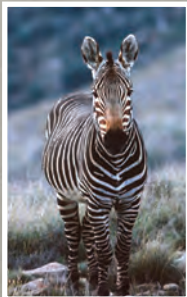




Part IV
**Outlook:
2005-2025**

Chapter 11
Alternative environmental futures







Chapter 11 Outlook 2005- 2025: Alternative environmental futures

At a glance

While the previous chapters have looked at the past and present condition of our environment, this chapter presents four different scenarios of what our future environment might look like. It highlights the major drivers of environmental change that will shape our future, the 'current future' scenario, as well as the uncertainties that define the particular scenario that might play out. The storylines of each scenario are presented and the environmental implications are highlighted.

11.1	ENVIRONMENTAL SCENARIOS FOR SOUTH AFRICA	298
11.1.1	Scenario planning in South and southern Africa	299
11.1.2	South African Outlook approach	301
11.2	DRIVERS	301
11.2.1	Driver 1: Demography and human well-being	301
11.2.2	Driver 2: Economic development	303
11.2.3	Driver 3: Governance	303
11.2.4	Driver 4: Science and technology	304
11.2.5	The enabling and limiting role of the environment	305
11.3	THE 'CURRENT FUTURE' OF THE SOUTH AFRICAN ENVIRONMENT	305
11.3.1	Land and inland water	306
11.3.2	Marine and coastal systems	306
11.3.3	Atmosphere and climate	307
11.3.4	The biodiversity barometer	308
11.4	PLANNING SCENARIOS: FOUR POSSIBLE FUTURES	308
11.4.1	'Tata ma chance' scenario	308
11.4.2	'Skorokoro' scenario	309
11.4.3	'Going Nowhere Slowly' scenario	310
11.4.4	'Laduma' Scenario	310
11.4.5	How does the environment fare?	311
11.5	HEADING FOR 'LADUMA!'	312
11.6	CONCLUSION	312
	NOTES	313
	REFERENCES	313



11.1 ENVIRONMENTAL SCENARIOS FOR SOUTH AFRICA

The previous chapters in this report assess the past and present condition of our environment. Looking at what the future might hold assists us in planning for a more sustainable future. Much of what will happen has already been set in motion by past policy decisions and actions¹. New decision-making frameworks and related behaviour will be important in shaping the future, however. To put the best ones in place, we need to understand the forces that shape our environment, the uncertainties, and the future implications of today's actions or lack of action. Building images of possible environmental futures is a way to investigate the environmental and developmental tools that can be mobilized in pursuit of desired outcomes.

The state of the environment programme has therefore embarked on a process of environmental scenario development.

Scenarios are stories describing the way in which future events could crystallize². They differ from forecasts, projections, and predictions, all of which deal more with the 'probable' than the 'possible'. In the realm of the possible, scenario-based planning is a useful, structured way to stimulate thinking and debate about future events or trends, and to make our uncertainties explicit. It can be particularly

informative when dealing with complexity, in which numerous biophysical, socio-economic, political, and cultural factors interact in ways that are neither well understood nor easily controlled.

Qualitative and quantitative approaches to generating and presenting scenarios are used in studying possible futures:

- **Qualitative** scenarios are presented as written narratives, and they explore relationships and trends for which no data are available
- **Quantitative** scenarios are numerical estimates of future developments, presented as numerical data in tables, maps, and graphs. They are often generated using simulation models.

Many recent large-scale scenarios have combined qualitative and quantitative approaches, such as the Global Environment Outlook 3³, the Africa Environment Outlook⁴, and the Millennium Ecosystem Assessment⁵.

Our Outlook 2005–2025 joins a family of global, African, and southern African environment outlooks. It does not update, review, or critique them – scenarios are not right or wrong – but adds a perspective based on our understanding of the current state of South Africa's environment and of the forces acting upon it. The Outlook 2005–2025 is not an end in itself, but adds impetus to what it is hoped will be a meaningful and continuing discourse on where South Africa is headed as a nation.

Box 11.1 Getting to grips with scenarios

What are scenarios?

The Global Environmental Outlook Scenario Framework describes scenarios as follows:

"A scenario is a story, told in words and numbers, concerning the manner in which future events could unfold, and offering lessons on how to direct the flow of events towards sustainable pathways and away from unsustainable ones.

In the theatre, a scenario is a summary of a play. Analogously, development scenarios are stories about the future, each with a logical plot and narrative. Scenarios usually include images of the future – snapshots of the major features of interest at various points in time – and an account of the flow of events leading to such future conditions.

Scenarios draw on science – our understanding of historical patterns, current conditions, and physical and social processes – and on the imagination to conceive, articulate and evaluate alternative pathways of development and the environment. In so doing, scenarios can illuminate the links between issues, the relationships between global and regional development, and the role of human actions in

shaping the future. It is this added insight, leading to more informed and rational action, that is the foremost goal of scenarios, rather than prediction of the future".

There are many unfamiliar terms used in scenario development, some of which are defined below:

- **Scenario:** a plausible story about the future.
- **Drivers:** causes of change. Direct drivers are the immediate and fully evident causes of change, while indirect drivers are more complex and long-term, with multiple links to change.
- **Current Future:** how the future may look under current drivers of change.
- **Key Uncertainties:** drivers that are highly influential, but which might in the medium term move in different directions. Different futures are postulated for the key uncertainties (for example, high economic growth vs. low economic growth) and these inform the development of scenarios.

Source: Adapted from UNEP (2004)²



11.1.1 Scenario planning in South and southern Africa

South Africans have embraced scenario planning enthusiastically, desiring to create the best possible future for the country while recognizing multiple uncertainties. Over the past two decades, scenario planning has been used to investigate potential social, economic, political, and environmental futures. This section highlights selected relevant South African scenario planning exercises (three, in chronological order), adds two that focussed on southern Africa (also in chronological order), and one on Africa as a whole. The initiatives are described briefly, and the scenarios are reviewed in the section that follows.

South African Environments into the 21st Century (1989)

In one of the earliest local examples of scenario planning, Brian Huntley, Roy Siegfried, and Clem Sunter described scenarios for South Africa and its environment⁶ arranged along two axes: 'Socio-economic Trajectory' and 'Environmental Management'. These represent the key uncertainties that the authors identified in their analysis. This 1989 work identified HIV and AIDS as one of the critical 'wild cards' or surprises that could affect the future, predicting that AIDS would become the most prevalent and critical disease of the decade.

Africa Environment Outlook (2002)

The Africa Environment Outlook is a component of UNEP's Global Environment Outlook (GEO) initiative. Drawing on the work of the Global Scenarios Group, the Africa Outlook study defined the following scenarios: 'Market Forces', 'Policy Reform', 'Fortress World', and 'Great Transitions'.

Millennium Ecosystem Assessment: Gariep Basin (2003)

A contemporary and relevant project is the Gariep Basin component of the United Nation's Millennium Ecosystem Assessment. The Gariep Basin group emerged with four views of the future, entitled 'Fortress World', 'Policy Reform', 'Market Forces', and 'Local Learning'⁷.

Millennium Ecosystem Assessment: Southern Africa (2003)

The southern African component of the Millennium Ecosystem Assessment⁸ built explicitly on the overall global assessment as well as other relevant regional scenario initiatives. The effectiveness of national and regional governance was identified as the key uncertainty facing

southern Africa's development over the next three decades. Two scenarios were developed on this basis: 'African Patchwork' and 'African Partnership'.

South Africa 2014 (2004)

In 2000, the Presidency of the South African government turned to scenarios when planning the country's medium-term future⁸. The scenario development team used the year 2014 as their benchmark. The two axes of uncertainty on which the scenarios were based were 'global economic and political trends' and 'social cohesion' in South Africa. The names given to these scenarios were S'gudi S'nais, Dulisanang, Skedonk, and Shosholoza.

SADC Environment Outlook (2005)

The SADC Environment Outlook (2005) developed environmental scenarios for the SADC region for the year 2015¹⁰, which were informed by the Global and Africa Environment Outlook documents⁴ of the United Nations Environment Programme (UNEP). Three scenarios were developed: 'Market Forces', 'Policy Reform', and 'Fortress World'.

