Southern Africa
ENVIRONMENT
Outlook

SARDC
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Southern Africa Environment Outlook
A report by the Southern African Development Community (SADC)
and partners:
Southern African Research and Documentation Centre (SARDC)
IUCN-The World Conservation Union
United Nations Environment Programme (UNEP)

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Southern Africa
Environment
Outlook

Southern Africa ENVIRONMENT Outlook

A Southern African Development Community (SADC) report
under the
Regional Indicative Strategic Development Plan (RISDP)

in collaboration with

Southern African Research and Documentation Centre (SARDC)
Musokotwane Environment Resource Centre for Southern Africa (IMERCSA)

IUCN-The World Conservation Union
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FOREWORD

Tomaz Augusto Salomão
SADC Executive Secretary

The Southern African Development Community (SADC) recognizes that natural resources are critical to regional development and poverty eradication, and hence has enshrined "sustainable utilization of natural resources and effective protection of the environment" in the revised SADC Treaty. In line with the Treaty, the SADC Regional Indicative Strategic Development Plan (RISDP) calls for regular environmental assessment, monitoring and reporting for the purpose of analysing regional trends. The importance of environmental sustainability in the SADC region is reflected in the many regional and international agreements to which Member States are signatory. The critical role of natural resources in economic, social and political integration was also recognised at the Rio Earth Summit of 1992 and the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002..

The *Southern Africa Environment Outlook* is an integrated assessment of the state and trends of key environmental resources, including land, freshwater, marine and coastal resources, forests and woodlands, and wildlife. The report takes a 10-year retrospective and forward-looking analysis of issues, and also covers cross-sectoral elements relating to human settlements, energy and atmospheric dynamics. It provides an effective tool for monitoring regional and continental targets under the RISDP, Millennium Development Goals, Johannesburg Plan of Implementation, and the environment programme of the New Partnership for Africa's Development (NEPAD).

More than a decade ago, SADC published its first comprehensive environmental status report: *State of the Environment in Southern Africa*. In his Foreword to the first regional report on the *State of the Environment in Southern Africa* in 1994, the then SADC Chairperson, the former President of Botswana, Sir Ketumile Masire, likened community building to the process of making a basket, taking different strands and weaving them into a product of strength and durability. One of the strands in weaving a strong and sustainable regional community is the environment.

When SADC later published the first assessment of a single ecosystem, the Zambezi River Basin, in 2000, the former President of Mozambique and then SADC Chairperson, Mr. Joaquim Chissano, stated that the rationale for sustainable natural resources management was "to achieve a balance between human demands on natural resources and the natural environment's ability to meet these demands."

Today we have come to realise that the environment not only supports our economy, but determines our destiny as a people and as a region. Therefore, environmental issues, both in the region

and in the wider world, should be addressed at all levels by all stakeholders due to the complexity of the environment and the intertwined nature of its components.

This *Southern Africa Environment Outlook* showcases some of SADC's work and achievements over the past 10 years. The approach to environmental assessment and reporting used in producing this report is based on regional ecosystems and policy impacts, rather than country specifics.

In view of the need for sustaining the process of producing the Outlook, SADC regional environment reporting should be closely linked to and built from national environment reporting. Furthermore, the *Southern Africa Environment Outlook* should be dynamic in order to accommodate new and emerging environmental challenges such as climate change. This will be facilitated by the SADC Protocol on Environment now being developed.

It is gratifying to note that this publication, being the first *Southern Africa Environment Outlook* produced under the RISDP and an assessment tool for sustainable development, is a significant contribution to mainstreaming and awareness creation.

Tomaz Augusto Salomão
Executive Secretary
SADC
July 2008

PREFACE

Communicating the Environment Programme (CEP) is a unique and longstanding partnership of an inter-governmental organisation, the Southern African Development Community (SADC); an international membership organisation, IUCN-The World Conservation Union; and a regional knowledge resource centre, the Southern African Research and Documentation Centre (SARDC). The partnership receives technical support from the United Nations Environment Programme (UNEP).

The CEP partnership produced the first regional state of environment report for SADC in 1994 and several thematic updates at two-year intervals over the past decade. CEP was formalized through a Memorandum of Understanding in 1995, and has continued to develop as a productive regional partnership through commitment, hard work and patience to build the trust required to successfully combine the strengths of the partners.

The CEP partnership was initiated after the Earth Summit in Brazil in 1992 for the purpose of developing regional State of Environment reporting for southern Africa, a process in which continuity is important in monitoring environmental trends.

The first report followed the recognition of the critical importance of the region's natural resources to economic, social and political integration, which many of the region's country reports had confirmed at the Rio Earth Summit. This has been recognized by SADC in its Regional Indicative Strategic Development Plan (RISDP), which plans environmental reporting at five-year intervals.

The objective of CEP is to inform, motivate and empower people at all levels of environmental decision-making in southern Africa, from the individual and NGOs to the private sector and governments, to take positive actions to counter environmental degradation and move towards sustainable development paths by providing them with clear, objective and meaningful information on the environment.

The current partnership, which aims at facilitating communication and understanding between environmental groups and decision-makers, draws its strength from the complementary roles of the three partners. IUCN, through its global network of scientists and expert institutional members provides technical backstopping to the region's environmental assessment and reporting processes while SADC provides the political framework to engage in the decision-making processes.

The regional knowledge resource base and networks coordinated by SARDC through its Musokotwane Environment Resource Centre for Southern Africa (IMERCSA) are key to making the analysis correct and scientifically credible.

IUCN is proud to have played a key role in the development of the CEP partnership through its Regional Office for Southern Africa (ROSA) and in particular, through the vision of two

exceptional people: the late Zambian environmentalist India Musokotwane, who was then the IUCN Regional Director for Southern Africa; and Achim Steiner, then Programme Coordinator at IUCN ROSA, later the Director-General of IUCN, based in Gland, Switzerland, and now Executive Director of the United Nations Environment Programme in Nairobi. Both were dynamic forces in developing the concept of the CEP partnership and facilitating the progress of its development. They worked closely in establishing CEP with Phyllis Johnson, the SARDC Executive Director, and Munyaradzi Chenje, the first Director of SARDC IMERCSA and later Regional Coordinator for Africa in the UNEP Division of Early Warning and Assessment in Nairobi, who is now Head of the Global Environment Outlook at UNEP DEWA.

IUCN is also proud to be part of the long but rewarding process leading to the publication of this report, the *Southern Africa Environment Outlook*. The publication of this report shows timeliness in advancing toward some of the targets of SADC. In addition, CEP is the vehicle through which southern Africa participates in environmental reporting at continental and global levels, as SARDC IMERCSA is the regional collaborating centre for UNEP in preparing the *Africa Environment Outlook* and the *Global Environment Outlook*. The collaboration with UNEP includes training of national focal points and others to strengthen national environmental reporting, as agreed under Agenda 21 in Brazil in 1992 and at the WSSD in South Africa in 2002.

The publication of the 1994 *State of the Environment in Southern Africa* initiated what has become a long-term SADC process. In order to ensure continuity of this environmental reporting process, the region has over the past decade produced thematic environmental updates on water resources and biological diversity of forests and woodlands, as well as a multiplicity of products such as databases, factsheets, policy briefs, news articles and posters.

Also of importance is the ecosystem approach in environmental reporting which has seen some extensive work being carried out on some of the major river basins of the region, including the Zambezi and the Limpopo.

As IUCN President, I find this process enriching and challenging, and commend the CEP partners, in particular SADC for encouraging an initiative that seeks to create environmental awareness in southern Africa, and SARDC IMERCSA, an IUCN member, for coordinating the development of this report. IUCN is a membership organisation and believes in partnerships. IUCN has over the 50 years of its existence created a web of partnerships between institutions and people to manage and restore ecosystems integrity and protect threatened species.

It is this experience that we will continue to share as we consolidate the CEP partnership to build a sustainable southern Africa.

M. Valli Moosa
President, IUCN-The World Conservation Union

INTRODUCTION

The *Southern Africa Environment Outlook* provides an integrated analysis of southern Africa's environment. It assesses the current state of the environment in the region, and gives a reflection on trends over the past decade and the next one beyond.

The report highlights key emerging environmental issues in southern Africa, and also presents a set of future scenarios for the region. It comes more than 10 years after the first comprehensive *State of the Environment in Southern Africa* published in late 1994, and more than five years after the first report on a single ecosystem, *State of the Environment Zambezi River Basin 2000*.

Process

The preparation of the *Southern Africa Environment Outlook* was based on a wide consultative and participatory process in the region, during which consensus was built around regional perspectives and priorities. The *Outlook* was constructed around a firm data and indicator development process. In particular, regional projects on geographic information systems and on indicator development for environment assessment and reporting were supportive to the process.

Experts from specialised organisations and from national institutions mandated to carry out state of environment reporting were involved in providing inputs, as well as in the review of the manuscript. This ensured regional balance, scientific credibility and comprehensiveness of the report.

This process was coordinated by Communicating the Environment Programme (CEP), which is a long established partnership of the Southern African Development Community (SADC) with IUCN-The World Conservation Union and the Southern African Research and Documentation Centre (SARDC) through the Musokotwane Environment Resource Centre for Southern Africa (IMERCSA).

The *Outlook* benefited from a capacity development process driven by the United Nations Environment Programme (UNEP) through the Africa Environment Information Network (AEIN). Areas covered in the capacity-building initiative included integrated environmental assessment and reporting, policy analysis, scenario building, and data management and analysis.

The process leading to this *Outlook* started in 1998, initially to build the foundation through issues identification, consensus building on the ideal framework to use in the analysis, as well as agreement on the core datasets and indicators to support the analysis.

The research and compilation of data for the various topics started in 2002, and contributors were engaged in 2003 to develop chapters containing data and analysis. Priority was given to research and writing of the manuscript following a CEP partners meeting in October 2003 hosted by SADC in Gaborone. This meeting acknowledged the targets for environmental reporting given in the Regional Indicative Strategic Development Plan (RISDP) and the

fact that 10 years had elapsed since the first regional report.

Although this has been an ambitious undertaking, it was deemed to be a worthy initiative that continues to showcase the results of SADC activities and partnerships.

Ten contributors were engaged to research and write the chapters. The draft manuscript was then reviewed at a regional workshop in South Africa. This gave a cross-section of stakeholders an opportunity to discuss the draft chapters and the structure of the report.

Regional experts also reviewed the chapters in a process that ran parallel to the review workshop. Comments from the regional reviewers and the regional workshop were used to finalise the draft chapters.

The scenarios chapter was developed through a consensus process. A draft chapter was subjected to scrutiny through a workshop during which the plausibility of the presented scenarios was reviewed.

After the extensive consultative process, the technical editor worked with SARDC IMERC-SA to further review and edit the chapters, which were then finally reviewed again by the partners.

Framework

The traditional approach of environmental reporting in the region focused on national boundaries, sectors or natural resources. In this report, the issues are presented in an integrated manner, using the Drivers Pressure State Impact Response (DPSIR) framework.

Drivers and pressures are defined as the root causes of environmental change, and they can be natural or human-induced. The State is a reflection of the current situation and trends over the last decade, while Impacts are the consequences of the environmental change on human and ecological systems, and on social and economic development potential. Responses include national policies, plans, laws and strategies, and regional and global agreements and strategies for cooperation.

The DPSIR framework describes societal developments and natural processes to explain change in environmental state, using appropriate indicators to show trends over time. An analysis of the impact of the various pressures on ecosystems and human welfare in the region is made, and appropriate responses that have been taken to mitigate the impacts articulated. This reflects the importance attached to the sustainable management of natural resources and to the process of regional integration.

The integrated assessment and reporting approach, through the DPSIR framework, answers four questions that are key to effective decision-making. The questions are:

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

Format

The *Southern Africa Environment Outlook* contains nine chapters, which are interlinked as they address the southern African region, its physical environment and the way its people interact with the resources.

Chapter 1 describes the socio-economic and biophysical features of southern Africa as defined by the boundaries of SADC. Key biophysical details, including the region's geographical location in relation to the rest of the world, climate and weather patterns, physical features and ecological zones are described. Also discussed are the socio-economic issues of the region, including population dynamics, poverty, gender, politics and governance, consumer culture, technology and processes towards regional integration, which are all issues of concern to the region's environment. Protocols supportive of the process of regional integration are discussed, and so are recent key developments such as the SADC restructuring process and the Regional Indicative Strategic Development Plan (RISDP). These are discussed in the context of global and continental processes such as the Millennium Development Goals

(MDGs) and the New Partnership for Africa's Development (NEPAD).

Chapter 2 describes the land resources of the region, including its role as a factor for production and livelihoods. Trends associated with land resources are analysed, as well as the politics of land in southern Africa. Key land issues articulated include tenure, access and equity, degradation and desertification, and the impact that the land issues have on food security. Regional policies and reforms on land are covered, including the impact of the Sub-Regional Action Plan (SRAP) in addressing land degradation and desertification.

Chapter 3 covers emerging atmospheric issues that are of regional and global significance, including pollution, climate change and variability, and the ozone layer. Climatic features whose occurrences are based on atmospheric developments, such as drought and floods, are also discussed. The chapter follows and analyses global and regional protocols formulated to address atmospheric issues.

Chapter 4 describes the region's freshwater resources, their distribution, and availability. Demand for water, including competing uses, particularly between domestic, agriculture and industry, are discussed. Analysis is made of key freshwater issues in the region, including access, sanitation and pollution. Regional integration through water is also discussed, with particular emphasis on the Regional Strategic Action Plan (RSAP) as a platform for the implementation of the Protocol on Shared Watercourses, and a plan to support Integrated Water Resources Management.

Chapter 5 describes the marine ecological zones and resources of the region, stretching from the coast of Angola and Namibia through Cape Town, Port Elizabeth and Durban, and Mozambique up to Tanzania, as well as the island state of Mauritius. Issues associated with coastal and marine resources are highlighted and these include coastal erosion, over-fishing and pollution, as well as sea-level rise for the islands. Response measures such as the conservation of marine resources through the creation of marine parks and the formulation of regional policies and protocols for the management of marine resources are also discussed.

Chapter 6 covers the forest and woodland resources of the region, their types and uses, and patterns of conservation. Key forest issues in the region, including deforestation and forest conversion are analysed, and also the impact of forest issues on livelihoods, security and economies.

Chapter 7 describes the richness of southern Africa in terms of its wildlife resources. A broad overview is given, of various habitats where wildlife is found in the region. The chapter also covers the cross-cutting issue of biodiversity, as it relates to the region's wildlife resources. The pressures affecting wildlife resources of the region are discussed, through analysing trends and impacts in terms of species loss, rates of extinction and threatened species. Response measures being implemented to mitigate pressures on wildlife resources, such as the global Convention on Biological Diversity, are also discussed.

Chapter 8 describes human settlement patterns common to the region, and key issues associated with them, including waste management, pollution, sanitation, crime, lack of housing, access to services such as roads, electricity and water. Refugee settlements and those for internally displaced people are also covered. The environmental impacts of the various settlement patterns in the region are analysed.

Chapter 9 is a presentation and analysis of trends and scenarios, as they relate to the resources described in the earlier chapters. The chapter gives a 10-year, forward-looking analysis of the way three possible scenarios could play out. The scenarios discussed are Market Forces, Policy Reform, and Fortress World.

Emerging issues have had significant impacts on food security in the region, among other things. The issue of Genetically Modified Organisms (GMO) and the debate around GMO technology is discussed mainly under the

land chapter, as is the regionally significant land reform process. HIV and AIDS is a current cross-cutting issue that is mentioned in most chapters, as it impacts on the region's environmental resources and their management. Efforts have been made to engender the analysis and to present gender disaggregated data.

Target Audience

The envisaged target audience for the *Southern Africa Environment Outlook* includes:

- Decision makers and policy makers at national, regional and sectoral levels, such as ministers, permanent secretaries, legislators, directors and heads of departments;
- Media editors of newspapers, magazines, newsletters, radio and television as well as journalists, particularly those who write about environmental and regional issues;
- Environmental organisations including NGOs, community-based organisations, and environmental specialists and interest groups;
- Educational institutions including teachers and schools (primary and secondary), universities, polytechnics, colleges, teachers associations;
- Private sector such as corporations, trade unions, employers organizations, financial institutions, industries such as mining and tourism;
- Cooperating partners, donors and development agencies;
- People of the South and people of the North.

Call for Action

A key aim of the *Southern Africa Environment Outlook* is to provide policy options for reversing the current environmental degradation trends in southern Africa. The *Outlook* emphasises the need to address environment and development together, as one option for reducing poverty and moving towards a sustainable development path. Of concern to the report is progress towards achieving goals and targets as set out in key continental and global strategies such as the RISDP, NEPAD, Johannesburg Plan of Implementation and the MDGs.

The *Southern Africa Environment Outlook* is the beginning of a long-term process supported by the RISDP, which calls for five-yearly state of environment reports, among other targets. While areas of concern in the region are discussed, the regional assessment and reporting process should continue long after this publication as new approaches and analytical methods continue to evolve, while environmental issues continue to change.

This publication is accessible in full text, searchable format through the Virtual Library for Southern Africa at www.sardc.net which is linked to the SADC website.

Clever Mafuta, Director
Musokotwane Environment Resource Centre for Southern Africa
SARDC IMERCSA

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The contributions made by many individuals and institutions in the preparation of the *Southern Africa Environment Outlook* are acknowledged here.

The *Outlook* was developed over a period of almost 10 years, involving experts in SADC Member States and beyond, and is produced by Communicating the Environment Programme (CEP), a SADC partnership with SARDC and IUCN.

As part of the initial preparation and focusing of the report, 16 experts from the SADC region gathered in 1999 in Harare to identify key environmental issues in southern Africa, and to define a core set of data and indicators to support regular comprehensive assessments and generation of multiple State of Environment products.

That foundation workshop and the entire *Outlook* process benefited immensely from the guidance and inspiration of Bob Kakuyo, then Regional Coordinator for Africa at UNEP.

The methodology draws on the UNEP-driven *Global Environment Outlook* and the *Africa Environment Outlook*, an initiative of African environment ministers, into which it feeds directly. The southern African process benefited from training support by UNEP in areas of integrated environmental assessment and reporting, policy analysis, data management and analysis, and scenarios building.

The CEP partnership acknowledges this valuable training with resource persons provided by UNEP, including Jesper Kofoed, Ojijo Odiambo, Musisi Nkambwe, Bothepa Nkabung and Joseph Opio-Odongo. This training benefited more than 30 people involved in preparation of the *Outlook*, including chapter contributors, reviewers and editors. Among the CEP partners, Tabeth Matiza Chiuta, Bertha Nherera and Cathrine Mutambirwa at the IUCN Regional Office for Southern Africa; Charles Obol, Nthabiseng Majara, Paul Maro and Jobo Molapo from the then SADC Environment and Land Management Sector (ELMS); and later, Stephen Nanthambwe and Nyambe H. Nyambe, the previous and current Environmental Advisers at the SADC Secretariat, and Margaret Nyirenda, the SADC Director for Food, Agriculture and Natural Resources (FANR), provided guidance and made valuable comments on the manuscript.

The vision and input by Arthur Nemakonde, then Head of Statistics at SADC, is also acknowledged in setting the regional data focus at a SARDC-organised workshop on Geographical Information Systems (GIS), which sought to lay the data foundation for state of environment assessment and reporting.

At SARDC, Munyaradzi Chenje initiated the process toward the *Southern Africa Environment Outlook* and provided its operational vision when he was the Director of SARDC's Musokotwane Environment Resource Centre for Southern Africa (IMERCSA) from 1994 up to year 2000. He continued to provide encouragement and support in his new position as the Regional Coordinator for Africa at the Nairobi-based UNEP Division of Early Warning and Assessment (DEWA). He now heads the Global Environment Outlook at UNEP DEWA. Without his vision, dedication and professional abilities, this lengthy process may not have started or been sustained.

Many former SARDC staff contributed to the early stages of the *Southern Africa Environment Outlook*, including Lovemore Sola, Alice Kwaramba, Elton Laisi, Tendayi Kureya, Maria Mutama, Wilson Yule, Matts Kullberg,.Sekai Mubako and Maonei Nyoni.

The coordination of the *Outlook* process was the responsibility of SARDC IMERCSA. Stanley Mubako, CEP Coordinator, and Clever Mafuta, the Director of IMERCSA, played a leading role, working with an energetic team of researchers, writers and editors.

The editorial eye of Leonissah Munjoma kept watch over the organization of the material into a manuscript, while Ronald Chawatama, Egline Tauya and Patricia Mamvoto helped with research for drafting of the chapters. Tafadzwa Ndoro and Wilfred Gondoro provided financial guidance, and the SARDC logistics committee chaired by Dambudzo Jambwa managed the well-organized workshops, with assistance of Runyararo Mutambirwa, Shumirai Govo and Evans Chifamba.

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The Chairperson of the SARDC Board, Ambassador (Professor) Peter Katjavivi, and Board members are a great source of inspiration for their vision and guidance in strengthening partnerships and focus on "research that informs development".

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SADC, through the *Southern Africa Environment Outlook*, has established the basis for environmental reporting under the RISDP goals and targets, and the SADC Executive Secretary, Tomaz Augusto Salomão, has contributed a thoughtful Foreword to this publication.

M. Valli Moosa, the IUCN President and a former environment minister in South Africa, has commended the process and partnership in his Preface, saying this will advance ecological governance in the region and help to strengthen UCN as a membership organisation. The CEP partners appreciate his support in this regard.

The *Southern Africa Environment Outlook* would not have been possible without the support of our cooperating partners. We must thank UNEP and Belgian Technical Cooperation for funding this initiative, as well as the Governments of Belgium, Ireland, Netherlands and Norway, the UNEP Environment Fund and the UN Development Fund who supported the process through the Africa Environment Information Network. The Department of Environment Affairs and Tourism (DEAT) in the Ministry of Environ-ment and Tourism of South Africa supported the Indicators development process through their cooperation programme with the Government of Norway, and the Director, Rudi Pretorius, is a source of encouragement and inspiration.

There were many organizations and individuals who contributed directly and indirectly to this process. While every effort has been made to acknowledge their input, it may be that not everyone has been credited by name. Please accept this as acknowledgement of your role in this importance process. The editors, while sharing credit with this extensive team of participants, accept full responsibility for the contents.

C. Mafuta, L. Munjoma, S. Mubako

ACRONYMS

ADMADE	Administrative Design for Game Management Areas
AEIN	Africa Environment Information Network
AEO	Africa Environment Outlook
AIDS	Acquired Immune Deficiency Syndrome
AIJ	Activities Implemented Jointly
AU	African Union
CAMPFIRE	Communal Areas Management Programme For Indigenous Resources
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resources Management
CCD	Convention to Combat Desertification
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDM	Clean Development Mechanism
CFCs	Chlorofluorocarbons
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CMS	Convention on the Migratory Species of Wild Animals
COP	Conference of the Parties
COSTECH	Commission on Science and Technology
CSIR	Council for Scientific and Industrial Research (SA)
DEAT	Department of Environment Affairs and Tourism (SA)
DMC	Drought Monitoring Centre
DRFN	Desert Research Foundation of Namibia
DRC	Democratic Republic of Congo
EEZ	Exclusive Economic Zone
EFR	Estuarine Flow Requirements
EIA	Environmental Impact Assessment
EIS	Environmental Information Systems
ENSO	*El Nino* Southern Oscillation
FAO	Food and Agriculture Organisation
FDI	Foreign Domestic Investment
FFA	Framework For Action
GDCF	Gross Domestic Capital Formation
GDP	Gross Domestic Product
GEO	Global Environment Outlook
GIISP	Global Invasive Species Programme
GMO	Genetically Modified Organism
GNS	Gross National Savings
GWP	Global Water Partnership
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council (SA)
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICLEI	International Council for Local Environmental Initiatives
ICT	Information Communication Technologies
ICSU	International Council of Scientific Unions
IDPs	Internally Displaced People/ Persons
IFR	Instream Flow Requirements
IMERCSA	I Musokotwane Environment Resource Centre for Southern Africa
IOTC	Indian Ocean Tuna Commission
IPCC	Inter-Governmental Panel on Climate Change

IPPC	International Plant Protection Convention
ITCZ	Inter-Tropical Convergence Zone
IUCN	The World Conservation Union
IWRM	Integrated Water Resources Management
LIFE	Living in a Finite Environment
LME	Large Marine Ecosystems
MAR	Mean Annual Runoff
MCS	Monitoring Control and Surveillance
MDGs	Millennium Development Goals
NEPAD	New Partnership for Africa's Development
NGO	Non Governmental Organisation
ORASECOM	Orange-Senqu Commission
PCN	Project Concept Notes
RDC	Rural District Council
REEC	Regional Environmental Education Centre
RETOSA	Regional Tourism Organisation of Southern Africa
RFB	Regional Fisheries Body
RISDP	Regional Indicative Strategic Development Plan
RSAP	Regional Strategic Action Plan
SABSP	Southern Africa Biodiversity Support Programme
SACU	Southern Africa Customs Union
SADC	Southern African Development Community
SADC FANR	SADC Food, Agriculture and Natural Resources
SAEO	Southern Africa Environment Outlook
SAPP	Southern African Power Pool
SARCOF	Southern Africa Regional Climate Outlook Forum
SARDC	Southern African Research and Documentation Centre
SEACAM	Secretariat for Eastern Africa Coastal Area Management
SEAFO	South East Atlantic Fisheries Organisation
SETU	SADC Environment Technical Unit
SIRDC	Scientific Industrial Research and Development Centre (Zim)
SLSA	Sustainable Livelihoods in Southern Africa
SOI	Southern Oscillation Index
SPGRC	SADC Plant Genetic Resource Centre
SST	Sea-Surface Temperatures
SRAP	Sub-Regional Action Programme
SWIOFC	Southwest Indian Ocean Fisheries Commission
TBNRM	Trans-Boundary Natural Resources Management
TFCA	Trans Frontier Conservation Areas
UNCCD	UN Convention to Combat Desertification
UNCHS	UN Centre for Human Settlements (Habitat)
UNDP	UN Development Program
UNEP	UN Environment Program
UNFCCC	UN Framework Convention on Climate Change
WDM	Water Demand Management
WHO	World Health Organisation
WMO	World Meteorological Organisation
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation
WWF	World Wide Fund (for Nature and Natural Resources)
ZACPLAN	Zambezi River Basin System Action Plan
ZAMCOM	Zambezi River Commission
ZIMOZA	Zimbabwe, Mozambique and Zambia

COMMON AND SCIENTIFIC NAMES

Common Name	Scientific Name
Abalone	*Haliotis midae*
Anchovy	*Engraulis encrasicolus*
African blackwood	*Dalbergia melanoxylon*
African chewing gum	*Azanza garckeana*
African mahogany	*Khaya anthotheca*
African penguins	*Spheniscus demersus*
African star chestnut	*Sterculia africana*
Atlantic little	*Euthynnus alletteratus*
Baobab tree	*Adansonia digitata*
Beds of kelp	*Ecklonia maxima*
Bloodwood or African teak	*Pterocarpus angolensis*
Benguela hake	*Merluccius polli*
Blackbacked jackals	*Canis mesomelas*
Brown ivory	*Berchemia bark*
Buffalo throne	*Ziziphus* species
Cape vultures	*Gyps coprotheres*
Caracals	*Felis caracal*
Cape horse mackerel	*Trachurus trachurus*
Cape rock lobster	*Jasus lalandii*
Chub mackerel	*Scomber japonicus*
Cichlids	*Haplochromines*
Common rye	*Setaria palustris*
Copalwood	*Guibourtia coleosperma*
Crozet shag	*Phalacrocorax [atriceps] melanogenis*
Cunene horse mackerel	*Trachurus trecae*
Eastern rockhopper penguin	*Eudyptes chrysocome filholi*
Fever tree	*Parinari curatefollia*
Frigate	*Auxis thazard*
Gentoo penguin	*Pygoscelis papua*
Guinea grass	*Panicum maximum*
Gum trees	*Eucalyptus* species
Humpback whale	*Megaptera novaeangliae*
Micro-frog	*Microbatrachella capensis*

Common Name	Scientific Name
Liex	*Illex mitis*
King protea	*Protea cynaroides*
Maroela	*Sclerocarya birrea*
Mopane	*Colophospemum mopane*
Monkey-orange/Bitter-berry	*Strychnos mellodora*
Mountain albizia	*Albizia brevifolia*
Mountain cypress	*Widdringtonia nodiflora*
Mulanje cedar	*Widdringtonia nodiflora*
Msasa	*Brachystegia spiciformis*
Pelagic goby	*Sufflogobius bibarbatus*
Pepper bark tree	*Warburgia salutaris*
Pilchard	*Sardinella* species
Piscivorous fish	*Loligo reynaudii*
Pod mahogany	*Afzelia quanzensis*
Round herring	*Etrumeus whiteheadi*
Sardine	*Sardinops sagax*
Savannah Dwaba-berry	*Friesodielsia abovata*
Scented thorn	*Acacia nilotica*
Sickle bush	*Dichrostachys cinerea*
Skipjack	*Katsuwonus pelmis*
Small-fruited waterberry	*Syzigium masukuense*
Smooth creeping milkweed	*Euphorbia inaequilatera*
Spiny monkey orange	*Strychnos spinosa*
Tsetse fly	*Glossina* species
Syringa	*Melia azedarach*
Tamarind	*Tamarindus indica*
Velvet corkwood	*Commiphora mollis*
Water hyacinth	*Eichhornia crassipes*
White mulberry	*Morus alba*
White syringa	*Kirkia acuminata*
White thorn	*Acacia polyacantha*
Yellowfin	*Thunnus albacares*
Wild loquat	*Uapaca kirkiana*
Zambezi redwood	*Baikeaea plurijuga*

Southern Africa **Map 0.1**

SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, p xvii, 2002

REGIONAL OVERVIEW 1

Southern Africa is richly endowed with abundant agricultural, mineral and other natural resources. The region covers a total area of almost 10 million sq km, of which approximately 25 percent is arable land.[1] Consequently, agriculture plays a major part in the region's economy, contributing 35 percent of Gross Domestic Product (GDP). About 70 percent of the region's population depend on land for food, income and employment.[2]

Two distinct, over-riding trends have characterised the region's state of the environment since the 1970s.

One is the human condition that has been and continues to be threatened by imbalances in the production and distribution of goods and services, with the majority of the population living in conditions of poverty, despite the region being richly endowed with natural resources. The differential progression in extremes of wealth and poverty threatens the stability of not only human existence, but also the region's environment.

The second trend is that the region is undergoing accelerated change with environmental management lagging behind economic and social development. Environmental management trends are being overtaken by the pace and magnitude of population growth and social development.

M Murasa, SARDC

The symbiotic relationship between people and the environment, which traditionally characterised the region in the not-so-distant past, has been eroded with the passage of time and the introduction of new technologies brought about by modernisation and the integration of the region's economy into the global economy.

Thus, people are benefiting more than the environment.

The region's population grew from 136 million in 1994 (excluding countries that joined SADC after 1994) when the annual growth rate was estimated at three percent,[3] to almost 220 million in 2004[4] due to natural growth and the addition of new SADC members: Mauritius in 1995, the Democratic Republic of Congo (DRC) and Seychelles in 1997. Seychelles withdrew its membership of SADC in 2004, while Madagascar became a member in August 2005, thus adding almost 17 million people to the SADC population.

A critical social factor with drastic impacts on the region's population dynamics and the environment is the HIV and AIDS pandemic. Southern Africa has the highest recorded HIV infection rates in the world. Many countries of the region are experiencing infection rates of above 20 percent among the economically active population. The HIV and AIDS pandemic can undermine most of the hard-won development gains of the past 50 years.[5] This includes losses of human resource capacity across key sectors such as health and education, and a sharp decline in life expectancy. UNAIDS estimated that the reduction in real

output caused by HIV and AIDS a decade ago was already 2.5 percent of annual GDP in some countries.[6]

The demographic profiles of southern African countries are being systematically changed by HIV and AIDS due to adult mortality, which has doubled since 1994. There is also a reversal of falling trends in mortality among under-fives caused by increasing levels of mother-to-child transmission of HIV.

Environment is a key issue in SADC. All member states have acceded to some or all of the following Multilateral Environmental Agreements:

- UN Framework Convention on Climate Change;
- UN Convention to Combat Desertification;
- UN Convention on Biological Diversity;
- Basel/Bamako Convention;
- Persistent Organic Pollutants; and,
- Ramsar Convention.[7]

In addition, a number of environment-related protocols have been signed at the regional level, notably on fisheries, forestry and wildlife, mining and the Revised Protocol on Shared Watercourses. The Revised Protocol on Shared Watercourses was known as the Protocol on Shared Watercourse Systems when it was first signed in 1995 before revision, signing and subsequent ratification in 2003.[8]

BIOPHYSICAL FEATURES

In the context of this publication, southern Africa covers the member states of SADC – Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe. This includes 12 continental countries in Africa south of the Equator and two island states, Madagascar andMauritius. Madagascar was accepted as a full member of SADC in 2005.
.

Madagascar was therefore not included fully in this process, but available data has been used where possible. The SADC region is as shown in Map 0.1.

Topography

Southern Africa consists largely of an extensive inland plateau, the Great African Plateau, which rises 900m above sea level, and is surrounded by narrow coastal lowlands in the west and south, and a broad lowland area in the east.[9] The Kgalagadi Basin covers much of the western part of the plateau, extending from the Orange River in South Africa to the southern DRC.

Other distinctive features of the region are the eastern and western Rift Valley networks. The eastern Rift bisects Tanzania and continues to the northeast through Kenya, while the western Rift runs from Lake Edward in Uganda south through Lake Tanganyika and Lake Malawi/Nyasa to the mouth of the Zambezi River on the east coast, north of Beira in Mozambique. Less distinctive branches of the western Rift also extend along Luangwa and the middle Zambezi Valley to the southern margins of the Okavango Delta in Botswana.[10]

South of the Limpopo River, the topography of southern Africa varies widely, ranging from sea level in Mozambique to about 2,300m in the mountainous region of the Drakensberg Mountains in South Africa.[11] Most of this part of the region consists of undulating terrain between ranges of hills and mountains. Other prominent topographical features south of the Limpopo River include the Magaliesberg and the Witwatersrand ridges and the Waterberg Plateau.

In Mozambique the terrain is gently undulating, largely consisting of alluvial plains. A continuous belt of coastal sands of varying width occurs adjacent to the coast except at the mouth of rivers. The eastern border of these coastal sands is characterised by a series of high dunes generally parallel to the coast, which normally attain their highest elevations just inland of the high water mark.

In Mauritius, which is 2,400 km off the south-east coast of Africa, ancient volcanic

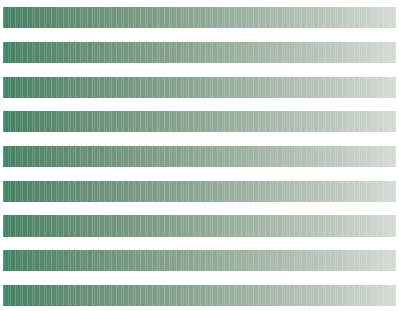
activity left its mark on the island's landscape. The central plateau reaches a height of 580m bordered by four mountains, while coral reefs surround most of the coast except the south.

Climate

The southern African climate varies spatially from arid in the west through semi-arid and temperate areas in central zones to semi-arid in the east, with a few sub-humid pockets in the central regions. Closer to the equator in Angola, DRC and coastal Tanzania, the climate is largely humid.

The climate of the region is influenced by air masses of different origins.[12] Three prevailing wind systems have a strong influence on the region's climate, and these are the sub-tropical eastern continental moist maritime (with regular occurrence of cyclones); the south-easterly wind systems that bring rainfall from the Indian Ocean (including Mauritius); and the Inter-Tropical Convergence Zone (ITCZ).

Southern Africa's climate during the last century has been characterised by oscillating wet and dry decades, with droughts occurring in



In 1999-2000, Cyclone Eline hit the region with widespread flooding that devastated large parts of southern and central Mozambique, south-eastern Zimbabwe, parts of South Africa and Botswana.

These recent wet and dry spells have been linked to oscillations in temperature of the southern oceans and the *El Niño* phenomenon.

Rainfall patterns in the region change from winter rainfall in the Cape to a single summer rainfall season in the sub-tropics, and a dual rainy season close to the equator in parts of DRC and the northern half of Tanzania. Mean annual rainfall varies from less than 100 mm on the west coast to more than 1,800 mm in the eastern regions. However, most of the region receives less than 600 mm per year and thus falls within the semi-arid to arid category.[14]

Southern Africa's temperatures depend on altitude. Seasonal variations of the mean monthly temperatures are small, with the general pattern of daytime temperatures between 25-30 degrees Celsius.[15] The coolest months are generally June and July, while October and November are the warmest.

Soils

Soils in the region are closely tied to the geological substrate modified by climatic weathering processes, particularly moisture regimes.

The soils are generally derived from ancient nutrient-poor formations. Dominant soil types within southern Africa, in terms of area, are (according to the FAO soil classification scheme):

- *arenosols* covering the Kalahari basin;
- *acrisols* that cover much of the Sudano-Zambezian savanna (the plateaus of Tanzania, Zambia, Malawi and northern Mozambique); and
- *alluvisols* and *ferralsols* that cover much of Zimbabwe and Mozambique. These soils, which cover 66 percent of the region, are poor and generally not suited for cultivation.[15]

This explains the increasing demand by farmers in the region to adopt far more industrial (notably chemical and water-intensive) practices, which come with environmental as well as social costs, as they seek to produce more food. Fertilisers and other chemicals are washed off into the region's inland water bodies and the seas, starving water life of oxygen and polluting the limited freshwater sources.

Less dominant soils include *vertisols* found in Transvaal and parts of Natal in South Africa, southern Mozambique and in the south and east of Zimbabwe, as well as volcanic ash soils found in northern Tanzania.

Southern African Ecozones **Map 1.1**

SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, p 182, 2002

Vegetation

Of the 20 *phytochorial* regions (broad areas with similar suites of plant species) in Africa defined by White,[16] 10 occur within southern Africa.

The smallest *phytochorial* region is the Cape regional centre of endemism. The others are:

- Afro-montane regional centre of endemism;
- Zambezian region;
- Guinea-Congolia/Zambezi transition zone;
- Zanzibar-Inhambane regional mosaic;
- Kalahari regional transition zone;
- Karoo-Namib regional centre of endemism;
- Somali-Masai;
- Lake Victoria regional mosaic; and,
- Tongoland-Pondoland regional mosaic.

The environment of southern Africa has also been defined in terms of ecozones.[18] The region is divided roughly into eight ecozones and a ninth transitional zone:[19]

- Lowland tropical forest;
- Afromontane and temperate forest;
- Grassland;
- Savanna;
- Nama-karoo;
- Succulent karoo;
- Desert;
- Fynbos; and,
- Transition of forest and savanna.

SOCIO-ECONOMIC PROFILE

The human context, be it political, social or economic, has both direct and indirect impact on the environment. Southern Africa has undergone major social, economic and political transformations during the past 30-40 years. At the root of political transformation was the transition by most of the countries from colonialism to independence starting in 1960, and the removal and replacement of the apartheid system in South Africa with majority rule in 1994.

Socio-economic transformation was and is still driven largely by the need to combat poverty, which is too high at roughly 40 percent of the population.

Regional, continental and global context

Socio-economic developments in SADC are often facilitated through engagement in processes at the continental and global levels, such as the UN Millennium Development Goals (MDGs) and the African Union's New Partnership for Africa's Development (NEPAD), as well as within the region through SADC's Regional Indicative Strategic Development Plan (RISDP). These processes are interlinked as each one of them addresses common issues such as poverty and environmental degradation.

At the global level, the Millennium Declaration adopted by world leaders at the UN Millennium Summit in September 2000, set the development agenda. The declaration sets out eight goals that commit countries, rich and poor, to eradicating poverty, promoting human dignity and equality as well as achieving peace, democracy and environmental sustainability. (See Box 1.1) For each goal, targets have been set, most for 2015, using 1990 as the benchmark.

These MDGs are embraced by the AU through NEPAD, and by SADC within its 15-year blueprint for regional development, the RISDP.

In 2002, the Organisation of African Unity transformed into the African Union (AU), shifting its development agenda from a predominantly political mandate towards a more economic paradigm. The AU, which has brought with it a new impetus towards the African Economic Community as envisaged in the Abuja Treaty of 1991, adopted a multi-dimensional economic development framework, NEPAD. This recognises the various dimensions of development, ranging from environmental, economic, political, security, to other social issues.

SADC is one of the building blocks of the AU and the African Economic Community.

SADC's regional development plan is the RISDP, whose core focus is on poverty reduc-

Millennium Development Goals **Box 1.1**

There are eight Millennium Development Goals (MDGs). For each goal one or more targets have been set, most for 2015, using 1990 as a benchmark.

- **Eradicate extreme poverty and hunger**
  - Target 2015: Halve the proportion of people whose income is less than one dollar a day, and Halve the proportion of people who suffer from hunger.
- **Achieve universal primary education**
  - Target 2015: Ensure that all girls and boys will be able to complete primary school.
- **Promote gender equality and empower women**
  - Target 2005, 2015: Eliminate gender disparity in primary and secondary education preferably by 2005, and all levels of education no later than 2015.
- **Reduce child mortality**
  - Target 2015: Reduce by two-thirds the mortality rate of children under five.
- **Improve maternal health**
  - Target 2015: Reduce by three-quarters the ratio of women dying in childbirth.
- **Combat HIV and AIDS, malaria and other diseases**
  - Target 2015: Halt and begin to reverse the spread of HIV and AIDS, and the incidence of malaria and other major diseases.
- **Ensure environmental sustainability**
  - Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.
  - Target 2015: Reduce by halve the proportion of people without access to safe drinking water.
  - Target 2020: Achieve significant improvement in the lives of at least 100 million slum dwellers.
- **Develop a global partnership for development**
  - Develop an open, rule-based, predictable, non-discriminatory trading and financial system that includes a commitment to good governance, development and poverty reduction – nationally and internationally.
  - Address the special needs of the least developed countries, and landlocked and small island developing states.
  - Deal comprehensively with the debt problems of developing countries.
  - Develop decent and productive work for youth.
  - In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.
  - In cooperation with the private sector, make available the benefits of new technologies – especially information and communications technologies.

Source www.undp.org

tion, with sustainability rooted in the development of infrastructure. The RISDP is a regional framework for integration and development, setting the priorities, policies and strategies for achieving the long-term goals of SADC. It is intended to guide member states, SADC institutions, regional stakeholders and international cooperating partners in the process of deepening integration, thus turning the community's vision into reality.

The RISDP identifies key intervention areas, which are divided into two main groups, cross-sectoral intervention areas and sectoral intervention areas, as follows:

Cross-sectoral intervention

- poverty eradication;
- combating HIV and AIDS pandemic;
- gender equality and development;
- science and technology;
- information and communications technology;
- environment and sustainable development;
- private sector development; and
- statistics.

Sectoral cooperation and integration intervention

- trade/economic liberalization and development;
- infrastructure support for regional integration and poverty eradication;
- sustainable food security; and
- human and social development.

The SADC strategic plan clearly embraces NEPAD and the MDGs, and sets goals and targets for each of the intervention areas over the next 15 years. Nine targets have been identified for environment and sustainable development as shown in Box 1.2.

Target 3 of the RISDP is to ensure that "State of Environment Reports for Southern Africa are produced regularly at intervals of five years."[20]

SADC countries identify environment and sustainable development as a key development objective as shown in policy documents, notably the SADC Treaty of 1992.

Environment and sustainable development targets of the RISDP **Box 1.2**

- Legal instrument for regional cooperation in environment and natural resources finalised by 2006.
- Environmental standards and guidelines developed and being implemented by 2008.
- State of environment reports for southern Africa produced regularly at intervals of five years.
- The strategy and programme for the management of the Brown Environment in southern Africa, finalized and being implemented by 2005.
- Finalisation of strategy and programme for management of the Brown Environment in southern Africa.
- Adoption of environment-responsive planning and implementation processes, regular environment and sustainable development capacity-building and training programmes by 2007.
- Implementation of at least 50 percent of the transboundary natural resources management programmes and projects in line with NEPAD, initiated by 2008.
- SADC plan of action for implementation of the Johannesburg Plan of Action (2002 WSSD) developed by 2004 and specific programmes and projects emanating from the plan developed by 2005.
- Principles of sustainable development integrated into country policies and programmes and reverse the loss of environmental resources by 2015.

SOURCE SADC, *Regional Indicative Strategic Development Plan,* 2004

Member states, individually and as a region, have shown commitment to environmental management as demonstrated by their accession to and implementation of various UN environment conventions, as well as SADC protocols on key natural resources in the region.

Despite progress and commitment to environmental management, the region continues to experience considerable levels of land degradation, deforestation, loss of biodiversity, inadequate access to clean water and sanitation facilities, and poor urban conditions. These conditions can be attributed to challenges such as poverty, HIV and AIDS, armed conflict and political instability. It therefore comes as no surprise that SADC places high priority on these and other challenges in its 15-year blueprint, the RISDP.

Population

The region's population has more than doubled since 1970, and has grown from 136 million (176 million if new SADC members are included) in 1994 to almost 220 million in 2004.[21]

Despite the rapid population growth, southern Africa remains under-populated by global standards. The average population density of southern Africa is 21.6 persons per sq km[22] compared to the world average of 44.2 per sq km.[23] However, wide variations occur between and within countries. Mauritius has the highest population density in the region at 556 people per sq km, while Namibia, which is predominantly desert, has 1.9 people per sq km, the lowest population density in the region.[24]

The former SADC Environment and Land Management Sector (ELMS) noted in 1991 that the increasing population was multiplying the effects of all environmental problems in the region.[25] Then, the population was growing at an average annual rate of three percent. Currently the region's population is growing at an average rate of 2.6 percent per year, albeit with wide variations – population growth rates in Zambia and Zimbabwe are among the highest, at around three percent compared to Mauritius' 1.2 percent.[26]

Southern Africa's demographic profile is largely the same as reported in the 1994 *State of the Environment in Southern Africa,*[27] in which the majority of the region's population was of child-bearing age or younger. However, the same age group is currently at the highest risk of HIV infection. Available statistics show that more than 10 million people in the region live with HIV and AIDS. Fertility rates have been on the decline in southern Africa during the last couple of decades which could be due to the impact of HIV and AIDS, and the prevalence of contraceptive use. Average fertility rates for the region declined from 6.2 in 1970 to 4.8 in 1998.[28] In

Environment and Sustainable Development Objectives of the RISDP **Table 1.1**

Objectives	Strategies	Measures
Development of legal framework to promote regional cooperation of all issues relating to environmental and natural resources.	Develop a SADC Protocol on environment. Harmonization of national environmental policies and legal frameworks. Develop a regional programme and strategy on Brown Environment.	Harmonise national environmental policies and a regional Protocol. Develop collaborative mechanisms for exchange of environmental information. Capacity building and training on pollution and waste arising from urbanization and industrialization. Develop projects on pollution control, industrial and domestic waste management. Ratify relevant MEAs and regional instruments on environmental management and develop regional and national action plans.
Promote environmental responsiveness of all SADC programmes to ensure sustainable development.	Compliance to Multilateral Environmental Agreements (MEAs) and regional instruments on environment. Development of SADC Plan of Action for the implementation of 2002 WSSD agreements. Establishment of environmental standards and guidelines across all directorates and programmes. Promotion of environmental awareness among resource users.	Facilitate Member States' capacity-building in negotiations and implementation of MEAs Formulate specific programmes and projects. Environmental impact assessment of existing and planned programmes. Strengthen environmental education in all sectors.
Mobilise and coordinate resources for environmental and transboundary natural resources management programmes.	Catalysing and creating opportunities for the other areas of cooperation to become creative and innovative.	Develop new partnerships and consolidate old ones with international institutions including secretariats of various MEAs.
Assessment and reporting of trends in environmental conditions.	National and regional State of Environment reporting.	Harmonize environmental information systems. Develop capacities in environmental assessments, and reporting. Facilitate national and regional state of the environment reporting. Develop and harmonise sector-specific environment and sustainable development tools.
Ensure mainstreaming of environmental and sustainable development issues into all sectoral policies, programmes and activities at national and regional level.	Capacity building and training in environment and sustainable development and in trade related concerns. Environmental auditing and impact assessment.	Develop and conduct training programmes in environment and sustainable development. Update and harmonize environment guidelines.

SOURCE SADC, *Regional Indicative Strategic Development Plan*, 2004

Programme areas for NEPAD's Environment Action Plan **Box 1.3**

- Combating land degradation, droughts and desertification
- Conserving Africa's wetlands
- Prevention, control and management of invasive alien species
- Conservation and sustainable use of marine, coastal and freshwater resources
- Combating climate change in Africa
- Cross-border conservation and management of natural resources.

SOURCE NEPAD Action Plans for the Environment, 2003

addition, infant mortality rates, which had been declining prior to 1995, are beginning to increase as shown in Table 1.2, and this is attributed to HIV and AIDS.

High poverty levels and declining economic conditions in most countries of the region have resulted in sustained rural-urban migration as the economically active migrate to the urban areas in search of employment and perceived economic opportunities.

About 60 percent of the region's population of almost 220 million (2004)[29] lives in the rural areas although the rate of urbanisation is increasing. The rural-urban drift leaves the elderly and the youth in the rural areas where, because of depressed economic circumstances, they rely increasingly on the natural resource base; while in the urban areas services such as sewage reticulation, refuse removal and urban transport become overburdened. Figure 1.1 shows population growth trends in the rural and urban areas.

Gender

Women make up 52 percent of the total SADC population yet control less than one-third of all decision-making positions in most countries. As a result of limited access to key means of production, women constitute the majority of the poor in the region. The SADC RISDP says that in order for the region to achieve its poverty reduction and eradication objectives, its policies and strategies should address the various gender gaps

South African Tourism

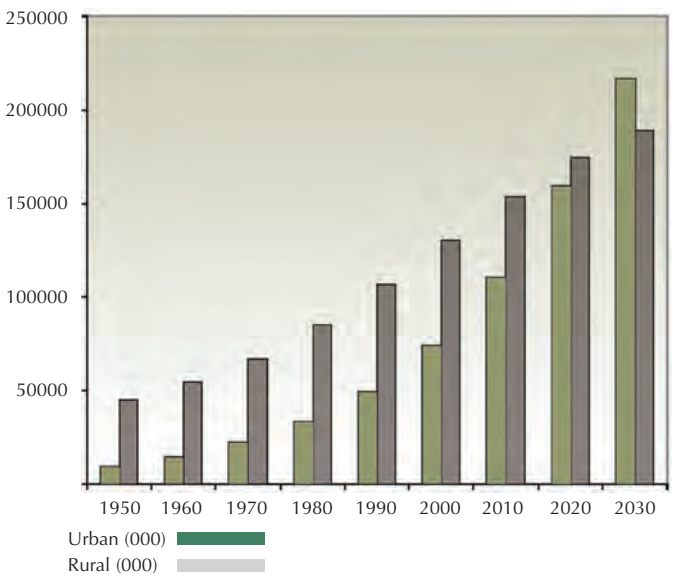
Major cities have become an attraction for people in the region as these are perceived as offering economic opportunities including employment.

Infant Mortality Rates (per 1,000 live births) in the SADC Region, 1995-2005 **Table 1.2**

Country	1995	2000	2001	2002	2003	2004	2005
Angola	126	141.7	140.3	138.3	137.0	135.3	133.5
Botswana	68.8	51.7	51.3	51.0	49.3	47.6	45.9
DRC	62.2	124.5	121.5	118.5	117.3	116.1	114.9
Lesotho	105.2	67.7	67.1	66.5	64.9	63.4	61.8
Malawi	144.4	114.1	112.4	110.8	109.2	107.5	105.9
Madagascar	103.5	82.21	80.5	78.8	77.3	75.8	74.3
Mauritius	19.8	16.1	15.6	15.0	14.8	14.5	14.3
Mozambique	135.8	105.7	103.3	100.9	98.9	96.8	94.8
Namibia	80	45.9	44.9	43.8	42.4	40.9	39.5
South Africa	56.4	42.7	42.7	42.7	41.9	41.2	40.4
Swaziland	83.8	73.5	73.3	73.1	71.2	69.4	67.5
Tanzania	83.4	104.5	104.5	104.4	104.3	104.2	104.2
Zambia	108.9	96.4	95.7	95.1	93.7	92.4	91.0
Zimbabwe	67.4	59.6	61.0	62.0	61.6	60.9	60.2

SOURCE African Development Bank, *ADB Statistics Pocketbook 2006*

Rural and Urban Population in Southern Africa, 1950-2030 **Figure 1.1**



SOURCE SADC/IUCN/SARDC, *Reporting the Southern Africa Environment 1998*

that exist across the southern African society. *Beyond Inequalities: Women in Southern Africa* (2000) identifies the following as key issues for women that impact on the environment:[30]

- lack of access to and control over land;
- lack of access to financial resources;
- lack of access to skills, education, technical training and information;
- lack of access to and control over appropriate technology;
- demand on time and energy;
- lack of empowerment at the national, local and household levels;
- vulnerability to diseases;
- lack of power and decision-making;
- the gender dimension of domestic migration and displaced persons status; and
- gender discrimination in the labour market.

Issues of gender equality became prominent in southern Africa in the mid-1990s during preparations for the Fourth World Conference on Women, in Beijing, China, in 1995. Women in the SADC region then took the initiative to bring together governments and the non-governmental sector in a collaborative process that led to the signing of the SADC Declaration on Gender and Development, and the subsequent Addendum on the Prevention of Violence Against Women and Children. SADC Heads of State and Government signed these Declarations in 1997 and 1998 respectively, and established a Gender Unit at the SADC Secretariat in Botswana.

P Wade

Women constitute the majority of the region's population and yet they have little control over resources.

The declarations commit SADC countries to:

- achieve at least 30 percent representation of women in political and decision-making structures by 2005 (later increased by Summit to 50 percent);
- promote women's full access to and control over productive resources to reduce poverty;
- repeal and reform laws, amend constitutions and change social practices which discriminate against women; and
- take urgent measures to prevent and deal with the increasing levels of violence against women and children.

Due to factors such as urbanisation, gender roles and responsibilities are changing. More women are now in decision-making positions that traditionally have been dominated by men. In all countries of the region, appropriate gender machineries have been put in place, mainly at government level. Their effectiveness, however, varies from country to country.

Only two countries, South Africa and Mozambique, reached the minimum 30 percent women's representation in parliament before 2005. As of 2005, South Africa had 32.8 percent women parliamentarians while Mozambique had 33 percent.[31] Mozambique was the first country in the SADC region to appoint a woman Prime Minister, in early 2004, followed by Zimbabwe where a woman Vice President was appointed in late 2004, and in South Africa in 2005.

Research has shown that women, particularly those in the rural areas, are the managers for the natural resources, including soil, water and forests.[32] Gender and the natural environment are crosscutting issues that cannot be seen in isolation from one another nor from broader social implications such as health, economics or legal rights, as noted in the book, *State of Environment Zambezi Basin*

2000. Key gender issues that impact on the environment are related to access and ownership of resources.

Economy

For most economies to grow, they must utilise natural resources from the environment. In southern Africa, agriculture and mining make significant contributions to the region's economies, as shown in Table 1.3. In 2002, SADC countries had a combined GDP of US$226.1 billion.[33] Although all SADC countries are generally classified as developing economies, the individual member states are at varying stages of development. Socio-economic growth and development across the region's economy are heterogeneous, with some countries attaining high growth rates and others achieving very low growth rates.

South Africa, the largest economy in southern Africa and in the whole of Sub-Saharan Africa, accounts for two-thirds of the SADC GDP. The next largest are Angola and Tanzania each with 6.1 percent of combined GDP. Table 1.4 gives a country-by-country share of the region's GDP.

SADC countries registered an average GDP growth rate of 3.2 percent for the year 2002. Although the economic growth rate was higher than in the previous three years, the region is still far below the target of seven percent identified in the RISDP as the minimum needed to achieve the millennium goal of halving the proportion of people living on less than US$1 a day by 2015.

Since 1994, SADC's average economic growth rate has fluctuated from year to year, recording a high of five percent in 1996 and a low of one percent in 1998. Countries that have consistently achieved high growth rates in recent years are Angola, Botswana, Mauritius, Mozambique and Tanzania. However, only Angola and Mozambique surpassed the seven percent minimum growth target in 2002, registering 13.8 percent and 8 percent, respectively. Most countries would need to at least double their current growth levels if they are to meet the poverty goal.

SADC's average per capita income, measured as the Gross National Income (GNI), of US$1,563 recorded in 2002 belies reality. This is because of the wide variations that exist at the national level. Mauritius has the highest GNI per capita of US$3,830 followed by Botswana (US$3,100) and South Africa (US$2,820), while on the lowest end the DRC has US$80, Malawi (US$160), Mozambique (US$210) and Tanzania (US$320).[34] The rest are in between.

Structure of the economy

Southern Africa's economy is largely dependent on natural resources with the major economic activities being agriculture, mining, manufacturing and tourism. This condition is due to the fact that the region is largely underdeveloped and as a result the economy depends more on natural resources than secondary and tertiary sectors, putting high pressure on the environment.

On average, agriculture and mining contribute over 50 percent of total GDP.[35] Only Mauritius and South Africa have sizeable manufacturing sectors of approximately 25 percent of GDP, while in Zimbabwe, which used to be among the countries with a significant manufacturing base, the sector has contracted on the back of the current economic downturn.

In addition to having a small manufacturing sector, production in most SADC countries is quite similar, and driven by agriculture, for instance, in processing of food products (maize meal, cooking oil, dairy products, textiles and beverages). South Africa and Zimbabwe have significant mineral-resource-driven industries.

Fluctuations in the agriculture sector over the last decade, caused by natural disasters such as drought and flooding, have contributed significantly towards destabilising the SADC economy, resulting in erratic GDP growth.[36]

Agriculture

Major crops produced for the local market and for export include tobacco, cotton, maize, sugar, tea and coffee. Livestock pro-

Sectoral GDP Contribution in SADC for Agriculture and Mining **Table 1.3**

Year	Angola	Botswana	DRC	Lesotho	Madagascar	Malawi	Mauritius	Mozambique
1999								
GDP at current prices	16 987	21 523.7	51 824	5 564.9	3 721.29	82 168.2	107 749	50 827 306
Agric as % of GDP	6	3	52.1	15.7	28.6	36.8	5.99	29.6
Mining as % of GDP	67.1	31.1	7.4	0.1		1.3	0.14	0.3
2000								
GDP at current prices	90 502	24 943.1	297 065.5	5 963.7	3 877.68	105 850.5	119 529	56 917 356
Agric as % of GDP	5.7	2.7	49.4	16.8	27.7	4.92	6.84	24.1
Mining as % of GDP	67.3	33.6	10.3	0.1		0.18	0.14	0.36
2001								
GDP at current prices	194 680	28 636.5	1 407 545	6 608.9	4 529.57	131 740.4	132 092	71 134 759
Agric as % of GDP	8.6	2.6	58.7	16.5	24.7	4.02	7.2	24.1
Mining as % of GDP	58.1	35.2	7.3	0.1		0.16	0.13	0.36
2002								
GDP at current prices	423 108	31 922.4	1 923 210.3	7 530.6	4 39.26	137 773.9	141 903	82 747 356
Agric as % of GDP	9.2	2.5	50.1	15.6	25.0	3.6	6.36	24.2
Mining as % of GDP	55.7	35.2	8.6	0.2		0.1	0.06	0.32
2003								
GDP at current prices	1 037 039.8	36 337.5	2 282 434.1		5 474.02	164 804.2	156 906	
Agric as % of GDP	7.7	2.4	47.9		20.4	6.8	6.23	
Mining as % of GDP	53	34.8	20.1		23.5	0.06		

SOURCE http://www.sadcbankers.org
Madagascar data from African Development Bank, *ADB Statistics Pocket Book*, 2005

duction is also a major agricultural activity, with Africa's largest export abattoir situated at Lobatse in Botswana.[37]

Although the manufacturing sector is largely agro-based, there have been marked shifts in the sectoral composition of economic output over the last 30 years, reflecting long term changes in patterns of regional and global demand. As a result of the shifts, the share of services in GDP – finance, insurance, distribution, tourism, etc – increased in most countries of the region. In some countries, services now account for about 50 percent of GDP, and this is seen to have a stabilising effect on the economies in the region since services are less susceptible to wide fluctuations.[38]

Manufacturing

The share of manufacturing, which also helps to stabilise the region's economy, declined or remained static for most SADC countries since 1990 due to the influx of cheaper foreign goods, high input costs and shortages of foreign currency. Nevertheless, agriculture remains a dominant activity and

IRIN

Vanilla pods, Madagascar

the biggest employer in the region. About 69 percent of the labour force in southern Africa was employed in the agricultural sector in 1990 compared to 68 percent in 1970. The situation remains largely the same, despite the strong push towards industrialising the sector.

