vegetation and trees to make space for houses and crops, exploiting the soil without replacing nutrients. In rural areas, the direct impact of poverty on the environment includes:

- Cultivation of marginal lands;
- Depletion of water resources; and
- Over-exploitation of trees and other plants for firewood, medicinal herbs and food.

Many indicators of human development highlight Africa's relative poverty and vulnerability. With small holdings and little investment in agriculture, household production faces difficulties in meeting subsistence requirements and in developing specialized export crops. Household expenditures on food are high - more than half of the annual budget, on average. Yet, Africa receives the largest amount of food aid of any continent. Low rates of female literacy and high rates of infant mortality are indicative of populations that have low status and inadequate infrastructure for education and health - two essential requirements for vigorous rural development.

The high number of refugees highlights potential economic and political instability. Vulnerable populations include smallholder agriculturists with inadequate resources, pastoralists, rural landless labourers, and the urban poor. Rural populations are directly affected by climatic variations. Reduced food supplies and high prices immediately affect landless labourers who have little savings. The effect on agriculturists and pastoralists depends on how much surplus they produce and store and the relative terms of trade (e.g., between food and livestock).

A dramatic increase in urban poverty has been noted in the past decade - one consequence of stagnant rural development and high population pressures. The urban poor are also affected indirectly by climate change through changes in prices and regional investment. In general, poor households rely on access to wild foods, although in some areas, pressure on the land is so great that wild food supplies have been exhausted.

Table 2.2: Proportion of Food from Wild Products for Poor, Medium and Relatively Wealthy Households in Africa

Survey site	Years	Poor %	Middle %	Better off %
Wollo – Dega, Ethiopia	1999	0-10	0-10	0-5
Jaibor, Sudan	1997	15	5	2-5
Chitipa, Malawi	1997	0-10	0-10	0-5
Ndoywo, Zimbabwe	1997	0-5	0	0

Source: Save the Children Fund in Blench, 2000.

2.5 Agriculture Development and Deforestation

The expansion of agriculture and plantation forestry and other commercial or subsistence activities are a source of threat to the natural, biological resources. This often leads to deforestation, soil erosion, land degradation, rangeland degradation, bush encroachment, desertification, biodiversity loss, and various forms

of water and air pollution. One factor that has contributed to deforestation has been the relative absence of technological change in African agriculture. In the absence of such change, yields have remained relatively constant, thus placing pressure on the land as the range of cultivation increases.

As a means of generating internal revenues, Governments in Southern Africa employed both direct and indirect taxes. The latter is often undertaken through agricultural marketing boards. In the process, a severe burden is imposed on agriculture, with the result that its profitability falls. Farm workers migrate from the countryside in pursuit of economic opportunities in towns and cities, thereby placing pressure on Africa's urban environment.

Africa is consuming its forest and woodlands at a rate of just under one-half of one per cent per year, a rate only slightly less than the deforestation rates of Latin America and Oceania, and at a rate twice the world average. Progressive deforestation in Africa not only reduces the habitat of plant and animal species but also bears on the prospects for annual rainfall. This, in turn, affects patterns of agriculture, food sustainability and the suitability of population settlements.

Table 2.3 below reflects annual percentage changes in forest resources of Southern African countries. Deforestation has been occurring on annual basis in most of the countries at a rate of between 0.2 per cent and 1.6 per cent. FAO (1995) estimated an annual loss of 61,000 hectares of 'natural forest' in Zimbabwe, though this loss was partially offset by an increase of 14,000 hectares in commercial plantations. However, deforestation - defined as the clearing of forestlands for all forms of agricultural uses, settlement, infrastructure and mining uses - is more pronounced in Malawi.

Bush encroachment is the process that transforms grass-dominated vegetation type into a woody species-dominated one. This is a very serious problem throughout sub-Saharan Africa because it means that large areas of grazing lands are lost (or reduced in capacity). It transforms habitats and reduces species diversity. In 1956, it was estimated that almost 13 million hectares of veld in South Africa had been badly affected by bush encroachment, and by 1983, it was estimated that 33 per cent of Southern Africa's bush, scrub, and savannah vegetation had been invaded and dominated by woody species. Although only a few species are regarded as problematic, bush encroachment can be rapid, and costly to control. The worst affected areas in South Africa are in the Northern Cape, the Eastern Cape, and the Northern Province.

Table 2.3: Forest Resources of Southern Africa, 1990-1995

Total Forest Area (000 ha)				Natural Forest Area (000 ha)			Plantations (000 ha)		
Country	1990	1995	Annual % Change	1990	1995	Annual % Change	1990	1995	Annual % Change
Angola	23285	22200	-1.0	23265	22080	-1.0	120	160	5.8
Botswana	14271	13917	-0.5	14270	13916	-0.5	1	--	--
Lesotho	6	6	0.0	0	0	0.0	7	6	0.0
Malawi	3612	3339	-1.6	3486	3213	-1.6	126	122	-0.6
Mauritius	--	--	--	--	--	--	--	--	--
Mozambique	17443	16862	-0.7	17415	16834	-0.7	28	45	9.5
Namibia	12584	12374	-0.3	12584	12374	-0.3	0	1	--
South Africa	8574	8499	-0.2	7279	7204	-0.2	965	1429	7.8
Swaziland	--	--	--	--	--	--	--	--	--
Zambia	32720	31398	-0.8	32677	31355	-0.8	48	44	-1.9
Zimbabwe	8960	8710	-0.6	8876	8626	-0.6	84	110	5.4

Source: WRI, 2001

Deforestation could also be the result of the age-old practice of the slash and burn technique employed by farmers in Africa to boost crop yields and to hunt game. Herders set fire to bush because it is believed that the re-growth of young offshoots is more palatable and contains more nutrients for livestock. Hunters set fires to drive game to more open areas so that they become easy targets. Climatic factors such as rainfall, vegetation, and wind also play a crucial role in bush burning.

2.6 Land Degradation

Land degradation manifests itself through deforestation, biodiversity loss, soil erosion, soil infertility, siltation, sedimentation and flooding. Soil degradation is the most serious effect of land degradation. Soil degradation, typified by soil erosion is made up of water and wind erosion, chemical degradation, and physical degradation. At 53 per cent, water erosion is the main problem in Africa, followed by wind erosion (30.5 per cent), chemical degradation (11.2 per cent) and physical degradation (5.3 per cent). Soil erosion comprises water and wind erosion and is widespread in the sub-humid and semi-arid areas of Southern Africa. Wind erosion can either be human induced or result from the effect of prolonged drought. Soil erosion is mainly associated with annual crops such as maize, millet, and so on.

In sub-Saharan Africa, 72 per cent of arable land and 31 per cent of pastureland are considered degraded. Soil loss in Southern Africa is estimated to be as high as 400 million tons annually (UNEP). When soils are subjected to severe and extreme degradation, their original biotic functions are damaged and reclamation is at worst impossible and at best difficult or costly. Yield reduction in food

crops due to past soil erosion has been estimated for Africa to be 9 per cent (FAO, 1996). In Zimbabwe it is estimated that 30 per cent of smallholder farmland is now totally degraded. In the densely populated areas of Malawi, such as the Lilongwe plains, the situation is worse.

It is estimated that 14 per cent of degraded soil result from vegetation removal, 13 per cent from overexploitation, 49.5 per cent from overgrazing and 24 per cent from agricultural activities (WRI, 1992). In South Africa, soil losses are estimated to be as high as 400 million tons annually (Griffen et al, 1999; in UNECA, 2001). Table 2.4 gives an idea of soil loss in Malawi.

Table 2.4: Soil and Yield Loss in Gross Arable Land by Districts in Malawi

Agricultural Development Districts	Arable Land (ha)	Soil Loss Tons/ha/year	Weighted Average Yield Loss Low Impact (%)	Weighted Average Yield Loss High Impact (%)
NORTH:				
1. Karonga	28,100	29	5.5	15.6
2. Mzuzu	42,500	22	4.3	12.2
CENTRAL:				
1. Kasungu	235,050	20	3.9	11.1
2. Lilongwe	231,150	22	4.2	12.1
3. Salima	46,400	16	3.1	8.8
SOUTH:				
1. Machinga	47,200	13	2.6	7.4
2. Blantyre	88,200	29	5.6	15.7
3. Shire Valley	0	17	3.2	9.3
Total	718,600	20	4.0	11.3

Source: GOM, 1999

When land degradation is a consequence of human activities, it usually results from a mismatch between land quality and land use (Beinroth *et al.*, 1994), with attendant implications for land productivity. Mechanisms that initiate land degradation include physical, chemical, and biological processes (Lal, 1994). Important among physical processes are a decline in soil structure leading to crusting, compaction, erosion, desertification, anaerobism, environmental pollution, and unsustainable use of natural resources. Significant chemical processes include acidification, leaching, salinization, decrease in nutrient retention capacity, and fertility depletion.

Biological processes include reduction in biomass carbon and decline in land biodiversity. The latter comprises important concerns related to eutrophication of surface water, contamination of groundwater, and emissions of trace gases (CO_2 , CH_4 , N_2O , NO_x) from terrestrial/aquatic ecosystems to the atmosphere. Soil structure is an important property that affects all three degradative processes. Thus, land degradation is a biophysical process driven by socio-economic and political causes.

Chemical soil degradation in Africa accounts for some 3.9 per cent of total susceptible drylands of Africa. It is made up of loss of nutrients (83.4 per cent), salinization (11.4 per cent) and acidification (5.2 per cent). Salinization and acidification are mainly the results of irrigation and inappropriate fertilizer application. Chemical soil degradation affects some 51 million hectares of land out of which 40 million hectares are nutrient deficient. Salinity affects 6 million hectares (UNECA, 1999). Physical soil degradation results in the deterioration of the structure of the soil and makes it more compact and harder to use due to impermeability to rain and poor drainage. The soil also develops hardpans and surface crusting. The process has affected 17 million hectares of land in Africa (UNECA, 1999).

Land degradation is also closely related to land tenure systems. If people do not have title to land, they have no incentive to invest in long-term improvements. On rangeland, traditional methods of managing grazing have become less effective. Free-range grazing has led to overgrazing, especially in arid and semi-arid areas, resulting in deteriorated land cover.

Until fairly recently, Africa's environment was sustained by a combination of traditional methods of natural resource management, coupled with relatively stable levels of population. Since the population levels were relatively low at that time, traditional agricultural techniques based on shifting cultivation were sufficient to provide sustainable levels of food production. This combined with low population densities to ensure that there was sufficient land to enable ample time for recovery under a system of fallow rotation of fields. Africa's natural environment has suffered from a breakdown in traditional systems of property rights. Many forest and woodland areas used to be managed by local communities. Effective control was maintained on extraction and replanting rates.

As programmes of modernization have been implemented, they have largely been accompanied by replacement of traditional communal rights by more centralized systems of administration, including national ownership of lands. This has the result that accountability at the end-user level has diminished. In the absence of well-defined property rights, the price of forest and woodland products to local consumers is often only a fraction of the replacement cost of these resources. Deforestation is thus encouraged.

2.7 Industrial Development, Mining and Environmental Degradation

Industrial processes contribute invariably to water, land and air pollution. In South Africa, for example, a major contribution to air pollution in South Africa comes from the country's oil refineries. Though there are only four refineries in

the country, they contribute to high levels of pollution in the northern suburbs of Cape Town and southern Durban, emitting high levels of sulphur dioxide and several other chemicals known to cause health problems. Residents of low-income communities have been forced to relocate due to pollution from refineries, waste sites and other major industries. Botswana, South Africa and Zimbabwe, the three economic powerhouses of the sub-region, produce the highest per capita carbon dioxide emission in that order, mainly from liquid and solid fuels (see table 2.5).

Table 2.5: Carbon Dioxide Emissions from Industrial Processes Southern Africa, 1996 (kgs)

Country	Solid fuels 1996	Liquid fuels 1996	Gas fuels 1996	Gas flaring 1996	Cement manufacture 1996	Total 1990	Total 1996	Total since 1950	Per capita emissions (kg) 1996
Angola	0	2151	344	2465	149	4650	5108	145,552	450
Botswana	6383	12579	4	9	691	2415	19665	51,505	13,035
Lesotho	...	...	...	...	...	...	...	...	...
Malawi	44	616	0	0	70	601	733	18,184	75
Mauritius	...	...	...	...	...	...	...	...	...
Mozambique	158	821	0	0	15	997	997	89,149	56
Namibia	...	...	...	...	...	...	...	...	...
South Africa	227,71	56,821	3532	0	4684	291,1	292,75	8,541,575	7,678
Swaziland	...	...	...	...	...	...	...	...	...
Zambia	773	1499	0	0	174	2444	2444	111,151	291
Zimbabwe	13,623	4217	0	0	573	16,65	18,412	369,232	1,667

Source: GRI, 2001

Pollution from mining activities is probably the most direct cause of groundwater pollution in South Africa. Furthermore, small waste coal dumps cause both pollution and safety problems, as waste coal may spontaneously ignite. The major impacts of mining in South Africa are related to mine dewatering, tailings management, atmospheric emissions, and acid mine drainage, which in some cases are mine-specific. Physical impacts on water resources include:

- Use of water for a variety of mining operations;
- Siltation of water courses by contribution to suspended solids loads;
- Salinization by contribution to dissolved solids loads;
- Creation of large pits (that act as rain water traps);
- Diversions of watercourses; and, sometimes
- Associated extensive deforestation or de-vegetation of mine sites, with concomitant erosion problems.

The areas affected can be segmented into three typical classes or groups, namely: the mine environs only (typically consisting only of the mine property), the local

area (one or more properties that are adjacent to the mine property), and more widespread areas (regional).

Most of the potential environmental impacts associated with mining exploration and surveying activities occur at a much smaller scale than those recorded during mine operational activities, and are mainly restricted to specific exploration areas and sites or slightly larger localities. However, the cumulative effects of exploration activities at multiple sites within an area have the potential to drive environmental change, particularly from a larger regional perspective. The more common and noticeable effects of these cumulative impacts include changes in aquatic and terrestrial ecosystem health. The general environmental impact of mining exploration includes:

- Removal of vegetation for survey lines;
- Vegetation damage and soil erosion from vehicle tracks;
- Abandoned equipment and supplies; and
- Soil, vegetation and water resource pollution and contamination.

Mining exploration impacts include local spillage and leakage of fuels, oils and drilling fluids resulting in site and vegetation contamination. Potential surface water pollution may result from wastewater discharges, sewage disposal, waste rock dump, heavy metal and sediment drainage. Habitat disturbance and soil erosion impacts are caused by vegetation clearing for access routes and drilling sites, and the use of bulldozers for stripping overburden to examine the underlying bedrock. Many mines dispose of large quantities of wastewater, including water from processing, water in slimes and groundwater pumped out of the mine.

The countries in the sub-region with significant mineral industrial sectors are Angola, Botswana, South Africa, Zambia, and Zimbabwe. Some of these countries have started to implement comprehensive mining policy reforms. A departure is being made from the colonial mining policy that virtually gave mining companies perpetual mineral rights and tenure. This is being done through enactment of mining legislation and investment codes, to attract the necessary investment in the minerals industry sector and stem environmental degradation.

2.8 The Demand for Water and Water Pollution

Water, once a freely available common access resource, has become a scarce and often expensive commodity in many countries. Scarcity has arisen from a number of causes such as catchment degradation, water pollution and, more recently, frequent droughts. The most affected are the poor. Lack of access to good quality water has far-reaching impacts on their social, economic and environmental security.

Table 2.6: Fresh Water Resources and Withdrawals in Southern Africa 1970-2000

Annual renewable water resources			Annual River flows		Annual withdrawals					Sectoral withdrawals		
Country	Total (cubic km)	Per capita (cubic metres) 2000	From other countries	Year of Data	Total (cubic km)	% Water resources	Per capita cubic metres	Domestic use	Industrial use	Agricultural use		
Angola	184	14288	...	1987	0.48	0.3	57	14	10	76		
Botswana	3	1788	11.8	1992	0.11	3.8	81	32	20	48		
Lesotho	5	2430	0.0	1987	0.05	1.0	31	22	22	56		
Malawi	18	1605	1.1	1994	0.94	5.4	98	10	3	86		
Mauritius	..	..	..	..	..	..	..	..	..	..
Mozambique	100	5081	116	1992	0.61	0.6	40	9	2	89		
Namibia	6	3592	39.3	1990	0.25	4.0	185	29	3	68		
South Africa	45	1110	5.2	1990	13.3	29.7	391	17	11	72		
Swaziland	..	..	..	..	..	..	..	..	..	..
Zambia	80	8747	35.8	1994	1.71	2.1	214	16	7	77		
Zimbabwe	14	1208	5.9	1987	1.22	8.7	136	14	7	79		

Source: WRI, 2001

In the SADC sub-region, water demand is projected to rise by at least 3 per cent annually until 2020, in line with population growth projection. Consequently, it is estimated that by 2025, up to 16 per cent of Africa's population will be living in countries facing water scarcity and 32 per cent in water-stressed countries (WWF, 2000).

With the increasing demand for water, water-poor countries are looking to cross-border sources for future supplies. In most cases, countries in the region try their best to store large quantities of water in dams, thus altering and reducing natural flow regimes of rivers. The future of these dams depends largely on land-use patterns in neighbouring countries, since soil erosion in the river catchments will cause siltation, thereby reducing water quality and the viability of dams. Thus, a dam receives impact from an "upstream" neighbour and, in turn, causes impact on a "downstream" neighbour.

One factor threatening the water resources of developing countries is water salinity. A rise in sea level and floods, caused by storms, could push huge quantities of seawater into the interior and threaten portable water sources. Salinity can also harm agriculture in coastal regions under five metres above sea level.

Millions of poor people lack adequate access to water and sanitation and many are vulnerable to disasters, are victims of conflicts over water resources, or face declining stocks of fish or other products essential to their livelihoods. Poor water security also has other consequences for the poor, for example, ill health that undermines the family's livelihoods. Water needs are intricately woven through the daily life of poor communities. Four aspects are particularly important:

- Availability of water for production and income generation;
- Water, sanitation, and hygiene for health;
- Sustainable environmental management; and
- Vulnerability to water-related disasters.

Access to water has increasingly become influenced by economic considerations driven by prevailing market conditions superimposed on land tenure systems. The commoditization of water and the need to value water in monetary terms have become paramount. Furthermore, with regard to the provision of access to water of good quality, governments have tended to focus on recovery of investments for good quality water supply. The informal sector, to which the majority of the poor belong, is marginalized because the poor cannot pay for the provision of clean water.

Per capita water availability to South Africans in 1990 was 1 420 m³ per year (Gleik, 1993). In 1995 it was 1 030 m³ per year. In 2025 it will be less than 790 m³ per year, well below the cut-off of 1 700 m³ per year (Postel, 1999:130). South Africa is therefore a water-stressed country and already has less water per

capita than Namibia and Botswana. On the other hand, Zambia is a water-abundant country. Population density is low by African standards, although Zambia is the third most urbanized country on the continent. Zambia also has some of the largest rivers in the Southern African sub-region. The Kafue and Luangwa River Systems water the central and eastern region, joining the Zambezi south of Lake Kariba. The Luapala River System, which runs northwards to Lake Mweru, drains the northern sub-region between the Muchinga Mountains and the borders with DRC. Even where surface water is not conveniently available, there are plentiful underground water sources, usually at no great depth. This means that while it should be relatively easy for the Government to provide water services (Turton, 1998:158) under these conditions, in reality this is often problematic. Only 55 per cent of the population has access to safe drinking water.

