

Specialist Review Paper on Biodiversity for the National Strategy for Sustainable Development

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1 Introduction

1.1 What is biodiversity and why does it matter for sustainable development?

The term biodiversity refers to genes, species (plants and animals), ecosystems, and landscapes, and the ecological and evolutionary processes that allow these elements of biodiversity to persist over time. South Africa's biodiversity provides an important basis for economic growth and development, in obvious ways such as providing a basis for our fishing industry, rangelands that support commercial and subsistence farming, horticultural and agricultural industry based on indigenous species, our tourism industry, aspects of our film industry, and commercial and non-commercial medicinal applications of indigenous resources. Keeping our biodiversity intact is also vital for ensuring ongoing provision of ecosystem services such as production of clean water through good catchment management, prevention of erosion, carbon storage (to counteract global warming), and clean air. Loss of biodiversity puts aspects of our economy and quality of life at risk, and reduces socio-economic options for future generations.

People are ultimately fully dependent on living, functioning ecosystems and the services they provide. Loss of biodiversity leads to ecosystem degradation and subsequent loss of important services, which tends to harm the rural poor more directly - poor people have limited assets and are more dependent on common property resources for their livelihoods, whilst the wealthy are buffered against loss of ecosystem services by being able to purchase basic necessities and scarce commodities. Our path towards sustainable development, poverty reduction and enhanced human well-being for all, is therefore dependent on how effectively we conserve biodiversity.

Effective management of biodiversity does not guarantee sustainable development, but sustainable development is not possible without it. Wise use and management of biodiversity is a cornerstone of sustainable development.

1.2 What's special about South Africa's biodiversity?

South Africa is diverse not only in terms of our people and culture, but also in terms of our biological resources and ecology. Indeed South Africa has one of the world's richest diversities of plants and animals. South Africa occupies about 2% of the world's land area, but is home to nearly 10% of the world's plants and 7% of the reptiles, birds and mammals. We have three globally recognised biodiversity hotspots; the Cape Floristic Region, which falls entirely within our boundaries; the Succulent Karoo, shared with our neighbour Namibia, and Maputaland-Pondoland, shared with Mozambique and Swaziland. Our seas straddle three oceans, the Atlantic, the Indian and the Southern Ocean, and include an exceptional range of habitats, from cool-water kelp forests to tropical coral reefs. The southern African coast is home to almost 15% of known coastal marine species, providing a rich source of nutrition and supporting livelihoods of coastal communities.

2 Trends and forecasts¹

2.1 Historical and current trends

- The global Millennium Ecosystem Assessment, which included a Southern African component, found that **over the past 50 years humans have changed ecosystems more than in any other comparable period of time** in human history, largely to meet growing demands for food,

¹ The information in Sections 2 and 3 comes from the National Spatial Biodiversity Assessment 2004 (Driver et al. 2005), the National State of the Environment Report (1999), and the NBSAP Country Report (DEAT 2005) (see Section 5 on References and Resources), unless otherwise stated.

fresh water, timber, fibre and fuel. This has resulted in substantial and largely irreversible loss of biodiversity. Implications of this trend for the future are addressed in Section 2.2 below.

- There is **not much quantitative information about historical or long-term trends** in the state of biodiversity in South Africa. The National Spatial Biodiversity Assessment (NSBA) 2004, South Africa's first comprehensive spatial assessment of biodiversity, provides a baseline against which future trends can be measured. The NSBA will be updated every five years.
- In the terrestrial environment, **loss and degradation of natural habitat** is the biggest cause of biodiversity loss and the corresponding loss of ecosystem functioning. Loss of natural habitat occurs as a result of, for example, cultivation, forestry, urban sprawl, and mining. Overgrazing is a major cause of degradation of natural habitat. Loss of natural habitat usually goes together with fragmentation of the remaining natural habitat, which further exacerbates loss of ecosystem functioning. The Southern African Millennium Ecosystem Assessment identified the largest, immediate threat to biodiversity as the expansion of degraded lands into areas currently under sustainable use. The next biggest cause of biodiversity loss is **invasion by alien species**. Other causes of biodiversity loss are unsustainable harvesting and hunting of species, water and air pollution, and climate change.
- River ecosystems are under pressure from **over-abstraction of water**. River biodiversity is also directly impacted by land management – poor management of land results in loss of river ecosystem functioning.
- In the marine environment, **unsustainable harvesting of marine living resources** is the biggest cause of biodiversity loss. Loss of natural habitat often occurs together with this harvesting, for example when the sea bed is trawled.