During the past decade, there has been slow growth in formal sector employment in southern Africa, implying that a larger proportion of new labour entrants had to be

Sectoral GDP Contribution in SADC for Agriculture and Mining continuedTable 1.3

Year	Namibia	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
1999						
GDP at current prices	3 151.1	800 769	8 407.7	6 432 911	7 479.5	228 435
Agric as % of GDP	10.7	3.42	12.27	45.1	21.6	23.7
Mining as % of GDP		6.33	0.74	1.4	3.8	1.5
2000						
GDP at current prices	23 690	888 454	9 638.9	7 268 380	10 075	328 658
Agric as % of GDP	9.9	3.22	10.8	45	20	21.6
Mining as % of GDP		6.79	0.01	1.49	4	1.2
2001						
GDP at current prices	27 333	983 450	10 971	8 274 606	13 117	603 668
Agric as % of GDP	9.7	3.47	9.6	44.7	20	29.9
Mining as % of GDP		7.51	0.01	1.57	4	0.8
2002						
GDP at current prices	30 101	1 120 895		9 363 666	16 228	1 210 636
Agric as % of GDP	10.3	4.12		44.1	20	24.8
Mining as % of GDP		7.73		1.78	4	0.9
2003						
GDP at current prices		1 209 497			20 299	
Agric as % of GDP		3.8			21	
Mining as % of GDP		7.13			3	

SOURCE http://www.sadcbankers.org

Share of SADC GDP, 2002 **Table 1.4**

Country	Share of GDP (%)
South Africa	65.7
Tanzania	6.1
Angola	6.1
Zimbabwe	3.6
DRC	3.3
Botswana	3.1
Mauritius	2.9
Zambia	2.4
Mozambique	2.2
Namibia	1.9
Malawi	1.2
Swaziland	0.7
Lesotho	0.5

SOURCE SADC, *Regional Indicative Strategic Development Plan*, 2004

absorbed in agriculture or informal sector activities.

In addition, all countries in the region except for South Africa depend on a few primary and semi-processed goods for their exports, which are subject to world price fluctuations and thus low foreign currency earnings. As a result, most countries are heavily indebted to the developed world, creating economic crises which are symbolized by rising unemployment and inflation, declining export performance, high domestic and foreign debt, weak currencies, and declining access to social services.

Trade

With only a few exceptions, all SADC countries have been experiencing declining terms of trade since the 1980s. Intra-regional trade is just over 20 percent of total international trade, and this is concentrated in the Southern Africa Customs Union (SACU). Available statistics show that intra-regional trade outside SACU is a meagre five percent of total international trade. Intra-regional trade is now guided by the SADC Trade Protocol, as well as a number of bilateral trade agreements. Apart from trading among themselves, the bulk of SADC countries trade with the Organisation of Economic Cooperation and Development (OECD) countries and Asia.[39]

Mining

A wide range of minerals is mined in the region, and these include coal, diamonds, asbestos, nickel, copper, platinum, chrome

and gold. While the mining sector remains one of the highest foreign currency earners, and a major contributor to GDP, its threat to the environment remains significant. Mining activities do not only upset the natural environment in terms of earth moving and deforestation, but are also major sources of air and water pollution. Similarly, informal sector mining activities in a number of SADC countries pose even greater challenges as they remain largely unregulated. The SADC Protocol on Mining, which was signed in 1997 and came into force in 2000, provides the main regulatory framework for this sector at the regional level.

Tourism

The SADC tourism sector sees this industry as having a "catalytic influence for widespread economic and social progress and as a means of promoting sustainable development", based on the untapped resources, such as unique natural, cultural and historic resources including wildlife, wilderness areas, natural wonders, pristine beaches, mountain ranges and round-the-year sunshine.[40]

SADC sees the challenge for the region as putting in place a conducive environment for the growth of the tourism industry through a policy mix that focuses on, among others, the promotion of investment in tourism facilities, the removal of barriers to tourism

P Johnson, SARDC

The tourism industry has been growing significantly.

(including but not limited to, visas), and the competitive marketing of the industry. The tourism industry has been growing significantly in the region as shown in Table 1.5.

The Protocol for Development of Tourism in SADC which was signed in Mauritius in 1998 and came into force in 2002, is the regulatory instrument at the regional level, while the Regional Tourism Organisation of Southern Africa (RETOSA) provides the institutional framework.

Transport

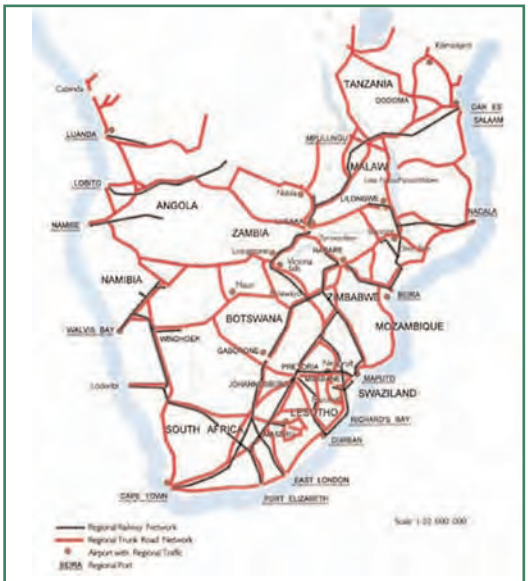
The economic performance of southern Africa also hinges on the region's transport networks. The colonial legacy of a weakened and inefficient transport system still prevails in the region, although road and air transport have responded to changing socio-economic circumstances faster than rail transport. The

Tourism Trends in Southern Africa, 1997-2000 **Table 1.5**

Countries	Arrivals		% Annual growth rate of arrivals		% Share of arrivals in SADC		Tourism receipts in US$ million	
	1997	2000	1998	2000	1997	2000	1997	1999
Angola	45 000	45 000	15.6	0	0.4	0.3	9	13
Botswana	734 000	863 000	0.8	8.0	6.9	6.4	136	176
DRC	30 000	55 000	76.7	3.8	0.3	0.4	2	2
Lesotho	144 000	231 000	4.2	24.2	1.4	1.7	22	19
Malawi	206 000	126 000	13.6	16.0	1.9	0.9	11	20
Mauritius	536 000	599 000	4.1	3.6	5.1	4.5	485	545
Mozambique	30 000	55 000	76.7	22.2	0.3	0.4		
Namibia	562 000	570 000	0.4	0.9	5.3	4.3	333	336
S. Africa	5 653 000	6 280 000	4.3	6.0	53.4	49.4	2 769	2 752
Swaziland	340 000	341 000	6.2	3.3	3.2	2.5	39	34
Tanzania	347 000	603 000	29.7	3.1	3.3	4.5	392	733
Zambia	341 000	570 000	6.2	25.0	3.2	4.3	75	85
Zimbabwe	1 495 000	2 593 000	39.8	11.4	14.1	19.3	230	145
Total SADC	10 593 000	13 409 000			100	100	4 625	4 989

SOURCE SADC, *SADC Tourism Report July – 2000 July 2001*

Regional Surface Transport Networks **Map 1.2**



SOURCE *SADC Today*, Vol 8 No 6, February 2006

David Martin, APG

Raiway corridors, such as the Tazara, are jointly managed by the national railways.

return of peace and stability in the region saw increased demand for cross-border trade and movement of people, resulting in increased demand for transport systems, services and facilities. There has been a phenomenal growth in road networks, at the expense of railways in many instances. However, both poor allocation and lack of financial resources for maintenance and rehabilitation is causing existing infrastructure to deteriorate at an alarming rate.[41] The existing infrastructure was built with resources mainly from international donors, whose focus has now shifted to other priorities.

This has prompted governments to implement policy reforms that promote market-based and private-sector-led infrastructure and service provision, thus accelerating the pace of privatisation in the sector. The SADC Protocol on Transport, Communications and Meteorology clearly defines the new vision, and the roles of the public and private sectors. It says governments are expected to concentrate on policy, legislative, regulatory and institutional reforms in order to create an environment conducive to private sector participation in the provision, maintenance, operation and management of transport systems.

In an effort to improve competitiveness, the SADC railway network has been divided into 12 railway corridors to be jointly managed by the national railways in the corridor and the environment is being made conducive for private investment into the railways industry so that an efficient service can be provided to customers. These corridors, shown in Map 1.2, include Limpopo corridor (*Caminhos de Ferro de Moçambique Sul*, National Railways of Zimbabwe, and Zambia Railways Limited) and the Beitbridge corridor (National Railways of Zimbabwe, Zambia Railways Limited and Spoornet).

Telecommunication

Another key driver for the region's economic development is the telecommunications sector. Telecommunication services density is low in most of the SADC region as highlighted in Table 1.6. There is, however, ongo-

ing proliferation of both mobile telephone services and internet service providers, and actions are being taken in a number of member states to effect rapid expansion and improvement of basic telephone services through increased participation by the private sector.

SADC's strategic development plan recognises the importance of Information Communication Technologies (ICTs) as "a tool for development and as an evolutional cross-cutting key factor for regional integration and development, globalisation and modernisation."

SADC thus recognises the need for basic strategies and policy options that promote ICT development.[42]

R Chavatama, SARDC

A study in 2002 on the E-readiness of SADC member states highlighted the challenges and made recommendations on priority areas. Despite the diverse stages of ICT development in the region, three key groupings were identified. The Fundamental Level addresses the need for strategy and policy options on basic telecommunications, electrification, human resources development and capacity-building; and the cultivation of awareness and positive attitudes towards ICTs. This situation is common in the majority of SADC countries, with South Africa, Mauritius and Seychelles taking the lead in basic infrastructure.

The Middle Level addresses the expansion and strengthening of strategy and policy options on telecommunications services and the increase in Personal Computers (PCs) penetration, and is prevalent in Seychelles, Mauritius and South Africa, with notable variations in the rest of the region. The Advanced Level addresses the strategy and policy options on increasing internet access and utilisation, development of the banking infrastructure, advanced content development, and development of an e-commerce infrastructure and culture. This exists primarily in South Africa.[43]

Status of Telecommunication Availability in Southern Africa **Table 1.6**

Country	1997 Cellular access	1998 Telephone base (lines)	1998 Telephone density (%)	2000 Telephone base (lines)	2000 Telephone density (%)	2001 Telephone base (%)	2001 Telephone density (%)	2002Country Telephone base (lines)	2002Country Telephone density (%)
Angola	7 052	7 224	0.65	95 506	0.73	166 500	1.23	215 000	1.54
Botswana		110 000	7.36	335 900	20.44	458 600	27.28	565 000	32.85
DRC		19 350	0.04	24 810	0.05	159 980	0.3	570 000	1.08
Lesotho		19 400	0.94	43 800	2.03	78 382	3.63	125 446	5.79
Madagascar		43 197	0.27			205 900	1.33	222 000	1.40
Malawi	2 500	3 600	0.35	95 444	0.92	110 337	1.06	159 147	1.52
Mauritius	45 000	240 000	21	460 885	38.61	579 189	48.26	675 362	55.79
Mozambique	2 200	75 503	0.4	136 779	0.8	242 140	1.37	338 498	1.86
Namibia	16 000	121 000	7.5	192 176	10.8	217 398	11.9	271 413	14.48
S. Africa	1 500 000	5 000 000	11.88	13 300 743	30.45	1 5713 458	35.26	18 658 035	41.05
Swaziland		30 000	3.2	64 858	6.43	88 739	8.7	103 060	9.99
Tanzania	19 000	126 000	0.4	353 791	1.08	575 428	1.71	921 590	2.68
Zambia	11 300	80 000	0.96	182 179	1.77	206 862	1.96	226 766	2.08
Zimbabwe	25 000	224 238	1.8	558 400	4.91	582 407	5.06	640 854	5.51

Note Telephone density, Lines per 100 inhabitants; Cellular density, Access per 100 inhabitants.
SOURCE SATCC-TU database. In *SADC, Transport, Communications and Meteorology Annual Report, July 2000-June 2001*

Telecommunications Usage in SADC, 2001 **Table 1.7**

Country	Population 2001 (000)	Fixed lines (% of population)	Fixed line penetration	Public telephones	Mobile users	Mobile penetration (% of population)
Angola	13 660	80 000	0.59	270	86 500	0.64
Botswana	1 690	150 300	9.27	3 000	278 000	16.65
DRC	53 500	20 000	0.04		3 000	0.47
Lesotho	2 200	22 200	1.03	370	33 000	1.53
Malawi	12 920	54 100	0.47	540	55 700	0.48
Mauritius	1 290	306 800	25.56	2 920	300 000	25.00
Mozambique	17 650	89 400	0.44	1 860	169 900	0.84
Namibia	1 860	117 400	6.57	5 300	100 000	5.59
South Africa	44 880	4 969 000	11.35	178 110	9 197 000	21.00
Swaziland	1 100	32 000	3.14	830	66 000	6.47
Tanzania	32 200	148 500	0.41	720	427 000	1.19
Zambia	11 100	85 400	0.8	870	98 300	0.92
Zimbabwe	13 890	253 700	1.86	3 230	328 700	2.41
*Madagascar	15 529	58 400	0.36	460	14 750	0.9

*Madagascar joined SADC in 2005
SOURCES Jenson, M. *Information and Communication Technologies (ICTS) in Africa - A Status Report,* 2002. Population data from SADC Statistics 2004. See also Table 8.1 in Chapter 8.

Poverty

Poverty and environmental degradation are linked in a vicious circle in which poor people are left with no choice but to use whatever natural resources are available to them. With poverty, it is a question of survival of the fittest. Because of their situation, people living with poverty cannot afford to take proper care of the environment. Poverty is a cause and consequence of environmental degradation and resource depletion.

SADC statistics show that 70 percent of the combined population of the region lives below the internationally recognised poverty line of US$2 a day, while 40 percent live on less than US$1 a day.[44] There are wide variations at the national level.

In a joint report to the 1992 Earth Summit in Bazil, the southern African countries reflected the concerns of many others in concluding that: "Throughout the negotiations before and during the Rio Conference in June 1992 we must never forget that the majority of people and countries in the SADCC region and the world are poor. If the poor sometimes behave in a way that degrades the environment it is not because they choose to do so. They only do so when they have no other choices."

They added: "The Earth Charter and Agenda 21 must expand the development choices and opportunities for the majority of poor people, communities and countries. No new political and economic arrangements within or among our countries can be called sustainable if they fail to change the present situation of a rich minority and poor majority by significantly reducing the gap between them. The Earth Charter and Agenda 21 must provide a new basis for a new deal for the majority of poor people and countries in order to secure and sustain our common future."[45] This position is more relevant today than it was more than a decade ago when it was stated.

The World Summit on Sustainable Development, whose aim was to review progress made since the 1992 Earth Summit reinvigorated the global commitment to addressing underdevelopment and poverty. This led to the adoption of resolutions in which countries committed themselves to halving world poverty by 2015, and halving the proportion of the population that is unable to reach or afford safe drinking water and who do not have access to basic sanitation, as well as to direct resources towards the goal of creating income-generating opportunities for the people. These global commitments resonate very well with SADC's agenda to reduce poverty.

HIV and AIDS and other diseases

Poverty further impacts on health as has been experienced in the region where the most poor are suffering the worst effects of diseases such as HIV and AIDS, tuberculosis, malaria, polio, hepatitis B, cholera and dysentery. Although most SADC countries have invested heavily in health delivery, the prevalence of these communicable diseases has undermined the gains. In particular, HIV and AIDS is the most serious development and health challenge confronting southern Africa over the last decade.

SADC has the largest proportion of people affected by HIV and AIDS of any region in the world.[46] The extent of the problem differs from country to country with prevalence rates peaking as high as 30 percent in some member states. The worst affected are Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. A number of factors are cited as contributing to the spread of the pandemic, including poverty, gender inequality, intergenerational sex, illiteracy, stigma and discrimination, alcohol abuse and lack of communication about HIV and AIDS due to cultural barriers.

Its impact is far and wide, ranging from exacerbating poverty to damaging the social fabric, upsetting demography to depleting the labour force. Population growth has slowed down in nearly all SADC countries, with life expectancy dropping, while child and adult mortality rates have gone up. The worst affected age group is the sexually active, who also happen to be the economically active. This has put a huge stress on skilled personnel.

In view of the trends and prevalence of HIV and AIDS, it is quite challenging and difficult to predict the natural resources management regimes for the future. A study by Hastings Chikoko[47] on the uncertainty of natural resources management says the impact of HIV and AIDS is two-pronged – loss of human capacity and changes in the use of land and natural resources. The key impacts of the HIV and AIDS pandemic on natural resource management include:

- overuse of natural resources including medicinal plants, timber, and wildlife;
- changes in land use as agricultural practices change with falling capacity for heavy labour;
- changes in access to resources and land especially when widows and orphans cannot inherit land;
- loss of traditional knowledge of sustainable land and resource management practices;
- loss of human capacity for natural resource management in government, non-governmental organisations, academic institutions, communities, donor organisations, and private sector;
- increased vulnerability of Community-Based Natural Resource Management (CBNRM) programmes as communities lose leadership and capacity, and HIV and AIDS issues take priority; and diversion of conservation funds to cover HIV and AIDS related costs.

In response to the magnitude and far-reaching effects of the pandemic, SADC has put in place a Multi-sectoral HIV and AIDS Strategic Framework and Programme of Action 2003-2007. The focus is on both prevention and mitigating the impact. In addition, a SADC summit was held in Lesotho in July 2003 to map out a common vision as well as prioritise areas requiring urgent attention. The summit adopted four important decisions:

- Adopted the framework as a working document;
- Agreed that an HIV and AIDS unit be established at the SADC Secretariat which would ensure an effective institutional framework at the regional level. The unit was established in 2004;
- Agreed to establish a Regional Trust Fund to combat the pandemic; and
- Mapped out a common vision and prioritised areas of response through the Maseru Declaration on HIV and AIDS.

Food security

Agriculture, which has the strongest influence on food security in southern Africa is the backbone of the economy of the SADC

region with 80 percent of the population dependent on it for food, income and employment. Agriculture contributes 35 percent of Gross Domestic Product (GDP), as well as 13 percent of total export earnings.

According to SADC, the past 13 years have seen declining food production, donor aid flows, government budgetary allocations, against a backdrop of increasing food imports, food aid and population. In addition, almost a quarter of SADC's total land mass is arable, but only a small fraction of that is under cultivation.

The region's agricultural potential is limited by a number of factors, including susceptibility to droughts, floods and other natural disasters, vulnerability of the farming community to HIV and AIDS, and a general lack of advanced farming techniques and equipment. SADC further concedes that the prevalence of hunger in the region is caused by inappropriate national agricultural and food policies and inadequate access by farmers to key agricultural inputs and markets.

In response to the problem of recurrent food shortages in the region, an Extra Ordinary SADC Summit on Agriculture and Food Security was convened in Tanzania in May 2004 to adopt ways of boosting development in agriculture and food security in the short, medium and long term. The summit reviewed trends and challenges in the region's agriculture and food security sector. The leaders noted that inadequate food security, poor nutrition, inadequate essential public services, limited reproductive health services, gender imbalances and high levels of illiteracy impact negatively on the quality of life of people, especially those affected by HIV and AIDS.

The agricultural sector has some of the poorest communities in southern Africa, ranging from the rural subsistence farmers who lack access to land and credit facilities, to the lowly paid farm labourers. This situation is compounded by the devastating impact of HIV and AIDS, which often condemns people to a vicious cycle of poverty.

To break this cycle, SADC member states need collective action, together with business and communities, to improve economic performance, reduce poverty and strengthen environmental management. The RISDP, which identifies sustainable food security as one of the priority intervention areas, provides the framework for improving food availability, access, nutrition and forecasting, prevention, mitigation and recovery from disaster-induced emergencies.

CEP

Agriculture drives most SADC economies.

Governance, peace and security

The new era of peace and stability in southern Africa has taken some pressure off the environment. Armed conflict has contributed significantly to environmental degradation directly through the concentration of refugees, destruction of vegetation, and poaching, and indirectly as a result of the temporary suspension of law and order. Landmines have made it impossible for people to use the land in some areas even after the conflict ends. Peace provides a conducive environment for upholding the rule of law, good governance and democracy, which can help to facilitate proper environmental care.

New policies and institutional mechanisms for maintaining peace and stability have been put in place at the regional level, notably the Organ on Politics Defence and Security of 1996 and the subsequent Mutual Defence Pact of 2003, which allows for collective military assistance of member states. The SADC

Dar es Salaam Declaration contains pro-active strategy for regional food security **Box 1.4**

At a SADC Extra Ordinary Summit held in the United Republic of Tanzania in May 2004, Heads of State and Government committed themselves to promote agriculture in order to develop a regional food reserve facility.

Following months of preparation and a week of meetings of officials and ministers, the leaders adopted and signed the Dar es Salaam Declaration on Agriculture and Food Security in the SADC Region, reaffirming their commitment to accelerate agricultural development, upon which most people in the region depend for food, income and employment.

The tone was set in the opening address by the then SADC chairperson, President Benjamin Mkapa of Tanzania, whose regional term of office was notable for his insistence on results and time-bound targets.

Urging his colleagues to ensure that the region can feed itself on a sustainable basis, Mkapa said bluntly, "unless we, the leaders of SADC, feel ashamed of having to beg for food – sometimes receiving it with all manner of conditions – we cannot bring honour to our countries. Let us work together to bring honour, not shame to independent southern Africa."

He reminded the Summit, "We are here to help each other build the political will to put the question of agriculture and food security at the heart of our national and regional priorities."

Mkapa called for a Plan of Action with activities "that are specific, have measurable targets, and are time bound," with clear responsibilities at national and regional levels.

Member states agreed to ensure availability of key agricultural inputs, to support vulnerable farmers, and to vigorously embark on water management programmes including flood control and implementation of the Revised Protocol on Shared Watercourses.

They undertook to accelerate the use of irrigation technologies such as treadle and motorized pumps, canalisation and water-saving technologies, as well as to mobilize resources for agro-processing and increase the use of savings and credit schemes, and rural mobile banks.

The SADC leaders also agreed to consider establishing a regional agricultural development fund, and a regional food reserve facility.

Adapted from SADC Today Vol. 7 No. 2 June 2004

Protocol Against Corruption is another legal instrument designed to promote good governance among member states.

The last decade has seen southern Africa emerging from a long period of pre- and, post-independence military conflicts and instability, moving into an era of peace and stability. Apartheid was officially ended in South Africa in 1994, with the successful holding of the first democratic elections.

Mozambique, whose 1992 peace agreement put an end to a protracted civil war and led to democratic elections in 1994, has, like South Africa, also completed the first decade of peace and stability. The country is still rebuilding its infrastructure, which was as shattered by the war as its economy. While the south of the country is enjoying an economic boom, attributable to peace and proximity to South Africa, the northern part of the country still faces major infrastructure challenges such as lack of roads and communications facilities. However, the prevailing peace and stability has presented unlimited opportunities for the country to efficiently exploit natural resources and carry out economic activities.

Civil war, which broke out in 1975 in Angola, ended in 2002 following an agreement between government and the rebel Movement for the Total Independence of Angola (UNITA). Elections are to be held in 2008.

The peace process in the DRC, which in 1998 slid into full-scale war during which the governments of Angola, Namibia and Zimbabwe sent in their troops to help the DRC government fight the rebel groups backed by Rwanda and Uganda, appears to be holding. A referendum in December 2005 accepted a new Constitution and elections, which were held in 2006.

Following disputed elections in 1998, the otherwise quiet mountain Kingdom of Lesotho suffered a military mutiny, which left infrastructure and the economy severely shaken. A military intervention by Botswana and South Africa successfully restored law and order.

Zimbabwe's land reform programme, accelerated in 2000 with the expropriation of land for redistribution to black African farmers, provoked anger in some sectors within and outside the country. Land was the top issue during the parliamentary or presidential elections in 2000, 2002 and 2005, and the harmonized elections of 2008.

With the exception of Angola and DRC, which at various stages have been at full-scale war since 1994, all SADC countries have been holding multi-party elections, although losing parties have challenged some of them in the courts.

Southern African leaders unanimously adopted SADC Principles and Guidelines Governing Democratic Elections during the summit held in Grand Baie, Mauritius, in August 2004. The Guidelines are in line with

the organisation's Treaty, which commits member states to "promote common political values which are transmitted through institutions which are democratic, legitimate and effective."

The diversity of political representation, whether across party lines or gender, and the emergence of a vocal civil society, has strengthened the institutions of democracy and governance in most of the region. However, challenges remain, for instance in terms of increasing the number of women in positions of political power, given that most countries still lag behind the 30 percent target agreed to by member states for attainment by 2005.

Another challenge is for SADC countries to begin to view environment as an important issue debatable around election time as prominently as is the case with issues such as the economy, and, increasingly, gender, and as is happening in other parts of the world where "Green Parties" contest elections.

It is important to note that as a region, SADC is still in the first decade of a post-conflict period and it is thus too early to measure the impact of the peace dividend on the environment. Nonetheless, the general peace and stability enjoyed over the last 10 years has allowed for the expansion of the scope of regional integration beyond political and economic spheres to include environment and natural resource conservation and management. In addition to a number of environment related protocols already signed and ratified, SADC is currently developing a specific protocol on the environment.

Furthermore, the tranquillity now enjoyed across borders has allowed for the expansion of environmental conservation strategies beyond community-based natural resources management, to transborder (transboundary) natural resources management initiatives, an approach that is more suitable for resources that transcend international borders.

Examples include the Greater Limpopo Transfontier Park, an arrangement involving Mozambique, South Africa and Zimbabwe;

David Martin, APG

the Kgalagadi Transfrontier Park (Botswana and South Africa); and the Zimbabwe, Mozambique and Zambia (ZIMOZA) transboundary natural resources management initiative.

POLICY CHALLENGES

The institutional transformation of SADC is in many ways a passive as well as active response to its many development challenges. In July 1979, a ministerial meeting that brought together what was then known as the Frontline States and donor agencies was convened in Arusha, Tanzania to ponder ways of enhancing economic liberation and reducing dependence on the then apartheid South Africa. That meeting led to the formation of the Southern Africa Development Coordination Conference (SADCC). SADCC, the precursor to SADC, was formally launched at a summit in Lusaka, Zambia in April 1980, with nine founding Member States.

Although SADCC was a loose regional functional cooperation organisation, it facili-

tated important political, administrative and infrastructural links and projects.

In 1992, at a summit in the Namibian capital, Windhoek, the organisation was transformed, through a Declaration and Treaty, from a "coordination conference" to a "development community", that is from SADCC to SADC. The aim was to give the organisation an integration mandate with a formal and legal basis. To facilitate this, sector protocols and charters were introduced and to date, more than 20 have been signed and ratified.

SADC membership has increased to the 14 members in 2005. With the organisation growing in size and mandate and new challenges and opportunities arising, it became necessary to realign the institutional structure of the organisation. Consequently, a decision was taken at an Extra Ordinary Summit held in Windhoek in 2001 to restructure all SADC institutions. As part of the process, 21 sectors previously coordinated by member states were clustered into four directorates that are now centrally managed by an enlarged SADC Secretariat in Gaborone, Botswana. The directorates are:

- Trade, Industry, Finance and Investment;
- Food, Agriculture and Natural Resources;
- Infrastructure and Services; and,
- Social and Human Development and Special Programmes.

LINKAGES TO OTHER CHAPTERS

Chapter 2 Land
The social, economic and political setting of southern Africa is critical to the region's land-use planning. The condition of the region's land resource base is also dependent on people.

Chapter 3 Atmosphere
Pollution, climate change and climate variability affect the health of the people and environment. Droughts and floods are key to societal livelihoods, while issues of temperature and sea level rise are topical debates on the future of the region.

Chapter 4 Freshwater Resources
People's activities, including settlement patterns, energy generation, transport and other drivers of national economies are determined by availability of freshwater resources. Integrated Water Resources Management (IWRM) is becoming an important tool for sustainability of the wellbeing of people and the environment.

Chapter 5 Marine and Coastal Resources
Marine and coastal resources are important as sources of food and economic development. With only 43 percent of the region landlocked, there is a big dependency by southern Africa on marine and coastal resources for trade, tourism and employment.

Chapter 6 Forests and Woodlands
The growth in population and economies of the region has raises demands for energy, resulting in environmental problems such as deforestation and habitat loss. The region's forest and woodland resources are also gaining global significance as they provide an important sink for the sequestration of carbon dioxide.

Chapter 7 Wildlife
The region is rich in wildlife and other biological resources, hosting some of the most captivating tourist attractions in the world. Developments in wildlife conservation through community-based natural resources management, transboundary conservation areas and protected areas are key to maintaining the region's rich culture, flora and fauna.

Chapter 8 Human Settlements
Settlement patterns are dependent on the region's prevailing socio-economic conditions. With urban areas providing better opportunities for security, education, health and employment, there is a growing tendency to migrate to towns and cities. Ad hoc settlements in the form of slums are a growing concern as the region is faced with unsustainable urbanization rates. Refugee camps, with their associated environmental problems, are still common in some parts of the region.

Chapter 9 Outlook
Population and economic growth will continue into the foreseeable future, placing increasing pressure on the environment. However, integrated and effective management of the region's natural resource base will go a long way in poverty alleviation and the realization of sustainable development.

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LAND 2

Land is an essential resource in southern Africa, representing a physical assembly of soils, minerals, water, and living elements. It provides a medium for the interaction with natural phenomena such as climate and weather, chemical and physical processes to sustain livelihoods through food production, income generation and environmental services. It is a basis for pride and security, a status symbol, and a source of social and political influence.

It is recognized the world over that land is a major intervening factor in promoting sustainable development. Agenda 21 and various international conventions and summits such as the World Food Summit, the Social Development Summit, and the Fourth World Women Conference in Beijing all recognised land as a significant factor in seeking sustainability. At the regional level, the Southern African Development Community (SADC) recognises land management and sustainable development as key elements for food security and environment management.[1]

CEP

Land has economic, social and cultural importance, and is a key factor in sustainable development, including food security.

Due to its multiple functions, land has been at the centre of most political, social and economic struggles throughout human history. Southern Africa has been no exception, especially because of the laws and policies developed during the colonial and apartheid periods, which saw the dispossession of land from the local population. The local people were pushed to fragile and marginal areas where land degradation is being compounded by increasing human and livestock population.

VALUE OF LAND

SADC countries cover a total land area of almost 10 million sq km (9,864,250 sq km as shown in Table 2.1) of which less than 25 percent is arable.[2] The region's arable and domesticated land is used for various purposes, including agriculture, forestry, wetlands and wildlife conservation, and human settlements. Agriculture is discussed in detail in this chapter while forestry, wetlands and wildlife, and human settlements are discussed in separate chapters.

At least 70 percent of the SADC population depends on agriculture for their food, income and employment, and agricultural output strongly influences the region's economic growth.[3] Both large and small-scale agriculture are widely practised in southern Africa. However, the value of small-scale agriculture is rarely reflected in national accounts. For example, in 2001 approximately 3.8 million households in Tanzania practised small-scale farming, the value of which did not go into national accounts.[4] As a result

Total Land in SADC Region **Table 2.1**

Country	Total area (sq km)	Arable land (ha)
Angola	1 246 700	30 000
Botswana	581 730	3 000
DRC	2 345 000	67 000
Lesotho	30 352	3 000
Madagascar	587 051	30 000
Malawi	118 484	21 000
Mauritius	2 000	1 000
Mozambique	802 000	39 000
Namibia	824 269	8 000
South Africa	1 221 040	1 147 000
Swaziland	17 164	1 000
Tanzania	945 087	40 000
Zambia	752 614	53 000
Zimbabwe	390 759	52 000
Total	9 864 250	1 495 000

SOURCE *SADC Statistics: facts and figures* 2000; Madagascar from FAOSTAT Data, 2005

poverty indicators for Tanzania and other SADC countries tend to be highly skewed.

Crop farming

Crop production is the most dominant land use in southern Africa. On average, crop production contributes 34 percent of southern Africa's Gross Domestic Product (GDP).[5] For this reason, the performance of crop production has a strong influence on food security, economic growth and stability in the region.

As the economies of most countries in southern Africa are based on agriculture, particularly crop production, there is a big demand for arable land, mainly in the rural areas. More than 65 percent of the region's population lives in rural areas depending on agriculture for their livelihood,[6] but as shown in Table 2.2 there has been a steady decline in the ratio of people living in rural areas. There are country variations in terms of people depending on agriculture for livelihood. In Malawi, for example, 85 percent of the population depends on tilling land, in Swaziland and Lesotho over 70 percent of the population is dependent on agriculture, while in Angola, Mozambique, Namibia, Tanzania and Zimbabwe, the ratio is well above 60 percent.[7]

CEP

The value of small-scale agriculture is rarely reflected in national accounts, despite its contribution, thus poverty indicators in SADC countries tend to be highly skewed.

SADC Rural Population Trends **Table 2.2**

Country	Rural population (%) 1980	1995	2001
Angola	79	68	65
Botswana	-	72	-
DRC	-	71	-
Lesotho	87	77	71
Madagascar	81	75	74
Malawi	91	86	85
Mauritius	58	59	58
Mozambique	87	66	67
Namibia	77	63	69
South Africa	52	49	42
Swaziland	82	-	73
Tanzania	85	76	67
Zambia	60	57	60
Zimbabwe	78	68	64

SOURCE Hirji et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, 2002, p38; UNFPA 2000; WB World Development Indicators; and FAOSTAT 2005

As Table 2.3 shows, there has not been an increase in the amount of land devoted to agriculture between 1994 and 2001 in most SADC countries. This has resulted in a decline in the average per capita arable land, thus impacting on individual food security. In some cases there have been attempts to increase productivity through use of fertilisers and other agro-chemicals.

Land Under Agriculture in SADC (sq km), 1994-2001 **Table 2.3**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Angola	575 000	575 000	575 000	575 000	575 000	575 000	575 000	575 000
Botswana	260 000	259 460	259 460	259 460	259 460	259 460	259 730	259 730
DRC	229 000	229 000	228 900	228 800	228 800	228 800	228 800	228 800
Lesotho	23 290	23 240	23 260	20 329	23 290	23 290	23 340	23 340
Madagascar	273 800	273 800	273 800	274 100	274 400	275 000	275 000	275 000
Malawi	38 100	38 550	38 820	39 350	39 850	40 370	40 900	41 900
Mauritius	1 130	1 130	1 130	1 130	1 130	1 130	1 130	1 130
Mozambique	478 000	478 000	479 850	481 350	482 350	481 850	481 350	482 350
Namibia	387 500	388 200	388 200	388 200	388 200	388 200	388 200	388 200
South Africa	990 000	995 250	997 000	996 500	996 780	996 400	996 400	996 400
Swaziland	13 400	13 400	13 400	13 400	13 400	13 900	13 900	13 900
Tanzania	396 000	396 480	396 500	396 500	396 500	396 800	399 500	399 500
Zambia	352 730	352 790	352 790	352 790	352 790	352 800	352 800	352 800
Zimbabwe	203 700	204 100	204 950	205 810	205 500	205 500	205 500	205 500

SOURCE FAOSTAT DATA, 2005

SADC Area Under Permanent Crops (000 ha), 1994-2000 **Table 2.4**

Country	1994	1995	1996	1997	1998	1999	2000
Angola	3 000	3 000	3 000	3 000	3 000	3 000	3 000
Botswana	394	343	343	343	343	343	370
DRC	6 700	6 700	6 700	6 700	6 700	6 700	6 700
Lesotho	325	320	322	325	325	325	325
Madagascar	2 800	2 800	2 800	2 820	2 850	2 900	2 900
Malawi	1 845	1 875	1 900	1 950	2 000	2 050	2 100
Mauritius	100	100	100	100	100	100	100
Mozambique	3 570	3 650	3 120	3 120	3 120	3 950	3 900
Namibia	747	816	816	816	816	816	816
South Africa	14 600	14 915	14 875	14 810	14 791	14 753	14 753
Swaziland	178	178	178	178	178	178	178
Tanzania	3 700	3 748	3 750	3 750	3 750	3 750	4 000
Zambia	5 254	5 260	5 260	5 260	5 260	5 260	5 260
Zimbabwe	3 042	3 080	3 165	3 251	3 220	3 220	3 220
SADC	43 993	43 539	43 580	43 518	43 468	44 445	44 722

SOURCE World Bank, *2003 African Development Indicators*

Due to constraining factors such as low soil fertility and low rainfall, only five percent of southern Africa is under permanent cropland.[8] The impact of the severe droughts of 1991-92, 1994-95 and more recently 2001-03 and 2004-05, as well as armed conflict and civil unrest in some countries have contributed to the decline and in some cases stabilised the area under permanent crops since 1994. The permanent crop sector is yet to fully recover from the effects of these impacts.

The expansion of cropland, though minimal, contributes to the destruction of forests and woodlands. The potential for further expansion of arable land, other than into marginal areas, is becoming very limited. A recent example of the large-scale expansion of arable farming into marginal lands is the settlement of the Zambezi valley following the eradication of Tsetse fly (*Glossina* species) in the early 1990s.[9] Due to this encroachment, the area under cotton farming in the Zambezi valley on the Zimbabwe side was expanding at a rate of nine percent per year until the mid-1990s.[10]

Even though agriculture is expanding into the natural environment, the area under permanent crops has not increased due to drought and low investment.

The expansion of agricultural land is due to the need to feed growing populations and

pressure to produce cash crops for export. The use and management of land is often hampered by poor extension services, lack of credit for inputs, and limited market access and price information.[11] The situation is exacerbated by low use of chemical fertilisers and improved seed stock, which enable land already under cultivation to be farmed intensively. At an average of 113 kg/ha/yr, fertilizer use in southern Africa is considered low by international standards, and this trend has not changed much between the period 1990 to 1999[11] as shown in Figure 2.1.[12]

There is a growing trend towards export agriculture in the majority of countries in southern Africa. As a result, large-scale production of cash crops including cotton, tobacco, tea, coffee, sugar and wheat is on the increase. However, maize, a staple food for the majority of the region's population, is still the dominant crop and is widely grown throughout the region. Cassava predominates in the lakeshore districts of Nkhotakota and Nkhata Bay in Malawi, and in Tanzania.[13] In Mauritius, sugar cane is the dominant crop.[14]

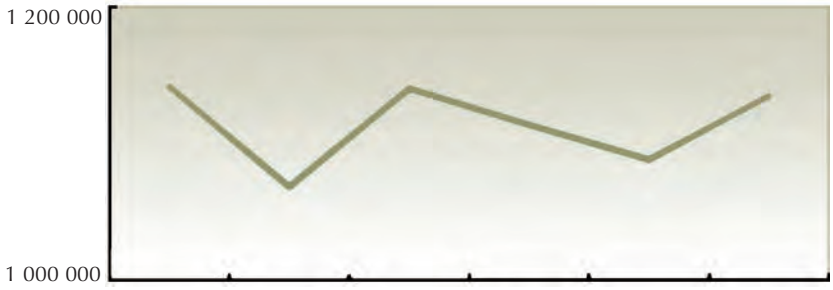
Livestock farming

Livestock farming is another common form of land use in southern Africa. However, the overall number of livestock in the region has fluctuated over the last three decades due to drought and diseases such as foot and mouth, cattle lung and anthrax. With an increasing human population, the region's per capita meat production has generally been declining as shown in Figure 2.2, and this is resulting in reduced access to animal protein.[15]

Animal production is still highly dependent on traditional subsistence systems that are very vulnerable to climatic conditions and diseases. Though well-adapted, indigenous farm animals are often not favoured when compared to the higher productive exotic breeds, hence the loss of genetic resources needed for long-term agricultural development.

Given the general declining fortunes of livestock production in much of southern Africa, and in spite of some efforts to re-stock, it is not surprising that, where appropriate institutions

Fertliser Consumption in Southern Africa **Figure 2.1**



Consumption in metric tonnes

Year	1990	1995	1996	1997	1998	1999
Total SADC consumption	1 141 647	1 068 202	1 140 461	1 113 786	1 088 138	1 134 819

SOURCE UNEP, *GEO-3 Data Compendium*, 2002

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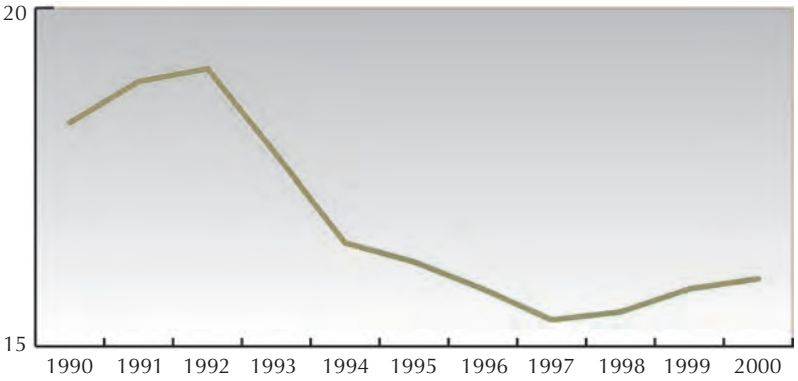
There ia a growing trend towards export agriculture in the majority of countries in southern Africa, including tea.

Illustrative Options

Despite the fluctuations in livestock numbers in the region over the last 30 years due to drought and disease, there are still significant numbers of indigenous cattle.

Per Capita Meat Production in Southern Africa **Figure 2.2**



Production (kgs per person)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production per person	18.3	18.91	19.1	17.83	16.53	16.25	15.85	15.39	15.51	15.85	16

SOURCE UNEP, *GEO-3 Data Compendium*, 2002

exist for farmers to turn to wildlife as a land use, this option is increasingly being preferred.[16] The region is thus witnessing the development of eco-tourism, which has seen large tracts of land being converted from agriculture into wildlife conservancies.

Protected Areas

Large tracts of land in the region are set aside as protected areas for the conservation of forests, wildlife and wetlands, and these areas also contribute to tourism receipts. At the regional level, Trans Frontier Conservation Areas (TFCAs) are emerging, such as the Great Limpopo Trans Frontier Park that has been established by the governments of Mozambique, South Africa and Zimbabw. The TFCAs are extensive forms of land use in addition to the already gazetted national protected areas, covering close to 755,000 sq km of the region by 2001.[17]

LAND TENURE SYSTEMS

There are three common land tenure regimes in southern Africa. These are:

- state;
- private/freehold;
- communal.

State land mainly covers forests, parks, and conservation areas. The state may either directly manage and control the use of state-owned resources through government agencies or lease the resources to groups or individuals who are given usufruct rights for a specified period.

Freehold land tenure system affords the holder ownership that is transferable, inheritable and provides collateral against loans, as leases do. Freehold titleholders have rights to dispose of the land without reference to the state. It allows individual accountability and encourages good resource management, and also encourages private investment.

Communal tenure system was based on land alienation.[18] Under this system communal land is entrusted to the state and traditional leaders. However, in the majority of cases, such land tends to be less endowed with natural resources, and has a high population density. Investment in productive infrastructure is low, and there tends to be a net flow of resources from this sector to the urban areas and commercial farms in the form of labour.[19]

Communal tenure is essentially private property for a group of co-owners each of whom has structured rights and duties. Under communal property tenure there are shared interests, cultural norms, indigenous authority systems and interaction among community members.[20]

The communal land tenure system is the most widespread in southern Africa, where the majority of the population is rural-based. A recent study of six countries concluded that current attempts to review tenure regimes in the region have created new insecurities and often discriminate against customary forms of tenure. The study, by the African Institute for Agrarian Studies, also said the new measures are weak in terms of addressing gender disparities.[21]

CEP

Land tenure systems include freehold, leasehold or private tenure; communal or customary; state or crown land; and conservation areas for forests, wildlife and water catchment.

Communal tenure lacks individual security, and may cause confusion at the local level which can impact negatively on land resources management. The major cause of tenurial insecurity in the communal lands is the absence of devolution of planning, decision-making, resource mobilisation, enforcement and administration of matters relating to the affairs of local communities.[22]

The lack of clear institutional roles at the local level with respect to land allocation in some countries causes further confusion and insecurity. In Zimbabwe, the 1994 Rukuni Land Tenure Commission[23] noted the confusion that existed, around 1994, between the state, local authorities, political structures and traditional leaders in the allocation of land. Similar confusion was noted in Namibia with respect to land allocation and fencing of grazing areas.[24]

An emerging trend across the region is the growing shift from communal use rights to *de facto* management by restriction and exclusion. The political and economic authority system is shifting from traditional authorities to the state in many countries. Customary authority is becoming subordinated in some countries and elected officials in local authorities are becoming more involved in local level administration of land. For example, in Malawi elected local authorities are administering land through the Ministry of Local Government.[25]

ACCESS TO LAND

A combination of local and global factors has put land firmly on the political agenda in southern Africa. Cutting across the national specifics are a set of factors associated with processes of liberalisation and globalisation that are putting severe pressure on the livelihoods of the people, resulting in many having to depend on land. Notable among these factors are a fall in formal sector employment, privatisation of key resources, reduced levels of state support to agriculture, and the continuing marginalisation of the non-commercial or peasant sectors.

The land question in southern Africa, insofar as it relates to access, should be understood within the context of colonial land policies and legislation, as well as gender relations.

While land reforms are as old as southern Africa's history, recent developments have elevated the issue of land to a level where it is now a major factor that will shape the region's socio-economic development. Recent developments are noted in seven countries – Mozambique, South Africa, Namibia and Zimbabwe, the United Republic of Tanzania, Zambia and the Democratic Republic of Congo (DRC).

Recent developments

Mozambique

In Mozambique, the promulgation of the 1997 Land Reform Law marked a major symbolic breakthrough in protecting the rights of the so-called "family sector" by granting legal recognition to informal or customary land rights, and introducing mandatory consultation with rights-holders prior to changes in land allocation. However, the social and economic disruptions brought by civil war gave rise to multiple competing land claims and continuing dispossession of smallholders by national and foreign business interests.

Upon return to peace, pressure from international donors and financial institutions led the country to diversify its productive assets and embrace a privatised, free-market

model of development. As a result, resources, including wildlife and indigenous forests on which rural communities have traditionally relied for much of their subsistence, are being privatised and access denied to local people.

Large areas of cultivable land such as the former state farms and colonial estates are being transferred to foreign investors leaving out locals on whom new and often exploitative relations such as sharecropping are being imposed. Notable among the new settlers are Afrikaner farmers from South Africa who were granted concessions in Niassa and Zambezia provinces,[26] and commercial farmers from Zimbabwe in Manica province.

South Africa

In South Africa, where dispossession of the local people was carried out to a greater extent than any other country in the region, the majority of the rural population is yet to enjoy the benefits of liberation in relation to land. Prior to 1998, some 60,000 white farmers owned 87 percent of the farming land while 13 million black peasant farmers were confined to 13 percent of the land.[27] The country's land ownership structure has not changed much since then.

South Africa's imbalance in land holdings is reflected in gross income disparities between the two groups, and greatly impedes growth in rural incomes for poor households, effectively stalling rural non-farm-sector growth and poverty reduction. Land redistribution transferred 480,400 ha to 45,454 households by 1999, falling far short of the estimated 25.5 million ha of agricultural land that was targeted under the reconstruction and development programme's 30 percent goal.[28]

Falling employment levels in the formal sector, particularly in mining, agriculture and manufacturing, have dealt a severe blow to the migrant labour system, forcing hundreds of thousands of workers and their dependents to fall back on the informal sector and subsistence agriculture for survival. None of the three main components of the South African land reform programme – restitution of land rights, land redistribution and tenure reform – have yet made a significant impact on either highly unequal distribution of land or the livelihood opportunities of the rural population. For example, 68,000 claims were lodged for restitution in 2003, out of which only 37,000 were settled. Several challenges are given for the slow pace, including:[29]

- Lack of rural documentation/proof of ownership;
- High land prices and uncooperative white farmers;
- Long disputes and negotiations;
- Claimants prefer money over land;
- Lack of skills for agriculture and conservation;
- Lack of integration and capacity at local government; and
- Lack of funding.

Both restitution and redistribution have also suffered from over-reliance on market mechanisms to acquire land, as well as cumbersome and ineffective bureaucratic processes.[30]

Namibia

In Namibia, before independence in 1990, white settlers who constituted eight percent of that country's population, owned and had freehold title to 60 percent of the national agricultural land of 82.4 million ha, while the rest of the population held 33.6 million ha, which they could neither sell nor purchase freely. The situation then was not very different from that which prevailed in 1977 when the per capita land distribution for whites and blacks was 390 ha and 28.4 ha, respectively.[31] The government has now started redistributing land to the disadvantaged black population.

In 1995, the Agricultural (Commercial) Land Reform Act was enacted to give powers to the government to buy land and allocate it to Namibians, especially those who had been socially, economically or educationally disadvantaged by the discriminatory laws. The Act also authorizes the state to expropriate any land for the purpose of land reform. However, the government's hands were tied for a long period as it followed the policy of

willing seller/willing buyer. This was not conducive as sellers benefited more than buyers. Often the land that was offered for sale was either exhausted or in an area where the rainfall was poor. The government bought such land out of necessity.[32]

Chapter 4 of the Agricultural Land Reform Act, empowers the Namibian government to scout for land and demand to buy it. Other instruments in the Act, which are helping ease the government's responsibility for providing land, are the Land Tribunal, Land Reform Advisory Commission and the Rules Board. These bodies advise the government on how to acquire commercial farmland and act judiciously to both buyer and seller.

Zimbabwe

In Zimbabwe, the unrest leading up to and following the 2000 general elections highlighted the slow progress of land reform since independence in 1980, as highlighted in Box 2.1. A minority 4,500 mainly white commercial farmers controlled 45 percent of the country's prime agricultural land until 1998.[33]

Prior to the year 2000, reliance on market mechanisms to effect redistribution, coupled with a top-down and technocratic approach to planning, limited the pace of reform and left the dualistic structure of the agricultural economy largely intact. Efforts at independence in 1980 to redistribute land to an initial target of 160,000 families resulted in only 60,000 families having been resettled by 1998.[34]

Poor quality support services to resettled farmers, and slow distribution of seeds and fertilizer, further limited the benefits accruing to smallholder farmers.[35]

Colonial land policies and legislation were designed to deprive the indigenous people of their land and natural-resource property rights in favour of white settlers. In order to entrench the deprivation and disenfranchisement process, key legislation partitioning all land into colonial settler farms and indigenous African reserves was passed in many countries of the region. State-promoted conservation practices were

The land question in Zimbabwe **Box 2.1**

Conflicts over land and other natural resources are both pre- and post-independence phenomena in Zimbabwe. They had been going on in the country between individuals and among communities even before the arrival of British settlers in 1890. The colonial era, however, introduced new dimensions that exacerbated the conflicts.

Conquest and a series of oppressive legislation resulted in a racially discriminatory settlement pattern. The key legal instrument was the Land Apportionment Act of 1931. It legalised the allocation of 198,539 ha to 50,000 white settlers and 117,602 ha to 1,080,000 indigenous Africans. The remaining 74,859 ha was set aside for national parks, forestry and other forms of state land.

The racially skewed distribution of land was the major source of discontent that forced the African population to seek redress through the liberation war. The liberation struggle and subsequent political independence were expected to resolve Zimbabwe's land problems. That did not happen. The 1979 Lancaster House Constitution that paved the way for independence (1980) presented many constraints that hindered the speedy redistribution of land in independent Zimbabwe. It emphasised the supremacy of market forces in the land acquisition process, a factor that has haunted the land reform programme since 1980.

Despite a series of constitutional amendments and the introduction of the Land Acquisition Act of 1992 and its subsequent amendments, the pace of the land acquisition decreased. The weakness of the market in facilitating land acquisition and land redistribution is at the centre of the performance of Zimbabwe's land reforms. A combination of lack of financial resources, particularly for compensating the large-scale commercial farmers, and court proceedings by farmers contesting acquisition of their farms, were also responsible for the slow progress of the land reform programme.

The failure of the land reform programme to meet the demands of the various sub-groups is at the centre of Zimbabwe's recent land conflicts, which exploded into farm occupations and fast-track resettlement in 2000.

At the national level, the main cause of confrontation between the government and the large-scale commercial farmers has been land acquisition. According to Professor Sam Moyo, "… the conflict over land acquisition includes: the lack of agreement on the means and the scale of acquiring land; the source of resources and forms of compensation for the land acquired; as well as the high profile confrontation that engulfs all sides, through inadequate media reports over the process."

Since 1980, the government has enacted land legislation and amended the Zimbabwean Constitution a number of times in an effort to improve land acquisition.

SOURCE Marongwe, N., *Conflicts Over Land and Other Natural Resources in Zimbabwe,* ZERO, Harare, 2001

imposed on land owned by indigenous people and enforced on the majority black population that was largely confined to infertile and arid areas.

The problem of unequal land distribution in southern Africa was further exacerbated by the pursuit of agricultural policies designed to marginalise production by the indigenous population and maximise supply of African labour. As a result, the land issue was heavily politicised, forming one of the cornerstones of nationalist struggles. At independence, some countries embarked on land acquisition through constitutional reforms that led to broad revisions of land ownership.[36]

United Republic of Tanzania

After independence in 1961, land was vested in the President instead of the colonial Governor. The Arusha Declaration, the country's policy on self-reliance adopted in 1967, set the basis for land reforms. A key feature was villagization, which was more systematic in south-eastern Tanzania. In 1991, a Land Commission was appointed with the mandate of reviewing laws and policies concerning the allocation, tenure, use and development of land, as well recommending reforms and examining and resolving disputes. Further reforms came into being following the enactment of the Village Land Act (1999) and the Land Act (1999) which gave legal tenure tocustomarily obtained land.[37]

Zambia

Zambia has had at least two land-reform phases since 1964. The first phase converted all land to state property with no selling rights. Between 1985 and 1995 came the second phase, which protected customary land tenure and allowed local authorities to recommend land owners who could be given title deeds.[38] An estimated 50-70 percent of households in each of the country's provinces are affected by land shortages, despite being primarily engaged in subsistence agriculture.[39]

Democratic Republic of Congo

Since independence in the Democratic Republic of Congo (DRC) in 1960, there has been an uneasy co-existence of village-based, land-use systems alongside modern modes of formal legal ownership, zoning, planning and control. Village and clan land rights and resource use persist, but in an ambiguous legal context, often conflicting with official policies and the formal economic sector. The state claims ownership to all the land and resources of the country without allocating the means to manage these assets efficiently and equitably. Local land claims are largely informal and are based on the principle of giving rights to those who put land to productive use. Unfortunately, this process provides a strong incentive to clear new land or forest.[40]

Land alienation, grazing and woodlands

Land alienation and unequal control are key land tenure problems. Therefore, land ownership and the need for reform are fundamental to the transitional processes taking place in the region. In some cases, there are huge tracts of under-utilised land. For example, significant reserves of under-utilized land totalling over 3 million ha were identified in commercial farming areas of Zimbabwe in 2001.[41]

Grazing lands, covering 45 percent of the region's total land, and woodlands are diminishing due to land pressures resulting from inequitable ownership of land and limited use of technologies suitable for intensive production. As a result, the majority of southern Africa's rural people are vulnerable to food insecurity due to poor yields.[42]

Gender dimension to land access

Currently, southern Africa's mixture of land tenure systems gives women varying degrees of access to land. Under the private freehold system, women have rights to access land but very few have the resources to purchase such land on the open market. Communal land held under the traditional or customary system allows women secondary access through marriage, but as soon as the marriage breaks up they lose the right to cultivate lineage land.[43]

Key obstacles to women's land rights **Box 2.2**

Custom/Tradition	Statutory Law	Socio-Economic
Patriarchy – all countries eg in Botswana some Land Boards ask women who apply for land to bring their husbands, fathers or brothers	No clause in the land law that promotes/ protects the land rights of women, eg South Africa	High female illiteracy rates
Matrilineal societies of Zambia, Malawi Mozambique – some men experience tenure insecurity	Land law not harmonised with other laws in the system eg in Botswana	Women ignorant of their land rights
Daughters cannot inherit land	Lack of capacity/knowledge by implementers, eg Mozambique and South Africa	Lack of resources, including capital and labour
Traditional leaders do not know about land laws that provide for non-discrimination against women	Some legal clauses do not allow joint ownership of land	Internalised discrimination.
Limited participation of women in traditional community decision-making	Women who marry become minors unless they marry under out-of-community-of-property type of the Roman Dutch Law in South Africa, Botswana and Lesotho	

SOURCE UNECA Office for Southern Africa, *Report on the Ad Hoc Expert Group Meeting on Land Tenure Systems and Sustainable Development in Southern Africa,* 1-3 October 2003, Lusaka, Zambia

CEP

Women's access to land is constrained by lack of primary land rights.

In South Africa, land allocation tends to exclude single men and women, although both might have established families.[44]

Although customary practices tend to vary between ethnic groups and countries, women's access to land is constrained by lack of primary land rights. Land is usually registered in the name of the male as head of the household. Other obstacles to women's land rights include literacy levels and customary practices as shown in Box 2.2.

Recent trends show that women are slowly beginning to control a sizeable proportion of rented, purchased, and allocated land.

Under matrilineal inheritance systems such as those found amongst the majority of Malawian and Zambian ethnic groups, women tend to have more secured rights to land than under patrilineal systems although they have little authority over land allocation.[45]

In South Africa, both colonial and apartheid administrative rulings and laws discriminated against women, and so did family law and inheritance provisions. Recent calls have been made to remove all legal restrictions on participation of women in land reform. In 1996 a Women 's Rights in Land Sub-directorate was established in the Department of Land Affairs, with the responsibility for ensuring that all the department's policies and programmes properly fulfil the requirement for gender equity.[46]

Tanzania's 2000 Land Act gives both women and men equal rights to access and ownership of land. Other national initiatives to improve women ownership of land are as listed in Table 2.5.

Most governments of southern Africa have explicitly recognised women's rights to land in their land-reform programmes. The SADC Policy and Strategy for Environment and Sustainable Development is being implemented as an integral part of a larger agenda

Initiatives to Improve Land Rights of Women in Selected Countries **Table 2.5**

Country	Initiative	Purpose
Lesotho	Amending Deeds Registry Act	To allow women to own land and to register in their own names.
	Draft Land Bill	Allows a woman to have right to own land.
Botswana	Raising women's representation in parliament and councils to 30%, and in other land related decision-making bodies.	Increase women's representation in land-related decision-making bodies .
Mozambique	Passed New Family Law 2003	Allow joint registration of property.
	Land Law of 1997	To clearly recognize the right of women to own land.
	Dissemination of New Land Law to women through sensitisation campaigns	Sensitise women on their land rights. Efforts very successful where message was integrated into literacy programmes.
Malawi	National Land Policy 2002	Promote registration of individual and family title.
Tanzania	Land Act 2000	Gives men and women equal access to and ownership of land
Zambia	Setting a quota of 30% for land that will be allocated to women.	Allows women to have access and right to own land.

SOURCE UNECA Office for Southern Africa, *Report of the Ad Hoc Expert Group Meeting on Land Tenure Systems and Sustainable Development in Southern Africa,* 1-3 October 2003, Lusaka, Zambia

and strategy for equity-led growth and sustainable development. It recommends that gender be integrated both as the essential element in the third crucial link of Environmental Impact Assessment (EIA3) and within the social progress component of sustainable development.[47]

Food production and security

Declining per capita landholdings and the general skewed land ownership pattern in southern Africa have been accompanied by a fall in human welfare indicators, such as per capita food production. The production of cereals, root crops, and livestock, which form the primary staple food in southern Africa, has been increasing since 1970, but has not kept pace with population growth, resulting in overall per capita food production falling by 25 percent since 1980.[48]

While the declining trends in per capita food production are largely attributable to declining land-holding sizes as shown in Table 2.6, other factors have also shaped the trends over the past 30 years. Drought is one factor that caused a significant decline in the per capita food production index for southern Africa following the poor seasons experienced in 1991-92, 1994-95, 2001-03 and 2004-05.

Per Capita Access to Land and Food Production Trends, 1980-2000 **Table 2.6**

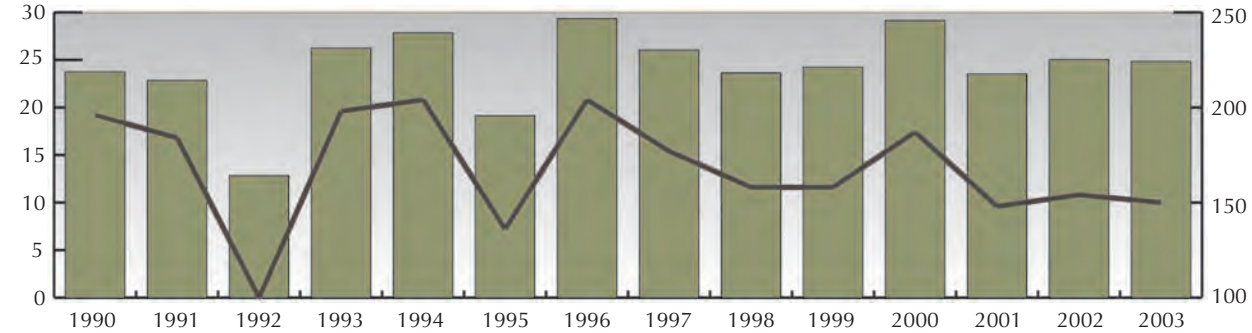
Country	Per capita arable land area (ha)			Food production per capita (index trends)			
	1980	1990	2000	1980	1990	1995	1999
Angola	0.5	0.36	0.28	120	98	104	105
Botswana	1.5	1.06	0.70	103	100	92	79
DRC	0.25	0.18	0.13	101	101	90	68
Lesotho	0.2	0.18	0.12	112	111	80	83
Madagascar	0.29	0.23	0.19	113	100	91	84
Malawi	0.4	0.28	0.36	137	97	100	140
Mauritius	0.10	0.09	0.04	86	101	100	77
Mozambique	0.3	0.2	0.21	119	107	89	104
Namibia	0.66	0.48	0.44	142	96	96	77
South Africa	0.42	0.37	0.34	112	98	79	88
Swaziland	0.3	0.21	0.14	110	97	76	69
Tanzania	0.3	0.19	00.18	102	100	86	83
Zambia	0.9	0.62	0.21	94	94	82	83
Zimbabwe	0.35	0.28	0.24	105	104	68	92

NOTE Per capita food production index is a three-year average normalized to the ten-year average for the period 1989-1991. The ten-year average is considered as the baseline and is equal to 100. An index equal to or above 100 signifies a state of food security.

