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**ABBREVIATIONS AND ACRONYMS**

|  |  |
| --- | --- |
| **BA** | Basic Assessment |
| **B-GIS** | Biodiversity Geographical Information System |
| **CARA** | Conservation of Agricultural Resources Act 43 of 1983 |
| **CBA** | Critical Biodiversity Area |
| **CBD** | Convention on Biological Diversity |
| **CoP** | Conference of Parties (of the CBD) |
| **CR** | Critically Endangered |
| **DAFF** | Department of Agriculture, Forestry and Fisheries |
| **DEA** | Department of Environmental Affairs |
| **DWA** | Department of Water Affairs |
| **EIA** | Environmental Impact Assessment |
| **EMF** | Environmental Management Framework |
| **EMP** | Environmental Management Plan/Programme |
| **EN** | Endangered |
| **ESA** | Ecological Support Area |
| **FEPA** | Freshwater Ecosystem Priority Area |
| **GA** | General Authorisation |
| **GG** | Government Gazette |
| **GN** | Government Notice |
| **IAIA** | International Association for Impact Assessment |
| **IAS** | Invasive alien species |
| **IDP** | Integrated Development Plan |
| **IEM** | Integrated Environmental Management |
| **IUCN** | International Union for Conservation of Nature |
| **LT** | Least Threatened |
| **MLRA** | Marine Living Resources Act 18 of 1998 |
| **MMP** | Maintenance Management Plan |
| **MPRDA** | Mineral and Petroleum Resources Development Act 28 of 2002 |
| **MSA** | Local Government: Municipal Systems Act 32 of 2000 |
| **NBA** | National Biodiversity Assessment |
| **NBF** | National Biodiversity Framework |
| **NBSAP** | National Biodiversity Strategy and Action Plan |
| **NEMA** | National Environmental Management Act 107 of 1998 |
| **NEMBA** | National Environmental Management: Biodiversity Act 10 of 2004 |
| **NEMICMA** | National Environmental Management: Integrated Coastal Management Act 24 of 2008 |
| **NEMPAA** | National Environmental Management: Protected Areas Act 57 of 2003 |
| **NFA** | National Forest Act 84 of 1998 |
| **NFEPA** | National Freshwater Ecosystem Priority Areas |
| **NHRA** | National Heritage Resources Act 25 of 1999 |
| **NPAES** | National Protected Areas Expansion Strategy |
| **NSBA** | National Spatial Biodiversity Assessment |
| **NSSD** | National Strategy for Sustainable Development and Action Plan |
| **NVFFA** | National Veld and Forest Fire Act 101 of 1998 |
| **NWA** | National Water Act 36 of 1998 |
| **PES** | Present Ecological State |
| **RDB** | Red Data Book |
| **SANBI/B-GIS** | South African National Biodiversity Institute/Biodiversity GIS (Unit) |
| **SALA** | Subdivision of Agricultural Land Act 70 of 1970 |
| **SBP (or SCP)** | Systematic biodiversity planning/ Systematic conservation planning |
| **SDF** | Spatial Development Framework |
| **SEA** | Strategic Environmental Assessment |
| **SPLUMA** | Spatial Planning and Land Use Management Act 16 of 2013 |
| **TOPS** | Threatened or Protected Species |
| **VU** | Vulnerable |
| **WHS** | World Heritage Site |
| **WRI** | World Resources Institute |
| **WUL/A** | Water Use Licence/Application |

# PART A: INTRODUCTION

## INTRODUCTION AND BACKGROUND

This guideline recommends minimum requirements for the consideration of biodiversity in the course of integrated environmental management (IEM), which includes spatial and development planning, environmental assessment and decision making.

'Integrated environmental management' (Preston et al., 1996, p 749) is a specific approach to planning and impact assessment that was developed in South Africa and hinges on the following principles:

* A broad understanding of the term 'environment';
* Informed decision making;
* Accountability for decisions and the information on which they are based;
* An open, participatory approach in the planning of proposals (and plans, policies and programmes); and
* Pro-active and positive planning.