Below we look at the current state of ecosystems, indigenous species and alien invasive species in the terrestrial, freshwater and marine environments. The marine and freshwater environments will be covered by other specialist review papers, so these are dealt with briefly.

2.1.1 Terrestrial biodiversity

Ecosystems

- There are few records of historical changes in land cover in South Africa.
- From the 1996 National Land Cover it was estimated that 12% of South Africa's land surface was under cultivation, 3% under plantations and 1% under urban development (Fairbanks et al. 2000).
- The NSBA 2004 found that **34% of South Africa's terrestrial ecosystems are threatened**. Of these, 5% are critically endangered, 13% endangered, and 16% vulnerable. Most threatened ecosystems are in the grasslands, fynbos and forest biomes.
- However, **this is a conservative estimate**. It is based on the amount of natural habitat lost according to the 1996 National Land Cover. We know that since 1996 there has been substantial further loss of natural habitat, particularly in some parts of the country such as Kwa-Zulu-Natal, which saw the amount of natural habitat lost increase from 26% of the province's area in 1994 to 36% in 2000.

Species

- A number of assessments of species (e.g. Red Lists) have been conducted, namely for mammals, birds, plants (currently being updated) and frogs. Other species assessments currently being conducted include those for reptiles and butterflies.
- The Red Data Book of Mammals of South Africa indicates that of the 295 species and sub-species of South African mammals evaluated, 57 (19%) are considered threatened (Critically Endangered, Endangered or Vulnerable), while a further 38 (13%) are Near Threatened (Friedmann & Daly 2004).
- An assessment of the status of birds in southern Africa (South Africa, Swaziland, Lesotho, Namibia, Botswana, and Zimbabwe) indicates that two species are extinct in the region, while 59 species are threatened and 64 are Near Threatened (Barnes 2000).

- The Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland indicates that 20 of the 115 recorded species of frogs (17%) are threatened and a further five species are Near Threatened (Minster et al. 2004).
- The Red Data List for plants is currently being revised and the final report will be available in April 2006. Currently there are 1262 threatened plant species in South Africa (181 Critically Endangered, 241 Endangered, and 840 Vulnerable) and 449 Near Threatened (SANBI, forthcoming).

Alien invasive species

- There are about 180 species of invasive alien plants already infesting the equivalent of 10 million ha (8%) of South Africa's surface area. This area is constantly expanding.
- Woody invasive alien species use considerably more water than indigenous vegetation, resulting in the loss of about 7% of the annual flow of South Africa's rivers.
- A study on the economic value of streamflow loss due to invasions of black wattle *Acacia mearnsii* in South Africa estimated a net present cost of R14 billion.
- The cost to clear alien plant invasions in South Africa is estimated to be around R12 billion, or roughly R600 million per year for the estimated 20 years that it would take to deal with the problem.

A new overall indicator of the state of terrestrial biodiversity is the Biodiversity Intactness Index (BII) recently proposed by Scholes and Biggs (2005). The BII synthesises information on land use, ecosystem extent, species richness and population abundance, using an expert assessment approach. South Africa's BII is 80%, compared with 84% for Southern Africa. The grassland, fynbos and forest biomes have the lowest BII within South Africa, aligning with the NSBA finding that these biomes have the highest numbers of threatened ecosystems.

2.1.2 Freshwater biodiversity

Ecosystems

- The NSBA 2004 found that freshwater ecosystems are under much greater pressure than terrestrial ecosystems, reflecting the fact that South Africa is a water-scarce country.
- **82% of South Africa's mainstem river ecosystems are threatened.** Of these, 44% are critically endangered, 27% endangered, and 11% vulnerable.
- These results drew on the DWA-CSIR-WRC National Freshwater Biodiversity Initiative, which is undertaking a systematic national river conservation plan.
- A national monitoring initiative, the River Health Programme, measures and reports on the ecological state of South Africa's river systems.
- There is no comprehensive national data on or assessment of the state of wetland ecosystems. However, it is estimated that 50% of South Africa's wetlands have already been destroyed, with severe implications for water quality, consistency of water supply, and prevention of flooding. The Working for Wetlands programme is in the process of establishing a national wetlands inventory.