SOURCE FAOSTAT Data, 2005

A review of the trends in cereal production from 1990 to 2003 shows that the region's total cereal production increased marginally from 22.062 million metric tonnes

Cereals Production and Per Capita Food Availability **Figure 2.3**



SOURCE FAOSTAT 2002

in 1990 to 22.753 Mmt in 2003. In the same period the region's population increased from 152 million to 230 million.[49] (See Table8.1, Chapter 8) Therefore the region's per capita food availability has declined considerably.

The leaders of SADC Member States have agreed to address the issue of food security on a sustainable and regional basis, rather than rely on food aid from outside the region, by adopting the Dar es Salaam Declaration on Agriculture and Food Security in 2004, reaffirming their commitment to accelerate agricultural development, upon which 70 percent of the population of the region depends for food, income and employment.

LAND DEGRADATION

Soil erosion is the most widespread form of land degradation, and one of the most important factors in the decline in agricultural productivity in southern Africa. It is estimated that about 15 percent of the region's land is degraded through erosion. The extent of degraded land due to erosion is likely to continue over the next decades, due to population pressure, skewed land tenure systems, and increasing demand for land.[50]

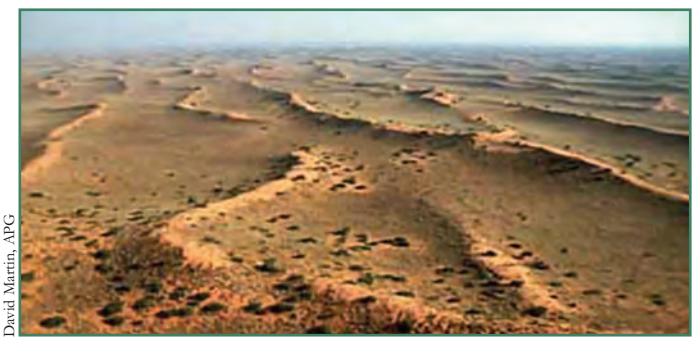
The pressure being applied to land resources is causing widespread environmental degradation in the region. The "food production – population imbalance" of the region's rural areas is forcing production increases through opening up of new and often marginal land to farming,[51] as well as over-cultivation, overgrazing, poor irrigation practices and deforestation.[52]

One of the challenges facing southern Africa is to feed the growing population through increased agricultural production. For the majority of the population, such increases in agricultural production can only be achieved through opening up forests and grazing land, and irrigation. For example, arable land has expanded by as much as 19 percent, 22 percent and 35 percent between 1983 and 1998 in Tanzania, Malawi, and Swaziland, respectively.[53]

Because the extent of suitable land is limited, there is increasing pressure to convert marginal lands for agriculture, a situation that exacerbates land degradation as Map 2.1 depicts.

There are many biophysical indicators of land degradation in southern Africa, including:[54]

- soil erosion by wind and water;
- loss of vegetation cover;
- soil crusting and compaction;
- declining soil fertility;
- siltation of dams;



David Martin, APG

There is increasing pressure to convert marginal lands for agriculture, a situation that exacerbates land degradation.

Extent and Severity of Land Degradation in Southern Africa **Map 2.1**

SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, p 187, 2002

- biodiversity loss;
- deterioration of rangelands;
- salinisation; and
- accumulation of toxic substances.

The progressive deterioration of the natural and productive state of the land resource results in social problems such as increased migration and marginalisation, higher risk of disputes over natural resources and increased poverty and vulnerability. The region's climate, which is generally semi-arid to arid with low and erratic rainfall, exacerbates land degradation. Droughts and floods that are becoming common occurrences in southern Africa contribute to land degradation.

Studies indicate that more than 50 percent of southern Africa's land degradation is caused by overgrazing from cattle, sheep and goats, some of which are bred and grazed in unsuitable areas. Communal grazing, which is generally not affected by stocking policies, is the norm over most of rural southern Africa. The timing and density of stocking affect the productivity of grazing land, particularly during sparse growth seasons when the land is grazed heavily resulting in the extermination of species that grow in these seasons.[55]

A FAO report notes that there is growing pollution of waterways, and sediment levels in rivers are increasing at five percent per year in countries such as Tanzania and Zimbabwe due to land degradation.[56] Gulleys and barren pieces of land are found throughout southern Africa, depicting the extent of soil erosion.

Lack of adequate resources limits livelihood choices resulting in the overexploitation of the environment which in turn worsens poverty by reducing agricultural productivity and food security at household levels. Land degradation severely affects people in as much as it affects biodiversity from land clearance and species overexploitation. Urban agriculture and stream-bank cultivation, for example, are some of the mechanisms used to cope with increasing poverty but are contributing to land degradation. These activities, which are spontaneous and haphazard, are on the rise in the region.

Orthodox planning principles view the open spaces used for urban agriculture as green wedges or "ecological lungs" of the cities but the urban farmers view such lands as "idle" and therefore put them to productive use.[57]

POLICY RESPONSES

Policy debates in the region are characterised by a range of common themes. Of particular importance in this convergence of policies is:

- the privatisation of resources, including both communal and state resources;
- the retreat by the state from key areas of the economy, including both productive activities and services;
- the pursuit of foreign direct investment; and,
- the sweeping deregulation of markets.

This convergence of policy in key areas can address the growing exposure of the region to the forces of globalisation, which has seen an accelerated phase of regional integration and inter-governmental programmes such as the SADC Regional Indicative Strategic Development Plan.

Regional Indicative Strategic Development Plan

Policy interventions for "sustainable food security" as agreed by SADC member states and contained in the SADC Regional Indicative Strategic Development Plan (RISDP) focus on the following areas:

- Improving food availability. Member states are required to promote agricultural production and productivity, take measures that increase competitiveness and promote trade, and also promote the sustainable use of natural resources.
- Improving access to food through rural non-farm income generation. Member states are encouraged to adopt policies which will generate the maximum employment gains and incomes, introduce measures that improve income stability and equity, and develop safety nets (such as food for work, cash for work and targeted distribution of inputs or food) for vulnerable groups. Most of these

measures require public, private and NGO partnerships.

- Improving nutrition. Member states are urged to adopt strategies that improve the nutritional value of food, minimise food losses, particularly for the resource poor, and address food safety.
- Disaster-induced emergencies. The objective is to improve forecasting, prevention, mitigation and recovery from adverse effects of natural disasters.
- Enhance institutional frameworks. The objective is to strengthen the institutional framework of the relevant institutions and expertise, as well as build capacity for implementing food security programmes in the SADC region.

The overall goal of the RISDP target on sustainable food security is to achieve lasting access to safe and adequate food at all times by all people in the SADC region for an active and healthy life. Figure 2.4 illustrates policy intervention areas for each component of food security. The focus is on identifying short to medium term policies that provide non-market mechanisms to promote secure and low-cost food availability and access; and medium to long-term economic and social policy that supports food availability and access through market-based economic growth.

Policy Priorities for Building Food Security in Southern Africa **Figure 2.4**

SOURCE Forum for Food Security in Southern Africa, *Achieving Food Security in Southern Africa: Policy Issues and Options,* March 2004. Page 63 Available on www.odi.org.uk/food-security-forum

The Sub-Regional Action Programme to combat desertification

A key global policy instrument in addressing land degradation is the United Nations Convention to Combat Desertification (UNCCD) which aims to address issues of land degradation and poverty in arid and semi-arid areas. SADC member states have demonstrated strong commitment to implement the UNCCD by ratifying it and by developing national programmes, the status of which is described in Table 2.7, and the sub-regional programme to combat desertification.

The Sub-Regional Action Programme (SRAP), which was approved by the SADC Council of Ministers in 1997, provides an effective collective response to problems of land degradation, drought and desertification

Status of National Action Plans (NAPS) in SADC **Table 2.7**

Countries with completed NAPs			Countries preparing for donor forums	Countries with draft NAPs	Countries without NAPs
Approved	Not Approved	Mainstreaming			
Lesotho Madagascar Malawi Namibia Swaziland Zambia Zimbabwe	Botswana Mozambique Tanzania	Lesotho Malawi Swaziland Tanzania Zambia	Swaziland South Africa Zambia	South Africa	Angola DRC Mauritius

SOURCES SADC and The Global Mechanism, *The GM-SADC Partnership for UNCCD Implementation in Southern Africa,* SADC, 2003
UNCCD, Forum on the Implementation of the UNCCD Preparatory to the World Summit on Sustainable Development, 2002 Praia, Cape Verde

Priority programmes of the SRAP **Box 2.3**

- Capacity and institution-building
- Enhancement of early warning systems
- Co-operation for sustainable management of shared natural resources and ecosystems
- Information collection, management and exchange
- Development and transfer of appropriate technologies to the community
- Development of alternative sources of energy, and
- Socio-economic issues.

SOURCE SADC, *Sub-regional Action Programme to Combat Desertification,* Maseru, 1997, p. 8-10

especially those of a transboundary nature. The priority areas of the SRAP are as listed in Box 2.3, and they include integrated management of ecosystems.

The implementation of the SRAP, now coordinated by the SADC Secretariat after the phasing out of sector coordination units in member states, is progressing through two activities that will have far-reaching and long-lasting impact on land management. One is the selection of capable institutions to serve as centres of excellence or lead institutions for capacity-building in specific areas of UNCCD implementation. The centres of excellence include:

- Desert Research Foundation of Namibia (RDFN) for capacity-building and research in desertification;
- Tanzania Traditional Energy Development and Environment Organization/Commission on Science and Technology for sustainable rural energy development;
- Faculty of Law, University of South Africa to lead the region in environmental law;
- Faculty of Agriculture, University of Zimbabwe for improved rangeland utilisation in SADC countries; and
- Farmer Support Group, University of Natal, South Africa for community participation, appropriate technology, and indigenous knowledge.

FUTURE CHALLENGES

Land reforms

The emerging debate around land raises three key questions in southern Africa:[58]

- Will the current round of land reforms mark a decisive break with the colonial past or will it entrench new forms of inequality?
- What is the impact of globalisation on the livelihoods of the rural poor?
- Do the land invasions in Zimbabwe herald a new phase of agrarian struggle in southern Africa?

Within the emerging paradigm, a number of older approaches remain, which do not directly challenge the current dominant position, live on. These include:[59]

- A technocratic approach, based on increased output, efficient land use and modernisation of the peasant agricultural sector, all grounded in the farmer settlement pattern of the colonial era; and
- A political or nationalist approach, currently dominant in Zimbabwe, and to a lesser extent in South Africa and Namibia, that advocates the indigenisation of landholding, but may not sufficiently address other fundamental issues such as gender.

Although the regional food output has improved significantly since 1994 largely due to measures taken by member states to boost food production, access to food is still a major problem. Critical challenges facing the region relate to intra-regional trade and effective market infrastructure. Thus, there is need to reshape policies at both the regional and national levels.

Genetically modified foods

Population increase in the region has not been matched by a corresponding increase in food production. The policy response to this situation, as presented in the SADC RISDP is, among other things, to increase productivity of the land through land-tenure reforms, increased use of fertilizers and irrigation, mechanisation and improved seed production and use of different crop varieties. This will generally transform agriculture from traditional to modern, intensive, scientific and technology-based farming. Indigenous crop and animal varieties may be lost in such transformations unless institutional frameworks for collecting, storing and breeding

traditional genetic material are put into place as advocated under the Convention on Biodiversity (CBD), illustrated in Box 2.4.

Food insecurity exposes the SADC region to the challenge of how to deal with Genetically Modified Organisms (GMOs) as some of the drought relief and food aid donations have consisted of genetically modified (GM) grains. Although SADC adopted policy recommendations on GMOs, this remains an emerging issue that needs further consultations and negotiations, especially in the context of continued trade liberalizations. Of concern to member states are:

- the issues of bio-safety;
- the impact of GMOs on the environment;
- trade with non-GMO partners;
- ethics issues;
- intellectual property rights; and,
- access to seeds by small-scale farmers.[60]

The biotechnology debate is highly polarised with proponents talking of the potential productive gains from GM crops, while critics point to the significant food and safety risks, environmental hazards, and economic and social concerns. The recurrent food crises in southern Africa highlight GM technology as an emerging but critical issue for the region.

Illustrative Options

Farm mechanisation is one way to increase food production and overcome food insecurity.

The urgency of the GM food issue has elicited varied responses from the region indicating that member states are unprepared for the technology. As of 2002 only three countries of the region – Malawi, South Africa and Zimbabwe – had legislation on GM foods.

The climatic conditions that acted as a trigger to the GM food debate in 2002 disguised and obscured the real issue, which must centre upon the complex nature of food security and the critical need to revise conventional approaches to food shortages.

Donations of GM maize during the 2002/03 drought-induced famine in southern Africa resulted in hotly contested debates in recipient countries. Zimbabwe was the first country to raise alarm in June 2002 when it refused 10,000 tonnes of GM food from the United States of America.[61] The objection was based on the argument that the maize could spread GM strains, thereby contaminating the country's crop germplasm. However, Zimbabwe subsequently revised its position, and agreed to accept GM maize subject to it being milled beforehand or immediately upon arrival in the country.

Mozambique too expressed concern, allowing securely packaged GM maize, to avoid any spillage. Malawi, Lesotho and Swaziland allow GM food only in milled

Convention on Biological Diversity and agro-biodiversity **Box 2.4**

The Convention's agricultural biodiversity work programme focuses on assessing the status and trends of the world's agricultural biodiversity and their underlying causes. It also pays attention at identifying and promoting adaptive management practices, technologies, policies and incentives. In addition, it promotes conservation and use of genetic resources that are of actual or potential value for food and agriculture.

The work programme focuses on various technical aspects of new technologies, such as Genetic Use of Restriction Technologies (GURT), and the potential implications of these technologies on agricultural biodiversity, bio-security, farming, and the economy. It also has cross-cutting initiatives within the agricultural work programme such as the international initiative for Conservation and Sustainable Use of Pollinators, and an international initiative for the Conservation and Sustainable Use of Soil Biodiversity. The programme of work also studies the impacts of trade liberalisation on agricultural biodiversity.

The work programme identifies policy issues that governments can consider when addressing such matters while considering various ways and means to improve the capacity of stakeholders and promote the mainstreaming and integration in sectoral and cross-sectoral plans and programmes at all levels.

SOURCE UNEP, *Convention on Biological Diversity*, Nairobi, 2004

form. Zambia rejects GM maize outright.

In order to make sense of the emerging debate around GM food, three separate issues are being explored in the region:

- Managing threats and concerns related to the importation of GM food;
- Ensuring food security and the role of GM food; and
- Managing GM foods using African solutions to African conditions and reality.

As part of efforts to manage GM foods the SADC region came up with guidelines on GMOs, biotechnology and bio-safety and these are listed in Box 2.5.

SADC recommendations on genetically modified organisms **Box 2.5**

The following recommendations were formulated by the SADC Advisory Committee on Biotechnology and Bio-safety and were approved by SADC in August 2003 as interim measures aimed at guiding the region on issues relating to biotechnology and bio-safety.

Handling of food aid

- SADC should develop and adopt a harmonised transit information and management system for GM food aid designed to facilitate trans-boundary movement in a safe and expeditious manner.
- SADC is encouraged to source food aid preferably from within the region, and advise all cooperating partners accordingly.
- Donors providing GM food aid should comply with the Prior Informed Consent principle and with the notification requirements in accordance with Article 8 of the Cartagena Protocol on Bio-safety.
- Food aid consignments involving grain or any propagative plant material that may contain GMOs should be milled or sterilized prior to distribution to beneficiary population.
- Food aid in transit that may contain GMOs should be clearly identified and labelled in accordance with national legislation.
- SADC countries managing or handling food aid in transit that may contain GMOs are encouraged in the absence of national legislation to make use of the requirements under the AU Model Law on Bio-safety and/or the South African Guidelines on the handling of transit material which may be GMO.

Policy and regulations

- Each member state should develop national biotechnology policies and strategies and expedite the process of establishing national bio-safety regulatory systems.
- All member states should sign and ratify the Cartagena Protocol on Bio-safety to the Convention on Biological Diversity.
- The region should develop a harmonised policy and regulatory systems based on the African Model Law on Bio-safety and the Cartagena Protocol on Bio-safety and other relevant international processes.
- Member states without a regulatory framework for GM crops should use approved guidelines and should not import genetically modified grain for seed before approved guidelines are in place.
- Risk assessments should be done on a case-by-case basis and every genetic modification should be tested in the environment under which it will be released.

Capacity building

- Member states should develop capacities at national and regional levels in order to develop and exploit the benefits of biotechnology.
- SADC should allocate resources for capacity-building in management of biotechnology and bio-safety.
- SADC should encourage member states to commission studies on the implications of biotechnology and bio-safety on agriculture, environment, health and socio-economics as part of an integrated monitoring and evaluation system.

Public awareness and participation

- Member states should develop public awareness and participatory programmes on biotechnology and bio-safety that involve all stakeholders.

SOURCE SADC, *SADC Today,* Vol.7 No.1, SADC/SARDC, Gaborone, April 2004

LINKAGES

Chapter 1 Regional Overview
Land is an important asset for southern Africa. However, poor land management practices can result in the impoverishment of the region or even conflicts.

Chapter 3 Atmosphere
The continued clearance of forests for agricultural expansion reduces southern Africa's contribution towards mitigating global warming through carbon sequestration. Burning of biomass through slash and burn modes of agriculture further contributes to atmospheric pollution.

Chapter 4 Freshwater Resources
The intensification of agriculture increases the demand for water for irrigation. Poor management of irrigation may result in the salinization of soils in hot dry areas. Land shortages also result in the shrinking of wetlands as these are converted into croplands.

Chapter 5 Marine and Coastal Resources
The growth in water demand for agriculture causes river impoundments, which in turn reduce water flows into marine ecosystems such as deltas and estuaries.

Chapter 6 Forests and Woodlands
Agricultural expansion always targets forests and woodlands, causing deforestation. For the majority of rural farmers, biomass energy remains a cheap and only viable source of energy for heating, cooking and rural-based industries, due to limited access to alternative energy sources such as solar.

Chapter 7 Wildlife
As land is opened up for agriculture, habitat for wildlife is modified causing loss of biodiversity. In some cases wild animals are viewed as pests, resulting in their wanton destruction.

Chapter 8 Human Settlements
Land provides the base resource for human activities, including shelter through settlements. In urban areas land is competed for, and therefore expensive. In emergency situations such as the case with internally displaced people and refugees, land may be poorly managed, causing soil erosion.

Chapter 9 Outlook
The number of people and levels of poverty have been increasing over the years. This trend is expected to continue, resulting in more land, including fragile land, being opened up for agriculture and settlements.

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ATMOSPHERE 3

The atmosphere provides the supporting medium to life, property and the environment. Its dynamism, characterised by seasonal and daily changes in temperature, rainfall and wind systems, shapes human cultures, food production, location of settlements and the general state of the environment.

The atmosphere is composed of layers that include the troposphere, which has immediate interactions with the earth surface. The troposphere has the right mix of gases to support life, and is protected from ultra-violet radiation from the sun by the ozone layer.

Global weather and climatic systems are defined in the troposphere. Other factors such as proximity to the equator also shape global and regional weather and climatic systems. Due to its location, southern Africa experiences tropical and sub-tropical climatic conditions, with rainfall decreasing from the equatorial regions of the Democratic Republic of Congo (DRC) southwards to the arid sub-tropical regions of Namibia, Botswana and South Africa.

South African Tourism

Interactions between the oceans and the atmosphere and the land surface cause variability in climate patterns.

Climate is the most important aspect of the atmospheric phenomena. Climate variability is caused by interactions between the oceans and the atmosphere and the land surface, often influenced by natural or human-induced changes in the region and elsewhere in the world. This variability may take the form of changes in rainfall patterns, rise in temperatures and sea level, and increased frequency of extreme events such as droughts, floods and tropical cyclones. Changes and variability in climate patterns thus have far-reaching impacts on the socio-economic development of southern Africa and the well-being of the region's inhabitants.

OVERVIEW OF THE CLIMATE SYSTEM

Except for the northern flank of the DRC, which straddles the equator, southern Africa is located south of the equator. The region lies between the South Atlantic and Indian Ocean subtropical high-pressure cells, and is subjected to the interaction of tropical easterly and westerly wind patterns that arise from outside the tropics. Both these high-pressure cells change their longitudinal positions during the southern hemisphere summer and winter, directly affecting the weather systems over the region.

The monthly variation of temperature across the region is gradual. During the period December to February, the peak of the rainy season, surface temperatures are warmest over the desert areas of Botswana and Namibia, and over the western Indian Ocean where temperatures are greater than 26°C. Relatively cooler conditions are dom-

inant over the central portions and also to the southeast of the region where temperatures are less than 20°C. This is due to the maximum mean cloudiness associated with summer rains that blocks radiation from the sun.[1]

Southern Africa experiences cooler temperatures during the period March to May. Temperatures of around 20°C are experienced across most of the region over this period. Higher temperatures are confined to the north-western areas such as western Angola, the DRC and over the length of the east coast where temperatures are higher than 24°C.[2]

In winter the temperatures are also warmer in coastal areas than inland. Only the equatorial belt, particularly the bulk of the DRC and the Indian Ocean bordering the region north of 25°S latitude experiences temperatures higher than 24°C during the period June to August. Elsewhere temperatures are generally lower. The core zone experiencing colder temperatures of less than 14°C stretches from Lesotho to most of South Africa and the southern tip of Namibia.[3]

From September to November most of the SADC region experiences very warm temperatures. However, Lesotho, part of South Africa and the southern tip of Namibia can experience temperatures less than 16°C. At the same time, parts of Tanzania and eastern DRC, which will be under rain bearing cloud, experience cool temperatures of around 20°C. Elsewhere, due to absence of clouds and influences of tropical air masses, it is usually warm with temperatures higher than 25°C.[4]

Rainfall is the most critical factor of production in the largely semi-arid or arid southern African region. Rainfall in the region comes from evaporation over the Indian Ocean, as well as wind systems originating from outside the region. Moisture in the air is generally higher in the northeast and lower in the southwest. Rainfall increases towards the equator. As a result, there tends to be more rain in Tanzania, northern Mozambique, Angola and the DRC, and less in Namibia and Botswana. Rainfall is seasonal throughout most of the region. A five-to-seven-month wet season occurs during summer, which usually stretches from October to April.

Some important determinants of southern Africa's rainfall patterns include the Inter-Tropical Convergence Zone (ITCZ), the Botswana Upper High and the El Ninõ phenomenon.

Inter-Tropical Convergence Zone

The Inter-Tropical Convergence Zone brings most of the rain that falls in southern Africa. It is a zone of intense rain-cloud development created when the southeast Trade Winds collide with the northeast Monsoons. The movement of the ITCZ southwards from the equator marks the start of the main rainy season over southern Africa.

The ITCZ migrates seasonally over Africa, in response to the position of the sun, and its arrival leads to substantial rainfall amounts. In a normal year, the ITCZ fluctuates between central Tanzania and southern Zimbabwe, bringing good rains to most of southern Africa. The ITCZ dominates the weather north of the Limpopo river, and seldom penetrates south of this river. Over Angola, it also swings northwards, seldom reaching Namibia.[5]

Rain-bearing cloud systems associated with cold fronts in westerly mid-latitude weather systems cross southern Africa regularly. During summer these cloud bands generally interact with the ITCZ. The swings in the intensity and position of the subtropical high-pressure systems and the westerly cloud bands then influence the impact of the ITCZ in the region.

Botswana Upper High

A middle level atmospheric condition known as the Botswana Upper High occurs from time to time. This is a high-pressure cell usually centred over Botswana between three and six kilometres above sea level. This circulation pattern is inimical to rainfall activity under it and in its vicinity.

At times the Botswana Upper High pressure is more dominant over the southern and central sections of southern Africa.

This disrupts both the ITCZ and the mid-latitude weather systems that influence the rainfall distribution over the region. Under these circumstances longer dry spells are experienced over parts of the region. Thus the persistent occurrence of the Botswana Upper High always results in drought in the region.

El Ninõ

One of the major contributors to the extremes in the climate system worldwide is the El Ninõ phenomenon. It is a weather condition that begins with the warming of waters in the western Pacific Ocean, eventually affecting global climate.[6] The condition has an effect on weather over a quarter of the world's surface. The El Ninõ develops as the warm waters of the tropical Pacific spread eastwards in concert with shifting patterns of atmospheric pressure. The phenomenon is thought to decrease southern Africa's rainfall. Studies show that many regions of the global tropics and subtropics exhibit climate anomalies that correlate with the El Ninõ Southern Oscillation (ENSO).

The Southern Oscillation Index (SOI) is taken as a sufficient index of ENSO. The SOI is the standardised pressure difference between Tahiti in the southeast Pacific and Darwin (Australia). A negative SOI indicates an El Ninõ episode while a positive index is La Nina.[7]

During most El Ninõ episodes the bulk of southern Africa is very likely to experience drought conditions. When there is La Nina, there are chances of higher than normal rainfall across southern Africa.

At a country level there are differences in the responses to the ENSO signals. In particular over Angola and the DRC there is a tendency of getting wetter conditions during El Ninõ events. The island state of Mauritius has an indistinct relationships with ENSO signals.

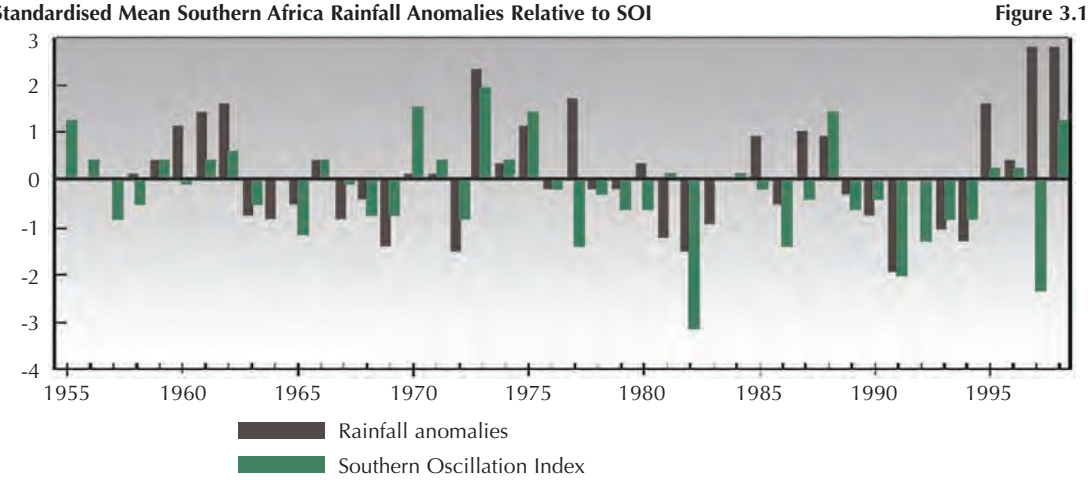
As shown in Figure 3.1, the relationship between ENSO and rainfall anomalies in the region sometimes breaks down as happened in the 1976/77, 1986/87 and 1997/98 seasons.

CLIMATE VARIABILITY

The most common indicator of climate variability in southern Africa is the amount of rainfall received over the years. Year-to-year rainfall variability is high in the region. The 1970s were relatively wet while the period 1980-1990 was relatively dry.[8] Climate variability significantly impacts on ecosystems, as well as presenting risks and opportunities to livelihoods. Water resources and food security are threatened as a result of declining rainfall amounts and increasing evaporation rates.

The most critical impacts of climate variability have been manifested through droughts, floods and tropical cyclones.

Standardised Mean Southern Africa Rainfall Anomalies Relative to SOI **Figure 3.1**



SOURCE http://www.dmc.co.zw

Drought

Hirji et al (2002)[9] define drought as an extended period where precipitation is absent when it is normally expected to occur in a region. It is not a purely physical phenomenon, but instead is the interplay between natural water availability and human demands for water supply. In southern Africa, drought is one of the main natural disasters causing food insecurity.

Droughts have occurred periodically in southern Africa throughout recorded history. As shown in Table 3.1, extensive droughts have afflicted the region in 1967-73, 1981-82, 1986-87, 1991-92, 1994-95 and 2001-03.[10]

The droughts of the 1980s and 1990s have had a marked negative impact on the region. For example, the water level of the Kariba Dam on the Zambezi river dropped by 11.6 m from 1981 to 1992 due to a series of droughts,[11] and this had a major impact on the dam's capacity to generate hydropower.

Droughts have also exerted severe impacts on a wide range of environmental and economic activities. As a result of the 1994/95 drought, cereal harvests in southern Africa declined by 35 percent compared to the previous season, with maize harvests falling by 42 percent.[12]

The impacts of drought in southern Africa are usually consistent with the north-south pattern of the El Ninõ events.[13] For example, during the 1994-95 season, three countries (Botswana, Malawi and Mozambique) produced more cereals than averages recorded over the previous five years, while Lesotho, Namibia, South Africa, Swaziland, Zambia and Zimbabwe produced far less than their requirements. This was also a period of significant political change in the region which could have impacted on crop production in some countries such as Malawi, Mozambique, Namibia, South Africa and Zambia, but no comparative studies have been done to indicate the different impacts. At national level, the north-south pattern of the El Ninõ phenomenon was emphatic in Mozambique where the southern part of the country was drought- stricken, while the northern part was not and had a grain surplus.[14]

Tropical cyclones and floods

Alternative to droughts, southern Africa can experience exceptionally wet seasons resulting in extensive flooding. Most flooding is associated with active cyclones that develop in the Indian Ocean. The 1999-2001 rainfall seasons were dominated by active tropical cyclonic activity, which caused considerable human suffering across parts of the SADC region. Tropical cyclone Eline had the most devastating effects in the region over this period.

Cyclone Eline ravaged parts of southern Africa. Heavy rains were experienced over southern Mozambique, as well as parts of

Rainfall Trends in Southern Africa 1967- 2000 **Table 3.1**

1967-73	This six-year period was dry across the entire region. Some records show a severe drought in 1967.
1974-80	This period was relatively moist over much of southern Africa. In 1974 the mean annual rainfall was 100 percent above normal throughout the region.
1981-82	Drought in most parts of southern Africa.
1982	Most of sub-tropical Africa experienced drought.
1984-85	Near normal seasons, but drought strains from the previous three years were still felt in most parts of the region.
1986-87	Drought conditions returned to the region.
1988-90	Near normal seasons.
1991-92	Severe drought in southern Africa, excluding Namibia.
1993-94	Conditions improved.
1994-95	Many SADC countries were hit by the worst drought in memory, surpassing effects of the 1991-92 drought in some parts of the region.
1996-97	Normal rainfall for most of the region.
1997-98	Normal rainfall throughout the region including the north-east, although impacts of El Nino were significant.
1999-2000	Cyclone Eline hit the region and widespread floods devastated large parts of the Limpopo basin (southern and central Mozambique, south-eastern Zimbabwe, parts of South Africa and Botswana).
2001-03	Another severe drought in the SADC region, particularly from Zimbabwe northwards.

SOURCE Adapted from SARDC,Chenje, M. (ed), *State of the Environment Zambezi Basin 2000*

the Northern Province of South Africa and south-eastern Zimbabwe where more than 200 mm of rain was recorded over periods of less than 48 hours at many stations. Consequently, people in this region experienced considerable suffering associated with flooding. Similar weather was experienced during the 2000-01 season with the southern portions of the region registering flooding again although the devastation was less dramatic than the previous season.

Cyclone Eline affected 150,000 families in Mozambique alone, resulting in physical damage worth US$273 million, and US$295 million in lost agricultural production. The country had to import food worth more than US$30 million.[15] There was widespread damage to infrastructure with bridges washed away and large sections of major roads rendered impassable, mainly in Mozambique, Malawi, South Africa and Zimbabwe.

Impact of the 1999/2000 floods **Box 3.1**

The 1999/2000 floods in southern Africa affected over 150,000 families and 200,000 ha of farmland. Many roads in Mozambique were destroyed, including important links between the north and the south and the vital route to South Africa, where only light traffic was able to pass.

The floods caused extensive damage to the state-owned Mozambique Ports and Railway (CFM) operations. It was estimated that the company was losing about $50,000 a day as the floods paralysed the rail system. The most damaged line was the Limpopo, which links Maputo to Zimbabwe. Four kilometres of the line were submerged and a further four kms were hanging over huge gullies. Repairing one kilometre of rail-track costs between US$300,000 and US$400,000. The state-owned electricity company EDM estimated that the damage caused to transmission lines from the Cahora Bassa dam was about one million dollars.

It was estimated that a quarter of Mozambican agricultural produce had been destroyed. According to the UN World Food Programme (WFP), the country lost at least a third of the staple maize crop and 80 percent of its cattle. The government required financial assistance to sustain a long-term food aid programme.

Environmental degradation including that of wetlands such as the Kafue and the damming of rivers worsened the impact of the floods. Due to the heavy rainfall most of the major dams were spilling and floodgates of major dams such as Kariba were opened.

The floods caused by Cyclone Eline affected four provinces in Zimbabwe – Manicaland, Masvingo, Midlands and Matabeleland South. More than 160,000 people were affected and displaced, 62 people died, and livestock and wildlife were lost. People living in rural areas lost their stored grain and the crops in the fields; the floods damaged bridges, and falling trees damaged electricity and communication lines.

SOURCE SARDC, *Limpopo Rapid Environmental Assessment,* 2002

CLIMATE CHANGE

Climate change is a global concern, which is currently receiving a lot of attention in scientific and political circles.

Mountain glaciers around the world continue to melt, with new, still tentative figures for 2005 confirming the trend in accelerated ice loss during the previous 25 years, and bringing the average ice thickness loss in that period to more than 10 metres.[16] Southern Africa's beacon in this regard is Mt Kilimanjaro in northern Tanzania.

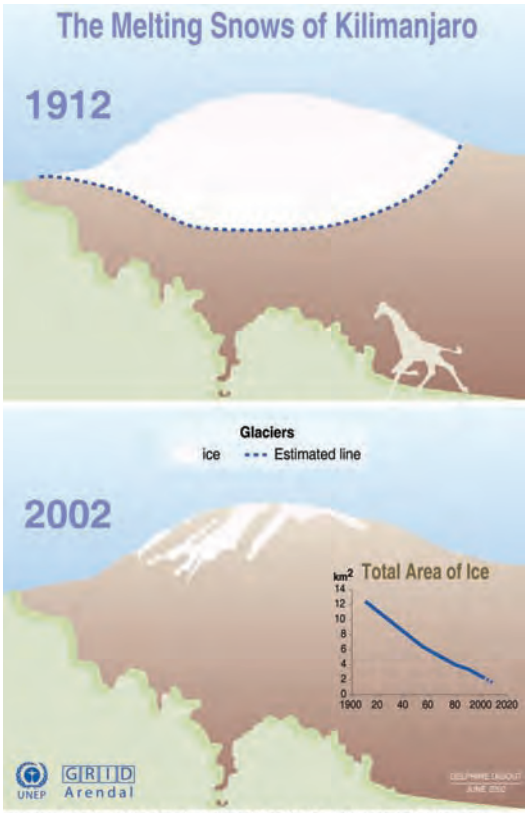
According to the World Wide Fund for Nature (WWF), there are indications of climate change in southern Africa. Records from the SADC countries reveal that temperatures have risen by more than 0.5°C over the past 100 years, and the 1990s were the warmest and driest ever.[17] There are also fears that the region could be affected by a rise in the sea level.

Temperature and sea level rise

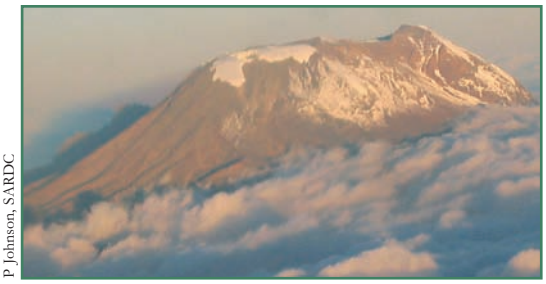
Human activities are increasing the atmospheric concentrations of greenhouse gases, which tend to warm the atmosphere. These changes in greenhouse gases are projected to lead to regional and global changes in climate, mainly temperature and rainfall, and climate-related parameters such as soil moisture and sea level. Climate models project an increase in global mean surface temperature of about 1-3.5°C by 2100 and an associated increase in sea level of about 15-95 cm.[18]

The measured atmospheric concentrations of several important gases which contribute to the enhanced greenhouse effect (such as carbon dioxide, nitrous oxides and methane) are increasing due to industrialisation. Over the last decade global industrial activity has grown 40-fold, and the emissions of gases such as carbon dioxide and sulphur dioxide have grown tenfold.[19]

There has been a marked increase in the atmospheric concentration of methane,



Sources: Meeting of the American Association for the Advancement of Science (AAAS), February 2001 ; Earthobservatory.nasa.gov.



P Johnson, SARDC

which is released during the decomposition of organic matter. The level of methane has risen from a pre-industrial level of around 700 parts per billion by volume (ppbv) to about 1,730 ppbv by the end of the 1990s.[20]

Southern Africa's emissions of greenhouse gases represent only two percent of the world total.[21] The region's emissions are, however, projected to rise as economies develop, including a threefold increase in Zimbabwe over the next 50 years.[22] South Africa already has a net positive greenhouse gas emission level, and accounts for 42 percent of all emissions from southern Africa.[23]

According to the Inter-governmental Panel on Climate Change (IPCC), the earth has warmed by an average of 0.4 to 0.8°C since 1860, with the period 1980-2000 being the warmest of the last century.

Consequently, global sea levels are expected to rise due to the melting of snow and ice. Already the snow on Mount Kilimanjaro is melting.[24]

Crop yields are expected to drop by as much as 10-20 percent in some parts of the region.[25] It is also predicted that the malaria-carrying *Anopheles* female mosquito will spread to parts of Namibia and South Africa where it has not been found before.[26]

There now appears to be agreement that, with increasing atmospheric emissions of greenhouse gases, summer rainfall will decrease over subtropical regions of southern Africa and will increase over tropical regions. Lower rainfall over the winter rainfall region of the southern Cape is also probable.

Over the long term, it is predicted that much of southern Africa will become more arid. This will exacerbate the current situation in the arid and semi-arid lands that constitute much of the region.[27] However, it is not possible to predict with any degree of certainty the exact timing, magnitude and nature of expected climate changes under the effects of global warming.[28]

Climate change and variability will amplify droughts and desertification, resulting in a further rise in global temperatures, and reduced economic growth, as finances will be diverted to deal with adapting to climate change rather than impact. WWF (2000)[29] forecasts that wildlife will be severely threatened in the Kruger National Park in South Africa; the Zambezi basin; the Okavango delta in Botswana; and Hwange National Park in Zimbabwe. The anticipated five percent decrease in rainfall will affect grazing species such as hartebeest, wildebeest and zebra.[30]

West Indian Ocean islands are particularly vulnerable to the impacts of sea-level rise due to their low-lying flat lands and a concentration of people, tourism, infrastructure, transport and industrial activities in coastal zones. It is estimated that a 100 cu m rise in sea level would submerge 70 percent of the land area of the Seychelles islands and five sq

Some signs of a changing climate **Box 3.2**

Testimony on the impact of climate change from a man born 1917 in Botswana
"When we arrived in 1952 it was very different. The village was green; there was enough grass for grazing. There were many more trees, big trees. Some places were made by God to be bare but all the rest of the land had a lot of grass for thatching. Then it started to be two years of good rain and then several bad years and so on. Now it has been bad for three years. The climate is changing and that is the main reason for the problems."

Ice rats multiply further in Lesotho
Ice rats, rodents found in Lesotho at altitudes higher than 2,500m, are being implicated in large-scale soil erosion. The numbers of ice rats are usually regulated by cold winter conditions common in the mountainous country. Very often their burrows are covered in a thick layer of snow, and the plants they feed on are scarce in winter. However, during the past decades, the winters in Lesotho have become relatively mild, resulting in the flourishing of the ice rat population. When ice rats feed on plants, they do not only bite off the green part above ground, but also pull the entire root, thereby exposing the topsoil to wind and water erosion. Their burrows also destabilise the topsoil layer and again, as water moves through the burrows, the nutrient-rich topsoil washes away.

SOURCE Government of Botswana, *Botswana Country Report to the Inter-governmental Panel on Climate Change (IPCC)*, undated; Government of Lesotho, *Lesotho Country Report to the Inter-governmental Panel on Climate Change (IPCC)*, undated

km of land in Mauritius.[31] Up to 2,117 sq km would be inundated in the United Republic of Tanzania, and a further nine sq km of the coast eroded, causing damage of more than US$50 million.[32]

POLICY RESPONSES

Southern Africa has a lot to lose if the climate changes at the anticipated rates. Participation by countries in the region in processes to address climate change is therefore of paramount importance at regional, continental and global levels.

Regional efforts

In order to effectively develop ways of managing climate-related disasters, the SADC Drought Monitoring Centre (DMC) was established in Harare in 1991. The main objective of the SADC DMC is to minimise negative impacts of climatic extremes on socio-economic development in the region. This is achieved through the monitoring of near real-time climatic trends and generating long-range climate outlook products on monthly and seasonal (up to six months) timescales. These outlook products are disseminated to the regional community to afford greater opportunity to decision-makers for development of strategic plans especially in dealing with adverse climatic conditions.

Efforts of the DMC are complemented by the SADC Regional Early Warning System, which in conjunction with the Famine Early Warning System, provides advisory services regarding status of the food security situation in the region. Such systems have been useful in informing national and regional policies, forming the basis for food aid requests, as well as laying the foundation for land and agrarian reforms.

Recently there have been further efforts in southern Africa to develop long-lead climate forecasting based on tropical sea surface temperature conditions. The reliability and usefulness of these forecasts to users in emergency relief, agriculture, water management and health is still being tested. In order to maximise the benefits of advances in climate prediction, southern Africa has demonstrated a need for a sub-regional climate network, which would meet regularly, interpreting global and regional climate signals, and providing seasonal rainfall forecasts for the region. This is done through the Southern Africa Regional Climate Outlook Forum (SARCOF) process, which advises on the likely status of the rainfall season before its onset. The forum produces simple maps that are interpreted and disseminated through various media across the region.

The region is also seeking ways of dealing with the root causes of climate variability

and change. For example, the region has been urged by regional pollution experts to develop a protocol to tackle the growing problem of transboundary air pollution, through the Harare Resolution on the Prevention and Control of Regional Air Pollution in Southern Africa and its Likely Transboundary Effects.

The proposed protocol would take the following into account:

- The need for harmonised and strengthened incentive structures;
- The advantages of developing strategies for increasing awareness and education;
- The benefits accruing from improved information availability and accessibility;
- The importance of developing, through SADC, a structure with required linkages in southern Africa, to carry out coordinated programmes in building up and applying standardised methodologies to monitor emissions, concentrations, depositions and impacts; and
- The importance of engaging stakeholders (industry, academic institutions, NGOs, communities, media, etc.) in these efforts and activities.

At the national level, all SADC member states have policies on air pollution control in one form or another. However, many of the laws are outdated and enforcement of the policies is also limited. In some countries, air pollution control is seen more as a health issue than an environmental concern, to the extent that monitoring and enforcement are difficult due to different priorities between health and environment departments.

International efforts

Climate change is a global phenomenon, requiring international efforts to complement regional and national policies, laws and programmes. The international efforts are enshrined in protocols and conventions, including the Montreal Protocol, United Nations Framework Convention on Climate Change, and the Kyoto Protocol. However, it is often difficult for such global efforts to be domesticated at the national level, mainly due to lack of financial and human resources.

Montreal Protocol

The Montreal Protocol was adopted in 1987, and subsequently revised in 1990 and 1992. It aims to eliminate some greenhouse gases,

Summary of Montreal Protocol Control Measures **Table 3.2**

Ozone-depleting substances	Developed countries	Developing countries
Chlorofluorocarbons (CFCs)	Phased out end of 1995[a]	Total phase out by 2010
Halons	Phased out end of 1993	Total phase out by 2010
Carbon tetrachloride	Phased out end of 1995[a]	Total phase out by 2010
Methyl chloroform	Phased out end of 1995[a]	Total phase out by 2015
Hydrochlorofluorocarbons (HCFCs)	Freeze from beginning of 1996[b]	Freeze in 2016 at 2015 base level
	35% reduction by 2004	
	65% reduction by 2010	
	90% reduction by 2015	
	Total phase out by 2020[c]	Total phase out by 2040
Hydrobromofluorocarbons (HBFCs)	Phased out end of 1995	Phased out end of 1995
Methyl bromide	Freeze in 1995 at 1991 base level[d]	Freeze in 2002 at average 1995-1998 base level
	25% reduction by 1999	20% reduction by 2005[e]
	70% reduction by 2000	
	Total phase out by 2005	Total phase out by 2015

a With the exception of a very small number of internationally agreed essential uses that are considered critical to human health and/or laboratory and analytical procedures.
b Based on 1989 HCFC consumption with an extra allowance (ODP weighted) equal to 2.8% of 1989 CFC consumption.
c Up to 0.5% of base level consumption can be used until 2030 for servicing existing equipment.
d All reductions include an exemption for pre-shipment and quarantine uses.
e Review in 2003 to decide on interim further reductions beyond 2005.

SOURCE *http://www.theozonehole.com/montreal.htm*

particularly the cholorofluorocarbons (CFCs), from industrial production. The agreement stipulates that the production and consumption of compounds that deplete ozone in the stratosphere – CFCs, halons, carbon tetrachloride, and methyl chloroform, were to be phased out by the year 2000 (2005 for methyl chloroform).

As a result of this rapid action, the global emissions of the most active CFCs, which deplete the stratospheric ozone layer shielding the planet from damaging ultraviolet radiation, fell by 40 per cent within the five years to 1997, and the levels of other chlorine-containing chemicals in the atmosphere have started to decline. It will be many decades before the CFCs already in the atmosphere are destroyed but as Table 3.2 shows, some ozone-depleting substances have already been phased out in developed countries and there are control measures and suggested timeframes to phase out a number by the end of the decade.[33]

UN Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) arose from the UN Conference on Environment and Development held in Rio de Janeiro, Brazil in 1992. The UNFCC is a result of scientific work that was done on behalf of the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) by the Intergovernmental Panel on Climate Change (IPCC).

The convention recommends methods for cooperation in reducing the effects of global warming. It recognises the sovereignty of nations and the need for economic development as a means to strengthen the countries' responsiveness to limiting their impact on the climate system. It is acknowledged in the convention that measures taken to correct the negative effects of human activity on the climate system should not be restrictive on trade. To date, all SADC countries are signatory to the UNFCCC, showing the importance the region accords to climate change and variability.

Activities Implemented Jointly (AIJ) emanate from article 42(a) of the UNFCCC, which states that parties may choose to implement the objectives of the convention "jointly" with other parties. By February 1998, 103 projects had been set up and only two were in Africa, of which none was conducted in southern Africa.

Poor participation by the southern African region has been attributed to limited private sector involvement due to lack of credits, as well as ignorance and skepticism, bias towards traditional foreign direct investment recipients and absence of capacities at the national levels to successfully campaign for and implement such projects. Another cause identified is the reactive approach usually taken by Africa on global issues.

Kyoto Protocol

The Kyoto Protocol was adopted in 1997 at the UNFCCC Conference of the Parties held in Kyoto, Japan. The Protocol calls for stronger action in the post-2000 period. The Parties to the Convention agreed that developed countries will have a legally binding commitment to reduce their collective emissions of six greenhouse gases by at least five percent of the 1990 levels over the period 2008-2012. The Protocol also establishes an emissions-trading regime, project-based credit trading and a "clean development fund."

In the emissions-trading provision, a country with emissions exceeding its target will be allowed to buy emission permits from another party with emissions below its target. The intended result will be that the country exceeding its emission target will be able to choose between reducing emissions through domestic measures or purchasing those reductions on the emissions-permit market, based on cost. Under the project-based credit trading, also referred to as joint implementation, a country will receive credit towards meeting its emissions target by supporting specific projects that reduce emissions in another country.

The clean development mechanism is designed to lower the cost of compliance for developed countries and promote participa-

tion by the developing world through the widespread use of clean technologies. Developed nations will earn credit towards meeting their emissions targets by partnering with a developing country in a project to reduce emissions in that developing country. Alternatively, developed nations will be able to purchase reductions permits directly from the mechanism, with proceeds from these permit sales funding projects to reduce emissions in developing countries, assisting nations harmed by the impacts of climate change, and paying administrative costs.

All southern African countries, with the exception of Angola, have ratified the UNFCCC and its proposed mechanism for implementation, the Kyoto Protocol.[34]

The Kyoto Protocol reiterates the objectives of the UNFCCC, with a more practical approach. It recognises the importance of exploiting natural resources for human survival, the need to cooperate to reduce global warming and climate change, and recalls the provisions of the declaration of the UN at the 1972 UN environment conference in Stockholm. It also recognises the need for nationally binding environment standards, declarations of the Vienna Convention, declarations of the second World Climate Conference, and provisions made by the General Assembly of the UN regarding protection of the environment.

The Protocol is conscious of the various efforts by many national and international organisations to curb climate change, that some countries are more likely to be affected by climate change (especially low-lying islands), and that developing countries still rely heavily on fossil fuels for energy requirements.

FUTURE CHALLENGES

Climate change and variability are global issues, requiring concerted international efforts. The global nature of these atmospheric phenomena presents a great challenge in that it is difficult to reach international consensus in finding solutions to mitigate their impact or even slow down their occurrence.

The delay by the United States of America in signing the Kyoto Protocol is seen by the international community as one of the challenges towards addressing issues of climate change and variability as that country is the world's largest contributor to industrial emissions of greenhouse gases.

Other international policies relevant to the climate change debate **Box 3.3**

Vienna Convention, 1985

The Vienna Convention was adopted in March 1985 and came into force in September 1988. Its objectives are to encourage cooperation in research and in the formulation and implementation of measures to protect human health and the environment against adverse effects resulting from modifications of the ozone layer.

Global Environment Facility

The Global Environmental Facility (GEF) was set up on a pilot basis under an agreement made by 25 countries in 1990 and is managed by the World Bank, UNEP and the United Nations Development Programme (UNDP).

The GEF provides funding for investments related to, among other things, the objectives of the Convention on Long Range Transboundary Air Pollution and its Related Protocols (1970), which was adopted in 1979 and came into force in 1983. The convention is open for accession to countries which are members of the European Union as well as to countries having consultative status with the UN Economic Commission.

The 32 countries which are signatories to the convention have committed themselves to adopting national policies for controlling air pollution.

This is defined in the convention as "the introduction by people, directly or indirectly of substances or energy into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment."

The objective of the convention and its protocols is to provide for the control or reduction of nitrogen oxide and sulphur dioxide emissions.

SOURCE UNEP, *African Environment Outlook: Past Present and Future Perspectives*, 2002

Closer to home, some countries may find no direct value in addressing climate change and variability issues since their contribution to the phenomena is minimal. There is, therefore a need to initiate high levels of awareness for all to appreciate their efforts towards mitigating the effects of climate change.

The reliability of regional predictions is also still low and the degree to which climate variability may change is uncertain. However, potentially serious changes have been identified, including an increase in some regions in the incidence of extreme high-temperature events, floods and droughts, with resultant consequences for fires, pest outbreaks, and ecosystem changes.

Policymakers have to decide to what degree they want to take precautionary measures by mitigating greenhouse gas emissions and enhancing the resilience of vulnerable systems by means of adaptation.

Uncertainty does not mean that the region cannot position itself better to cope with the broad range of possible climate changes or protect against potentially costly future outcomes. Delaying such measures may leave the region poorly prepared to deal with adverse changes and may increase the possibility of irreversible or very costly consequences.

Options for adapting to change or mitigating change that can be justified today (such as abatement of air and water pollution) and make society more flexible or resilient to anticipated adverse effects of climate change, appear particularly desirable.

LINKAGES

Chapter 1 Regional Overview
As a relatively industrialised region in sub-Saharan Africa, southern Africa is increasingly contributing to the threats to human and environmental health through atmospheric pollution.

Chapter 2 Land
Agriculture is a major source of pollution through the use of herbicides, fertilizers and pesticides, which find their way into the air, mainly when applied as aerial sprays. Such pollution affects human health, discolours physical structures and affects the environment.

Chapter 4 Freshwater
Climatic factors resulting in droughts and floods are of concern to southern Africa where disparities in the temporal and spatial variations in water supply are a common feature.

Chapter 5 Marine and Coastal Resources
Sea level rise resulting from climate change could have implications in the region through submergence of infrastructure.

Chapter 6 Forest and Woodlands
Forests and woodlands provide an important sink for greenhouse gases such as carbon dioxide. One of the global efforts towards climate change abatement is to maintain, as well as establish forests and woodlands.

Chapter 7 Wildlife
Climate change is already affecting habitats, especially marine and coastal ecosystems.

Chapter 8 Human Settlements
Settlement patterns are to a large extent determined by weather and climatic patterns. With sea level rise caused by climate change there are fears that stretches of coastal settlements will be inundated.

Chapter 9 Scenarios
Atmospheric pollution is a worsening problem in southern Africa with South Africa already producing net levels of greenhouse gases. There is need for timely interventions through appropriate policy and strategic interventions.

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FRESHWATER RESOURCES 4

Freshwater is a resource of strategic importance that plays a key role in regional integration. It is a vital resource on which whole ecosystems depend, and it is also important for social and economic interaction. Freshwater is essential in meeting basic human needs including drinking, cooking and hygiene. Animals and plants depend on water for survival and many can only live in freshwater or close to a permanent source.

Southern Africa has an abundance of freshwater resources found in surface and ground reservoirs. Despite its abundance, freshwater distribution in southern Africa is variable in both time and space. The resource is also vulnerable to inappropriate management practices which result in pollution, and limit access to safe drinking water and sanitation.

As a result there are initiatives by the Southern African Development Community (SADC) to promote Integrated Water Resources Management (IWRM) through the Protocol on Shared Watercourses, and the Regional Indicative Strategic Development Plan (RISDP)[1] which clearly sets out water-related targets.

SARDC

Animals and plants depend on water for survival and many can only live in water or close to a permanent source.

AVAILABILITY OF FRESHWATER RESOURCES

The availability of internal renewable freshwater resources per year in southern Africa is 2,121.8 cubic kilometres,[2] as shown in Table 4.1. These are found in:

- fresh groundwater aquifers;
- freshwater lakes and reservoirs;
- freshwater aquatic ecosystems, including wetlands; and
- rivers.

Freshwater resources are also available as soil moisture and atmospheric water vapour.

Annual Renewable Freshwater Resources in Southern Africa **Table 4.1**

Country	Total annual renewable freshwater available (cu km/yr)
Angola	184.0
Botswana	14.7
DRC	1 019.0
Lesotho	5.2
Madagascar	337
Malawi	18.7
Mauritius	2.2
Mozambique	216.0
Namibia	45.5
South Africa	50.0
Swaziland	4.5
Tanzania	89.0
Zambia	116.0
Zimbabwe	20.0
SADC region	**1,121.8**

SOURCE Hirji *et al*, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, 2002, p25; Gleick, *The World's Water*, 2000

The region's freshwater resources are largely replenished through rainfall. Factors that affect the availability and distribution of water resources in the region include:

- extremely variable climatic conditions;
- population dynamics;
- water-related environmental issues such as the need to maintain ecosystems;
- economic development; and
- political and socio-cultural matters such as food security at regional, basin and national levels.[3]

Rainfall

Freshwater is a renewable resource made available by the sun's energy which evaporates it into the atmosphere from the oceans and land surfaces, and redistributes it into stocks, flows and interactions of ice, liquid and vapour that are known as the "hydrological cycle."[4] Through this cycle, freshwater occurs as runoff in rivers and streams or in lakes, soils and aquifers. An essential component of the cycle is rainfall, which is the most critical factor of production in the region.

Rainfall in southern Africa comes from evaporation over the Indian Ocean, as well as wind systems originating from outside the region, and is highly seasonal, with most areas receiving a wet season of between five and seven months during the October to April summer months.[5] The Western Cape in South Africa is the exception, with a winter rainfall regime from April to September. The Inter-Tropical Convergence Zone (ITCZ) and the Botswana Upper High are an important influence on the region's rainfall regime. While the ITCZ brings good rains to most of southern Africa, the Botswana Upper High creates unfavourable conditions for heavy or widespread rainfall and its frequent occurrence almost always results in drought in some countries in the region. It tends to block the rain-bearing ITCZ, pushing it over the Indian Ocean.[6]

It's distribution is spatially and temporally uneven within countries and across southern Africa, resulting in unreliable water supplies. Surface runoff in the region is seasonal and this has an impact on water resources, as most of it is not harvestable. Seasonality of the rainfall is reflected in both biological and cultural processes such as ripening of indigenous fruits, and migration of wild and domestic animals between dry and wet season pastures.[7]

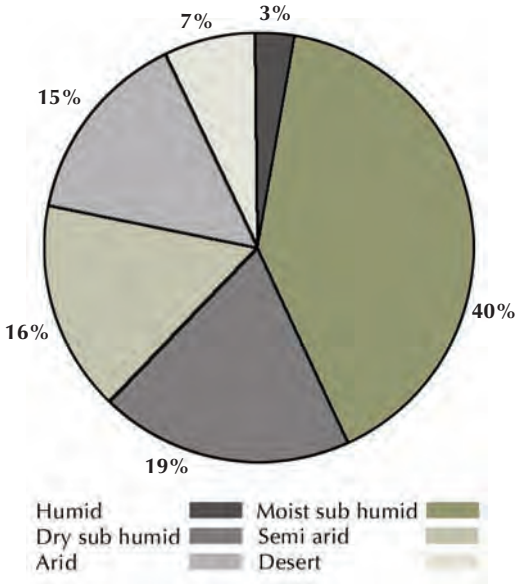
Many SADC countries are partially or largely semi-arid with low annual rainfall reliability. This ranges from 10mm in some parts of Namibia to about 2800 mm in some parts of DRC and Malawi. In most parts of the region, potential evaporation is twice as high as rainfall totals, as shown in Table 4.2. Topography and soil texture determine how much water seeps into the ground and what flows as runoff. Runoff and evapo-transmission losses have a dominant influence on the

Rainfall and Evaporation Statistics of Some SADC Countries* **Table 4.2**

Country	Annual rainfall range (mm)	Average rainfall (mm)	Potential evaporation range (mm)	Cumulative annual rainfall (cu km)	Total surface runoff (cu km)	Surface runoff to rainfall ratio (%)
Angola	25-1600	800	1300-2600	997	130	13
Botswana	250-650	400	2600-3700	233	0.35	0.2
Lesotho	500-2000	700	1800-2100	21	4.13	20
Malawi	700-2800	1000	1800-2000	119	7.06	6
Mozambique	350-2000	1100	1100-2000	879	220	25
Namibia	10-700	250	2600-3700	206	1.24	0.6
South Africa	50-3000	500	1100-3000	612	47.45	8
Swaziland	500-1500	800	2000-2200	14	1.94	14
Tanzania	300-1600	750	1100-2000	709	74	10
Zambia	700-1200	800	2000-2500	602	100	17
Zimbabwe	350-1000	700	200-2600	273	13.1	5

* excluding DRC, Madagascar and Mauritius
SOURCE Pallet, J., *Sharing Water in Southern Africa*, 1997

Water Distribution in SADC **Figure 4.1**



SOURCE SARDC, *Water in Southern Africa*, 1996

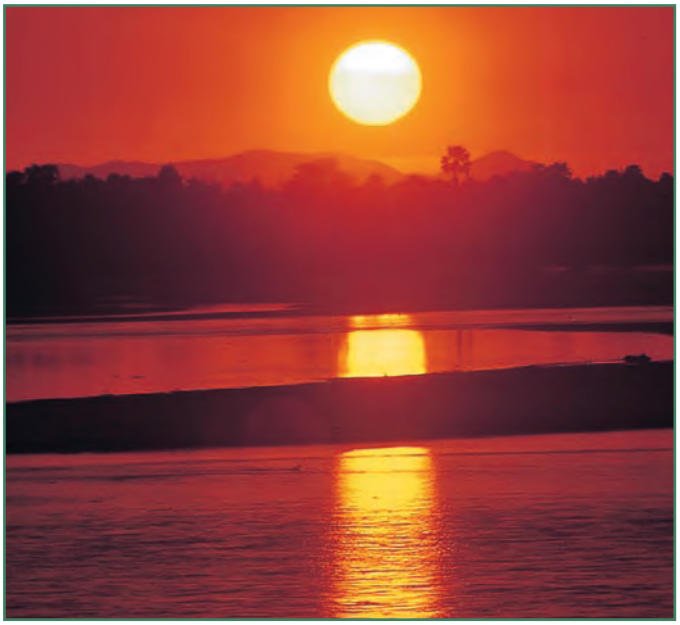
overall water balance, with the consequence that generally less than 15 percent of the rainfall contributes to runoff, river flow and infiltration to groundwater.[8]

The region's climatic features determine hydrological processes, which have a direct influence on the occurrence and distribution of water in the region, as shown in Fig 4.1.