Water security is found where the whole community, including the poor and marginal, has access to and a level of control over water resources and services to meet their basic needs in a secure and sustainable manner. It also implies that they can realize development opportunities in which water is a key element and that they are protected from water-related hazards. The development of water security is closely linked to improved water governance and recognizes that poor security is a reflection of institutional weaknesses in water management.

Table 2.7: Proportion of Households with Access to Clean Water Zambia 1996-1999

Household Residence/ Province	1996	1999
Rural	28	35
Urban	82	90
Luapula	10	20
Northern	11	24
Northwestern	18	36
Western	28	37
Eastern	40	44
Central	51	61
Southern	55	63
Copperbelt	67	77
Lusaka	88	93
All Zambia	47	55

Source: GRZ, 2000

In rural Africa, about 65 per cent of the population does not have access to adequate water supply. In Lesotho, the water supply coverage is 34 to 66 per cent for rural and urban areas respectively (UNECA, 1999). In 1996, 61 per cent of rural dwellers and almost 100 per cent of urban dwellers in Namibia had access to a safe drinking water supply (GON, 2000). Sharma et al (1996) have evaluated the sub-Saharan African countries with respect to their degree of national commitment and planning to address water problems in general and have developed a list of country

performance indicators. It is useful to note that most Southern African countries rank high in respect to issues regarding governance of water resources.

2.9 Coastal Resource Degradation

Coastal population pressures and increasing exploitation of coastal resources, utilizing conflicting exploitation methods, have led to coastal degradation. Coastal erosion, flooding, pollution (air, water, land), deforestation, saltwater intrusion, and subsidence are some of the environmental problems degrading large parts of the coastal areas of Africa. Coastal erosion has already been reported to reach 23–30m annually in some parts of coastal West Africa (Ibe and Queleennac, 1989). Industrial pollution from oil spills and discharge of domestic untreated wastes are polluting large areas of the coast, including lagoons and near-shore areas. This has resulted in loss of fisheries resources.

Another problem of coastal resource is that many of the fisheries of the sub-region are artisanal and based mainly in the coastal zone. Here, population pressures have increased consumption and demand and led to the use of destructive fishing methods. In the coastal zone of Eastern Africa, the most environmentally destructive method of fishing is dynamite blasting, mostly associated with coral reef habitats. Bryceson (1978a) reported that repeated blasting over a long period of time has meant the destruction of extensive areas of coral reef and decline of economic productivity. The livelihoods of artisanal fishermen who employ more traditional methods are threatened. Bryceson (1978a) also reported that spearfishing had been banned in most countries of the sub-region owing to its damaging effects on reefs and on populations of particularly vulnerable species. For the same region, Kayambo (1988) points out that depletion of the mollusk population as a result of its intensive collection for export and sale to tourists has been a cause for concern.

Mining of sand, gravel, and other construction materials (e.g. limestone) from estuaries, beaches, or the near-shore continental shelf is common in the coastal States and islands of sub-Saharan Africa. The mining of sand and gravel from coastal rivers and particularly from estuaries tends to diminish the amount of fluvial sediment input to the coastline, thereby accelerating shoreline retreat. Sand extraction directly from beaches seriously depletes the sediment pool available, and beach retreat is either induced or accelerated. Dredging of sand from the inner continental shelf is an obvious cause of beach erosion in Africa.

This is because the beaches along these coasts exist in dynamic equilibrium with the near shore continental shelf. Therefore, dredging of sand/gravel for replenishment, land reclamation, or other civil engineering construction from the shore area or, for that matter, anywhere else within the dynamic system inevitably disrupts this equilibrium and enhances shoreline retreat. Countries where this prob-

lem has been documented include Liberia, Sierra Leone, Cote d'Ivoire, Nigeria in West Africa, Tanzania and Kenya in East Africa, and Mauritius, the Seychelles, and Mozambique in Southern Africa (Byrceson et al 1990).

Development of tourism provides revenues but at the same time can also be the source of natural resource degradation. The construction of hotels and other recreational facilities located on the shore has been responsible for the clearing of coastal vegetation, the filling of wetlands, and increasing loads of solid and sewerage waste. The situation can be further exacerbated by lack of maintenance infrastructure. Of particular concern here is the degradation of biodiversity and fragile ecosystems, such as coral reefs, mountains, coastal areas and wetlands (UN, 1999).

2.10 Human Settlement, Urbanization and Environmental Degradation

The influence of population growth on the environment is controversial. Some authors contend that the creation and improvement of the environment is more easily achieved with higher populations. Scoones (1997) examined the ways and circumstances in which the productivity of soils in Zimbabwe has been created by labour-intensive garden-scale farming. A greater part of the garden-scale farming effort is from women. Men, on the other hand, manage soils under less intensive management regimes, which remain at low levels of productivity. Increased rural populations may lead to environmental gains beyond the increased productivity of the land. Kandeh and Richards (1996) find that in Sierra Leone, an increase in rural population may also lead to increased biodiversity as more intensive use of landscape can create more diverse environments.

Table 2.8: Proportion of Households with Access to Clean Water Zambia 1996-1999

Country	Urban population as % total 1975	Urban population as % total 2000	Urban Population as % total 2015	Annual population growth rate: 1975-00	Annual population growth rate: 2000-2015
Angola	17.8	34.2	44.1	3.0	3.1
Botswana	12.8	49.0	56.0	2.8	0.6
Lesotho	10.8	28	38.9	2.0	0.3
Malawi	7.7	14.7	21.3	3.1	2.2
Mauritius	43.4	41.3	48.6	1.1	0.8
Mozambique	8.7	32.1	48.2	2.3	1.7
Namibia	20.6	30.9	39.4	2.7	1.8
South Africa	48	56.9	67.2	2.1	0.2
Swaziland	14	26.4	32.7	2.6	0.7
Zambia	34.8	39.6	45.2	2.9	2.3
Zimbabwe	19.6	35.3	45.9	2.9	1.7

Source: GRZ, 2000

The significance of rural-urban migration for the environment is in the changes brought about in the spatial distribution of people. Rural-urban migration may help reduce pressure on the rural environment although it brings a new set of pressures on the urban environment associated with the demand for land and services (Pebley, 1998). It has been found, for instance, that urbanization and particularly unplanned informal settlement negatively impacts on runoff from storm water, concentrating flows and causing land degradation and erosion (DEA, 1992). As a result of rural-urban migration and population growth, African cities have often become very overcrowded, with inadequate levels of water, sanitation, police, health, and fire services.

Uncontrolled settlement places severe stress on service provision. The poor are often forced to settle in areas not suitable for human habitation where they are exposed to industrial hazards and pollution. In environmentally sensitive areas such as coastal zones, uncontrolled settlement may damage environmental integrity (e.g. through overgrazing and pollution), as well as pose severe human health threats (e.g. through contamination of air and water). For example, if no provision for sanitation infrastructure is made in areas with a high water table (typically in coastal areas), surface and groundwater pollution takes place and may lead to the spreading of waterborne diseases such as typhoid, diphtheria and cholera.

As urbanization accelerated in many countries, it left behind a less educated and older workforce in agriculture. In the absence of productivity-enhancing investments in human and non-human resources, agricultural production in many African countries has remained stagnant. As population growth has expanded, food security has diminished, at least in terms of the traditional domestic crops on which many African societies depend. In turn, in the absence of significant increases in productivity, because the majority of Africa's populations still live and work in rural environments, levels of per capita income have also stagnated.

Rapid urbanization poses numerous urban management challenges including intense demographic pressure; sprawling, unplanned settlements; inadequate infrastructure and services, conflicting demands on scarce resources for priorities of funding; and generally, a poor quality of life. The vast majority of African urban dwellers are, consequently, deprived of essential services. Failure to manage these challenges effectively is responsible for the rapidly rising levels of urban, human and environmental crisis in Africa. The crisis expresses itself in many ways including:

- Overcrowding and poor housing conditions;
- Over-consumption of limited natural resources, especially freshwater supplies;
- Uncollected solid waste and untreated waste water;

- Environmental pollution, degradation and other forms of ecological imbalances;
- Social conflicts of crime, prostitution and delinquency; and
- Various forms of gender and child abuse, including domestic violence and child labour.

The majority of the urban population - e.g. 65 per cent in Dar-es-Salaam (Mosha, 1990), 67 per cent in Blantyre (Mwafongo 1991), and 80 per cent in Luanda (Hill 1992) - lives in squatter settlements. Squatter settlements refer to shanty towns, most of which start as illegal settlements. These settlements are characterized, among other things, by poorly constructed houses, poor sanitary conditions, lack of all services (power, running water, and garbage collection), and lack of legal status as residential dwellings.

Most cities do not have sufficient capacity to deal with the garbage that is generated. Dar-es-Salaam, for example, generates an estimated 2,000 tons of refuse a day but the city's removal capacity is only 100 tons a day (Mosha 1990). In many cases, refuse collection is restricted to high-income areas (Leduka 1991; Mwafongo 1991). There are no regular collections, if any, in the squatter areas, and the uncollected refuse soon attracts rodents, flies, and other vermin. Over 42 million cubic metres of general waste is generated every year across South Africa, with the largest proportion (42 per cent) coming from Gauteng province (DWAF, 1997a).

In addition, more than 5 million cubic metres of hazardous waste are produced every year, mostly in Mpumalanga and KwaZulu-Natal (due to the concentration of mining activities and fertilizer production in these provinces). The average amount of waste generated per person per day in South Africa is 0.7 kg. This is closer to the average produced in developed countries (0.73 kg in the UK and 0.87 kg in Singapore), than to the average in developing countries such as 0.3 kg in Nepal (DWAF, 1997b).

When refuse is collected, it is often dumped at the edge of the city. The waste is untreated and is often a mixture of both domestic and industrial waste. Of the 5 million cubic metres of hazardous waste generated every year in South Africa, less than 5 per cent reaches hazardous-waste disposal sites (DWAF, 1997b). This causes pollution of the soil and the ground water. Meanwhile the built-up area gradually extends towards the dumps and, in time, surrounds the waste dump. In cities such as Harare that have been coping, residents are now resorting to emptying uncontrolled refuse in open spaces (Musandu-Nyamayaro 1991).

The situation with respect to waste disposal is very serious because its direct effect on the quality of the environment is tremendous. The main sources of hazardous waste include heavy metals, oxides of nitrogen and sulphur, and petroleum

hydrocarbons (Habitat 1989; Christiansson 1993). Most of these come from the chemical industries, although other industries such as primary and fabricated metal and petroleum industries and leather-tanning industries also produce significant quantities of hazardous substances (Habitat 1989; Christiansson 1993). Effluents are discharged into the rivers, lakes, or estuaries, some of which are sources of drinking water (Christianson 1993). Alternatively, they may be dumped with ordinary domestic garbage and thus cause soil and groundwater contamination.

It has been estimated that the quantity of domestic waste in Lusaka will increase by 141 per cent between 1996 and 2011, as indicated in the following table.

Table 2.9: Estimated Quantities of Waste Generated in Lusaka in 1996

Category of Waste	Quantity (tons)	% of Total Waste
<i>Domestic:</i>		
High density	169,143	69.5
Medium density	36,493	15.0
Low density	13, 678	5.6
<i>Trade and industry:</i>		
Hotels	1,392	0.6
Markets	11,783	4.8
Industry/commerce	5,559	2.3
<i>Other:</i>		
Hospitals	5,281	2.2
Total	243,329	100.0
Projected increases in quantity of domestic waste in Lusaka from 1996 level		
1996	219,314	-
2001	273,280	25
2006	393,537	79
2011	529,604	141

Source: ECZ, 2000

In South Africa, for example, each South African household generates, on average, one ton of waste annually. Overall, South Africa produces approximately 460 million tons of waste annually, two million tons of which are defined as toxic, accounting for less than half a percentage of all hazardous waste generated in the world. Approximately 95 per cent of all waste is disposed of on land. There are eight permitted sites for hazardous disposals. In 1997, only 255 of the 1,200 existing waste-disposal sites had been issued with a permit. These systematically collect wastes for onward transfer to landfills without any further treatment than covering.

In most countries, the main reason for the poor state of waste management is inadequate local authority capacity, although rapid urbanization, inadequate legislation and lack of public concern are also contributing factors. The local

authorities' inability to provide effective solid-waste management services is due to a complex interrelationship of financial and management constraints, including inadequate financial resources, insufficient and poorly maintained equipment, insufficient and inadequately qualified human resources, inappropriate management systems, and corruption and mismanagement.

Although these constraints can be blamed partially on the local authorities themselves, many of the causes are external in nature. These include the limited autonomy of local authorities, particularly with regard to revenue raising, and the interrelated problems of an inhospitable macro-economic environment and cut-backs in government expenditure, which characterized most countries undergoing structural adjustment reforms.

Finance is central to effective and efficient urban management, as it determines the level or quality of services that can be provided. The poor state of the finance of local authorities has affected their ability to maintain the systematic management of urban solid waste. This has in turn contributed to an increase in the urban mortality rate, especially among infants and children, due to such diseases as malaria, cholera, dysentery and typhoid, which resulted from the unkempt and filthy urban environment.

The result is a filthy, unpleasant, disease-ridden and dangerous urban environment. It is further noted that the cause of this decay within local authorities is not only the lack of financial resources but also, and most important of all, inadequate and ineffective management. In order to save this important arm of government, there is an urgent need to take bold decisions, which would give local authorities greater and direct access to financial resources, and also improve their management. The amount of solid waste collected by the local authorities has been an alarmingly small proportion of that generated.

In Zambia, for example, a government survey to monitor living conditions found that in the country as a whole only 4 per cent of households had their waste collected. In urban areas, where local authorities are expected to provide better services than in rural areas, only 10 per cent of solid waste was being collected. The survey also found that dumping was the most common form of waste disposal in rural areas. In urban areas, burying waste in pits was the method most commonly used, although dumping also existed.

The problem of urban waste management in Zambia was greatest in Lusaka. The city's population growth rate of 6.2 per cent was almost twice that of the country as a whole - 3.2 per cent. There were large numbers of in-migrants from other parts of the country to Lusaka, attracted by the possibility of business and employment opportunities. The majority of migrants settled in the peri-urban areas, causing more overcrowding in these already poorly serviced townships.

These high-density peri-urban areas have shown the highest estimated annual population growth rates and have also generated the largest amounts of domestic waste. In 1993, Lusaka City Council was able to collect less than 10 per cent of the estimated 1400 tons of waste generated every day. This failure to manage solid waste adequately has been causing many environmental concerns, including air pollution due to decomposing rubbish, leakage of pollutants into the soil, thus creating a risk of both soil and groundwater contamination, and the spread of disease by flies and rodents.

In many urban and peri-urban areas, sewerage networks are either non-existent or incomplete. About 73 and 43 per cent respectively of rural and urban dwellers in Africa do not have access to adequate sanitation facilities. In Lesotho, it is estimated that 0 to 33 per cent of rural and urban dwellers respectively have access to adequate sanitation (UNECA, 1999). In 1996, 20 per cent of rural dwellers and 93 per cent of urban dwellers in Namibia had access to adequate sanitation (GON, 2000).

The major factor responsible for the low rate of solid waste collection seems to be was lack of vehicles and equipment for transporting the waste. For example, in 1970, Kitwe City Council in Zambia had 70 refuse trucks to cater for a population of less than 200,000, but in 1997, when the population had grown to almost one million, there were only two trucks. Similarly, in Ndola, there were 33 refuse trucks and 16 open tippers up to 1982, but less than 10 vehicles in 1997. The following table shows a similar deterioration in the situation in Lusaka, over the 25-year period, between 1970 and 1995. During the late 1990s, Lusaka City Council had only eight vehicles (two trucks, two tippers and four tractors) to serve a population of between 1.5 and 2 million people.

Table 2.10: Refuse Collection Equipment in Lusaka 1970-1995

Year	Population '000	Side loader	Open truck	Tipper/Tractor	Skip Lift	Compactor	Total
1970	278	22	0	6	0	0	28
1975	462	15	0	27	2	8	52
1980	538	0	0	39	2	10	51
1985	750	0	0	36	2	11	49
1992	1 170*	2	5	1	0	2	10
1994	1 200*	1	3	4	1	2	11
1995	1 500*	1	3	5	1	2	12

Source: ECZ, 2001

* Lusaka City Council estimate

By far the biggest contributor to the solid waste stream is mining waste, followed by pulverized fuel ash, agricultural waste, urban waste and sewage sludge. Solid-waste management in Southern Africa in most urban areas is generally poor. Large quantities of waste are dumped indiscriminately or disposed of inadequately. This has negative implications in terms of public health, environmental pollution

and the economic value of land. Incineration of wastes, a common and largely unregulated practice in Southern Africa, releases a hideous cocktail of air pollution including deadly carcinogens such as dioxins and furans.

2.11 Armed Conflict and Environmental Degradation

The main impact of armed conflict on the environment occurs through habitat destruction and loss of wildlife, over-exploitation and degradation of natural resources, and pollution (Shambaugh et al, 2001). Vegetation may be cut, burned, or defoliated to improve mobility and visibility for troops. When large numbers of displaced people are temporarily resettled, they often clear away vegetation for farming and fuel wood and this invariably leads to deforestation and soil erosion. Protected wildlife areas are also affected if displaced people are located near them. Individual animals may be killed or injured by land mines as happened to elephants in Mozambique.

Over-exploitation of natural resources is often directly linked to armed conflict, and occurs for both subsistence and commercial reasons. During situations of war, local people are unable to grow basic crops as they would have done under conditions of peace. For survival, many are forced to depend on wild foods such as bush meat and wild food plants. When conflict ends, physical access to natural resources open up again to the general public. Sometimes private sector operators move in and extract resources in an unsustainable way as occurred in Mozambique (Hatton et al, 2001).

In situations of armed conflict, environmental concerns are accorded secondary importance. However, a degraded environment puts people's future livelihoods at risk, setting a stage for further political instability and conflict. African countries have experienced more than 30 wars since 1970. Some were quite prolonged, such as the wars in Angola and Mozambique. Most of these conflicts were fought within national borders (McNeely, 2000). They were driven by a wide variety of contributing factors such as ideology, access to resources, ethnicity and religion, among others. Some are fuelled by the desire of political elites to control and exploit valuable natural resources such as gold, oil, diamond, and timber.

The relationship between these conflicts and their impact on the environment depends on the type, intensity and duration of the conflict. The conflicts in Mozambique and Angola were low in intensity but long in duration. During and following armed conflict, an armed and lawless society has direct and indirect impact on the environment, for subsistence, strategic, and commercial reasons that often have political, social and economic root causes.

Pollution of rivers and lakes also occurs when human bodies are deposited in them and decompose, as occurred during the Rwandan genocide. When refugees

and internally displaced people find themselves living in overcrowded conditions, they are a potential source of pollution. In order to subsist, they may pollute surface water and their immediate environment.

In addition to the terrible toll on human lives, the use of landmines during armed conflicts has other environmental consequences. In Mozambique, mines reportedly have killed more than 100 elephants. Another avenue for direct impact on wildlife may be the intentional use of landmines as a technique for poaching wildlife. Landmine poaching presents the ultimate distortion of this insidious weapon. It is used as a simple and effective mechanism for killing wildlife.

Since the Second World War, landmines have been extensively used in Africa during armed conflicts. Wars of national liberation in Southern Africa during the last quarter of the twentieth century left millions of landmines and other unexploded ordnance. Although many regions of the world are heavily mined, it is generally accepted that Africa is the most heavily mined continent. Severely affected countries in Southern Africa include Angola, Mozambique, Zimbabwe, Zambia, Namibia, Malawi, South Africa and Swaziland.