Species

- Although no known fish species have become extinct in South Africa, there are records of some species being eliminated from certain river systems with many species showing range reductions.
- 36% of freshwater fish are threatened but their conservation status in South Africa needs to be urgently re-assessed.
- A freshwater species assessment is being initiated by the South African Institute for Aquatic Biodiversity (SAIAB).

Invasive alien species

- Invasive alien fish can be extremely destructive, destroying populations of indigenous fish and disrupting river ecosystem functioning. They are extremely difficult to eradicate once established.
- Up to 60% of threatened endemic freshwater fish may be threatened by introduced fish species.
- Invasive alien plant species use 7% of the available surface water in South Africa annually.

2.1.3 Marine and estuarine biodiversity

Ecosystems

- The NSBA 2004 found that **65% of South Africa's marine biozones are threatened**. Of these, 12% are critically endangered, 15% endangered, and 38% vulnerable.
- The value of the fishing industry, incorporating commercial, recreational and subsistence fishing, is estimated to be R4.5 billion per year.
- South Africa has 259 estuaries, divided into 13 groups. Three of these groups are critically endangered and five are endangered. Estuary functioning is compromised by activities immediately around them, such as coastal development, as well as by overabstraction of water from rivers and land management practices throughout catchments, such as effluent disposal into rivers.

Species

- The conservation status of marine species in South Africa needs to be urgently assessed.

Invasive alien species

- There are currently no active control programmes for invasive alien species in South Africa's marine environment, although a prevention programme aimed at ship's ballast water is being developed.

2.2 Forecasts

There are few forecasts available for the two major causes of loss of terrestrial biodiversity: loss of natural habitat, and invasive alien species.

- At a conservative expansion rate of 5% per year the impacts of alien vegetation could double in 15 years.

The global Millennium Ecosystem Assessment found that:

- The changes to ecosystems have led to increased net gains for human well-being and economic development, but not all regions and groups of people have benefited from this process. Moreover, these gains have been achieved at growing costs in the form of the degradation of many ecosystem services.
- The degradation of ecosystem services could grow significantly worse during the first half of this century, and is a barrier to achieving the Millennium Development Goals.
- The challenge is to reverse the degradation of ecosystems while still meet the increasing demand for their services.

As South Africa's economy strengthens and economic growth rates are sustained or increase, our ecosystems will come increasingly under pressure. In particular, freshwater ecosystems are under unprecedented pressure, especially as a result of expansion of agriculture and industry. Coastal ecosystems face unprecedented pressure as a result of the appeal of the coast for peri-urban development, such as golf courses and luxury estates, which often cut off access to the coast for all except the wealthy. The challenge is to ensure that economic growth does not compromise access and benefits from our natural heritage for all South Africans.

Forecasts in the marine environment, such as overharvesting, should be covered by the marine specialist review paper. Forecasts for freshwater resources and ecosystems should be covered by the water specialist review paper. As noted, the fate of freshwater biodiversity depends to a large extent on how land is used and managed, so trends in land cover, habitat loss and invasive alien plants have a direct bearing on freshwater ecosystems.

2.3 Intersections with other trends: climate change

- Climate change scenarios for South Africa show severe impacts of climate change on biodiversity, with knock-on effects for human security and livelihoods, especially in the arid west which is likely to be hardest hit.
- As South Africa becomes warmer ecosystems are likely to become increasingly prone to invasions by more tropical alien species. Extreme climate events such as floods exacerbate the problem, allowing alien plants to move into riverine areas.
- The effects of climate change on highly variable environments such as estuaries are difficult to predict but expected to be severe.
- Changes in the passage or volume transport of the Agulhas and Benguela currents is likely to have enormous implications for marine biota along the South African coast.
- **Healthy terrestrial and aquatic ecosystems, and the existence of intact ecological corridors linking different parts of the landscape, will help to mitigate the impacts of climate change and should be seen as a crucial element of South Africa's climate change adaptation strategy.**
- The specialist review paper on climate change should highlight the impacts of climate change on biodiversity.

3 Summary of relevant policies, legislation and strategies

Numerous policies, and regulatory and strategic frameworks exist regarding biodiversity conservation. Many of the older statutes do not directly use the term biodiversity but refer to the need for conserving environments and species. In the sections that follow, we look at policy, legislation and strategies that deal directly with the biodiversity sector, and then at related policy, legislation and strategies.