Comparative overview

The scenarios outlined above are based on different assumptions, but significant areas of convergence lend weight to the various outcomes (see Table 11.1). All the cases include, as polar opposites, the most and least desirable scenarios. Those falling between the extremes are more difficult to rank, so they are described as intermediate.

In general, 'doomsday' scenarios describe governance and economic failure, which bring mixed environmental impacts. They envisage declining impacts from large industrial and agricultural enterprises, for example, as these activities shrink dramatically. By contrast, the lack of regulatory tools and structures is seen to allow opportunistic over-exploitation of environmental resources resulting in unsustainable use.

The scenarios telling stories of growth and development fall into two broad categories: those seeing the predominance of economic and market-driven priorities, and those envisaging more balanced and sustainable approaches to development. Unfettered market forces are viewed as having huge environmental impacts. The sustainability scenarios all emphasize the need for having appropriate policies in place and the capacity to implement them. While market scenarios ascribe a limited role to the state, government emerges as a key player in promoting and entrenching sustainability. Policy and regulatory roles are particularly prominent, with 'Policy Reform' emerging as a strong scenario theme.

Over the past two decades, scenario planning has been used to investigate potential social, economic, political, and environmental futures.

Table 11.1: Comparative overview of selected African, regional, and local scenarios

	SA Environments in the 21 st Century	Millennium Ecosystem Assessment: Gariep Basin	South Africa 2014	Millennium Ecosystem Assessment: Southern Africa	SADC Environmental Outlook	Africa Environment Outlook
MOST DESIRABLE	Rich Heritage	Policy Reform	Shosholozza	African Partnership	Policy Reform	Great Transitions
	Robust economy and political stability support wise use of the environment, land rehabilitation, electrification, mineral beneficiation, and increased agricultural productivity using less land. Continued air pollution from energy production.	Good governance, strong economy. Investment in poverty reduction, social services. Better food security and access to water and energy. Intensified agriculture, strong protected areas, and effective catchment and water management.	At the end of the second decade of freedom: global and local economy booming, with jobs and greater economic participation. World political conflicts are being mediated by multilateral institutions, and at home a diverse and tolerant society is in place.	Programmes such as NEPAD improve governance, security, economies, and well-being. Better food security and more tourism. Population growth and development affect the environment. Impacts stabilize with effective regulation.	Markets/economic growth mediated by targeted social and environmental policy and practice. Private provision of social services. Gradual reduction in air pollution. Land reform and balanced land use. Greater demand for water, integrated resource management.	Moves from conventional views on markets and policy reform to a new sustainability paradigm, with values of simplicity and community. Environmental outcomes include greater regional cooperation on key issues such as water and food.
INTERMEDIATE	Boom and Bust	Market Forces	S'gudi S'nais		Market Forces	Policy Reform
	Pursuit of growth with limited concern for the environment. High GDP growth, improved quality of life and productivity. Pressure on the environment including widespread pollution, uncontrolled land use, and soil erosion.	Strong economy and national governance. Poor wealth distribution and weak local government. Increased poverty and inequality. Increased mining and water resource development. Widespread pollution. Development before conservation.	Initially high economic growth, but declining at the end of the decade. The rich seek to amass wealth, and the state is indecisive in containing this situation. Social fragmentation sets in and conflicts emerge between the haves and the have-nots.		Emphasis on market-driven economic growth, and undervalued biodiversity. Income inequality. High urbanization. Initial inability to supply urban services. Increased air pollution and use of land for export agriculture. More demand for water and water disputes.	Proposes a balance between social and economic development and respect for environmental issues. There are many obstacles, however, including strong market forces, political fragmentation, and instability stemming from poor quality and vulnerability.
INTERMEDIATE	Separate Impoverishment	Local Learning	Dulisanang			Market Forces
	State control of settlement and the economy. Disinvestment, slow growth, and political instability. Subsidized mismanagement of land and agricultural resources and agricultural collapse in the communal areas.	Weak economy and governance, active civil society and informal sector. Raised mortality from waterborne diseases and indoor pollution. Poor service delivery and over-use of resources. Crop failures common. Encroachment on protected areas. Conflict over scarce resources.	Low economic growth, but in a more considerate and inclusive society. Global insecurity and economic crises force the country to focus on its own resources. The state seeks to deliver on its social obligations but cannot sustain social delivery because of low growth.			Global economic forces prevail. Owing to the weak position of Africa in this context, the continent and its countries are subject to relatively unrestrained exploitation of natural resources and unsustainable patterns of living.
LEAST DESIRABLE	Paradise Lost	Fortress World	Skedonk	African Patchwork	Fortress World	Fortress World
	Failure of governance and of economic and infrastructure systems. Local overexploitation of environmental resources, and environmental abuse due to lack of regulation. Reduced pressure of agricultural development and industrial pollution.	Collapse of governance and the economy. Elites live in security enclaves and poverty increases. Illegal unregulated exploitation of the environment and ineffective service delivery. Sources of pollution decline but are unregulated.	Unilateralism and conflict reign at global level. Economic growth is low in South Africa, and the political and economic leadership fails to address the problem. Poverty increases and high unemployment and general social dislocation prevail.	Democracy and good governance in some countries, but cases of conflict and economic mismanagement adversely affect well-being. Food security does not improve, and agricultural expansion and poor regulation put pressure on the environment. High-cost tourism continues.	Low growth and limited social and environmental concern. High poverty and inequality. Reduced industrial pollution. Low farm productivity and high land pressure. Pockets of protected land. Water supply precarious and water quality bad. Health crises.	Wealth continues to be severely skewed, leading to regional and local disparities. These fuel the breakdown of law and order, and elites adopt a fortress approach to protecting themselves. Use of the environment is both exploitative and unmanaged.

The scenarios developed for this report emphasize the role of effective environmental governance (including policy development and implementation) in realizing sustainable development. While the state is a central player in the environmental governance arena, it does not act alone.

11.1.2 South African Outlook approach

The scenario planning material in this chapter is founded on the current state of the environment trends that are detailed in chapters 1-10 of this report, and are based on available data and expert opinion. Scenarios can serve many purposes. In this case, they are anticipatory, describing a possible future state and providing a point of departure for debate on ways to reach an end state that is desirable.

A 'back-casting' approach is therefore used to identify alternative environmental futures as well as to assist and guide role players when they formulate policy and other initiatives in support of environmental sustainability. Options for action can in this way be both targeted and purposeful, offering maximum leverage as desired environmental objectives are formulated.

The scenario generation was largely accomplished in a two-and-a-half day workshop. (For process detail, see Figure 11.1.) Key steps were as follows:

- **Scoping.** This exercise (incorporating a questionnaire completed by workshop participants) defined the spatial, temporal, and thematic boundaries of the study. The scenario horizon was set at 2025.
- **Stakeholders and game-plan.** Environment stakeholders and their roles were discussed. Stakeholder profiling promotes an understanding of interest-driven dynamics in the sector and guides strategic interventions.
- **Trends and driving force.** The drivers of change of South Africa's environment were identified and discussed. They emanate largely from human activity.
- **The Current Future.** With trends and drivers in mind, a 'business-as-usual' perspective was discussed and elaborated. Specialist reports provided the basis for this exercise.
- **Scenario framework.** The key uncertainties that will differentiate the environmental scenarios were discussed and agreed. The workshop considered the two critical uncertainties to be (a) the determination or will of South Africans to pursue environmental sustainability and (b) the means to do so. To capture these uncertainties, 'Environmental Governance' and 'Economy and Technology' were selected as the axes for a two-by-two scenario matrix.
- **Scenario development.** The scenario stories were developed in an iterative process, starting at the

workshop and continuing through cycles of reporting and review.

NOTE: Although it is tempting to do so, the outputs of scenario development initiatives such as the one reported here should not be seen as discrete products. To be useful, however, scenario reports should remain 'living' documents that must evolve, and improve, over time. This evolution must be rooted in a broad-based dialogue with all relevant environmental stakeholders.