Rivers

An important feature of southern Africa is the presence of 15 transboundary rivers and consequential groundwater, whose combined drainage area covers 78 percent of the region's continental land area.[9] Major international rivers in the region include the Congo, Zambezi, Okavango, Limpopo, Orange, Ruvuma, and the Cunene. These rivers, together with their tributaries form seven of the principal river basins of southern Africa (Map 4.1) with a total catchment area of 6.76 million sq km.[10]

The abundance of water in the largest river in the region, the Congo, can be attributed to the intensity of rainfall in its catchment. Spanning over the Equator, this catchment experiences rainfall throughout the year, with flows characterised by a unit runoff that is five times greater than that of the Zambezi basin, as illustrated in Table 4.3.



Illustrative Options

An important feature of southern Africa is the presence of 15 transboundary rivers including the Congo, Zambezi, Okavango, Limpopo, Orange, Ruvuma, and the Cunene.

Mean Annual Runoff of Selected River Basins in Southern Africa **Table 4.3**

River basin	Basin area (sq km)	River length (km)	Mean annual runoff at mouth (M cu m/yr)	Unit runoff (mm)
Congo	3 669 100*	4 700	1 260 000	330
Cunene	110 300	1 050	5 500	52
Limpopo	415 500	1 750	5 500	13
Okavango	708 600	1 100	11 000	19
Orange	947 700	2 300	11 500	13
Save	116 100	740	7 000	76
Zambezi	1 388 200	2 650	94 000	67

* Portion of Congo river basin within the SADC region is 2 942 700 sq km
SOURCE Hirji et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, p 30-31, 2002

Drier catchments such as the Limpopo experience limited runoff and are subject to flash floods and frequent drying.

The Zambezi river has its source in the Kalene Hills of northwestern Zambia and flows over a distance of nearly 3,000 km to its delta in the Indian Ocean. Its major tributaries include the Luena and Lungue-Bungo in Angola; the Chobe in Botswana; Shire in Malawi; Luiana in Namibia; Kabompo, Kafue and Luangwa in Zambia; and Manyame, Sanyati and Gwayi in Zimbabwe. The river carries more than 75 percent of

Main International River Basins **Map 4.1**

SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, p 24, 2002

the mean annual runoff of the region's interior and drains more than 40 percent of the land mass.[11] The Zambezi river basin, draining an area of almost 1.4 million sq km, is the most shared watercourse system in southern Africa, and third in Africa after the Congo and the Nile.[12]

The largest section of the Limpopo river basin is within South Africa (Map 4.1). Rivers in South Africa and Botswana that are part of this basin are intensely dammed and they contribute very little to downstream flow. Flow in the lower Limpopo is thus derived almost entirely from tributaries in Zimbabwe, mainly from Shashe river.

The Orange river basin covers the whole of Lesotho (including the Vaal river basin), half of South Africa, a small part of southern Botswana and the southern part of Namibia, and flows into the Atlantic Ocean. While the Okavango river rises in Angola as the Cubango, the Cuito joins it before crossing the Caprivi Strip of Namibia and flowing into Botswana, where it forms the Okavango delta It never reaches the ocean.[13] The Cunene river, shared by Angola and Namibia, has its source in the Sierra Encoco mountains in south-western Angola. Most of its tributaries are ephemeral and add very little to the total flow.

The Incomati river (of which the Save river is an important tributary) drains from South Africa and flows through Swaziland into Mozambique, while the Maputo river (of which the Usutu and Pongola rivers are important tributaries) flows through Swaziland into Mozambique.[14] Other major transboundary rivers in the region are the Ruvuma, Songwe, Save and Pungwe rivers (Map 4.1).

In the arid and semi-arid areas of the region, rivers are non-perennial and only flow a few months a year, after the rains. As rainfall intensity decreases, transmission losses become an important component of the water balance. Groundwater becomes the main reliable source of water under these conditions.

Aquifers

Groundwater is available in variable quantities throughout the region mainly in aquifers recharged through infiltration. It is an important source of water in the region's rural areas, and to a lesser extent, for the supply of water to urban centres. It also supports base flows of perennial rivers during dry seasons and periods of surface water drought. Some important aquifers in the region are shown in Table 4.4.

R.J. Boroto for SARDC

A dry riverbed caused by upstream damming

Aquifers in Southern Africa **Table 4.4**

Name of aquifer	Formation	Country
Karoo Supergroup	Sandstone	Angola
Ntane Sandstone	Sandstone	Botswana
Ramotswa	Ramotswa Dolomite	Botswana
Molteno Formation	Sedimentary	Lesotho
Dune Aquifer	Aeolian Sands	Mozambique
Mazamba	Mazamba	Mozambique
Oshivelo	Kalahari Sands	Namibia
Strampriet	Karoo Sandstone	Namibia
Venterpost	Dolomitic	South Africa
Wankie Sandstone	Karoo	Zimbabwe
Save Alluvial	Alluvial	Zimbabwe

SOURCE Envirotek, CSIR, 2003; SADC WSCU, 2001; Mendelsohn, J. et al, 2002.

Eighty percent of animals and people in Botswana depend on groundwater. Most rural areas in Namibia also rely on groundwater. In the Limpopo river basin most farmers depend on groundwater for irrigation during the dry months. It is sourced from springs or pumped from drilled wells and boreholes.

In Mozambique, groundwater is found in the young dune deposits along the coastal strip, the northeastern region and the alluvial valleys of the Limpopo basin, where development of the aquifers is risky due to fre-

Majority World

Groundwater accessed through sources such as boreholes is the main reliable source of water in the arid and semi-arid areas of the region where rivers are non-perennial and flow a few months a year, after the rains.

quent flooding of the Limpopo river. Some groundwater, such as the Kalahari/Karoo aquifer (shared by Namibia, Botswana, and South Africa) is fossil water, which is not renewable.

Although the environmental role of groundwater is not well understood and recognised within much of SADC and Sub-Saharan Africa,[15] it sustains ecosystems directly and indirectly through its interactions with surface water resources. Some ecosystems that depend on groundwater resources are:

- shallow, localised regolith aquifers;
- spring-type discharges associated with fault zones, major faults, fractures, dykes and sills, and contacts between rocks with different aquifer characteristics and permeabilities;
- floodplain systems with shallow unconfined aquifers which can be reached by the root systems of trees in the woodlands and forests that typically develop on these floodplains.[16]

Studies in the region have suggested that aquifer recharge responds disproportionately to drought. The impact of drought is greater on aquifer recharge than the realised impact on the surface.[17] The sustainability of groundwater resources depends on the balance between abstraction and recharge as over-abstraction can lead to the depletion of the resource.

Dams and lakes

Freshwater in southern Africa is found in a number of artificial lakes, or dams. Dams are built to store excess river run-off and provide a secure long-term water supply. South Africa and Zimbabwe have the largest number of dams in the region and are globally ranked number 11 and 20, respectively, in the top countries with large dams.[18]

These dams are needed because of the spatial and temporal variability of rainfall in the region; they are built to store water during the rainy season for use during the dry season. The dams store water in order to convey it, often over long distances, to areas such as irrigation schemes, cities, industries and mines where water consumption is high and exceeds the capacity of nearby sources. This is the case in the Gauteng Province of South Africa, which imports water from the Lesotho Highlands where the Khatse and Mohale dams have been built for this purpose.

The Zambezi river basin has more than 30 large dams including the Kariba and Cahora Bassa, which were built for domestic, industrial and mining water supply, irrigation and power generation. Other dams built for hydropower generation in the region include Gariep and Vanderkloof dams on the Orange river and Inga dam on the Congo river. Table 4.5 indicates the extent of damming on some of the shared rivers.

A number of downstream environmental problems are associated with dam construction. These include:

- increased river bank erosion, due to low sediment concentration in the river, downstream of the dam;
- changes in river course;
- low sediment and nutrient deposition;
- alteration in habitat stability;
- changes in species composition;
- changes in dynamic equilibrium of sea river interfaces;
- salt water intrusion;
- coastal abrasion; and
- alteration in downstream riparian ecosystems and associated livelihood regimes.

Upstream consequences include sediment trapping, resulting in delta formation and

Extent of Damming on Some Shared Rivers in the SADC Region **Table 4.5**

River	Countries	Dams
Incomati	Mozambique, South Africa, Swaziland	10
Limpopo	Botswana, Mozambique, South Africa, Zimbabwe	43
Save	Mozambique, Zimbabwe	20
Orange/Senqu	Botswana, Lesotho, Namibia, South Africa	29

SOURCE Turton et al, *Policy Options for Water Stressed States,* 2003

increased flooding. Sedimentation of reservoirs results in the loss of storage capacity and subsequent decrease in dam life expectancy. The Welbedacht dam in South Africa is reported to have lost 65.6 percent of its storage capacity in just 13 years.[19]

Major natural lakes in the region are Victoria, Tanganyika and Malawi/Nyasa/Niassa (Map 4.1). The latter two are the world's second and third deepest respectively, after Lake Baikal in Russia. Most other lakes in the region are shallow, due to the landscape.[20] Some lakes such as Bangweulu, Chilwa, and Mweru are entirely within the SADC region, while others are shared with countries outside the region. For example, Lake Victoria is shared by Tanzania, Kenya and Uganda; while Lake Tanganyika is shared by Tanzania, DRC, Zambia and Burundi; Lake Kivu by the DRC and Rwanda; and Lakes Albert and Edward by the DRC and Uganda. These lakes are sources of fisheries and provide a livelihood for people living nearby.

Current environmental problems in these lakes include alien invasive species such as the water hyacinth, and the transfer of fish species from one lake to another. One example is the Nile perch, introduced into Lake Victoria in the 1970s. This has led to the extinction of around 200 fish species through its predatory activity. These include Cichlids (*Haplochromines*), of which more than 100 known species have disappeared since 1987.[21]

Semi-arid and arid regions have limited freshwater in the form of non-perennial and ephemeral rivers, and are characterised by the absence of lakes. This is the case in the southwestern part of southern Africa, including Namibia as well as parts of both Botswana and South Africa.

Illustrative Options

Dams and lakes are an important source of livelihood, many people in the region earn their living through fishing.

Wetlands

Wetlands constitute an important source and form of freshwater in southern Africa. They have a significant ecological value through provision of habitat for various species of flora and fauna. Wetlands sustain the livelihoods of communities who depend on them for survival. They also support river flow and groundwater recharge, and are important in flood regulation and drought mitigation.

They reduce the flood peaks and reduce flow velocity due to their ability to store large quantities of water. The release of stored water into streams and rivers as part of base flow maintains dry season water supplies. Thus both people and wildlife converge on wetlands during drought periods.

There is no uniform definition of wetlands in the SADC region. The Ramsar Convention (1971) definition, which is widely accepted, explains wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exclude six metres. Examples of important wetlands in the region include

the Kafue flats in Zambia; the Okavango delta and Makgadikgadi pans in Botswana; the Etosha pan in Namibia; and various dambos, pans and deltas scattered throughout the region (Map 4.2).

Environmental impact of upstream dam construction on the Zambezi delta **Box 4.1**

The lower Zambezi valley, home to more than one million people, is of economic, social and ecological value to the local communities and to Mozambique as a whole. Its fertile floodplains historically provided recession agriculture, hunting, fishing and abundant natural resources for its inhabitants.

The delta and floodplain supported abundant wildlife populations, including elephant, buffalo, waterbuck and the endangered Wattled crane. It also provided spawning grounds for riverine and brackish-water fish, dry-season grazing lands for livestock and wildlife. The extensive mangroves and estuary supported production of prawn fishery.

That is until the major reservoirs were built upstream: in Kariba (completed 1959) and Cahora Bassa (closed in 1974). The dams were essentially built for and are operated to optimise hydropower generation, at the expense of other benefits and potential water-users. The operation of the dams does not allow for the historically established flow regimes into the delta, and have significantly reduced seasonal flooding, thus there is extensive drying of areas which were previously flooded on a seasonal but regular basis.

It is estimated that the prawn fishery production alone declined by more than US$10 million per year and availability of water, fuel wood, building material and medicinal plants are a problem as a result of the damming of the river. There is widespread encroachment of woody savannah into open floodplains, an estimated 95 percent reduction in heavy mammals (1978-1992) and Wattled cranes have ceased to breed across most of the delta.

The solution, which is being sought through consultations with operators of the dams, especially the Cahora Bassa, is to realise a more ecologically sensitive dam-operating regime. This will benefit the communities living in the delta, and will go a long way towards contributing to wise-use and conservation of this wetland, which has been declared a wetland of international importance by Mozambique.

SOURCE Carlos Bento, 2003

Estuaries

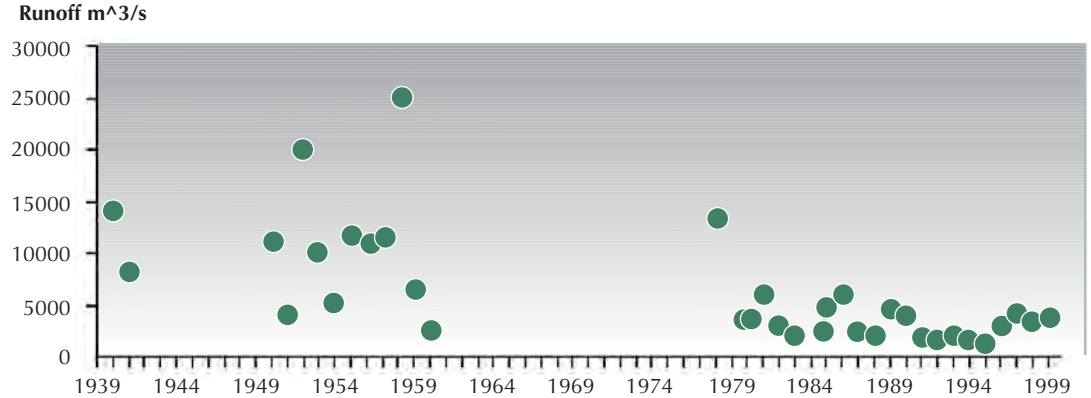
Estuaries are the interface for tidal exchanges between the saline waters from the sea and freshwater from rivers. They provide a unique and rich habitat for various species. In addition to the Zambezi, major estuaries in the region include the Congo, Limpopo, Rufiji and Cunene (Map 4.2). The demand for freshwater that results in dams being built upstream of estuaries has the potential to adversely affect the delicate balance between marine and freshwater in estuaries.

Figure 4.2 shows the reduction in runoff on the Zambezi river measured at Tete in Mozambique. Before the construction of the Cabora Bassa Dam in 1975, the maximum flows were more than 10,000 cu m. Since this regulation, the maximum flows are generally below 5,000 cu m. This implies that the dam might have contributed to the reduction in flows by about 50 percent.[22] When river flows are reduced, estuaries become hyper-saline with the consequent loss of biodiversity.

DEMAND FOR FRESHWATER

Freshwater is an essential factor of production in the economies of all countries in southern Africa. Demand for freshwater is growing with increases in population, as the region strives to achieve socio-economic development. Freshwater has many uses, including in agriculture, commercial and industrial development, electricity generation,

Flow Reduction in the Zambezi due to Dam Construction **Figure 4.2**



SOURCE Hoguane, A.M., *The Role of Zambezi Runoff in the Shrimp Abundance in Sofala Bank*, 2000

Distribution of Major Wetland Ecosystems **Map 4.2**

SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, , p 60, 2002

terrestrial and aquatic ecosystem maintenance, sustenance of wildlife and national parks, sanitation, navigation, and religious purposes.

Freshwater withdrawal varies greatly by sector and within each country, as illustrated in Table 4.6. Except for the DRC, agriculture, which includes irrigation and livestock, is by far the biggest water user in the region.

Despite the fact that agriculture is the biggest water user, the potential for irrigation in the region has not yet been reached. South Africa has the largest area under irrigation and this has been increasing since the 1970s, as shown in Table 4.7.

Although there are cases of well-managed irrigation systems, many are poorly managed (Box 4.3), with low water-use efficiency. The Botswana Technology Centre estimates that the efficiency of overhead irrigation ranges from 60-70 percent compared to drip irrigation at 85-95 percent.[23] Environmental problems associated with the wastage of this valuable resource include soil salinisation, waterlogging, and increased prevalence of malaria and bilharzia. Irrigation is necessary only where there is insufficient rainfall; unfortunately these areas also coincide with high evaporation rates resulting in high moisture losses. Water is often used uneconomically through the growing of low-value crops under irrigation.[24]

Although the industrial sector has the lowest usage of the available water in the region, use is expected to increase by 20 percent as a result of population growth and expansion of the sector. For example, in South Africa's Crocodile/Limpopo and Olifant basins, mining water requirements were estimated at eight percent of the total available water in 1996 but this is expected to rise to nine percent by the year 2030.[25]

Industry accounts for about 11 percent of water consumption in Namibia. Manufacturing industries such as food and beverages, pulp and paper, and petrochemicals are particularly reliant on water. Water has the ability to dilute and transport wastes, and to purify some biodegradable wastes. It is in fact used as a conduit for waste disposal in most industries.

Industrial output also depends on hydroelectric power generated from water. Hydropower generation is one of the most important instream uses of water in the region because most countries rely heavily on hydroelectricity for domestic and industrial use as well as for water pumping and other agricultural uses. There are a few, very large dams intended primarily for hydropower generation in the region, including the Cahora Bassa, Inga, Kariba and Kafue Gorge. The advantage of this non-consumptive use is that water is returned to the main stream with minimal change to its original quality or quantity and can be used for other purposes.

Freshwater Withdrawal by Country and Sector **Table 4.6**

Water use Country	Domestic	Industrial	Agricultural
	(% of total water use)		
Angola	14	10	76
Botswana	32	20	48
DRC	61	16	23
Lesotho	22	22	56
Malawi	10	3	86
Mauritius	16	7	77
Mozambique	9	2	89
Namibia	29	3	68
South Africa	17	11	72
Swaziland	2	2	96
Tanzania	9	2	89
Zambia	16	7	77
Zimbabwe	14	7	79

FAO 1995 in Hirji, R. et al, 2002

Irrigated Areas in SADC Countries, 1979-2003 (hectares) **Table 4.7**

	1979-1981	1989-1991	1999-2001	2002	2003
Angola	80 000	80 000	80 000	80 000	80 000
Botswana	2 000	1 000	1 000	1 000	1 000
DRC	6 000	10 000	11 000	11 000	11 000
Lesotho	1 000	2 000	3 000	3 000	3 000
Madagascar	646	1 000	1 086	1 086	1 086
Malawi	18 000	20 000	52 000	56 000	56 000
Mauritius	16 000	17 000	20 000	21 000	22 000
Mozambique	65 000	103 000	115 000	118 000	118 000
Namibia	4 000	4 000	7 000	8 000	8 000
South Africa	1 119 000	1 200 000	1 498 000	1 498 000	1 498 000
Swaziland	40 000	45 000	50 000	50 000	50 000
Tanzania	117 000	144 000	163 000	184 000	184 000
Zambia	19 000	30 000	133 000	156 000	156 000
Zimbabwe	80 000	106 000	174 000	174 000	174 000

SOURCE *FAO Statistical Yearbook 2005-2006*

Cases of irrigation inefficiencies **Box 4.2**

The Chokwe irrigation scheme in Mozambique, along the Limpopo river, covers an area of approximately 30,000 hectares and consumes an estimated 500 million cu m of water per year, through its network of primary, secondary and tertiary channels. In its current state of disrepair, it has little agriculture output because of high water losses through leakages, and evaporation. The scheme is currently being rehabilitated and it is hoped that it will be returned to optimum production levels to justify its water consumption.

Along the Orange river in South Africa, 80,000 hectares are irrigated, mostly to grow maize and partly some high-value crops such as table grapes, but the annual potential evaporation rate of close to 3,000 mm compares to an average annual rainfall of less than 500 mm.

SOURCE R J Boroto for SARDC, 2004

The importance of hydroelectricity in the region is shown by the fact that hydropower accounts for 65 percent of the total commercial energy requirements. However, low water levels caused by frequent droughts and high sediment levels carried by some of the major rivers are some of the threats associated with hydropower generation. Generation levels can fall by as much as 12.2 percent depending on the severity and persistence of the drought. For example a total of 1578MW from Kariba hydroelectric power station were used in 1991 but the figure dropped to 1458MW one year later due to the 1991-92 drought.[26]

Some of the world's most active water-resource development programmes are located in the SADC region.[27] Those mentioned above are the largest impoundments in the region's rivers. Other large projects being developed or investigated include the Lesotho Highlands Water Project, the Maguga dam in Swaziland, and Epupa dam in Namibia. Medium-to-large development projects under consideration include the Lower Kihansi and Rumakali water projects in Tanzania, the Batoka, Gwaayi/Shangani, Pungwe and Matabeleland-Zambezi pipeline projects in Zimbabwe.

Many of the rivers targeted for such developments are sites of biodiversity importance and/or have large human populations that are directly dependent on them. Thorough investigations of the impacts of these developments on the environment and on the affected people, and possible mitigatory actions, should be central to any decisions taken about feasibility. Similarly, mitigation of the impacts of extant water-resource developments on downstream rivers must be addressed.

Illustrative Options

With growing and competing demands on freshwater, some parts of the region face water scarity and pollution.

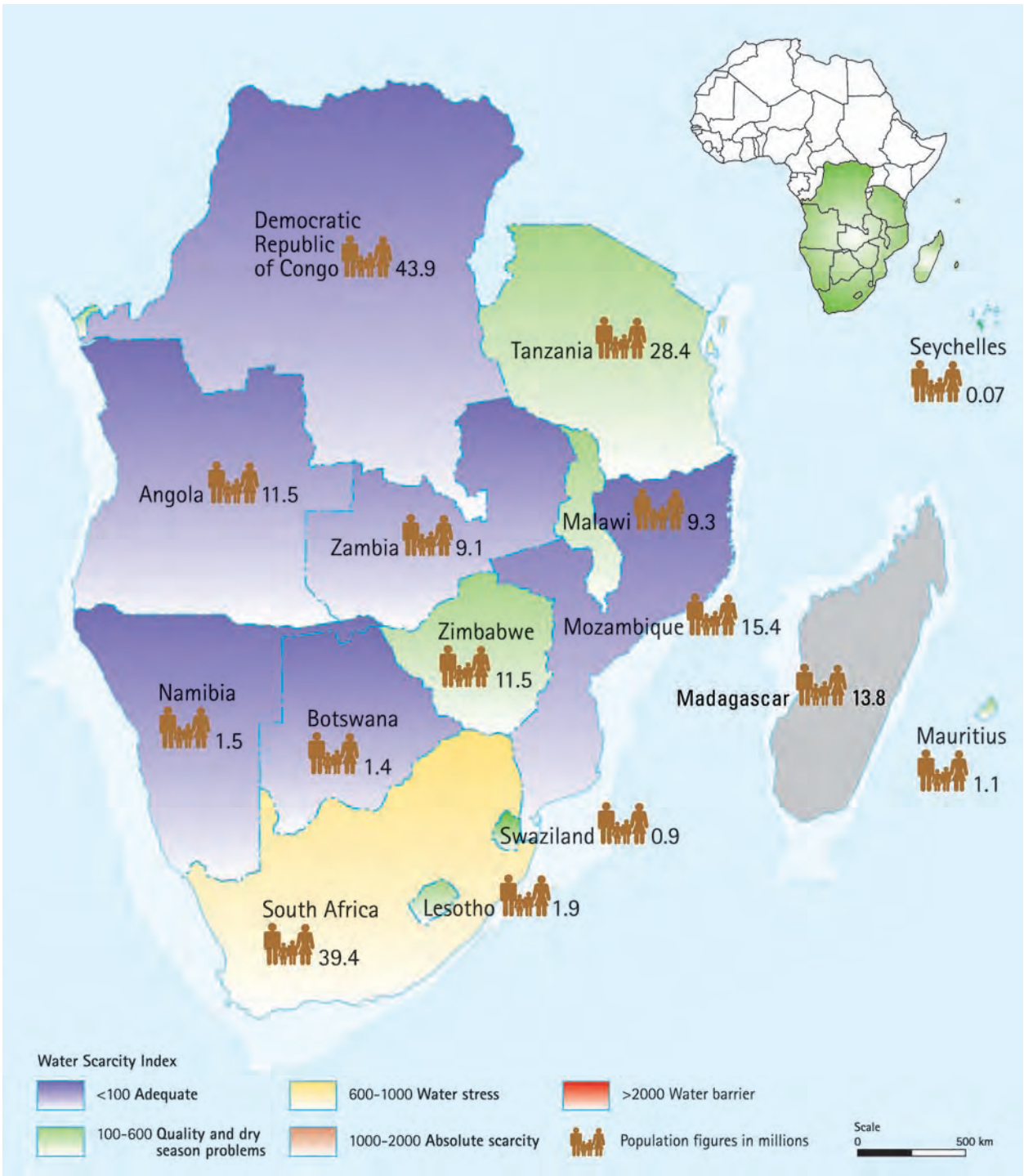
Water scarcity

Water demand for a rapidly increasing and urbanising population will increase the stress on the limited water resources, and exacerbate competition and conflict between and among sectoral users in southern Africa. A commonly used indicator for socio-economic development and water scarcity is access to water and sanitation, which is covered in the chapter on Human Settlements.

Water is also a limited resource in southern Africa, already scarce in a number of local basins (Map 4.3). By 2025, on the basis of data on renewable supplies and demographics, it is expected that Malawi and South Africa will be facing absolute water scarcity, and Lesotho, Mauritius, Tanzania and Zimbabwe will be water stressed; while Angola, Botswana, DRC, Mozambique, Swaziland and Zambia are likely to experience water quality and availability problems in the dry season (Map 4.4).

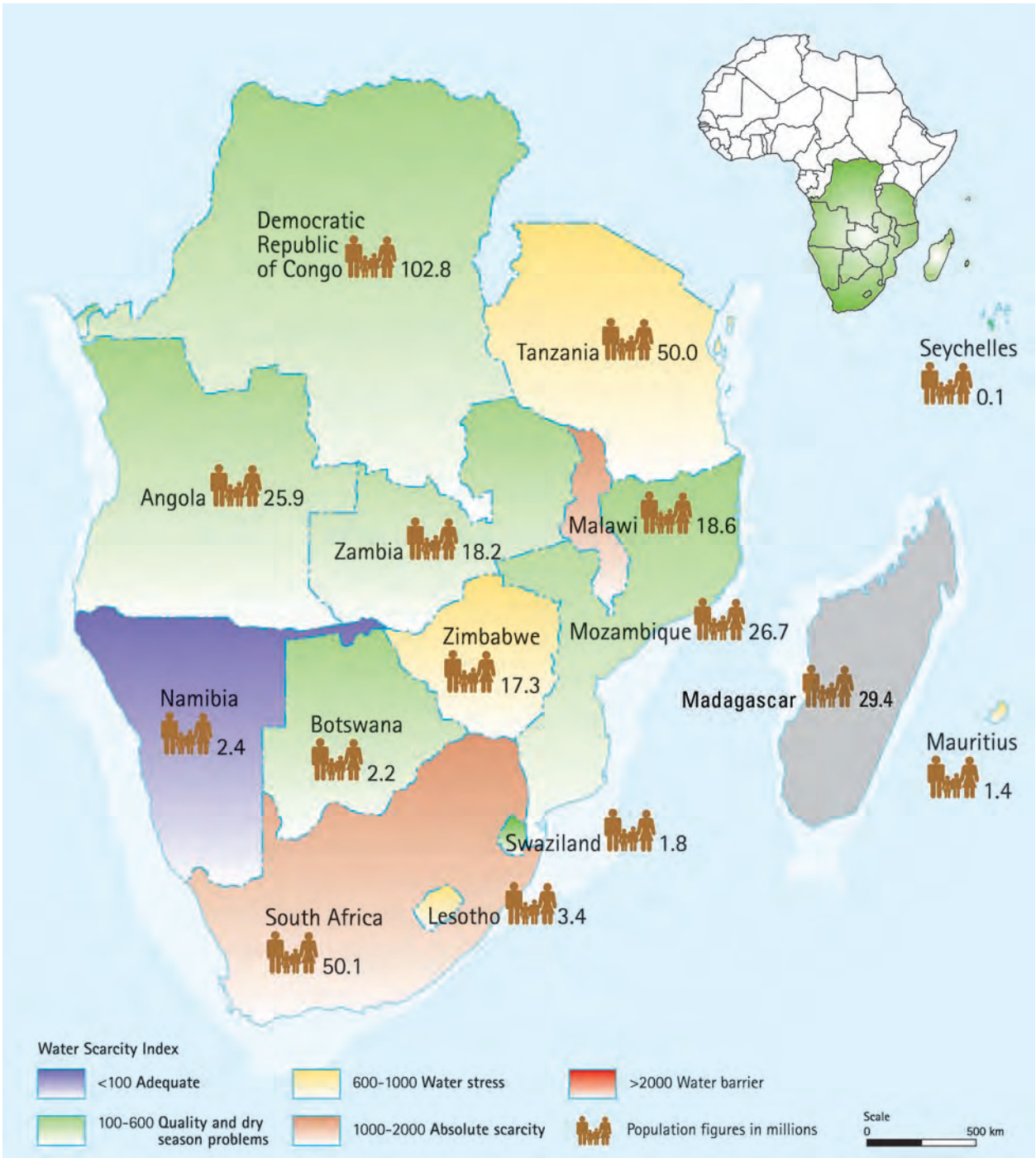
In addition to stress on the limited water resources due to competition and conflict among sectors, southern Africa's water sup-

Water Scarcity in Southern Africa: Water and People, 1995 **Map 4.3**



SOURCE Hirji et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, 2002 p8. Water Scarcity Index from Falkenmark 1993. Recalculated using water availability data from Gleick 2000, and population figures 1995 from *SADC Statistics 2000*. Data on availability represent average annual freshwater resources, as the actual will vary from year to year. The data cover surface and ground water including surface inflows from neighbouring countries, what FAO (1995) calls "total natural renewable water resources". Most countries do not measure or report internal water resources data, and estimates are calculated using flows, runoff and other measurements. Data from small countries and countries in arid and semi-arid zones are less reliable than those for larger, wetter countries (Ohlsson 1995). Serious gaps in regional hydrological data still exist.

Projected Water Scarcity in Southern Africa: Water and People, 2025 **Map 4.4**



SOURCE Hirji et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, 2002 p9. Water Scarcity Index from Falkenmark 1993. Recalculated using water availability data from Gleick 2000. Population projections for 2025 based on projections 2000-2025 from UN Population Division 1998, in UNFPA 2000, and projected at the same rate using 1999 population and annual growth rates in *SADC Statistics 2000* as baseline for 2000. Comparative data for 2025 are reliant on UN calculations which are not uniform for each country, thus showing outdated and unadjusted figures, for example, for Angola and the DRC. Geographical variations within countries are also a factor, for example in Malawi and Namibia, where water resources are concentrated mainly in one part of the country while other parts of the same country are already short of water. However, Maps 4.3 and 4.4 represent the situation based on the most reliable data when calculated.

R.J. Boroto for SARDC

Access to clean water and sanitation is a commonly used indicator for socio-economic development and the Millennium Development Goals set the year 2015 as a target for halving the number of people without that access.

ply is vulnerable. The vulnerability stems largely from the following factors:

- extreme climate variability and emerging climate change which, in a predominantly rural-based society and agrarian economy determines if a season will result in a bountiful harvest or catastrophic droughts or floods;
- increasing degradation of water resources due to unsustainable water and land use practises such as overabstraction of surface sources or overpumping of groundwater, water pollution, watershed degradation, loss of and encroachment on wetlands, proliferation of aquatic weeds and introduction of alien species; and
- numerous transboundary waters in the region with complex water rights issues, contributing to the insecurity of downstream uses and nations.[28]

Water pollution

The main threats to water quality in the region include siltation due to deforestation and resultant erosion; intensive irrigation; and pollution from cities and industries.

Population growth and intensive urbanisation, as well as increased industrial and agricultural activities have led to an increase in the amount of discharge and type of pollutants in the region (see chapter on Human Settlements).

The major sources of water pollution in the region include:

- Point source pollution – sewage effluent, industrial processes, power generation, and mining activities.
- Non-point source pollution – natural pollution, storm water runoff, agricultural activities, leachate from landfills, soil erosion, and gold panning.

The main impacts of water pollution include health effects, eutrophication and waterweeds, and ecological effects.

In many southern African cities, rapid urbanisation is presenting new challenges for urban authorities responsible for the provision of services and water and sanitation facilities. Migration into urban areas such as Lusaka in Zambia, Chitungwiza in Zimbabwe and the Johannesburg-Pretoria area in South Africa is happening at a faster rate than the expansion of existing sewage systems. As a result, the discharging of untreated sewage and industrial waste into water sources such as rivers and lakes is contributing to the degradation of water quality and to high costs of water treatment. The supply of water is sometimes unpredictable and limited to a few hours a day due to infrastructure that is poorly operated and maintained, and sewage is not properly disposed of.

The Lilongwe river in Malawi, the Kafue river in Zambia and Manyame river in Zimbabwe flow through urban areas and have experienced water pollution problems. In Malawi, the quality of river water is generally poor, especially those flowing through cities of Blantyre, Lilongwe and Mzuzu due to effluent discharges.[29]

The Kafue river catchment in Zambia is a hot spot for water quality degradation, as is the Manyame river catchment in Zimbabwe, through effluent received mainly from mining and urbanisation. The Kafue receives sewage and effluent from various activities, which include mining, manufacturing and agriculture, as it caters for about 40 percent of the Zambian population and provides 85 percent of the total irrigated land.[30] Studies carried out in the period 1996-2000 indicate that in the Mazabuka area, phosphate levels

were found to be as high as 0.71 mg/1, which is twice the internationally recommended value of 0.3mg/1. This is primarily due to the use of chemical fertilizer.[31]

Boreholes sited in selected areas within the region have recorded high levels of nitrate concentration, as a result of on-site sanitation problems. For example, a recent survey of borehole water quality in two adjacent villages in the Northern Province of South Africa has revealed that 90 percent of the source did not meet drinking water standards.[32] Heavy metal contamination of groundwater has also been reported in Tanzania, as a result of unregulated mining activities in the north and central areas.[33]

In addition to deliberate regular industrial discharge, water pollution can also result from isolated accidents. An incident in Zimbabwe in early 2005 saw 40,000 litres of sulphuric acid spill into the Mtshabezi river in Umzingwane catchment, upstream of Mtshabezi dam which supplies the town of Gwanda with water (Box 4.3).

Acid spills into river **Box 4.3**

Residents of Gwanda are staring danger in the face after a goods train derailed and spilt 40,000 litres of highly toxic sulphuric acid into a river in a catchment area of the dam that supplies water to the town.

An environmental disaster is also feared in the surrounding areas as plants and organisms that live in soil and in water are under threat from the acid. The goods train, owned by the Beitbridge-Bulawayo Railway Company (BBR), derailed just three kms outside Gwanda town on Wednesday, spilling at least 40,000 litres of sulphuric acid into a stream that feeds into Mtshabezi river.

The river is within the catchment area for Mtshabezi Dam that supplies Gwanda town with potable water. Besides the sulphuric acid, the train, pulling 36 wagons, was also carrying diesel and fertilizer. The derailment occurred on Wednesday morning around 8.30am and there were no injuries.

…Matabeleland South police spokesperson, Trust Ndhlovu, said police have sent messages to Gwanda and surrounding areas warning residents of the dangers of using water from the river and the dam. He said police had cordoned off the scene of the accident, as fears were high that a fire could break out because the acid is highly inflammable and other health dangers arising from inhaling the fumes and the skin coming into contact with the acid. BBR manager Mr Alex Sibanda said his company, with the assistance of the government and environmentalists, was working to neutralise the damage caused by the acid.

The Herald observed workers digging ponds around the area of spillage as a measure to trap the chemical from finding its way into the stream. Piles of neutralising chemicals were seen at the sight of the derailment.

"We are trying to localise the effects of the chemical by barricading the area," said Mr Sibanda. Although police said more chemicals and diesel disgorged into the stream, Mr Sibanda said only one tanker containing 40,000 litres of sulphuric acid had spilled. …

Matabeleland South provincial administrator Mr David Mpofu… said investigations into the cause of the derailment were still underway, adding that the accident was the second in three months. "We asked the Bulawayo-Beitbridge Railway Company to carry regular checks on their railway line. This is a busy line," he said. Mr Mpofu said local businesspeople and farmers were assisting in the removal of the wagons and controlling environmental damage.

The Herald, 28 January 2005, Zimpapers, Harare, Zimbabwe

POLICY RESPONSES

The goal of the SADC Water Division is the attainment of sustainable, integrated planning, development, utilisation and management of water resources that contribute to the overall SADC objective of an integrated regional economy on the basis of balance, equity and mutual benefit for all Member States.

A number of regional and national policies have been formulated and adopted by SADC in this regard, to promote the sustainable management of water resources. These include:

- the Protocol on Shared Watercourses;
- the Regional Strategic Action Plan;
- the Southern African Vision for Water, Life and Environment;
- the concept of Integrated Water Resources Management (IWRM);
- the Regional Indicative Strategic Development Plan (RISDP);
- the SADC Regional Water Policy and strategy development process; and
- Water Demand Management (WDM) strategies.

The demand for water in southern Africa's 15 shared river basins is the basis for the SADC Protocol on Shared Watercourses and the main focus of the Regional Strategic Action Plan (RSAP) for Integrated Water Resources Management in the region.[34]

Shared Rivers in the SADC Region **Table 4.8**

River basin	Number of basin states	Basin states in SADC	Basin area in SADC region (sq km)	Length of river (km)	Mean annual runoff at river mouth (M cu m/yr)
1 Buzi	2	Mozambique, Zimbabwe	27,900	250	2,500
2 Congo	9	Angola, DRC, Tanzania, Zambia	2,942,700 of total 3,699,100	4,700	1,260,000
3 Cunene	2	Angola, Namibia	110,300	1,050	5,500
4 Incomati	3	South Africa, Swaziland, Mozambique	46,200	480	3,500
5 Limpopo	4	Botswana, Mozambique, South Africa, Zimbabwe	415,000	1,750	5,500
6 Maputo	3	Mozambique, South Africa, Swaziland	31,300	380	2,500
7 Nile	2	DRC, Tanzania	142,000 of 3,038,100	6,700	86,000
8 Okavango	4	Angola, Botswana, Namibia, Zimbabwe	708,600	1,100	11,000
9 Orange	4	Botswana, Lesotho, Namibia, South Africa	947,700	2,300	11,500
10 Pungwe	2	Mozambique, Zimbabwe	32,500	300	3,000
11 Ruvuma	3	Malawi, Mozambique, Tanzania	152,200	800	15,000
12 Save	2	Mozambique, Zimbabwe	116,100	740	7,000
13 Umbeluzi	2	Mozambique, Swaziland	5,400	200	600
14 Etosha-Cuvelai	2	Angola, Namibia	167,600	430	Ephemeral
15 Zambezi	8	Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe	1,388,200	2,650	94,000

SOURCE Hirji *et al, Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa,* 2002 p30

Illustrative Options

The Zambezi river basin is shared by eight SADC member states.

SADC Protocol on Shared Watercourses

The SADC region is characterised by 15 main river basins that are shared by two or more countries. Some of the river basins, such as the Congo and the Nile, are shared with countries outside the region. Table 4.8 shows details of the 15 river basins.

Given the scarcity of water over most of the region, the potential for disputes over the development and utilisation of water resources was increasingly becoming a reality in the 1990s. The desire to move from dispute potential to prevention through regional cooperation and integration formed the basis

for the formulation of the SADC Protocol on Shared Watercourse Systems in 1995 and the establishment of a dedicated SADC Water Sector in August 1996.

The Protocol on Shared Watercourse Systems was the first sectoral protocol to be developed by SADC. Its history goes back to 1993 when SADC was implementing a basin-wide programme, the Zambezi River Action Plan (ZACPLAN). The Protocol was developed through one of the ZACPLAN projects, the Zambezi Action Programme (ZACPRO) 2, which aimed to establish a basin-wide legal and institutional framework to facilitate environmentally friendly and sound management of the Zambezi river basin.

In the process of negotiating the agreement for the establishment of the Zambezi River Commission (ZAMCOM), a decision was reached to develop a region-wide legal framework on which all river basin instruments should be based. As a result of this decision, a process of negotiation was initiated in 1993 to formulate the protocol, which was adopted and signed in 1995 by 10 mainland SADC member states. Mauritius signed on in 1996, after joining SADC the previous year.

An amendment process was undertaken from 1997-1999, influenced by the concerns of member states and by developments in international law, particularly the adoption by the United Nations of the Convention on the Law of the Non-Navigational Uses of International Watercourses (the UN Watercourse Convention) in April 1997. This led to the Revised SADC Protocol on Shared Watercourses, adopted in Namibia in 2000 by SADC Heads of State and Government. This is aligned with the UN Watercourse Convention with regard to issues such as environmental protection and the compensation of harmed basin states.

The revised protocol, based on the principles summarised in Box 4.4, came into force in 2003 upon ratification by the required two-thirds majority of SADC member states.

In the spirit of the protocol, co-operation among basin states is increasing, as shown by these initiatives:

Principles of the Revised Protocol on Shared Watercourses **Box 4.4**

The main points of the Protocol on Shared Watercourses are:

- Ensuring that utilisation of shared watercourses is open to each riparian state without prejudice to its sovereign rights;
- Observing the objectives of regional integration;
- Ensuring that all interventions are consistent with sustainable development;
- Respecting the existing rules of customary and general international law;
- Recognising the unity and coherence of each shared watercourse system;
- Maintaining a balance between water resources development and conservation;
- Pursuing close cooperation in the study and execution of all projects on shared watercourses, exchange of information and data;
- Utilising a shared watercourse in an equitable and reasonable manner;
- Maximising the benefits from a shared watercourse through optimal and sustainable development;
- Participating and cooperating in the use, development and protection of a shared watercourse;
- Taking all appropriate and reasonable measures when utilising a shared watercourse to prevent significant harm to other states;
- Eliminating or mitigating such harm and where appropriate, discussing and negotiating the possibility of compensation; and
- No state shall deny anyone the right to claim compensation or other relief in respect of significant harm caused by activity carried out in a shared watercourse.

SOURCE *Revised Protocol on Shared Watercourses in the Southern African Development Community,* SADC, 2000

- The Orange-Senqu Commission (Orasecom) was established by the governments of Botswana, Lesotho, Namibia and South Africa in November 2000, to develop a basin-wide management plan, execute an environmental assessment, initiate a study on the Molopo-Nossob river system, and investigate the establishment of a Secretariat.
- The Okavango River Commission (Okacom) was established by the governments of Angola, Botswana and Namibia in September 1994 to develop an integrated water resources management plan.
- The IncoMaputo (Incomati Maputo) was created in 1983 out of the Tripartite Permanent Committee, established by Mozambique, South Africa and Swaziland to cover the Incomati, Umbeluzi and

Maputo rivers, with the subsequent Tripartite Interim Agreement (August 2002) for cooperation on the protection and sustainable utilisation of the water resources.

- The development of the Pungwe Joint Integrated Water Resources Management Strategy between Mozambique and Zimbabwe, initiated in February 2002.
- Four agreements were signed during international meetings in Maputo 24-27 November 2003 on shared watercourses in the SADC.[35]
  - Agreement on the Limpopo river basin by Botswana, Mozambique, South Africa and Zimbabwe;
  - Agreement on managing Lake Malawi/Niassa/Nyasa, and the sub-basin of the Shire river, shared by Malawi, Mozambique and the United Republic of Tanzania;
  - Accord to set up a joint commission between Malawi and Mozambique on water resources of common interest;
  - Agreement on the preliminary phase of a joint study on the Maputo river, between Mozambique, South Africa and Swaziland.
- Seven of the eight Zambezi river basin states signed the agreement to establish ZAMCOM in mid-2004, following suspension of negotiations in the early 1990s to allow for discussions on the SADC Protocol on Shared Watercourses.

It is worth noting successes achieved in community involvement in the management of transboundary waters, such as the Okavango river basin through a project titled, "Every River has its People."

The framework for establishing and developing joint management arrangements is now in place through the Protocol, and this will see greater regional cooperation in the management of transboundary river basins.

Regional Strategic Action Plan

The Regional Strategic Action Plan (RSAP) for Integrated Water Resources Development and Management (1999-2004) was prepared by the then SADC Water Sector Co-ordination Unit (WSCU) to provide a framework for the region to meet the challenges associated with the development of a comprehensive approach to water resources development and management.

Forty-four projects were developed in 1998 under the RSAP and of these, 31 were identified as priority projects to be implemented by the new SADC Water Division (Table 4.9).

Initial studies on the 31 projects were done in the form of the Project Concept Notes (PCNs) with the assistance of multi-disciplinary specialists (Table 4.10).

The PCNs were designed to create an enabling environment through which effective development and management of water resources could take place. A mid-term review recommended that the RSAP be revised to place emphasis on infrastructure development to meet the development challenges of the region.

Southern African Vision for Water, Life and Environment

During 1999, SADC developed the "Southern African Vision for Water Life and the Environment for the 21st Century." This was ratified by SADC water ministers and presented to the international community during the second World Water Forum in The Netherlands in March 2000.

P Johnson, SARDC

Lake Tanganyika, Tanzania, showing human settlement.

RSAP Projects **Table 4.9**

PCN No.	Project Description
1	Guidelines for Review and Formulation of National Water Legislation
2	Regional Guidelines for Dam Safety and Legislation Procedures
3	Capacity Building for Joint Integrated Basin Management
4	Consultative Forums on Water Issues
5	Development of a Programme for SADC Region
6	Groundwater Management Programme for SADC Region
7	Water Sector Co-ordination Unit Capacity Building
8	Support for the Implementation of the SADC Protocol on Shared Watercourse Systems
9	Guidelines for National Water Policy and Review in Member States
10	Support Development of National Water Sector Policies/Strategies in Selected Member States
11	Formulation of Regional Water Sector Policy and Strategy
12	Economic accounting of Water Use
13	Study of Expanding Private Sector Participation in Water and Sanitation Services
14	Assessment of Surface Water Resources
15	Expansion of SADC-HYCOS
16	Regional Project to Control Infestation and Translocation of Aquatic Weeds
17	Training in Surveying, Mapping, and Geographic Information Systems
18	Upgrade and Modernise Water Resources Monitoring System for Lake Malawi/Nyasa
19	Rehabilitation of Joint Monitoring Systems Between Angola and Namibia
20	Awareness Building for Decision Makers
21	Involving the Media in Water Issues
22	Human Resources Development Programme
23	WaterNet
24	Promotion of Stakeholder Participation in Water Resources Management
25	Feasibility Study for Creating a Fund to Support NGO and CBO Participation in Water Resources Management Issues
26	Programme on Means to Empower Women in Water Issues
27	Control and Development of Lake Malawi/Nyasa and Shire river
28	Study of the Navigability of the Zambezi and Shire rivers
29	Stabilisation of the Course of the Songwe river
30	Pre-feasibility Study of Future Developments and Management Options on the Lower Orange river
31	Integrated Basin Management Plan for the Okavango river

SADC WSCU, *RSAP*, 1998

Categories for the 31 RSAP Projects **Table 4.10**

Project category	Project number (as in 4.9 above)
Legislation, Policy and Strategic Planning	PCN 1, 2. 5, 6, 8, 9, 10 and 11
Capacity Building and Training	PCN 3, 7, 17, 22 and 23
Consultation, Participation and Awareness Creation	PCN 4, 13, 20, 21, 24, 25 and 26
Information Collection, Analysis and Management	PCN 12, 14, 15, 16, 18, 19, 30 and 31
Infrastructure Investment	PCN 27, 28 and 29

SADC WSCU, *RSAP*, 1998

The Vision, facilitated with support of the Global Water Partnership Southern Africa (GWP SA), calls for "Equitable and sustainable utilisation of water for social, environmental justice, and economic benefit for present and future generations."[36] It has the eight sub-vision statements:

- Equitable and sustainable social and economic development in Southern Africa.
- Equitable access to water of an acceptable quantity and quality.
- Proper sanitation for all and safe waste disposal.
- Food security for all households.
- Energy security for all households.
- A sustainable environment.
- Security from natural disasters.
- Integrated water resources development and management.

After the second World Water Forum, GWP SA launched an awareness campaign and spearheaded the development of a

Framework for Action process **Box 4.5**

The Framework For Action (FFA) process gained momentum in 2002-2003 with the initiation of various review studies that fed into a regional desktop study outlining the challenges associated with the attainment of the Vision for Water, Life and Environment. Through a workshop involving 11 SADC member states, it was agreed to develop FFAs at national and regional levels, through a multi-stakeholder consultative process. Since then, several countries have embarked on internal country consultations to unpack the Vision issues that are relevant to their respective countries and to formulate an appropriate FFA. National consultations will culminate in the formulation of a FFA for SADC as a region, the structure of which has already been agreed upon. The FFA process will contribute towards development of the SADC Regional Water Policy and Strategy.

SOURCE R.J.Boroto, 2003

Framework for Action (FFA) to be used in translating the Vision into reality by the year 2025 (Box 4.5).

The following challenges were identified as common to southern Africa with regard to achieving the Vision:

- policy and institutional arrangements for the effective implementation of IWRM;
- effective stakeholder participation;
- effective and reliable information system for the region;
- indicators and targets to achieve the Vision (MDGs may serve as milestones);
- understanding the economic value of water;
- developing a regional water strategy that recognises ecological and social issues;
- regional cooperation in the management of shared watercourses; and
- the need to take into account existing initiatives that contribute towards the Vision, such as all initiatives under the New Partnership for Africa's Development (NEPAD), as well as resolutions from the World Summit on Sustainable Development (WSSD) and regional initiatives such as the Regional Strategic Action Plan (RSAP) and relevant initiatives at country or bilateral levels.

Integrated Water Resources Management

Since the early 1990s, there have been discussions at global level for the sustainable management of the world's water resources. Following the Rio and Dublin conferences in 1992, the concept of Integrated Water Resources Management (IWRM) was formulated as a possible approach to dealing with the diverse challenges posed by managing and developing water resources. It is against this background that the RSAP was formulated in order to provide a framework and enabling environment for the implementation of IWRM in the region.

IWRM is defined as:
"a process that promotes the co-ordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."[37]

IWRM is based on the four Rio/Dublin principles (Box 4.6).

Rio/Dublin Principles **Box 4.6**

1. Fresh water is a *finite and vulnerable resource*, essential to sustain life, development and the environment.
2. Water development and management should be based on a *participatory approach*, involving users, planners and policy-makers at all levels.
3. *Women play a central role* in the provision, management and safeguarding of water.
4. Water has an economic value for all its competing uses and should be recognised as *an economic good*.

These principles are relevant to the southern African region in the context given below:

- The prevailing semi-arid climate and the seasonal and temporal variability of rainfall make freshwater a finite and vulnerable resource in southern Africa.
- The need to involve communities and other stakeholders in decision-making in order to promote the sense of ownership of a common resource that must be managed responsibly.
- The fact that in both rural and urban areas, women are still responsible for household chores associated with water, and should be given a voice in the management decisions.

R.J. Boroto for SARDC

Women play a central role in provision, management and safeguarding of water in rural and urban areas, and must have a voice in management decisions.

- The need to recognise that water is an important input in most economic activities and comes with a cost, and is essential to human dignity. Thus, it is an economic good, but also and mainly, a social good, which should be accessible to people.

IWRM seeks to achieve a balance between economic *efficiency*, social *equity* and *environmental* sustainability. The need for this balance is relevant in southern Africa given that water has to play a key role in unlocking potential for economic development.

Further, the majority of the population still need to gain access to safe water and sanitation, and most people cannot afford to pay for the true cost of water. Competition for water among sectors should not overlook the need to protect the environment for the benefit of future generations.

The status of water policy reform in SADC member states, in relation to IWRM and the Revised Protocol on Shared Watercourses, is summarised in Table 4.11. It shows that most countries have embarked on water sector reforms, which embrace IWRM as the core philosophy of their approach to water resources management.

RISDP and SADC regional water policy

The Regional Indicative Strategic Development Plan (RISDP) is the new blueprint for the SADC region's socio-economic development. The plan was launched in March 2004 at a SADC Summit in the United Republic of Tanzania.

Water is recognised in the RISDP as having a key role in the development of the region, with special attention given to development that is integrated and ensures all other sectors benefit from the contribution of the water sector. The SADC region has thus embarked on the development of a regional water policy and strategy to guide the holistic management of water resources.

A draft Regional Water Policy was developed in mid-2004 through an innovative process, which used various studies and amalgamated the findings. The development process, guided by the SADC Water Division, saw the production of a draft policy document through a series of consultative forums involving multi-sector regional experts and stakeholders. Further comments were received on the draft through workshops at country level.

The overall goal of the policy is regional integration and poverty eradication. The objectives are inspired by the sub-vision statements of the *Southern African Vision for Water, Life and Environment*. The policy recognises IWRM as the basic approach to achieving these objectives and ultimately the goal. Appropriate tools for implementing IWRM are proposed, including:

- establishment of institutions at national and regional levels;
- capacity building;
- stakeholder participation;
- water resources information management;
- implementation of IWRM plans;
- conflict resolution; and,
- environmental management.

The policy has been passed through the SADC system for approval, and development of a regional water strategy will follow approval of the regional water policy. SADC has held initial meetings for the formulation of the strategy. During strategy formulation, linkages will be established between the Framework For Action (FFA) process, the

Status of Water Policy Reform in Relation to IWRM and the Protocol on Shared Watercourses **Table 4.11**

Country	Formal policy document	Date	Policy reform process
Angola	No	-	New water legislation passed in June 2002 and a comprehensive Water Sector Development Strategy in draft by November 2002.
Botswana	No	-	National Water Master Plan (NWMP) of 1991 and reviewed in 2005 proposes revision of policies and legislation. A Sanitation Master Planning Study undertaken, and plans for revision to the NWMP include a policy and legislative review.
DRC	No	-	A draft Water Code (legislation) exists but no formal policy document.
Lesotho	Yes	1999	Water Resources Management Policy, adopted by Cabinet in 1999, is not consistent with existing legislation, not yet revised. An initiative is underway to revise and elaborate the water policy and water legislation.
Malawi	Yes	2000	Water Resources Management Policy and Strategies of 2000 is a revision of 1994 policy. Task team set up to revise legislation, and draft Water Resources Bill prepared.
Mauritius	No	-	No formal policy document. Water legislation in place. Water master planning study commissioned.
Mozambique	Yes	1995	Water Law passed in 1991 following extensive reforms from the 1980s. National Water Policy approved 1995. Work on strategy revision planned for 2003.
Namibia	Yes	2002	Water Supply and Sanitation Sector Policy adopted in 1993, following independence in 1990. Namibian National Water Policy adopted in 2002 after restructuring of civil service and establishment of national public water utility,Namwater. A new water act is being prepared.
Seychelles	No	-	Main legislation relevant to the water sector is the Public Utilities Corporation Act and the Environmental Protection Act. The UNDP country strategy has strong focus on sustainable development and IWRM.
South Africa	Yes	1994 & 1997	Water Services Act 1997 enacted following consultations on a White Paper on basic water supply and sanitation, developed rapidly by the new government after elections in 1994. Revision planned after consultations on a new policy White Paper on water services. The Water Act of 1998 was developed after extensive consultation on the 1997 White Paper on water resources policy.
Swaziland	No	-	The Water Act of 2003 repeals the 1967 Water Act.
United Republic of Tanzania	Yes	2002	National Water Policy (NAWAPO) developed over seven years, adopted in 2002, replacing 1991 policy.
Zambia	Yes	1994	National Water Policy focusing on basic water supply and sanitation and water resources management adopted in 1994. This led to the National Water Supply and Sanitation Act in 1997. Reforming water resources management commenced in August 2001 when government implemented the Water Resources Action Programme, guided by the principles of IWRM, and a new legal and institutional framework is being developed.
Zimbabwe	Yes	2000	Water Resources Management Strategy process commenced in 1995 and resulted in a new National Water Policy, a Water Pricing Policy and Strategy, and a new Water Act in 1998, which replaced the pre-independence Act of 1976. The Zimbabwe National Water Authority Act was passed, and the process completed in 2000.

SOURCE *Revised Protocol on Shared Watercourses in the Southern African Development Community,* SADC, 2000; Environmental Law Alliance Worldwide, 2003

water strategy itself, IWRM plans and the revised RSAP. These are all related initiatives that will converge towards actions that lead to a sustainable improvement in the livelihoods of the people of southern Africa through socio-economic development, while ensuring that the environment is protected.

Water demand management

Water demand management is "a management approach that aims to conserve water (quality and quantity) by controlling demand." The aim is to apply a selection of technological, behavioural, economic, institutional and regulatory incentives to promote the efficient and equitable use and allocation of water.

From 1997 to date, IUCN-The World Conservation Union has contributed to awareness and understanding of water demand management through the Regional Water Demand Management Project. Studies conducted under the project have shown that the sustainability of the region's water resources is threatened both in terms of quality and quantity, and that water demand management is one of the tools that can be implemented in the management of the region's scarce water resources.

All countries in the SADC region now recognise water demand management as a cost-effective strategy in providing water for current and future water needs. However, water demand management policies and strategies have so far been emphasised only in urban water supply and their application has been realised in water-scarce cities such as Windhoek in Namibia, Gaborone in Botswana and Bulawayo in Zimbabwe (Box 4.7).

R.J. Boroto for SARDC

A lot of water is lost through deteriorating infrastructure such as burst pipes in urban areas.

Water Demand Management – lessons and experiences from Bulawayo **Box 4.7**

Bulawayo is located in the dry part of Zimbabwe, which is vulnerable to drought. The 1992 once-in-a-century drought had very severe impact on Bulawayo. Extraordinary measures were taken by both domestic and industrial water users in response to this situation. These measures have had long-lasting consequences:

- water conservation has become part of the ethos of the city;
- the block tariff system combined with water conservation has resulted in very low domestic per capita water consumption figures (36 litres per capita per day in high density areas and 75 litres per capita per day in low density areas);
- there is a degree of complacency within the Water Department of the Bulawayo City Council about the supply situation because the city coped so well with such a severe shortage of water, and water demand has remained at surprisingly low levels.

Bulawayo's drought story, coupled with its ongoing battle to have a major investment project executed to secure the city's water supplies through the Gwayi-Shangani Dam initially, and a pipeline from the Zambezi ultimately, made it possible to secure a grant from Norway for a water demand management project.

Started in 1999, the Bulawayo Conservation and Sector Services Upgrading Project introduced new management tools, conducted studies to enhance understanding of what needs to be done in the area of water demand management, and made a start at replacing corroded parts of the water supply network. It introduced sophisticated GIS-based utility mapping, network modelling, pressure and metre zoning, and water-loss control systems. Although some of the impetus may be lost, with the end of the project in 2002, much of what has been done has been embedded in the planning and operations of the Water Department as a lasting legacy.

The following ranking from some of the staff members captures this:

- pressure management (including mapping, network modelling, maintenance and system upgrades) to reduce pipe bursts and water leakage;
- improved operations and maintenance management system;
- a tariff structure which is equitable but also conservation-oriented;
- establishment of a leak detection unit; and
- an asset management strategy, which provides for progressive replacement of old parts in the transmission and distribution network.

SOURCE SADC Water Sector, *Guidelines for the Development of National Water Policies and Strategies That Support IWRM*, SADC Water Sector, Maseru, 2003

Water pollution guidelines

SADC member states are at different levels in developing water quality guidelines. South Africa, Zambia and Zimbabwe have well-established standards for controlling water pol-

lution. Tanzania uses temporary standards for water quality and effluents, passed in 1979. The other countries which have not set water utility standards use the World Health Organisation (WHO) guidelines. These include Angola, Malawi and Mozambique. Botswana and Lesotho intend to make water quality guidelines part of their environmental protection legislation. There are also plans to develop regional quality guidelines so as to have a common minimum standard of water quality.[38]

Estuarine management measures

A number of initiatives are being implemented in the region to support decision-making for the conservation and management of estuaries. These include the setting up of institutions such as the Consortium for Estuarine Research and Management (CERM) in South Africa, and various projects carried out through academic institutions such as the Beira University in Mozambique.

Research is being carried out on the concept of Estuarine Flow Requirements (EFR), to ensure that estuaries continue to receive adequate freshwater so as to maintain the ecological balance. Because estuaries are usually rich in biodiversity they require more freshwater than the upper reaches of river systems, thereby creating an imbalance between EFRs and Instream Flow Requirements (IFRs).

A better understanding of these flow requirements ensures that ecological demands on freshwater are catered for through appropriate releases from dams and integrated river basin management.

Virtual water trade

In addition to previous strategies of food self-sufficiency, countries in the region, such as Botswana, have adopted the alternative policy of economic development for food security, in which the economy has to be strong enough to purchase food from other countries.

The concept of "virtual water" links water, food and trade by arguing that global processes, in particular food trade can effectively ameliorate serious local water shortages.[39] It refers to the water needed to produce agricultural commodities, but can also be expanded to include the water used to produce non-agricultural commodities.[40] The concept holds the potential for reducing agricultural water consumption, since agriculture is by far the biggest user of water in the region.

Through proper planning at regional level, food crops can be grown in the wetter parts and sold to the drier parts of the region. More water is then made available to other sectors where greater economic benefits can be realised, especially in the drier countries.