3.1 National policy, legislation and strategies

3.1.1 In the biodiversity sector

Policy

- **White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity** (1997) emphasises that sustainable resource use depends on the conservation of biodiversity.
- **White Paper on Environmental Management Policy** (1998) recommends a coordinated action is needed to conserve natural resources and use them sustainably.

Legislation

- **National Environmental Management Act** (107 of 1998) (NEMA) provides the overarching framework governing environmental management in South Africa. It provides for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment. One of these principles is sustainable development, which requires the consideration of a range of factors including that the *disturbance of ecosystems and loss of biological diversity be avoided, or, where they cannot be altogether avoided, are minimised and remedied.*

- **Biodiversity Act** (10 of 2004) forms part of the National Environmental Management suite of legislation. It provides for the management and conservation of South Africa's biodiversity, the protection of ecosystems and species, the sustainable uses of biological resources, and the fair and equitable sharing of benefits arising from bioprospecting of genetic material. It also provides for the development of a National Biodiversity Framework (see Strategies, Frameworks and Programmes below).
- **Protected Areas Act** (57 of 2003 as amended 2005) forms part of the National Environmental Management suite of legislation. It provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, the establishment of a national register of national, provincial and local protected areas, and the management of these areas according to national norms and standards.
- **Marine Living Resources Act** (18 of 1998) provides for the conservation of marine ecosystems, the long-term sustainable utilisation of marine living resources, the orderly access to exploitation, utilisation and protection of certain marine living resources, and the exercise of control over marine living resources in a fair and equitable manner to the benefit of all citizens of South Africa.
- **Environment Conservation Act** (73 of 1989) has largely been replaced by NEMA.

Strategies, frameworks and programmes

- **National Biodiversity Strategy and Action Plan** (NBSAP) builds on the above policies by translating biodiversity-related policy goals into prioritised objectives and implementation action plans.
- **National Biodiversity Framework** (NBF) is required in terms of the Biodiversity Act, and will be based on the NBSAP. It must provide an integrated, coordinated and uniform approach to biodiversity management throughout the country.
- **State of environment reporting** provides a framework for tracking the impact of policy, legislation and strategies on the state of biodiversity. Consistency between the biodiversity indicators used in national, provincial and local State of Environment Reports is important. The National State of the Environment Report (1999) considers the forces driving economic change, the environmental pressures, the state of the environment, the impacts of environmental change, the country's responses to this change, and environmental management scenarios for South Africa.
- **Environmental Management Plans** and **Environmental Implementation Plans**, required of national departments in terms of NEMA, should include a focus on biodiversity. However, biodiversity tends to be weakly integrated into these.
- **Bioregional programmes** are multi-sectoral partnership programmes that aim to link biodiversity conservation with socio-economic development. They include:
 - Cape Action for People and the Environment (CAPE)
 - Succulent Karoo Ecosystem Programme (SKEP)
 - Subtropical Thicket Ecosystem Programme (STEP)
 - Wild Coast Conservation and Sustainable Development Programme
 - Maloti-Drakensburg Transfrontier Project
 - National Grasslands Biodiversity Programme
 - St Lucia World Heritage Site
- **River Health Programme** measures and reports on river health in order to achieve ecologically sound water resource management of South Africa's river systems.

3.1.2 In related sectors

Policies

- **National Spatial Development Perspective** (2003) (NSDP) provides spatial guidelines for infrastructure investment and development, based on spatial patterns of population settlement and economic potential. This will assist in indicating where biodiversity is likely to come under pressure from development sectors.

- **White Paper on Water Policy** (1977) promotes equity, sustainability and efficiency in water use.
- **National Water Resource Strategy** (2002) promotes integrated water resource management including water conservation, demand management, water pricing, infrastructure development, monitoring and information systems.
- **White Paper on Land Policy** (1997) promotes land and tenure reform.
- **White Paper on Spatial Planning and Land-use Management** (2001) promotes development plans to be reflected in a spatial development framework.
- **Policy for Sustainable Coastal Development in South Africa** (2000) promotes wise management of coastal resources and sustainable coastal development.
- **Policy for Sustainable Forest Development in South Africa** (1996) promotes sustainable use, management and development of forests; the protection of certain forests and trees; the promotion of community forestry; and enhanced participation.