11.2 DRIVERS

In examining the state of South Africa's environment, this report has presented trends and identified specific causes of change. Environmental scenario development exercises often distinguish between direct and indirect change drivers. Many causes of change identified in earlier chapters are direct drivers, where cause and effect are relatively clear. Indirect drivers are typically long-term and complex, with multiple links to changes in the environment. They often emanate from collective human activity and frequently have national and even global implications. In essence, they create conditions for change.

Recent environmental scenario studies have settled on a more or less consistent list of indirect drivers, with some differences in selection and emphasis. (See Figure 11.2.) Some studies treat environment itself as an indirect driver but many do not. Among the scenario exercises reviewed in this chapter, the Africa Environmental Outlook alone includes the environment in its list of indirect drivers. The case for doing so is compelling, since the environment provides the resource endowment that underpins human activities. It also limits or enables these activities in specific places and at specific times. Hence, while human drivers change the environment, the environment in turn shapes and modifies the human-based activities that collectively impinge upon it.

Chapter 2 of this report asks "What affects our environment?" The section below distils the drivers to their essential elements, discusses briefly the environment as a driver, and illustrates complex feedback loops that are typical of human-environment interactions.

11.2.1 Driver 1: Demography and human well-being

Demographic forces and population growth are often seen as the fundamental drivers of environmental change, but the interface is complex. The prevailing macro-trends within this driver are summarized below (based on earlier parts of this report, in particular Chapter 2), clustered in three groups: demography – whose components determine and steer population growth trajectories; population growth itself; and human well-being – whose manifestations of which influence the way in which humans use the environment and are affected by it.

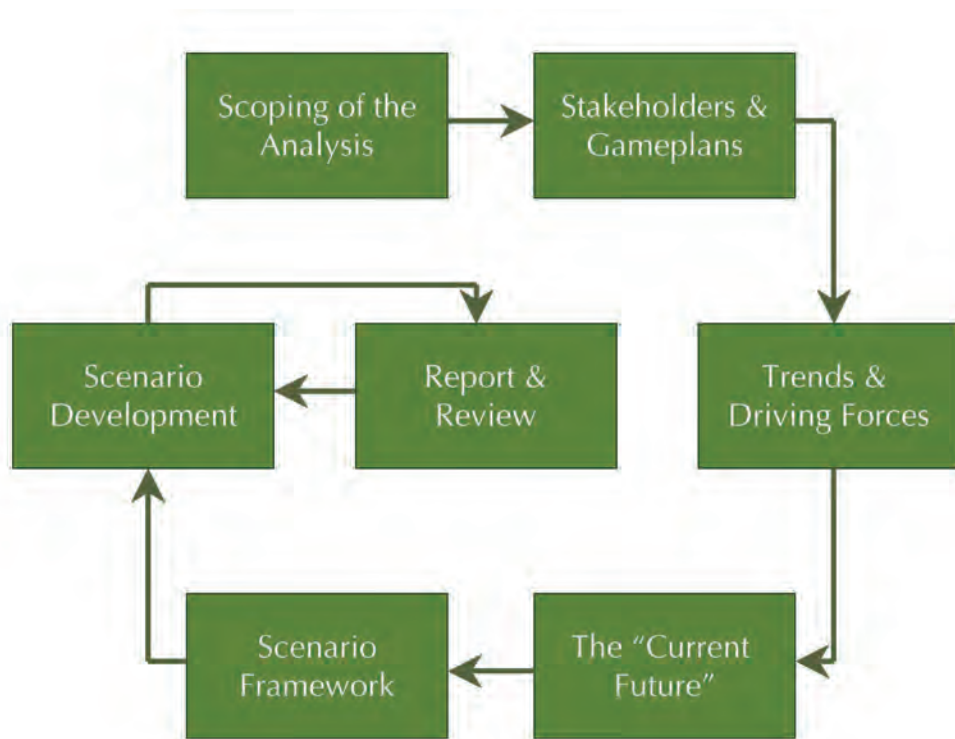


Figure 11.1: Scenario generation process

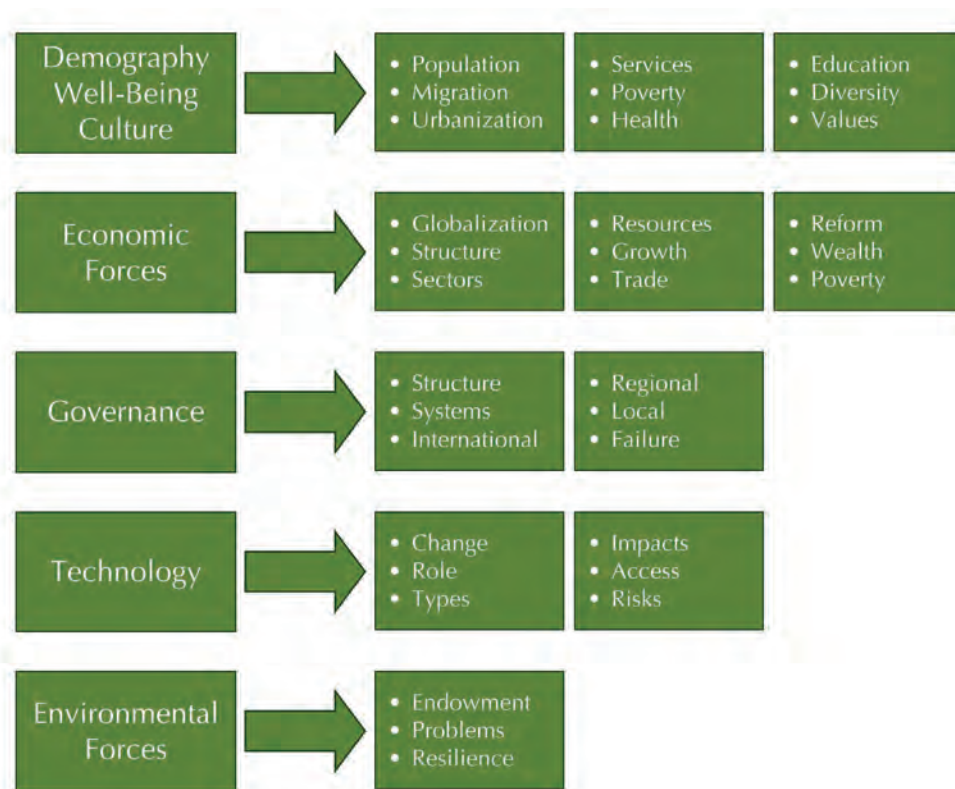


Figure 11.2: Indirect drivers of environmental change

Demographic trends

- By international standards, South Africa has a youthful population structure. Under normal conditions of demographic transition, this would provide a base for continued growth (albeit slowing because of urbanization), a modernizing economy, and the empowerment of women.
- High mortality related to HIV and AIDS is, however, slowing growth more rapidly than would have been the case under AIDS-free circumstances. This mortality has economic consequences, as it affects the potentially economically active cohorts of the population.
- Migration into South Africa seems set to increase, adding a dynamic that will counterbalance, to some extent, the forces slowing population growth. The migration has economic outcomes, depending on the profile of the migrants and the extent to which they are (or are not) assimilated into the economy.
- Patterns of human settlement will continue to change, with the predominant trend being a growing population concentration in large cities, accompanied by ongoing pressure on the provision of housing and other services. Informal settlements are likely to be part of the landscape for many years to come.

Population growth trends

- In the recent past, population growth in South Africa was relatively high, in line with other developing countries. The total population increased from 16 million in 1960 to 37 million in 1990. It reached 46 million in 2005 and is expected to increase to just below 50 million by 2020 (projections vary markedly, from 35 million to 47.6 million by 2020).
- A decline from the current population figure of 46 million is possible if some of the worst-case forecasts of the HIV and AIDS impact on population growth are included in the population forecast calculations.
- The proportion of the population living in urban settlements increased from below 47% in 1960 to 57% in 2001, and this figure will increase in the near future.

Human well-being trends

- Human development is being influenced by several encouraging trends, including increasing expenditure on education and social services, with an emphasis on housing, water, health, and electricity provision. Rural agricultural development is one of government's central policy concerns.
- Despite the attention given to human development, the composite Human Development Index (HDI) has declined since 1995, dropping below pre-1980 levels.