2.12 Atmospheric Degradation and Climate Variability

The atmosphere is the essential physical and chemical environment for land-based life, including a significant proportion of the biosphere on which human life depends. Changes to the physical and chemical properties of the atmosphere have the potential of directly or indirectly affecting the quality of life and even the very existence of some forms of life (WMO, 2000).

Africa contributes very little to global climate change, with low carbon dioxide emissions from fossil fuel use and industrial production in both absolute and per capita terms. Africa accounts for 2-3 per cent of the world's carbon dioxide emissions from energy and industrial sources, and 7 per cent of emissions from land use (forests) are taken into account (UNECA, 2002a). South Africa is by far the largest emitter of carbon dioxide in Africa. The country is responsible for about 39 per cent of the continent's total emissions. South Africa's per capita carbon dioxide emissions (1.88 tons) are higher than the global average of 1.13 tons a year. More than 90 per cent of South Africa's electricity is generated from the combustion of coal that contains approximately 1.2 per cent sulphur and up to 45 per cent ash. Coal combustion can lead to particulate matter in the air and contribute to acid rain. It is estimated that around 2,000 children die annually as a result of respiratory infections caused by air pollution, the sixth largest killer of children under four in South Africa.

In addition to industrial pollution, low-level atmospheric pollution often results from coal combustion in stoves, as well as coal-heated boilers that are found in

hospitals and factories. Vehicular emissions, while not nearly as significant in absolute terms as in cities such as New York, Tokyo or Los Angeles, nonetheless have a negative impact on the environment. Studies in 1990-1996 found that Zimbabwe is a greenhouse gas sink. Though the energy sector in Zimbabwe is a major emitter of greenhouse gases, the country's forests are able to absorb far more gases than the quantity that all other sectors emit (ENDA, 1997).

In Southern Africa, the main environmental issues of concern, regarding atmospheric degradation are the occurrence of flooding and droughts. These arise from climate variability, impacts of climate change on vegetation systems, biodiversity, freshwater availability, food production and localized air quality problems associated with emissions from industry, vehicles and use of domestic fuels. Droughts, cyclones, floods, and bushfires have brought untold hardship to millions of people.

Rainfall in Southern Africa is strongly influenced by the Inter-Tropical Convergence Zone (ITCZ), a zone close to the equator where massive rain-bearing clouds form when the South East Trade Wind (from the south east of the continent) meets the North East Monsoon Winds. The ITCZ changes position during the year, oscillating between the Equator and the Tropic of Capricorn, and its southward movement usually marks the beginning of a rainy season. The further south the zone moves, the more promising this is considered to be for the rainy season. In a normal season, the ITCZ can exert an influence between mid- Tanzania and southern Zimbabwe and is associated with favourable rainfall. Another system, the Botswana High, often tends to push the ITCZ away, resulting in periods of drought.

ENSO also influences Southern Africa's climate, tending to bring either heavy rains often accompanied by severe floods, as in 1999/2000 when Mozambique was exceptionally hard hit, or drought, as in 1982-1983 when much of Southern Africa was severely affected. In the wet season, normal rainfall ranges from 50 mm to over 1000 mm. Recent weather patterns have been erratic with severe droughts recorded in 1967-1973, 1981-1983, 1986-1987, 1991-1992 and 1993-1994. Floods have also been observed, most notably across most of Southern Africa in 1999-2000 (WMO 2000).

The drought of 1991-1992 was the severest on record, causing a 54 per cent reduction in the cereal harvest and exposing more than 17 million people to the risk of starvation. Zimbabwe alone imported an additional 800,000 tons of maize, 250,000 tons of wheat, and 200,000 tons of sugar (Makarau 1992). Water and electricity shortages resulted in a 9 per cent reduction in manufacturing output and a 6 per cent reduction in foreign exchange earnings (Benson & Clay 1994).

The potential effect of climate change on drought in Africa is uncertain. At a local level, increased temperatures are likely to lead to increased moisture demand. The

balance between rainfall and higher evapo-transpiration implies more frequent water scarcity. However, a great deal depends on vegetation response to higher CO₂ concentrations and the timing of rainfall. The combination of higher evapo-transpiration and even a small decrease in precipitation could lead to significantly greater drought risks. An increase in precipitation variability would compound temperature effects. For example, Hulme (1996b) reports that inter-annual variability increases on the order of 25 per cent in much of southern Africa in the transient scenario (UKTR) for the 2050s.

Within the sub-region, some areas experience a similar decrease in variability. The temperature-precipitation-CO₂ forcing of seasonal drought is less significant than the prospect of large-scale circulation changes that drive continental droughts that occur over several years. A change in the frequency and duration of atmosphere-ocean anomalies, such as the ENSO phenomenon, could force such large-scale changes in Africa's rainfall climatology. However, such scenarios of climate change are not well developed at the global level, much less for Africa.

3. COST OF ENVIRONMENTAL DEGRADATION

3.1 Financial Cost

Actual damage costs caused by environmental deterioration could be assessed on the basis of defensive expenditures or costs. These comprise the actual environmental protection costs involved in preventing or neutralizing a decrease in environmental quality and the actual expenditures that are necessary to compensate for or repair the negative impacts of a deteriorated environment (UN, 1993).

Environmental costs are those connected with the actual or potential deterioration of natural assets due to economic activities. They are caused when economic units are associated with actual or potential environmental deterioration by their own activities. Environmental costs are borne by economic units independent of whether they have actually caused or might potentially cause environmental deterioration. Depletion costs refer to the quantitative depletion of natural assets by economic activities, whereas degradation costs reflect the quantitative deterioration of the natural environment by economic activities.

The qualitative impact on the environment comprises the deterioration of landscape and ecosystems caused by economic activities or the discharge of residuals of economic activities into the natural environment. Degradation costs could therefore refer to the costs caused by economic activities or to those related to the effects of a degraded nature borne by industries and households (UN, 1993).

The actual expenditures connected with environment-related activities are called actual environmental costs. They comprise environmental protection costs and repercussion costs. Environmental protection costs can be sub-divided into avoidance (prevention) costs and restoration costs, and the repercussion costs into avoidance and (damage) treatment costs (UN, 1993). Actual environmental costs do not include the gross capital formation of environmental protection facilities and of produced assets used for damage avoidance or treatment activities. Only the economic depreciation of those assets is taken into account. Environmental expenditures on the other hand usually include capital formation (capital expenditures) and running (operational or current) costs.

Environmental expenditures cover the expenditure of several government departments and private individuals and firms. One aspect of environmental expenditure is one devoted to the provision of health services. The table below suggests that the share of health expenditure in the GDP of Southern African countries is low, usually below 4 per cent in spite of the critical health problems affecting the sub-region in the provision of adequate water and sanitation and coping with the HIV-AIDS pandemic.

In Zambia, for example, the cost of mitigating climate change brought about by deforestation is estimated at \$US 15 million over a 5-year project cycle. This comprises expenditures on various programmes of re-forestation, enhanced natural regeneration, national parks, agricultural land improvement, the planting of natural timber, fuel wood end-use efficiency, and efficient charcoal production (ECZ, 2001).

Table 2.11: Refuse Collection Equipment in Lusaka 1970-1995

Social Sector	Expenditure Million Kwacha	Share of expenditure (%)
Education	332,121	53.4
Health	204,302	32.9
Social Safety Net	55,039	8.9
Water and Sanitation	25,235	4.1

Source: GOZ, 2002

The main environmental concerns in Malawi are handled by the Ministry of Forestry, Fisheries and Environmental Affairs. In 1998-1999, the Ministry's financial allocations was less than 2 per cent of the National Budget while the proportion for debt serving was almost 27 per cent (UNCCD, 1999). In Angola, the Ministry of the Environment only receives 0.03 per cent of the National Budget (UNEP, 1999).

In Mauritius, the Government plans to spend Rupees 10 billion during 2002-2003 to 2012-2013 on environmental resource management especially on environmental protection and management. This is a country where more than 80 per cent of the population is not connected to the sewerage system, and those who have access reside in a few predominantly urban areas. Rs 912 million is to be spent on major environmental projects such as the construction of the St. Martin Treatment Plant, and the Plaines Wilhems, Montagne Jackquot, Baie du Tombeau and Grand Baie sewerage projects. Rs 192 million is being devoted to rehabilitation of the dumping grounds at Roche Bois and Mantagne St. Pierre, construction of a new transfer station in the East of the country and operation of existing transfer stations and landfills (Government of Mauritius Budget Speech, 2002/2003).

The Government of Botswana's budget for 2002 allocated Pulas 578 million or 11 per cent of the development budget, to the Ministry of Minerals, Energy and Water Affairs, of which, more than half, amounting to P300 million, is allocated

to one major project, the Major Village Water/Sanitation Development. Other projects with significant amounts under this Ministry, together requiring P164 million or 28 per cent of the Ministry's development budget are: Rural Power Supplies (P78 million), BCL Finances (P58 million) and Village Water Supplies and Technology (P28 million).¹⁶

The budget for the Ministry of Lands, Housing and Environment is P348 million or 7 per cent of the total development budget and is intended to implement nine ongoing projects. An amount of P304 million, or 87 per cent of the Ministry's budget, is set aside for four projects, namely, Government Office Blocks (P103 million), District Housing (P138 million), SHHA Development (P40 million), and Land Boards Development (P23 million). The remaining P44 million of the Ministry's budgetary allocation is to be shared among environment management activities, computerization, Botswana Housing Corporation Finances, surveys and mapping, and land use planning (GOB, 2002).

Firms in Southern Africa are increasingly aware of the magnitude of their environmental protection costs. The findings of a survey conducted among 19 of South Africa's top organizations (KPMG 2001), suggests that there is growing awareness of the significant financial implications of environmental performance and that environmental accounting practices are gradually increasing. The current application of environmental accounting remains extremely low. While the surveyed companies claimed to have financial environmental information of various types, including capital expenditure, operating expenditure, liabilities and provisions, very few seemed able or willing to access and accurately report on this data readily.

Environmental capital expenditures were mostly associated with water, waste and air impacts, while environmental operating expenditure related mainly to technology, rehabilitation and consultants. Environmental liabilities were chiefly incurred in relation to land rehabilitation and water contamination.

Approximately a third of the sample was spending more than R100 million on environmental issues. However, environmental cost savings, cost avoidances and revenues are not widely measured or reported. Where they were disclosed in the survey, most comprised environmental revenues and were related to energy programmes. The South African Paper and Pulp Industry (2001) reports \$US 29 million in spending, related to a one-off environmental expenditure in North America (to comply with the Environmental Protection Agency "cluster rules") and in Southern Africa.

When examining aspects of environmental expenditure in terms of spending on water and sanitation, it becomes clear that there are fundamental problems with regards to social sector spending. The main problem is in connection with waste

¹⁶ Government of Botswana, 2002.

disposal. Sewerage facilities appear to be of lower priority than water in many parts of Africa.

In South Africa, for example, increasing South Africa's Rand Water's capacity by around 1,200 megalitres per day from the end of 1998 was estimated to cost R1.5 billion. Also in South Africa, the Albany Coast Water Board is developing a sea-water desalination plant, at an estimated cost of R2.5 million. Plans to upgrade and expand the Rustenburg area in order to meet demand are expected to cost approximately R230 million. The Department of Water Affairs and Forestry budget for Community Water Supply and Sanitation was R500 million in 1997-1998, targeting 4.7 million people (US Department of Commerce, 2000).

The priority of South Africa's Department of Environmental Affairs and Tourism, since 1999, has been tourism on one hand and waste management on the other. Programmes and resources have been reprioritized to strengthen Government's capacity in these two areas. South Africa's annual budgets for environment and tourism during the 1996-1997 to 2002-2003 period are summarized in table 2.12 below. This expenditure is to guide development and conservation of the coastal and marine environment and ensure sustainable use of coastal and marine resources.

Table 2.12: Share of Environmental Management in the Departmental Budget: South Africa

Expenditure Outcomes (%)				Medium-Term Expenditure Estimates			
	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
Administration	5.9	6.0	5.9	5.3	5.5	4.6	4.6
Environmental Coordination and Communication	3.3	3.4	4.1	3.1	4.0	3.4	3.4
Marine and Coastal Management	21.4	20.9	21.7	15.4	17.3	31.3	31.2
Weather Bureau	15.1	15.1	14.6	11.0	10.2	8.7	8.8
Tourism	16.0	18.0	19.6	33.8	37.5	31.1	31.3
Environmental Quality and Protection	6.7	8.0	5.6	8.0	5.1	4.2	4.2
Biodiversity and Heritage	26.3	24.1	24.5	19.9	17.1	14.0	14.1
Auxiliary and Associated Services	5.1	4.4	3.9	3.5	3.3	2.7	2.6
Departmental Vote (Total)	100.0	100	100	100	100	100	100

Source: Derived from DEAT (2002)

3.2 Economic and Social Costs

Dalfelt, Mendelshon and Diner (1999) estimate potential annual loss of agricultural GDP, due to climate change in Africa, to be on the order of \$US 50 to 200 billion. A combination of dry spells, severe floods, and disruption of farming activities between 1999 and 2001 has left Southern Africa with meagre food reserves. Several of the sub-region's countries have faced food shortages (FAO 2001a).

Cyclone Eline, which hit south-eastern Africa in 1999-2000, affected 150, 000 families and wreaked havoc in Mozambique where it caused \$US 273 million worth of physical damage, and cost \$US 295 million in lost production, and \$US 31 million in food imports (Mozambique National News Agency 2000, in UNEP 2002). Flooding in Mozambique in 2000 caused direct and indirect losses of about 6 per cent of the country's GDP (World Bank, 2001).

Land degradation has significant impact on soil productivity and, consequently, on food security. Soil erosion reduces soil productivity and plant nutrients to such an extent that soils become unsuitable for crop production. The total nutrient loss between 1970 and 1999 is estimated to be 1.4 tons per hectare of urea fertilizer, 375 kg of triple super phosphate and 896 kg of potassium chloride (UNECA, 1999). Crop-yield losses due to soil erosion in 1989 ranged from 2 to 40 per cent in Africa with a mean of 8.2 per cent. Irreversible loss of soil productivity of at least 20 per cent of the land due to erosion occurred over the past century in parts of South Africa, Lesotho and Swaziland (UNECA, 2001). Table 2.13 below gives the trend in per capita food production in southern Africa.

Table 2.13: Per capita Food Production of Cereals, Roots, Tubers and Pulses (kg) in Southern Africa

Country	1974-1979	1980-1989	1990-1998
Angola	322.7	240.8	274.2
Botswana	120.1	56.9	45.8
Lesotho	196.1	127.6	122.6
Malawi	386.1	304.8	249.2
Mauritius	14.9	21.5	18.1
Mozambique	381.5	340.8	249.2
Namibia	267.3	244	210.9
South Africa	510.7	425.1	346.4
Swaziland	228	196.5	133.4
Zambia	340.4	244.6	209.1
Zimbabwe	354	308.6	216.2
Sub-regional Average	298.6	256.9	218.9

Source: World Bank (2001)

Soil erosion can also lead to sediment pollution of water supplies, flooding and the reduction of hydroelectric power through siltation of dams. Loss of top soil, terrain deformation and also chemical deterioration of the soil account for 4.8 per cent of total land use in Africa (UNECA, 2001). Siltation of dams due to soil erosion costs South Africa R200 million per year (DEAT 2002).

The economic impact of land degradation is extremely severe in densely populated countries of sub-Saharan Africa. The productivity of some lands in Africa (Dregne, 1990) has declined by 50 per cent as a result of soil erosion and desertification. Yield reduction in Africa (Lal, 1995) due to past soil erosion may range from 2 to 40 per cent, with a mean loss of 8.2 per cent for the continent. If accelerated erosion continues unabated, yield reductions by 2020 may be 16.5 per cent. Annual reduction in total production for 1989 due to accelerated erosion was 8.2 million tons for cereals, 9.2 million tons for roots and tubers, and 0.6 million tons for pulses. On a global scale the annual loss of 75 billion tons of soil costs (at \$US 3 per ton of soil for nutrients and \$US 2 per ton of soil, for water) the world about \$US 400 billion per year, or approximately \$US 70 per person per year (Lal, 1998).

Soil compaction is also a serious problem in Africa. It has caused yield reductions between 40 and 90 per cent in West African countries (Charreau, 1972; Kayombo and Lal, 1994). Nutrient depletion as a form of land degradation has a severe economic impact on the global scale, especially in sub-Saharan Africa (Stoorvogel et al., 1993) have estimated nutrient balances for 38 countries in sub-Saharan Africa. Annual depletion rates of soil fertility were estimated at 22 kg N, 3 kg P, and 15 kg K ha⁻¹. In Zimbabwe, soil erosion results in an annual loss of nitrogen and phosphorus alone, totaling \$US 1.5 billion.

Despite environmentally unfavourable conditions in many areas, from 1960-2000, agricultural production was poor but variable throughout Africa. The highest growth in agricultural production was experienced in 1950 and 1970 when there was an average yearly growth rate of 3 per cent. The period between 1970 and 1985 saw a slowdown in the continental agricultural growth rate though the average annual agricultural production growth rate exceeded 3 per cent between 1990 and 1995. There was a strong recovery of agricultural output in 1996, though this was not sustained in 1997. For the African region as a whole, agricultural production growth decelerated to 1.7 per cent in 1997, after bumper crops had raised output by a record 5.2 per cent in 1996. This was essentially due to weather conditions that affected production in major producer nations. The production of the major export commodities fell in 1997 below their 1996 levels and this decline was particularly noticeable in the case of cocoa and coffee.

In the food sub-sector, regional production in 1997 was adversely affected by the erratic changes in weather conditions, mainly because most countries depend

overwhelmingly on rain-fed agriculture. Civil strife also played a significant role in accentuating the region's food-supply difficulties. According to data from FAO, cereal production fell by about 10.5 per cent from 126 million metric tons in 1996 to 113 million metric tons in 1997. Fruit, jute and vegetable production was slightly lower than in 1996, while the production of pulses increased.

Due to poor performance, difficulties are emerging in the eastern and north-eastern parts of the sub-region. In Tanzania, for example, the 1997 cereal crop declined by one-third. In Rwanda and Burundi, although production has been recovering, it remained well below pre-crisis level. In Ethiopia and Eritrea, food production fell drastically. Stocks were exhausted in an effort to make up for the shortfall and this required an urgent call for assistance to the international community to contain an impending disaster.

While the agricultural growth rate has been modest between 1960 and 2000, productivity was low over the same period (Ehui, 2001). In the late 1990s, cereal yields in sub-Saharan Africa were about 40 per cent of the world average, having fallen by 0.7 per cent a year between 1985 and 1995 (UNECA, 2002). Low agricultural productivity is attributable to low investments in agricultural inputs. Only 4.2 per cent of land under cultivation in Africa is irrigated. Fertilizer application in 2001 was the same as it was in 1980. At present, less than 15 kg per hectare of fertilizers are used in Africa and the number of tractors used per farm worker is lower than the figures for other continents. Endemic animal diseases reduce the use of animal draft power in Africa.

Throughout Southern Africa, the staple crops are cereals, maize in particular. Millet and sorghum are widely grown as well; wheat and groundnut are common in some regions. Almost all agriculture is rain-fed, although irrigation is important in some regions. Less than 10 per cent of the cultivated area is irrigated and this increases the sensitivity of crop yields to climatic variations. Cash crops are important in every country but vary in their distribution and profitability. Coffee, tea, groundnuts, and tobacco are grown as cash crops.