Institutional reforms and water pricing

An important dimension of IWRM is the presence of appropriate institutional arrangements to facilitate the sustainable management of water resources. Capital investments

Water privatisation in the United Republic of Tanzania **Box 4.8**

Chronic underfunding of Tanzania's water infrastructure due to World Bank structural adjustments left the utility in need of almost US$600 million to provide water for all citizens. Privatising the Dar es Salaam Water and Sewerage Authority (DAWASA) was one of the conditions if the country was to receive the Heavily Indebted Poor Countries (HIPC) debt relief.

The government raised a credit to fund the US$145 million upgrade of DAWASA, but had to sell off the company at a lower price, effectively increasing the national debt it seeks to reduce. The move was supported with a World Bank loan of US$61.5 million designed to pass enabling legislation and prepare the water utility for sell off.

Unfortunately, it will be taxpayers who repay the money that government was forced to borrow – and worse still, they will have to pay increased water rates, with water bills becoming another corruption trap. In Tanzania, less than 40 percent of the rural population and 70 percent of the urban population have access to piped water. The rest of the population seek water from untreated sources. Women often walk up to 15 km to fetch water of dubious quality and cholera outbreaks persist.

SOURCE Adapted from:
http://www.citizen.org/cmep/Water/cmep_Water/reports/tanzania/index.cfm www.yellowtimes.org/article.php?sid=369

in infrastructure and maintenance for water supply and sanitation services are too costly for most governments in the region.

The need for financial sustainability has led to a number of privatisation arrangements, ranging from semi-government parastatals such as REGIDESO, the sole national water utility which is in charge of water supply in urban areas in the Democratic Republic of Congo, and Johannesburg Water, a company run by a local authority, to entirely private local or international companies tendering for water service contracts in southern Africa.

It is however expected that greater political stability will result in governments investing more in social services and that access to water will therefore improve with time.

The South African government has moved to reverse the legacy of apartheid and improve the provision of water services to the poor since 1994, through the free basic water policy (Box 4.9). This policy states that each South African household (rich or poor) is entitled to a free basic water allocation of 6,000 litres per month (the reserve). This figure is calculated by assuming a daily per capita water consumption of 25 litres and a household size of 8 people.

Other countries in the region use various water-pricing systems to promote more efficient and equitable water use, although it is generally agreed that like elsewhere, water in southern Africa is heavily under-priced and subsidised.[41]

Water pricing **Box 4.9**

Water pricing is one tool to promote more efficient and equitable water use.

The pricing approach recommends that public authorities raise the user price of water to reflect its opportunity cost, thereby inducing water conservation and making more water available at higher values. Water pricing typically varies with consumer categories.

In southern Africa, as elsewhere, water is generally under-priced and heavily cross-subsidised, and varies according to consumer category and region. At best the price covers the direct use value or the production costs. In Zimbabwe, for instance, the main pricing mechanism is a national "blend price", which is calculated from the historical cost of several government-constructed dams and associated works.

Under the framework of the revised 1998 legislation, South Africa has put forward a comprehensive water-pricing policy, which aims to charge all significant water-resource use, regardless of where it occurs. The only exception will be in respect of the reserve, which is to be provided free of charge.

The pricing will include operating, maintenance and capital costs where appropriate as well as water resource management levy and a resource conservation charge. The levy may include charges for effluent disposal or stream flow interception as a result of land uses such as afforestation or agriculture.

SOURCE Scholes, R.J. and Biggs, R., *Ecosystems Services in Southern Africa,* 2004

FUTURE CHALLENGES

Access to safe water and sanitation

With more than half of the total SADC population lacking access to safe water and sanitation, the region faces two main challenges of providing adequate and safe water supplies.

Halving the number of people without access to safe water and sanitation by 2015 as the UN Millennium Development Goals stipulate is one major challenge. This challenge is compounded by the increase in HIV and AIDS in most SADC countries, with prevalence among the economically active age groups of 18-49 estimated at 12 percent.[42]

The vulnerability of the region's water resources and the projected water scarcity will determine the level of access to clean water and sanitation by all sectors of the population. Therefore all countries in the region have to deal with it.

The region's safe water supply and access to sanitation are further worsened by the pattern of migration from rural to urban areas in most of southern Africa, which has not been matched by a corresponding expansion in infrastructure in urban areas, leading to pressure on available water resources.

Water resource assessments

Future studies in the region need to focus on establishing and agreeing on the current state of water resources utilisation, environmental

water requirements, and options for integrated management and development of the river basins towards realisation of equitable allocation and sharing. All these need to evolve with direct participation of all stakeholders including communities living in the basins.

A better understanding of groundwater resources in the SADC region is important in the development of groundwater management strategies to reduce the impact of drought. SADC now supports the implementation of sustainable and integrated management of groundwater resources which takes into account the needs of ecosystems. This will be achieved through strengthening capacity of member states in developing drought management policies, specifically in relation to the role, availability and supply potential of groundwater resources.

The importance of data availability in water resources assessments, through appropriate sharing mechanisms and policies cannot be overemphasised.

Water demand management

Major issues that still need to be tackled by SADC countries in relation to water demand management include the introduction of the concept to the broader economic sector and not just to confine it to urban water supply.

Other sectors should include agriculture and hydroelectric power generation. This could lead to some countries adopting food security instead of food self-sufficiency policies, in order to be consistent with the real water availability in the country, and in line with principles of regional economic integration.

Another strategy that will increasingly be considered is the full integration of water demand management as part of integrated water resources management plans.

Virtual water

Despite the promise held by the concept of virtual water trade in promoting regional integration and the optimal use of scarce freshwater resources, there are challenges for governments, who have the social responsibility for food production and supply policies in individual member countries. Pursuing such a policy requires adequate financial resources and strong international collaboration.

LINKAGES

Chapter 1 Regional Overview
The growing human population and developing industrial base in southern Africa will result in growth in demand for water. Already people are encroaching on fragile aquatic ecosystems such as wetlands due to increased pressure for water resources.

Chapter 2 Land
Agriculture, especially irrigation agriculture, takes up a big share of the region's water. The use of agro-chemicals also contributes towards pollution of freshwater resources, affecting the health of ecosystems in the process.

Chapter 3 Atmosphere
Hydropower offers a reliable non-polluting form of energy. The full potential of the region's hydropower generating capacity is yet to be fully realised.

Chapter 5 Marine and Coastal Resources
Much of the region's rainfall comes through evaporation from the oceans. River systems help complete the hydrological cycle when freshwater received through rainfall flows back to the oceans.

Chapter 6 Forests and Woodlands
Soil erosion caused by water flowing over barren soil is common in southern Africa. However, with proper forest management soils are saved from water erosion.

Chapter 7 Wildlife
The biodiversity of wetlands is important to the region as it promotes the tourism industry, apart from offering other benefits such as food, building materials and incomes. However, some wetlands are being converted to agricultural land.

Chapter 8 Human Settlements
Water supply is becoming a major limiting factor in the development of settlements in southern Africa. Water transfer schemes are becoming common in the region, especially in Botswana and South Africa.

Chapter 9 Scenarios
Projections into the future point out that there is likely to be water stress in southern Africa in the next 20-25 years. Planning for sustainable use of water is therefore urgent.

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MARINE AND COASTAL RESOURCES 5

Southern Africa's marine coastline serves as a gateway to the outer world as well as a source of livelihood for millions of people in the region. The coastline generates employment in the fisheries, exports, services, and tourism and hospitality industries. At least 200,000 people are directly employed in fisheries while over one million people are dependent on related activities.[1] The region's marine and coastal resources are also rich in oil and gas energy and have a wealth of mangroves and coral reefs.

Despite this richness, the region is faced with declining fish resources, coastal degradation including pollution from oil spills and erosion. The marine and coastal region is also vulnerable to the effects of climate change especially temperature and sea level rises.

ECOLOGICAL REGIONS

The southern African coastline stretches from about 5ºS on both sides of the continent to about 35ºS at the southern tip of Africa, covering more than 15,000 km that include eight of SADC's 14 member states, shown in Table 5.1. In addition, the Prince Edward Islands, at about 47ºS in the southwest Indian Ocean, are South African territory. Therefore, the region of interest spans a latitudinal range of more than 40º, changing from tropical conditions near the equator to sub-Antarctic conditions at the Prince Edward Islands.

Four quasi-distinct marine ecological regions can be distinguished in southern Africa. These are defined by the Benguela System, Agulhas Bank, and the Angola and Mozambique Currents, as shown in Map 5.1. These marine regions do not operate independently of each other, or indeed of neighbouring oceanic regions. For example, several fish species migrate regularly within the Benguela System between the Agulhas Bank and the Benguela Current, whereas some whales move even further, feeding in the Southern Ocean but migrating to the west and east coasts of Africa to calve.[2]

David Martin, APG

The region is rich in marine and coastal resources.

Coastal and Marine Boundaries/Areas by Country **Table 5.1**

Country	Coastline (km)	Continental Shelf within Exclusive Economic Zone (EEZ) (sq km)	EEZ (sq km)
Angola	1 650	51 000	330 000
DR Congo	160	11 538	59 264
Madagascar	4828	96 653	1 079 672
Mauritius	150	1 208	1 900 000
Mozambique	2 780	104 300	562 000
Namibia	1 500	111 000	504 000
South Africa	2 880	143 400	1 050 000
Tanzania	1 425	41 200	223 000
Total	15 373	560 299	7 100 936

SOURCE SADC, *Food, Agriculture and Natural Resources-Annual Report, July 1999-June 2000;* Madagascar data from World Resources Institute http://earthtrends.wri.org/searchable_db/index.php?theme=1 and Wild Madagascar, http://www.wildmadagascar.org/overview/geography.html

Ocean Currents and Marine Ecozones **Map5.1**

SOURCE SADC, *State of the Environment in Southern Africa*, 1994

Angola Current

The Angola-Benguela front, which is usually located off southern Angola, separates the cool water of the Benguela upwelling system from warmer water to the north. Off northern Angola, substantial discharge of freshwater from the Congo River creates a plume of relatively low salinity water.[3]

The Angola Current is not as productive as the Benguela System but nevertheless supports large concentrations of fish. These include Cunene horse mackerel (*Trachurus trecae)*, Benguela hake (*Merluccius polli)*, Yellowfin *(Thunnus albacares)* and other tunas, Skipjack (*Katsuwonus pelmis)*, Atlantic little (*Euthynnus alletteratus),* Frigate (*Auxis thazard)* and two species of Pilchard (*Sardinella).*[4]

Benguela System

The Benguela Current brings nutrients from deep waters to the surface, where, in the presence of sunlight, they stimulate the production of phytoplankton. This forms the basis of a food web that is dominated by a suite of planktivorous fish. These include Sardine (or Pilchard) (*Sardinops sagax)*, Anchovy (*Engraulis encrasicolus)*, Round herring (*Etrumeus whiteheadi)*, Pelagic goby (*Sufflogobius bibarbatus)*, several mesopelagic mid-water species (eg, *Lampanyctodes hectoris*, *Maurolicus muelleri*), Cape horse mackerel (*T. trachurus)*, Chub mackerel (*Scomber japonicus)* and two species of hake.[5]

The mackerels and hakes grow larger than the other species and they often become predatory on smaller fish. Other abundant predators on small fish include squid, notably piscivorous fish (*Loligo reynaudii)* and some tunas, seabirds and the Cape fur seal. Several of the seabirds breed only in the Benguela System.

In the inshore region, beds of Kelp (*Ecklonia maxima)* support substantial populations of Cape rock lobster (*Jasus lalandii)* and Abalone (*Haliotis midae).*

The coastal wetlands of Namibia and western South Africa provide nursery areas for some fish species and are important feeding grounds for large flocks of palaearctic and resident shorebirds. These areas include Sandwich Harbour, Walvis Bay lagoon and the Orange River mouth in Namibia, which are all Ramsar sites, as well as the Berg River estuary and Langebaan lagoon in South Africa.

Agulhas Bank

The Agulhas Bank, off southern South Africa, provides an environment intermediate between the cool Benguela Current in the west and the warm Agulhas Current in the east. The Agulhas Current flows in a south-westerly direction along the east shelf of the bank. Friction at the shelf edge causes topographical upwelling that brings cool water to the surface and results in a counter-current inshore of the Agulhas Current that is much cooler. Some upwelling occurs at capes along South Africa's south coast, while storm-induced mixing over the shelf in winter[6] also brings nutrients within reach of sunlight, thereby stimulating production of plankton.

On the Agulhas Bank the conditions are generally less turbulent than off South Africa's west coast, providing a more stable spawning environment for fish that spawn in the water column. As a result, many fish migrate to this region to spawn. Their eggs and larvae are swept westward and then

northwards into the Benguela system, where the intense upwelling provides rich feeding grounds for the young fish.

Mozambique Currents

The east coast is exposed to consistent, tropical environmental conditions, with sea surface temperatures usually between 24 and 31°C. Tides may recede up to 500 m from the shoreline. As well as open waters, there are extensive deltas, estuaries, mudflats, mangrove forests (especially around river estuaries), seagrass beds and coral reefs. Although not as productive as the west coast, the coast has a much greater diversity of plant and animal life.[7] The coastline from Somalia to eastern South Africa supports at least 11,000 species of plants and animals.[8]

The mudflats are rich feeding grounds for shorebirds, many of which migrate from northern Europe. The mangrove forests consist of salt-resistant trees. The roots trap river sediment that would otherwise be washed out to sea. When exposed at low tide, the muddy substrate becomes a feeding ground for birds. At high tide, the mangrove forests are feeding grounds for many species of fish, crabs and shrimps. The mangrove forests protect the coastline from storm surges from the Indian Ocean and other natural hydrological influences such as spring tides and disturbances from currents.[9]

The coastal areas of Mozambique are also relatively protected from wave action of the open Indian Ocean by the island of Madagascar. The Mozambican coast is considered a low energy shoreline characterised by long-shore transport and deposition of large quantities of riverine sediments carried by several large rivers, which drain into the Indian Ocean. These factors contribute to establishment of mangroves along the coast of that country, which total some 390,500 ha in extent.[10]

About 20 percent of Mozambique's mangrove forests occur in the provinces of Sofala and Zambezia in the central part of the country.[11] The Sofala Bank, which fringes the coast of these provinces, is a productive fishing ground for shallow-water Prawns (*Panaeus* spp. and *Metapenaeus monoceros*). There is a positive correlation between mangrove vegetation and shrimps and other commercially important marine organisms.

The depth of the seagrass beds and coral reefs is limited by light penetration. The seagrass beds provide habitat for a wide range of organisms, from invertebrates such as prawns and starfish through to fish and Dugongs (*Dugong dugong)*. Coral reefs cover an estimated 1,500 km of coastline in the eastern African region (Somalia to eastern South Africa) and also support a wide diversity of fish and invertebrates. Growth of the corals varies between a few millimetres and 10 cm per year.[12] The internationally renowned reefs of the western Indian Ocean islands, including Mauritius, support a booming tourism industry and subsistence and commercial fisheries.

The open waters of the east coast are important for large pelagic fish such as tuna and billfish. They also provide habitat for the coelacanth and calving grounds for the migratory Humpback whale (*Megaptera novaeangliae)*.[13]

David Martin, APG

The region's marine and coastal resources are also rich in oil and gas energy and have a wealth of mangroves (shown above) and coral reefs.

VALUE OF MARINE AND COASTAL RESOURCES

Apart from offering easy access by sea to merchants from early times and the promotion of development of the interior, the southern African marine coastline contains an abundance of natural resources that include animals, plants and marine life such as fish, lobsters and prawns, among others. These result in many social and economic activities that are directly related to the resources. The coastline also has natural gas and oil reserves that generate significant income for some countries of the region.

On the east coast, Mozambique commands approximately 2,700 km of coastline that is characterised by a wide variety of ecosystems that are of regional and national importance. These include mangroves, coral reefs, sea grass beds, sand dunes and rocky shores that are a haven for fish and other aquatic resources. They act as breeding grounds and habitat for wildlife, natural grounds for recreation and tourism and serve as a medium for transportation.[14]

Due to the high potential offered by coastal areas for socio-economic functions and activities, people find the marine environment highly attractive for both settlement and exploitation.

Major settlements along the seacoast of mainland southern Africa are Cabinda, Luanda, Lobito and Namibe in Angola; Swakopmund, Walvis Bay and Lüderitz in Namibia; Cape Town, Port Elizabeth, East London and Durban in South Africa; Maputo, Inhambane, Beira, Quelimane, Nacala and Pemba in Mozambique; and Mtwara, Dar es Salaam and Tanga in Tanzania.

By virtue of their location on the coast, these urban settlements offer opportunities for fishing, tourism, harbours, and other amenities and therefore require comprehensive service provision mechanisms in order to sustain the environmental conditions of the maritime ecosystem.

Fishing is an important industry within the region. Fish exports generate income of around US$892 million per year for southern Africa,[15] with the European Union being the main export market.[16] The bulk of the marine fish catch of SADC coastal states is landed by Angola, Namibia and South Africa. Between 1971 and 2001 the three countries contributed 90-97 percent of the annual catches. The industry is predominantly industrial in these countries. Artisanal and recreational fisheries are more common on the east coast, where they have high social and economic importance. The fisheries industry on the east coast includes shrimp. Estimates of the value of shrimp fisheries of the Sofala Bank in Mozambique are as high as US$50-60 million per year.[17] In 1997, proceeds from shrimp contributed 40 percent of Mozambique's net foreign exchange earnings.[18]

South African Tourism

Due to the high potential for socio-economic activities, people find the marine environment attractive for both settlement and exploitation.

The coastline is a habitat for fish and other aquatic resources.

Declining fish stocks

The overall marine fish catch by SADC countries in 2001 was about 1.7 million tonnes. It was between 1.8 and 1.9 million tonnes from 1972-1974, then fell to less than 1 million tonnes from 1984-1986, before increasing again, with fluctuations.

The marine fisheries catch for the region, as shown in Table 5.2 is much lower than the potential sustainable annual catch of between 2.7 and 3.0 million tonnes.[19]

There have been substantial decreases of Cape rock lobster and abalone in the Benguela system through over-fishing.[20] This has been exacerbated by poaching, which has proved difficult to control because of the ready accessibility of these resources in the near shore environment and the high prices that they fetch.

The long-term survival of many marine species of commercial importance is threatened by the destruction of their habitat, inappropriate fishing methods, marine pollution and coastal erosion, as well as management and enforcement problems. Table 5.3 shows some threatened fish species of southern Africa, ranging from the vulnerable to the critically endangered.

Catches on the west coast of Africa, once regarded as one of the richest fishing grounds in the world, have declined sharply from the 3.0 million tonnes harvested during the 1950s and 1960s.[21] The reduced levels of catches are partly due to unsustainable rates and methods of harvesting, including dynamite fishing, use of mosquito nets in the code end of the trawling nets,

Marine Catches of SADC Countries **Table 5.2**

Country	1991 (000 tonnes)	1996	2001
Angola	110	197	247
Madagascar	58	66	90
Mauritius	19	12	11
Mozambique	26	27	24
Namibia	205	266	546
South Africa	494	439	754
Tanzania	54	62	53
TOTAL	966	1 069	1 725

SOURCE FAO Yearbook, *Fishery statistics*, 2002
Madagascar data 1991, WRI; 1996 and 2001, FAOSTAT

Some Threatened Fish Species of Southern Africa **Table 5.3**

	Scientific name	Common name	Level
1	*Aetomylaeus nichofii*	Banded Eagle Ray	Vulnerable
2	*Balistes vetula*	Queen Triggerfish	Vulnerable
3	*Carcharias taurus*	Grey Nurse Shark	
		Sand Tiger Shark	
		Requin Taureau	
		Toro Bacota (S)	Vulnerable
4	*Carcharodon carcharias*	Great White Shark	Vulnerable
5	*Centrophorus granulosus*	Gulper Shark	Vulnerable
6	*Centrophorus squamosus*	Deepwater Spiny Dogfish	
		Leafscale Gulper Shark	
		Nilson's Deepsea Dogfish	
		Squale-Chagrin De L'atlantique	
		Quelvacho Negro	Vulnerable
7	*Cetorhinus maximus*	Basking Shark	
		Pelerin	
		Peregrino	Vulnerable
8	*Chaetodon marleyi*	Marley's Butterflyfish	Vulnerable
9	*Cheilinus undulatus*	Humphead Wrasse	Vulnerable
10	*Epinephelus lanceolatus*	Giant Grouper	Vulnerable
11	*Galeorhinus galeus*	School Shark	
		Tope Shark	Vulnerable
12	*Hemipristis elongatus*	Fossil Shark	
		Snaggletooth Shark	
		Milandre Chicor	
		Comadreja Sobrediente	Vulnerable
13	*Hippocampus capensis*	Cape Seahorse	
		Knysna Seahorse	Endangered
14	*Latimeria chalumnae*	Coelacanth	
		Gombessa	
		Coelacanthe	
		Celecanto	CRITICALLY ENDANGERED
15	*Nebrius ferrugineus*	Tawny Nurse Shark	Vulnerable
16	*Negaprion acutidens*	Sharptooth Lemon Shark	Vulnerable
17	*Pristis pectinata*	Smalltooth Sawfish	
		Wide Sawfish	Endangered
18	*Pristis pristis*	Common Sawfish	CRITICALLY ENDANGERED
19	*Pristis zijsron*	Green Sawfish	Endangered
20	*Rhina ancylostoma*	Bowmouth Guitarfish	
		Mud Skate	
		Shark Ray	Vulnerable
21	*Rhincodon typus*	Whale Shark	
		Requin Baleine	
		Tiburón Ballena	Vulnerable
22	*Rhynchobatus djiddensis*	Whitespot Giant Guitarfish	Vulnerable
23	*Rhynchobatus laevis*	Smoothnose Wedgefish	Vulnerable
24	*Scylliogaleus quecketti*	Flapnose Houndshark	Vulnerable
25	*Stegostoma fasciatum*	Leopard Shark	
		Zebra Shark	Vulnerable
26	*Thunnus maccoyii*	Southern Bluefin Tuna	CRITICALLY ENDANGERED
27	*Thunnus obesus*	Bigeye Tuna	Vulnerable
28	*Urogymnus asperrimus*	Porcupine Ray	Vulnerable

SOURCE IUCN Species Survival Commission, *Red List of Threatened Species*, IUCN, Gland, 2003

South African Tourism

South African Tourism

Marine fisheries catch for the region is lower than the sustainable annual catch, but mean size of fish caught is decreasing.

trawling in the corals and seagrass beds, and poisoning.

In Namibia, marine fish catches decreased markedly after 1974, as a result of the decline of the Namibian sardine population. Catches fell to a low of about 200 tonnes from 1984-1986. Intrusions of warm water from the north, known as Benguela *Niños*, which took place in 1974, 1984 and 1995, reduced the abundance of fish and led to decreases in catches in periods following these events.

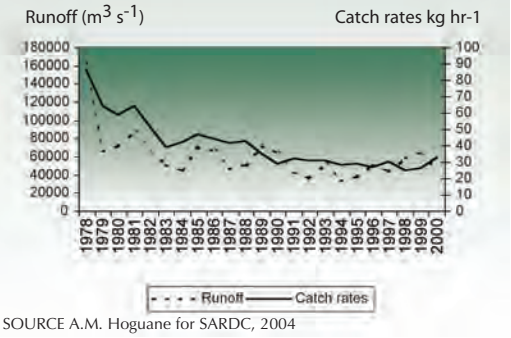
In Angola, the fisheries industry almost collapsed at independence in 1975 following the withdrawal of the Portuguese fleet. This was replaced later by boats from the former Soviet Union, but these could land only 300,000 tonnes per year compared to the 600,000 tonnes landed per year prior to the country's independence.[22] In the late 1990s, Angola's catch began to increase and it reached about 250,000 tonnes by 2001.[23]

Reduced catches and a decrease in the mean size of fish caught led to calls for the protection of stocks by governments in the region. However, controls have not always been easy to monitor and enforce.

Studies in Mozambique have shown that the abundance of the shallow water shrimp is related to freshwater availability, both from river runoff and direct rainfall into the coastal areas. A decrease in shrimp catches has been attributed to a reduction of annual runoff in the Zambezi river, due to regulation of the river flow following construction of the Cahora Bassa dam, as shown in Box 5.1.

Effects of flow regime on shrimp production **Box 5.1**

The shallow water shrimp are related to freshwater availability, both from river runoff and direct rainfall into the coastal areas. Sætersdal (1992) showed how shrimp catches are positively correlated with the precipitation in the Gulf of Carpentaria, in Australia. Previous studies conducted in Sofala Bank have revealed a strong correlation between Zambezi runoff and the shrimp abundance (Jorge da Silva, 1986; Gammelsrød, 1992a,b; Hoguane 1997). The Zambezi annual runoff has remarkably reduced since 1978, following the regulation of the river by Cahora Bassa dam. Based in the linear relationship developed between shrimp catch rates and Zambezi runoff, Gammelsrød and Hoguane (1995) and Hoguane (1997) have attributed the reduction in shrimp catches to the reduction in Zambezi runoff.



SOURCE A.M. Hoguane for SARDC, 2004

POLLUTION

Marine and coastal ecosystems in southern Africa are being degraded through pollution from land-based activities and dumping at sea. Land-based pollution sources include discharge of sewage, industrial effluents, stormwater runoff, wind-blown litter, suspended sediments and agro-chemicals. For example, in South Africa there are 63 ocean outfalls along the coast, discharging about 800,000 cu m of sewage and industrial effluent into the sea every day.[24]

Industrial effluents in the region come from large fish processing plants, abbatoirs, and chemical and manufacturing industries. In Mozambique, 126 factories in and around Maputo do not have waste treatment plants and their drains discharge toxic wastes, poisons, non-degradable substances and organic matter into the sea.[25] Most of Tanzania's textile mills release dyes, bleaching agents, alkalis and starch directly into Msimbazi creek in Dar es Salaam, from where they can easily flow into the Indian Ocean.[26]

Stormwater flow depends on rainfall and usually the first flows following a dry spell contain high levels of pollutants, such as heavy metals (particularly lead), oil residues, nutrients (nitrogen and phosphorus) and pathogenic (disease causing) micro-organisms, such as viruses, bacteria and protozoa, from faecal material. It is difficult to control and manage stormwater drainage, and Cape Town offers a typical example in the region, where, according to the Delta Environmental Centre, more than one hundred stormwater outlets discharge over beaches and rocks.

Oil spills at sea have caused major problems for the conservation of seabirds in South Africa (Box 5.2), as well as affecting shorelines.

Ships often paint their hulls with anti-fouling substances such as Tributyl-tin (TBT) to prevent growth of marine organisms. These substances leach into water and in high traffic areas such as harbours and marinas, can affect animal life.

Plastics kill many marine animals. Turtles, for example, often swallow floating plastic bags, mistaking them for jelly-fish. Animals are often strangled when they become entangled with plastic debris.

Combating the effects of oil pollution **Box 5.2**

In the past 10 years, two major oil spills caused the oiling of about 30,000 penguins near Cape Town. On 20 June 1994, the *Apollo Sea* sank between Dassen and Robben Islands, respectively home to the largest and third largest colonies of African Penguins. About 10,000 penguins were oiled, of which half died and half were successfully returned to the wild.

South African Tourism

Penguins oiled in the Treasure *spill of 2000 were held in portapools in a large warehouse in Cape Town.*

On 23 June 2000, the *Treasure* sank, between the same islands. More than 19,000 penguins were oiled. A decision was taken to evacuate as many unoiled penguins as possible from the two islands, ferrying them to Port Elizabeth in trucks, boats and helicopters for translocation and cleaning. More than 3,000 orphaned chicks were also collected for captive rearing. During the time the penguins were away, the oil was removed. Satellite tracking and flipper banding showed that the penguins returned rapidly to the islands, a distance of about 900 km, some arriving within 10 days.

The massive rescue effort involved help from around the world and about 12,000 volunteers who handled more than 41,000 live birds making it perhaps the largest ever in terms of the number of animals caught. An estimated 4,000 chicks died at the islands and about 2,000 adults also died, mostly during rehabilitation. More than 300 portapools were used to keep the penguins in discrete groups and 64 dams were built for them to swim in using some 6,000 tonnes of sand. The captive birds ate 360 tonnes of fish; their carers consumed 500 kg of coffee.

SOURCE R. Crawford for SARDC, 2004

CLIMATE CHANGE

Global sea-level is estimated to have risen by 10-25 cm over the past 100 years. Tide gauge records at three sites on the Atlantic coast of South Africa and Namibia showed a sea-level rise comparable with these estimates.[27] The IS92a Greenhouse Gas Emissions Scenario estimates a global sea-level rise, in addition to that recorded in the mid-1990s, of 6-25 cm by 2030, 10-65 cm by 2070 and 23-96 cm by 2100.[28]

Sea level rise would inundate extensive mangroves of Mozambique and Tanzania, and this would increase rates of erosion of 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 impacts could result in a loss of income from coastal industries and port activities throughout the region, as well as loss of opportunities for development of tourism.[29]

In Tanzania, a sea level rise of 50 cm would inundate more than 2,000 sq km of land, causing damage costing around US$51 million.[30]

The coral reefs off the coasts of Mozambique, Tanzania and South Africa 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 a sea temperature rise of about 1°C causing the death of up to 90 percent of the corals in the region.[31]

A preliminary study on the vulnerability of Walvis Bay conducted by Namibia's Directorate of Environmental Affairs in 1991 established that increased incidence of flooding and inundation of the low-lying areas of the town and increased vulnerability to sea storms are likely to be the main threats from sea-level rise.[32]

South African Tourism

Increased vulnerability to storms is likely to be a threat to coastline towns.

Western Indian Ocean islands are particularly vulnerable to the impacts of sea-level rise due to their low-lying flat lands and a concentration of people, tourism, infrastructure, transport and industrial activities in coastal zones. It is estimated that a 100 cm rise in sea level would submerge 70 percent of the land area of the Seychelles islands and five sq km of land in Mauritius, with appreciable but as yet unquantified impact on low-lying areas of Madagascar.[33]

Long-term climate change may affect the distribution of marine resources, and this is thought to have been responsible for the decrease in numbers of several seabirds at Marion Island, southwest Indian Ocean (Box 5.3).

Increased air temperatures will cause marine animals breeding on land, e.g. African penguins (*Spheniscus demersus)*, to be subjected to increased heat stress. This could reduce reproductive output by causing animals to abandon their young. Increased temperatures could also alter the structure of some marine populations whose breeding is temperature dependent. An example is the changing ratios of hatchling turtles of different sex that could be expected because of changed temperatures.[34]

In addition to long-term change, shorter-term climatic agitations may have a substantial influence on the environment. The 1997/98 *El Niño* Southern Oscillation event triggered very high sea-surface temperatures in the southwest Indian Ocean. These higher temperatures caused extensive bleaching of corals along the East African coast and at islands in the west Indian Ocean. In Seychelles, more than 80 percent of coral reefs were lost.[35] High temperatures due to the *El Niño* Southern Oscillation event also led to a decrease in breeding by seabirds at Marion Island.[36]

COASTAL EROSION

Coastal erosion is primarily due to uncoordinated and inappropriate developments in the coastal zone, rapid development of the tourism industry and high population growth.

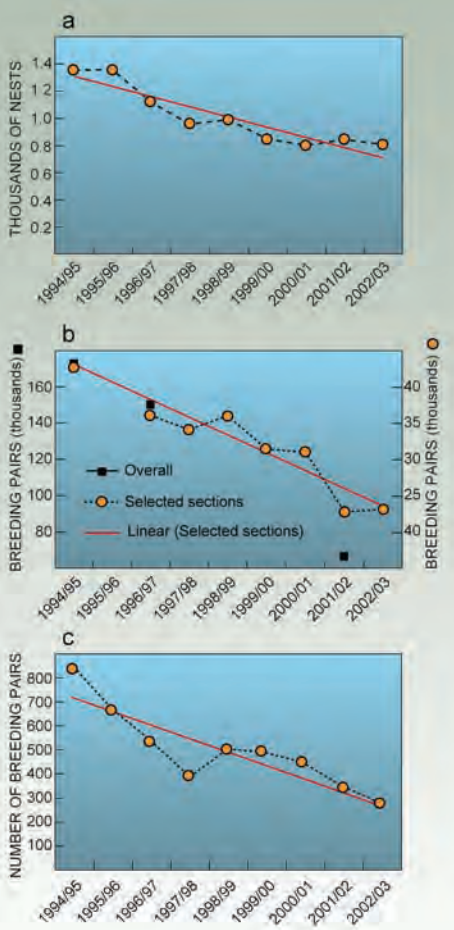
Climate change and marine resources **Box 5.3**

Altered climate has potential to influence marine resources in several ways. For example, it has been suggested that, should sea temperatures increase, there may be a clockwise redistribution of several marine organisms around the South African coast (Shackelton *et al,* 1996). The clearest evidence obtained to date of the impact of climate change on southern Africa's marine resources is for Marion Island, one of South Africa's Prince Edward Islands, at 47ºS in the southwest Indian Ocean.

Sea surface temperature at Marion Island increased by 1.4ºC between 1949 and 1998 (Melice *et al*, in press). Mean surface air temperature increased by 1.2ºC between 1949 and 1999 (Smith 2002).

During the 1990s, there were substantial decreases in numbers of three seabirds breeding at Marion Island: Gentoo penguin (*Pygoscelis papua)*, Eastern rockhopper penguin (*Eudyptes chrysocome filholi)* and Crozet shag (*Phalacrocorax [atriceps] melanogenis)*. All three species feed relatively close to Marion Island and the most likely reason for the decreases in populations is an altered availability of food resulting from climate change (Cooper 2003).

The graph shows trends in numbers of pairs of birds breeding at Marion Island for a) Gentoo penguin, b) Eastern rockhopper penguin and c) Crozet shag, 1994/95-2002/03. For Eastern Rockhopper Penguin there were three counts of the overall population and more frequent counts of a subsection of the population. For each species, the linear trend is also shown.



SOURCE R. Crawford for SARDC, 2004

A substantial proportion of the total population in the coastal countries live within 100 km of the coastline, as shown in Table 5.4.

This is a growing problem, often exacerbated by the development of coastal infrastructure such as artificial lagoons, clearing of mangroves and the upstream construction of dams that trap silt normally deposited along the coastline.

Coastal erosion along the east coast of southern Africa is not nearly as dramatic as along the Atlantic Coast. Rather, siltation of coral reefs and seagrass beds, due to excessive upstream erosion and sediment discharge, is a principal concern.

Suspended sediments create turbidity in the water column, blocking photosynthesis by primary producers. Once settled, these sediments clog the delicate filter-feeding apparatus of corals and other reef-building organisms. Together, these effects are degrading the reefs, thereby undermining one of the most diverse habitats in the region's waters along the coast.[37]

Estimated Population within 100km of Coast **Table 5.4**

Country	Population % within 100 km	Population 2004 (000)
Angola	29.4	15 073
Madagascar	55.1	16 908
Mauritius	100	1 233
Mozambique	59	18 962
Namibia	4.7	2 000
South Africa	38.9	46 587
Tanzania	21.1	35 300

SOURCE Adapted from *World Resource Institute 2000*, and *SADC Calendar*, 2005. Population data from SADC Statistics 2004; see Chapter 8, Table 8.1 in this volume

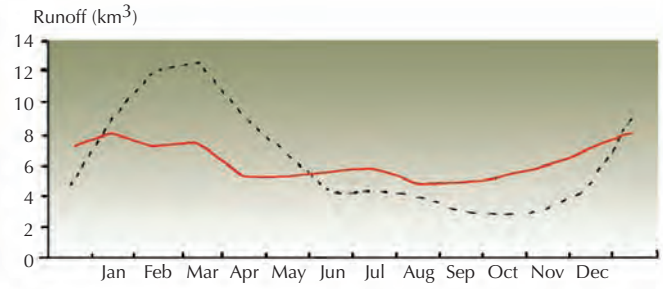
Mining of sand, coral, limestone and shells depletes the buffer zone provided by coral reefs, and as a result shores are exposed to wave action, storm surges and inundation. For example, in Mauritius, a million tonnes of coral sand are excavated every year by hand and transported by canoes.[38]

One of the most serious impacts of coastal erosion is loss of habitat and food supply, which in turn causes depletion of fish stocks. Coastal erosion also reduces the aesthetic quality of the environment essential for development of sustainable tourism.

Coastal erosion is influenced by the modification of stream flows through river impoundments, which in turn cause habitat change in estuaries. For instance, the Zambezi river, which is the most shared in southern Africa, has an annual discharge of about 140 cu km, representing about 67 percent of the total discharge of all the rivers of Mozambique.[39]

Under natural conditions the Zambezi river, like the rest of the rivers of Mozambique, is torrential with high flows during the wet season, from November to March, and relatively low flows in the dry season, from April to October. On average it would discharge between 60 and 80 percent of its mean annual flow during wet season months, but because of the dams (about 30 dams along the river with two large hydroelectric dams, Kariba and Cahora Bassa) the wet season runoffs have been reduced by about 40 percent, whereas the dry season runoffs have been increased by about 60 percent, as shown in Fig 5.1.[40]

Seasonal Runoff of Zambezi: Before deregulation (dotted line) and after the regulation (thick line) **Figure 5.1**



SOURCE E?Q? Hoguane for SARDC, 2004

This has changed the original state of the Zambezi delta, with significant impacts on mangroves and associated marine resources such as fish.

POLICY RESPONSES

As part of efforts towards integrated coastal zone management in the region, a number of measures are being implemented. These range from the establishment of a fisheries protocol, participation in several regional and global programmes, developing integrated coastal zone management policies, to the establishment of marine parks in order to limit harvesting of coastal and marine resources.

SADC established the Fisheries Protocol for inland and marine fisheries in 2000. The Fisheries Protocol seeks to address problems faced by the region in terms of monitoring, control and surveillance of its waters. The problems range from activities by unlicensed foreign vessels to misreporting of catches by national vessels, by-catch issues, the encroachment of industrial vessels in artisanal fishing zones and the use of prohibited fishing methods and gear, among others. A proposed initiative, the Monitoring, Control and Surveillance (MCS) programme (Box 5.4) will assist in improving the management of the region's marine fisheries resources.

Fishery management measures introduced in the region include minimum size limits, bag limits, closed seasons and closed areas (marine parks). For example, under the Marine Living Resources Act of South Africa (1998),[41] all South African fish stocks must be used on a sustainable basis and over-exploited populations must be allowed to recover to sustainable levels before harvesting resumes. In December 2000, drastically reduced stocks of line fish prompted the South African Minister of Environmental Affairs and Tourism to declare a state of emergency, suspending commercial, artisanal and recreational fishing so as to allow stocks to regenerate.[42]

Marine parks are established to limit harvesting of coastal and marine resources.

The SADC regional MCS programme **Box 5.4**

The overall objective of the proposed Monitoring, Control and Surveillance (MCS) programme is the improved management of marine fisheries resources.

The purposes of the programme are to improve national capacity for efficient, cost-effective and sustainable MCS, and to establish and enhance effective regional cooperation on MCS and fisheries management.

The primary focus of the programme will be on the development and strengthening of national MCS capacity, in particular through the training of fisheries inspectors and senior MCS management staff, and the establishment of efficient and cost effective MCS systems. Programme components will include: training and development of effective MCS systems; long-term and short-term technical assistance; cost control and monitoring of MCS effectiveness; attention to the control of small-scale fisheries; and improvement in marine environmental protection.

The second objective of the programme is the development of the SADC marine fisheries "community". This will be achieved through support for regional workshops with a view to enhanced control of shared stocks and international fisheries; improved regional communication on fisheries matters; attention to marine environmental problems; support for regional training; and programme coordination and management.

The programme will be implemented through the SADC Food Agriculture and Natural Resources (FANR) directorate, and partly financed by member states, with additional funding from the European Union.

SOURCE Adapted from *http://indigo.ie/~fishybiz/projects3.htm #Feasibility%20Study%20for%20SADC%20Monitoring,%20Control%20and*

Southern Africa has about 50 marine parks along its coast, and these include the Mafia Island park in Tanzania, and the Agulhas and Cape Peninsula Parks, both in South Africa. The marine protected areas are mostly under the jurisdiction of governments.[43] Where some marine parks have been formally established and regulated, as in parts of South Africa, inshore fisheries have successfully recovered.[44]

Southern Africa is working hard to meet world limits of 20 percent protected coastal areas by 2012. South Africa has almost reached the world targets following the designation of five new marine protected areas at the 2003 World Parks Congress. The country has 19 marine parks covering 19 percent of the coastal area with the most recent parks being the Aliwal Shoal, Pondoland Marine Park, the Bird Island Park in Agoa Bay, the Cape Peninsula and Namaqualand.[45]

Famous marine parks in the region include South Africa's St Lucia Wetlands, Bazaruto Archipelago in Mozambique, Mafia Island Marine Park and Menazi Bay conservation area in Tanzania.

Marine parks have been established for many reasons, including protection of ecosystems from the following:

- human pressure and urban development;
- pollution which may be caused by sewage, industrial effluent, thermal effluent from power stations, oil pollution from ships, plastic and rubbish;
- recreational activities such as boating, fishing, bait collecting and harvesting for the pot;
- commercial ventures such as fishing and harvesting rock lobsters, *perlemoen*, kelp and seaweeds;
- mining ventures, especially diamond mining and the mining of sand dunes for heavy metals; and
- use of beach vehicles which damage sand dunes, compact the sand and destroy the sand-dwelling plants and animals.

Informal protection is successful in other areas. For example, in Namibia fishing within 200 m of the coast is illegal. Although there

SARDC

Marine parks are established to limit harvesting of coastal resources.

Marine protected areas – The case of Tanzania **Box 5.5**

A government notice in 1975 facilitated the gazetting of several marine parks in Tanzania, and their management is the responsibility of the Ministry of Natural Resources.

In Dar es Salaam, four sites were reserved for Marine Park Areas (MPAs) and these are Mbudya, Bongoyo, Pangavini and Fungu Yasini marine reserves. In Mafia island and Rufiji delta, the Chole and Tutia marine reserves, as well as the Maziwi island reserve and the Tanga Coral Gardens were established following the same government gazette.

Mafia island and Rufiji delta are renowned for their richness in marine biodiversity, including coral reefs, mangroves and turtles, all supported by the rich and habitable delta and estuary. The reefs around Mafia, with 350 reef fish and 40 genera of corals, are among the best on the East African coast. It is therefore not surprising that Mafia island was established as Tanzania's first Marine National Park.

The Saadani Game Reserve, on the Tanzanian mainland coast north of Dar es Salaam, is known for its diverse and extensive mangroves. On Zanzibar, Nature Conservation Area committees are facilitating the declaration of marine sanctuaries and territorial marine parks.

Such marine parks are community managed and they include Mwemba island and Fumba, which are both managed by fishing communities.

SOURCE Adapted from Kelleher, G. et al, *A Global Representative System of Marine Protected Areas: Volume III*, 1995

is no formal protection, fisheries within this zone have been successfully protected.[46]

The decline in the availability of wild fish and an increased demand for seafood products promote mariculture.[47]

As part of developing its capacity in integrated coastal zone management, the region participates in several international programmes. For example, Mozambique, South Africa and Tanzania participate in the UNEP Regional Seas Programmes for Eastern Africa, and have ratified the Nairobi Convention, which covers regulation and minimisation of ecological damage from dredging and land reclamation, and introduces a requirement for prior assessment of environmental impacts to control and coordinate urban, industrial and tourism development. Angola and Namibia come under the UNEP Regional Seas Programme for West and Central Africa, and have signed the Abidjan Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region.

Another multilateral agreement of importance to the region is the Convention on the Conservation and Management South East Atlantic Fisheries Organisation (SEAFO) signed in 2001 by Angola, Namibia, South Africa and United Kingdom (on behalf of St Helena Island), and several deepwater fishing nations, including the European Community, Iceland, Norway, Republic of Korea and USA.

The SEAFO is the first international fisheries agreement establishing a regional organisation to manage and conserve straddling fish stocks, following the adoption of the UN Fish Stocks Agreements in 1995. The Convention provides for a management regime that will ensure long-term conservation and sustainable use of fish resources on the high seas of the South East Atlantic Ocean.[48]

Angola, Namibia and South Africa, the three countries bordering on the Benguela Current Ecosystem, have initiated a cooperative management plan designed to overcome fragmentation in coastal zone management, and to ensure integrated and sustainable development of coastal and marine resources. Improved understanding through research and monitoring, together with increased capacity and resources, is critical to successful implementation of the plans.

Countries on the east coast of southern Africa have been actively involved in cooperation for improved coastal zone management. A Secretariat for Eastern Africa Coastal Area Management (SEACAM) was established at a meeting of environment ministers held in Seychelles in 1996. SEACAM seeks to assist countries implementing integrated coastal zone management.

Achievements under this cooperative arrangement include training workshops and publication of training manuals, development

of a coastal management database, information dissemination through newsletters, a website, distribution of documents and participation in international conferences.

Co-operative research programmes have also been initiated in the region, and these include the Benguela Large Marine Ecosystem Programme on the west coast and African Coelacanth Ecosystem on the East Coast. The recognition by the New Partnership for Africa's Development (NEPAD) that the conservation and sustainable use of coastal, marine and freshwater resources is a major issue for Africa, demands that the region takes steps for sustainable management of its coastal and marine resources. Thus, indications are that fisheries and ecosystem management will improve.

At the national level, all countries in the region are in the process of developing integrated coastal zone management policies. For example, the Marine Research Institute in Angola has a number of research programmes aimed at improving the understanding of the living marine resources in order to provide management recommendations to the Ministry of Fisheries.

Mozambique developed a national integrated coastal zone management policy and programme in 1998. Integrated coastal zone management projects are also being conducted in Namibia for particularly sensitive regions of the coast such as the Erongo region.

Efforts are also being made to combat pollution of the seas. For example, South Africa's Prevention and Combating of Pollution of the Sea by Oil Act (1981) provides for the prevention and combating of pollution in the country's territorial waters. Mauritius has regulations to control pollution by oil, noxious liquid wastes, and harmful packaging.

FUTURE CHALLENGES

Some measures have been taken in response to a number of challenges in southern Africa, but much more is yet to be done. The region still has to develop adequate capacity for monitoring, surveying and compliance of the SADC fisheries protocol. Such capacity is crucial if southern Africa's marine and coastal resources are to be preserved.

The climate change debate is global but any one or combinations of the following broad effects of sea-level rise are possible in future, depending on local geomorphological conditions:

- Increased coastal erosion;
- Loading, inundation and displacement of wetlands and lowlands;
- Impairment of water quality into freshwater aquifers and estuaries due to increased salt intrusion;
- Reduced protection from extreme storm and flood events.

Vulnerability is expected to increase dramatically in areas that have been modified or exploited by humans. Thus, any current environmental threats to ecological systems, human health, underground water resources, inshore marine industries, the tourism sector, coastal urban infrastructure and investment are likely to be compounded by any future rise in sea levels.

In order to identify feasible adaptation options and reduce potential losses to land, property, infrastructure and tourism/recreation potential, it is essential to conduct sea-level rise impact assessment investigations, similar to the preliminary Walvis Bay study, on all of the region's rapidly growing coastal settlements and sites of ecological importance. Expected future responses to sea-level rise need to be considered during all coastal zone planning processes through integrated coastal zone management plans.

LINKAGES

Chapter 1: Regional Overview
The growing human population and a developing industrial base in southern Africa will result in increased demand for coastal space for harbours, settlements and factories. Already people are encroaching on fragile coastal ecosystems, thus worsening coastal erosion.

Chapter 2: Land
Siltation caused by land degradation is a big threat to the flows of the region's major rivers. Together with coastal erosion, siltation affects activities such as marine transport and fish breeding.

Chapter 3: Atmosphere
Climate change threatens to destroy the majority of the world's coral reefs, as well as wreak havoc on the fragile economies of Small Island Developing States. There has been an average sea level rise of between 10 and 25 cm in the past 100 years.

Chapter 4: Freshwater
River impoundments are affecting the region's estuaries through reduced river flows. As habitats, estuaries are being converted, causing biodiversity loss.

Chapter 6: Forests and Woodlands
The destruction of mangroves affects shrimp farming and other small-scale coastal activities.

Chapter 7: Wildlife
It is estimated that more than 90 percent of marine species are directly or indirectly dependent on coral reefs. However, less than half of the known marine ecosystems are protected.

Chapter 8: Human Settlements
Major settlements are located along the region's coastline, including leisure resorts. Pollution from these settlements causes coral bleaching, a major threat to the health of coral reefs.

Chapter 9: Scenarios
Marine fish stocks continue to be depleted despite global initiatives such as the 1992 World Summit on Sustainable Development during which governments agreed to maintain fish stocks to sustainable levels by 2015.

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FORESTS AND WOODLANDS 6

Southern Africa has a range of forest and woodland types that follow the region's rainfall distribution pattern. The main forest areas in the region are the wetter equatorial parts around the Congo River Basin, while the drier countries to the south have predominantly woodlands.

Forests and woodlands are of significant importance to southern Africa's social, economic and cultural development. They have a number of ecological functions, including providing habitat, organic matter to fertilize and nurture the soil, protecting the soil from erosion, and cleaning the air of greenhouse gases. Forests and woodlands also have economic values through eco-tourism, timber, and pulp and paper production. They are a source of fuel, medicines and foodstuffs such as fruits, honey, vegetables, seeds and nuts, mushrooms, insects and small animals.

The functions and uses of forests and woodlands in the region underscore the need for people to take care of these resources in a way that would sustain them. Analyses of trends in forests and woodlands indicate that there has been a general decline in forest resources in southern Africa due to deforestation, and this is worsening soil erosion and siltation of water bodies.

South African Tourism

Forests and woodlands are of significant importance to southern Africa's social, economic and cultural development, in addition to ecological functions.

FOREST AND WOODLAND RESOURCES

The Southern African Development Community (SADC) Technical Committee on Forests and Woodlands defines forests as having a tree canopy cover of above 80 percent while woodlands have a canopy cover of between 10 and 80 percent. In a forest the crowns of individual trees touch to form a single canopy, while in a woodland, trees grow far apart, and the canopy is open.

Southern Africa's forests and woodlands cover 38 percent of the region's total land area of 9.86 million sq km.[1] There is considerable variation in vegetation cover across countries, as shown in Table 6.1.

Lesotho, South Africa, Namibia, and Mauritius are the least forested countries with less than 30 percent of their land areas under forests and woodlands. At 59.6 percent vegetation cover, the DRC is the most densely forested country in the region followed by Angola at 56 percent. The DRC alone has more than 20 percent of Africa's forest cover.[2] Madagascar has about the same land area and forest cover as Botswana.

Of the total forested area in the region, 25,000 sq km, or 0.7 percent, was under forest plantations in 2001.[3] This represents a nine percent growth when compared with the 23,000 sq km of plantations as in 1992.[4]

Forest and Woodland Cover in Southern Africa in the Year 2000 **Table 6.1**

Country	Total land area (000 ha)	Forest & woodland cover in 2000 (000 ha)	% of land area	*Total forest plantation (000 ha)
Angola	124 670	69 756	55.9	141
Botswana	56 673	12 427	21.9	1
DRC	226 705	135 207	59.6	97
Lesotho	3 035	14	0.4	14
Madagascar*	58 154	13 023	22.4	293
Malawi	9 408	2 562	27.2	112
Mauritius	203	12	6	15
Mozambique	79 409	30 601	38.5	50
Namibia	82 329	8 040	9.7	0.3
Seychelles	45	30	66.7	5
South Africa	122 704	8 917	7.2	1 554
Swaziland	1 720	522	30.3	161
Tanzania	88 604	38 811	43.8	135
Zambia	74 339	31 246	42.0	75
Zimbabwe	38 667	19 040	49.2	141

SOURCE SADC, *FANR Annual Report July 2000-June 2001*
* FAO, *Global Forest Resource Assessment 2000*

Lesotho has had considerable growth in the extent of its forests, doubling the area under forest plantation from 70 sq km in the year 2000 to 140 sq km in 2003.[5]

South Africa has the largest extent of forest plantations, as shown in Table 6.1, followed by Swaziland, Zimbabwe, Angola, Tanzania and Malawi in that order. Plantations are established to reduce pressure on natural forests for various products and services, including production of industrial round wood and fuelwood. In South Africa, Swaziland and Zimbabwe, the plantation programme is strongly linked to industrial utilisation and farming.

The forest and woodland types of southern Africa include tropical rainforests, afromontane forests, mangroves, Zambezi teak forests, Cape floristic centre, Miombo and Mopane woodlands. Box 6.1 characterises these forest and woodland types, including their biological diversity richness.

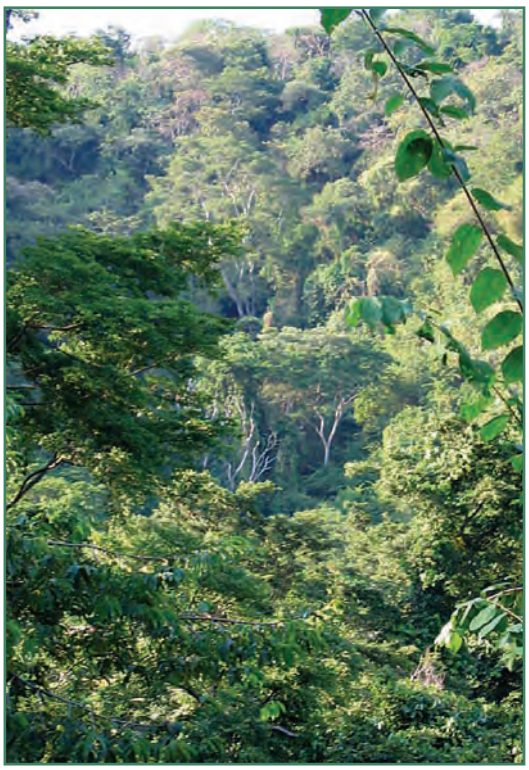
FORESTS TENURE

Forest tenure systems impact on access, use patterns and ecological sustainability of forests and woodlands in southern Africa. The major forest tenure categories found in the region are state, private and communal forests.

State forests

These are reserved areas, including gazetted forest reserves, game reserves and national parks, managed by governments for environmental protection, conservation of biodiversity, water catchment functions, wildlife reservoirs, commercial exploitation of natural timber and for aesthetic value. The extent of protected areas in the region is about 15 percent of the total land area. However, this figure varies by country, ranging from 0.2 percent in Lesotho and 2 percent in Madagascar, 4 percent in South Africa and Swaziland, to around 30 percent in Tanzania and Zambia.[6]

In most countries of the region, the extent of protected areas has not changed over the past decade, although South Africa and Tanzania have increased their protected areas slightly following the designation of new marine parks, which include mangrove forests. (Table 7.8 in Chapter 7 shows the extent of protected areas by country.)



P. Johnson, SARDC

The forest and woodland types of southern Africa include tropical rainforests, afromontane forests, mangroves, Zambezi teak forests, Cape floristic centre, Miombo (shown) and Mopane woodlands.

Forest and woodland types of southern Africa **Box 6.1**

Tropical rainforests
Tropical rainforests are found in parts of Angola and the Congo basin. The Congo basin contains the second largest contiguous rainforest in the world. These forests harbour a diverse assemblage of plants and animals with about 400 mammal species, more than 1,000 bird species and over 10,000 plant species of which about 3,000 are endemic to the region.

Afromontane forests
The afromontane forests are found in pockets in the high altitude and high rainfall areas of Malawi, Mozambique, Tanzania, Zambia and Zimbabwe. The tree species are quite similar to those found in tropical rainforests. One of the few differences between the two is the occurrence of tree ferns and conifers. Common tree species include small-fruited Waterberry *(Syzigium masukuense*), Mountain cypress *(Widdringtonia nodiflora*), Ilex *(Illex mitis)*, African mahogany *(Khaya anthotheca*) and Monkey-orange/Bitter-berry *(Strychnos mellodora*). Some of the afromontane forest areas host unique and rare animal species. They are conserved for their aesthetic value, watershed protection, as well as for scientific, educational and historical values.

Mangrove forests
Mangrove forests are found along the coastline of Angola, South Africa, Mozambique, Tanzania, Madagascar, Mauritius and Seychelles. The extent of the region's mangroves declined from 733 sq km in 1980 to 639 sq km in 2000. There was a positive trend in Tanzania, however, where the area covered by mangroves expanded from 141 sq km in 1980 to 164 sq km in 2000.

Zambezi teak forests
The Zambezi teak forests are found in the western parts of Zimbabwe and Zambia, extending into northern Botswana, northeastern Namibia and parts of southeastern Angola. The forest type is sometimes called "the Kalahari forest". The dominant tree species is Zambezi redwood *(Baikeaea plurijuga*) and is usually found in association with Bloodwood or African teak *(Pterocarpus angolensis*) and Copalwood *(Guibourtia coleosperma*). Other common tree associates include Msasa *(Brachystegia spiciformis*), Pod mahogany *(Afzelia quanzensis*) and White syringa *(Kirkia acuminata*). The Zambezi teak forest is managed for commercial timber exploitation, wildlife utilisation, cattle grazing and catchment area protection.

Miombo woodlands
Miombo woodlands form the most extensive woody vegetation type in areas north of the Limpopo river. Msasa (*Brachystegia)* and Munondo *(Julbenardia)* species (Miombo woodlands) dominate this woodland type. Other common tree species include Wild loquat *(Uapaca kirkiana*), Bloodwood, Spiny monkey orange *(Strychnos spinosa*), Pod mahogany *(Afzelia quanzensis*), White syringa and Fever tree *(Parinari curatefollia*). Most of the miombo woodlands have been converted into intensive agricultural areas, hence it is difficult to locate pristine woodlands.

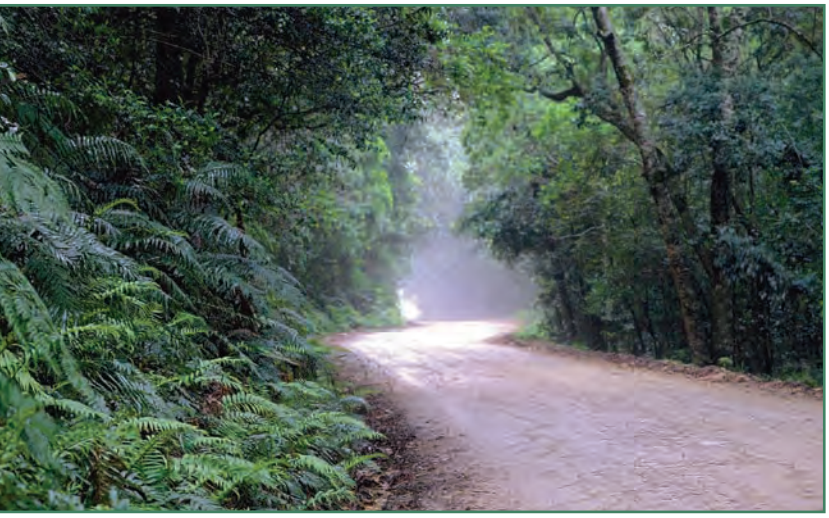
Mopane woodlands
Mopane woodlands are found in the drier and lower lying parts of Angola, Botswana, South Africa, Mozambique, Zambia and Zimbabwe. The woodland is associated with sodic soils. The main tree species is Mopane *(Colophospemum mopane*). Mopane woodlands are often associated with other major vegetation types such as the miombo. The associated tree species include Scented thorn *(Acacia nilotica*), Baobab *(Adansonia digitata*), African blackwood *(Dalbergia melanoxylon*), Maroela *(Sclerocarya birrea*) and Buffalo thorn *(Ziziphus* species). Where Mopane is dominant, the woodland assumes economic importance, especially as a source of browsing for both domestic and wild animals. It is also a source of timber for craftwork, firewood, fence posts, hut poles, mine props, railway sleepers and parquet flooring.

Cape Floristic
Hugging the coastline along the far south-western tip of the African continent is the 74,000 sq km Cape Floristic Region hotspot, located entirely within the borders of South Africa and dominated by the Cape Floral Kingdom. The Cape Floral Kingdom is the smallest of the six Floral Kingdoms in the world and is the only one contained in its entirety within a single country. It is characterized by its high richness in plant species (8,700 species) and its high endemism (68 percent of plant species are confined to the Cape Floral Kingdom). Although the Cape Floral Kingdom contains five biomes, only the Fynbos Biome, comprising the Fynbos and Renosterveld vegetation groups, contains most of the floral diversity. The Fnybos consists mainly of members of the Protea and Erica families as well as sour grasses. Of the Protea family alone there are 450 different species in the Fynbos vegetation zone. The best-known representative of the Protea group is South Africa's national symbol, the King Protea (*Protea cynaroides*).

SOURCE SADC, *Biodiversity of Indigenous Forests and Woodlands in Southern Africa*, SADC, IUCN, SARDC, 2000

Spike Wilkinson, Beho Beho Camp

Kristin Mosher, APG



Forests of the region include tropical rainforests, afromontane, mangroves, Zambezi teak, Cape floristic centre, miombo and mopane woodlands, which also benefit animals such as the elephants in Selous Game Reserve and the chimpanzees of Gombe National Park in Tanzania.

These vast protected areas and their rich forest and wildlife biodiversity are facilitating the development of a booming tourism industry in the region with significant private sector involvement.

Communal forests

Communal forest areas provide open access to communities that reside in them. The communities usually manage the areas through communal user rights arrangements. Legislation in the majority of the region's countries allows inhabitants to utilise forest resources for their own use only and not for commercial gain. The latter is done under license by the state.