The decline is strongly linked to dropping life expectancy, and the trajectory of this index will be significantly influenced by the course of the HIV and AIDS pandemic.

- Wide differences in human development (spatially and among sub-sections of the population) are likely to prove persistent. Through a suite of reconstruction and development policies, the government is seeking purposefully to narrow these gaps in levels of human development, which are substantial and entrenched.

11.2.2 Driver 2: Economic development

The South African economy has complex and extensive impacts on the environmental resource base of the country (see Chapter 2). These stem from the nature of the economy, from its size and growth, and from the wealth and income it distributes. Current trends in the economy are outlined below (drawing again on Chapter 2) as three main groups: economic underpinnings – the foundation of today's economy; the status and growth of the economy; and economic relationships and disparities – including the ways in which economic benefits reach (or do not reach) sections of the population.

Economic underpinnings

- South Africa experienced relatively high rates of economic growth between 1950 and 1970 (around 4% each year) but limited human development. The economy was driven substantially by capital-intensive industrialization and the exploitation of vast stocks of minerals and coal. Cheap energy generation, based on lower grades of coal, contributed substantially to this industrial growth process.
- Segregation-based social and economic policies constrained the long-term economic growth potential of the country. Industrial economic growth declined during the 1970s, with an even more rapid decline during the 1980s. The divide between haves and have-nots grew and, by the 1990s, about half of the country's population lived in poverty.
- A more robust economy has characterized the second half of the 1990s and the first half-decade of the new millennium. Increased integration with the global economy has made its mark on the South African economy, including trade agreements, growing exports, and foreign direct investment.
- There has been limited change in job-creating economic conditions and unemployment has remained the enduring downside of a generally improved economic outlook. Even with a policy focus on jobs, high levels of joblessness seem likely to persist for some time.

- In some areas, access to basic services has improved, with increased expenditure on infrastructure. Infrastructure spending will increase, at least in the short to medium term.

Economic growth macro-trends

- Gross domestic product (GDP) has grown modestly but consistently since 1994. The annual rate of growth has varied between 0.5% (1998) and 4.3% (1996), and a long-term growth rate of around 4% per year seems a reasonable prognosis. GDP per capita also increased in real terms since 1994, suggesting that the economy has kept pace with population growth over this period.
- The government has placed a high premium on economic growth, to promote employment and to improve service delivery. To give effect to this policy, the government launched the Accelerated and Shared Growth Initiative for South Africa (AsgiSA) in 2006. The ultimate aim of AsgiSA is to halve unemployment by 2012. This policy, and the initiatives that support it, will require ongoing environmental trade-offs.

Trends in economic disparity

- South Africa is characterized as having two economies; one is formal, modern, and well serviced; the other is informal, peripheral, and fragmented. Narrowing the gap between the two economies is an explicit policy focus, but up to 2004, there was relative stability in the ratio between them. In 2004, one fifth of employed people were in the informal sector (see Chapter 2). This sector is likely to remain a significant element of the economy for a considerable time to come.
- There is increasing affluence in the industrialized world, but global wealth disparity continues and seems unlikely to improve significantly. South Africa mirrors this situation, but manifests inequality more acutely than most countries. More than half of the population lives in poverty, and there has been little change in this situation over the past decade. Evidence suggests that extreme poverty has worsened.
- Poverty increases vulnerability to environmental threats such as polluted water, soil degradation, and air pollution. Along with poverty, environmental change is likely to afflict many South Africans well into the first decades of the millennium.

11.2.3 Driver 3: Governance

Governance is society's system for organizing itself to determine and codify desired futures and to implement decisions leading to their realization. The tools of governance include policy, legislation, institutions, strategies and



guidelines, and enforcement. The state is a major player, but the private sector and civil society are also part of the governance system. Environmental governance is no exception, and relies more on non-government actors than many other sectors. As a driver, environmental governance sets agendas, mobilizes commitment and compliance, and responds to outcomes.

South African environmental governance has progressed significantly over the past decade. The major trends outlined below are organized into three main themes: international macro-trends; national macro-trends; and implementation challenges.

International macro-trends

- Two worldwide environmental governance trends are evident: first, increased regional and global integration, and second, a move toward decentralization in country governance systems³. South Africa is in line with both trends.
- South Africa plays an increasingly prominent international and regional role. It has signed many multi- and bilateral environmental agreements and, since the Johannesburg World Summit on Sustainable Development, has raised its profile in international environmental governance. The key implication of the international links is that national policy is, and will continue to be influenced by global agendas and objectives.

National macro-trends

- Spheres of government in South Africa entrench cooperative government but, along with many other nations, South Africa has devolved implementation responsibilities to the provincial and local spheres. In concept (and to some extent in practice) this brings environmental governance closer to the people. There are, however, institutional and capacity challenges that will affect performance at this level (see 'Implementation Challenges' below).
- Active policy and legislation development has resulted in a largely adequate and modern framework for environmental governance. Roll-out is supported by increased budgets for environmental management nationally, the reinforcement of compliance and enforcement capacity in the Department of Environmental Affairs and Tourism, and the implementation of integrated medium-term sector planning.
- State of the environment reporting is growing in government structures and increasingly among private-sector organizations operating in high-impact sectors. Policy and legislation are promoting higher levels of participation by civil society in environment-related

planning and decision making, and a growing number of businesses are subscribing to standards of performance that promote sustainability. These trends are by no means universal, but suggest an iterative mainstreaming of environmental issues in South Africa.

- Against the background of more widespread environmental reporting, there remains a need for integrated and nationwide monitoring of environmental governance.

Implementation challenges

- Demographic and economic trends, as well as the national drive to promote economic growth, growth-related job creation, and service delivery, present ongoing and serious challenges to environmental governance systems and players. The government's 10-year review⁸ recognizes these and includes a long-term "framework of encompassing interest" to facilitate coordinated action within government and between government and with social partners. Securing the envisaged convergence of interests is likely to be a long-term task.
- Building the capacity for implementation and enforcement at provincial and local government levels is a key environmental governance challenge. Success or failure in this critical task is likely to be a major determinant of governance effectiveness over the next decade or two.

11.2.4 Driver 4: Science and technology

Technology can change interactions, influence the use of resources in production, and change the flow of waste products and the manner in which they are managed. Cleaner production technologies seek both to protect the environment and improve production. Technology itself is not always benign in environmental terms, as it enables more intensive exploitation of certain resources (for example, undersea oil) and extensive manipulation of natural systems. The following are identified as key trends in science and technology in South Africa.

- Rapid global progress in communication and information technology, and its adoption and development in South Africa, has improved the collection and flow of environmental information. This, in turn, has promoted awareness and in some cases environmental responsibility. In the longer term, better environmental communication may help to improve universal approaches to natural resources.
- Although South Africa invests in innovation through science and technology, it falls a long way short of most developed countries in terms of the funds and human



resources it deploys. In the African context, South Africa leads in its support for science and technology.

- Cleaner production is an important area of technological investment in South Africa. It is promoted and supported by institutional structures; enabling legislation has been promulgated (for example, the National Air Quality Act); and research and demonstration projects have been implemented.
- Alternative energy sources are now part of the country's official agenda: the potential regional and national impacts are enormous (assuming that regional political problems are resolved) if the huge hydro-electric resources of Central Africa can be developed to benefit the whole southern African region.

11.2.5 The enabling and limiting role of the environment

Anthropogenic drivers interact with the environment, and both change in the process. In these interactions, the environment performs several roles, acting as

- a promoter of human activity and endeavour (providing the resources for production, consumption, and living)
- a buffer or sink for the products of human activity and endeavour
- a cap or limit on aspects of human activity and endeavour under particular conditions.

This report illustrates the first interaction extensively, and offers examples of the second and third. Highlighted briefly below are two of the most profound environmental drivers: global climate change and the 'end of oil'.