Legislation

- **National Water Act** (34 of 1998) provides for the development, use and protection of water resources.
- **National Forests Act** (84 of 1998) recognises that natural forests and woodlands form an important part of the environment and need to be conserved and developed according to the principles of sustainable management and that conservation of biological diversity within woodlands should be promoted in a way that is consistent with the primary economic purpose for which the plantation was established.
- **National Heritage Resources Act** (25 of 1999) allows for conservation and management of national heritage and cultural resources.
- **Genetically Modified Organisms Act** (15 of 1997) provides for measures to promote the responsible development, production, use, and application of genetically modified organisms.
- **Conservation of Agricultural Resources Act** (43 of 1993) provides for the conservation of natural agricultural resources by maintaining the production potential of land through combating and preventing erosion, the weakening or destruction of water sources, the protection of vegetation, and the combating of weeds and invader plants.
- **Sustainable Utilisation of Agricultural Resources Bill** will replace the Conservation of Agricultural Resources Act.
- **Mountain Catchment Areas Act** (63 of 1970) provides for the conservation, use, management and control of land in mountain catchment areas.
- **Development Facilitation Act** (67 of 1995) set out local government land development principles and procedures. It includes a principle that encourages environmentally sustainable land development practices and processes.
- **Municipal Property Rates Act** (6 of 2004) includes an important provision for a rates exclusion for formally declared protected areas, including private land which is declared a contract nature reserve in terms of the Protected Areas Act.

Strategies and programmes

- **Working for Water** is aimed at removing invasive alien species and restoring water supplies, while addressing social objectives through poverty alleviation and job creation.
- **Working for Wetlands** aims to facilitate the conservation, rehabilitation and sustainable use of wetland ecosystems, while at the same time contributing to poverty alleviation, job creation, training and empowerment.
- **National LandCare Programme** is a programme for natural resource management with the overall aim of optimising productivity and sustainable use of natural resources, to ensure the conservation of natural resources, improved productivity, food security and empowerment.
- **CoastCare Programme** is assisting in increasing awareness regarding coastal management while at the same time addressing poverty.
- **National Action Programme for Desertification** (falls under the UN Convention to Combat Desertification – see Section 3.2) builds on existing initiatives, including public works and poverty relief programmes and initiatives to combat land degradation.

3.2 International agreements and policy frameworks

- **Convention on Biological Diversity** (1993) (CBD) provides broad principles for the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the utilisation of genetic resources. The CBD is being implemented through several national policies and laws including the NBSAP, the Biodiversity Act, and the Protected Areas Act.
- **RAMSAR Convention** on Wetlands of International Importance. South Africa has 17 sites designated to the List of Wetlands of International Importance.
- **Convention on International Trade in Endangered Species** of Wild Fauna and Flora (CITES) is being implemented through the Biodiversity Act.
- **Convention to Combat Desertification** (CCD) is being implemented through the National Action Programme approved by Cabinet (2004).
- **UN Framework Convention on Climate Change** (UNFCCC) is being implemented through the Climate Change Response Strategy approved by Cabinet (2004).
- **Convention concerning the Protection of World Cultural and Natural Heritage** (World Heritage Convention) is being implemented nationally through the World Heritage Convention Act (49 of 1999).
- **Cartagena Protocol on Biosafety**. The Genetically Modified Organisms Act (15 of 1997) is currently under review to enable implementation of this Protocol.

3.3 Provincial and local policies and strategies

- All **provinces** inherited provincial conservation legislation that was in force prior to 1994, particularly the provincial Nature Conservation Ordinances, and are in various stages of phasing out the old legislation and implementing new legislation. New legislation differs from province to province.
- Following from these different legislative provisions, provinces have different institutional arrangements for conservation. Some have independent statutory conservation boards, some have conservation directorates in their environment affairs department, and some have a combination of the two.
- Provincial Growth and Development Strategies, provide the overall framework, strategic direction and scope for development within the province, and should include reference to biodiversity. Some provinces have a Provincial Spatial Development Framework, while others do not. PSDFs provide an important opportunity for highlighting spatial biodiversity priority areas at the provincial scale.
- Provincial Environmental Implementation and Management Plans, required in terms of NEMA, should include a focus on biodiversity. However, biodiversity tends to be weakly integrated into provincial E&IMPs.
- In the **local government** sphere, the Municipal Systems Act (32 of 2000) provides the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities. It does not explicitly refer to biodiversity, but in terms of the Biodiversity Act municipalities must align their Integrated Development Plans (IDPs), and thus their Spatial Development Frameworks (SDFs), with the National Biodiversity Framework and any published bioregional plans.
- There is an increasing focus in the biodiversity sector on working with municipalities to integrate biodiversity considerations into IDPs and SDFs. A number of pilot projects are addressing this issue, with SANBI playing a facilitating, co-ordinating role.