It is often argued that the communal forest and land tenure system is a disincentive to long-term investment in agriculture and forestry, as the highest rates of deforestation and land degradation take place in the communally owned forest areas of the region. However, another perspective points to poverty in those areas as the cause.

Private forests

Private forests occur in areas with freehold tenure systems that are characterised by individual land ownership. The registered landowner has exclusive property rights and full control and responsibility over the land and everything attached to it except to the extent that statutory provisions may limit ownership and exclusive control over the land and some natural resources.

Such limitations may relate to changes in land use, controls over public watercourses, felling of indigenous timber resources and controls on wildlife.

Freehold tenure offers an incentive to landowners to conserve and improve the forest resource base. However, some private forests are targeted for land redistribution programmes underway in Mozambique, Namibia, South Africa and Zimbabwe. The initial impact of such land

reforms is deforestation as forests are cleared in order to meet the land needs of larger numbers of farmers. However, the long-term consequences of land reforms on forests are yet to be quantified.

Private forests are usually managed for the production of sawlogs, veneers and pulp products by the private sector or the state. Private forests are mostly planted to exotic species, with *Eucalyptus* species (Gum trees) making up the bulk. *Eucalyptus* adapts to different kinds of land and soil types but grows best where there is plenty of water.

The *Eucalyptus* tree lowers the water-table due to fast growth and excessive transpiration. It also secretes biochemical substances, which inhibit the germination or growth of surrounding vegetation. Its highly flammable volatile oil content can trigger forest fires during the hot and dry season. The large-scale introduction of *Eucalyptus* does not only change landscape characteristics but in the long run has detrimental effects on water resources.[7]

VALUE OF FORESTS AND WOODLANDS

Forest products are a valuable source of export earnings and revenue throughout southern Africa. However, the region's total exports are comparatively low due to the small resource base. In 2000, southern Africa exported 413,000 cu m of industrial round wood, representing seven percent of total exports from Africa.[8]

The region's major exporters of forestry products are South Africa, DRC, Angola and Zimbabwe. In 1998 for example, South Africa's forest products exports totalled US$837 million, mainly from wood pulp and paper. Zimbabwe's exports for the same year amounted to US$42 million, mainly from sawn wood.[9]

The forestry sector's contribution to the Gross Domestic Product (GDP) of most countries in southern Africa is less than three percent.[10] This contribution comes largely from exotic timber plantations and commercial indigenous timber. However,

Some Uses of Plant Species from Mopane Woodland **Table 6.2**

Botanical name	Common name	Local use
Acacia polyacantha subsp. *camphlacantha*	White thorn	Treating snake bite and gonorrhoea
Adansonia digitata	Baobab	Edible fruit
Anthericum pterocaulon		Leaves eaten as vegetables
Azanza garckeana	African chewing gum, Snot apple	Edible fruit
Cissus integrifolia		Boiled leaves eaten as vegetables
Colophospermum mopane	Mopane	House, bridge and tobacco barn construction, wood carvings, farm tools, pestles and mortars, firewood, charcoal Powder from leaves is a cure for sores and wounds Leaves are fed to livestock
Dalbergia melanoxylon	African blackwood	House construction and wood carvings
Dichrostachys cinerea subsp. *africana*	Sickle bush	Antidote to scorpion bite and snake bite, and an aphrodisiac
Euphorbia inaequilatera	Smooth creeping milkweed	Fishing by poison, especially in stagnant water
Friesodielsia obovata	Savannah dwaba-berry	Stem used for weaving food stores Fruit is edible by humans and snakes
Panicum maximum	Guinea grass	Fed to livestock
Setaria palustris	Common rye	Grass commonly used as thatch for houses, stables and tobacco barns
Sterculia africana	African star chestnut	Filtrate of burnt fruit used as potash for cooking vegetables Seeds are roasted, pounded to powder and added to vegetables as substitute for groundnuts Bark is stripped for string fibre Oil is extracted from roasted seeds
Tamarindus indica	Tamarind	Edible fruit, wine production Fruit abundance is a drought indicator.

SOURCE Adapted from Chikuni 1996 in SADC, *Biodiversity of Indigenous Forests and Woodlands in Southern Africa,* SADC, IUCN, SARDC, 2000. p. 116

the figure grossly misrepresents the contribution of forests and woodlands to the region's economy as the bulk of their products and services are not captured in national statistics. For example, the FAO (2000) estimates that forest-based products such as wild foods, firewood, medicines, grass, reeds, honey and leaves contribute over 35 percent of average rural incomes in some parts of Zimbabwe.[11]

Important products and services derived from forests and woodlands include industrial timber and timber products, fuelwood, non-timber forest products, and environmental services. Forests and woodlands are also important culturally as sacred and burial sites. Table 6.2 lists the multi-uses of the Mopane woodland species.

Timber products

Industrial round timber production in southern Africa was estimated at 24 million cu m in the year 2000, and this accounted for about 35 percent of the total production in Africa. Table 6.3 shows the significance of the region's industrial timber production and consumption in comparison with the rest of Africa.

The bulk of timber production comes from the DRC, South Africa, Swaziland and Zimbabwe. Zambia's sawmill industry is largely dependent on timber from natural forests. There is scope for expanding exotic timber plantations, although infrastructural development remains a major constraint. Botswana, Lesotho and Namibia have no primary forest industry largely due to their poor forest resource base. Botswana imposed a ban on all timber operations in 1992.

Angola's forest industry was interrupted by civil war but is likely to come on stream during this post-war period. Malawi has a small primary timber processing industry, which consists of a few small sawmills that are complemented by several board mills and some furniture factories. Population pressure limits the scope for expanding industrial plantations in the country. Mozambique has a small primary timber processing industry that consists of a few sawmills, a board mill and a mill that processes recycled paper.

Fuelwood

With the exception of South Africa, Mauritius and Seychelles, fuelwood is the primary source of energy in the countries of southern Africa, and consumption continues to increase, as shown in Fig. 6.1. In 2000, total fuelwood consumption was estimated at 178 million cu m. Some 41 percent of this amount was consumed in the DRC.

About 87 percent of the round wood production in the region is used as fuelwood. The situation is likely to continue due to the following:

- Fuelwood is the most reliable, affordable and accessible source of energy for poor households;
- In the majority of cases, fuelwood is not

Forest Timber-based Industry in Southern Africa* **Table 6.3**

Product	Production in 2000	Consumption in 2000	Percentage of total African production (%)	Lead southern African producers
Industrial round timber (million cubic metres)	23.97	23.61	34.9	SA, Swaziland, Zimbabwe
Sawn timber (m cu m)	2.22	2.47	28.9	SA, Swaziland, Zimbabwe
Wood based panels (m cu m)	0.603	0.597	29.3	SA, Malawi, Zambia
Plywood (m cu m)	0.070	0.071	10.2	SA, Angola, Mozambique
Fibreboard (m cu m)	0.150	0.154	65.2	South Africa
Wood pulp (million tonnes)	2.351	1.464	87.5	SA, Swaziland, Zimbabwe
Paper/paperboard (million tonnes)	2.125	1.892	72.9	SA, Zimbabwe
Newsprint (million tonnes)	0.345	0.201	93.8	SA, Zimbabwe
Printing/writing paper (million tonnes)	0.515	0.672	78.3	South Africa

* Figures do not include Tanzania, DRC, Madagascar, and Mauritius
SOURCE FAO. *Forestry Outlook Study for Africa. Subregional Report for Southern Africa.* 2003

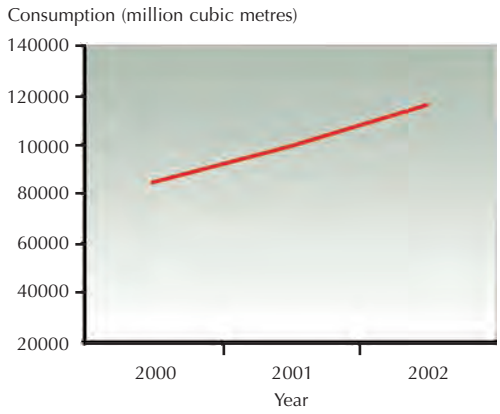
Majority World

National statistics do not adequately capture the contribution of forests and woodlands to the economy as the bulk of their products and services are not included.

Illustrative Options

Fuelwood is the primary source of energy in most southern African countries and the most reliable, affordable and accessible source of energy for poor households.

Fuelwood consumption in southern Africa **Fig. 6.1**



SOURCE Broadhead et al, 2001 in *State of the World's Forests 2003*, FAO, 2003

purchased but just collected. This "free resource" enables poor households to channel their incomes to other needs; and

- Trading in charcoal is a major source of income for some households. For example, in Zambia, the charcoal industry generated about US$30 million in 1998 alone.[12] In the same year, about 60,000 Zambians directly depended on charcoal production for the bulk of their income.[13]

Non-timber forest products

In southern Africa, non-timber forest products provide a wide range of goods for subsistence and trade. The products include medicinal plants, fruits, exudates, bee products, insects, roots, thatch grass, forage and mushrooms. Since these products are largely traded on the informal market, very limited and reliable statistics exist on their production, consumption and trade. However, there is a growing international trade in medicinal plants and indigenous fruits.

Medicinal plants

An increasing number of people in the region are relying on medicinal plants for their primary health care needs as modern drugs are becoming unavailable or prohibitively expensive. The increased use of medicinal plants is due in part to harsh economic circumstances and high population growth, as well as ease of access and the prevalence of incurable diseases such as AIDS.

In 2003, annual trade in medicinal plants in South Africa was estimated at about US$60 million, while in Zambia annual exports were valued at about US$4.4 million.[14]

Some of the common medicinal plants found in southern Africa and their uses are shown in Table 6.4.

Fruits

Indigenous fruits are of great importance in the diet of both rural and urban people. The role of indigenous fruits in the cash economy is also growing, and such fruits assume greater significance in drought years when agricultural performance is poor. The unprocessed fruit generates little income to the gathering communities. This is giving rise to a drive to process and market indigenous

Some Medicinal Plants from Indigenous Forests **Table 6.4**

Plant Name	Common name	Medicinal Use	Part Used
Annona senegalensis	Wild custard apple	Wound healing, chest colds, diarrhoea, dysentery	Gum, roots
Sclerocarya birrea	Maroela	Bark infusion used for dysentery treatment, tonic, skin diseases	Fruit, leaves
Gymnosporia buchananii	Willow koko tree	Wound-healing, ulcers, boils, mouth infections, toothache, dysentery	Bark, leaves, roots
Olea europaea	Wild olive	Intermittent fever, laxative, diarrhoea	Leaves, bark, fruit
Aloe esculenta	Leach	Treatment of burns	Leaves
Pterocarpus angolensis	Wild teak	Treatment of skin ailments such as sores, ringworm	Bark
Acacia mellifera	Black thorn	Anti-venom, provides relief from snake bite	Leaves, bark
Ziziphus mucronata	Buffalo throne	Treatment of malaria and diarrhoea	Leaves, bark
Albizia anthelminica	Worm cure albizia	Used as worm expeller	Leaves, bark
Afzelia quanzensis	Pod mahogany	Relieves toothache	Bark
Albizia antunesiana	Purple-leaved false-thorn	Prophylactic against colds and coughs	Root
Combretum molle	Velvet bushwillow	Treatment of wounds and sores	Leaf paste
Diospyrus mespiliformis	Jackal-berry	Treatment of ringworm, wounds and sores	Root
Tamarindus indica	Tamarind	Leprosy treatment, fevers, laxative, cardiac diseases, constipation	Fruits, leaves, bark, roots
Trichilia emetica	Natal mahogany	Parasitic skin infections and inflammation, anti-epileptic, bronchial inflammation	Bark, roots

SOURCE Adapted from Iwu 1993, Ngozi 1996 and Chidumayo 1954 in *Biodiversity of Indigenous Forests and Woodlands in Southern Africa,* SADC, IUCN, SARDC, 2000. p. 127

fruits, particularly in Malawi, Mozambique, Tanzania, Zambia and Zimbabwe. Several fruits have been tested for commercialisation, as shown in Table 6.5.

A number of value-added products from indigenous fruits are now being commercially produced at the local level (through cottage industries), and joint venture partnerships between local communities and private companies. According to Gondo,[15] some commercially viable ventures have been developed in Zimbabwe to process baobab oil, marula juice and herbal tea (from *Fadogia ancylantha*).

Environmental services

Forests and woodlands enhance biodiversity, protect water catchments and clean the air by absorbing carbon dioxide and releasing oxygen (carbon sequestration). Forests also induce precipitation. These functions are critical in ensuring food security and human survival.

Woodlands and forests provide habitat for wildlife biodiversity. Southern Africa has about 63,940 known plant species compared to some 270,000 in the whole of Africa. Of the known species in southern Africa, 3,000 are endemic to the region and about 2,000 are threatened.[16]

Some Indigenous Fruit Products Tested for Commercialisation **Table 6.5**

Indigenous fruit tree	Type of product tested for the market					
	Dried fruit	Oil	Jam	Juice	Sweets	Fresh fruit
Adansonia digitata (Baobab)		•		•		
Azanza garckeana (Chewing gum)						•
Flourcotia indica (Governor's plum)			•			•
Parinari curatellifolia (Mobola plum)		•	•			•
Schinziophyton autanenii (Manketti nut)		•				
Sclerocarya birrea (Marula)		•	•	•	•	•
Strychnos cocculoides (Wild orange)						•
Uapaca kirkiana (Wild loquat)					•	•
Vangueria infausta (Wild meddler)	•		•		•	•

SOURCE Laverdiere, M. et al, *Food for Life. Indigenous Fruit Trees in Southern Africa*, 2003

Forests and woodlands also serve as barriers to soil erosion and ensure that vital nutrients are naturally returned to the soil. The clearing of trees to make way for agriculture and livestock in tropical areas results in high rates of soil erosion and a decline in crop yields. Eroded soil often ends up in streams and rivers, leading to siltation. These processes, in turn, disrupt aquatic ecosystems, often killing fish.

With the increasing occurrence of floods, watershed protection from forests has become a critical issue in all of southern Africa's national and shared river basins. Protected watersheds ensure adequate supplies of water for agriculture and power generation. This is important in mountainous terrain such as in Lesotho, where the soils are more vulnerable to erosion.

The protection of the Lake Malawi watershed is receiving particular attention as problems such as declining fish populations are becoming evident in the lake.[17] In South Africa, legislation on watershed management was recently enacted.

DEFORESTATION

Southern Africa has one of the fastest growing populations in the world, and faces the challenge of needing to increase food supplies by three percent per year to meet demand.[18] In many instances this challenge is being addressed by bringing large areas of wooded and forested land under agricultural production. The region is therefore facing high rates of deforestation.

Between 1990 and 2000, forest cover in the region fell from 3.8 million sq km to 3.57 million sq km. This represents an average decrease of 0.6 percent per annum. During this period Malawi, Zambia and Zimbabwe had the highest deforestation rates ranging from 2.2 percent to 1.4 percent while South Africa, Angola, Mozambique and Tanzania had the lowest rates of between 0.1 percent and 0.2 percent. Swaziland actually recorded a growth in forest cover of 1.3 percent over the same period,[19] and the reasons for this positive development are presented in Box 6.2.

The unique forest cover situation of Swaziland **Box 6.2**

The unique situation about Swaziland is that its forest cover grew by 1.3 percent per year while other southern African countries had a decline in forest cover.

Although Swaziland has a high population density of more than 57 inhabitants per sq km, it has a diversified economy and a relatively high per capita income (about US$1,300 in 2001) coupled with a high literacy rate (over 75 percent).

The country is predominantly rural, but every household has a wage earner employed in the industrial or service sectors. This shift from over-dependence on agriculture is probably the main factor in the improvement of forest cover in Swaziland.

SOURCE FAO, *Forestry Outlook Study for Africa*, 2003

The major causes of deforestation in southern Africa are agricultural expansion, fuelwood collection, harvesting of non-timber forest products, commercial harvesting of natural/indigenous timber species and forest fires.

Agricultural expansion

Agricultural expansion and overgrazing are the major causes of the loss of woody vegetation cover in southern Africa. Most economies of the region are agro-based and the majority of the inhabitants practice subsistence farming. Thus there is pressure to increase the area under agriculture to meet the food requirements of the growing population, at the expense of forestry. However, the scope for further expansion of agriculture in rural southern Africa is fairly limited except in Angola, DRC, Mozambique and Zambia.[20]

Although shifting cultivation under long fallow cycles is sustainable and less damaging to the environment, short fallow shifting cultivation is not. The latter is the major cause of deforestation in some countries, such as Zambia.

With the increase in urbanisation, the pressure on land in peri-urban areas for cultivation is also on the increase. This is taking place within the context of rural-urban migration and the low incomes received from urban employment.

The ongoing land reforms in southern Africa have seen movement of commercial farmers from Zimbabwe and South Africa to Mozambique and Zambia, and other countries outside the SADC region. This development has the potential of reducing forest cover in the recipient countries as newly settled farmers open up new land for crop cultivation.

The impact of agriculture on forest cover in the near future depends on the efforts being made to modernise and intensify agriculture as well as the ongoing land reform initiatives.

Fuelwood Collection

Studies show that rural and urban demand for wood energy has increased and is expected to continue rising due to growing populations and macro-economic changes. The use of fuelwood increased during the 1990s as an indirect result of Structural Adjustment Programmes (SAPs) under which various subsidies were removed across southern Africa, particularly in Tanzania, Malawi, Zambia and Zimbabwe. Given that most programmes on alternatives to wood energy were based on subsidised prices, much of the progress made in reducing pressure on natural forests has been reversed. SAPs have also resulted in the devaluation of currencies, the erosion of purchasing power and the impoverishment of segments of the population. Many people have therefore been forced to revert to wood energy for their domestic and commercial needs.

Urban fuelwood and charcoal use

Most urban areas in southern Africa are surrounded by cleared land, the result of intensive woodcutting to supply the urban demand for fuelwood. In areas where there are sufficient trees, woodcutters choose certain types, which burn better and command a higher price

Much of the fuelwood cut in Angola, Mozambique, Tanzania and Zambia is converted to charcoal for urban households. More than half of Zambia's fuelwood is converted to charcoal, and every year the equivalent of 430 sq km of woodland is cleared to produce more than 100,000 tonnes of charcoal.[21] In South Africa, most of the charcoal is produced from plantations of wattle, which have their own environmental impact on the water-table, growing quickly but drawing heavily on water resources in the process.

Fuelwood for rural industries

Rural industries use substantial amounts of fuelwood to burn bricks, smoke fish, cure tobacco, brew beer and to dry salt. Tobacco curing is particularly significant on both commercial and subsistence farms in Malawi, Mozambique, Tanzania and Zimbabwe. The equivalent of one hectare of woodland (50-60 cu m of solid wood) is cut to cure each hectare of tobacco. This quantity of wood is enough to supply the yearly domestic needs of up to 200 people.[22]

Brick burning and construction of houses also consume large amounts of wood. In Tanzania, six percent of the total fuelwood is used to burn bricks. Constructing a village of 350 brick homes uses 1,050 cu m of fuelwood or more than 20 ha of clear-felled woodland.[23]

Harvesting non-timber forest products

The harvesting of non-timber forest products, such as medicinal plants and wood used to produce crafts, also causes deforestation in a number of countries in southern Africa, and this an area where Indigenous Knowledge Systems (IKS) can be used for sustainable harvesting.

Illustrative Options

Trading in charcoal is a major source of income for many households.

Medicinal plants

The commercial exploitation of medicinal plants from forests and woodlands is becoming an important component of forest conversion and is threatening a number of plant species:

- A number of medicinal plants are threatened in Zimbabwe, according to Mavi,[24] including *Pterocarpus angolensis* (Bloodwood) and *Warburgia salutaris* (Pepper bark tree).
- Plant species regarded by traditional healers as becoming more difficult to obtain in Namibia include *Albizia brevifolia* (Mountain albizia), *Colophospernum mopane* (Mopane) and *Commiphora mollis* (Velvet corkwood).
- In Lesotho, traditional medicine holds an important place in the health care system, but regulations pertaining to the exploitation of flora are not rigorously enforced. This results in some medicinal plant species coming under threat from uncontrolled collection.[25]
- Traditional medicine is an important component of the health care system in Swaziland. While some plant species are identified as being in demand for their medicinal value, none are said by traditional healers to be scarce.[26] This suggests that current demand does not exceed availability. However, with the increase in the number of traditional healers and the likelihood of increased foreign demand from neighbouring South Africa, it is possible that the situation might not remain static. For example, Cunningham[27] reported a growing scarcity of species like *Warburgia salutaris* (Pepper bark tree) in the country.

As Box 6.3 shows, there is some scepticism about the healing powers of medicinal plants, mainly by modern scientists.

Medicinal plants used in general health **Box 6.3**

Many medicinal plants are used traditionally to improve general health by boosting the immune system and thus strengthening the body to resist illnesses and infections, including those associated with HIV and AIDS. These plants include *Morenga*, which many medical doctors accept is an immune-booster, and the African potato, a dark, bulbous and fibrous root of the *Hypoxis* plant.

Majority World

The African potato

Despite being well known and widely used in traditional medicine, modern medical science has been slow to accept some medicinal plants in their natural state, although many pharmaceutical drugs are based on them, to the extent that a new word has entered into global dialogue – bio-piracy.

Some medicinal plants, such as the *morenga* bush and the African potato tuber, are now grown and sold commercially, thus reducing the impact on the natural habitat. Medical experts still caution that medicinal plants could be toxic if used improperly.

SOURCE SARDC

Crafts

The commercialisation of crafts such as baskets and wood curios often results in the decline of certain tree species:

- The major source of weaving materials in Botswana, Mozambique, Namibia, South Africa and Zimbabwe is fibre from palm leaves and brown dye from *Berchemia* bark (Brown ivory). In the case of Botswana, Brown ivory trees are traditionally conserved, but they tend to be debarked resulting in their drying up. Similarly, the unorganised debarking of *Adansonia digitata (*Baobab) trees for mat and basket-making in Zimbabwe contributes to their destruction.
- The commercialisation of wood curios in a number of countries contributes to over-harvesting of some tree species, including *Afzelia quanzensis* (Pod mahogany) and *Pterocarpus angolensis* (Bloodwood).

Commercial harvesting of natural/indigenous timber species

The felling of trees for commercial/industrial purposes is a major cause of deforestation and loss of forest biodiversity in some southern African countries. This can be attributed to the following:

- Timber concessionaires/loggers only focus on a few valuable tree species, which happen to be in demand at that time.

Commercial timber harvesting in the Congo basin **Box 6.4**

Industrial and commercial logging is an important revenue source and a primary cause of deforestation in the Congo basin (which includes, among others, the southern African countries of DRC and Angola). Studies indicate that this causes 10 percent loss of tree canopy. Up to 50 percent of the canopy can be disturbed as trees are damaged or destroyed in the process of reaching and felling the harvestable tree.

During the 19th century, timber was initially felled on the coast. Logging then spread along the major rivers, as logs could be floated down to ports where they could be exported. As the quality of the trees declined, the logging companies advanced deeper into the forest interior. The majority of trees felled in the previously unlogged forest areas of the basin were between 400 and 1,000 years old.

SOURCE Global Forest Watch of the World Resources Institute, 2000

However, the harvesting of large diameter and high quality trees of a few species reduces the commercial value of the remaining forest and alters its species and structural composition. This is more pronounced in the Congo basin (See Box 6.4).

- With mechanised harvesting, many trees are crushed or destroyed during felling, cutting, loading and transportation of the logs. In some cases, only 15 percent of the timber cut in the forest actually reaches the market, while up to half of the area's trees may be destroyed in the process.
- There have been situations where timber concessionaires remove more trees than their allocated quota due to poor monitoring and enforcement by the authorities.
- The bulk of harvested timber is exported in log form (unprocessed). Without some form of processing, timber has a low economic value. Consequently, large volumes are required to make logging ventures worthwhile. This contributes to excessive harvesting.

Forest fires

Fire plays an important role in determining the distribution and composition of some vegetation types. It is responsible for the widespread occurrence of grasslands in southern Africa, although some owe their existence to natural factors such as topography and drainage conditions.

Observations from Mbeya, Tanzania, indicate that burning encourages the growth of grass and prevents regeneration of woody plants.[28] Total fire exclusion can impoverish forest biodiversity because there may be no external forces to check species that grow vigorously and multiply, choking out others.

On Mount Mulanje in Malawi, *Widdringtonia nodiflora (*Mulanje cedar) succumbs to intense fire, and yet without infrequent "cool" fires, it is not able to establish itself and compete with other vegetation. In such cases, fire is used as a woodland management tool.[29]

Invasive alien tree species

Major invasive alien tree species found in southern Africa were introduced for a number of economic and ornamental purposes (e.g. the exotic plantation species) but they have since invaded a variety of vegetation types. They distort the composition of forests by out-competing other species.

In South Africa, Swaziland, Malawi and Zimbabwe, exotic plantation timber species such as pine, wattle and eucalyptus are taking up far more water than indigenous tree species. This disrupts microclimates and hydrological cycles of the affected areas and downstream. To address this problem, South Africa launched the "Working for Water Programme" in 1995. This is a nationwide alien-plant control programme which focuses on building capacity and generating employment and income among some of the country's poorest communities.

The programme uses mechanical, chemical and biological control methods. Some 2,380 sq km were cleared under the programme in the year 2000, and 510 sq km of land infested with alien vegetation was rehabilitated. Some 21,000 people were employed in these activities.[30]

POLICY RESPONSES

A number of countries in southern Africa have undertaken rural afforestation pro-

grammes in an attempt to address foreseeable fuelwood shortages. Unlike in the 1970s when afforestation was based on the establishment of *Eucalyptus* village woodlots, communities are increasingly engaging in agroforestry activities, while in some cases efforts are geared towards planting indigenous species.

The new trend follows the realisation that exotic plantations, especially of *Eucalyptus,* have limited success. This is because *Eucalyptus* trees provide good poles, but have poor burning qualities and environmental services compared to indigenous trees, and cannot substitute for the multitude of other products that natural woodlands provide. With agro-forestry, multi-purpose tree species are grown to provide plant nutrients, animal fodder, building poles, fuelwood and timber.

In an attempt to reduce deforestation caused by the harvesting of commercial indigenous timber, some countries such as Zambia and Botswana have completely banned logging of timber for commercial purposes. Zimbabwe has imposed a ban on the export of unprocessed indigenous timber. This is intended to promote value addition to the timber within the country and to create employment for local people.

At the regional level, all SADC Member States signed the SADC Forestry Protocol, and three countries had ratified it by 2004. The protocol had not yet come into force as it needs ratification by the required two-thirds majority. The overall goal of the protocol is to foster collaboration in areas of forestry conservation and its sustainable use within the region. The specific objectives are to:

- promote the development, conservation, sustainable management and utilisation of all types of forests and trees;
- promote trade in forest products throughout the region in order to alleviate poverty and generate economic opportunities for the people of the region; and
- achieve effective protection of the environment and safeguard the interests of both present and future generations.[31]

The growing awareness of the negative environmental and social impacts of deforestation taking place in the region is leading to increased consumer pressure to certify wood products as regards their origin to prove that they are obtained from sustainably managed areas. However, the transaction costs associated with certification are so high that it can only be justified when the resultant products are sold at a premium price.

As most of the commercial indigenous timber from the region is exported in its raw form, there has been no incentive to certify natural forests. Certification has only been done in some exotic timber plantations where considerable value addition is done to timber products. The entire 9,740 sq km of certified plantations in Africa are found in southern Africa.[32] The largest proportion of the land is in South Africa followed by Swaziland and Zimbabwe. These countries export to elite markets in Europe and Asia.

The bulk of the region's forests and woodlands are found in communal areas where communities face the challenge of ownership and governance. In response to this problem, some governance changes are taking place throughout the region. Local bodies and communities are being empowered to manage communal resources through a process of decentralisation and devolution of administrative powers and responsibilities.

Customary ownership of land and associated resources such as forests is also receiving legal recognition. For example, Mozambique's land reform law of 1997 recognised customary land rights over local resources including forests. Similarly, Namibia's 1998 land policy recognises the right of local communities to woodland resources. However, the impact of these policy changes on forest management and utilisation still remains to be seen.

As a way of protecting state and other protected forest areas, most southern African countries have legislation that prohibits neighbouring communities from accessing goods and services in such areas. This results in the creation of "islands of green" surrounded by degraded communally owned landscapes. The degradation is increased by poaching and illegal settlements.

Community participation and the development of appropriate systems for benefit sharing through structured approaches to decentralising management of natural resources through Community Based Natural Resources Management (CBNRM) programmes are therefore critical to the success of sustainable wildlife and forestry management in protected areas. Some working examples are:

- Administrative Management Design for Game Management Areas (ADMADE) in Zambia;
- South Africa's Peace Parks Initiative;
- Namibia's Living in a Finite Environment (LIFE); and
- Communal Area Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe.

These present major participatory approaches for communities that live adjacent to national parks, gazetted forests and other protected areas.

Besides deforestation, the region is also struggling with the problem of alien invasive species, a problem which has assumed greater significance at the global level. As a result the issue of invasive alien species is enshrined in Article 8(h) of the Convention on Biological Diversity to which all SADC Member States are party.

The Article calls upon Parties to the Convention to "…prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species."

At the regional level, the management of invasive alien species has become a key component of the Southern Africa Biodiversity Support Programme.

FUTURE CHALLENGES

The people of southern Africa will continue to be highly dependent on forests and woodlands for the foreseeable future. Despite their aspirations, many people may even become more dependent on natural resources as poverty and population increase. The region is therefore challenged to realise the multiple benefits accruing from forests and woodlands, in addition to crop production which converts forests to cultivable land as a traditional way of life.[33]

The multiple uses of forests include commercial timber production which can be sustainably managed through a process of certification. However, the process of certification is expensive, and this challenges the region to add value to forest and woodland products and increase their revenue. It must also be realised that adding value and commercialising forest products raises the demand for certain tree and plant species and this may lead to their overexploitation. This presents the region with another challenge of protecting the species that are in high demand.

The growing interest in non-timber forest products by the private sector presents the region with an opportunity to manage its forests and woodlands in a sustainable way. Non-timber forest products such as wines (*eg*, amarula), nuts and worms have become so commercially viable that the private sector is beginning to engage communities in forest and woodland conservation efforts through out-grower schemes.

The commercialisation of non-timber forest products raises the issue of benefit sharing at the community, national and international levels. The majority of individual countries in southern Africa have no legislation that regulates access to forest resources by outside parties. This may result in biopiracy in a number of areas such as medicinal plants, where traditional healers harbour a lot of knowledge on medicinal plant biodiversity. Despite limited documentation, the healers have a good knowledge base of plants of medicinal value in various ecosystems. Such knowledge is orally handed over from generation to generation.

The apparent lack of protection of their knowledge makes most traditional healers reluctant to divulge their secrets that could otherwise lead to major breakthroughs in the treatment of some ailments. This problem, which also applies to other non-timber forest products, can be addressed through the development of appropriate intellectual property rights legislation that protects both

communities and nations from bio-piracy. The Convention on Biological Diversity (CBD), to which all southern African countries are signatories, provides national guidelines for the crafting of such legislation.

Box 6.5 shows the various ways in which bio-piracy takes place.

It must be noted that existing information on the region's forests and woodlands is often outdated and incomplete. This is partly because most of it is obtained from secondary sources. For example, no forestry inventory has been done in Angola since independence in 1975. However, the country's Ministry of Agriculture estimates that there is a minimum reserve of 17.45 million cu m of trees, which would allow 20 years rotational annual cuts of 850,000 cu m.[34]

The majority of the countries in the region have inventories of smaller forest and woodland areas for purposes of investment or management

Given the foregoing scenario, there is need to update the region's forest and woodland cover database through regular national and regional forest inventory exercises. Such information assists in planning for sustainable forest management both nationally and regionally.

Bio-piracy in medicinal plants **Box 6.5**

Bio-piracy in medicinal plants takes a number of forms that include the following:

- **Non-acknowledgement of information sources**

Academics from colleges and universities interview traditional healers and publish results without acknowledging their information sources. It is up to a researcher's goodwill to acknowledge a traditional healer's contribution. Similarly, scientists interview and even observe traditional healers at work. In some cases, scientists give such information to established pharmaceutical companies who publish the results without the traditional healers' consent.

- **Patenting of a local medicinal plant by outside parties**

Swartizia madagascariensis is a medicinal plant used to treat fungal diseases such as oral rush, foot rot and candida. The plant was used by traditional healers before it was patented by the University of Lausanne and a United States based pharmaceutical company. The company is set to earn about US$4 billion.

SOURCE Shumba, E.M. (ed), *The Status of Biodiversity in Zimbabwe*, 2003

LINKAGES

Chapter: 1 Regional Overview
Forests and woodlands are an important source of livelihood, providing basic needs such as food, energy and shelter. They also play important environmental functions that lead to better life through watershed protection and clean air provision.

Chapter 2: Atmosphere
Forests and woodlands regulate the nitrogen and carbon cycles. The carbon cycle is a key factor in climate change. Forests and woodlands act as carbon sinks, and are credited with helping in maintaining or lowering global temperatures.

Chapter 3: Land
Land supports the growth of forests and woodlands, while forests and woodlands protect land from degradation.

Chapter 4: Freshwater Resources
Forests and woodlands play pivotal roles in regulating natural cycles such as the water cycle. Besides their role in the hydrological cycle, forests and woodlands play a physical function of protecting river catchment areas.

Chapter 5: Marine and Coastal Resources
Mangrove forests protect the coastline from soil erosion, and provide a good habitat for the breeding and growth of marine resources such as prawns.

Chapter 7: Wildlife
The different forest and woodland types of southern Africa are associated with different types of biodiversity. Some forest ecosystems such as the *Fynbos* are a centre of endemism for both fauna and flora.

Chapter 8: Human Settlements
Forests and woodlands provide timber for the construction of settlements. However, the same forests and woodlands tend to be cleared for the development of new settlements.

Chapter 9: Scenarios
Southern Africa's forests and woodlands will continue to be depleted as long as human needs continue to grow. The growth of the region's forestry and woodlands sector depends on policies and practices.

ENDNOTES

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WILDLIFE 7

Southern Africa is rich in wildlife ranging through plants, insects, birds, mammals, reptiles, amphibians, fish and invertebrates. These are found in a vast range of terrestrial, freshwater and marine ecosystems of pristine beauty and diversity, making them key assets to the region's economy through tourism and other uses, as well as a key part of human and environmental well-being.

Wildlife is an important source of food and medicines, and a stimulant to regional integration through trans-frontier conservation. Wildlife in its many forms is an important source of income for communities through community-based, natural resources management programmes.

Despite the rich wildlife resource base, southern Africa is under threat of species loss from habitat fragmentation, invasion by alien species and poaching. Some of the key wildlife species such as elephant are at the centre of international debate, with southern Africa arguing that its population has exceeded the habitat's carrying capacity.

John and Jane Woolmer for TANAPA

Southern Africa is rich in wildlife in its many forms.

MAJOR WILDLIFE HABITATS

Southern Africa's wildlife habitats are defined in terms of ecozones which range from the equatorial rainforests of the Democratic Republic of Congo (DRC) to the *fynbos* of the Cape in South Africa, and include the mangroves on the region's coastline and the desert areas of Angola, Botswana and Namibia.[1] Southern Africa's ecozones can be divided into 12 major regions, as shown in Table 7.1.

Apart from the influence of geology and soils, this distribution of ecozones is also influenced by rainfall patterns. The western part of the region is arid to semi-arid, receiving less than 300 mm average annual rainfall. The eastern parts are warm and moist, receiving over 800 mm of rainfall per year. The central areas of the region vary from dry scrub to savanna woodland interspersed with a variety of wetlands and, at higher altitudes, afromontane forests.

WILDLIFE BIOLOGICAL DIVERSITY

The region possesses a rich biological diversity in terms of mammals, birds, reptiles and amphibians, as shown in Table 7.2, of which many are endemic to the southern African region. The concentration of large mammal species is spectacular. The region supports a population of more than 320,000 elephants.[2] Species such as buffalo, zebra, giraffe, wildebeest, kudu and many other varieties of antelope are also available in large numbers. Tanzania's Serengeti National Park is home to 2,500 lions, the

P. Johnson, SARDC

Serengeti lions inhabit a rich ecosystem.

largest number found in any national park in Africa or the world.

Populations of other cats, such as cheetah and leopard, are shrinking in some countries and subject to special protection. Small populations of rhinoceros, both Browse and Grass varieties, are heavily protected in several countries to facilitate an increase in numbers.

The region is home to some unique cases of localized endemism, which include Lake Malawi's cichlids, the South African Cape flora and the Mount Mulanje cedar. The island nation of Madagascar has a large number of endemic species, including several varieties of lemur, with new ones recently identified.

Based on almost unparalleled levels of endemism, species diversity, and human threat, Madagascar is among the most critical global priorities for conservation action, and has been designated as one of the world's most important biodiversity hotspots. Estimates of the vascular plant diversity on the island are 10,000-12,000 species with rates of endemism of about 85 percent. Total species richness for the *macroinvertebrate* groups is slightly more than 5,800 species, of which 86 percent are endemic to the island.[3]

South Africa has a very rich flora with over 20,000 species. The Cape flora alone has over 8,600 species of which 68 percent are endemic.[4] Of Africa's more than 3,000 species of butterflies, 1,370 exist in Tanzania and 121 are endemic.[5]

Major Ecological Zones and Habitat Types of Southern Africa **Table 7.1**

Ecosystem	Ecozone	Habitat Type	Distribution
Terrestrial	Central and South Eastern Miombo Woodlands	Tropical and Subtropical Grasslands, Savannas, and Shrub lands	Angola, Botswana, DRC, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
	Zambezian Flooded Savannas	Flooded Grasslands and Savannas	Angola, Botswana, DRC, Malawi, Mozambique, Namibia, Tanzania, Zambia
	Southern Rift Montane Woodlands	Montane Grasslands and Shrub lands	Malawi, Mozambique, Tanzania, Zambia
	Drakensberg Montane Shrub lands and Woodlands	Montane Grasslands and Shrub lands	Lesotho, South Africa, Swaziland
	Fynbos	Mediterranean Forests, Woodlands and Scrub	South Africa
	Namib-Karoo-Kaokeveld Deserts	Deserts and Xeric Shrub lands	Angola, Namibia, South Africa
	South East African Mangroves	Mangroves	Mozambique, Tanzania
Freshwater	Rift Valley Lakes	Large Lakes	DRC, Malawi, Mozambique, Tanzania, Zambia
	Cape Rivers and Streams	Small Rivers	South Africa
Marine	South Temperate Atlantic/ Benguela Current	Temperate Upwelling	Namibia, South Africa
	South Temperate Indo-Pacific/ Agulhas Current	Temperate Upwelling	Mozambique, South Africa
	South East African Marine	Tropical Coral	Mozambique, Tanzania

SOURCE WWF, *Emergency Conservation Measures for a Critically Endangered Global 2000 Ecoregion: Major Ecozones and Habitat Types of Southern Africa*, 2000

Estimated Richness of Major Wildlife Groups in Southern Africa **Table 7.2**

Country	Mammals[a]	Birds[a]	Reptiles[b]	Amphibians[b]
Angola	276	765	227	78
Botswana	164	386	133	20
DRC[c]	415	1050	300	200
Lesotho	33	58	41	6
Madagascar	141	202	381	217
Malawi	195	521	108	46
Mauritius	4	27	35	2
Mozambique	179	498	195	52
Namibia	250	469	215	31
Seychelles	6	38	38	12
South Africa	247	596	364	117
Swaziland	47	364	111	41
Tanzania	316	1119[d]	335	116
Zambia	233	605	143	57
Zimbabwe	270	532	180	31

SOURCES
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VALUE OF WILDLIFE

Wildlife provides benefits for human development, such as environmental services, scientific, educational, aesthetic and amenity values from protected areas.[6]

Wildlife is a unique economic resource. Land use systems that are based on wildlife utilisation are also more ecologically sustainable in comparison to other land uses.

Wildlife makes better use of vegetation compared to livestock, and has many marketable uses in addition to meat production. For example, trophy hunting of Kudu or Oryx can earn several times more than the amount earned from selling a cow.[7] However, it takes much longer for wildlife to mature than livestock.

Wildlife is utilised for both consumptive and non-consumptive purposes. Wildlife-based tourism generates large flows of foreign currency for the SADC region. Major tourist activities include viewing of game and other wildlife, as well as trophy hunting. Local communities usually hunt for their own consumption.

Common forms of consumptive wildlife utilisation are culling/cropping, live game sales, safari and subsistence hunting. One of southern Africa's most prestigious and largest wildlife auctions for live game is organised by the KwaZulu Natal Conservation Service in South Africa. Excess animals from public parks are sold to private wildlife areas, predominantly in southern Africa. Table 7.3 provides average auction prices for live game in the year 2000 at which time the prices ranged from US$75 for a Grey duiker to US$25,000 for a White (Grass) rhino.[8]

Safari hunting is the main income-generating form of consumptive wildlife utilisation. It involves the off-take of mature male animals using set quotas to ensure the maintenance of a high trophy quality. This makes controlled safari hunting an economically and ecologically efficient use of wildlife. Safari hunting requires accurate scientific information for setting of ecologically realistic hunting quotas. It is against this background that safari hunting has become an increasingly important and profitable form of land use in southern Africa.[9] The income is often used to support conservation efforts in protected areas.

Although safari hunting is considered a financially viable and ecologically sustainable enterprise, it has its own caveats. The narrow

Average Prices of Live Game in KwaZulu Natal, year 2000 **Table 7.3**

Species	Price US$
Grey Duiker	75
Impala	150
Kudu	370
Blue Wildebeest	450
Zebra	580
Springbuck	670
Red Hartebeest	700
Waterbuck	1 000
Bushbuck	1 000
Giraffe	2 700
Hippo	4 000
Sable	10 300
Roan	14 200
Buffalo	16 700
White Rhino	25 000

SOURCE Francis Mkanda, 2004

International Tourist Arrivals **Table 7.4**

	Tourist arrivals (000)			% change		Tourism receipts (US$m)			% change	
	2001	2002	2003	02/01	03/02	2001	2002	2003	02/01	03/02
Total Africa	29 248	29 902	30 834	2.1	3.1	10 556	12 064	14 253	14.4	18.1
Southern Africa	8 099	8 804	8 778	8.7	-0.3	3 157	3 496	5 006	10.7	43.2

SOURCE UNWTO, *World Tourism Barometer,* 2006; Hospitality and Tourism Association of Botswana, *Report on the Tourism Impact on SADC Countries,* 2006

range of hunting products is one of the future challenges facing the enterprise. The revenue base could be broadened through alternative activities such as biltong production, handgun hunting, and bow-and-arrow hunting, thus reducing the pressure on big trophy hunts.

The most common and widespread use of wildlife in southern Africa is non-consumptive tourism, which takes place in areas where densities of wildlife are high. Non-consumptive direct use includes activities such as wildlife viewing and photographic tourism where wildlife is viewed in its natural habitats.[10] Wildlife viewing is a major attraction for international tourists, and a number of activities fall under photographic tourism, including mobile photographic safaris (in an open vehicle, on horseback or even on the back of an elephant), wildlife film industry, educational and research tours, and walking safaris.

In most of the region, wildlife utilisation inside protected areas is restricted to non-consumptive uses, mainly photographic tourism and research. The 14 member states of the Southern African Development Community (SADC) boast a wide range of habitats, wildlife, a rich natural heritage/culture and an ideal climate. They are committed to ensuring that tourism development is carried out in a sustainable manner, which does not exceed carrying capacities or threaten the unique land and marine environment and the heritage/culture.

In addition to the regional organisation, the Regional Tourism Organisation of Southern Africa (RETOSA), most SADC countries have strategic marketing initiatives to strengthen the position of their tourism industries in the source markets of Europe, North America and, more recently, Asia. The numbers of visitors from outside the region and the income from tourism have been increasing, as shown in Table 7.4.

Tourism, considered one of the fastest developing sectors in southern Africa, grew at a rate of seven percent per year during the late 1990s,[11] and much of this growth is attributed to the region's rich biodiversity. In most southern African countries, wildlife-based tourism (including photographic and hunting) ranks among the top three contributors to national Gross Domestic Product (GDP).

LOSS OF WILDLIFE

Despite the abundance of wildlife resources in the region, there are pressures that threaten the existence of this resource. The highest numbers of threatened species reported are, not surprisingly, in the largest countries with the most varied wildlife, ie Tanzania, South Africa, Madagascar and DRC, with the lowest being in Lesotho and Swaziland (Table 7.5).

There is a worrying trend whereby the number of threatened species continues to increase in every country in southern Africa, as shown in Table 7.6, though a few coun-

Terms commonly used in IUCN's Red List **Box 7.1**

The threat to wildlife species is commonly assessed using the IUCN Red List, which was designed to provide an impartial appraisal of the likelihood of extinction of wildlife under current circumstances. The following categories are the most relevant for evaluating the status of wildlife in the wild:

- **Critically endangered species** are facing an extremely high risk of extinction in the wild in the immediate future;
- **Endangered species** face a very high risk of extinction in the wild in the near future; and
- **Vulnerable taxa** are not critically endangered, but face a high risk of extinction in the wild in the near future.

SOURCE Francis Mkanda, 2004

Country Totals of Threatened Species, 2003 **Table 7.5**

Country	Mammals	Birds	Reptiles	Amphibians	Molluscs	Other Inverts
Angola	19	15	4	0	5	1
Botswana	7	7	0	0	0	0
DRC	40	28	2	0	41	4
Lesotho	6	7	0	0	0	1
Madagascar	50	27	18	2	1	1
Malawi	8	11	0	0	8	0
Mauritius	3	9	4	0	27	5
Mozambique	15	16	5	0	6	1
Namibia	14	11	3	1	1	0
Seychelles	4	10	3	4	2	2
South Africa	36	28	19	9	10	103
Swaziland	5	5	0	0	0	0
Tanzania	41	33	5	0	41	6
Zambia	11	11	0	0	4	2
Zimbabwe	11	10	0	0	0	2

SOURCE IUCN Species Survival Commission, *Red List of Threatened Species 2003 and 2007*

tries show stability in the number of species under threat in recent years.

In terms of species extinction, only one known mammalian species, the Blue Antelope, has become extinct in southern Africa in recent times,[12] although several other subspecies may have been lost. The White (Grass) and Black (Browse) rhinoceros, Black wildebeest, Heaviside's dolphin, Dusky dolphin, Indo-Pacific hump-backed dolphin, Ader's duiker, Crowned crane, East Coast akalat, Velvet gecko and Cape Mountain zebra have all come critically close to disappearing altogether, but decisive conservation action is allowing populations to revive.

African wild dogs are also an endangered species in southern Africa, surviving only in large protected areas, with innovative conservation and awareness methods. Similarly the Bearded vulture has suffered serious population depletion in southern Africa where it is now restricted to the Drakensberg mountain range of South Africa and Lesotho. The declines in the bird population have often been blamed on reduced prey, changing animal husbandry practices and direct persecution. In Lesotho, the bird is killed for its plumage, which is used in designing traditional ceremonial dress.

The micro-frog (*Microbatrachella capensis*) has disappeared from the immediate vicinity of Cape Town due to habitat loss, and is found only in a few isolated sites along the coast, south-eastwards from Cape Town.[13]

Number of Threatened Species, Trends in Southern Africa **Table 7.6**

Country	1996[a]	2000[b]	2003[c]
Angola	41	62	71
Botswana	12	12	31
DRC	113	n/a	179
Lesotho	9	16	16
Madagascar	93	99	99
Malawi	24	41	41
Mauritius	52	n/a	142
Mozambique	41	82	108
Namibia	27	36	46
Seychelles	22	n/a	80
South Africa	205	275	327
Swaziland	11	12	21
Tanzania	132	379	390
Zambia	27	37	36
Zimbabwe	20	38	40

SOURCE
a IUCN Species Survival Commission, *Red List of Threatened Species 1996*
b UNEP, *Africa Environment Outlook, Past, Present and Future Perspectives*, 2002
c IUCN Species Survival Commission, *Red List of Threatened Species 2003*

Nick Greaves, APG

High-profile animals such as the African wild dog have special protection.

The Wattled crane, which is the largest and rarest of the six crane species that occur in Africa, is endangered in southern Africa due to increasing demands on water and impact on wetlands. Over the last several decades, the species has been declining over much of its range. In Zambia, a hydroelectric scheme on the Kafue river is controlling floods and reducing nesting sites.[14] In Botswana, nesting opportunities may be reduced if the waters of the Okavango delta are tapped.

Historically, the species was more abundant and more widely distributed across southern Africa than now. The total population estimate of 13,000-15,000 has remained constant over the last decade, but this is due largely to the discovery of some 2,500 birds in Mozambique in the early 1990s.[15]

Principal causes of loss of wildlife species in the region include habitat loss, invasive alien species and poaching. Human-wildlife conflicts, policy and legislative constraints, and other factors also contribute to loss of wildlife resources.

Habitat loss

The most serious long-term threat to wildlife in southern Africa is habitat loss resulting from agricultural land expansion, settlements and infrastructure development such as roads, electricity power lines, dam construction and many others. Loss and modification of habitat, as well as the regular burning of vegetation around the shallow, seasonal pans (in which, for example, the micro-frog breeds) have been the major causes of wildlife declines. The original collection site of the micro-frog around the Cape Flats now forms part of suburban Cape Town.[16]

Invasive alien species

Invasive alien species are introduced deliberately or unintentionally outside their natural habitats, and they have the ability to establish themselves, invade, out-compete natives and take over the new environments.[17]

Thousands of hectares of land and water have been colonised by alien plant species such as Water hyacinth (*Eichhornia crassipes*),[18] Kariba weed (*Salvinia molesta*), Water lettuce (*Pistia stratiotes*), Parrot's feather (*Myriophyllum aquaticum*) and Red water fern (*Azola filiculoides*).[19] Other exotic plant species that have invaded southern Africa are *Jacaranda mimosifolia*, *Lantana camara*, Syringa (*Melia azedarach*), and White mulberry (*Morus alba*), which are widespread in the world and are found in all types of ecosystems. Blue gum (*Eucalyptus globules)* and Wattle (*Acacia meamsii),* which make huge demands on the water-table are considered to have the potential of becoming invasive alien species in southern Africa, but have not reached that status due to their commercial value.[20]

The socio-economic impacts of invasive alien species can be enormous. The IUCN *Red List of Threatened Species 2000* considers invasive alien species as being a "significant direct threat" affecting 10, 15 and 30 percent of all threatened mammals, plants, and birds, respectively.

The costs due to invasive alien species are huge, and include not only costs of prevention, control and mitigation, but also indirect costs due to impacts on ecological services. For example, the indicative economic cost to restore South Africa's *fynbos* due to invasions by *Pinus, Hakea* and *Acacia* species is estimated at US$169 million;[21] and costs due to the invasion of water bodies by Water hyacinth in Zambia and Zimbabwe are estimated at US$71.4 million/year.[22]

S. Bethune

Alien plant species such as Water hyacinth are costly to remove.

Poaching

Excessive legal and illegal off-take of wildlife can impact on the ecological sustainability of photographic tourism, which is dependent on large concentrations of big game.

Elephant and rhinoceros are particularly targeted by poachers, for their tusks and horns, respectively. The rhinoceros population was dramatically reduced some 150 years ago by tremendous hunting pressure. In the mid-19th century, one writer noted that "the black rhino with a double horn is as common as the elephant," and another observed that, "long before the close of the century, the white rhinoceros will have vanished from the face of the earth."[23] This is when big game hunting became popular and the numbers began to drop dramatically, as rhino have poor eyesight and are easy targets.

The White (Grass) rhino population in South Africa has recovered to more than 4,000 with smaller populations elsewhere. The total number of Black (Browse) rhino in Africa declined to a low of 2,400 in 1990, increasing slightly to 2,600 in 1997,[24] largely due to the growth of the populations in Namibia, South Africa and Zimbabwe, where some 80 percent of the remaining Black rhinos and White rhinos are conserved.

These populations are heavily protected, as are those in Tanzania, where there are breeding programmes in some protected areas. The venues are well guarded and the locations are often kept secret.

Poaching for horn is largely responsible for the massive decline in the rhino population, and the remaining populations are coming under increasing pressure. The illegal trade in rhino horn now appears to be driven by stockpiling for later sale for the traditional demands of medicine in Asian markets and Yemeni dagger handles.

David Martin, APG

Rhinoceros breed slowly and are heavily protected to increase numbers.

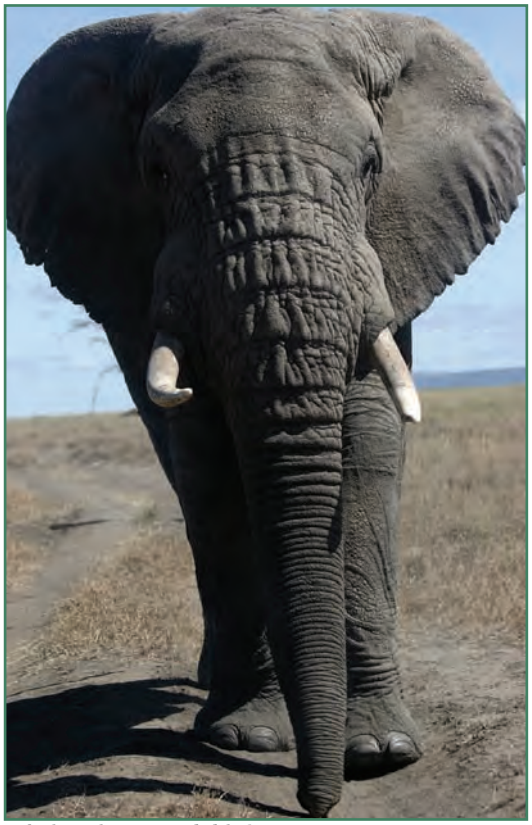
Trafficking in birds, plants, fish and wild animals is a serious problem for the region. Often small and more difficult to document or quantify, these are captured live and smuggled out to other markets, usually by air or sea.

Trafficking of wildlife products is also common. The Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora, signed by South Africa, Swaziland, Tanzania and Zambia in 1994[25] to prevent illegal trafficking in plants and animals, has so far been of little effect, especially with regard to the trafficking of wildlife products such as rhino horns.

Elephant overpopulation

In Botswana, Namibia and Zimbabwe, the elephant population has grown so much in recent years that it now exceeds the carrying capacity of its habitat in these three countries, creating problems of overstocking and habitat destruction. For example, the elephant population in Zimbabwe grew from 47,000 in 1980 to 81,500 in 2002.[26] The country's elephant density is estimated at six animals per sq km over its range. It is estimated that at average densities of 0.5 elephant per sq km, forage and biodiversity may actually be enhanced, while higher densities lead to a loss of biodiversity.[27]

Of particular concern is the effect of large elephant populations on rhinos, which may become unable to utilise areas under heavy elephant pressure and may in some cases be prevented from accessing water points.[28] Botswana has an elephant population of 106,000, which is double the country's carrying capacity of 50,000.[29] Tanzania has greater carrying capacity but also has a high population of elephants, which has increased from 55,000 in 1989 to 141,000 in 2006, and continues to rise.[30]



David Martin, APG

Elephant have exceeded habitat capacity in some countries.

The elephant population is growing in all countries of the region except in the DRC, Malawi and Swaziland. Such elephant population growth is happening at a time when the elephant range area is shrinking mainly due to encroaching agricultural activities. (Table 7.7)

Elephant Population, 2002 and 2006 **Table 7.7**

Country	Elephant numbers Definite 2002	Definite 2006	Range area 2002 (sq km)	Range area 2006 (sq km)
Angola	36	818	658 620	406 964
DRC	7 667	2 447	912 105	263 700
Botswana	100 629	106,000*	99 099	100 265
Malawi	647	185	7 939	7 538
Mozambique	11 647	14 079	415 906	334 786
Namibia	7 769	12 531	147 349	146 921
South Africa	14 071	17 847	29 356	30 455
Swaziland	39	31	187	50
Tanzania	92 453	141,000*	456 555	390 366
Zambia	12 457	16 562	208 072	201 247
Zimbabwe	81 555	84 416	113 602	76 931
Totals	328 970	395 916	3 048 790	1 959 223

SOURCE IUCN, *African Elephants Database 2002*; *African Elephant Status Report 2007: An Update from the African Elephant Database.* *Data for Botswana and Tanzania from the respective submissions… *to Downlist its Elephant Population from Appendix I to Appendix II of the CITES*, 2006

Wildlife-human conflict

While protected areas make ecological and economic contributions, their creation is often associated with various forms of conflict with human settlements.[31] This wildlife-human conflict is driven by increasing human populations encroaching and causing pressure on wildlife areas through conversion of rangeland to agricultural use. Expansion of agricultural land through forest clearance also modifies habitat. Forests are suitable habitats for wildlife. As forest cover is lost, wildlife habitat also shrinks. This conflict can result in crop damage and human fatalities.

This conflict strains relationships between the local communities and wildlife management authorities. As the human population continues to grow, the wildlife-human conflicts are likely to continue.

Cattle degrade wildlife habitat by grazing and trampling, thus exposing and compacting the soil, leading to erosion. Cattle can also cause bush encroachment by reducing grass cover. These processes reduce the habitat, particularly for wildlife outside of protected areas. Besides cattle production, sheep farming can be a threat to the survival of some wildlife species. The demise of the Blue Antelope is blamed on sheep farming.

The future of wild dogs is bleak in some areas because of the inevitable conflict with livestock farmers who often shoot or poison them for preying on small stock.[32]

Besides the threat posed by grazing, farmers perceive the predatory and scavenging fauna of the bushveld as pests, and often hunt them down. Black-backed jackals (*Canis mesomelas*), caracals (*Felis caracal*), and Cape vultures (*Gyps coprotheres*) are common target species.[33]

Policy and legislative constraints

The lack of or inadequacies in wildlife policy and legislation remains a key constraint to sustainable wildlife management and contributes to wildlife species loss. Where adequate legal and policy frameworks exist, there may be lack of capacity in terms of both financial resources and human capital for enforcement.

Weak legislation results in small penalties for wildlife offences. Consequently, these penalties do not act as deterrents to poaching and the associated illegal trade in wildlife products and by-products. According to the World Resources Institute (2000), in a number of cases, presiding magistrates impose very low fines. For example, the National Parks and Wildlife Act (1992)[34] of Malawi stipulates that illegal possession of ivory is punishable by a fine of MK10,000 (about US$92). While the ordinary poacher may find this steep, it is very little for the "big guns" behind poaching.

Other threats

Human resource constraints, both in capacity and numbers, hamper professional wildlife management in the region. Lower remuneration packages in the civil service also cause flight to the private sector of personnel from state institutions charged with the responsibility to manage wildlife. Consequently, wildlife departments are short of qualified staff.

The impact of the "brain drain" to the private sector and even to countries abroad is being worsened by the HIV and AIDS pandemic to which many trained personnel are being lost or hampered by illness.

Another major cause of wildlife loss in southern Africa has been past conflicts. Southern Africa has witnessed conflicts in the DRC, Mozambique and Angola, resulting in devastating impacts on wildlife resources mainly due to the breakdown of management and control systems in war torn areas, as well as poaching of big game by *apartheid* South Africa's military. The main impacts of armed conflict on the environment occur through habitat destruction and loss of wildlife through overexploitation, and degradation of natural resources. Animals may also be killed or injured by land mines, as happened to elephants and other animals in Mozambique and Angola.

The increasing frequency of droughts in the region is a major challenge to wildlife management, especially as most of the wildlife in southern Africa occurs in arid and semi-arid areas. Every time a severe drought occurs in the region, wild animals are subjected to limited pasture and scarcity of drinking water.

Frequent droughts in Chobe, Botswana, have led to a scarcity of water in the river systems that provide water for wildlife during the dry season. Also of particular concern is the Okavango Delta, which has been slowly drying up due to droughts experienced in recent years. Associated with droughts is the problem of disease outbreaks, particularly anthrax which is common in buffalo and hippos. In recent years, anthrax has decimated large herds of hippos in the Luangwa Valley in Zambia during drought periods.

In the DRC, volcanic eruptions in sensitive areas such as Virunga National Park have caused large movements of people and a resultant emergence of human settlements in areas that are traditional habitats to mountain gorillas. This has exerted increasing pressure on the habitat, thus threatening the survival of the gorillas (Box 7.2).

Nyamulagira volcano eruption threatens wildlife in Virunga **Box 7.2**

The Nyamulagira volcano in eastern DRC erupted on 8 May 2004. Continuous lava and ash from the central crater of the volcano destroyed wildlife habitats, and impacted on human and wildlife health.

Nyamulagira is located north of Lake Kivu in Virunga National Park, home to endangered mountain gorillas. Although the eruption did not directly threaten the health and habitat of the mountain gorillas, destruction of human settlements and agricultural areas increased pressure on the gorillas' forest homes as local people turned to the park for food, water, and shelter materials.

Ash and acid (sulphur dioxide and fluoride) emitted from the volcano contaminated food crops and local sources of drinking water.

Mount Nyamulagira is one of eight volcanoes found on the borders of Rwanda, DRC and Uganda. With dense, tropical montane forests, six of the volcanoes are home to the remaining population of highly endangered mountain gorillas.