Global climate change

Several chapters (see Chapter 8 in particular) discuss the nature and potential impact of climate change in South Africa, with the focus largely on global warming. The atmosphere acts as a sink for greenhouse gases generated by natural phenomena and human activities. Ongoing industrialization (amongst other things) has raised the levels of atmospheric greenhouse gases to a point where the effects of global warming on human systems are becoming apparent. The atmospheric sink is beginning to alter anthropogenic drivers, with consequences that are potentially far-reaching and long-lasting.

In South Africa, the predicted outcomes of greenhouse gas accumulation include a net drying of the western half of the country and a possible increase in rainfall in the east. The Western Cape could have a shorter rainfall season (see Chapter 8). There are many potential impacts, including issues related to health (such as the spread of malaria), changes in the distribution and availability of water

resources, changes to biodiversity and ecosystems, and changes in patterns of agriculture (including reduced maize production). Global, regional, and national responses to global warming are emerging, but climatic trends will not be reversed easily or quickly.

Running on empty: the decline of oil

Oil accounts for over 60% of global fuel consumption, and there is compelling evidence that global oil production may shortly peak and then go into decline. The timing of the 'peak' is the subject of hot debate, but oil experts seem to agree that this will happen within a decade or two^{11, 12}, with one body of opinion expecting production to peak far sooner.

Social, economic, and political responses will be complex and multifaceted, but increased global attention to alternative energy sources is clearly necessary and urgent (these alternatives include other fossil fuels such as gas and coal, as well as nuclear energy and renewable energy sources), as is the equally important focus on increased efficiency. Shifts away from 'business-as-usual' approaches to energy might not be easy, however, and the potential exists for market-damaging price shocks and conflict over remaining resources.

In South Africa, the short-term impacts of uncertainties about oil are likely to include price volatility, underpinned by a steady price increase. Price changes will be felt most immediately in the transport sector, but will filter through the economy in the form of inflation and a higher cost of living. In the longer term, the position of coal as South Africa's primary energy source will be reinforced and nuclear and regional hydropower options as well as renewable energy are likely to become increasingly attractive. Our policy commitment to the development of sustainable energy sources should gain momentum, but these sources will probably take considerable time to become significant in the national energy mix.

11.3 THE 'CURRENT FUTURE' OF THE SOUTH AFRICAN ENVIRONMENT

This report presents the status of South Africa's environment and notes the immediate causes of change (direct drivers) in various environmental domains. It has also identified the collective human-based forces (indirect drivers) that are likely to influence broad environmental change over the coming decades.

This section presents the business-as-usual or 'current future' environmental outlook. It assumes that all drivers will influence the environment as they have in the past, and that no additional forces (including intentions to improve implementation) will act on the system. This perspective provides a baseline or reference for the scenarios that follow.

The business-as-usual outlook is presented under four headings, reflecting the structure of the report as a whole, but with land and inland water grouped together in the single sub-section dealing with land-based natural resources.

11.3.1 Land and inland water

The business-as-usual prognosis for land-based resources deals with changes in the pattern of land utilization and land resources management, changes in the state of inland water resources, and patterns of change in the land-based biosphere. To illustrate, such trends include the following:

- Approximately 81% of South Africa's surface is farmland, 6% is formally protected, and 1.1% is under forestry. Only 11% of the country is arable, which represents less than 0.4 hectares (ha) per capita compared to 0.8 ha per capita in North America. At current population growth rates, arable land per capita is set to decline to around 0.3 ha by 2030, which points towards a growing need for improved technology and efficiency in agricultural production.
- Land degradation and desertification will continue to affect biodiversity and land productivity, although the extension of conservation farming practices in South Africa will increase. A more serious, but uncertain, threat to biodiversity is the possible effect of climatic changes, which, current research suggests, will be significant, and includes the possible shrinkage and disappearance of the Succulent Karoo biome (the planet's largest assemblage of succulent flora and a biome unique to South Africa). The use of wood as a household fuel source will continue with its associated environmental and health effects.
- A larger human population and the recognized need to improve standards of living will place pressure on the country's ability to feed its people. South Africa is self-sufficient in food production, but about 48% of its population lives below the poverty line. To address this problem, the efficiency with which agricultural resources are used will have to increase over the next 20 years, with water availability already limited owing to rising urban and industrial demand. Currently, about 2 million tonnes of fertilizer are applied annually to South African soils, which may cause systemic pollution of surface and underground water. Greater use of other agricultural inputs, such as pesticides and herbicides, will also contribute to the pollution of the country's water resources.
- South Africa is largely semi-arid, with rainfall patterns that are spatially variable and temporally erratic. Some 65% of the country receives less than 500 mm rain per year, a figure generally accepted internationally as the minimum for dryland farming. Dryland farming will

continue to be marginal and risky in these areas, and the difficulties will be compounded by cycles of drought and the potential effects of climate change.

- Water resources are vital for economic development and the health and well-being of the population. South Africa has a total mean annual runoff of approximately 49 500 million m³, of which 4 800 m³ originate in Lesotho and 700 m³ in Swaziland. Many of the country's metropolitan centres and industrial and mining development nodes are remote from major river courses. In this context, inter-basin water transfer will continue, with associated ecosystem impacts. These impacts are expected to intensify due to water shortages, which are anticipated by 2020.
- Groundwater extraction will increase, due to local availability, to supplement surface resources in some areas.
- Industrialization, urbanization, and changing patterns of land use will continue to affect water flow and quality. For example, hydrological patterns are significantly altered by human activities, such as urban encroachments into flood plains; the building of dams, weirs, bridges, and canalization; and the diversion of watercourses. As demand for water increases, interventions will increase as well. Ongoing impacts on water will also include: in urban areas, larger impervious surfaces that increase runoff volumes and reduce groundwater recharge; land disturbance and overgrazing that result in increased flooding and sedimentation of water courses, dams, and estuaries; the continued yield-reducing intrusion of alien vegetation into catchments; deteriorating water quality resulting from mining, industrial, and urban growth, aggravated by overstretched management and regulatory capacity; and increased nutrient loads and microbial contamination from fertilized fields, animal feedlots, and the discharge of sewage.

In overview, the intensification of land use will continue in the business-as-usual outlook. Land degradation will remain a problem, further restricting already limited land resources. Water demand will increase, severely limiting development potential in some catchments. Pollution of water resources will worsen.

11.3.2 Marine and coastal systems

The business-as-usual outlook for marine and coastal systems includes changes in the marine biosphere, changes in the exploitation of marine resources, patterns of change in the utilization of the coastal and marine environment, emissions into the sea, and the effects of climatic change. The following trends provide illustrations:

- While the fishing landings through demersal fisheries have decreased from 90% to 60% since the 1960s,

A more serious, but uncertain, threat to biodiversity is the possible effect of climatic changes, which, current research suggests, will be significant, and includes the possible shrinkage and disappearance of the Succulent Karoo biome (the planet's largest assemblage of succulent flora and a biome unique to South Africa).

hake stocks have been showing signs of depletion since 1999 through demersal and long-line fishing. Pelagic catches increased from 250 000 tonnes in the early 1990s to over 500 000 tonnes per annum since 2000. Rock lobster catches decreased from over 10 000 tonnes in the 1960s to less than 2 000 tonnes since 1994. There have been severe declines in Abalone density in the main commercial fishing grounds since 1980s. The South African marine and coastal resource base is close to being fully exploited, with some line-fish stocks having collapsed and many species now threatened with collapse. Yields will not increase much beyond the current levels over the next 20 years. With global marine yields also reaching their limits, international rivalry over the South African resource base will increase.

- A continuing spread of high-density coastal settlements is likely over the next 20 years, producing ongoing habitat alteration, changes in river mouth dynamics, and the contamination of coastal areas through sedimentation and plastic pollution, sewage, oil, and effluent into the sea. Settlement will pose a serious threat to estuaries, which provide a vital habitat and nursery function for several fish species. Climatic changes may exacerbate this threat, especially around the country's southern and western seaboard, with shifts in the distribution of commercial species a real possibility. This, in turn, will impact on coastal livelihoods.
- A threatening trend is the introduction of alien species to the South African coastline, as they are transported around the globe, mainly through international shipping. Some of these species are difficult to eradicate and may significantly reduce indigenous biodiversity in coastal waters. The European mussel, however, which has replaced indigenous stocks on much of South Africa's coastline, has created the opportunity for a thriving mussel culture industry.