Other significant crops (at least in terms of household consumption) include cassava, yams, legumes, and horticultural crops. Agro-pastoralism and extensive nomadic pastoralism are common in semi-arid regions. Relying as it does on grass and browsing, pastoralism is particularly sensitive to long periods of drought when grazing resources are depleted by livestock and are not renewed.

In Africa as a whole, in 1999, for the third consecutive year, overall agricultural production rose by only 2.1 per cent, remaining lower than the population growth rate. Crop production is estimated to have increased by 2.2 per cent, while livestock production expanded by a modest 1.7 per cent. In per capita terms, however, agricultural production continues to stagnate, with 2000 production levels being virtually identical to those attained in 1990 (FAO, 2001a).

In Southern Africa, per capita food production has significantly declined in many countries due to lower plantings and adverse weather. Maize output, which accounts for over 90 per cent of the sub-region's total cereal production, was estimated at 13.7 million tons in 2001, 26 per cent lower than in 2000. In Zimbabwe, Maize output was estimated at over 25 per cent lower than the 2000 level, a reflection of lower plantings and reduced yield (FAO, 2001c).

Pressure to increase productivity of agricultural systems to meet mainly domestic and international demands has encouraged widespread use of fertilizers, and other agro-chemicals. Application of fertilizers is important to achieve optimum yields. However, it is equally important not to over-fertilize the land. Excessive use of reduced (energy rich) sources of nitrogen is an important cause of soil acidification, following its biological oxidation to nitric acid. Over-fertilization also increases the concentration of nitrates in underground and surface waters, and of phosphates in surface waters. This causes pollution and eutrophication.

Fertilizer use to improve agricultural output performance was high for individual Southern African countries from 1965 to the early 1980s after which they stagnated for South Africa and Zimbabwe. Botswana, Swaziland, Zambia and Mozambique experienced fertilizer use stagnation or decline during the 1990s. Though Lesotho improved agricultural fertilizer use from 1965 to early 1980s, this has since stagnated in that country. Table 2.14 below gives details of fertilizer use in selected countries.

Falling or stagnant agricultural yields are linked to poor extension services and high costs of input such as fertilizers. This has encouraged farmers to expand production through land extensification, often into forests and woodlands. While it is essential to utilize fertilizers and other agricultural chemicals to boost production, it is important not to overuse or overstock them. Africa had a 500,000-ton stockpile of environmentally damaging pesticides as of 2002. South Africa alone has a stockpile of obsolete pesticides estimated at 3000 tons, which would cost \$US 12m to treat through incineration. Some of the pesticides used in agriculture only have a shelf life of two years and farmers sometimes hold on to obsolete pesticides that are hazardous to the environment (Business Day 2002b).

Table 2.14: Fertilizer Use in Selected Southern African Countries (metric tons)

Country	1965	1970	1975	1980	1985	1990	1995	1998
Botswana	2,100	1,700	2,400	1,400	541	900	2,284	4,200
Lesotho	550	374	1,500	4,500	3,500	4,600	5,904	6,000
Mozam-bique	6,800	6,565	5,900	27600	3,803	2,600	7,800	5,035
South Africa	364,100	557,700	772,712	1,064,340	878,715	791,549	767,000	782,600
Swaziland	5,500	6,023	9,400	20,323	8,798	13,397	5,095	5,500
Zambia	11,000	36,199	53,300	78,600	80,200	59,600	55,000	40,300
Zimbabwe	75,000	106,300	147,208	173,462	170,135	176,696	146,600	174,400

Source: World Bank, 2001. African Development Indicators

The effects of climatic variations on African agriculture have been well established through decades of field experiments, statistical analyses of observed yields, and monitoring of agricultural production. The most important climatic element is precipitation, particularly seasonal drought and the length of the growing season. The distribution of rainfall within the growing season may also affect yields. Local flooding and storms are minor problems. Low temperatures and radiation limit production in some high-elevation regions; frost is a hazard in South Africa. High temperatures can affect yields and yield quality in semi-arid and arid regions, although water is more important. Sea-level rise and coastal erosion will affect groundwater, irrigated agriculture, and low-lying coastal land in some areas.

The direct effects of CO₂ enrichment on plants tend to increase yields and reduce water use. Increased CO₂ concentrations increase the rate of photosynthesis and increase water-use efficiency (the efficiency with which plants use water to produce a unit of biomass or yield). The direct effects are strongest for plants with C₃ pathways, such as wheat, compared with C₄ plants such as maize, sorghum, millet, and sugarcane - which are staples for much of sub-Saharan Africa. CO₂ enrichment also affects weeds, many of which are C₄ plants (Ringius et al., 1996).

According to the IPCC Second Assessment Report, the effect of a doubling in CO₂ concentrations (from the present) varies from a 10 per cent increase to almost a 300 per cent increase in biomass; WUE may increase by up to 50 per cent (or more) (IPCC, 1996). Thus, the beneficial effects of increased concentrations of CO₂ are likely to offset some of the effects of decreased precipitation. However, the effect of CO₂ on crops in Africa - where nutrients are a limiting factor and leaf temperatures are high - remains highly uncertain.

Table 2.15: Crop Production and Yields per Hectare in Zambia, 1997-2001

Crop	Area planted (hectares).				Yields per Hectares			
	1997/98	1998/99	1999/00	2000/01	1997/98	1998/99	1999/00	2000/01
Maize	510374	598181	618162	583856	14	16	19	15
Sorghum	35864	36405	37387	43353	8	8	8	8
Paddy Rice	9065	16120	10531	14321	9	11	10	11
Finger Millet	90047	95520	61279	70129	8	8	8	7
Sun-flower	15692	13356	12983	37388	9	10	11	10
Ground-nuts	154682	141320	141319	137108	5	5	5	5
Soya beans	11681	11716	11721	16754	12	25	25	19
Mixed Beans	35444	39854	39853	51025	4	5	5	5
Cassava	116709	138360	n.a	116464	7	7	7	7
Cotton	n.a	105539	36680	56933	n.a	1.3	n.a	1
Tobacco	n.a	7851	5280	4247	n.a	1.1	n.a	1

Source: GRZ, 2002.

At the national level, there is significant variability in national maize yields for selected countries (Hulme, 1996a). The effects of the 1984-85 and 1991-92 droughts are clear. The coefficient of variation for annual maize yields varies from about 10 per cent in central Africa to almost 50 per cent in drier countries such as Botswana and Swaziland. A significant component of the variability is likely to be related to rainfall, although prices and market policies are influential. Table 2.15 above gives variation in crop production in Zambia for the period 1997-2001.

The role of precipitation in agricultural productivity was demonstrated dramatically in the Sahel and in eastern and southern Africa during the drought period 1970-1995 (Buckland, 1992). Water scarcity revealed widespread dependence on rain-fed agriculture and the lack of infrastructural development for supplemental irrigation and water resources. For example, Zimbabwe in 1991 and 1992 imported 800,000 tons of maize, 250,000 tons of wheat, and 200,000 tons of refined and semi-refined sugar to make up the shortfall associated with reduced agricultural production as a result of rainfall shortages (Makarau, 1992).

3.2.1 Food Security

A loss of agro-biodiversity presents risks to food production, in three ways:

- a) By the narrowing of future options, through the loss of genetic information and genetic material that could be introduced into domesticated crops and stock through breeding;
- b) An increased susceptibility to disease and pests because of fewer varieties and species that are grown over large areas, which may also result in pesticide and fertilizer dependence; and
- c) The destabilization of ecosystem processes, through soil formation predator-prey cycles, and so on.

Food security implies that an individual has access at all times to enough food for an active and healthy life. Food security has numerous interrelated dimensions. Availability of food and access to food are the two most common defining characteristics of food security. Availability and access to food are affected by population growth, demographic trends, economic development, government policies, income levels, health, nutrition, gender, environmental degradation, natural disasters, refugees, migration, disease, and concentrated resource ownership. Nations increasingly understand that one country alone or one group of countries alone cannot resolve many of these problems; the problems transcend national borders, spreading starvation, instability and environmental degradation throughout a region and around the world.

Throughout the 1970s, the food-security debate focused primarily on the collective ability of the world's nations to produce enough food to feed a rapidly

expanding population. Most studies during this period tended to define food as cereals. Record low levels of cereal stocks and high cereal prices in the early 1970s raised fears about the long-term prospects of the world food system. The 1974 World Food Conference convened to address the growing perception that the world was moving irrevocably toward food shortages and to suggest mechanisms to protect food supplies from major crop failures.

The solutions that emerged focused on enhancing production possibilities, establishing national level self-sufficiency targets, coordinating world food stocks and implementing import stabilization policies (UN, 1975; Maxwell, 1994). For the most part, developing countries tended to pursue food self-sufficiency goals through agricultural policies and programmes that would increase domestic food production to meet national level targets. Empirical evidence has demonstrated that while availability of food supplies is important, access to food by individuals is the greater constraint (Sen, 1981; Ravallion 1987; Ravallion, 1997). Access to food depends on an individual's access to resources, technology, markets, social networks and food-transfer programmes.

The opportunities to produce or obtain food by any of these means are described by Sen as entitlements. Sen provides the theoretical basis for entitlements to food by demonstrating its relevance in famine situations (Maxwell, 1994), pointing out that during the Ethiopian famine of 1972-1974, food output, supplies and consumption at the national level were normal, yet 50 to 200 thousand people starved to death. Most died because they could not afford to buy food. These findings drew attention to the need for policy-oriented growth strategies aimed at providing an economic environment conducive to broad-based development, poverty reduction and access to food.

3.2.2 Flood and Drought

Over 300, 000 people were adversely affected by the floods of 2000 in Mozambique, 699 deaths were also recorded. Infrastructure was destroyed, settlements cut off, and housing damaged. Prior to the floods and after five consecutive years of increasing production, Mozambique had achieved exportable surpluses of maize, estimated at 150, 000 tons in the marketing year 1999-2000. (FAO, 2000a). These gains were eroded in a flash by the floods. The impact of floods in SADC countries in year 2000 is discussed by FAO (2000a; 2000b). The Government requested \$US 2.7 million in financial assistance.

The direct cost of the damage in the public and private sectors amounted to about \$US 275 million. The total cost of the damage amounted to \$US 490 million. Extensive losses were reported of small animals, such as goats and chickens. Emergency food aid for flood-affected and food deficit communities, amounted to 60, 000 tons for 650, 000 people. In Botswana 25,000 people were affected

Table 2.16: Per Capita Food Supplies and Undernourished Population in Southern Africa

Calories Per Day % Change				
Angola	2147	1798	1900	-12
Botswana	2124	2320	2228	5
Lesotho	2248	2222	2236	-1
Malawi	2279	1977	2068	-9
Mauritius	2669	2838	2923	10
Mozambique	1922	1782	1782	-7
Namibia	2206	2214	2141	-3
South Africa	n.a	n.a	n.a	n.a
Swaziland	2467	2653	2479	1
Zambia	2180	2065	1958	-10
Zimbabwe	2230	2146	2095	-6
Undernourished population as a percentage of total population in Southern Africa % improvement				
Angola	29	50	43	-48
Botswana	28	19	25	11
Lesotho	26	31	28	-8
Malawi	26	45	37	-42
Mauritius	10	6	6	40
Mozambique	54	66	63	-17
Namibia	25	26	30	-20
South Africa	n.a	n.a	n.a	n.a
Swaziland	14	9	14	0
Zambia	30	39	45	-50
Zimbabwe	30	40	39	-30

Source: Stringer, 2000.

and 4,000 homes destroyed. The main roads and railways were cut off in several places. The damage costs were estimated to be \$US 8.5 million. In Swaziland, there was evidence of loss of life and extensive damage to roads, bridges, and housing, and shortages of drinking water was experienced.

In Lesotho, it was reported that cereal production was reduced. In South Africa, there were losses of life and damage to housing and infrastructure, while 100,000 people were left homeless. Crop losses amounted to over \$US 11 million. In Angola 6,000 people affected needed food aid. In Zimbabwe, roads, bridges, dams and power lines were swept away. An estimated 250,000 people were left homeless. The greatest challenge facing the southern African sub-region is its capacity to adapt to climate change.

3.2.3 Marine Pollution

The impact of oil spills on coastal and marine life can be very serious depending on the severity of pollution. The International Tankers Owners Pollution Federation points out that various factors determine the seriousness and cost of an oil spill, one of the factors being the type of oil spilled. Heavy crude and heavy fuel oils such as is used in ship bunkers tend to cause significantly more damage to the marine environment and are more costly to deal with on the basis of dollar per ton spilled than light refined products and some light crude oils. South Africa's

experience with the bulk carrier *Apollo Sea* found the response cost per ton of oil spilled at \$US 4,444. This is comparable with the United States experience of 26 spills between 1980 and 1986, when spills of heavy oils cost \$US 4, 127 per ton to clean up, compared with \$US 3, 237 for crude oil (Julian, 2000).

It is in this context that the issue of the increasing number of vessels should be viewed, particularly bulk carriers. These carry upwards of 10,000 tons of heavy oil as bunkers and pose a threat to the marine environment in Southern Africa.

3.2.4 Health Implications

There is increasing evidence that many emergent and resurgent diseases may be related to ecosystem instability (Epstein, 1995). In many cases, this resurgence may be related not to climatic change but to other human-induced changes in the environment (e.g., lyme disease, dengue, hantavirus) (Levins et al., 1994; Epstein, 1995). Other diseases with clear links to climate and climatic change include malaria (Loevinsohn, 1994) and cholera (Epstein, 1992, 1995; Epstein et al., 1993).

It is projected that climate-related mortality will increase in the large African cities (IPCC, 1996), from direct effects and from indirect impacts of climate change. These impacts will include potential increases in the incidence of vector-borne diseases such as malaria, yellow fever, dengue fever, onchocerciasis, and trypanosomiasis, arising from elevated temperatures and altered rainfall. High-elevation locations such as Nairobi or Harare could become vulnerable to malaria epidemics because the malaria parasite might be able to survive in the possibly warmer conditions (IPCC, 1996) at higher elevations.

Within Africa, 71.3 per cent of the burden of disease is attributed to infectious diseases; malaria is the single greatest contributor (10. per cent). All other vector-borne, helminthic, and environmentally related diseases that are affected by climate contribute about 2 per cent of the total burden of disease. With regard to environmentally related diseases in Africa, malaria contributes more than 80 per cent of the cause of lost disability adjusted life years (World Bank, 1993; WHO, 1996b). These estimates exclude diarrhea but include cholera.

Malaria contributes the highest percentage (about 80 per cent) of the climate-related disease burden in Africa. The physiological relationships among climate, vectors, and pathogens are only partially understood. Malaria provides a good example of how potential climate change may affect environmental and vector-borne diseases. Surveillance systems and epidemiological data on malaria exist in some of the areas most susceptible to climate change, allowing future monitoring to move from speculative to causal relationships. Rogers (1996) modeled the effect of projected future climate changes on the distribution of three important disease vectors—mosquitoes, tsetse flies, and ticks - in Southern Africa. The human diseases relating to these vectors

are malaria (mosquitoes) and human African trypanosomiasis (tsetse flies). Climatic change may alter not only the physiological constraints placed on the vector but also the ability of the parasite to survive within the vector (Molineaux, 1988).

Meteorological variables can create conditions conducive to disease spread or even to clusters of outbreaks (in the case of flooding or drought) (Epstein et al., 1993). A drop in water level in dams and rivers also would affect the quality of household and industrial fresh water because reduced water volume increases the concentration of sewage and other effluent in rivers - resulting in outbreaks of diseases such as diarrhea, dysentery, and cholera.

In 1992 and 1993, cholera affected almost every country in the SADC sub-region, claiming hundreds of lives. In many drought-affected areas in Botswana, South Africa, Zambia, and Zimbabwe, streams and rivers dried up. Villagers (mainly women) had to walk long distances - only to collect polluted water, which they shared with wild animals and livestock. SARDC (1994) noted that the sub-region had just come out of drought when a major cholera outbreak occurred in several countries in Southern Africa in the mid-1980s. Reduced water flow during these droughts reduced the capacity of rivers, streams, and swamps to dilute agrochemicals and process fertilizers in fields, adversely affecting soil ecosystems. These drought-related problems are likely to increase under projected climate change. Vulnerabilities and control measures should help to mitigate the impact.

Nutritional status also is likely to be severely affected by droughts and associated crop failures, as in Southern Africa during the droughts of the 1980s to early 1990s. This factor will further reduce the natural persistence of African communities and increase exposure to disease. One of the deficient micronutrients in malnourished Africans is iron. Women and children are disproportionately affected by anemia, and pregnant women are especially at risk. In addition, one of the major causes of death in acute and complicated malaria is anemia. Thus, the potential exists for exacerbated morbidity and mortality in areas where climate change may decrease nutritional status and increase malaria transmission.

3.2.5 Illegal Activities

Illegal activities that contribute to environmental degradation are quite costly to the economies of Southern African countries. Illegal logging, trade in precious minerals, toxic waste dumping and illegal fishing constitute an industry in South Africa worth around \$US 31 billion (R310 billion) annually. Trade in endangered species amounts to between \$US 6 billion (R60 billion) and \$US 10 billion (R100 billion) annually, while illegal fishing was worth around \$US 5 billion (R50 billion). Illegal logging ranged from \$US 500 million (R5 billion) to \$US 1 billion (R10 billion), illegal trading in precious metals amounted to almost \$US 2 billion (R20 billion) and toxic waste dumping cost between \$US 1 billion and \$US 2 billion per year (Business Day, 2002a).

4. CLIMATE CHANGE

4.1 Global Context

African economies depend on natural resources, and the impact of changing natural resources affects several sectors. Perhaps more so than in many regions, the cross-sectoral impact of climate change needs to be understood. Agriculture depends on water resources, a healthy labour supply, and demand for its products. In turn, rural health, incomes, and development depend on viable agricultural economies.

One example of the potential interactions is the role of drought. A small change in drought risk need not affect agriculture to a great extent, as long as food supplies and household income can be saved over several years. However, an increase in drought risk could affect regional water supplies, leading to rationing of water and energy and reduced irrigation. Increasing aridity and prolonged spells of severe drought could accelerate abandonment of the rural economy and migration to urban centres.

Most livestock in Africa are herded in nomadic areas, although significant numbers are kept in paddocks on farms. Domestic animals, especially cattle are also affected by climate change. In the cold highlands of Lesotho, for example, animals would benefit from warmer winters but could be negatively affected by a lowering of the already low nutritional quality of grazing. Heat stress also is a concern in warmer areas.

The direct impact of changes in the frequency, quantity, and intensity of precipitation and water availability on domestic animals is uncertain. However, increased droughts can seriously impact the availability of food and water - as in Southern Africa during the droughts of the 1980s and 1990s (IPCC, 1996). Drought conditions have also resulted in the deaths of many animals in the sub-region.

Agricultural pests, diseases, and weeds are also be affected by climate change. Little quantitative research on these topics has been undertaken in Africa, however. Perhaps the most significant shifts could occur in tsetse fly distributions and human-disease vectors (such as mosquito-borne malaria). Tsetse fly infestation often limits where livestock can be kept and impedes expansion of extensive

agriculture (Hulme, 1996a). In addition, declining human health affects labour productivity in agriculture.

Ultimately, climate change is a global issue - even more so for traded commodities such as agricultural products. Some regions, for example, may be less competitive in national and global agricultural markets, with corresponding impacts on exports and imports. Africa, in particular, may be sensitive to changes in world prices and stocks because many countries rely on food imports. Several world-trade models have been tested with climate-change scenarios, with differing assumptions regarding economic growth, population growth, trade liberalization, and technological innovation (Fischer et al., 1994, 1996; Rosenzweig and Parry, 1994). Because they are global simulations, they can illustrate some of the dynamic adjustments in world prices and regional imports and exports that may result from climate change.