4 Key challenges and policy implications

South Africa has good policy and legislation for the wise use and management of biodiversity, notwithstanding some gaps (see Section 4.2 below). Much of it is relatively new. The **overall challenge is to implement existing policy and legislation effectively.**

4.1 Key challenges for sustainability

We have identified more specific implementation challenges below. A theme that runs through all of them is **mainstreaming biodiversity**, which means integrating biodiversity considerations in the policies, strategies and day-to-day operations of a range of sectors whose core business is not biodiversity conservation. Mainstreaming biodiversity is essential for sustainable development.

1. Making the case for the value of biodiversity

The biodiversity sector has not made an effective case for the role of biodiversity in sustainable development, and for the links between biodiversity and socio-economic development. There is an urgent need to make the case for biodiversity, and to disseminate it among decision-makers and the public.

2. Minimising loss and degradation of natural habitat, especially in threatened ecosystems

This requires working with production sectors that are major land users (such as agriculture, infrastructure and property development, forestry and mining), to develop and implement sector-specific wise-practice guidelines to minimise loss of natural habitat and species in threatened ecosystems, and to protect ecosystem functioning.

In marine and coastal environments, engagement with the mining industry, the coastal property development sector, and the emerging mariculture industry is required, to develop and implement sector-specific wise-practice guidelines to reduce impacts on marine and coastal habitats.

The new tools provided by the Biodiversity Act, including publishing bioregional plans and listing threatened ecosystems, provide important mechanisms for meeting this challenge.

3. Preventing and controlling the impact of invasive alien species

Multiple institutions are involved in preventing invasive alien species (plants, animals and micro-organisms) from entering the country and in controlling invasive alien species already present. These institutions include Department of Water Affairs and Forestry, Department of Agriculture, DEAT (including Marine and Coastal Management), Department of Health, Customs and Excise, and Department of Transport (through their management of harbours and airports).

Co-ordination and alignment of resource allocation and implementation strategies is needed between these institutions, for example through a multi-agency national programme that deals with the full suite of impacts posed by invasive alien species across the landscape and seascape.

Alien clearing efforts, such as Working for Water, should focus on areas where socio-economic needs coincide with areas of high biodiversity priority.

4. Making sure that extractive use of our natural resources is sustainable, especially in the marine environment

This requires engaging with the commercial fishing industry to find ways to reduce negative impacts on marine biodiversity (both on fish stocks themselves, and on marine habitats, especially soft-bottom trawling grounds), thus contributing to the long-term health of the industry.

In the terrestrial environment, the ecological sustainability of extractive use of biological resources needs to be assessed and monitored, and opportunities for improvement identified. Our knowledge and understanding of this aspect of sustainable development, which is particularly important for the rural poor, is inadequate

5. Building the capacity of local government to include biodiversity opportunities and constraints in integrated development planning and other municipal functions

Local and district municipalities play a key role in managing biodiversity and other natural resources, for example through their role in spatial planning, land-use decision-making and infrastructure development. Yet municipalities often do not have the information, systems and human resources to take biodiversity considerations effectively into account in these activities.

Several pilot projects around the country are working with municipalities to develop tools and methods for building municipal capacity to incorporate biodiversity considerations. Results from these pilot projects should be used to roll such support out to more municipalities. The results of the NSBA can help to identify municipalities that require support most urgently, for example, those with high numbers of threatened ecosystems.

6. Unlocking a mechanism for integrated natural resource management at the local level

It is not only municipalities that make decisions about land and resource use at the local level. For example, Catchment Management Agencies, provincial departments of environment affairs, provincial conservation agencies, provincial departments of agriculture, and provincial offices of the national Department of Agriculture, all make local-level decisions that impact on ecosystem functioning. Integrated planning and management of water and land at this local level is a priority if we are to manage biodiversity and other natural resources effectively. Yet at the moment, different agencies carry out their functions in relative isolation from each other.

A relatively simple mechanism to align and co-ordinate natural resource management at the local level would be the appointment of a natural resource management co-ordinator in each district, who would make sure that the staff of different agencies and departments working in the district were in regular contact with each other, aware of priority ecosystems in the area, and not working at cross-purposes.