In summary, in a business-as-usual future, the coastal and marine resource base will continue to be strongly exploited, but with ever-diminishing returns in some cases and collapse of stocks in others. Coastal development will persist and grow, as will the associated land and habitat degradation and marine effluent pollution. This degradation will also have a significant and direct impact on the livelihoods of those communities that rely on marine and coastal resources.

11.3.3 Atmosphere and climate

The business-as-usual perspective on the atmospheric and climatic system includes changes in air quality, greenhouse gas emissions, global warming and other climate changes, and ozone depletion with its associated impacts. Some of the key trends under this scenario are presented below:

- Ambient (outdoor) air quality is affected by industrial

and commercial activities, electricity generation, waste treatment and disposal, household fuel-burning, transportation, mining, agricultural processes (including crop residue burning), other miscellaneous activities (such as tyre burning), and wild fires. In general, such sources of pollution and emissions will persist at present or increased concentrations.

- High ambient sulphur dioxide and fine particulate concentrations (due primarily to fuel-burning within households, industrial emissions, and power generation) will persist in many parts of South Africa. Increased fine particulate concentrations will be more common, with health thresholds widely and frequently exceeded. Air quality limit exceedances due to sulphur dioxide will be more concentrated (in the vicinity of significant sources) and more frequent. The location of heavy industries near residential areas will be a continued source of health risks and latent conflict.
- Household inhalation of emissions by the burning of coal and wood indoors will remain one of the country's most serious and pressing air pollution problems, but current electrification programmes will limit their spread.
- Growth in vehicle activity and the aging of the national vehicle fleet will offset the planned and proposed national emission reduction measures (by means of fuel-composition regulations and new vehicle technology). Although air quality limits for nitrogen oxide and ozone are at present relatively infrequently exceeded within South African cities, concentrations of these pollutants will increase, especially with the growth in vehicle activity. Volatile organic compound releases from fuel filling stations, as well as nitrogen oxide and hydrocarbon releases from major airports, will compound the air quality implications of transportation.
- South Africa is vulnerable to global climate change, particularly because global warming is expected to produce an increase in the frequency and intensity of extreme weather events, namely droughts and floods. South Africa's contribution to per capita greenhouse gas emissions will remain above the global average, higher than most developing nations and equivalent to several developed nations.
- National total carbon dioxide equivalent emissions increased by around 9.4% between 1990 and 1994. The three source groups contributing most significantly to these emissions are energy industries (including electricity generation for the national grid), industry, and transport. Energy industries are by far the largest contributor, but transport emissions showed the greatest increase (by 38%) between 1990 and 1994. Emissions from all sources will rise with business-as-usual.

Overall, air pollution levels will continue to increase, with health limit exceedances becoming more common. Indoor pollution will persist, with its damaging effects on

human health. The global and local conditions driving atmospheric warming will continue, and elevated average temperatures (with all their consequences) are probable.

11.3.4 The biodiversity barometer

Biodiversity is a good barometer of the intensity and spread of environmental impacts. The business-as-usual biodiversity outlook is as follows:

- Terrestrial ecosystems will continue to be lost or fragmented, but significant areas of natural habitat will remain. In many cases, these will be under pressure.
- The already severely compromised state of many aquatic ecosystems will deteriorate further, and other aquatic ecosystems will be added to those that are already deteriorating.
- Coastal biodiversity, which is still healthy in places, will be subjected to intensifying developmental pressure.
- Marine biodiversity will continue to be exposed to the over-exploitation of commercial species.

The outlook seems discouraging, but the threats and challenges are well recognized and form the basis for effective policy and management. Furthermore, society has been actively seeking sound and sustainable environmental governance (see Chapter 3), which exists and is effective in some contexts. As the scenarios in the next section show, however, governance involving all sectors of society must remain centre stage if sustainability is to be achieved.

11.4 PLANNING SCENARIOS: FOUR POSSIBLE FUTURES

The workshop participants identified two key uncertainties that could steer the evolution of the South African environment. These drivers are highly influential and potentially variable in the medium and even the short term. The uncertainties are:

- The *capability and willingness* of the people and institutions of South Africa to act effectively, efficiently, and decisively in managing and mediating environmental change (that is, 'environmental governance')
- The *availability* of the social, economic, and technological means to implement actions related to the management and mediation of environmental change (that is, 'socio-economic and technological resources').

In line with standard scenario-development practice, these two key uncertainties formed the x and y axes of a two-by-two matrix, within which four future scenarios were articulated (see Figure 11.3). For scenario purposes, environmental governance were understood holistically, and included the values, policies, and institutions used by

the state, the private sector, and civil society to influence and manage affairs relating to the environment.

Willingness to act was seen as a critical element of environmental governance. A country may have the resources to implement sound environmental policies but, if its values and national priorities are not supportive, it may lack societal and political will. It may, for example, emphasize high rates of economic growth, industrialization, and rapid increases in the average wealth of its citizens because its electorate or powerful pressure groups demand these things. In addition, despite relatively high average income levels, it may face serious inequalities in wealth and its policies may emphasize rapid economic growth as an instrument for income redistribution.

Socio-economic and technological resources were understood to include human resources (people, skills), technological resources (science, knowledge, technologically-informed tools and approaches) and economic resources. These were seen to be embodied in a strong and developed economy that has the capacity and potential to develop and support the implementation of effective and efficient environmental policies, strategies, and actions. The scenario narratives are presented in the sections below.

11.4.1 'Tata ma chance'^a scenario

This scenario focuses strongly on economic and industrial growth, with fragmented, poorly developed environmental policies and poor enforcement capacity. Apart from islands of environmental advocacy in the private sector and civil society, environmental concerns are not a priority for most South Africans.

Public institutions support the idea of environmental management, but the process is dominated by administrative procedures. The motions and rhetoric are present, but the pressures of job creation through growth and capital accumulation are foremost in the minds of policy-makers. This produces institutional ineffectiveness and failure in the environmental domain, allowing for relatively unchecked environmental abuses.

Abuses include 'elite capture', where big commercial monopolies misuse resources and do not account for their externalities, which are the costs to society and the environment from, among others, pollution and the depletion of natural resources. The economy continues to rely on fossil fuels to meet its energy requirements with little progress being made to develop and use renewable energy sources. The results are extensive environmental damage and declining ecosystem services. In influential circles of society at large, environmental damage is regarded as an acceptable price to pay for a booming economy and growing personal wealth. This mindset undermines society's value of biodiversity.