However, Africa is not well represented in such assessments. Scenarios tend to be trend projections that discount the potential for dramatic improvements in agricultural welfare. Moreover, the lack of uniform and accessible data on crop-climate sensitivity in Africa leads to large uncertainties in the predicted impact on Africa. A critical question is the extent to which climate change, at the global level, alters African exports (reflecting changes in comparative advantage) and food imports (reflecting the world price of cereals).

4.2 Forestry and Climate Change

Plantations may be most vulnerable to climate change through increased stress resulting from drought, which makes conditions ideal for new or old pests and diseases. In a matter of a few years, an important species can be wiped out before control measures are developed or new species found to replace it. No data exist on how plantation species in Africa may respond to increases in carbon dioxide concentrations. It would seem likely that improved WUE associated with carbon dioxide fertilization effect could boost productivity.

4.3 Fisheries Resources and Climate Change

The vulnerability of fisheries to climate change depends on the nature of the climate change, the nature of the fishery, and its species and habitats. Changes in climatic conditions such as air temperature and precipitation affect fisheries by altering habitat availability or quality. Specifically, fisheries habitats may be affected by changes in water temperature; the timing and duration of extreme temperature conditions; the magnitude and pattern of annual stream flows; surface-water elevations; and the shorelines of lakes, reservoirs, and near-shore marine environments (Carpenter et al., 1992).

Mean annual air temperature is the most important factor in predicting lake-fish production across latitudes. Alterations in seasonal climate patterns should change the population distributions in larger lakes. Large lake-fish production could increase by about 6 per cent with a 1°C rise in average annual air temperature (Meisner et al., 1987; IPCC 1996, WG II, Section 16.2.1). Warm-water lakes generally have higher productivity than cold-water lakes, and existing warm-water lakes are in areas with the least change in temperature. It is reasonable to expect higher overall productivity from freshwater systems.

Although changing rainfall patterns and flood regimes may have profound effects on freshwater fish, marine fisheries are likely to be affected more by elevated temperatures (Hernes et al., 1995). The impact of elevated temperatures could include a shift in the centre of production. It could also affect the composition of fish species as ecosystems move geographically and change internally. This is in contrast to freshwater fish species, particularly in small, shallow rivers and lakes, which will have limited possibilities for adapting to the changes through migration. Economic values can be expected to fall until long-term stability is re-established. Rapid changes resulting from physical forcing favour smaller, low-priced, opportunistic species that discharge large numbers of eggs over long periods.

Where ecosystems shift position, national fisheries will suffer if institutional mechanisms are not in place to enable fishermen to move within and across present exclusive economic zone boundaries. Subsistence and other small-scale fishermen (who dominate in Africa) will probably suffer disproportionately from such changes (Everett, 1994). A reduction in fish stocks will have the greatest effect on countries such as Namibia that are heavily dependent on fisheries and cannot diversify easily into other activities.

4.4 Coastal Zones and Climate Change

Climate change will exacerbate existing physical, ecological/biological, and socio-economic stresses on the African coastal zone. Most existing studies focus on the extent to which rising sea levels could inundate and erode low-lying areas or increase flooding caused by storm surges and intense rainstorms. The coastal nations of west and central Africa (e.g., Senegal, The Gambia, Sierra Leone, Nigeria, Cameroon, Gabon, Angola) have low-lying lagoonal coasts that are susceptible to erosion and would be threatened by sea-level rise.

Most of the countries in this area have major and rapidly expanding cities located on the coast (IPCC, 1996). Africa's west coast is often buffeted by storm surges and is currently at risk from erosion, inundation, and extreme storm events. Inundation can be a significant concern and major cities situated at sea level would be very vulnerable. Moreover, tidal waves, storm surges, and hazards may also increase and possibly modify littoral transport (Allersman and Tilsman, 1993).

Sea level rise as a result of global climate change would cause inundation of the extensive mangroves of Mozambique and Tanzania and these would retreat, thus increasing rates of erosion on the shoreline. The coastal lagoons of Angola would also be inundated. Sea level rise is also a major threat to low-lying coastal urban centres and ports, such as Cape Town, Maputo, and Dar-es-Salaam. Its impact could result in loss of income from coastal industries and port activities throughout the sub-region, and loss of opportunities for development of tourism (IPCC 1998).

In Tanzania, a sea level rise of 0.5 m would inundate over 2 000 km² of land, costing around \$US 51 million and a rise of 1.0 m would inundate 2 100 km² of land and erode a further 9 km², resulting in costs of more than \$US 81 million (IPCC 1998). The coral reefs off the coasts of Mozambique, South Africa and Tanzania are under threat of bleaching due to sea temperature rise resulting from El Niño events and global climate change. In 1998, the El Niño induced sea temperature rise of around 1°C causing the death of up to 90 per cent of the corals in the sub-region (Obura et al., 2000).

5. TRENDS IN ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT

5.1 The General Framework

It is widely recognized that the conservation of biological diversity is important to the drive towards sustainable development and that saving biodiversity must go hand in hand with meeting humanity's social and economic needs. In Southern Africa, as in many parts of the continent, the regulation and protection of the environment span many government ministries and departments. They have traditionally come under the jurisdiction of the departments of environment and tourism, department of energy and environment, ministry (or department) of agriculture and rural development, and of forestry, fisheries and water affairs.

In 1994, the African Ministerial Conference on Environment (AMCEN) adopted "The African Common Perspectives and Position on the Convention on Biological Diversity (CBD)", which outlined Africa's approach to implementation. Within the past decade, a number of African countries have undertaken various activities within the framework of CBD implementation, including development of biodiversity strategies and action plans and passage of biodiversity legislation. Countries have also carried out biodiversity assessment, research and monitoring, development of economic tools and policy instruments for management of biodiversity, capacity building involving human and institutional strengthening, and public-awareness campaigns.

In the SADC sub-region, the SADC Protocol on Transport, Communications and Meteorology was signed by the Heads of State and Government in August 1996. It was ratified by the required two thirds of member States and has since entered-into-force. The protocol sets out the sub-region's objectives in regard to transport, communications and meteorology, and the policies essential for attaining those objectives. It explicitly recognizes the need for private sector involvement, for restructuring state enterprises and for co-operation between state and private sectors. It commits member States to establish transport, communications and meteorology systems which provide efficient, cost-effective and fully integrated infrastructure and operations, which best meet the needs of customers

and promote economic and social development while being environmentally and economically sustainable.

Member States should also adopt and implement road-traffic measures that enhance their capacity to assess and their capability to control the impact of road transport on the environment, including:

- Common standards to enhance vehicle pollution control;
- Measures relating to the transboundary movements of hazardous substances; and
- Development and implementation of management systems for environmental incidents impacting on road transport contemplated in Article 6.14 of this protocol.

At the individual country level, many Governments including those of Angola, Lesotho, Mozambique and Namibia, are signatories to a number of international agreements such as the Law of the Sea and other international agreements on biodiversity, climate change, desertification, marine dumping, endangered species, and hazardous wastes, among others.

5.2 Land Reform

The demand for agricultural land is increasing rapidly. The use of marginal or unsuitable land for farming is increasing, while intense pressure on some existing farmland often leaves it completely exhausted. In addition, large areas of forest are being cleared. Cultivation of very steep or very dry land is becoming common. The demand for land for cultivation is not only due to population pressure but also to land distribution. Large expanses of land farmed commercially, reduce the amount available to small-scale, subsistence farmers. In Southern Africa, the problem of land redistribution is compounded by inequitable distribution of high productive farmland. In some countries, a policy of land tenure reform is being introduced as part of the environmental management strategy.

In Botswana, land tenure reform shifted from the control of traditional authorities to land boards that have specified responsibilities under both customary and common law. This has eased the problem of access to land in the country. The new structures also underpin the practice of community-based natural resource management.

In other countries, programmes of redistribution of land in a more equitable way are also being planned or implemented where this problem exists. In addition to traditional forms of land tenure, appropriate government policy can enhance protection of the environment, as shown by the Zimbabwean effort to protect temperate forests. As a result, increased population in the villages was depleting

the forests through land clearing, firewood gathering, building of huts and shelters and woodcarving.

Recognizing the problem, the Government intervened and protected these threatened forests by law and educated the villagers on the importance of preserving these forests. They were also encouraged to plant trees for woodlots so as to cater for their energy needs. It turns out that the protected temperate forests, together with the cooler climate in this part of the country, have become one of the tourist attractions and have generated substantial economic benefits to the country (Low and Salleh, nd.).

5.3 Wildlife Conservation and Management

Environmental management strategies in colonial and post-colonial Southern Africa did not involve direct users in sustainable management decision-making processes. Environmental resources, such as forests, were managed according to protectionist and exclusionary principles, which denied local communities the rights and means of benefiting from such resources. These measures have included:

- a) Strict legal protection of wildlife species;
- b) Establishment of protected areas in several of the key wetlands used by the species, especially in Zambia, Namibia, and Botswana;
- c) Identification and communication of appropriate habitat conservation practices for farmers and other private landholders;
- d) Marking and relocation of utility lines;
- e) Expanded counts and surveys (especially since the early 1980s); and
- f) Expanded research, especially in South Africa, Zambia, and Namibia.

Priority conservation measures for many wildlife species include:

- a) Transfer of the species to CITES;
- b) Enforcement of existing legislation protecting them;
- c) Strengthening of key protected areas;
- d) Surveys to identify additional areas of critical habitat for designation as protected areas; and
- e) Assessment of large-scale habitat threats and development of a coordinated programme for protection of such species.

The quota-based system for managing marine resources in South Africa indicates that the fishing quota for Hake, SC Rock Lobster and Abalone are decreasing while those for Pilchard and Anchovy are increasing.

Table 2.17 highlights the activities of wildlife management in Zambia, from 1996-1999. These activities are similar to those found elsewhere in Southern Africa where national parks and wildlife protection units have been established in many countries. These agencies have concentrated on arresting violators/poachers and confiscating poaching equipment and products.

Table 2.17: Anti-Poaching Seizures and Arrests in Zambia 1996-1999

Seizures/Arrests	1996	1997	1998	1999
Arrests	1213	1184	865	714
Short guns		70	63	41
Assorted rifles	261	299	156	100
Muzzle loading guns	1720	297	164	249
Assorted animal skins	30	----	21	5
Elephant tusks/ivory	85	253	34	29
Poaching equipment	---	---	121	442
Others	---	---	303	6

Source: GRZ, 2000.

Table 2.18 illustrates the seriousness attached to enforcement of environmental laws in Zambia. Fifty Zambian companies were fined in the area of waste management, air pollution control, pesticides and toxic substances in 2001. Many other countries are carrying out similar exercises.

Table 2.18: Environmental Licences Issued/Penalties Zambia, 2001

Area	Licenses	Penalty
Environmental Impact Assessment	43	----
Air pollution control	66	1
Water pollution control	90	---
Pesticides and toxic substances	110	1
Waste management	112	48
Total	436	50

Source: MFNP, 2002.

Realizing the important weaknesses of the previous policy of environmental management, the main thrust of the new environmental management strategy in Southern Africa is largely one of integrating ecocentric management strategies into the development process. The main ingredients are summarized in the following table along with a comparison with the traditional management approach adopted in the past. One of the priorities of integrated environmental management is to establish a framework of co-operation between the public sector, the private sector and the public so that sustainable development can take place. A well-planned, integrated environmental management system should adhere to the aims outlined in table 2.19 (Hugo, 1997:201).

Community-based natural resource management (CBNRM) programmes and projects across Southern Africa are increasingly advocating development of partnerships between communities and other stakeholders. This form of management is broadly termed co-management. It involves the sharing of authority, power and responsibility among local groups and other stakeholders, such as government departments, private sector companies and NGOs. Evidence of co-management emerges when one examines the stalwarts of CBNRM in Southern Africa, the wildlife and habitat conservation programmes promoted in Botswana (NRMP), Zambia (ADMADE), Zimbabwe (CAMPFIRE) and Namibia (LIFE).

These initiatives have all been characterized by partnerships between communities, government, NGOs and private sector companies, such as government conservation agencies and tourism and safari hunting operators. The Awash National Park in Ethiopia survived during an extended period of political and civil instability due to the participation of local communities in the Park's management (Jacob and Schloeder, 2001). Some specific examples of these public-private partnerships in environmental resource management are discussed below.

Table 2.19: A Comparison of the Traditional Management Approach to the Ecocentric Management Approach

Traditional Management versus Ecocentric Management	
Traditional management	Ecocentric management
Goals:	
<ul style="list-style-type: none"> • Economic growth and profits; • Shareholder wealth 	<ul style="list-style-type: none"> • Sustainability and quality of life; • Stakeholder welfare
Values:	
<ul style="list-style-type: none"> • Anthropocentric; • Rationality and packaged knowledge; • Patriarchal values 	<ul style="list-style-type: none"> • Biocentric or Ecocentric • Intuition and • Understanding; • Post-patriarchal feminist • Values
Products:	
<ul style="list-style-type: none"> • Wasteful packaging • Designed for function, style and price 	<ul style="list-style-type: none"> • Designed for the Environment; • Environmentally friendly
Production system:	
<ul style="list-style-type: none"> • Energy and resource intensive • Technical efficiency 	<ul style="list-style-type: none"> • Low energy and resource use; • Environmental efficiency

Organization:	
<ul style="list-style-type: none"> • Hierarchical structure; • Top-down decision-making; • Centralized authority; • High-income differentials 	<ul style="list-style-type: none"> • Non-hierarchical Structure; • Participative decision-making; • Decentralized authority; • Low-income differentials
Environment:	
<ul style="list-style-type: none"> • Domination over nature; • Environment managed as a resource; • Pollution and waste are externalities 	<ul style="list-style-type: none"> • Harmony with nature; • Resources regarded as strictly finite; • Pollution and waste; • Elimination management
Business functions:	
<ul style="list-style-type: none"> • Marketing aims at increasing consumption; • Finance aims at short-term profit maximization; • Accounting focuses on conventional costs; • Human resource Management aims at increasing labour productivity 	<ul style="list-style-type: none"> • Marketing for consumer education; • Finance aims at long-term sustainable growth; • Accounting focuses on environmental costs; • Human resource management aims to make work meaningful and safe

Source: van Rooyen, 2002

5.4 Community Benefit Sharing

Pilanesberg National Park in the former Bophuthatswana was one of the first efforts in South Africa to integrate community development with wildlife management. In an attempt to compensate local people for the loss of residence, grazing land and access to wild resources caused by the fencing of a large area of the National Park and to encourage them to support wildlife conservation, a range of benefit-sharing arrangements were put in place by the Park authorities through the formation of a community development organization.

This organization undertook activities aimed at the development of local enterprises such as vegetable growing and clothing manufacture, the establishment of a community games reserve, local employment and the use of local contractors and infrastructure development. Surveys carried out before and after these arrangements showed that there was a shift from the previously hostile reaction to the Park, to a situation in which there was about 90 per cent local community support for the Park and a willingness to work in the Park even on a voluntary basis (Davis, 1993).

5.4.1 Lake Malombe and the Upper Shire River Fisheries Co-management Programme, Malawi

Inland fisheries are an important economic activity for many rural dwellers in Malawi, where fish is the most important source of animal protein for the majority of the people. Artisanal fisheries are also much more important than commercial fisheries in the lakes of Malawi. International studies on artisanal fishery that

were conducted at the beginning of the 1990s found that fish stocks of the most economically important species, locally known as *chambo*, had collapsed. One of the key recommendations arising from these studies was adoption of participatory fisheries management accompanied by much greater involvement of the artisanal fisheries sector in management.

The Participatory Fisheries Management Programme (PFMP), a multi-donor funded project, was initiated in 1993. Lake Malombe and the Upper Shire River (Mangochi District) were selected as the pilot areas for testing the PFMP that would involve local level institutions in the management of the fishery. Local-level institutions, known as Beach Village Committees (BVCs), were formed and incorporated a range of actors such as village heads, gear owners, crew members and local villagers. The main task of the BVC was to open channels of communication between the fishers and the Fisheries Department.

The ultimate aim of PFMP was to work towards self-regulation of the fishery. The BVCs are involved in disseminating information about fishing regulations (mesh size, closed seasons and closed areas) to fishers. They also provide community inputs into the annual management meetings where fishing regulations are developed. In some instances, the role of BVCs has extended to enforcement of fisheries regulations. The BVCs are not legal entities and have, according to the law, no rights to confiscate illegal nets. This is one of the key problems that hamper the process of co-management in the area.

The primary motivation for entering into the arrangement was for the Fisheries Department to conserve fish stocks by involving fishing communities in management. For the fishing community, the motivation was to restore and strengthen the fisheries resource, which forms the basis of most livelihoods in Mangochi District (Mohamed, 2000).

5.4.2 The Richtersveld Contractual National Park, South Africa

The local communities of the Richtersveld, an area rich in mineral and plant resources, entered into a contractual agreement with the then National Parks Board in July 1991. This agreement was a milestone for implementation of new conservation policies and practices in South Africa. This biologically rich area, situated in the northwestern corner of South Africa, had long been earmarked as a potential conservation area. The mountain desert environment, with its associated natural endowments, is said to have the most biologically diverse representation of this particular biome. With substantial support from the wider conservation community, the National Parks Board (NPB), now known as the South African National Parks (SANP), entered into negotiations to establish a

contractual national park in the Richtersveld. In August 1991, the 162,445 hectares Richtersveld National Park (RNP) was proclaimed.

Livestock farming forms an important source of livelihood but the mountainous terrain and mining concessions in the mineral-rich area reduce the amount of land available for grazing. Communal use of the grazing lands is widespread in the Richtersveld. Vehement opposition from the Richtersveld communities to the establishment of the RNP in 1989 led to a court interdict on the eve of the signing of the agreement between the NPB and the local authority. The communities were dissatisfied with the compensatory mechanisms and with many other conditions as set out in the agreement with the local authority. After lengthy negotiations, an agreement was finally reached in 1991. This agreement addressed community concerns and culminated in the signing of a contract between the NPB and the community of the Richtersveld. The contract agreement specified a number of conditions for the management of the park, such as establishment of a joint management committee, improvement of infrastructure in the area and the payment of lease fees to a community trust.

According to the contractual agreement, a Management Plan Committee (known by its Afrikaans acronym, BPK) was set up to guide management of the Park. The Park also accommodated the seemingly competitive land uses of conservation, grazing and mining within its borders. Agreements were reached that existing mining operations could continue and that local stock farmers would be accommodated within the Park. There is also an increase in community-based tourism initiatives that can be traced to the existence of a national park in the area. Though the park has brought important benefits to the Richtersveld, critical questions have emerged as to whether the park is truly a co-management arrangement.

5.4.3 Water Resource Governance: The Lesotho Highlands Water Project

As people realize that water is a finite resource, the move for co-operative management is growing worldwide. Southern African countries are beginning to establish management agreements and structures for shared water-bodies, the most notable being the SADC Zambezi River Action Plan (ZACPLAN), which involves eight countries, and focuses on ways to guarantee the quantity and quality of water crossing borders. A number of other joint programmes exist, such as the Permanent Okavango River Basin Commission (OKAKOM) between Angola, Namibia and Botswana, and various Permanent Joint Technical Committees (PJTCs) between two or more countries. At a 1993 SADC/IUCN conference in Botswana, delegates recommended that ZACPLAN be broadened to take in all river basins in the SADC sub-region. The revised ZACPLAN is now the SADC Protocol on Shared Watercourse Systems.