7. Expanding the protected area network through innovative mechanisms

The Protected Areas Act provides for any land, including private or communal land, to be declared a formal protected area, and allows for co-management of such a protected area by the landowner(s) or any suitable person or organisation. This means that formal protected area status, with an associated property rates exclusion in terms of the Municipal Property Rates Act, is not limited to state-owned land, and that government agencies are not the only organisations that can manage protected areas, opening the way for a range of innovative protected area arrangements that were not previously possible. A related challenge is to make the links between protected area development, sustainable tourism, and benefits to surrounding communities who should be key stakeholders in protected areas.

4.2 Policy gaps and contradictions

As noted, South Africa's biodiversity policy and legislation is good on the whole. However, there are some significant policy gaps and contradictions that should be addressed in the interests of sustainable development.

1. Gap: Policy framework for integrated management and decision-making in terrestrial and freshwater environments

There is an urgent need to integrate land and water policy and management, as a basis for integrated management strategies. The way we manage land has profound impacts on river

biodiversity and the production of water. Since DWAF is the national custodian of inland water resources and DEAT is the national custodian of biodiversity, conservation of freshwater biodiversity cannot be successful without achieving some interface in policy and strategies between these two departments. Development of criteria for river management that address social, economic and ecological sustainability would be one step towards achieving this.

2. Gap: Fiscal instruments for improved biodiversity management

a. Fiscal instruments that encourage private landowners to contribute their own resources to effective biodiversity management

Most of South Africa's biodiversity is in private hands, and private landowners (individuals or companies) are often willing to contribute their own resources to maintaining biodiversity and ecosystem functioning on their land. Incentives such as income tax deductions for expenditure on controlling invasive alien species or on rehabilitating ecosystems, and estate duty provisions that encourage philanthropy towards the environment, would help to harness this pool of private resources, with benefits for the provision of ecosystem services that contribute to the public good.

b. Mechanisms that allow for payment for ecosystem services, and reinvestment of the revenues generated in securing the health ecosystems

Some payment mechanisms for ecosystem services exist already, for example levies on water and charges for pollution discharge. It is important to ensure that the revenues thus generated are invested in maintaining the ecosystem services concerned, for example in improved catchment management.

3. Gap: Tools for including biodiversity considerations in environmental assessment and land-use decision-making

Our current system of environmental assessment and decision-making about land use usually fails to take adequate account of and respond to biodiversity priorities. This could be improved through:

a. Ecosystem-specific guidelines for environmental assessment, and generic terms of reference for biodiversity specialist studies conducted as part of EIAs.

Biodiversity specialist studies in EIAs are often limited to listing species of special concern on the site. They usually fail to address impacts on ecosystem functioning, or cumulative impacts, yet these are often crucial for sustainable development. Such guidelines have recently been published for the Western Cape, and could be produced for other provinces.

b. Framework for guiding trade-offs that decision-makers have to make.

In many cases, conflicts between, for example, biodiversity management, food production and job creation, can be avoided through intelligent project planning and design. However, in some cases, trade-offs have to be made. There is currently no framework to guide decision-makers about how to weigh up biodiversity considerations against more immediate socio-economic considerations.

c. Policy framework for biodiversity offsets

In some cases, following avoidance and mitigation, there is still residual damage to biodiversity as a result of a development. In such cases, if the development is socially and economically sustainable, ecological sustainability can be achieved through a biodiversity offset. A biodiversity offset involves setting aside land in the same or a similar ecosystem elsewhere, at the cost of the developer. Biodiversity offsets are already being implemented to some extent in South Africa, but with no legal or policy framework to guide them, and thus little consistency in the way they are being applied. Systematic application of biodiversity offsets could provide significant benefits at little cost to the fiscus.

4. Gap: Framework for clarifying biodiversity mandates and resource allocation between the three spheres of government

There is lack of clarity on how biodiversity-related functions are divided in practice between the three spheres of government, and between management of protected areas and management of the wider landscape. There is significant scope to clarify, and to develop more appropriate and effective resource allocation mechanisms to allow the respective spheres to fulfil their mandates.

5. Contradiction: Lack of clarity in the application of NEMA

Currently NEMA is taken into account to a limited extent in cultivation and mining authorisations. This is a grey area that warrants high-level attention, given that loss of natural habitat is the biggest pressure on biodiversity.

5 References and resources

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