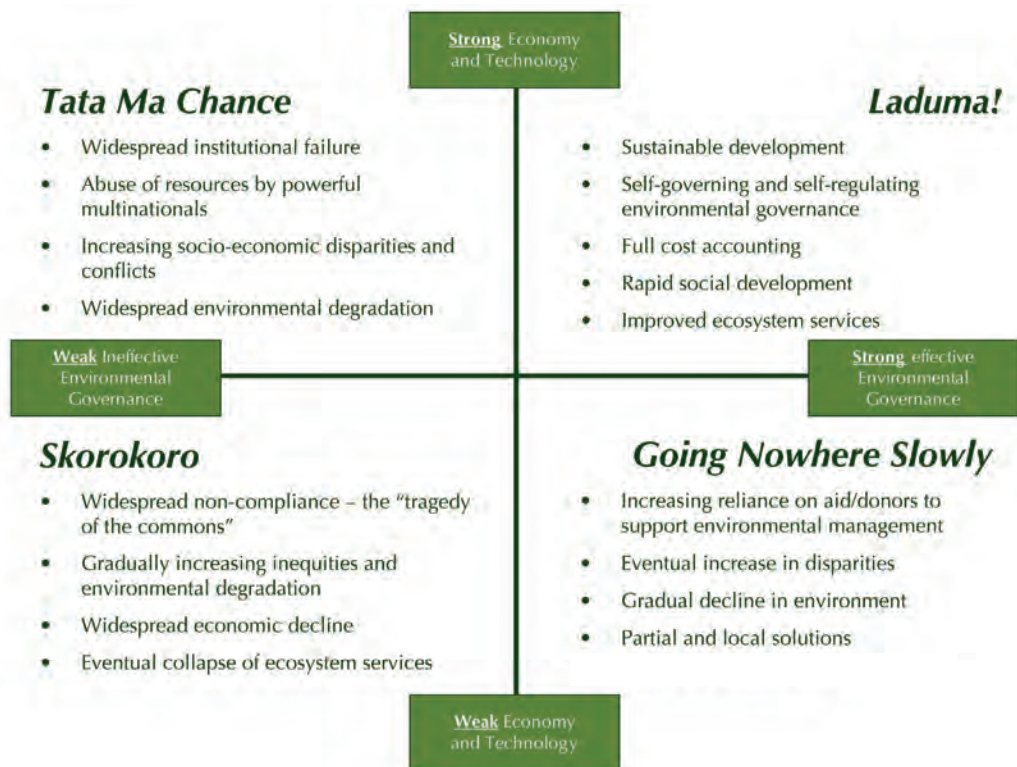


Figure 11.3: Four scenarios of the future environment

This environmental damage is exacerbated by ongoing high rates of urbanization resulting in the large-scale (and mostly uncontrollable) change in land use, the loss of arable land and the encroachment on and destruction of natural areas. Growing urban settlements place ever greater demands on the country’s water resources leading to deficits by 2025.

The country continues to export primary resources, securing quick returns and limiting investment in beneficiation. The ‘quick win’ economic situation deepens economic and social disparities and polarization (shown by rising GINI coefficients), and corruption and crime are endemic.

Weak environmental controls allow over-exploitation of ‘free’ natural resources for which people do not have to pay (such as fish stocks, communal grazing and soil), playing out the pessimistic vision of the ‘tragedy of the commons’^b. Human vulnerability may drop for some people in the short term, thanks to economic and technological advances, but it rises in the long term.

Because of the widespread destruction of environmental capital, the initial increase in national wealth begins to slow down over the 20-year scenario period. Amongst other things, water resources are over-exploited in many catchments, and problems with water quality increasingly

limit the utility of water in some sectors (such as agriculture).

The evolving environmental outcome is policy paralysis and environmental crisis management. Complex and cumulative degradation problems force government into initiatives that try to contain the symptoms but that fail to address the underlying systemic drivers, so the overarching environmental malaise worsens. Ultimately the economy starts to suffer and the ‘Tata ma chance’ scenario starts moving toward the wasteland of ‘Skorokoro’. The opportunity to initiate effective environmental governance systems and to steer towards ‘Laduma!’ is lost.

11.4.2 ‘Skorokoro’^c scenario

In this scenario, poor governance and poor economic performance result in a gradual downward environmental and social spiral, a situation that is deepened by disinvestment. The advantage for the environment is that exploitation slows down, making environmental degradation more gradual, but this situation leads eventually to ecosystem collapse. Socio-economic decline increases the gap between rich and poor; it also grows the ranks of the impoverished.

Poverty and the need to secure livelihoods encourage over-exploitation of common property resources and

Weak environmental controls allow over-exploitation of ‘free’ natural resources for which people do not have to pay (such as fish stocks, communal grazing and soil), playing out the pessimistic vision of the ‘tragedy of the commons’.

exacerbate conditions that favour corruption and crime. Mounting dependence on ecosystem services coupled with limited and ineffective enforcement by the government contributes to the illegal and unregulated overexploitation of our natural resources and biodiversity stocks. Deficits in water lead to severe restrictions that increase the prevalence of waterborne diseases and mortality among the poor and vulnerable. There is increasing food insecurity in the country. The country is heavily reliant on fossil fuels for energy and shows little improvement in the use of renewables. The middle class fights to secure its eroding resources, resulting in a 'laager'^d worldview. An exodus of skills occurs among those with the resources to move, and civil society institutions become orientated towards relief and welfare, or simply moribund.

Human vulnerability to natural disasters increases as the country struggles to contain the crises mounting on every front. The backward slide is steady and unrelenting, and tired resignation sets in among those unable to break away. Seeds of conflict are present, especially relating to access to resources; violent incidents become increasingly common.

11.4.3 'Going Nowhere Slowly' scenario

The state adopts a rational but centralist policy stance. Economic growth falters because of globally unfavourable conditions and national loss of confidence, but government holds fast to a vision of a better and more equitable society. There is understanding of the main environmental and social issues and strong commitment to institute the appropriate governance systems. This improves service delivery in the short to medium term and supports the maintenance of ecosystem services in the medium term.

There is a slight reduction in the poverty gap (that is, the Gini coefficient improves) and some communities experience a related modest lowering of human vulnerability to environmental shocks. Civil society (including environmental organizations) is active and effective, but there is increasing reliance on donor and aid funding.

In the longer term, many social and environmental gains decline once more as the economic and skills resource base stagnates. South Africa discovers that it is not an island: marginal economic success and state-supported social services invite an influx of immigrants. The country does not have the capacity to promote economic development in the rest of Africa, so people move to South Africa in order to survive.

Slower economic growth places constraints on the government's programmes for delivering social services. It also hampers the country's ability to tap cross-border resources such as gas, water and hydro power.

The effects of global warming and other environmental problems place ever greater demands on the country's fiscal resources. Policies increasingly emphasize local and regional economic development, nudging the scenario in the direction of 'Laduma!' This lowers the risk that the situation will drift in the direction of 'Skorokoro'.

11.4.4 'Laduma!'^e scenario

In this scenario, the people, the economy, and the environment move together steadily in a sustainable direction. This positive and symbiotic energy is symbolized by the country's sports rallying cry, 'Laduma!' A sense of excitement and dynamic ubuntu prevails. Sustainable development rather than pure growth is the reoccurring theme of economic policy, where full-cost accounting becomes the norm, measures are brought in to support self-regulating governance, and there is widespread meaningful reporting of the 'triple bottom line' in the private sector.

The government is successful in establishing sustainable human settlements through, among others, environmentally centred landuse planning, the large scale roll-out of service delivery programmes, the elimination of slums, and the reduction of unemployment to a manageable level.

Technological innovation, value-added exports, functional institutions, high levels of compliance with commonly agreed regulations, good safety and security, and good international relations all support a self-regulating system. Strong leadership, characterized by the emergence of charismatic patrons of the environment, continually revitalizes the country's sense of purpose and achievement.

Firm developmental initiatives under New Partnership for Africa's Development (NEPAD) incorporate programmes of regional environmental governance within socio-economic development strategies: the poverty gap is significantly reduced; human vulnerability to disasters declines and ecosystem services improve in the region; civil society is active, well resourced, and effective.

The natural resource bases of bordering countries are stabilized. With political stability comes opportunity for regional natural-resource management and use. This includes developing the agricultural, forestry, and wildlife resource base of southern Africa north of the Limpopo.

All these developments create greater economic capacity to improve environmental governance systems: integrated waste management and an integrated energy policy that emphasize renewable energy are implemented and effective. Positive feedback loops between environmental and economic development strengthen the process.

11.4.5 How does the environment fare?

The four scenarios have different implications for elements of the natural environment, and for linked social and economic systems. (Table 11.2 summarizes these implications.)

- Two scenarios ('Laduma!' and 'Tata ma Chance') proceed from the assumption of a strong **economy** and two ('Going Nowhere Slowly' and 'Skorokoro') assume a weak one, so the scenario implications for economic growth are built into the scenario development process. The exceptional case is 'Tata ma Chance', where economic growth without attention to sustainability leads ultimately to economic decline.
- **Human development** is likely to fare best under 'Laduma!' In 'Tata ma Chance' and 'Going Nowhere Slowly', initial advances in human development are driven by economic activity and by purposeful state intervention, respectively, after which the trend reverses. In 'Tata ma Chance', this is because the strong

economy that causes poverty and vulnerability is environmentally unsustainable, and in 'Skorokoro' there are insufficient resources for welfare.