Water is the only natural resource in relative abundance in Lesotho. South Africa showed long-standing interest in utilizing water from the Lesotho Highlands to meet its growing industrial demand. A \$US 5 billion joint venture between Lesotho and South Africa has been proposed, to build a network of dams and channels in the remote mountains of Lesotho to funnel rainwater to the industrial heartlands of South Africa. The dams will trap water that normally runs into the Orange River and out west into the Atlantic Ocean, and turn it north towards Johannesburg.

The prime objective is to turn Lesotho's only abundant natural resource -water- into export revenues. In addition, on the way down, it will generate enough hydroelectricity to supply all Lesotho's power needs and reduce its dependency. However, the project is likely to cause environmental damage in terms of population dislocation, grazing land flooding, and degradation of the site by workers and tourists.

On October 24, 1986, an agreement between South Africa and Lesotho to proceed with the implementation of the Lesotho Highlands Water Project (LHWP) was signed. The "Treaty on the LHWP between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa" covers the rights and obligations of each party and lays down the quantities of water to be delivered, the cost-sharing provisions and the scope and calculation of payments for the water. The Treaty provides that South Africa will be responsible for all the costs of the LHWP related to the delivery of water, covering the cost of implementing, operating and maintaining the scheme. In addition, the country would provide loan guarantees if required by the lenders. Thus, Lesotho has virtually no financial obligation for the water-transfer component of the project. The Treaty also states that South Africa will pay Lesotho the equivalent of \$US 60 million (at 1983 prices) a year in water royalties. The royalty would be a net benefit to Lesotho as the cost of exporting the water will be paid in full by South Africa.

5.4.4 Public Private Partnership in the Provision of Water and Sanitation in Queenstown, South Africa

In 1989, the old Queenstown Municipal Council began to experience financial problems, which affected its ability to deliver municipal services adequately. The Municipality entered into a concession contractual agreement in 1992 with Water Services South Africa (WSSA) in the operation, maintenance and management of water and sanitation systems over a period of 15 (later extended to 25) years (DBSA, 2000). At the time of signing, South Africa's legislation prohibited private sector management of water billing and collection though it was foreseen that customer management responsibility might be taken over by the contractor

in the future (Palmer Development Group, 2000). In order to lease Municipal property, the Municipality published a notice of intention to engage the service of a private company in the provision of water and sanitation for public comment. As there was very little opposition to the intention of the Municipality, the Council went ahead with the contract in 1992.

5.4.5 The Dolphin Coast Concession in South Africa

The Dolphin Coast's drive for private involvement in the delivery of public services predates the 1994 democratic elections. It was decided in November 1996 to seek private sector involvement in the delivery of water and sanitation services with a view to bringing in management efficiency and source for capital. In April 1997, 15 companies and consortia submitted technical and financial bids for implementing the water and sanitation concession contract and only 4 were adjudged for short-listing on the basis of a number of criteria used by the Adjudication Committee.

In 1998, the preferred bidder was chosen. SAUR International won the R1 billion service concession contract to manage the Dolphin Coast's water and sanitation systems over a period of 30 years. The company is expected to meet prescribed levels of service based on affordability and to take full responsibility for commercial risk by maintaining and developing infrastructure, providing services, billing consumers and assuming responsibility for tariff collection.

5.5 Ecosystem and Coastal Zone Management

The application of principles of the Ecosystem Approach, as defined and adopted by the Conference of Parties to the Convention on Biological Diversity (CBD), offers a planning and implementation framework for integrated water resources management that could lead to improved livelihoods for the poor. Most African States are party to the CBD and implementing the ecosystem approach is a part of their obligations under this Treaty.

Ecosystem management is of critical importance in both defining the limits of exploitable water resources and in understanding the vulnerabilities poor people face. As part of this, the variability of water flows through ecosystems and the minimum flows needed to maintain the integrity of these ecosystems are critical issues for water management. Environmental flows are necessary for sustainability of ecosystems, availability of water resources and sustenance of the natural resource base of livelihoods. Environmental flows that contribute directly to the livelihoods of the poor should be given legal status in all countries.

Some Southern African countries have already begun to implement meso-scale interventions in the area of coastal zone management. Mozambique, Namibia and South Africa have launched integrated Coastal Zone Management (CZM) initiatives. Of the Southern African coastal countries, only Angola has yet to do the same (Parnell, 2000). Namibia's CZM gives special attention to the integration of management structures and procedures with an emphasis on developing appropriate management instruments, information needs, capacity building and the coordination of sectors involved with coastal resource management.

The developmental impacts will accrue through improved efficiency and better coordination. In Mozambique, the CZM was designed to link directly to other national development strategies. Interventions are based on sector-specific coastal actions that are designed to meet general development objectives and protect the coast. In South Africa, CZM is more committed to the interface between environment and poverty. It adopts an area-based strategy for implementation. A deliberate attempt is made in the White Paper to give economic value to coastal resources and ensure equitable access and distribution so that benefits reach all South Africans (Parnell, 2000).

5.6 New Approaches to Water Resource Management

One of the main problems in water-supply provision in cities in Africa is the inability of municipal governments and public utilities to deliver and maintain basic infrastructure services for their growing populations. The traditional supply orientation of government places emphasis on physical facilities and public-sector provision instead of focusing on services and on effective approaches to complementary partnerships. The consequences are most severely felt in low-income urban areas that often remain outside the reach of basic public and civic services.

In order to improve the performance of municipal governments and public utilities, public-private partnerships in the provision and management of water and sanitation services are being increasingly promoted. Such partnerships introduce competition and a commercial orientation and increase the efficiency of service delivery and investment in the sector.

The experiences of public - private partnerships in Africa and elsewhere are varied, but some of the pertinent ones in Southern Africa are discussed here. Such private-sector participation in water supply and sanitation services brings in new investment capital, management and organizational skill and technical know-how, which may be factors in short supply in the public sector. However, criticisms are often leveled against private utilities for what is perceived as a bias

towards meeting the demands of upper- and middle-income groups and non-responsiveness to the need for equality of access to all segments of society.

Assessment at the policy and implementation level in Botswana, Mozambique, Namibia, South Africa and Zimbabwe revealed that only South African and Namibian policies have catered for water demand management (WDM). WDM was not yet an intrinsic part of water resource planning at the national and regional levels (IUCN, 2000).

The coverage of safe and adequate water supply in rural Zambia is 45 per cent and the major source of water is from groundwater. According to Kampata et al., it is largely recognized by rural people that water is expensive and existing resources need to be efficiently used, since it is beyond the means of the local community to increase supply easily. Community-based management of local water resources is common practice and is taken very seriously. In most cases, the community rules and regulations for managing water are close to the WDM measures in use. These include:

- Limiting the daily household amount of water drawn;
- Ensuring spillage is channeled to livestock watering or vegetable gardens;
- Utilizing different sources of water for specific purposes, based on the different water qualities of each source; and
- Scheduling water withdrawal times (Kampala et al, in preparation).

The abovementioned rules are also common in local water management schemes in rural Botswana (Kgathi, Segosebe and Arntzen, unpubl.) and the rural areas of Northern Namibia (Regional Awareness Project, cited by Kampata et al., in preparation). Water re-use and rainwater harvesting are also included in rural water management practices in Namibia. In Botswana, it was noted that District Councils tended to adopt “WDM measures” only during times of water shortage (Kgathi et al., unpubl.). Measures taken are not necessarily part of a comprehensive, systematic WDM strategy.

Provision and management of water supply and sanitation services in peri-urban areas in Zambia is done by the Resident Development Committees, who are usually supported by NGOs, water vendors (as agents for a Commercial Utility) or by a community based organization. Where there is no organized service, individual households access water from shallow wells (often of poor quality). Metering at main pumps has been installed in some peri-urban areas in Zambia, such as Chipata Compound near Lusaka. Formal community water schemes are also developed whereby a flat monthly fee is paid to the community scheme for monitoring (by tap attendants who control access to those who have paid and are part of the scheme), operation and maintenance (Kampata et al., in preparation).

5.6.1 Southern Bottlers: Blantyre, Malawi

Southern Bottlers Limited in Blantyre, Malawi, provides an interesting example of WDM applied in the industrial sector. The company manufactures soft drinks and distributes beers. Peak water use is 12, 000 cubic metres per month and water use is for actual manufacture, cleaning of bottles, and for washing and maintaining the company vehicles and gardens. WDM measures applied include leakage detection and control, awareness campaigns and incentive schemes for employees to limit their water use. Southern Bottlers also established a recycling plant that treats water and recovers it for various processes. The WDM measures save the company Malawian Kwacha 100,000 (approximately \$US 1500) per month.

While the benefits of implementing WDM measures are obvious for Southern Bottlers, an end user, it is unclear how the reduced demand impacts on the Blantyre Water Board, the supplier, and further up the water management chain. If demand declines, does this mean that Blantyre Water Board can actually serve more customers, without having to access more water? What does this “successful local WDM case” mean for the Blantyre area, and for Malawi and beyond? These are important directions for future research.

5.7 Economic Instruments for Environmental Management

The importance of economic instruments for environmental policy is emphasized in both the Rio Declaration and in Agenda 21, where it was stressed that the use of economic instruments represents a tool for national authorities for promoting internalization of environmental costs and applying the polluter-pays principle in the most efficient manner. They are a means of enhancing the capacity of governments to deal with environmental and development issues in a cost-effective manner, promoting technological innovation, influencing consumption and production patterns, and providing an important source of funding (Panayotou, 1995).

Private resource exploitation that leads to biodiversity loss could be attributable to low private costs in the process of deriving substantial private benefits. The private costs are low because individuals do not pay the spillover costs imposed on others or the depletion costs in terms of foregone future benefits. Some individuals also receive direct or indirect government subsidy for engaging in resource-depleting activities. Spillover costs can be addressed by the use of fiscal measures such as taxes.

Fiscal instruments could include pro-conservation subsidies that internalize positive externalities, such as the level of biodiversity provided through conservation or reforestation efforts that benefit the rest of the society. Individuals would not

provide this benefit if their conservation efforts are not rewarded. Such subsidies could be funded from tax revenues generated from unsustainable activities. They could also take the form of tax exemptions and tax credits.

The National Waste Management Strategy is handling the cost-recovery mechanisms for environmental degradation activities in South Africa. Other issues being considered in determining environmental charges include the elasticity of demand and the supply of environmentally damaging products or services, since these influence the effectiveness of all control instruments, including economic instruments.

Another economic instrument is based on the incentive approach, through which investment, in cleaner production technologies, for example, is promoted. This type of instrument is being handled in collaboration with the Department of Trade and Industry in South Africa and may include:

- a) Investment credits;
- b) Accelerated depreciation;
- c) Product/service subsidies; and
- d) Basic needs subsidies (already in place in the form of a lifeline tariff for water services).

A number of governments have introduced levies against pollutants with a view to ensuring that environmental costs are borne by the pollutants. In its 2001 fiscal year, the Zimbabwean Government introduced a carbon tax on all vehicles. The levy depends on the engine capacity of the vehicle, ranging from ZWD 1,200 (about \$US 22) per year for vehicles with engine capacities less than 1.5 litres, ZWD 2,400 (almost \$US 44) for vehicles with 1.5 - 3.0-litre capacity, to ZWD 4,800 (\$US 87) for vehicles with engine capacities above 3 litres. The levy is collected by insurance companies along with Third Party premiums, for onward transmission to the Treasury.

Zambia has reduced or abolished import duties on pollution-control equipment and environmentally sound technologies. Mauritius provides manufacturing enterprises with duty exemptions, tax credits and other incentives for importation of pollution-control equipment and environment-protection facilities to assist economic, industrial and technological development (UNEP, nd).

The National Water Act of South Africa makes provisions for the payment of pollution levies and catchment levies. These funds are specifically intended to promote protection of the water resource and can be tapped to support both the capital and operational costs of providing a higher level of service. However, it is important that these funds are used only to cover the *incremental* costs associated with providing the higher level of services required to protect the water environ-

ment. This is important when considering the financial sustainability of higher levels of services to poorer communities. The Catchment Management Agency, or the Department of Water Affairs and Forestry (DWAF) can administer these funds.

The Department of Finance requires that these levies collected by central government should revert back to the central fiscus. This means that special arrangements have had to be made to make these monies available for pollution management. Some water boards have funded service provision in their areas of jurisdiction, particularly where they perceive that the services improve the quality of the water they supply. These agencies could be approached in this regard.

Under the South African Minerals Act, all operating mines must have an Environmental Management Plan (EMP) approved by the Department of Minerals and Energy. In order to assist companies to comply with this law, an Environmental Management Programme Report has been prepared, covering a description of pre-mining environment, motivation for and description of the project and an indication of how the environmental impact of the project will be managed. There should also be provision for financial guarantees for environmental rehabilitation and arrangements for project monitoring and auditing.

5.8 Trends in Infrastructure Management

Africa's urban problems are unlikely to be solved by interventions designed to simply contain the pace of ruralurban migration. What is required of Africa's urban managers is to identify the positive aspects of the urbanization phenomenon, including the great potential in human resources that urbanization holds, and formulate appropriate strategies to exploit the opportunities presented for development. Participatory community programmes constitute one such strategy. Examples abound of successful community initiatives that managers can use.

Most countries in Southern Africa initiated some innovative methods of infrastructure management. Examples of such innovations in the sub-region are discussed below:

5.8.1 Luanda-Sul Self-financed Urban Infrastructure Programme, Angola

Luanda Sul is an innovative practice, based on a self-sustaining urban infrastructure programme aimed at valorizing public assets through careful land-use management and planning. In close partnership with Government agencies, the

private sector and community-based organizations, the population living in temporary settlements and the people displaced by the war are being resettled.

The Government issued guarantees for private investments and provided the basis for self-financing of the programme, which operates from an Achievement and Management Fund mobilized through:

- a) The sale of concessions (or land tenure rights) derived from the allocation of public land for private development;
- b) Taxes and tariffs on the exchange of goods and services; and
- c) Investments made by the private sector.

The programme has so far:

- Resettled 2,700 families displaced by the war;
- Managed to service 8 million square metres with 121 km of power lines, 70 km of piped water and 3 sewerage treatment plants;
- Generated and invested \$US 96m, mostly in social services; and
- Created 4,000 jobs.

Other achievements include secure land tenure to settlers, incorporation of the project in the World Bank's Luanda Master Plan, community participation in programme design and planning and reserving the first option to buy land for the community. The project meets internationally accepted standards and is guaranteed by the Government. There are plans to replicate the programme in Angola's Benguela Province (Habitat, 2002).

5.9 Private Sector Involvement in Solid Waste Management

Some countries in Southern Africa have initiated some innovative methods of solid waste management. Although experience is still limited, there appears to be some scope for the following innovations:

- Contracting out waste-collection services to private companies, especially in commercial and high-income residential areas, where there is capacity to pay user charges for the services.
- Involving community in rubbish collection in low-income residential areas; for example, the employment of community groups to collect waste and deposit it at central collection points.
- Recycling or other forms of "resource recovery", including recovery of certain types of waste from disposal sites and directly from large-scale producers for composting. This is an area in which experience is still limited.

These innovative methods will only be effective if they are planned, co-ordinated and monitored by local authorities. Local authorities must continue to have the ultimate responsibility for solid-waste management and need to improve their management capacities. This requires local capacity-building initiatives and effective decentralization of powers to local authorities, especially revenue-raising powers. Measures to address current macroeconomic problems and to resuscitate the public sector as a whole are also needed. Some examples of innovations in solid-waste management in southern Africa are discussed below.

5.9.1 The Privatization of Solid Wastes in Zambia

Between 1889, when the first Zambian local authorities were established, and 1990, the idea of private operators participating in solid-waste management on a commercial basis was unheard of. The only form of private-sector involvement in solid-waste management was that by a few large companies (for example, in the mining, shoe manufacture, cement and textile industries), who collected and disposed of their own waste, either because they were producing specialized waste or because they found it was cheaper or more efficient to do so. However, in 1991, the Government embarked upon an extensive economic liberalization and privatization process, which created new opportunities for private entrepreneurship in many sectors, including solid-waste management.

5.9.2 The Case of Zimbabwe

Since the adoption of the Economic Structural Adjustment Programme (ESAP) in 1991, there has been pressure on local authorities to contract out some of their activities, including solid-waste management. In contracting out, the Council invites tenders for the provision of the service, usually won by a private company. However, the Council remains responsible for setting standards and ensuring that these standards are maintained. Contracting out is not a new idea in Zimbabwe. Many local authorities have for years used the private sector to provide certain functions. What is new is the contracting out of street cleaning, waste collection and disposal services, to the private sector, particularly to indigenous companies.

The private sector in Zimbabwe is involved on a contractual basis in the disposal of solid waste, the recovery of solid-waste materials, landfill operations and, most recently, in the collection of domestic solid-waste in some local authorities, such as in Harare. At the time of the study, the private sector had initiated the establishment of a National Cleaner Production Centre, the purpose of which is to stimulate development and adoption of cleaner production strategies through provision of information and technical services to industry and government.

Lack of comprehensive legislation to support cleaner production activities constrained these efforts. For example, organizations were not bound by legislation to conduct environmental or waste audits, which play a valuable role in encouraging recycling and waste-management planning.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study has discussed some aspects of environmental degradation in Southern Africa, including the nature, extent and impact of the phenomenon. It has become abundantly clear that the state of the environment in the sub-region will determine the level of prosperity of the people, not only in the short-term but also for future generations. While people have to exploit the environment and natural resources to alleviate poverty and raise their standard of living, such exploitation is not without cost. Overexploitation and abuse of natural resources not only lead to environmental degradation also exacerbate the very poverty that the people are seeking to alleviate.

Whereas many authors subscribe to the view that high rates of fertility have fuelled population growth resulting in environmental degradation, some others cite specific cases in which population growth has resulted in environmental/biodiversity improvements. Nevertheless, it is increasingly understood that in the majority of cases African population growth has been sustained by substantial deforestation.

Major issues of concern in the forests of Southern Africa include degradation of forests and woodlands, overexploitation of certain species, and the loss of ecosystem goods and services. Economic necessity frequently impacts negatively on the environment. Forests are cut down to provide land for shifting agriculture, pasture or for other uses. This removal of productive forestlands is not conducive to sustainable development - neither for agricultural practices nor for natural resource conservation. Much biodiversity is lost and the world's genetic storehouse becomes impoverished. With forests depleted, foods that normally supplement diets or add valuable nutrients during times of need, vanish. Local knowledge of traditional foods and medicinal plants is lost too because the forest has disappeared and because the people acquire a dependence on purchased foods.

Soil erosion that results after timber harvesting leads to siltation in rivers and reservoirs and causes serious problems in hydroelectric generation. Erosion prob-

lems are also associated with clear-cutting and log extraction. This can be quite serious, especially where logging is being carried out in catchment areas that are important for drinking water or hydroelectric generation.

The rate of deforestation is of particular interest to policy makers in Southern Africa because the cost of deforestation goes beyond the losses of forest products alone. It extends to such indirect costs as soil erosion and the substitution of animal and agricultural residues for cooking that would have otherwise been used for fertilizer. There is also the additional element of deforestation contributing to climate change.