Adapted from Africa Wildlife Foundation, 2004 http://www.awf.org/content/solution/detail/3589/

RESPONSE MEASURES TO CURB WILDLIFE LOSS

As a way of curbing wildlife loss, southern Africa has established protected areas and has taken other measures to ensure wildlife conservation. These include the study and use of traditional wildlife management practices; the setting up of institutions; promulgation of policies and legislation; and accession to Multilateral Environmental Agreements (MEAs). Conservation programmes such as Community Based Natural Resources Management (CBNRM) and Trans Boundary Natural Resources Management (TBNRM) are also proving effective in this regard.

Traditional wildlife management practices

There are many cases whereby wildlife is protected outside proclaimed or gazetted areas, often by local communities for cultural and traditional purposes, and to maintain harmony with their natural environment. Such traditional management strategies take into account the interaction between people and wildlife. However, these Indigenous Knowledge Systems (IKS) have not been taken seriously in the context of modern management systems.

People living with wildlife have, over the years, studied their environment resulting in the evolution of indigenous management systems. Governments are gradually changing attitudes to accommodate these knowledge systems, which include:

- Management by conservative and judicious use of resources;[35]
- Selective hunting of animals and clearance of forests;
- Promotion of valuable species; and
- Management by taboo or religious sanction.

Protected areas

With landscapes as beautiful and varied as the Namib desert, the Okavango delta, the Drakensburg mountains and the spectacular Victoria Falls, Lake Malawi and Lake Tanganyika as well as a large quantity of wildlife species and more than 10,000 kms of coastline, it is not surprising that southern Africa has numerous protected areas.

These include national parks, botanical reserves and gardens, sanctuaries and safari areas, which comprise more than 15 percent of the total land area of the region, a figure that is higher than the UN and IUCN recommended minimum of 10 percent.

Zambia, Tanzania and Botswana have respectively, 31 percent, 28 percent and 18 percent of their total land areas set aside for conservation. At 0.2 percent, Lesotho has the smallest area set aside for conservation.[36] Table 7.8 shows the extent of protected areas in the region.

Extent of Protected Areas in Southern Africa (sq km) **Table 7.8**

Country	1994	1996	1998	2000	2001	2002	2003	Country Size	% of Total
Angola	81 812	81 812	81 812	81 812	81 812	81 812	81 812	1 246 700	7
Botswana	104 988	104 988	104 988	10 4988	104 988	104 988	104 988	581 730	18
DRC	139 285	139 285	139 285	139 285	139 285	139 285	139 285	2 345 000	6
Lesotho	68	68	68	68	68	68	68	30 352	.2
Madagascar	11 150	11 150	11 190	11 210	11210	11 921	14 040	587 051	2
Malawi	10585	10 585	10 585	10 585	10 585	10 585	10 585	118 484	9
Mauritius	158	158	158	158	158	158	158	2 040	8
Mozambique	66 020	66 020	66 020	66 020	67 300	67 300	67 300	802 000	8
Namibia	112 160	112 160	112 160	112 160	112 160	112 160	112 160	824 269	14
South Africa	52 178	52 178	52 466	53 052	53 052	53 052	54 199	1 221 040	4
Swaziland	601	601	601	601	601	601	601	17 164	4
Tanzania	261 821	262 643	263 141	263 791	263 791	263 791	263 791	945 087	28
Zambia	230 419	230 419	236 919	236 919	236 919	236 919	236 921	752 614	31
Zimbabwe	46 504	46 504	46 504	46 504	46 504	46 504	46 504	390 759	12

SOURCE UNEP-WCMC. *United Nations List of Protected Areas 2003: From the World Database on Protected Areas*, 2003; Madagascar data from *African Development Indicators 2004*, The World Bank, 2004. Country sizes from *SADC statistics* http://www.sadc.int/

Mwalimu J.K. Nyerere Conservation Centre **Box 7.3**

T. Gustafson

The conservation policies of the United Republic of Tanzania were first presented by the late founding president, *Mwalimu* Julius K. Nyerere, a few months before independence. The country then had only one national park, the world famous Serengeti National Park. The number of national parks has now reached 16 with the decision to declare Mkomazi a national park. There are numerous other conservation areas, game reserves, controlled and protected areas.

Addressing a symposium on Conservation of Nature and Natural Resources in Arusha in September 1961, Nyerere said:

"The survival of our wildlife is a matter of grave concern to all of us in Africa. These wild creatures amid the wild places they inhabit are not only important as a source of wonder and inspiration, but are an integral part of our natural resources and of our future livelihood and well-being.

"In accepting the trusteeship of our wildlife we solemnly declare that we will do everything in our power to make sure that our children's grandchildren will be able to enjoy this rich and precious heritage.

"The conservation of wildlife and wild places calls for specialist knowledge, trained manpower, and money, and we look to other nations to cooperate with us in this important task – the success or failure of which not only affects the continent of Africa but the rest of the world as well."

This Arusha Manifesto has guided the evolution of conservation policy until today. The text is displayed in the entrance to the new headquarters of Tanzania National Parks (TANAPA) in Arusha. The TANAPA headquarters is named for its founding father and inspiration, the Mwalimu J.K. Nyerere Conservation Centre.

Although Tanzania is defined by the international community as a Heavily Indebted Poor Country (HIPC), in terms of biodiversity it ranks among the richest in the world.

SARDC

Protected areas comprise more than 15 percent of total land area in the region.

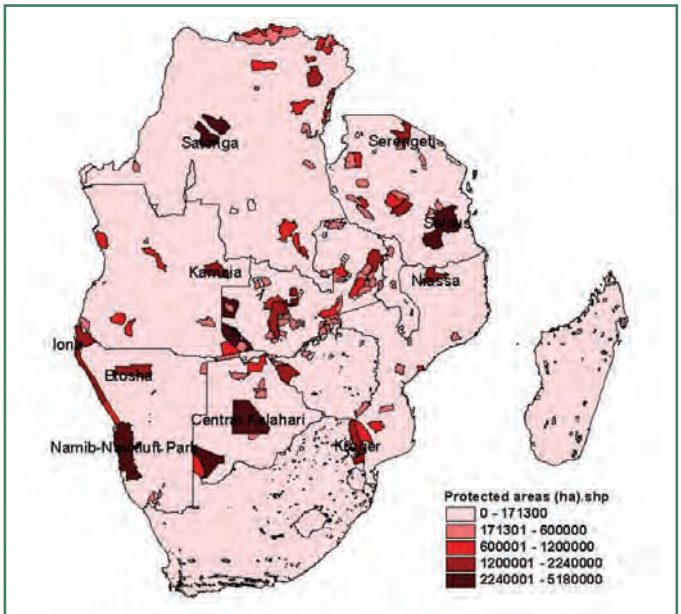
Southern Africa has some of the world's largest terrestrial and marine protected areas (Map 7.1).

Selous Game Reserve is the largest protected wet wilderness area in Africa, covering 54,600 sq km, almost 6 percent of Tanzania's land surface. The reserve has the largest elephant population of any single conservation area in the world, and contains a wealth of other wildlife, located on the vast Rufiji river system. Protected areas adjacent to the reserve and areas of low population density expand the range for elephants to roam over more than 100,000 sq km.[37] The Selous is a World Heritage Site.

Central Kgalagadi Game Reserve covers 52,800 sq km of Kgalagadi scrubland in Botswana, with a wide range of wildlife species, large and small. The CKGR, like the Ngorongoro Conservation Area in Tanzania, is also home to people, who live and herd domestic animals in the reserve. The Basarwa people of the CKGR challenged in the courts a government directive to remove them from the park.

Namib-Nauklauft Park in Namibia, which protects the desert wildlife and massive sand dunes of the Namib desert, is 49,768 sq km in size.

Distribution of Protected Areas in Southern Africa **Map 7.1**



SOURCE Developed from WDPA Consortium, *World Database on Protected Areas 2006*, IUCN and UNEP WCMC, 2006

Kafue National Park in Zambia is 22,400 sq km – more than two and half times the size of the USA's largest national park, Yellowstone.[38]

Kruger National Park in South Africa is 20,000 sq km.[39]

Serengeti National Park protects 14,763 sq km of wide plains full of large numbers of wild game that support an extensive population of predators, as well as the massive annual migration of wildebeest and zebra. The Serengeti ecosystem, which hosts the migration, is much larger than the park and includes the Ngorongoro Conservation Area, three Controlled Areas (Grumeti, Ikorongo and Loliondo), and Maswa Game Reserve in Tanzania, and Maasai Mara Game Reserve in Kenya.

Hwange National Park in Zimbabwe is only slightly smaller than Serengeti, at 14,651 sq km,[40] about the same size as Belgium.

Other famous protected areas in the SADC region include the Etosha National Park in Namibia where the wildlife has adapted to a desert habitat; Gombe and Mahale National Parks in Tanzania, which are protected areas for chimpanzees; and the Virunga, Garamba and Salonga National Parks in the DRC, home to the rapidly disappearing population of mountain gorillas.

There are a number of constraints associated with protected areas in southern Africa, including the following:

- Although most of the parks are huge by international standards, some are not sufficiently large to encompass the territories of some mammals, such as lion, elephant and cheetah.
- Many parks do not encompass complete ecosystems. For example, Zimbabwe's Hwange National Park has no perennial water in some parts.
- Protected areas in the region were originally set up to preserve game so that not all habitats are represented in some parks.
- Some parks such as South Africa's Kruger Park have been ecologically isolated and their wildlife populations are at risk from in-breeding. For example, the black rhino population has declined to a level where no single wild population is large enough to ensure sufficient genetic diversity.

All national parks suffer from lack of human and financial resources to the extent that some are managed and protected ineffectively.

Although protected areas play an important part in biodiversity conservation, there are problems with relying on national parks as the only way of conserving wildlife in the region. Rural people need their natural resources to survive and develop. For most rural communities wildlife is a nuisance – lions and leopards prey on their livestock while elephants and buffaloes trample their crops.

One way of solving these problems is through community-based wildlife management programmes, which are springing up all over southern Africa. These programmes enable rural people to manage their wildlife legally, allowing them to harvest wildlife products as well as contribute to conservation.

Commercial wildlife, utilised with the motive to generate profit through trade, can also contribute to the region's wildlife economic growth and conservation measures. For example, in Namibia, 80 percent of game is found on private land. In South Africa, there are some 9,000 wildlife farms and ranches each holding an average of 11 game species. These enterprises cover 160,000 sq km of ranch land, and are used for trophy hunting and meat production.[41]

P Johnson, SARDC

More than one million wildebeest and zebra move in an annual migration that takes them long distances through the Serengeti ecosystem.

Wildlife management institutions

There are different forms of wildlife management institutions in the region as determined by national legislation, policies and funding arrangements. These include government ministries and departments. Non-governmental organisations, the private sector and communities also play various roles in the management of wildlife in the region. Table 7.9 shows the institutions responsible for wildlife in the SADC countries and their policies.

Wildlife management policies

Almost all countries in the region have policies relevant to the conservation and management of wildlife (Table 7.9). The policies generally provide strategies for realising the full potential of wildlife resources in order to create economic opportunities, jobs and incomes for governments and the citizens of the region. Specifically, the policies cover a number of issues including administration and management of wildlife programmes, and public use and development of parks and wildlife estates.

Policies address the development of the wildlife industry through promotion and control of wildlife utilisation; encouragement of private sector investment in wildlife enterprises; and also provide measures to deal with adverse ecological impacts of wildlife-based industries.

It is also through such policies that wildlife utilisation is specified, mainly safari hunting, culling and cropping operations, game farming/ranching, live capture, game viewing and processing, and sale of wildlife products. Policies also provide a foundation for community involvement in wildlife management.

Regionally, the SADC Wildlife Policy (SADC 1997)[42] governs the conservation and management of wildlife. However, it is underpinned by existing national policies. The mission of the SADC Wildlife Policy is to improve the quality of life of the region's population by means of a regional approach to sustainable utilisation of wildlife resources, while ensuring the protection of transboundary ecosystems and associated biodiversity.

The purpose of the policy is to provide guidance to member states on national wildlife management programmes, so as to address concerns of regional significance.

Legislation

In addition to national policies, each country has national legislation that governs the conservation and management of wildlife. These are usually in the form of Wildlife or Game Laws, and are accompanied by Rules and Regulations.

The legislation provides for establishment of *in-situ* and *ex-situ* wildlife management

Wildlife Management Institutions and National Widelife Policies in Southern Africa **Table 7.9**

Country	National Wildlife Management Institutions	Wildlife National Policies
Angola	Ministry of Tourism, National Parks and Wildlife	Angola Wildlife Policy
Botswana	Ministry of Trade, Wildlife Industry and Tourism	Botswana Wildlife Policy
Lesotho	Ministry of Environment, Gender and Youth Affairs	National Biodiversity Strategy
Madagascar	Ministry of Environment, Water and Forests	Madagascar Wildlife Policy
Malawi	Ministry of Tourism, Parks and Wildlife	National Environment Policy of Malawi
Mauritius	Wildlife and National Parks Board	National Parks and Wildlife Act
Mozambique	Ministry of Environment	Forest and Wildlife Policy and Strategy
Namibia	Department of Wildlife and National Parks	The Wildlife and Environmental Society Policy
South Africa	Department of Environmental Affairs and Tourism	National Environmental Management Second Amendment Act
Swaziland	Ministry of Tourism Environment and Communications	National Environment Policy
United Republic of Tanzania	Ministry of National Resources and Tourism	Wildlife Policy of Tanzania
Zambia	Zambia Wildlife Authority	Wildlife Policy
Zimbabwe	Ministry of Environment and Tourism	Zimbabwe Wildlife Policy

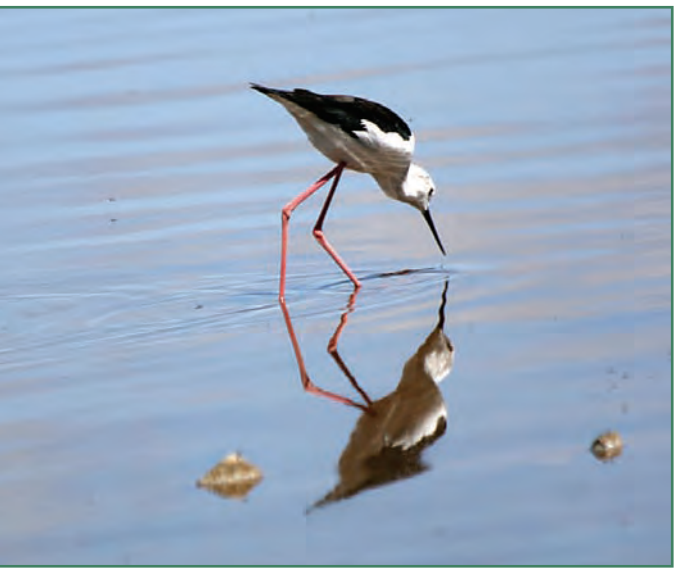
SOURCE www.safari.com; www.gov.bw; www.enviro.gov.za; www.tawiri.org; www.orusovo.com/wildlife/default.; www.fao.org; www.jiwlp.com; www.pps.gov.sc/enviro/Wetland_ Policy_Penultimate_Draft.pdf; Madagascar data from www.wildmadagascar.org
National Environmental Secretariat, *Lesotho Second State of the Environment Report*, 2004

estates such as national parks, game reserves, sanctuaries, game ranches, conservancies, nature reserves and botanic gardens. They also provide for preservation, propagation or control of wildlife, fish and plants of the region and the protection of natural landscapes and scenery.

At the regional level, the 1999 Protocol on Wildlife Conservation and Law Enforcement provides the vehicle for dealing with wildlife management issues in the SADC region.[43] The protocol addresses common issues on legal instruments for the conservation and sustainable use of wildlife resources, management and conservation programmes, information sharing and capacity building for effective wildlife management within the region.

Multilateral agreements

There are various international conventions that countries in the region have either ratified or signed as part of efforts towards effective wildlife management. These include the Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).



David Martin, APG

The Ramsar Convention on Wetlands protects the habitat of birds and other wildlife.

As Table 7.10 shows, nearly all countries have ratified the CBD and CITES.

Other important international agreements involve migratory birds, and they include the 1971 Ramsar Convention on Wetlands, and the 1979 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Only three SADC countries – DRC, South Africa and Tanzania – are party to the Bonn Convention, while Angola, Swaziland and Zimbabwe are yet to ratify the Ramsar Convention.

Conservation programmes

There are several regional conservation programmes seeking to promote sustainable development, and these include the Southern African Biodiversity Support Programme, Community Based Natural Resources Management programmes, conservancies and trusts, and the Trans Boundary Natural Resources Management programmes.

Status of Signature and Ratification of the CBD and CITES by SADC Member States **Table 7.10**

Country	Convention	Date signed	Date ratified
Angola	CBD	12/06/92	01/04/98
Botswana	CBD	08/06/92	12/10/95
	CITES	14/11/77	12/02/78
DRC	CBD	11/06/92	03/12/94
	CITES	20/07/76	18/10/76
Lesotho	CBD	01/06/92	10/01/95
	CITES	01/10/03	30/12/03
Madagascar	CBD	08/06/92	04/03/96
	CITES	20/08/75	18/11/75
Malawi	CBD	10/06/92	02/02/94
	CITES	05/02/82	06/05/82
Mauritius	CBD	10/06/92	04/09/92
	CITES	28/04/75	27/07/75
Mozambique	CBD	12/06/92	25/08/95
	CITES	25/03/81	23/06/81
Namibia	CBD	12/06/92	16/05/97
	CITES	18/12/90	18/03/91
South Africa	CBD	04/06/93	02/11/95
	CITES	15/07/75	13/10/75
Swaziland	CBD	12/06/92	09/11/94
	CITES	03/03/73	24/01/97
United Republic of Tanzania	CBD	12/06/92	08/03/96
	CITES	29/11/79	27/02/80
Zambia	CBD	11/06/92	03/12/94
	CITES	24/11/80	22/02/81
Zimbabwe	CBD	12/06/92	11/11/94
	CITES	19/05/81	17/08/81

SOURCE Convention on Biological Diversity http://www.biodiv.org/world/parties.asp
Convention on International Trade in Endangered Species
http://www.cites.org/eng/disc/parties/alphabet.shtml

Southern African Biodiversity Support Programme

Since 2001, ten SADC countries have been implementing the Southern African Biodiversity Support Programme (SABSP). These are Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

The main goal is "to promote the conservation and sustainable use of biodiversity in Southern Africa by strengthening regional biodiversity planning, interstate co-operation and information exchange." The programme intends to do this by assisting governments to implement their objectives and obligations under the Convention on Biological Diversity (CBD).[44]

Consistent with the Global Invasive Species Programme, the International Plant Protection Convention and the CBD, the SABSP is developing best practices in reducing risks from invasion by alien species.

Community Based Natural Resources Management

In the post-independence era, it has been realised that the inherited and centralised wildlife management regime cannot solely conserve wildlife because of declining funding from central government. Thus there has been an increasing realisation of the importance of involving local people in wildlife management.

The introduction of Community Based National Resources Management (CBNRM) programmes in wildlife conservation in southern Africa started in the late 1980s, based on the premise that if communities accrue direct benefits they will be encouraged to stay actively involved in conservation.

The wildlife CBNRM programmes have sought to return rights of access to wildlife resources to communities through policy and legislative changes, but with varying degrees of authority and responsibility devolution.

As a result, new policies and approaches to conservation strongly articulate the need for participation of local people in the management of natural resources in communal areas while placing emphasis on equitable sharing of benefits.

Almost all countries in the region have some form of CBNRM, including:

- Communal Areas Management Programme for Indigenous Resources (Campfire) in Zimbabwe;
- Administrative Design for Game Management Areas (Admade) in Zambia;
- Living in a Finite Environment (Life) in Namibia;
- Tchuma Tchato in Mozambique; and,
- South Africa's Peace Parks initiative.

In addition, Tanzania National Parks in collaboration with the Africa Wildlife Foundation (AWF) established a park outreach capacity known as the Community Conservation Service (CCS). The CCS has been successfully institutionalised in the National Parks programmes and policy, and is generally considered successful in having improved the relationship between parks and surrounding communities.[45]

All these programmes exhibit different levels of devolution of rights to communities, revenue-sharing mechanisms, and impacts on biodiversity and rural livelihoods. Communities are afforded the necessary tenure rights to the resources as the biggest incentive for their participation.

Such rights are important in creating the necessary incentives. Once the communities have secure proprietorship rights over wildlife, they can make independent management decisions and retain any benefits for use. They will be happy to conserve wildlife as long as the benefits outweigh the costs.[46]

The Campfire programme in Zimbabwe is one of the pioneer wildlife-based community conservation programmes in southern Africa. This was done by legislative provisions, which gave Rural District Councils (RDCs) in communal areas appropriate authority over wildlife in 1989 and became operational in 1991.[47]

The authority conferred on the RDCs allows them to manage and benefit from wildlife utilisation as a legal entity. The rural district councils consult with communities and make decisions on their behalf on how

to use the wildlife in the area, and how to use benefits accruing from such wildlife uses.

Under ADMADE, 35 percent of the revenue from safari hunting in game management areas is retained by local communities through a revolving fund managed by the Zambia Wildlife Authority. Other than through the village scouts recruited by the community, the local people have no direct involvement in wildlife management except to receive the 35 percent share of revenues, which is usually channelled through community projects such as schools and health facilities.

Conservancies and Trusts

Conservancies are one of the common open area wildlife management estates. A conservancy in Zimbabwe and South Africa is defined as a group of commercial farms pooling resources for the purpose of establishing, maintaining, and utilising a wildlife estate.

A number of conservancies have emerged in recent years and now form an important part of the wildlife estate. Neighbouring game farms opened up their internal fences to create conservancies. The conservancies are rarely fenced so as to allow for the migration of animals in and out of their areas from adjacent forest areas and national parks. However, some conservancies are fenced as a measure against poaching and crop raiding.

A number of wildlife utilisation types are carried out in the conservancies. These include hunting safaris and non-consumptive use of wildlife by photographic safaris, such as day and night game drives, safari walks and bird watching. Tourist facilities such as lodges are also provided within the conservancies. Under the conservancy arrangement, devolution of authority is restricted to resource tenure, and not land, which remains state property.[48]

Based on the successes of wildlife management on private commercial farms where rights over wildlife were conferred on the commercial farmers, the post-independence Namibian government conferred rights over wildlife to communal areas. The communities form a collective management institution called a conservancy. This is a legally constituted local institution[49] to which rights over wildlife and tourism, and the benefits thereof, are transferred directly.

In this case, the community makes wildlife utilisation decisions, and the community earns the benefits directly through the conservancy without any intermediary government or any other agency.

In Botswana, conservation trusts are the local level institutions to which wildlife rights are devolved. These are made up of village trust committees whose duties are to represent the needs of the villages to the board of directors on all aspects of the trust. The committee is also responsible for negotiating lease arrangements with private sector partners. Once the quota is utilised, the revenues come directly into the community's bank account. These revenues are shared in predetermined proportions of 15 percent to the Land Board and 13 percent to the Conservation Trust, while the remaining 72 percent is shared among the villagers.[50] It is the community share of the revenue and its use that is assumed to improve the livelihoods of the local people and thereby motivate them to participate in wildlife conservation.

Trans Boundary Natural Resources Management

The past decade has witnessed the emergence of a new concept in conservation in southern Africa in the form of Trans Boundary Natural Resources Management (TBNRM), also known as Trans Frontier Conservation Areas (TFCAs). In emerging literature on transboundary conservation, much is made of the subtle differences between TBNRM and TFCAs, but in essence these all refer to situations where conservation initiatives straddle national boundaries.

A TFCA "straddles the boundaries of two or more countries, encompassing one or more protected areas, as well as multiple resources use areas."[51] The concept stems from the realisation that some conservation

areas do transcend administrative boundaries (national, regional, international) thereby creating a need for cross-border collaborative management of such areas.

TBNRM arrangements are important because they constitute a means of re-establishing cultural and ecological integrity separated by artificial administrative or legislative boundaries. It is hoped that these initiatives will result in cultural harmonisation of divided ethnic groups.

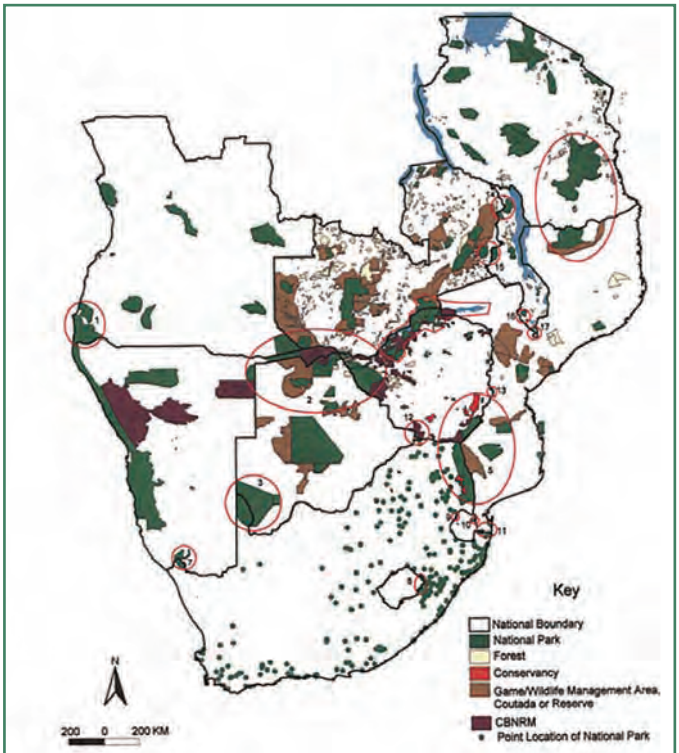
Ecologically, TBNRM arrangements enable more biodiversity to be conserved by maintaining diverse and large gene pools, and may encompass migratory ranges necessary for the management of large mammals. From a socio-economic perspective, it is hoped that the establishment and proper management of TBNRM areas will promote wildlife conservation and economic development through enhanced tourism in the region.

There are a number of TBNRM arrangements in southern Africa, including the Four Corners area comprising Botswana, Namibia, Zambia and Zimbabwe. This important conservation area boasts the highest concentration of elephants in the world.

The most publicised TBNRM is the Great Limpopo Transfrontier Conservation Area. The core protected areas are the Kruger National Park in South Africa, Gonarezhou National Park in Zimbabwe, Zinave and Banhine National Parks and the Coutada 16 Wildlife Utilization Area (Limpopo National Park) in Mozambique. It also encompasses private game reserves and state-owned communal agricultural land in all the three countries.[52] The three governments established the park in the year 2000.

Other trans-frontier conservation areas are Chimanimani in Mozambique and Zimbabwe; ZIMOZA (Zimbabwe, Mozambique, and Zambia); and Tuli/Shashi, which is Botswana, South Africa and Zimbabwe. Tanzania and Mozambique are working on a conservation area that would protect an extensive corridor for elephants in southern Tanzania and northern Mozambique.

National Parks, Conservancies, Wildlife Management Areas, Community Based Natural Resources Management Areas, and Trans Boundary Natural Resources Management Areas of Mainland Southern Africa, excluding DRC **Map 7.2**



SOURCE Griffin, J. et al, *Study on the Development of Transboundary Natural Resources Management Areas in Southern Africa,* 1999

Other forms of wildlife management outside protected areas

Different systems of management are practised outside protected areas in various countries in the region. Areas surrounding protected areas are often designated as buffer zones and managed in various ways with the aim of cushioning the impacts of the human-wildlife interface such as crop damage.

In Botswana such areas are called Wildlife Management Areas (WMAs), while in Zambia they are called Game Management Areas (GMAs). In many cases such areas are set aside to promote the sustainable utilisation of wildlife and other resources. Both consumptive and non-consumptive uses of wildlife resources are practised in these areas.

Usually, adjacent to the buffer zones, are zones for various types of management. These areas are referred to as Controlled Hunting Areas and Open Areas in Botswana and Zambia, respectively. In the other coun-

tries, open areas exist and are used for various types of community-based wildlife management programmes, either as conservancies (Namibia) or appropriate authority designated areas (Zimbabwe). They are planned around existing settlements and are designed to benefit local people through as wildlife utilisation.

Gene banking

The SADC Plant Genetic Resources Centre (SPGRC) was established in Lusaka, Zambia, in 1988, with the following responsibilities:

- to keep the SADC gene base collection, which involves maintenance of the long term storage facilities; and
- to ensure efficient coordination of plant genetic resource work within the region.

The centre collects representative seed samples of populations of indigenous plant species throughout the SADC region. Collection expeditions also target populations of introduced species that have been in the region long enough to have developed unique adaptive features. High priority is accorded to materials under immediate threat.

Seed samples are maintained in triplicate. The active sample is maintained in several small distribution bags and is used for research and other activities. The base collection sample is for long term conservation whose storage is guaranteed for use even by future generations, while the base safety duplicate is a backup against unforeseen events such as war or natural disasters that might damage the collection at the gene bank.

For species whose mode of propagation is vegetative rather than seed or whose seeds may not be kept alive for long, the national plant genetic resource centres have established field gene banks where clones of sweet potato, cassava and similar crops are planted in small plots.

FUTURE CHALLENGES

The largely positive trends in biodiversity and wildlife conservation are attributed to the fact that all countries in southern Africa have a commitment to wildlife conservation and sustainable management, and most have national policies and legislation that incorporate provisions of two international conventions that are crucial to the conservation of biodiversity. These are the CBD and CITES. Most SADC member states are also party to other conventions that support the principles of the conservation of biodiversity, such as the Ramsar Convention.

Trade controls and bans, mainly through CITES, have been used at the global level as a tool for managing largely big game but without much success in southern Africa. For example, the listing of the black rhino in Appendix 1 of CITES during the 1970s has not helped to revive the rhino population, which has not grown big enough for breeding and multiplication in the wild.

On the other hand, restricted trade coupled with sound management has seen significant growth in national elephant herds with populations in Botswana, Namibia and Zimbabwe considered too large for their habitats, thus causing ecological damage. The CITES listing of elephants remains a contentious issue for southern Africa.

The community-based, natural resources management programmes that have been introduced in the region encourage the sustainable utilisation of wildlife by people living near game areas, who become guardians and beneficiaries of the wildlife. Although the programmes represent a good philosophy and practice, some issues still need to be considered, as the programmes do not benefit all rural areas and the majority of rural people are not involved in wildlife management. The programmes are better known in areas close to national parks.

Local communities living on the periphery of the protected areas bear numerous conservation costs, in the form of loss of ancestral land, and wildlife damage to crops, livestock and human lives. In addition, they may be denied access to important food and medicinal sources, building materials and other important values. Yet their own knowledge systems may not be recognised or

tapped for input into national policy and practice.

Land pressure is growing with the expansion of agriculture to feed a growing human population, resulting in less habitat, fewer breeding sites and less water for wildlife. Funding for wildlife conservation needs to be improved, as well as the capacity to address commercial poaching activities.

The growth of tourism, considered the fastest developing sector in southern Africa, has been attributed to the rich biodiversity.

Sustaining the region's gene base collection is a future priority for the region, if the wide range of species is to be preserved. A new approach is needed for biodiversity conservation in southern Africa that:

- respects and incorporates African values, knowledge systems and perspectives;
- involves local people in the management and use of biological resources;
- can control or reverse the loss of biodiversity in every country in the region; and
- treats biodiversity conservation and economic development as integral aspects of the same process of sustainable development.

LINKAGES

Chapter 1: Regional Overview
Southern Africa has a variety of ecosystem, habitats, species and genetic resources critical for the region's development and poverty alleviation.

Chapter 2: Land
Land clearance in response to population pressure is a major threat to biodiversity through loss and modification of habitat. The productivity of the region's land resource base is key to the on-going debate on genetically modified organisms.

Chapter 3: Atmosphere
Atmospheric pollution, droughts, floods and fires can threaten biological diversity as these create conditions that are not suitable for the surviving species. Marine and coastal biological resources such as coral reefs are affected through bleaching and sea level rise.

Chapter 4: Freshwater Resources
Freshwater and wetlands constitute major ecosystems in the region sustaining aquatic species through habitat and terrestrial ecosystems through food.

Chapter 5: Marine and Coastal Resources
There is a growing realisation of the significance of living marine resources. As a result the region is witnessing the establishment of marine protected areas to conserve marine ecosystems and species.

Chapter 6: Forests and Woodlands
Southern Africa's major ecosystems are largely comprised of forests and woodlands, which provide food and shelter to the region's wildlife.

Chapter 8: Human Settlements
Most southern African ecosystems are modified as they are opened up for human settlements. The greatest negative impact on ecosystems results from informal settlements for refugees and internally displaced people as such settlements are rarely planned.

Chapter 9: Outlook
If development continues to disregard ecological processes, there is a danger that the region will continue losing its wildlife resources, with resultant impact on the environment, human development and tourism.

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HUMAN SETTLEMENTS 8

Southern Africa's population is predominantly rural, despite a high level of urban migration and some large cities of several million inhabitants, such as Kinshasa and Cape Town. The region is also home to refugees and internally displaced people who live in temporary settlements.

Well-planned human settlements are important for effective and efficient provision of services and infrastructure such as roads, schools, telecommunications, hospitals or clinics and other supporting services. The nature of human settlements portrays the economic status of individuals, countries and the region.

While most of the settlements in southern Africa are planned, increasing populations create challenges for the provision of adequate health and education facilities, housing, sanitation, safe water, electricity, waste disposal, roads and other social services. As a result, the region also has to grapple with issues of informal settlements and homeless people.

South African Tourism

Durban (eTekwini) population is more than two million.

Population Trends for SADC Countries **Table 8.1**

Country	% share in 2000	2000 (000)	2001	2002	2003	2004
Angola	6.8	13 399	13 816	14 262	14 662	15 073
Botswana	0.8	1 651	1 681	1 667	1 691	1 711
DRC	26.4	52 009	53 870	55 702	57 596	59 554
Lesotho	1.1	2 144	2 189	2 233	2 282	2 334
Malawi	5.3	10 475	10 816	11 175	11 549	11 938
Mauritius	0.6	1 187	1 200	1 210	1 223	1 233
Mozambique	8.8	17 240	17 653	18 077	18 513	18 962
Namibia	1.0	1 900	1 830	1 902	2 000	2 000
South Africa	21.5	42 400	44 600	45 400	46 430	46 587
Swaziland	0.5	1 003	1 030	1 056	1 081	1 105
Tanzania	16.2	31 900	32 900	33 600	34 200	35 300
Zambia	5.0	9 886	10 060	10 356	10 666	10 987
Zimbabwe	5.9	11 696	11 666	11 635	11 763	11 892
SADC	100	196 890	203 311	208 275	213 656	218 678
*Madagascar		15 085	15 529	15 981	16 441	16 908

SOURCE *SADC Statistics 2004* *Madagascar joined SADC in 2005

All types of human settlements impact on the natural environment, but traditionally this was a mutually beneficial impact.

SETTLEMENT TYPES

About 60 percent of the region's population of some 240 million[1] lives in the rural areas although the rate of urbanisation is increasing.[2] A number of the region's major urban areas have populations of more than one million people, as shown in Table 8.2.

A number of factors draw people from rural areas to the cities, including conflict, employment prospects, and natural disasters such as a drought or floods. Better services in the education and health sectors are often an attraction to the urban areas, and employment opportunities seem brighter in the cities. The rural areas in some countries are poorly devel-

Population Trends in Urban Areas of More Than One Million People **Table 8.2**

Country	Municipality	Estimates and projections (000) 1990	1995	2000	2005	2010	2015
Angola	Luanda	1 597	1 958	2 341	2 839	3 487	4 271
DRC							
	Kinshasa	3 392	4 099	4 745	5 717	7 076	8 686
	Lubumbashi	660	783	906	1 102	1 384	1 714
Mozambique	Maputo	860[a]	968[a]	1 078[b]	1 316	1 588	1 880
South Africa	Cape Town	2 155	2 394	2 715	3 103	3 205	3 239
	Durban (eTekwini)	1 673	2 081	2 370	2 643	2 696	2 709
	Ekurhuleni	1 531	1 894	2 392	3 043	3 276	3 439
	Johannesburg	1 878	2 265	2 732	3 288	3 539	3 666
	Port Elizabeth	828	911	958	998	1 018	1 023
	Pretoria (Tshwane)	911	951	1 084	1 282	1 363	1 405
	Vereeniging	743	800	897	1 033	1 075	1 095
Tanzania	Dar es Salaam	1 316	1 668	2 116	2 683	3 371	4 123
Zambia	Lusaka	991[c]	1 131	1 432[c]	1 450	1 605	1 792
Zimbabwe	Harare	1 047	1 257	1 386	1 527	1 670	1 801

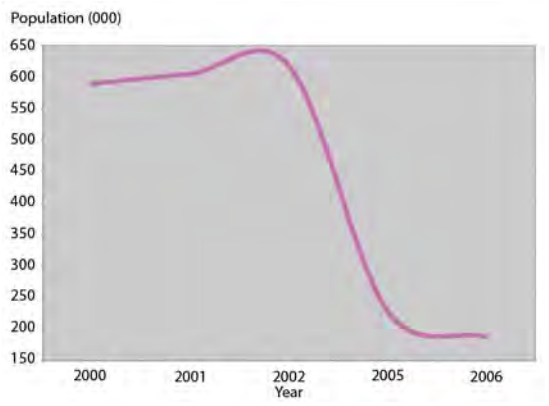
SOURCE UN Habitat, *Financing Urban Shelter: Global Report on Human Settlements 2005*
[a] National Statistics Institute (INE) in *Mozambique National Human Development Report 1998*, and [b] *2005*; [c] Central Statistical Office of Zambia, 2000

oped in terms of infrastructure, and the provision of services is weak. The main economic activities of rural areas are agriculture, mining and forestry where communities rely heavily on natural resources for their livelihood.

Of the many types of traditional rural dwellings, permanent or semi-permanent houses grouped in villages are found in agricultural settlements. A typical farming village consists of a number of family compounds along with structures that serve the larger community. Each family compound may have separate structures for cooking, eating, sleeping, storing food, and protecting animals at night. Communal structures for holding meetings, schools, clinics and shopping centres, are often located in a prominent place in the village.

Formal and informal settlements for refugees and internally displaced persons exist in some countries, largely in rural areas. While refugee settlements were meant to be temporary, some have been in existence long enough to be classified as permanent settlements. As shown in Figure 8.1, the number of displaced people in refugee settlements was increasing up to 2003, with four countries – Angola, DRC, Zambia and the

Refugee Trends in Southern Africa **Figure 8.1**



SOURCE UNHCR, *Statistical Yearbook*, 2002

United Republic of Tanzania – playing host to significant refugee populations, mainly from Angola, DRC and the Great Lakes region, although most of those have since been returning home.[3]

Although the region has various types of settlements, with the majority of the population residing in rural areas, the major environmental challenges are in urban areas.

Local authorities have to cope with high population densities and enforcement of stringent by-laws that stipulate minimum standards for putting up infrastructure and

Urban areas face many environmental challenges.

accessing social services. For example, houses have to be well planned and approved, and sanitary facilities have to meet set standards. Waste has to be properly disposed of, and the authorities face challenges of refuse collection and disposal.

In well-managed urban areas, people cannot just dig a well or put up a pit latrine toilet, as is the case in the rural areas.

URBAN GROWTH

Southern Africa is urbanising at an average rate of three percent per year, with year 2000 estimates showing that 38 percent of the total population lived in urban areas,[4] compared to 11.2 percent in 1970.[5] Urbanisation rates in southern Africa are low in comparison with other regions of the world, such as South America, where urbanisation is pegged at 70 percent.[6]

Poverty levels of around 40 percent[7] in most SADC countries have resulted in sustained rural-urban migration as the economically active migrate to the urban areas in search of employment and perceived economic opportunities.

The urbanisation rate varies from country to country but Botswana and South Africa are among the most urbanised, with more than 50 percent of their population living in urban settlements, as shown in Table 8.3. In most SADC countries, less than one-third of the population lives in urban settlements.

The rate of urbanisation varies between countries, with the biggest growth in urban population in recent years recorded in Botswana, where the urban population grew from 1.7 percent of the country's total population in the 1970s[8] to more than 50 percent in 2000.[9] Malawi, Lesotho and Swaziland are among the least urbanised countries in the region. However, the population of Malawi living in urban areas is set to increase dramatically over the next 15 years if the estimated annual urban growth rate of 6.3 percent is sustained. By that time, it is estimated that more than 3.8 million Malawians will be living in urban areas, a 400 percent jump from less than one million in 1988.[10]

Urbanisation Trends in Southern Africa **Table 8.3**

Country	National population % living in urban areas 1998	2000	2004	2006	Projected urban annual growth rate 2000-2015 %	Projected rural annual growth rate 2000-2015 %
Angola	28.6	29.9	36.4	38.0	4.5	1.8
Botswana	47.6	49.4	52.0	53.0	2.3	0.1
DRC	29.0	29.4	32.2	33.4	4.7	2.0
Lesotho	17.4	17.6	18.1	18.4	3.3	0.9
Madagascar	25.5	25.6	26.8	27.3	4.5	1.5
Malawi	14.3	14.9	16.7	17.6	6.3	0.5
Mauritius	42.2	42.7	43.5	44.0	1.9	-0.1
Mozambique	29.8	32.0	36.8	39.1	3.3	0.3
Namibia	29.8	30.8	32.9	34.0	2.7	0.2
South Africa	52.5	53.5	57.4	58.3	1.2	-0.4
Swaziland	23.2	23.7	23.7	24.1	4.0	1.9
Tanzania	30.2	32.3	36.5	38.5	4.5	0.8
Zambia	35.0	34.2	36.1	36.9	3.1	1.6
Zimbabwe	32.7	33.8	35.4	36.4	2.8	-0.2

SOURCE African Development Bank, *Statistics Pocketbook 2006, 2007*; Projected growth rates from UNCHS 2001, Annex A2

The projected population growth rates of the urban centres are much higher than the national population growth rates. There is cause for concern when these rates are examined in the context of the projected population growth rates of the rural areas. The rural population growth rate is lower than the expected national growth rates. In Mauritius and South Africa the rural population is projected to decline due to continued migration to urban areas.

The region is currently at its peak in terms of rural-urban migration caused by a fairly high population growth rate of 2.6 percent[11] as well as the pull factors of urban settlements such as job opportunities, and better infrastructure and housing. Push factors from rural areas such as poverty, shortage of land and declining returns from agriculture, also contribute to the high rates of urbanisation. The rapid rates of urbanisation pose a major challenge to urban local authorities, with most countries in the region struggling to

maintain existing infrastructure. As a result, the region is faced with poor management of solid and liquid waste, air pollution, contamination and degradation of urban environs, and inadequacies in the institutional framework and responses of local authorities as called for under Agenda 21.

Agenda 21 Chapter 21 **Box 8.1**

"Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives. Local authorities construct, operate and maintain economic, social and environmental infrastructure, oversee planning processes, establish local environmental policies and regulations, and assist in implementing national and local environmental policies. As the level of governance closest to the people, they play a vital role in educating, mobilising and responding to the public to promote sustainable development."
Earth Summit, Brazil, 1992

Solid waste management

The high rate of urbanisation in the SADC region is leading to the generation of huge volumes of solid waste that some urban authorities are failing to cope with. Although the situation varies between countries, a regional average of 58.6 percent of urban households had access to garbage collection services in 2000. In Lesotho, the situation was much worse with only seven percent of urban households having garbage collection facilities.[12]

Even where refuse is collected, it is usually not properly disposed of. Only a few municipalities in Botswana, Lesotho, Mauritius, Namibia, South Africa, Swaziland and Zimbabwe have the capacity to dispose of at least 80 percent of their waste through properly constituted landfills. The rest of the region's municipalities simply dump or burn waste.

The Zambian capital, Lusaka, which has a population of about 1.5 million and a high concentration of people in the central business district and the peri–urban informal settlements, produces 1,400 tonnes of solid waste daily of which only 10 percent is collected by the city council. In Dar es Salaam, less than 13 percent of solid waste generated is collected.[13] The United Nations Conference on Environment and Development (UNCED)[14] estimated that one urban resident produces 0.3-0.6kg of waste per day. This implies that Dar es Salaam generates about 2,000 tonnes of refuse per day, a quantity that is 20 times the capacity of its three refuse sites at Kinondoni, Ilala and Temeke.[15]

The major constraint in the proper management of solid waste in cities of southern Africa is inadequate finance. The revenue base of many local authorities is eroded by lack of systems for collection of revenue from the informally settled households, many of whom have difficulties in paying for the services. According to UN sources, 30-40 percent of local authorities' budgets in cities of the developing world are consumed by the provision of waste management services, and yet most cities are unable to keep pace with the growing demand.[16]

The privatisation of waste collection services, brought about by structural adjustment programmes that were introduced in many countries of the region a decade ago, has to an extent worsened the problem of improper waste dumping as some private companies at times avoid using designated dumping sites to evade paying fees. Recycling is being introduced by a number of municipalities and should bring some relief to the problem of improper waste disposal.

Data on the collection and disposal of hazardous waste within the region is not readily available. To some extent this may indicate the general absence of facilities. However, some cities, such as Windhoek in Namibia, have invested in new technologies for hazardous waste disposal.[17]

More than 42 million cu m of general waste is generated every year across South Africa, with 42 percent of this produced by Gauteng province.[18] In addition, more than five million cu m of hazardous waste is produced every year, mostly in Mpumalanga and KwaZulu-Natal, due to the concentration of mining activities and fertiliser production in those provinces.

The proportion of hazardous waste that does not receive proper treatment or disposal is quite alarming. Of the 5 million cu m of

hazardous waste generated every year, less than five percent reaches hazardous waste disposal sites.[19]

By far the biggest contributor to the solid waste stream is mining waste, followed by pulverised fuel ash, agricultural waste, urban waste and sewage sludge.

Problems caused by the improper handling of waste include:

- risks of disease;
- blockage of drains and sewers;
- contamination of surface and ground water by seepage from landfills and uncontrolled dumps; and
- unpleasant odours and sights of uncontrolled garbage.

Water supply and sanitation

Rapid population growth and urbanisation are causing an increase in the demand for domestic, industrial and agricultural water resources.

The region's population has doubled since 1970, and the combined population of SADC Member States has grown from 132 million in 1994 (excluding countries that joined SADC after 1994) when the annual growth rate was estimated at three percent,[20] to almost 200 million in 2000 and 218 million in 2004.[21] This was due to natural growth and the addition of new SADC members: Mauritius in 1995 and the Democratic Republic of Congo (DRC) in 1997. Madagascar became a member in August 2005, thus adding 17 million people to the SADC population, which was estimated at almost 240 million in 2005 and projected to reach 357 million by 2025. (Table 8.4)

However, the total supply of renewable freshwater resources available remains the same, or in some cases is reduced due to pollution. The estimated amount of water available per person per year in the region was just over 11,000 cu m in 1995, but this is projected to decrease significantly to less than 5,500 cu m per capita per year by 2025, as shown in Table 8.4. The per capita water

South African Tourism

Freshwater resources, Tugela Klein, South Africa.

Water Availability per Person in the SADC Region, Real and Projected, 1995-2025 **Table 8.4**

Country	Total annual renewable freshwater available (cu km/yr)	1995 population (000)	1995 water availability per capita (cu m)	2000 population (000)[a]	2000 water availability per capita (cu m)	2025 population (000) UN medium projection	2025 water availability per capita (cu m)
Angola	184	11 558	15 920	13 399	13 732	25 940	7093
Botswana	14.7	1 459	10 075	1 651	8 904	2 270	6 476
DRC	1 019	43 900*	23 212	52 009	19 593	102 830	9 909
Lesotho	5.2	1 930	2 694	2 144	2 425	3 400	1 529
Madagascar	337[b]	13 789[b]*	24 440	15 085*	22 340	29 434	11 449
Malawi	18.7	9 374	1 995	10 475	1 785	18 695	1 000
Mauritius	2.2	1 122	1 960	1 187	1 853	1 410	1 560
Mozambique	216	15 400	14 026	17 240	12 529	26 730	8 080
Namibia	45.5	1590	28 616	1 900	23 947	2 460	18 496
South Africa	50	39 477	1 266	42 400	1 179	50 160	997
Swaziland	4.5	908	4 956	1 003	4 486	1 800	2 500
Tanzania	89	28 400	3 134	31 900	2 790	56 090	1 587
Zambia	116	9 100	12 747	9 886	11 733	18 285	6 345
Zimbabwe	20	11 526	1 735	11 696	1 710	17 395	11 580
SADC	2 121.8	189 539*	11 194	211 975	8 922	356 959	5 444

* NOTE that DRC and Madagascar were not SADC members in 1995, and Madagascar was not yet a member in 2000. Their data are added here fore comparative purposes. Therefore, the total population of SADC in 1995 was 131,844, and 196,890 in 2000.

SOURCE Hirji et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa,* 2002

[a] *SADC Statistics 2004* (See Table 8.1 above); [b] FAO Statistics Database, 2004

share will be lower in urban settlements due to the high concentration of people.

By 2025 South Africa will have a paltry 997 cu m per capita water availability per year. Forecasts have indicated a serious shortage of water in the Gauteng province of South Africa. As a result, Gauteng province invested in a major water supply project developed under the Lesotho Highlands Development Authority. The Lesotho Highlands Water Project is to supply water to Gauteng at a flow rate of 70 cu m/s from a series of four dams and through a 100 km transfer tunnel.[22]

There is a close link between water supply and sanitation, and areas with developed water supplies also enjoy high levels of sanitation. Generally, the older and more affluent parts of most cities and towns in southern Africa enjoy adequate water supplies and sanitation. Poor maintenance and lack of investment are causing sewage disposal services to deteriorate in some major centres such as Maputo, Luanda and Lusaka.

Lesotho Highlands Water Project

Katse dam spilling, Lesotho Highlands Water Project.

Over the last 10 years the SADC countries have made significant progress in the delivery of safe water and sanitation with a number of settlements having provided total or near total coverage in terms of access by their populations to safe water and sanitation. Table 8.5 shows that Mauritius has achieved significant progress in the provision of safe water services with 100 percent of its population in urban and rural areas having access to safe water. The Table shows similar levels of progress for Namibia and Zimbabwe.

Concerns in the urban areas relate more to the delivery of services to unplanned and informal settlements that have developed as a result of rising rural-urban migration. These informal settlements generally do not have sewage or waste disposal facilities. Water is supplied through communal water points and most residents depend on non-flush toilet systems.

Access to Safe Water and Sanitation in Southern Africa **Table 8.5**

Country	Population[a] 2004 (000)	Proportion urbanised[b] % 2001	Access to safe water % 1990–2000	Access to sanitation % 1990–2000	Access to safe water % 2000		Access to sanitation % 2000	
					Urban	Rural	Urban	Rural
Angola	15 073	30.9	38	44	34	40	70	30
Botswana	1 711	50.0	95	61	91	91	84	44
DRC	59 554	30.1	45	20	89	26	53	6
Lesotho	2 334	17.6	91	92	98	88	93	92
Madagascar	16 908	25.9	16	34	85	31	70	30
Malawi	11 938	15.3	57	77	95	44	96	70
Mauritius	1 233	42.5	100	99	100	100	100	99
Mozambique	18 962	33.2	60	43	86	43	69	26
Namibia	2 000	31.3	77	41	100	67	96	17
South Africa	46 587	53.7	86	86	92	80	99	73
Swaziland	1 105	23.8	50	59[b]	61[b]	44[b]	66[b]	37[b]
Tanzania	35 300	33.4	54	90	80	42	98	86
Zambia	10 987	34.2	64	78	88	48	99	64
Zimbabwe	11 892	34.1	85	68	100	77	99	51

SOURCE WHO/UNICEF, *Global Water Supply and Sanitation Assessment 2000*

[a] Population data from SADC Statistics 2004; [b] African Development Bank, *Statistics Pocketbook 2006* (Table 8.3 above)

Table 8.5 also shows that Angola, Madagascar, Mozambique and DRC have the lowest sanitation levels in the region, ranging from 53 to 70 percent. This could be attributed to previous conflicts in some of the countries and to difficult circumstances of people migrating to the cities.

Inadequate access to sanitation gives rise to the proliferation of disease vectors such as mosquitoes, as well as pathogens that cause communicable waterborne diseases such as cholera. As Table 8.6 shows, the incidence of cholera continues to be high although there has been a steady decline in the number of fatal cases.

In many instances, sanitation services have lagged behind water development programmes. Emphasis has been placed on providing safe water for everyone, yet the levels of wastewater and other wastes generated by development activities are often sidelined. For example, in 1998, only 57 percent of Lesotho's rural population had access to safe drinking water and just 35 percent had access to sanitation services.[23] However, steady improvements have been made in the provision of urban water and sanitation with 2001 coverage in rural areas reaching 88 percent and 92 percent, respectively.[24] (see Table 8.5 above)

SADC countries have committed themselves to providing safe water and adequate sanitation, and have articulated a Vision document with the Global Water Partnership as part of these efforts, as shown in Box 8.2.

The responsibility for the delivery of services varies from country to country within the SADC region. The provision of water in many of the countries is the responsibility of local governments with support from national corporations. In South Africa and Tanzania the supply of water in urban areas has been privatised and is handled by private companies. This has its own disadvantages as consumers in these countries believe that they are not getting water, a basic human right, at a fair price.

A possible solution to water shortages in the major urban centres around the region could be water recycling. With few exceptions, wastewater from cities and towns in the region is not recycled and treated.

Cholera Cases and Deaths Reported in SADC, 2000/01 Season **Table 8.6**

Country	Number of cases	Number of deaths	Case fatality rate %
Malawi	10 304	19	1.83
Mozambique	3 140	43	1.36
South Africa	70 474	149	0.21
Swaziland	1 800	39	2.00
Tanzania	4 637	153	3.29
Zambia	498	27	5.42
Zimbabwe	377	6	1.59

SOURCE *SADC Health Sector Annual report July 2000-June 2001*

Vision for sanitation in southern Africa **Box 8.2**

The people of southern Africa call for a desirable future in which they have sustainable and equitable access to proper sanitation. They also require that waste in the region is safely managed, and managed in an environmentally and socially just manner.

The people therefore propose that the appropriate water sector stakeholders carry out the strategic actions listed below so as to achieve this Vision:

- Promote integrated education programmes for water supply, sanitation, health and hygiene.
- Create and impartially enforce appropriate national regulatory frameworks for proper sanitation and safe waste management.
- Effectively monitor the social and environmental impacts of sanitation and waste.
- Adopt full cost accounting methodologies in integrated people-centred planning for sanitation and waste management.
- Provide adequate technical and financial support essential for community planning, implementation and operation of sanitation and waste management works.
- Develop and promote sanitation and waste management technologies more appropriate to the specific local communities and environment.
- Develop and promote appropriate incentives for minimisation of solid waste and wastewater, and for the re-use and recycling of both.
- Adopt and enforce the polluter-pays principle.

GWP-SATAC, *Water for the 21st Century: Vision to Action - Southern Africa*, 2000

The Cities of Windhoek in Namibia and Mutare in Zimbabwe provide good examples of wastewater reclamation and treatment (see Box 8.3) as they both treat and recycle all their wastewater. Johannesburg reclaims 80 percent of wastewater and Gaborone 95 percent, while in Maputo only five percent is reclaimed.[25]

Wastewater Reclamation in Namibia **Box 8.3**

The city of Windhoek is located in the highlands of the Kalahari desert, in the heart of Namibia. The climate is very dry, and the city suffers from chronic water supply shortages. The rivers that transect the city are ephemeral, only flowing above ground for a few days in the year.

Water is therefore a precious resource in short supply. Currently, three dams supply the city with 70 percent of its required water. Other water sources include groundwater from deep boreholes and recycled water. The water situation is so critical that the city has implemented a double sewer system to ensure that water can be effectively recycled both for drinking and for reuse in the wastewater system.

The growth in the city's population has led to the realisation that water must be used sustainably to curb the growth in demand. It is also necessary to recycle the water so that the water needs of the city are met in the short to medium term.

One of the dams supplying Windhoek is the Goreangab Dam built in 1958. Located very close to the dam is an informal settlement with a substantial part located only a few hundred metres from the shoreline. The location of the settlement downstream of the city and leaks from the city's sewer pipes contaminate the Goreangab Dam.

As freshwater supplies are fully exploited, the need for more enhanced reclamation methods is needed to augment supplies. As a result the city of Windhoek constructed a new reclamation plant with a capacity of 21,000 cu m a day.

The reclamation plant is run by the Windhoek Goreangab Operating Company, a partnership between the city council and the private sector. Water reclaimed at the plant is bought by the Windhoek city and blended with water sourced from NamWater for distribution to residents.

The Goreangab Water Reclamation Plant is internationally renowned as the first plant in the world to reclaim domestic sewage for drinking water purposes. The plant seeks to exploit the maximum reclaimable freshwater from sources available to Windhoek and by doing so contribute to meeting the increasing demand for potable water and add security to the city's water supply.

Adapted from http://www.polytechnic.edu.na/Schools/civil/Symposium2004-web/excursion.htm

Marek Patzer

Housing

Most countries of the region are failing to meet the demand for housing. This is due to several factors, including high population growth and poor economic performance. This causes the challenge of intra-urban as well as peri-urban informal settlements, which are common to virtually all the cities in the region.

The majority of the people who live in unplanned informal settlements are poor. The settlements lack legal status and the provision of basic services such as clean water and sanitation is inadequate, making them extremely vulnerable to disease. That vulnerability is made worse by the inhabitants' insecure, low-wage employment. The vast majority of the urban poor work in the informal sector in a variety of activities, including petty trading and casual labour. Crime and other aspects of moral decay are prevalent in such settlements.

While per capita incomes continue to fall in most countries of southern Africa and urban poverty is widespread and increasing, there is no systematic method to measure its extent. Instead, some commentators tend to refer to the proportion of the population living in informal settlements as a surrogate indicator of urban poverty.

Table 8.7 shows the growing problem of urban poverty in South Africa manifested through lack of housing.

The exposure of informal settlements to environmental health risks arises largely from poor levels of access to urban services. For

South Africa's Informal Settlements Atlas **Table 8.7**

Province	1996	2001	2004
Eastern Cape	145 461	144 826	416 956
Free State	162 713	165 335	257 068
Gauteng Province	468 304	471 520	1 011 387
KwaZulu Natal	185 545	185 643	1 016 596
Limpopo Province	94 441	96 391	70 415
Mpumalanga	26 218	26 422	190 782
Northern Cape	47 911	47 764	31 405
North West	159 352	159 185	212 443
Western Cape	162 894	164 137	353 331
TOTAL	1 452 839	1 461 223	3 560 383

South Africa Census and Department of Housing, *Database: Informal Settlements Atlas*, 2004

example, while 12 percent of South Africa's population did not have access to clean water in 1999 and 30 percent depended on pit latrines, the situation was much worse in the informal settlements where 44 percent of the inhabitants used pit latrines.[26]

A major problem in Angola is that of peri-urban communities who settle around big cities, especially the capital Luanda, and constitute the largest and fastest growing sector of the population. During the post-independence war in that country, migration into the cities was high, with many of the people settling on land purchased in the peri-urban areas through informal markets. There are risks of losing such land to formal property developers. Three million people are estimated to live in the peri-urban areas of Luanda, where access to basic services such as water is difficult and expensive, and where they are not counted or fully included as part of urban population planning.

A World Bank study revealed that peri-urban dwellers of Luanda pay as much as 10,000 times the official water rates as they buy the commodity through traders. Following the study, Development Workshop in partnership with the Luanda Provincial Water Authority initiated a community-based water supply scheme in which communities pay for water supply infrastructure maintenance charges only.[27]

Low-income earners in the SADC region remain marginalised and in desperate need of adequate housing due to the rising costs of building materials and difficulties in securing land and mortgage finance. The formation of housing cooperatives in some countries such as Malawi and Zimbabwe has not solved the problem, as only a small percentage of the homeless has benefited. The number of housing units required to cater for a rising urban population in Malawi's capital of Lilongwe is approximately 160,000 units per annum. The private and public sectors are unable to meet the demand.

According to a recent case study on municipal development in sub-Saharan Africa, housing problems in Malawi were not that acute during the early 1990s but the

SARDC

Due to the high potential of coastal areas for socio-economic activities, people find the marine environment highly attractive for both settlement and exploitation, seen here in Mozambique.

Ronald Chawatama, SARDC

Informal settlements are common to most cities in the region.

country's urban population is now increasing at a rapid pace due to rural-urban migration. The same study states that in 1996 the housing backlog in Zambia was at 846,000 units and it is estimated that by 2020, there will be about one million new home seekers if no serious measures are taken to address the country's housing situation.[28]

South Africa needed between 2.3 million and 3.4 million housing units, almost 275,000 units per annum, between 1994 and 2000.[29] As of 1994, 39 percent of urban housing (about 1.5 million units) was informal, 5.2 percent of households lived in hostels and 13.5 percent of households lived in squatter settlements either on the periphery of urban settlements or within urban areas. There was also an enormous shortfall in the provision of amenities with 25 percent of

urban households not having access to piped water, 48 percent without flush toilets, while 46 percent were not linked to the electricity supply grid.[30] This was a legacy of the apartheid system that the post-apartheid government has been struggling to address, with some success.

Estimates from other countries also illustrate enormous housing gaps. Seventy percent of Dar es Salaam's population of more than 1.5 million people in 1997 lived in unplanned settlements with marginal access to piped water, sanitation, drainage or basic social services.[31]

In Zimbabwe the housing demand stood at one million units in the year 2000, up from 670,000 units in 1995.[32] Over the years the demand for housing continued to rise forcing many people to construct illegal structures that overloaded the infrastructure for supply of water and sanitation to urban areas. As a result, the Zimbabwe government launched a clean-up operation of the main cities known as "Operation Murambatsvina/Restore Order" in May 2005.