- Under 'Tata ma Chance' and 'Skorokoro', the sustainability of **land resources** is expected to decline, mainly because of weak environmental governance. Short-term economic gain will be a strong driver of land degradation in 'Tata ma chance', and the struggle for survival will drive it in 'Skorokoro'. In 'Going Nowhere Slowly', the regulatory hand of government will protect land resources for a time, but only in 'Laduma!' will this capacity be sustained. In both cases, environmentally responsible private-sector and civil-society groups will complement the role of the state but, in 'Going Nowhere Slowly', many of them will be under financial pressure.
- In 'Tata ma Chance', **water resources** will continue to deteriorate under the pressure of relatively unchecked development. 'Skorokoro' will slow deterioration down at first but, as governance resources weaken, this advantage will be lost. Both 'Going Nowhere Slowly' and 'Laduma!' will check the deterioration of water quality and spiralling demand, but possibly not reverse

Table 11.2: The environmental implications of the four scenarios

	Tata ma Chance	Going Nowhere Slowly	Skorokoro	LADUMA!
Economic growth	Downward curve	Downward straight	Downward straight	Upward straight
Human development	Downward curve	Downward curve	Downward straight	Upward straight
Sustainable land resources	Downward straight	Downward curve	Downward straight	Upward straight
Sustainable water resources	Downward straight	Downward curve	Downward curve	Horizontal straight
Sustainable marine and coastal resources	Downward straight	Downward curve	Downward curve	Upward straight
Air quality	Downward straight	Downward curve	Downward curve	Horizontal straight
Biodiversity	Downward straight	Downward curve	Downward straight	Horizontal straight
Human vulnerability	Downward curve	Downward curve	Upward straight	Downward straight



- these trends totally. In 'Skorokoro', economic stagnation will work in favour of water resources and, in 'Laduma!', sustained and responsible multi-stakeholder management will assist in maintaining the supply and quality of water resources.
- Outcomes similar to those for water resources are likely for both **marine and coastal resources** and for **air quality**, as they are all driven by the same economic and governance circumstances. While 'Laduma!' may reverse the loss of marine biodiversity, however, it may be less successful in the context of air. The energy demands of the buoyant economy and ongoing but diminishing use of fossil fuels will limit the potential for significant air quality improvement.
 - In 'Tata ma chance' and 'Skorokoro', **biodiversity** will continue to deteriorate under development and human survival pressures, respectively. 'Going Nowhere Slowly' and 'Laduma!' will succeed in holding biodiversity status steady, but gradual economic failure under 'Going Nowhere Slowly' will undermine efforts to manage biodiversity.
 - **Human vulnerability** is closely linked to poverty. In 'Laduma!' and 'Tata ma Chance', a strong economy will to some extent reduce poverty, but in the context of 'Tata ma chance' this will not be sustainable. Social initiatives under 'Going Nowhere Slowly' will address poverty and vulnerability, but they too will not be sustained. In the 'Skorokoro' scenario, vulnerability will intensify and spread.

11.5 HEADING FOR 'LADUMA!'

Environmental scenarios for South and southern Africa (and for Africa as a whole) embody a series of lessons to guide our thinking about sustainability-related options for action. These lessons are as follows:

- A series of environmental scenario studies for the country and the region suggests a growing body of environmentally concerned and strategically-orientated national and regional stakeholders. The sphere of influence of such work is not fully evident at present, but much can probably be done to widen it.
- There is a remarkable convergence of views about the drivers of environmental change in the different scenario studies, which suggests a robust base for policy development and regional cooperation.
- Many of the scenario studies link a solid economy with sustainable development, acknowledging that socio-economic development and environmental sustainability are not necessarily mutually incompatible. With this in mind, environmental policy and strategy should give serious attention to matters of development.

- None of the scenario studies entrust sustainable development to economic forces and markets alone. Effective governance (and, in particular, focused and appropriate policy) is seen by most people to hold the key. The risk, however, is that views of governance focus too narrowly on the institutions and functions of government, and the assumption that all environmental policy will automatically be fully assimilated and implemented is overly optimistic.

Against the above background, there is a clear need to move beyond the world of possibilities embodied in scenario planning, and to seek realistic, practical, and locally relevant options for action. These will have greatest influence if they involve the private sector and civil society as well as government, and if they deploy a wider range of tools, from hard regulation to subtle culture change.

Chapter 12 addresses options for action in greater detail.

11.6 CONCLUSIONS

This chapter has presented an environmental outlook for 2005–2025, based on a detailed state of the environment assessment, and expressed through four environmental scenarios. Only one of these scenarios, 'Laduma!', tells a story of longer-term sustainability. This conclusion may seem harsh but it reflects the realities.

The good news is that South Africa is in a position to move towards this most desirable environmental future. It is by no means out of our reach, as some of the key preconditions are in place and developing in the right direction – that is, we have a robust economy, good environmental policy and laws, and the ability to harness technology in service of cleaner production.

'Laduma!' is not a foregone conclusion, however. To follow it, South Africans will have to develop the collective intention to pursue growth with sustainability. The many challenges include: progress in redressing the deep inequalities of our society; forcing HIV and AIDS into managed retreat; developing a common purpose and will among the broad environmental governance community; and ensuring and entrenching the capacity for strong environmental management and enforcement of legislation wherever needed.



NOTES

- a. 'Tata ma chance' is a local South African catch-phrase used by the National Lottery. It is translated as 'take chances' and infers that it is risky to continue the drive toward high levels of economic growth without adequate consideration for the natural resource base.
- b. A body of knowledge contends that if a resource is collectively owned by a group of people, each will exploit the resource and overuse it, and ultimately, destroy the resource.
- c. 'Skorokoro', also known as 'skedonk', is a South African slang word used to describe a car that is old, dilapidated, and damaged.
- d. 'Laager' comes from the Afrikaans word meaning a defensive encampment encircled by armoured vehicles or wagons.
- e. 'Laduma!' is a colloquial South African expression derived from the Xhosa word 'duma', which means to make a big noise. It is used as a sports rallying cry to signify that a goal has been scored in football.

REFERENCES

1. United Nations Environment Programme/RIVM (2003). *Four Scenarios for Europe*. Based on the United Nations Environment Programme's third Global Environment Outlook. United Nations Environment Programme /DEIA&EW/TR.03-10 and RIVM 402001021.
2. United Nations Environment Programme (2004). *Global Environment Outlook Scenario Framework: Background Paper for United Nations Environment Programme's Third Global Environment Outlook Report (GEO-3)*. UNEP, Nairobi.
3. United Nations Environment Programme (2002). *Global Environmental Outlook 3: Past, present and future perspectives*. UNEP Earthscan, London.
4. United Nations Environment Programme (2002). *Africa Environment Outlook*. UNEP Earthscan, London.
5. Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute, Washington, DC.
6. Huntley, B., Siegfried, R., and Sunter, C. (1989). *South African Environments into the 21st Century*. Human and Rousseau, Tafelberg.
7. Bohensky, E., Reyers, B., van Jaarsveld, A.S., Fabricius, C., Erasmus, L., Ginsburg, A., Holgate, C., Knowles, T., Lebesa, L.N., Pfab, M., van der Merwe, M., Shackleton, C., and Zondo., L. (2004). *Ecosystem Services in the Gariiep Basin: a component of the Southern African Millennium Ecosystem Assessment*. Millennium Ecosystem Assessment, Stellenbosch University, Stellenbosch.
8. Bowes, B., Lundy, G., and Pennington, S. (eds.) (2004). *The Story Of Our Future – South Africa 2014*. South Africa – The Good News (Pty) Ltd, Hyde Park, Johannesburg.
9. Scholes, R.J. and Biggs, R. (eds.) (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. Southern African Millennium Ecosystem Assessment, Council for Scientific and Industrial Research, Pretoria.
10. Southern African Development Community (2005). *SADC Environment Outlook 2005*. Unpublished draft, Southern African Development Community.
11. Campbell, C.J. (2002). *Forecasting Global Oil Supply 2000-2050*. M. King Hubbert Center for Petroleum Supply Studies, Hubbert Centre Newsletter No. 2002/3, Colorado.
12. Lloyd B. (2005). *The End of Oil*. Unpublished report. <http://www.vuw.ac.nz/chaplains/issues/bob-lloyd-the-end-of-oil.pdf>