Since early March 1997, significant warming of the sea surface temperature in the Pacific Ocean has been observed and recognized as the beginning of an El Niño cycle. El Niño weather conditions are known to occur every 2 to 7 years with varying degrees of intensity and duration. They have been blamed for droughts in Southern Africa, Southeast Asia and Australia and for massive flooding in Central and South America. It usually peaks around late December. El Niño characteristically causes important changes in temperatures and rainfall that affect agriculture and water resources and natural conditions for marine ecosystems, either positively or negatively.

In southern Africa, some governments have prepared comprehensive contingency plans for mitigating the impact of a possible drought. Countries such as Botswana, Mozambique, Namibia, South Africa and Zimbabwe, for example, have initiated water-saving measures although major dams are currently about 91 per cent full. Others are preparing to meet the national demand either by producing more food or by importing it from abroad in order to meet the sub-regional food requirement of 26.85 million tons.

Natural resources such as the atmosphere and oceans are public goods as they are not owned by anyone and there is thus no incentive, other than a stewardship ethic, to conserve the resource for the future. The result is adoption of open-access resource management systems, which often leads to over-exploitation. A common property resource is one that is owned by a community, whether local, regional, national, or global (Pearce 1995). When a community does not co-operate to manage the resource sustainably, this collective system of management breaks down, with open access prevailing and leading to degradation.

Private goods, on the other hand, have owners who may have more of an incentive to conserve the resource for future use. Biodiversity tends to have the characteristics of both public and private goods (Pearce 1995). Biodiversity is a public good in that use of biodiversity by one person does not diminish its use by another person. However, biodiversity and in particular, certain biological resources, may yield benefits that accrue to individuals and

firms, whether the user, the landowner, the corporation or the State. Genetic diversity is currently being secured as a private good through the establishment of intellectual property rights.

Efforts to address environmental degradation pose the following important challenges:

- Mobilization of the scientific community to mount an integrated programme for methods, standards, data collection, and research networks for assessment and monitoring of soil, water, land, forest and atmospheric degradation;
- Development of environment-use models that incorporate both natural and human-induced factors that contribute to degradation and that could be used for resource-use planning and management;
- Development of information systems that link environmental monitoring, accounting, and impact assessment to degradation;
- Implementation of policies that encourage sustainable environmental resource use and management and that assist in the greater use of environmental resource information for sustainable livelihoods; and
- Implementation of economic instruments for assessment of environmental degradation and promotion of sustainable use of environmental resources.

Appropriate government policy can enhance protection of the environment. The inclusion of local communities in the management of natural resources and the environment is also essential for sustainability. There are specific cases of official inability to manage natural and coastal resources sustainably, partly because of human and budgetary constraints. However, local communities have vested socio-economic interests in preservation of their environment and the resources upon which they depend for their livelihoods. Involving such local communities in natural and environmental resource management will impart a sense of ownership of such resources in the local community, improving their stake in sustainable management.

Although many Southern African countries are signatory to the major international conventions relating to environmental resource management, many are still not committing sufficient resources to tackle the problem. Some governments in the sub-region do not see degradations such as those related to climate change as a priority issue, despite global recognition of their adverse impact. There are currently almost no domestic or external pressure to formulate such a policy, given the low level of greenhouse gas emissions in many of these countries and given the possibility that there is a net sink for carbon dioxide.

Africa's challenge is to find policies that enhance economic growth but preserve the natural resource base. Devising sustainable environmental policies requires an appropriate mix of economic incentives and suitable institutional arrangements based on a clear specification of property rights. By economic incentives, natural resources need to be priced on an opportunity-cost basis, that is, at a level reflecting their replacement costs. To do so, policymakers need to take the external costs of development projects into more careful account than has been the case in the past. The costs have to be translated into realistic market prices.

Efforts at privatizing public services within the framework of public private partnership are in top gear in many countries in the sub-region. This approach creates incentives for the bidders to identify areas where they can drive operating costs down and improve service quality.

Often, the two will be linked. People are more willing to pay when they receive a reliable service, with demonstrable improvements in water quality. Reducing distribution losses allows more water to be provided to the customer without needing to mobilise new resources. Progressive tariff policies, allied with effective billing and the removal of illegal connections, drive down the overall cost of water provision for the less well off.

Genetic improvement of food crops that use both conventional and biotechnology research tools is needed to shift the yield frontier higher and to increase yield stability. There is growing evidence that genetic variation exists within most cereal crop species, for genotypes that are more efficient in the use of nitrogen, phosphorus, and other plant nutrients than are currently available in the best varieties and hybrids. In addition, there is evidence that further heat and drought tolerance can be built into high-yielding germplasm¹⁷.

Biotechnology programmes in the field of crop improvement are rapidly emerging in Kenya and Zimbabwe, to address resistance to the maize stem borer and drought tolerance. Examples of the use of genetic engineering in Africa include Kenya's virus-resistant transgenic sweet potato project, (which is under development with the US company, Monsanto). Egypt's development of transgenic potato, maize, bean and tomato and South Africa's new tobacco and cotton varieties with resistance to herbicides are other examples.¹⁸

In view of the record of fertilizer use and the effect on agricultural yield in Southern Africa, it is imperative that agricultural biotechnology addresses

¹⁷ See Borlaug and Doswell, 2002

¹⁸ See Omiti et al., 2002

the particular needs of African farmers and the poor. Some of the elements considered to be useful target traits for genetic modification include:

- a) Drought resistance;
- b) Shorter growth cycles;
- c) Low input requirements (fertilizers, labour);
- d) Low use and maximum retention of soil nutrients (i.e., crops that are good in fragile soils);
- e) Avoidance of need for complex seed distribution systems (i.e., easy planting);
- f) Improved storability; and
- g) Hardiness, even at the expense of higher yields.

6.2 Recommendations

Based on the analysis of environmental degradation and the nature and extent of their impact on the economy of Southern African countries, the following recommendations target national and sub-regional policymaking:

6.2.1 National Level

- Environmental management should receive higher priority in budgetary allocations. Government incentives and tax systems need to be reviewed in light of the growing awareness of the linkages between poverty, sustainable development and environmental degradation.
- Effort should be made to encourage agricultural production diversification into drought-resistant, disease-resistant, non-traditional crops to ensure food security.
- Member States should continue to implement UNCCD, to strengthen reforestation and reduce the rates of desertification and deforestation.
- There is scope for adoption of “home-grown” genetically modified crops that are resistant to drought, diseases and pests, and which are proved to be safe for human consumption.
- Providing rural households with electricity would, to some extent, diminish the direct impact on fuel wood consumption. The adoption of energy-efficient cooking stoves, for example, should be promoted, in another effort to reduce household fuel wood consumption. Where possible, local communities should be encouraged to manufacture improved cooking stoves for sale in their localities.

- Air pollution should be prevented by the use of alternative energy sources and such renewable technologies as wind energy, small-scale hydro projects and conversion of waste to energy.
- There is a need to incorporate environmental concerns to industrial and mining development goals. Economic instruments that discourage environmental degradation should be designed and implemented.
- Public urban infrastructure and rural development programmes that have long-term objectives should be pursued, to reduce unsustainable utilization of natural resources.
- Appropriate legislation should be passed to ensure clearly defined and secure property rights to land, natural and environmental resources, as an essential ingredient to any strategy for conserving and encouraging sustainable management of the environment. Rights have to be vested at the community and individual level, with clear specification of contractual obligations. Strengthening a community's tenure rights over natural resources will provide them with the incentive to protect such resources.
- A programme of land redistribution needs to be implemented in some countries for environmental management reasons, in an effort to reduce the overuse of land in overcrowded communal areas.
- Incentive schemes with regard to water resources management must be reviewed, adjusted and integrated to reduce the overexploitation of water resources. Water conservation strategies should be strengthened. Financial systems for inter-basin transfers where users pay for resource protection in another part of the basin should be established based on valuation of ecosystem services.
- It is important to modify and strengthen fisheries management policies and institutions. Authorities should promote fisheries conservation and environmental education among fishermen. To reduce the possibility of fishery disruption, strict biological monitoring should be implemented and properly enforced fishing controls must be instituted. These strategies would help keep stock-replacement levels stable in the face of the physical stress caused by climate change and other environmental phenomena. They would also help to meet the growing demand for fish and fishery products by an ever-increasing population.

6.2.2 Sub-regional Level

- Southern African countries should commit more resources to joint initiatives for environmental management, including joint wildlife management and practice compatible land use and resource management

strategies along the lines proposed in the SADC Protocol on Wildlife Conservation and Law Enforcement.

- Wildlife management at the sub-regional level should be integrated with tourism development. Southern Africa has a number of world-class game reserves and national parks, many of which occur on the border of member countries. It is logical, therefore, that their management be integrated so that tourists can travel between parks on a circuit, which crosses national borders.
- With regard to water resources and water management in Africa, the large variability in projected climate scenarios for Africa's most vulnerable river basin systems (such as the Nile) makes any policy reformulation in anticipation of climate change difficult. However, improved efficiency in irrigation systems and water use are strongly recommended modes of action, because irrigation will benefit the sub-region regardless of the degree and direction of climate change.
- A programme of "debt for nature swaps" should be pursued as a part of the debt-relief package being sought and negotiated with the donor community. This is a short-term solution to enhance both economic growth and sustainable environmental management.
- Developed countries also need to make special efforts to enhance sustainable environment in Southern Africa, such as incorporation of appropriate environmental safeguards into marine and coastal fishing agreements between the developed countries and those in Southern Africa. Fishing vessels originating from developed countries should be made to comply with environmental standards in their countries of origin as well as those applicable in Southern Africa. Efforts should continue to recycle industrial and commercial waste generated in developed countries, to eliminate toxic waste dumping in Southern Africa and to stem increases in global levels of carbon dioxide, which contribute to greenhouse temperatures and to the risk of accelerated desertification and deforestation in Africa.
- It is important and commendable that governments in the sub-region and region prepare comprehensive contingency plans for mitigating the impact of a possible drought. They have to be aware of the possible impact of climate change on their countries.
- There is need for regional co-operation in research, monitoring and management of coastal resources along the lines of the Benguela Environment Fisheries Interaction and Training programme (BENEFIT) established by Angola, Namibia and South Africa. The integrated coastal

zone management initiative of Mozambique, Namibia and South Africa is also a welcome development, which should be emulated.

- Efforts should be made to achieve a peaceful negotiated settlement to political disagreements in the sub-region.
- It is essential that practical steps be taken to adopt various regional and international instruments that seek to promote good governance over natural and environmental resources. Renewed access to natural resources in post-civil war situations should also be sustainably managed.

PART III

STATISTICAL ANNEX

Table 3.1: GDP in Million \$US (Constant 1995 Prices), 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	6,295	6,503	6,659	6,892	7,925	8,757
Botswana	5,777	6,078	6,363	6,668	6,941	7,316
Lesotho	1,058	1,140	1,185	1,218	1,254	1,292
Malawi	1,644	1,713	1,777	1,834	1,885	1,941
Mauritius	4,709	4,886	5,101	5,376	5,655	6,017
Mozambique	3,095	3,630	3,748	4,269	4,781	5,268
Namibia	3,905	4,072	4,283	4,411	4,552	4,779
South Africa	162,422	165,508	170,638	172,685	177,175	183,022
Swaziland	1,454	1,483	1,520	1,559	1,587	1,628
Zambia	3,750	3,855	3,970	4,176	4,330	4,468
Zimbabwe	8,298	8,378	8,034	7,447	7,030	7,008

Source: World Bank, Africa Development Indicators, 2002

Table 3.2: GDP Growth Rates, 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	4.0	3.3	2.4	3.5	15.1	10.5
Botswana	8.1	4.1	4.7	4.8	4.1	5.4
Lesotho	-4.6	2.0	4.0	2.8	3.0	3.0
Malawi	3.3	4.2	2.3	-1.5	-1.8	3.0
Mauritius	5.8	3.4	4.0	5.4	5.2	6.4
Mozambique	12.1	17.3	1.6	13.9	12.0	10.2
Namibia	3.3	4.3	3.9	3.0	3.2	5.0
South Africa	0.7	1.9	3.1	1.2	3.0	3.3
Swaziland	2.7	2.0	2.5	2.6	1.8	2.6
Zambia	-1.9	2.4	3.0	5.2	3.7	3.2
Zimbabwe	2.5	0.5	-4.1	-7.3	-5.6	-0.3

Source: ECA Database

Table 3.3: Population in Millions, 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	12.0	12.3	12.4	12.7	13.1	13.3
Botswana	1.5	1.6	1.6	1.7	1.7	1.8
Lesotho	2.0	2.1	2.1	2.2	2.2	2.2
Malawi	10.5	10.8	11.0	11.5	12.0	12.3
Mauritius	1.1	1.1	1.2	1.2	1.2	1.2
Mozambique	17.0	17.2	17.3	17.6	18.0	18.6
Namibia	1.6	1.7	1.8	1.8	2.0	2.0
South Africa	41.4	42.1	42.8	44.3	45.3	45.5
Swaziland	0.9	1.0	1.0	1.1	1.1	1.2
Zambia	10.0	10.0	9.3	9.5	9.7	10.0
Zimbabwe	12.2	12.4	12.6	12.9	13.2	13.5

Source: ECA Database and UN World Population Prospects, 1998 Revision

Table 3.4: Growth Rate of Population, 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	2.8	2.5	1.0	3.0	2.5	2.0
Botswana	3.5	3.5	3.5	3.8	3.8	4
Lesotho	2.5	3.0	2.5	2.5	3.0	2.5
Malawi	3.4	3.5	2.0	3.8	4.0	3.5
Mauritius	0.8	0.5	0.5	0.5	0.5	0.5
Mozambique	1.0	2.0	1.0	2.0	1.0	1.0
Namibia	2.8	1.0	1.0	1.0	1.5	1.5
South Africa	2.3	2.5	2.0	3.0	2.8	2.8
Swaziland	3.2	3.5	3.8	3.0	2.8	2.8
Zambia	3.1	3.0	-6.4	2.1	2.1	2.5
Zimbabwe	3.3	2.0	2.0	2.3	2.3	2.2

Source: ECA Database and UN World Population Prospects, 1998 Revision

Table 3.5: Real GDP Per Capita Growth Rate, 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	-2.9	0.9	1.3	1.1	12.3	8.8
Botswana	4.2	-0.7	3.4	-0.5	4.3	0.7
Lesotho	1.3	-0.3	3.6	3.7	3.0	8.9
Malawi	2.9	1.3	0.0	-1.1	1.3	1.2
Mauritius	5.9	3.3	-0.1	5.7	5.2	6.7
Mozambique	4.9	6.0	1.0	13.8	21.1	7.8
Namibia	2.8	-0.2	-0.2	3.9	-0.8	4.9
South Africa	1.8	0.2	1.4	-0.3	0.3	2.9
Swaziland	2.0	-0.7	2.5	-0.7	4.5	-0.6
Zambia	14.6	2.9	11.2	3.5	1.5	0.4
Zimbabwe	-0.3	-2.3	-6.3	-14.52	-8.1	-0.4

Source: ECA Database and National Sources

Table 3.6: Inflation Rates, 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	134.8	329.0	268.0	116.0	85.0	50.0
Botswana	6.1	7.2	6.7	6.6	7.8	4.3
Lesotho	9.3	12.3	8.6	6.9	8.6	6.0
Malawi	29.8	44.9	29.5	27.5	20.9	12.5
Mauritius	6.8	6.9	4.5	5.4	6.0	6.0
Mozambique	-0.4	6.2	12.7	9.1	8.0	5.0
Namibia	6.2	8.6	9.3	9.2	8.5	7.8
South Africa	6.9	5.2	5.3	5.7	6.0	6.0
Swaziland	5.9	7.0	6.7	7.5	8.8	7.8
Zambia	30.6	20.6	30.10	18.7	16.0	16.8
Zimbabwe	31.7	58.5	60.0	74.5	119.0	100.6

Source: SADC Statistics, SADC/CM/3/2002/7.10

Table 3.7: Official Exchange Rates (National currency per US dollar), 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	0.4	2.8	10.0	31.9	45.0	98.0
Botswana	4.2	4.6	4.7	5.1	5.8	6.5
Lesotho	5.5	6.1	6.3	8.6	10.7	11.5
Malawi	31.1	44.1	59.5	72.3	75.1	84.5
Mauritius	24.0	25.2	26.6	29.1	30.7	32.3
Mozambique	12,110	13,028	15,689	18,667	23,530	25,600
Namibia	5.5	6.1	6.8	8.6	11.58	12.73
South Africa	5.5	6.1	6.9	8.5	12.2	13.3
Swaziland	5.5	6.1	6.7	8.6	11.5	12.7
Zambia	1,862	2,388	3,110	3,610	4,402	5,955
Zimbabwe	23.7	38.3	44.4	55.1	55.0	113.0

Source: World Bank, Africa Development Indicators, 2002 and National Sources

Table 3.8: Commercial Bank Lending (Interest Rate), 1998-2003

COUNTRY	1998	1999	2000	2001	2002E	2003F
Angola	116.0	97.3	102.3	96.0	96.7	98.0
Botswana	14.8	15.0	15.25	15.75	15.87	15.75
Lesotho	17.0	16.2	17.10	16.22	16.60	16.33
Malawi	52.3	53.5	63.6	59.0	61.7	52.0
Mauritius	21.0	21.0	20.8	20.5	21.0	21.8
Mozambique	N/A	N/A	N/A	N/A	N/A	N/A
Namibia	16.8	15.3	13.5	15.2	15.4	15.4
South Africa	15.5	14.5	14.3	13.3	13.0	14.3
Swaziland	14.0	15.0	14.0	13.0	12.5	14.5
Zambia	35.7	38.3	38.9	45.3	48.5	50.2
Zimbabwe	66.8	68.2	66.5	38.1	33.8	41.0

Source: World Bank, Africa Development Indicators, 2002

Notes:

E = Preliminary estimates from member States and EIU

F = Forecasts. GDP growth rates and inflation from EIU, others from ECA

N/A = Data not available

REFERENCES

- Abel, N. O. J. and Blaikie, P. 1989. "Land Degradation, Stocking Rates and Conservation Policies in the Communal Rangelands of Botswana and Zimbabwe" in *Land Degradation and Rehabilitation*, Vol. 1: 101-123.
- Beinroth, F.H., Eswaran, H., Reich, P.F. and Van Den Berg, E. 1994. "Land-Related Stresses in Agro-ecosystems" in *Stressed Ecosystems and Sustainable Agriculture* by S.M. Virmani, J.C. Katyal, H. Eswaran, and I.P. Abrol. New Delhi, Oxford and IBH.
- Biot, Y. 1988. *Forecasting Productivity: Losses Caused by Sheet and Rill Erosion. A Case Study from the Communal Areas of Botswana*. Ph.D. Thesis, University of East Anglia, UK, p225.
- 1991a. Quantifying Sustainability. Paper presented at the International Workshop on Evaluation for Sustainable Land Management in the Developing World. Chiang Rai, 15-20 September 1991, p27.
- 1991 b. "How Long Can Livestock Production Be Sustained in the Hardveld of Botswana?" *Pedologie* XL 1-2: 133-147.
- Blaikie, P. 1989. "Explanation and Policy in Land Degradation and Rehabilitation for Developing Countries" in *Land Degradation and Rehabilitation*, Vol. 1, No 1: 23-37.
- Blaikie, P.M. and H.C. Brookfield. 1987. *Land Degradation and Society*. Methuen, London, UK and New York, USA, pp296.
- Bryceson, I., T. F. De Souza, I. Jehangeer, M. A. K. Ngoile, and P. Wynter. 1990. *State of the Marine Environment in the Eastern African Region*. UNEP Regional Seas Reports and Studies No. 113.
- Bush, R. 1997. 'Africa's Environmental Crisis: Challenging the Orthodoxies', *Review of African Political Economy*, 74, 503-513.
- Cavendish, W. 1999. *Empirical Regularities in the Poverty-Environment Relationship of African Rural Households*. WPS, pp99-21.