The programme sought to enforce bylaws to stop all forms of illegal activities such as vending, illegal structures and illegal cultivation. The government justified the operation as a necessary process to arrest disorderly urbanisation, including its health consequences, and to reverse environmental damage caused by inappropriate urban agricultural practices.[33]

According to the UN Centre for Human Settlements, some lessons can be drawn from Operation Murambatsvina. These include an appeal to the international community to realise that without a concerted approach to promote urban environmental sustainability, other countries in Africa could experience "Operation Restore Order", as indeed several countries have previously.[34]

Millennium Development Goal 7 is to: Ensure environmental sustainability through integrating the principles of sustainable development into country policies and programmes and thus reverse the loss of environmental resources. Its targets are water and sanitation, and slum upgrading and prevention. Target 2015: Reduce by half the proportion of people without access to safe drinking water. Target 2020: Achieve significant improvement in the lives of at least 100 million slum dwellers.

Provision and upgrading of urban infrastructure have become priorities for the municipalities of the region. Great strides have been made in improving urban living conditions in recent years. These include the award-winning Luanda Sul Self-Financed Urban Infrastructure Programme in Angola, which aimed to provide satisfactory shelter for a significant proportion of urban migrants who fled the war during the 1980s. Between 1994 and 2000, more than 16,700 people constructed the 2,210 dwellings in which they live. This is in addition to the 12 km of power lines, 70 km of water pipes to carry clean water, and 23 km of drainage, which the same community constructed.[35]

In Namibia, a National Housing Policy was approved in 1991 and has facilitated construction of more than 3,400 housing units, improved women's access to shelter, and is assisting 1,300 families per year to get their own houses.[36] Other initiatives such as the Build Together Scheme in Windhoek are supporting the 1991 policy, with 867 homes having been built between 2000 and 2004.[37]

South Africa's efforts resulted in the construction of more than one million low-cost houses between 1994 and 2000.[38]

Pollution

Water and air pollution are of concern in urban settlements. The major sources of pollution in southern Africa are industrial and domestic waste, and industrial and vehicle emissions. Vehicle emissions have increased as the region has witnessed a significant rise in the number of cars on the roads. A 1998 report estimated that there were 51 persons per car[39] compared to 197 persons per car 20 years ago.[40] Currently there is an average of between 30 and 40 people per car. Most of the cars are second-hand, often poorly maintained and therefore generate large volumes

of emissions. Noise from road transport is also worsening due to lack of enforcement of regulations limiting the level of noise generated by cars.

The regulations in most countries are silent on the permissible levels and types of fumes which cars can emit.[41] The region is also not strict on the use of cleaner fuels such as unleaded petrol, although efforts are being made in most countries to set deadlines for this.

The concentration of industries in or near cities is also a major source of environmental pollution and resource depletion. Projections indicate that potentially large increases in emissions may occur during the next decades if current development patterns persist.

Human health impacts due to pollution include respiratory infections such as asthma and bronchitis. Buildings are corroded while surrounding plant communities are subjected to toxic pollutants. In order to curb the small but growing problem of pollution, most cities in the region have established air quality standards and have monitoring programmes in place.

In South Africa where the challenge is greatest because of the high density of industries and vehicles, an Atmospheric Pollution Prevention Act stipulates the technologies to be used in controlling noxious and offensive emissions. The act establishes grounds for prosecution of offenders, and empowers authorities to make regulations regarding the exhaust emissions from vehicles operating on public roads. Initiatives such as the Cities for Climate Protection have also been launched across the region to help monitor air quality within the major cities.[42]

Urban agriculture

Throughout southern Africa, urban farming is a growing business for the poor and middle class. They raise livestock and grow produce to feed families and to generate income. In the process, they recycle wastes, reuse water, and put idle land to productive use. Some governments of the region, though few, now recognise the contribution urban farmers make to cleaner and healthier cities. For example, the recognition of urban agriculture is reflected in many of Tanzania's laws, including the Local Government Act of 1982, the Town and Country Planning Ordinance of 1992, the National Land Policy of 1995, the Agriculture and Livestock Policy of 1997, and the National Human Settlements Development of 2000.[43]

Since most countries lack policies to integrate urban agriculture into sustainable urban management practices, the practice is in some countries illegal, and usually ignored by planners and policy-makers. Yet livestock and abattoir waste and field run-off can threaten fresh water supplies, while those living near intensive poultry or pig units may suffer considerable discomfort from air pollution. Vegetables grown on polluted soil, water and air, present both short and long-term health risks to consumers. Due to population pressure, urban agriculture is at times practised in fragile areas such as stream banks and hilltops.

Other risks associated with urban farming include soil erosion, destruction of wetlands and the improper use of pesticides. Data from Zimbabwe for 1996 indicated that in Harare, 8.6 percent of urban farming outside the residential properties occurred near stream banks with an additional 7.3 percent on wetlands.[44] Box 8.4 demonstrates some of the effects of stream-bank cultivation.

Urban agriculture is growing and so is local authorities' tolerance of the presence of crops and livestock in urban areas. Approximately 37 percent of urban households in Mozambique engage in subsistence agriculture, while 45 percent of low income households in Zambia grew horticultural crops or raised livestock around the home or in the city periphery in 1996.[45] In Zimbabwe close to 70 percent of urban residents in the capital Harare practised some form of urban agriculture during the same year.[46] In Maseru, the capital of Lesotho, the rearing of livestock within homesteads for milk production is a common sight.

Urban farming threatens Harare water sources **Box 8.4**

Uncontrolled urban agriculture in Harare is seriously threatening the water sources and the quality of the city's drinking water, environmentalists have warned.

The warning comes at a time when the Harare City Council is struggling to provide clean water to residents due to the shortage of foreign currency to buy chemicals for water purification.

Water sources that are under threat from urban agriculture include Manyame River, and Lake Chivero, water bodies that provide Harare's drinking water.

A lecturer in the department of rural and urban planning at the University of Zimbabwe stressed that raw sewage disposal into water sources by the city council was the main cause of pollution. It is estimated that about 70 percent of the raw sewage finds its way into Lake Chivero.

Takawira Mubvami, a scientific programme co-ordinator with the Municipal Development Programme (MDP), said water pollution is made worse because Harare "sits on its own watershed," resulting in all waste flowing into its water sources.

A 1997 study by ENDA Zimbabwe also noted that urban agriculture posed a serious threat to the urban environment.

"All sites (visited areas) had unacceptable levels of erosion. In addition, almost 90 percent of Harare's farmers use chemical fertilisers and nearly a third of 'off-plot' cultivation takes place near streams, swamps – leading to water pollution through runoff and leaching," said the study.

The use of chemicals results in high nitrogen content in the soil and can promote vegetative growth in the water. In the case of Harare, this has led to the growth of the notorious Water hyacinth weed, which is threatening Lake Chivero.

Mubvami urged farmers to stop using synthetic fertilisers and use organic fertilisers such as manure, which do not pollute water sources.

As a result of the economic problems, the report says, urban agriculture has become an alternative source of food and income for the urban poor. The urban low-income households, affected the most by economic hardships, have sought to supplement their family incomes and improve their family nutrition through urban agriculture.

Several environmental studies have recommended that urban planners should develop policies that enhance sustainable city agricultural development, rather than seek ways to eradicate the practise.

Caiphas Chimhete, *The Standard* 18 January 2004

POLICY RESPONSES

Human Settlements policies are essential in addressing set goals aimed at the eradication of extreme poverty, the promotion of gender equality, and environmental sustainability. These include the Millennium Development Goals (MDGs) and SADC's Regional Indicative Strategic Development Plan (RISDP) targets. Without eradicating poverty, and recognising the heterogeneous nature of the region's populations, issues of inadequate housing and environmental degradation including pollution, will persist.

In southern Africa, a number of policies and strategies are in place as response measures to the many challenges presented by the region's settlement patterns. This is in recognition of the fact that human settlements should be safer, healthier and more habitable, equitable, sustainable and productive.

As part of efforts to address the growing housing shortage, Malawi promulgated a national housing policy while in South Africa an urban development strategy was launched in 2002. In Zimbabwe a policy intended to decongest urban areas was launched in the mid-1980s to encourage the development of rural service centres, known as growth points. However, the policy has not been as successful as expected, due to limited investment and employment opportunities.

Legislation requiring Environmental Impact Assessments (EIAs) prior to development is a feature of most southern African local development plans. The EIAs take into consideration the priorities for integrated environmentally sensitive and socially acceptable development, and have been widely adopted. Maseru, Lilongwe, Maputo, Windhoek, Ekurhuleni and Bulawayo have all put in place local environmental plans which incorporate EIAs.[47] The City of Cape Town has an Integrated Metropolitan Management Policy in 2001, which it is implementing through a number of strategies for tackling air pollution, litter and illegal dumping.[48] In the other regional urban areas and rural communities, bylaws are in place to address issues

of litter, pollution and waste management. However, such bylaws, policies and plans are weakly enforced.

In the global arena, human settlements are receiving unparalleled attention. The UN Conference on Environment and Development in Brazil in 1992, known as the "Earth Summit", is recognised as the landmark occasion when the world acknowledged the importance of the environment for social and economic development.

The second UN World Conference on Human Settlements (Habitat II), in Istanbul in 1996, took this acknowledgement further by recognising the direct and vital contribution that productive and sustainable cities make to social and economic advancement. In particular, Habitat II recognises that:

- Sustainable cities are important for social and economic development;
- Environmental degradation obstructs the development contribution of cities; and
- Environmental deterioration is not inevitable.

In efforts to ensure that they are engines for sustainable development, several cities in southern Africa – including Durban, Dar es Salaam, Windhoek and Johannesburg – have appointed technical working groups to collaborate and help to manage the cities in the areas of finance, settlement planning, waste management, water management, urban agriculture, and upgrading the role of informal sector-based business in the urban economy.

FUTURE CHALLENGES

Improving the quality of life within human settlements is a major challenge for local authorities and governments as well as all other stakeholders. Within settlements, including cities, towns and villages, there is deterioration of conditions that in most cases have reached crisis proportions.

There are challenges of increasing poverty; unemployment; social exclusion; family instability; inadequate resources; lack of basic infrastructure and services; lack of adequate planning; growing insecurity and violence; environmental degradation; and increased vulnerability to disasters; and high population growth rates.

The settlements in the SADC region are heterogeneous and reflect the various levels of industrialisation and economic development within the region. The challenges of dealing with poverty and environmental problems related to urban squalor arise in virtually all of the settlements regardless of the economic development status of the countries. Cheap finance for the economically disadvantaged groups continues to dwindle while demand for basic needs such as housing continues to rise.

Local authorities have made efforts to deal with the provision of basic services for their ratepayers. Where these basic services (access to water and sanitation) have been dealt with, the problems of dealing with disposal of waste collected has sometimes remained. Improvement on the amount of solid, liquid and hazardous waste properly collected and disposed of is therefore the next challenge for local governments.

Ensuring that cleaner production methods are used as the SADC countries industrialise is yet another challenge.

Air pollution will continue to be a growing concern in southern Africa's urban areas. This calls for national and provincial governments to work together with local authorities to adequately enforce the anti-pollution laws already in place in most countries, cities and towns.

Perhaps the greatest challenge to the SADC region is the need to strengthen local governments' capacity to generate employment and increase the revenue base. This is important in stemming the growing challenge of rural-urban drift that stretches the local authorities' ability to provide adequate services.

National governments should also require, and support, local governments to improve their reporting on all aspects of the environment within their settlements. National departments responsible for the collection of statistics should ensure the inclusion of environmental statistics during any data collection exercises. While national

economic statistics and even citywide economic statistics are available, there appears to be a lack of environmental data at the city level.

HIV and AIDS is another challenge that requires local authorities to support national and regional efforts in managing the pandemic. Urban areas are particularly affected by HIV and AIDS and the demand for health facilities overstretches the services available.

The development challenge for the SADC region is to ensure that both rural and urban development takes place in an interdependent manner. Improvement of settlements in the form of adequate infrastructure, public services and employment opportunities should not be for the urban areas alone, but should be extended to rural areas to ensure they remain attractive.

LINKAGES

Chapter 1: Regional Overview
The state of human settlements defines the socio-economic status of individuals, countries and the region. Well-planned human settlements are important for effective and efficient provision of services and infrastructure development.

Chapter 2: Land
Land is a key factor in the provision of human settlements. The pattern and extent of settlements are important factors in defining the land-use types, as well as in worsening or reducing land degradation.

Chapter 3: Atmosphere
Human activities are a major cause of atmospheric pollution. Air pollution tends to be bad in areas with dense settlements such as urban areas. The clearance of land for human settlement often results in the destruction of forests, and reduces the capacity of the forest to act as carbon sinks.

Chapter 4: Freshwater Resources
Expansion of human settlements, particularly urban and refugee settlements, bring wastewater disposal challenges. In rural and agricultural settlements, the expansion also results in the shrinking of wetlands.

Chapter 5: Marine and Coastal Resources
Coastal and marine settlements are hubs for industrial and commercial activities in the region. However, the expansion of such settlements threatens habitats and modifies coastal ecosystems.

Chapter 6: Forests and Woodlands
Expansion of cities as a result of rural-urban migration leads to greater clearance of forests and woodlands. This reduces habitat for both endemic and introduced species.

Chapter 7: Wildlife
Wildlife conservation initiatives in rural settlements through Community Based Natural Resources Management are key to maintaining the region's rich flora and fauna.

Chapter 9: Scenarios
As urban settlements grow, pressure on basic amenities increases and the number of slums and unplanned settlements also increases. These changes have negative effects on the surrounding environments.

ENDNOTES

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2 UNCHS, *Basic Facts on Urbanisation*, 2001; see Table 8.3 below
3 UNHCR, *2002 Statistical Yearbook*
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OUTLOOK 9

The current state of the environment of southern Africa poses challenges for sustainable development. The creation of a sustainable development strategy requires insight into both the present and the future. Since the future is technically unknown there is need to develop mechanisms and methodologies to facilitate greater understanding.

Chapters 2-8 describe southern Africa's environment outlook, showing the interplay between the driving forces, pressures, impacts and responses as they shape the state of land, atmosphere, freshwater, marine and coastal resources, forests and woodlands, wildlife, and human settlements in the region.

Based on the analysis contained in the previous chapters, Chapter 9 looks back to find the direction that southern Africa has been taking and to project the direction in which it is moving. The chapter explores, compares and contrasts different scenarios regarding the future development of the southern African environment.

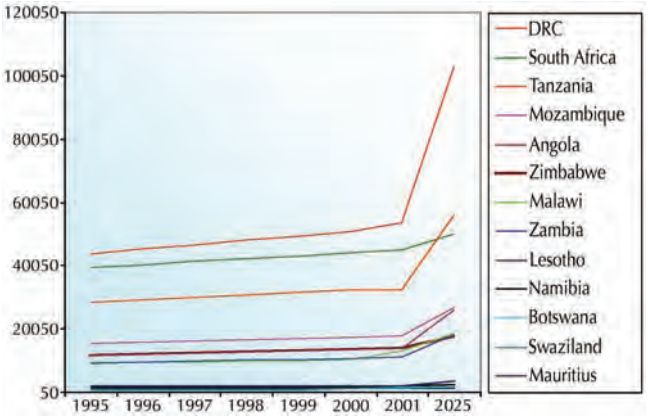
CURRENT TRENDS

Trends are about current positive or negative impacts on sustainable development. Barring unlikely processes such as earthquakes and major wars, the only factor that remains constant over the next decade is the geo-political boundaries. Everything else including the state of land, water and atmosphere will change and adapt to both natural and artificial phenomena. Trends in key driving forces such as population dynamics, economic events, social condition, settlement patterns, technological developments and governance determine the future state of the environment.

Population dynamics

With 132 million people in 1995,[1] the Southern African Development Community (SADC) represented 3.1 percent of the world population.[2] With the inclusion of the Democratic Republic of Congo (DRC) and a growth rate of three percent, the region's population grew to 197 million by 2000,[3] representing 3.3 percent of the world population,[4] and to 218 million in 2004. Madagascar joined SADC in 2005,[5] thus adding 17 million people to the SADC population, which was estimated at almost 240 million in 2005

Population Trends in Southern Africa, 1995–2025 **Figure 9.1**



SOURCE Hirji, R., et al., *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, SADC and partners, 2002
Population figures 1995 from *SADC Statistics: facts and figures*, SADC, 2000

and projected to reach 357 million by 2025.[6] This is illustrated in Figure 9.1.

The present and future population of southern Africa will determine environmental trends, through the decisions and actions taken. In most countries of the region, more than 40 percent of the population is under 14 years of age, implying a high dependency ratio and an expanding adult population in the future.

Three major trends are evident in the population dynamics of southern Africa:

- The population expands rapidly over the next 10 years;
- The demographic structure of society places a great burden on national economies due to the youthful population resulting in a high earner-dependent ratio, and subsequently an expanding and ageing population that requires jobs and health services; and
- The greatest urban growth takes place in small urban centres where people are dependent on agriculture and agro-industries for livelihoods as these are the dominant economic activities.

Southern Africa's population trends are affected by child mortality rates, which vary throughout the region. In 1980 the regional average child mortality rate was 83 per 1,000 births. This declined to 73 per 1,000 births by 1998. Despite this positive trend, which had then become better than the world average of 79 per 1,000 births, child mortality rates have started to deteriorate. The average child mortality rate for southern Africa reached 91.3 per 1,000 live births in 2001.[7]

Several factors are responsible for the deteriorating child mortality rates, including:

- The emergence of more virulent strains of malaria and cholera;
- Deteriorating health services due to cuts in health budgets; and
- The spread of HIV and AIDS through out the continent, with southern Africa being the hardest hit region in the world.

While some analysts predict that HIV and AIDS will cause a decline in population growth rates and even reduce the actual population, demographers argue that HIV and AIDS will have little effect on total population growth due to high fertility rates in the region. However, economic growth may slow down due to loss of skilled and unskilled labour.

Economy

The economies of southern African countries reflect three distinct characteristics. The countries have a small commercial manufacturing sector, based mostly on the extraction and export of natural resources (minerals, forestry, agriculture and tourism). They also have a large subsistence sector, as well as a rapidly growing service sector.

This dependence on the extraction and export of natural resources makes the economies of these countries vulnerable to global economic fluctuations, especially in mineral and commodity prices. If not handled properly, the extraction of natural resources can damage the environment.

The contribution of manufacturing to GDP has been declining since 1990. The regional average for 1990 was 20.8 percent, and this declined to 17 percent by 1999.[8]

Economies continue to follow a framework in which surplus from the primary sector, complemented by foreign aid, is converted to import goods and services. There are a few exceptions, particularly in Mauritius, South Africa and Zimbabwe where the manufacturing industry is well developed. However, the nascent industrial sectors in

these countries face stiff competition, especially from Asia.

The poverty reduction strategies (formerly structural adjustment programmes) imposed on countries in the region by international financial institutions have led to a marked decline in formal sector employment, largely as a result of retrenchments in the public and private sectors. This is coupled with a rapid expansion of the informal sector, a decline in real wages, and unemployment. The informal sector absorbs a large percentage of the labour force – up to 70 percent in Zambia, more than 45 percent in Zimbabwe, and 35 percent in Malawi.[9]

If present trends continue, the region's economic growth will not generate enough jobs and reduce poverty. In 1975-84, regional GDP growth averaged 3.1 percent. This improved to five percent in 1985-89, declined to 2.6 percent in 1990-98,[10] and has generally continued with recovery since 2000, with exception of Zimbabwe, as illustrated in Table 9.1.

The requisite GDP growth rates to achieve targets set out under the Millennium Development Goals (MDGs) might be achieved if the economies of post-conflict countries such as the DRC and Angola are successfully restructured, the debts of highly indebted poor countries, including Mozambique and Zambia, are genuinely and substantially relieved, and the region's economies are well managed.

Southern Africa is highly indebted. Debt has become a barrier for many countries in the region as they spend more on servicing debt than providing basic social services. The region's total debt was $78.535 billion in 1994,[11] and grew to $96 billion in 1999.[12]

Social profile

Considerable progress has been made in the improvement of social indicators across the region, although this can still be improved. The level of illiteracy among the age group of 15 and above declined from 29 percent in 1994 to 25 percent in 1999. This is a comparatively positive development given that during the same period, in the whole of Africa, illiteracy levels averaged 46 percent and 40 percent, respectively.[13]

Social development in southern Africa manifests itself in many dimensions, cutting across poverty and the huge disparity in standards of living, as well as issues of access to facilities and social security. One of the basic indicators for social development is access to sanitation and safe water. As of the year 2000, 75 percent of SADC's population had access to sanitation compared to the global average of 60 percent.[14]

There are declining trends in water availability in southern Africa due to population

GDP Growth Rates in SADC Region **Table 9.1**

Country	Year and % Growth								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Angola	11.5	14.2	3.6	4.0	2.7	3.9	5.2	13.0	5.2	-
Botswana	3.1	6.6	7.0	8.0	4.2	8.6	2.1	6.7	4.0	-
DRC	1.6	0.9	-6.4	-3.5	-5.0	-7.0	-2.0	3.5	5.6	6.6
Lesotho	4.3	10.0	8.1	-4.6	2.0	1.3	3.2	3.5	3.1	3.1
Madagascar	-	-	3.7	3.9	4.7	4.8	6.0	-12.7	9.8	5.3
Malawi	13.5	10.5	6.6	3.3	4.2	0.8	-4.1	2.1	3.9	4.6
Mauritius	5.6	5.8	5.8	5.8	3.4	-	2.8	2.1	3.8	4.8
Mozambique	3.3	6.8	11.3	12.1	9.0	1.9	13.1	8.2	7.9	7.5
Namibia	3.6	2.1	2.6	3.0	2.9	3.5	2.4	2.5	3.7	5.7
South Africa	2.9	4.2	2.5	0.6	1.2	4.2	2.7	3.6	2.8	3.7
Swaziland	2.7	3.6	4.0	2.7	2.0	2.0	1.7	2.8	2.4	-
Tanzania	3.6	4.2	3.3	4.0	4.8	4.8	5.8	6.2	5.7	6.7
Zambia	-2.3	6.6	3.3	-1.9	2.4	3.6	4.9	3.3	5.1	5.4
Zimbabwe	-0.6	8.7	3.7	2.5	0.5	-4.9	-8.4	-5.6	-13.2	-8.2

SOURCE SADC, *SADC Statistics: facts and figures 2004* http://www.sadc.int/english//memberstates/facts_figures/index.php
Madagascar, Institut National de la Statistique, 2006 http://www.instat.mg/

Increasing pressure on water resources **Table 9.2**

Country	Annual renewable water resources (cu km/yr)	Population pressure on water availability (people/M cu m/year)			
		1995	2000	2004	2025
Angola	184	63	73	82	141
Botswana	14.7	99	112	116	154
DRC	1019	43	51	58	101
Lesotho	5.2	371	412	449	654
Madagascar	337	41	45	50	87
Malawi	18.7	501	560	638	1000
Mauritius	2.2	510	539	560	641
Mozambique	216	71	80	88	124
Namibia	45.5	35	42	44	54
South Africa	50	790	848	932	1003
Swaziland	4.5	202	223	245	400
Tanzania	89	319	358	397	630
Zambia	116	78	85	95	158
Zimbabwe	20	576	585	595	870

This is total water available for all purposes, including industry, agriculture and the environment as well as domestic use, in million cubic metres (M cu m).
SOURCE Hirji, R. et al, *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*, 2002, Table 2.1
Updated using population figures from SADC, *SADC Statistics* 2004

pressure, as Table 9.2 shows. Increasing pressure on water resources could negatively affect gains made in the provision of safe water and sanitation facilities.

Poverty is another critical social factor affecting the current and future state of the environment. It is estimated that 40 percent of the region's population lives below $1 a day,[15] and the number of poor people is growing. For southern Africa to halve the number of people living in conditions of poverty from 1990 levels by 2015 as envisaged under the MDGs, a consistent economic growth rate of above seven percent is required. Given that the region is mainly dependent on the extraction of natural resources, the impact on the environment could be high. Poverty remains both a cause and an effect of environmental degradation.

Information Communication Technologies

Rapid changes are taking place in information and communications systems, ranging from satellite dishes to fibre optics, faxes to Internet (the fastest growing consumer service the world has so far experienced). Information Communication Technologies (ICTs) provide an opportunity to eradicate poverty and to raise awareness on the dangers of environmental degradation, as well as a challenge to improve productivity and competitiveness. The region is yet to make full use of ICTs.

While progress has been made in connectivity for urban areas, much still needs to be done to connect the rural areas. On average, the region has a low penetration of personal computers and a low density for fixed-line telephones. Internet access is expanding rapidly and growth in use of mobile phones is spectacular, in southern Africa and elsewhere on the continent (projected to reach 150 million users in Africa by year end 2007), while ICT infrastructure still lags behind. (see Box 9.1)

ICTs Development in Africa **Box 9.1**

Internet access

Access to the Internet has expanded rapidly, growing from 5.1m users in the year 2000 to more than 12m users at the end of 2003. The proliferation of Internet cafes in the cities has been a factor in achieving this growth. In outlying areas, access is still hindered in greater part, by the expensive infrastructure provided by monopoly fixed line operators.

Mobile phones

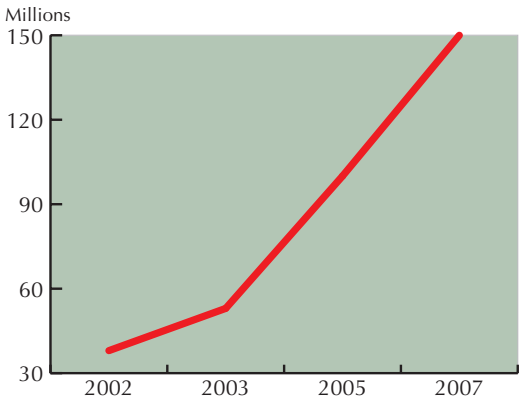
The star performer in African ICT is mobile phones. At the end of 2002 there were nearly 38 million mobile phones on the African continent. A year later, 53 million phones were in operation. Over the past few years, the growth in mobile phones in Africa has been truly spectacular considering that there were only a few thousand such phones on the continent less than ten years agro. The estimate for the end of 2005 was 100 million, while that for the end of 2007 is 150 million.

ICT infrastructure

The main motivation, the driving force, for future development is the need to make services available, to make them affordable and to make them ubiquitous. At the continental level we expect significant medium-term and long-term investments to result from implementing the NEPAD ICT programme. The key priorities of this programme are to accelerate the development of ICT infrastructure and to achieve the critical mass of ICT skills in the African population through implementing the NEPAD e-Schools initiative.

SOURCE Chasia, H., *NEPAD and ICTs in Africa: The Development Agenda*

Mobile phone users in Africa **Figure 9.2**



Settlement patterns

Southern Africa is witnessing high rates of urbanisation, ranging from three to six percent per year. As a result, the region is facing problems as follows:

- Outstripping of the capacity of municipal and central governments to provide necessary services and infrastructure;
- A growing number of slums and unplanned peri-urban settlements; and
- Poor waste and garbage collection.

Despite much of the urban growth being attributed to rural-urban migration, southern Africa's rural areas are still being populated. Serious problems are ensuing due to the growth in rural population. For example, in some countries, agrarian production systems are not developing quickly enough to adapt to the decreasing per capita land area. Increased production is achieved only by using natural resources such as water, land, forest and pasture.

Also important in discussing the region's settlement patterns is the fact that southern Africa has been hosting large numbers of refugees, mainly from the Great Lakes region, as well as shared refugees and internally displaced persons between neighbouring countries.

The process of repatriating refugees and resettling people who are displaced is long and expensive. Being largely rural and concentrated, the settlements of refugees and displaced people tend to depend on the natural environment for food, energy and medicines, among other needs. According to the *GEO Year Book*,[16] the DRC has both refugees and internally displaced people, Angola has displaced people, while Zambia and Tanzania have refugees only.

Governance

The people of southern Africa have always had close traditional ties to their environment, using natural resources for their sustenance and development. Such environmental rights were usurped under colonialism when access to land and other resources was removed. However, environmental rights have come to the fore in the region following democratisation processes that resulted in independence. Some countries, including Malawi, Mozambique, Namibia and South Africa have environmental issues in their Constitutions as illustrated in Box 9.2.

Environment: What some Constitutions say **Box 9.2**

Malawi. Article 13 of Chapter III (Fundamental Rights) commits the State to actively promote the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation aimed at, *inter alia*, managing the environment responsibly in order to "accord full recognition to the rights of the future generations by means of environmental protection and the sustainable development of natural resources."

The State is also obliged to prevent the degradation of the environment, provide a healthy living and working environment for the people, and conserve and enhance the country's biodiversity.

Mozambique. The Constitution obliges the State to promote efforts to guarantee the ecological balance, conservation and preservation of the environment. Article 72 (Fundamental Rights, Duties and Freedoms) states that Mozambican citizens "shall have the right to live in a balanced natural environment, and shall have a duty to defend the same."

Namibia. Article 95 (Promotion of the Welfare of People) refers to the maintenance of ecosystems, essential ecological processes and biodiversity of the country, and use of living natural resources on a sustainable basis for the benefit of all Namibians both present and future. In particular "the government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory."

South Africa. The Constitution stipulates that every person shall have the right to "an environment which is not detrimental to his or her health or well-being." Section 175, Subsection 3, extends this right to local governments. "A local government shall, to the extent determined in any applicable law, make provisions for access by persons residing within its area of jurisdiction, to water, sanitation, transportation facilities, electricity, primary health services, education, housing and security within a safe and healthy environment, provided that such services and amenities can be rendered in a sustainable manner, and are financially and physically practicable." The Constitution also provides for the restitution of land rights.

SOURCE Dalal-Clayton, B., *Southern Africa Beyond the Millennium*, 1997

There is also a growing trend towards awareness creation and community involvement. Community involvement has the potential to serve as a direct deterrent to the abuse of environmental rights. However, communities can only fully participate in development if they have full access to information. Globally there is a growing trend towards increased institutional transparency through "rights-to-information" legislation.

SCENARIO NARRATIVES[17]

Adapting the scenario-building processes for UNEP's *African Environment Outlook* (AEO) and *Global Environment Outlook* (GEO), and also drawing on previous SARDC scenario-building exercises, three scenarios are developed here for southern Africa based on the current trends. Box 9.3 gives a description of the scenario-building process.

The scenarios presented include Market Forces, Policy Reform and Fortress World. The scenario building exercise was concluded through a workshop, which discussed the implications of each scenario on the various environmental thematic areas discussed in the previous chapters.

Scenario formulation **Box 9.3**

The term "scenario" is borrowed from a Latin word *scaenarium,* and is used in theatre meaning a place for erecting stages. However, a more specific and fitting definition defines scenarios as plausible accounts of future events against which one can test ideas, or check assumptions.[18]

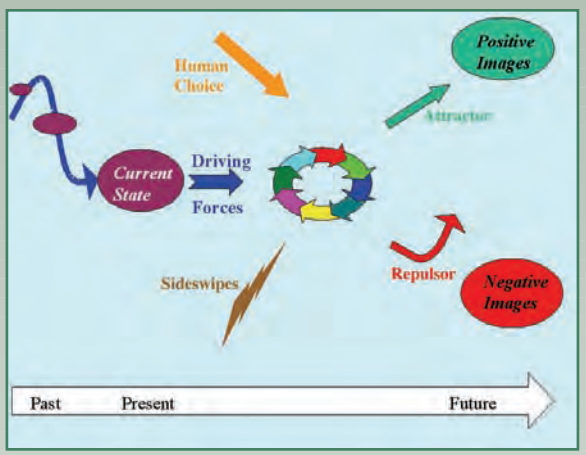
The need to assess long-range environmental issues poses significant methodological challenges. As the time horizon expands from years to decades, conventional techniques, such as trend analysis and mathematical modelling, become inadequate.

Insufficient information on both the current state of a system and on forces governing its dynamics lead to uncertainties over possible future states. The future is also unpredictable because it is subject to human choices that have not yet been made.

The figure shown sketches major features governing the future state of environmental systems. The *current state* of the system is the outcome of a historical process that is driven forward by a set of *driving forces*. These forces condition, but do not determine, the future path of a system. Moreover, the capacity of human beings to imagine alternative futures and act intentionally means that images of the future can act as *attractive* and *repulsive forces* in shaping a scenario.

Attractive attributes of future states might include their consistency with sustainability principles. Negative images can play an important role as well, in raising awareness and guiding efforts to redirect the environmental system away from perilous conditions. In addition, there is the possibility that surprises and extreme occurrences — called *sideswipes* in the figure below — could affect development.

From a sustainable development perspective, scenarios would be encouraged to minimize vulnerability of societal and environmental systems to unfavourable events and enhance their resilience.



Scenario formulation generally involves the following steps.

- The *boundary* of the analysis is specified in several senses — spatially (southern Africa, for this analysis), thematically (environmental sectors and issues), and temporally (the time horizon of the analysis, which in this case is 10 years forward looking and 10 years retrospective).
- *Current state* is described across a range of dimensions – economic, demographic, environmental, institutional and so on.
- The important *driving forces and trends* that are currently conditioning and changing the system are introduced.
- A *narrative*, or story line, provides the plot by which the scenario develops.
- An *image of the future* paints a picture of conditions at one or more points in time.

SOURCE UNEP, *Africa Environment Outlook*, 2002

1 Market Forces Scenario

The Market Forces Scenario assumes that world development evolves in an increasingly integrated fashion, both economically and culturally. Globalisation of labour markets is catalysed by free trade agreements, unregulated capital and financial flows, and information technology. The SADC Trade Protocol, together with the World Trade Organisation, provides the legal basis for the regional trading system. Governments advance a package of policy adjustments, which include modernisation of financial systems; investment in education to create a workforce that is competitive in the emerging global market; privatisation; reduced social safety nets; and in general, reliance on market-based approaches for development.[19]

The region adopts policy reforms promoted by the World Bank and the International Monetary Fund (IMF), resulting in the restructuring of economies through a combination of tight fiscal and monetary policies. The objective is to limit budget deficits and to allow market-determined interest rates, more free trade, capital flows and unhindered foreign direct investment.

The reforms also include privatisation of state enterprises, extension and consolidation of private property rights, and a shift in public expenditure away from subsidies.

According to UNEP,[20] the assumptions of the Market Forces Scenario may be summarised as follows:

- The dominant western model of development prevails, with the spread of consumerism/materialism and individualism;
- Policies promoted by international financial institutions are adopted, and they are found to have positive impacts on aggregate growth as the scenario progresses;
- The most effective poverty reduction strategy is seen as growth promotion, broad-based, that will trickle down;
- Effective institutions will emerge and spread;
- Economic growth will contribute to recover the environmental damage incurred as a result of development; and
- An active policy-making environment is in place, but the policies tend to be market-based.

Other literature[21] calls the Market Forces Scenario, the "fat-cat haven" scenario, representing a strongly market-driven scenario where economic considerations are dominant in all spheres of development and governance. Regional cooperation and integration is successful, but with strong economic drivers.

Potential outcomes in such a scenario include increasing influence of global economic forces and the private sector; stronger systems of regulation and enforcement; strong national and regional growth agendas; inequality in levels of human development; intensified rural-urban disparity; unrest among marginalized and disgruntled civil society; looming environmental disaster; and research and development bias towards economic priorities.

Environmental consequences of Market Forces Scenario

Atmosphere

Southern Africa is characterised by stable atmospheric conditions in winter. During this period temperatures are low, causing thermal inversions which trap emissions from industry, cars, homes and wild fires. This results in a substantial decline in air quality. In summer, the temperatures are warm, rainfall is variable and at times punctuated by cyclones.

While all countries of southern Africa have laws to control air pollution, the state of air pollution is not well known, although the situation in South Africa is worrisome.[22] In some countries air pollution is treated as a health and not an environmental issue such that monitoring and enforcement are a problem.

The continued use of wood fuel coupled with a rapid growth in industry and vehicle emissions result in an increase in greenhouse gas emissions and a marked decline in urban air quality, particularly in winter. In South Africa and Zimbabwe, the growth in coal-fired power stations further worsens localised decline in air quality. As a result the incidence of acute respiratory infections and other related diseases increases.

Despite the economic opportunities created under the Market Forces Scenario and international conventions such as UN Framework Convention on Climate Change and the Kyoto Protocol, to which all SADC countries are party, southern Africa remains vulnerable to imperfections in the provisions of international treaties governing climate. The region acts to protect its limited gains in industrialisation as these fledgling industrial sectors are considered essential to further economic and social development.

The issue of tradable carbon credits remains controversial and of little benefit to the region. Southern Africa also remains vulnerable to the effects of climate change, notably the increased incidence of droughts and floods, adverse changes in rainfall patterns, and the spread to new areas of water-borne diseases such as malaria.

The continued depletion of the ozone layer continues to cause health problems such as skin cancers. This is despite the gradual phasing out of ozone depleting substances in line with the Montreal Protocol. Old and polluting technologies are not quickly replaced, while the use of ozone depleting substances such as methyl bromide, continues due to lack of cheaper and more effective alternatives.

Land

Land is used in the most economically efficient way, especially in agriculture. In order to develop an export-led market economy, better quality agricultural land is used for producing cash crops. Such agricultural production increasingly falls under the control of multi-national companies, which have both financial resources and access to markets in order to make these ventures viable. Decisions about agricultural production become determined by external forces, in particular global markets.

With more of the better quality land being devoted to export agriculture, the growing numbers of rural poor are forced to use more marginal lands for subsistence. Those lands that would

normally require substantial technology and inputs in order to ensure sustainable use end up being used by those who are least able to supply the necessary inputs. Without technological and input support, soil erosion and nutrient loss occur in the marginal lands, leading to a reduction in soil fertility, and an increase in the siltation of rivers and dams.

Soil erosion is probably the most important factor in the decline in rural agricultural productivity in southern Africa, degrading about 15 percent of the region over the last three decades.[23] This trend is likely to continue over the next decade due to population pressure, skewed land tenure systems and increasing demand for land.

A more serious trend, resulting partly from soil erosion, is the decline in per capita food production. Southern Africa has produced net food surpluses for many years, but the region faces net food deficits well before 2015 due to new focus by farmers on non-food cash crops such as flowers, tobacco and cotton. Promises offered by new seed varieties and improved agricultural technology fail to catch up with population growth. Due to local warming in the region and higher atmospheric carbon dioxide concentrations as a result of climate change, there is faster growth and higher yields of crops per unit of water used. However, yield quality suffers as a result of shorter growing seasons.

The drive to increase economic returns leads to a diversification of land uses. As tourism is a fast growing industry in the region, some land continues to be set aside for this foreign-currency-generating land use pattern. The prospect of employment also attracts increasing numbers of people to areas of tourism development, resulting in concentrated pressures in attractive areas. The lack of skills among these migrants limits opportunities forcing many into hawking, and manufacturing of crafts and curios. This gradually diminishes the attractiveness of some tourist locations.

Forests and woodlands

There is growth in the demand for forest products. However, a large number of people are marginalised due to their inability to pay for goods and services. Forest industries are compelled to seek export markets in view of a low domestic demand stemming from low purchasing power.

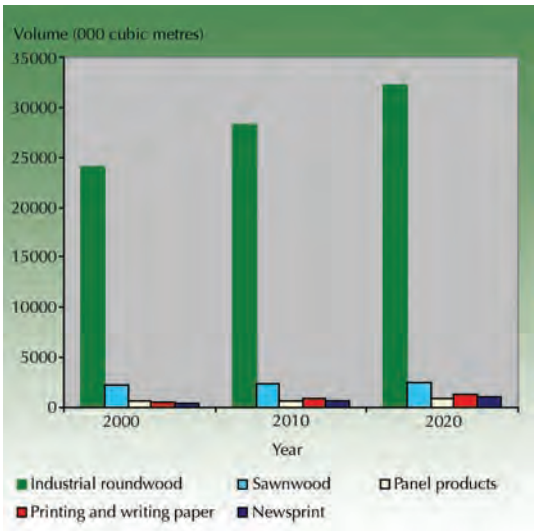
There is growth in technological development focused mainly at increasing the competitive advantages of investors, while areas critical to the well-being of people are neglected.

Wildlife

The dominant trend affecting terrestrial biodiversity continues to be the fragmentation and loss of habitats, resulting mainly from land use changes. The associated disruption of ecosystem integrity and reduction in population of some species alters the conditions necessary for the survival of others. Similar changes occur in aquatic ecosystems as a result of river impoundments, sedimentation and prolonged isolation of water bodies caused by droughts.

The loss of ecosystem integrity results in habitat change for some disease vectors including mosquitoes. Mosquitoes extend

Trends in the Production of Wood and Wood Producton **Figure 9.3**



SOURCE Rytkonen, A., *Wood and Wood Product Supply and Demand in Africa to 2030*

their range southwards and westwards into Namibia and northern South Africa. The greatest negative impacts of loss of habitat due to climate change are on ungulate habitats of grassland savannas where species richness declines. For example, the arid highlands of Botswana, Namibia and Angola become unsuitable for springbok and Hartmann's mountain zebra.[24]

The widespread undervaluation of biodiversity, and differing perceptions within society of the economic, environmental and cultural values of biodiversity continue to stifle both national and international conservation efforts. People and organisations from outside the region continue to play a role in conservation efforts. As a result, trade in wildlife and their products, as well as other biological resources, remains a hotly contested issue, even though the region may argue that this would generate resources for conservation.

Eco-tourism continues to grow, with efforts to ensure the expansion of benefits to local communities. Community-based natural resources management, currently focused on wildlife, gradually expands to communities that rely on freshwater, coastal and inshore marine resources.

The spread of alien species increases pressure on indigenous species, and contributes to the gradual loss of biodiversity. Extensive monocultures reduce on-farm agro-biodiversity. The resulting loss of natural predators, together with other disruptions to ecosystem integrity, creates conditions for widespread outbreaks of pests and diseases.

Concerns over the development and release of Genetically Modified Organisms (GMOs), and the resulting risk of genetic pollution of indigenous species are overridden by commercial pressures. This threatens agro-biodiversity, especially in areas where farmers rely on maintaining a mix of species and races as a hedge against annual and seasonal variations in farming conditions. The release of GMOs encoded with terminator genes worsens the situation by ensuring that on-farm seed production is non-viable.

Despite being a rich ground for bio-prospecting, lack of technical knowledge and skills means that much of the bio-prospecting is carried out by scientists from overseas. Bio-piracy remains an issue, with benefits of conserving biodiversity being inequitably shared. Royalties continue to accrue to multi-nationals rather than to the countries of the region. However, efforts by the region to develop its own gene pool through the SADC Gene Bank continue to strengthen.

Freshwater

As a result of the growing population, the availability of water declines overall. Disparities between rural and urban areas become more pronounced, with water access in urban areas increasing while in rural areas it declines.

Demand for water increases across all sectors of the economy, leading to further water scarcity. There is more competition and disputes over available water, both within and among economic sectors.

The SADC Revised Protocol on Shared Watercourses and the discussions around a regional water policy and strategy see growth in water sharing arrangements between water-rich and water-poor countries.

In an attempt to meet the rising demand for water, South Africa and Zimbabwe invest more in tapping groundwater while in neighbouring countries more dams are built. However, as more dams are built, there are fewer natural rivers, resulting in substantial losses in habitat.

In the major cities of Kinshasa, Johannesburg, Cape Town, Maputo, Dar es Salaam, Lusaka, Harare, Windhoek and Luanda, there is a marginal increase in the proportion of water that is recycled. In Mauritius and Seychelles the desalinisation of water is considered a supplement to freshwater sources.

In the absence of sound environmental management, water pollution through increased industrial and agricultural activities, leads to higher levels of eutrophication and the continued spread of waterweeds such as the Water hyacinth and the Kariba weed. Microbial contamination and waterborne diseases may also increase.

Coastal and marine resources

Coastal and marine resources are put under increasing pressure due to their aesthetic, biological and economic richness. Environmental degradation characterised by the loss of coral reefs and mangroves, coastal erosion, pollution and the depletion of fish stocks become widespread in areas where development is unregulated.

In some areas such as Cape Town and sections of Maputo, careful coastal zone planning is maintained, resulting in high environmental quality. This creates opportunities for properly managed tourism development, resulting in greater incentives and the generation of income for managing coastal and marine resources.

Human settlements

The proportion of people living in urban areas and the rate of urban population growth both increase. The number of cities with populations of over one million also increases. The growth in urban populations is driven mainly by the migration of people from rural areas, who come to towns to seek employment and opportunities outside agriculture. A disproportionate number of these immigrants are mostly young male adults.

The rate of urban population growth initially outstrips the capacity of municipal authorities to provide the necessary services and infrastructure, so that the number of slums and unplanned peri-urban settlements increases. These changes have negative effects on the environment in the vicinity of towns, which provides firewood for the increasing numbers of urban poor people.

Ultimately the generally negative effects of urbanisation are offset to some extent. As the cities grow, the proportion of the population with access to electricity, piped water and sanitation also increases. Over time the positive effects on the environment are further enhanced by a marginal decline in the ratio of people living in poverty in slums and other unplanned settlements.

2 Policy Reform Scenario

The assumptions of the Policy Reform Scenario may be summarised as follows.

- It is similar in many ways to the Market Forces scenario;
- It is based on a set of social and environmental goals adopted at global, continental, regional and national levels. These include the MDGs, the Johannesburg Plan of Implementation from the World Summit on Sustainable Development (WSSD), the New Partnership for Africa's Development (NEPAD), and the SADC Regional Indicative Strategic Development Plan (RISDP);
- There is an emergence of the political will to constrain and guide market-driven growth with a comprehensive set of sustainability policies;
- Policy initiatives for achieving goals are regionally differentiated, but include a mix of economic reform, regulatory instruments, voluntary actions, social programmes and technological development;
- The "western" model still prevails, and "western" values still spread;
- There is less trust in automatic positive results from markets, and more emphasis on targeted policies.

Environmental consequences of Policy Reform Scenario

Atmosphere

Increased economic development sees none of the countries in the SADC economic block being classified as highly indebted. There is increased manufacturing causing serious, but localised, air and water pollution.

Stringent measures to curb pollution are introduced through a regional protocol on air pollution. At the country level, the "polluter pays" principle is strictly enforced, while in South Africa where pollution is more serious, trade-in pollution per-

mits are introduced. Pollution gradually decreases as permits become more expensive, making the products of polluters more costly and less competitive.

Improvements in early warning systems result in the region being better prepared to handle climate variability. The impacts of climate variability are reduced as new technologies produce seed varieties that can withstand variable climate conditions.

Land

Land reforms are guided by principles of good governance and a tax system in order to maximise productivity and profitability, leading to equitable land distribution. Cash-crop farming is predominant. The region engages in farming activities in which it has comparative advantages. Food security is achieved through regional trade.

Land-based, rural agro-industries are key to poverty alleviation. The land resource base is seen as key to reducing by half the number of people living in poverty by 2015.

Besides the land reforms, efforts to curtail land degradation are increased. In particular, the Sub-Regional Action Plan complements National Action Programmes in combating desertification, as well as reducing soil erosion.

Freshwater

Although an increasing population exerts pressure, particularly on water and land resources, the introduction of integrated water resources management ensures that the needs of the people are adequately met, even though the resources available are much reduced compared to 1994.

Water distribution networks are upgraded in order to minimise water losses. Appropriate technology enables local authorities and the private sector to monitor water distribution, thus ensuring that burst water pipes are repaired as soon as leakages occur. Water piracy along distribution lines is also reduced due to heavy penalties. A complete mapping of urban groundwater supplies, using the latest geographical information systems technology enables authorities to monitor excessive water abstraction and enforce punitive tariffs.

Irrigation equipment is improved so as to reduce water losses through seepage and evaporation. This enables the intensification of agricultural production throughout the year.

There is proper accounting and valuation of water, resulting in water use efficiency and conservation, but restricting the supply of water to the poor unless heavily subsidized, especially where water delivery is privatised. The effects of water scarcity are less prominent, however, as consumers can no longer afford to be wasteful, especially in urban areas, as the resource is charged at commercial rates.

Wildlife

The region invests more in bio-prospecting, resulting in more species being identified and placed under protection. A lot of interest is generated in research on the region's biodiversity as this area becomes highly rewarding both financially and in terms of international acclaim. The Southern Africa Biodiversity Strategy raises greater awareness on biodiversity.

Much of the region's tourism is natural resources based. A fee to support the SADC Gene Bank, research and bio-prospecting is levied on all tourism receipts.

A major boost in the conservation of biodiversity comes from the Protocol on Shared Biological Resources, which regulates use, management and movement of wildlife in transfrontier conservation areas. As a result new transfrontier conservation areas are put in place, and tourism promoted.

Forests

There are more alternative forms of energy, resulting in a reduction in the dependency on fossil fuels. Public and private power utilities compete to provide electricity, making the service more efficient. The Southern African Power Pool provides a reliable infrastructure for conveying electricity. The demand for charcoal and firewood, which are more expensive than electricity, falls. The rate of deforestation is reduced considerably.

Clean energy sources such as hydro-power are supplemented by micro-energy sources such as wind, solar and biogas. This is supported through policies that support funding research and development of such micro-energy sources.

New technologies that are less polluting are found for fossil fuels such as coal, making thermal power generation more environment friendly.

Human settlements

The pace of urbanisation remains high. However, the provision of social services is privatised, resulting in adequate waste disposal in urban areas, at a cost, and the reuse of all recyclable waste.

The provision of services such as clean water, become equally available in both urban and rural areas, as a result of improvements in infrastructure. This region surpasses one of the MDG goals of halving the number of those without access to safe water by 2015. Tax and other incentives encourage investment in both rural and urban areas. As a result, most rural areas have access to piped water.

Investment in rural areas helps to diversify the agrarian economies, dominant in most parts of the region. This helps to avoid the use of fragile ecosystems for agricultural land. Rural-urban migration is slightly reduced.

3 The Fortress World

The failure by southern Africa and the world at large, to heed the need for strong policy reforms on the environment leads to a state of complacency, with governments retreating from social concerns and responsibilities. In such a situation, development declines as poverty rises. Environmental conditions deteriorate as pollution, climate change and ecosystem degradation interact to amplify the crisis.

Environmental degradation, food insecurity and emerging diseases foster a major health crisis. The affluent minority is alarmed by rampant migration, crime, terrorism and disease, and reacts with sufficient cohesion and strength to impose an authoritarian "Fortress World", where they flourish in protected enclaves in rich nations and also in strongholds in poor nations.

In southern Africa, there was optimism at the turn of the 21st century. Significant economic, social and political progress was made over the past decade. However, such optimism, and the improvements made are fragile due to the following challenges.

- Fast population growth, high migration resulting in refugees and internally displaced persons, and rapid urbanisation;
- The spread of poverty;
- Policy reversals;
- The spread of diseases, including HIV and AIDS, tuberculosis and malaria; and
- Foreign and domestic debt.

The Fortress World is a grim outlook for the future, in which social and environmental problems lead increasingly to authoritarian solutions of a minority of affluent people.

The assumptions of the Fortress World Scenario may be summarised as follows:

- Increasing social and environmental problems lead to authoritarian solutions;
- Members of the elite sectors of society live in protected enclaves. These may or may not involve physical walls, and they may be within a country or between countries;
- Those in the fortress reap the benefits of globalisation. Those outside the fortress have few options and few resources, and are excluded from the privileges of the elite;
- Components of the environment may actually improve under this scenario, because some valuable environmental resources are controlled by this elite; and
- This improvement is not necessarily unsustainable, but it may not be feasible to maintain for an indefinite time.

Environmental consequences of Fortress World Scenario

Atmosphere

Southern Africa's environment is negatively impacted, except in some protected or isolated areas away from human pressure, where limited improvement can be seen. Poor economic performance drives the region into competition over ever-dwindling natural resources.

Atmospheric emissions remain low, but the region remains more vulnerable to the imperfections of the provisions of international treaties related to climate change. For example, carbon trading could result in southern Africa losing cheap credits and having to pay more per unit of emission reduction.

Southern Africa is also pressured to adopt afforestation and re-afforestation programmes, for the good of the polluting developed countries. Access to large forest areas is controlled by the elite.

The region is more vulnerable to the effects of climate change. Malaria extends to new zones in places like South Africa and Namibia. Urban air quality declines due to dumping of old polluting technology by the developed world. Incidence of acute respiratory diseases such asthma become more prevalent.

Under continued international pressure, southern Africa bans the use of ozone depleting substance such as methyl bromide even though there are no effective alternatives. Efforts towards banning other ozone-depleting substances such as chloro-floro-carbons (CFCs) are hampered by the continued dumping of refrigeration technologies that emit CFCs by the developed world.

Land

With a stagnant and declining growth, southern Africa remains a subsistence economy. As a result of population pressure, the productivity of land continues to decline. This is compounded by poor farming methods, inequitable land distribution, unfavourable land tenure and inefficient irrigation systems.

The pressure on land, vegetation and water, makes southern Africa prone to food security crises. Dramatic increases in populations combined with land degradation, result in the decline in per capita food production. Annual population growth exceeds increases in food production, creating a chronic food crisis for the poor, and widening the food gap. A survival practice of the urban poor is the increasing practice of urban agriculture.

Environmental refugees and people displaced by conflict migrate to areas of greater security. With food aid declining, it becomes inevitable for the rural poor to migrate to towns or cities, considerably swelling the numbers of the urban poor. The elite become resource extractors, driven by the global market economy, and impoverish both the environment and the resources the poor depend upon for survival.

In southern Africa where land reforms are either being implemented or contemplated, radical changes in land ownership occur. Previously disadvantaged members of society are given the opportunity to own land. They have produced food crops, including surplus, on land with poor soils but some have limited knowledge of commercial farming operations and lack access to resources to acquire inputs for farming on a larger scale. Land is degraded further due to inappropriate farming practices and land pressure, and food production declines without appropriate inputs. The elite, who are better resourced, focus on cash-crop farming, and this, too, has serious implications for food security.

Wildlife

Habitats come under severe pressure, with natural ecosystems reduced to small pockets of protected areas where access is limited to the elite. National and international conservation and protection efforts decline as a result of lack of biodiversity conservation frameworks, lack of financial resources, and unfair practices which cause habitat destruction.

As ethics and cultural values are degraded, trade regulatory systems also break down, legitimising trade in endangered species. Loss of biodiversity and invasion by alien species become widespread, causing outbreaks of pests and diseases due to absence of natural predators and lack of ecosystem stability.

Unfair sharing of biodiversity benefits continues, with royalties accruing to multinationals rather than the region's source countries. The SADC Gene Bank fails to develop while those

located in the developed countries flourish with the region's genetic resources. Much of the genetic resources are pirated as the region does not have a thorough inventory of its resources. At the same time, high costs for medical treatment and increasing rates of HIV and AIDS infection turn many to traditional medicine, and this results in the over-harvesting of certain species.

Patenting of GMOs continues to discriminate against the region, and threaten agro-biodiversity, especially of wild species. The region's gene pool is narrowed through the introduction of terminator genes, and genetic pollution of indigenous species. In addition, southern Africa faces new weed and pest problems, arising from GMOs.

Forests

Deforestation and degradation of forests continue at high rates except in some few isolated areas. The elite, tempted by the high demand for forest products on the global market, act as resource extractors, and over-exploit forest resources. However, economic necessity may force them to safeguard some forest areas. Some remote forests such as those in parts of the Congo River Basin may also be saved.

The poor rely on extensive use of forest resources which they have access to, as a source of food, energy and shelter. Commercial exploitation of medicinal plants contributes to accelerated deforestation. Selective harvesting for crafts and invasion by alien species modify the structural composition of forests. Tree types that produce a lot of heat and less smoke are also selectively felled, further accelerating the changes in the structure and composition of forests.

Freshwater

The water supply situation continues to be precarious for most countries in the region. The situation is particularly bad in South Africa, Malawi and Namibia. Agricultural output is drastically reduced. Even with transboundary initiatives, water demand management, integrated water resources management and water recycling, the supply fails to meet demand. Stiff competition between water uses and users emerges.

Water-borne diseases, which had hitherto been under control, emerge once more due to poor drainage, reduced access to safe water and poor sanitation. The water inadequacies also result in poor health, low productivity and food insecurity.

Water continues to be underused in energy generation as the hydropower infrastructure collapses due to poor maintenance and lack of resources for modernisation.

The infrastructure for water management deteriorates due to inadequate institutional and financial arrangements, lack of data and weak human capacity. Regional cooperation in transboundary water issues is weakened and strained by escalating tensions and competition for resources, as openness and transparency are eroded.

Coastal and marine resources

Urbanisation and migration to coastal areas continue at higher rates. The demand for marine resources for food and shelter also increases. The elite utilise the region's unique coastal and marine resources for tourism, and aggressively market them globally, through international trading systems. This results in growth in eco-tourism and sustainable management of isolated resources, including mangrove forests, coral reefs and beaches.

In cities such as Cape Town and Maputo, private property development along coastal areas continues, and this denies the ordinary person access to the beaches and the sea. This contrasts sharply in some poor areas where local pollution increases due to the discharge of raw sewage and industrial waste into the sea. Valuable mangrove forests and coral reefs become vulnerable and threatened by human activities.

Uncontrolled development in coastal areas also accelerates coastal erosion. Growth of populations in coastal cities such as Durban, Luanda, Maputo and Dar es Salaam, exacerbates the over-exploitation of marine resources, including mangroves, fish and prawns.

Human settlements

Rapid urban growth exerts pressure for housing and infrastructure investment, in order to accommodate the rapidly growing population. However, the system of urban governance is responsive to the needs of the elite, and not those of the poor majority. This situation results in the spread of informal housing and slum areas, which are not provided with adequate transport, water, sanitation, electricity and health services. Housing finance is limited to the elite.

The deterioration of the urban economy leads to widespread poverty. As a result, crime becomes a problem in many large cities in southern African, and the cities become unsafe, even during daytime.

The elite who live in enclaves produce much higher waste per capita which they dump without regard for the consequences among the poor. This worsens land and water degradation, leading to the spread of diseases.

The proliferation of informal settlements in peri-urban areas result in disease, destitution and moral decay, which further worsens the spread of HIV and AIDS.

VISUALISING THE FUTURE

Of importance when describing southern Africa's environment is the outlook. This chapter explored different scenarios regarding the development of the region's environment in the future. While each scenario has some promise for the region, it must be highlighted that there should be the most desirable path that southern Africa must follow in order to achieve sustainable development.

The results of such a pathway in southern Africa must be characterised by the following:

- The next 10 years see little change in climate variability, but non-polluting industrial and domestic technologies result in greatly reduced atmospheric and indoor pollution.
- Democratic systems of governance facilitate more secure systems of land tenure. The resultant sense of ownership leads to reduced land degradation, and this, combined with improved agricultural technologies and policy implementation, ensures higher yields and a step towards total food security.
- The pressure on forests as the most reliable source of energy is reduced through an extensive electrification programme facilitated by the Southern African Power Pool. Better heating and cooking technologies, as well as the adoption of micro-power technologies such as solar and wind power provide alternative energy sources, as well as help to reduce greenhouse gas emissions.
- Improved water harvesting technologies and the replacement of wasteful water consumption patterns with efficient systems such as drip and micro-jet irrigation effectively result in better access to water. Proper accounting and costing of water further ensures water use efficiency.
- Sustainable harvesting of marine resources and reduced coastal erosion become the norm due to greater awareness and the impact of national, regional and global policies.
- Urban growth continues, but in a more planned fashion as more people become aware of the human risks and environmental dangers of shanty settlements. This awareness is supported by growth in incomes, which enable many to afford decent housing.
- Collaborative conservation efforts between traditional practices and modern research methods result in a slowdown in the loss of biological diversity, while compulsory environmental impact assessments reduce loss of habitat.
- International instruments such as the Convention on Biological Diversity and CITES are used to facilitate research and bio-prospecting by locals.

SARDC

LINKAGES to the Future Outlook

Chapter 1: Regional Overview
A state of sustainability evolves around proper environmental management and planning centred around such tools as Environmental Impact Assessment and Strategic Environmental Assessment. Population growth is the ultimate driver of socio-economic, political and environmental challenges.

Chapter 2: Land
Per capita access to land and per capita food productivity continue to decline unless countries of the region make use of their comparative advantages, and vigorously pursue the goal of food security by promoting intra-regional trade.

Chapter 3: Atmosphere
Atmospheric anomalies such as temperature rise, and frequency of droughts and floods continue to haunt. However, global consensus bear fruit in mitigating the impacts of global warming, ozone depletion and sea level rise.

Chapter 5: Marine and Coastal Resources
The coastline remains attractive for settlement and development despite concerns of sea level rise. Due to their richness as a source of food, leisure, transport and research, marine ecosystems continue to draw regional attention.

Chapter 6: Forests and Woodlands
Increasing awareness and more binding policy measures bring stability in the development of the forest and woodland sector.

Chapter 7: Wildlife
Important wildlife species continue to be restricted in protected marine and terrestrial areas. Global policies such as CITES remain key to the protection of endangered species such as the black rhino and white rhino.

Chapter 8: Human settlements
The urban growth phenomenon remains a key developmental challenge. Urban areas continue to be attractive due to the better education, health, sport and social services when compared to the rural areas.

ENDNOTES

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4 UNEP, *GEO 3, Data*
5 *SADC Statistics*
6 Hirji, R., et al (eds), *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa,* 2002
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