Claassen, P. E. 1990. "Environmental Concerns in Third World Cities: A Case Study of Khayelitsha, South Africa) in *International Society of City and Regional Planners* (ed.), *The Environment and the City Case Studies*. Amsterdam: ISCRP.

Collignon, B and Vezina, M. 2000. *Independent Water and Sanitation Providers in African Cities*. World Bank Water and Sanitation Programme. Washington D.C., USA.

Department of Environmental Affairs. 1992. *Building the Foundation for Sustainable Development in South Africa: National Report to the United Nations Conference on Environment and Development (UNCED)*. Pretoria, CSIR.

Department of Environment and Tourism. 2002. *Impacts of Environmental Change in South Africa*, Pretoria.

Ehui, M. 2001. *Concept Note: State of Food Security in Sub-Saharan Africa and Strategy for the Future*. Discussion Paper. UNECA, Addis Ababa, Ethiopia.

Environmental Development Action in the Third World. 1997. *Building Capacity in Sub-Saharan Africa to Respond to the UNFCCC*. Draft synthesis report. Dakar, Senegal. <http://www.enda.sn/energies/rapports/sythba/>

FAO, 1996c. *Food Production and Environmental Impact*, World Food Summit. Technical Background Documents, No. 11, Rome.

.....2001a. *The State of Food Insecurity in the World*, Rome.

.....2001b. *News and Highlights: Food Crisis Deepens in East Africa*.

<http://www.fao.org/NEWS/2000>.

.....2001c. *Food Supply Situation and Crop Prospects in Sub-Saharan Africa*. Rome, Italy.

Folland, C.K., T. Karl, and K.Y. Vinnikov. *Observed Climatic Variations and Change*, Chapter 7. pp195–238.

Gleick, P.H. 1993. "Water in the 21st Century" in Gleick, P.H. (ed.), *Water in Crisis: A Guide to the World's Fresh Water Resources*. Oxford University Press, Oxford.

Government of Botswana. 2002. *The Budget Speech*. Gaborone.

Government of Malawi. 1994. *Malawi Environmental Action Plan*. Blantyre.

..... 1999. *New Environmental Action Plan*, Blantyre.

Government of Mauritius. 2002. *The Budget Speech*. Mauritius.

Government of Namibia. 2000. *Namibia National Report for Istanbul*. Windhoek.

Government of Zambia. 2002. Economic Report 2001, Ministry of Finance and Economic Planning, Lusaka.

..... 2000. Economic Report 1999, Ministry of Finance and Economic Planning, Lusaka.

Habitat. 1987. Global Report on Human Settlements. Oxford: Oxford University Press.

..... 1989. Urbanization and Sustainable Development in the Third World: An Unrecognized Global Issue. Nairobi.

Harrison, P. 1987: The Greening of Africa: Breaking through in the Battle for Land and Food. Paladin. Grafton Books, UK, p380.

Hill, H. 1992. Concrete and Clay: Angola's Parallel City. Africa South, June.

Hjort af Ornas and Mohammed Salih, M.A. (eds.) 1989. Ecology and Politics: Environmental Stress and Security in Africa. Scandinavian Institute of African Studies. Sweden, p255.

Hounscome, R. and Ashton, P. 2001. Sustainable Development for the Mining and Mineral Sector in Southern Africa. Draft position paper, CSIR, Pretoria, South Africa.

Hulme, M. 1996a. "Climatic Change within the Period of Meteorological Records" in The Physical Geography of Africa. Adams, W.M., A.S. Goudie, and A.R. Orme (eds.). Oxford University Press, Oxford, United Kingdom, pp429.

Hulme, M. 1996. Climate Change and Southern Africa: An Exploration of Some Potential Impacts and Implications in the SADC Region. Report commissioned by WWF International and coordinated by the Climate Research Unit, UEA, Norwich, United Kingdom, pp104.

IPCC.1996a. Climate Change 1995: The Science of Climate Change. Contribution of WGI to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Houghton, J.T., L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg and K. Maskell (eds.). Cambridge University Press, Cambridge, United Kingdom, pp572.

Islam, N. 1995. Population and Food in the Early Twenty-First Century: Meeting Future Food Demands of an Increasing Population. Washington, D.C. IFPRI.

Lal, R. 1987. "Response of Maize and Cassava to Removal of Surface Soil from an Alfisol in Nigeria" in International Journal of Tropical Agriculture, 5, pp77-92.

Lal, R. et al. 1989. «Soil Degradation: Basic Processes in Land Degradation & Rehabilitation». Vol. 1, pp51-69.

Lal, R. 1994. «Tillage Effects on Soil Degradation, Soil Resilience, Soil Quality, and Sustainability» *Soil Tillage Research*, 27, pp1–8.

Le Breton, G.S. 2001. Trade in Biological Resources in Southern Africa. Paper presented to the Multi-stakeholder Dialogue on Trade, Intellectual Property Rights and Biological Resources in Eastern and Southern Africa. Nyeri, 31 July. <http://216.239.51.100/search?q=cache:89ZJ2JZRLDcC:www.ictsd.org/dlogue/2001-07-30/Le%2520Breton.pdf>.

Marsh, G.P. 1864. *Man and Nature*, Scribner, New York.

Maxwell, S. 1994. 'Food Security: A Post-modern Perspective', Institute of Development Studies, Working Paper No. 9, University of Sussex.

McNeely, J.A. 1988. *Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Resources*. IUCN, Gland, Switzerland.

Ministry of Environmental and Natural Resources. 1992. *Zambia's National Report to United Nations Conference on Environment and Development (UNCED)*. Lusaka.

Ministry of Environment and Quality of Life. 1991. *State of the Environment in Mauritius*, Port Louis, Mauritius.

Mulenga, B.S. 2000. Demand for Wood Fuel and Substitution Possibilities in Urban Zambia. Draft of a paper presented at the April Conference on Opportunities for Africa: Micro-evidence, organized by the Centre for the Study of African Economies, Oxford University, Oxford, UK.

Musandu-Nyamayaro, O. 1991. Urban Management in Zimbabwe: The Case of Harare. Paper presented at the RUPSEA Conference on Urban Management in Southern and Eastern Africa, Lilongwe, Malawi, 7 - 10 October.

Mwafongo, W. M. K. 1991. Rapid Urban Growth: Implications for Urban Management in Malawi. Paper presented at the RUPSEA Conference on Urban Management in Southern and Eastern Africa, Lilongwe, Malawi, 7 10 October.

Nicholson, S. E. and Kim, J. 1997. "The Relationship of the El Niño-Southern Oscillation to African Rainfall" in *International Journal of Climatology*, 17: pp117-136.

Niles, J.O, Brown, S, Pretty, J, Ball, A and J. Fay. 2001. Potential Carbon Mitigation and Income in Developing Countries from Changes in Use and Management of Agricultural and Forest Lands. Occasional Paper 2001-04, Centre for Environment and Society, University of Sussex, UK.

Owen, D. 2001. International Water Market Overview: Private Sector Participation and Prospects in Water and Waste Water Services. A Paper for the Water &

Wastewater Session at the Global Construction Superconference, 6th November 2001, Portman Sq., London.

Pearce, D. 1995. *Blueprint 4: Capturing Global Environmental Value*. Earthscan Publications, UK.

Pebbley, Anne R. 1998. "Demography and the Environment" in *Demography* 35 (4), November 1998, pp 377-389.

Ponzi, D. 1993. "Soil Erosion and Productivity: A Brief Review" in *Desertification Control Bulletin*, UNEP, No. 22, pp36-44.

Reutlinger, S., 1977a, 'Food Insecurity: Magnitudes and Remedies', World Bank Working Paper No 267, Washington, D.C.: The World Bank.

.....1985. "Food Security and Poverty in LDCs" in *Finance and Development*, Vol. 22, No 4, Washington, D. C. IMF.

Roger, (1999). Recent Trends in Private Participation in Infrastructure. *Private Sector Note 196*, September.

SADC. 2000a. *SADC Review and Country Profiles*. Southern African Development Community Country Profiles, [Online]. Accessed on 1 March 2001. Available at website: (<http://www.sadcreview.com/country%20profiles%202000/>).

Sahn, D.E. 1989. 'A Conceptual Framework for Examining the Seasonal Aspects of Household Food Security' in D.E. Sahn, ed., *Seasonal Variability in Third World Agriculture: The Consequences for Food Security*. Baltimore, John Hopkins University Press.

Sanjeev K. S. 2000. *Economic Development and the Need for Environmental Management in the Island of Mauritius*.

SARDC. 1994: *State of the Environment in Southern Africa*. A Report by the Southern African Research and Documentation Centre (SARDC) in collaboration with IUCN - The World Conservation Union - and the Southern African Development Community, Harare, Zimbabwe, pp332.

Schulze, R.E., G.A. Kiker, and R.P. Kunz. 1996. "Global Climate Change and Agricultural Productivity in Southern Africa: Thought for Food and Food for Thought" in *Climate Change and World Food Security*, Downing, T.E. (ed.)). North Atlantic Treaty Organization ASI Series, Vol. 137. Springer-Verlag, Berlin and Heidelberg, Germany, pp421-447.

Scoones, I. 1992 a. "Land Degradation and Livestock Production in Zimbabwe's Communal Areas" in *Land Degradation and Rehabilitation*, Vol. 3., pp99-113.

Sen, A. 1990. 'Food, Economics, and Entitlements', in J. Drèze and A. Sen, (eds.), *The Political Economy of Hunger*, Vol. 1, Oxford, Oxford University Press.

Shackleton, S, C, Shackleton and B. Cousins. 2000. "The Economic Value of Land and Natural Resources to Rural Livelihoods: Case Studies from South Africa", in *At the Crossroads: Land and Agrarian Reform in South Africa into the 21st Century*. Ben Cousins (ed.). Cape Town and Johannesburg. Programme for Land and Agrarian Studies, University of the Western Cape and the National Land Committee, pp35–67.

Shore, K.J. 2002. *Who Pays? Municipal Services in South Africa*.

http://www.idrc.ca/reports/read_article_english.cfm?article_num=1037#BBB.

Stringer, R. 2000. *Food Security in Developing Countries*. Policy Discussion Paper No 0011, Centre for International Economic Studies, University of Adelaide, Australia.

Sharma, M, I. Burton, M. Van Aalst, M. Dilley and G. Acharya. 2001. *Reducing Vulnerability to Environmental Variability*. Background Paper for the Bank's Environment Strategy. World Bank, Washington D.C.

[http://lnweb18.worldbank.org/essd/essd.nsf/GlobalView/ReducingVul.pdf/\\$File/ReducingVul.pdf](http://lnweb18.worldbank.org/essd/essd.nsf/GlobalView/ReducingVul.pdf/$File/ReducingVul.pdf)

Sharma, N.P., T. Damhaug, E. Gilgan-Hunt, D. Grey, V. Okaru, and D. Rothberg. 1996. *African Water Resources: Challenges and Opportunities for Sustainable Development*. World Bank Technical Paper No. 331, Washington, DC, USA, p115.

Siacinji-Musiwa, J. 1999. "Conservation Tillage in Zambia: Some Technologies, Indigenous Methods and Environmental Issues" in: Kaumbutho, P. G. and Simalenga, T. E. ((eds.)), *Conservation Tillage with Animal Traction. A Resource Book of the Animal Traction Network for Eastern and Southern Africa (ATNESA)*. Harare, Zimbabwe, p173.

<http://www.atnesa.org>.

Some, E.S. 1994. "Effects and Control of Highland Malaria Epidemic in Uasin Gishu District, Kenya" in *East African Medical Journal*, 71 (1), pp2–8.

Southern African Development Community. 1997. *Sub-regional Report on Implementation of Agenda 21: Review of Progress Made since the United Nations Conference on Environment and Development*. SADC Secretariat, Maseru, Lesotho.

Turton, A.R. 1998. *The Hydropolitics of Southern Africa: The Case of the Zambezi River Basin as an Area of Potential Co-operation Based on Allan's Concept of 'virtual water'*. M.A. Dissertation, Department of Political Studies and Administration, University of South Africa (UNISA), Pretoria, South Africa.

United Nations. 1975. Report of the World Food Conference, 5-16 November, United Nations, New York.

United Nations. 1993. Handbook of National Accounting: Integrated Environmental and Economic Accounting. United Nations, New York.

United Nations Conference to Combat Desertification. 1999. Malawi's First National Report. www.unccd.int/cop/reports/africa/national/1999/malawi-eng.pdf.

UNCED. 1992. 'The Protection of the Quality and Supply of Freshwater. Agenda 21, Chapter 18. United Nations, New York.

UNDP. 2002. Human Development Report. Oxford University Press, Oxford, UK.

United Nations Economic Commission for Africa. 2002. Harnessing Technologies for Sustainable Development. ECA Policy Research Report, Addis Ababa, Ethiopia.

..... 2001. State of the Environment in Africa. ECA/FSSDD/01/06, Addis Ababa, Ethiopia.

.....1999. Study on Soil Erosion and Destruction of Land Resources: Issues and Trends in Africa. Addis Ababa, Ethiopia.

UNEP. 1992. World Atlas of Desertification, Middleton, N.J. and D.S.G. Thomas (eds.). Edward Arnold Publishers, Sevenoaks, United Kingdom, p69.

UNEP. 2002. Africa Environment Outlook: Climate Variability in Southern Africa. <http://www.unep.org/aeo/050.htm>.

UNEP n.d. Assessment of Progress Made since 1992. www.unep.org/ROA/1/documents%20wssd%20prep/pdf/Assessment%20of%20progress%20made%20since%201992.pdf.

UNFCCC. 1992. United Nations Framework Convention on Climate Change. United Nations, New York, NY, USA, p29.

USAID. 2002a. Southern Africa - Complex Food Security Crisis Situation. Report #7 (FY), June 28,

..... (2002b). The State of the Environment in Zambia.

US DoC. 2000. National Trade Data Bank: Water Management in South Africa, November 3.

Valdés, A. and A. Siamwalla. 1981. Chapter 1. Introduction: Food Security for Developing Countries. A. Valdés (ed.). Westview Press, Boulder.

Wekwete, K. H. 1990. Planning the Urban Economies in Southern and Eastern Africa. Paper presented at the RUPSEA Workshop on Planning the Urban Economies in Southern and Eastern Africa. University of Zimbabwe, Harare, 12-16 November.

WHO.1990. Potential Health Effects of Climatic Change: Report of a WHO Task Group. WHO. 1994. Progress Report on Control of Tropical Diseases. CTD/MIP/94.4. Unpublished document.

WHO. 1996a. Climate Change and Human Health. Geneva, Switzerland, p297.

WHO/PEP/90.10, Geneva, Switzerland, p58.

Wigley, T.M.L and T.P. Barnett. Chapter 8. Detection of the Greenhouse Effect in the Observations, pp239–256.

Wilhite, D.A. and W.E. Easterling. 1987. Planning for Drought: Toward a Reduction of Societal Vulnerability. Westview Press, Boulder, Co., USA and London, United Kingdom.

Williams, M. 1990. "Understanding Wetlands" in Wetlands: A Threatened Landscape, Williams, M. (ed.). Basil Blackwell, Ltd., Oxford, UK, pp1–14.

WMO. 1995: Global Climate System Review: Climate System Monitoring. Geneva, Switzerland.

.....1998. The Global Climate System Review, December 1993 - May 1996. J.M. Nicholls (ed.). World Climate Data and Monitoring Programme, WMO, No.856.

Woodward, F.I. and W.L. Steffen. 1996. Natural Disturbances and Human Land Use in Dynamic Global Vegetation Models. International Geosphere-Biosphere Programme Report, 38, Stockholm, Sweden.

World Bank. 1992b. 'Development and the Environment' in World Development Report, Washington D.C. USA.

.....1995a. A Framework for Integrated Coastal Zone Management in Sub-Saharan Africa: Building Blocks for Environmentally Sustainable Development in Africa. Paper No. 4, Africa Technical Department, Washington, D.C., USA.

.....1995b. Toward Environmentally Sustainable Development in Sub-Saharan Africa. Washington, D.C., USA, 300 pp.

.....1995c, Poverty and Hunger: Issues and Options for Food Security in Developing Countries, Washington D.C., USA.

.....1996. Toward Environmentally Sustainable Development in Sub-Saharan Africa: A World Bank Agenda. Washington D.C., USA, p40.

World Water Forum. 2000. The Africa Vision for Water for 2025: Equitable and Sustainable Use of Water for Economic Development. The Hague, The Netherlands.

WRI. 1994. World Resources: A Guide to the Global Environment, 1994–1995. World Resources Institute/United Nations Environment Programme/United Nations Development Programme/The World Bank. Oxford University Press, New York, NY, USA, p400.

Zinyowera, M.C., and S.L. Unganai. 1993. Drought in Southern Africa. An Update on the 1991–92 Drought. Drought Network News Int., 4(3), pp3–4.

GLOSSARY OF TERMS

1. *Domestic or residential waste:* This waste results from domestic activities, including food preparation, sweeping, cleaning, burning of fuel, gardening and recreation. It includes vegetables and other putrescibles, metals, glass, rags, plastics, packaging and paper, old furnishings, obsolete appliances, dust and litter. Although most of this waste is recyclable, there was no capacity to do so in the local authorities of the sub-region.
2. *Trade and commercial waste:* This waste results from activities in retail and wholesale outlets, offices, service stations, barber shops and hair salons, restaurants, hotels, warehouses and both outdoor and indoor markets. It generally consists of packaging and container materials, used office supplies, food waste and the by-products of barbershops and hair salons. It includes paper, vegetables and other putrescibles, wood, glass, metals, plastics, rags, dust and litter. If local authorities had the capacity for recycling, a significant proportion of this waste could be recycled.
3. *Institutional waste:* This waste is generated by institutions such as schools and other institutions of learning, government offices, police stations, army quarters, religious building, and playgrounds. It includes elements of both residential and office waste, with a high proportion of paper. Once again such waste provides opportunities for recycling and reuse.
4. *Non-hazardous industrial waste:* This is waste from industrial plants and utilities, both processing and non-processing. It includes sweepings and general refuse, vegetables and other putrescibles, various types of factory and office waste, scrap metals, ash, leather shavings and cuttings, rubber, textile off-cuts, plastics and glass.
5. *Hazardous waste:* This is waste that is potentially dangerous to human or animal health. It is generally either flammable (e.g. solvents and thinners) or reactive (e.g. peroxides and cyanides) in nature. It includes medical waste, chemical waste, pesticides and radioactive materials.
6. *Hospital and medical waste:* This waste is generated by the medical profession. It includes items such as disposable needles and syringes, fluid

and medicine containers, used medical dressings (i.e. bandages, cotton wool, sanitary pads, plasters), human and animal tissues, pathological waste and specimens, and dust and litter from sweepings. This type of waste also poses a danger to human and animal life. For example, contaminated surgical instruments and fluids can transmit diseases such as HIV/AIDS and hepatitis.

7. *Street and park waste*: This type of waste consists predominantly of dust and litter. However, in some local authority areas, it also contains appreciable quantities of household waste, waste from the clearing and cleaning of drains, building rubble, faecal matter, animal waste and dead animals.
8. *Special wastes*: This is non-hazardous waste which presents special disposal problems, such as demolition rubble, sewerage sludge, tyres and derelict vehicles, usually in quantities too big to be handled by normal waste-management methods.