These minimum requirements draw on the principles of IEM to motivate how best available information about biodiversity priorities can be used proactively to promote ecologically and socio-economically sustainable development when undertaking:

* Strategic spatial planning or designing environmental management frameworks;
* Pre-application screening; and
* Basic Assessment, Scoping and EIA and strategic environmental assessment (SEA).

They are therefore presented with the understanding that all South Africans have a basic, constitutional right to development that is ecologically sustainable – inasmuch as they also have the right to justifiable development that moves the country and its people towards the realisation of other basic human rights enshrined in the Constitution. The purpose of the minimum requirements, therefore, is to present a particular approach – premised on the principles of IEM – to development planning, impact assessment and decision making that is deliberately geared towards finding a defensible balance between ecological sustainability and justifiable socio-economic development.

There is a dire and urgent need for pre-emptive action that places biodiversity considerations at the forefront of development planning in South Africa: all major ecosystems (terrestrial, aquatic, coastal, inshore and offshore) are significantly threatened. This situation is compounded by low to very low levels of ecosystem protection (Driver et al., 2012), inadequate implementation and enforcement of legislation (DEAT, 2006), fragmented administrative procedures and a lack of co-ordination between regulatory authorities (DEAT, 2009). Degradation of 'ecological infrastructure' – particularly sources of fresh water such as catchments, wetlands and rivers – can substantially compromise the country's goal of eliminating poverty and reducing inequality by 2030.

South Africa is richly endowed with a great diversity of biomes, ecosystems and species, and its protected areas are world famous. The country's land surface represents just 1.2% of the earth's total land surface, but contains almost 10% of the world's total known bird, fish and plant species, and more than 6% of reptile and mammal species (Cadman et al., 2010, p 26). Three of the world's 34 global biodiversity hotspots occur in the country – namely regions with especially higher numbers of endemic plant species, but which have lost at least 70% of their original natural vegetation.[[1]](#footnote-1) These are:

* The Cape Floristic Region in the south west of the country falls entirely within the borders of South Africa and includes the world's smallest but, proportionally, most species-rich plant kingdom, the Cape Floral Kingdom;
* The Succulent Karoo Biome which extends inland from the Western Cape, via the West Coast and Namaqualand into southern Namibia; and
* The Maputaland-Pondoland-Albany hotspot which extends roughly from Port Elizabeth to southern Mocambique.

However, as denoted by the 'hotspot' status of three major biogeographical regions within South Africa, the safeguarding of this biodiversity is an immensely demanding challenge across all sectors and spheres of government.

A summary of the state of biodiversity in South Africa (Driver et al., 2012) shows that:

* Wetlands, representing some of the country's most critical ecological infrastructure, are the most threatened of all ecosystems in South Africa – 48% of wetland ecosystems are at the point where ecological and hydrological functioning are potentially irreparably compromised, and species associated with these systems may already have been lost. Wetlands occupy only 2.4% of the land surface in South Africa, yet play a massive role in providing a reliable, naturally clean source of water to dams that supply large urban centres such as Johannesburg, Durban and Cape Town, and feed springs and aquifers that support numerous rural towns and farms throughout the country. Degraded wetlands have also lost their natural ability to regulate floods and trap sediments, which can have a severe, downstream knock-on effect in the form of increased flood damage and destabilised watercourses. In 2011, for example, flooding in seven South African provinces cost the country around R160 billion in economic losses.[[2]](#footnote-2) Climate change forecasts indicate that the frequency, intensity and damage caused by floods likely to worsen.
* Rates of habitat loss in parts of the country are so rapid and extensive that, in the case of Gauteng, KwaZulu-Natal and North West Province, there will be almost no natural habitat left outside protected areas by 2050 – unless, that is, this massive inroad into the country's natural capital can be stopped and turned around. As it is, 40% of terrestrial ecosystems in South Africa are threatened, meaning that the remaining habitat has dropped below thresholds that sustain healthy ecological functioning or, at worst, have been so reduced in extent that few natural examples of these critically degraded systems still exist and extinctions are either imminent or have already occurred. Outright loss of habitat is not the only pressure on terrestrial biodiversity in South Africa. With increased fragmentation and isolation of surviving remnants, vital ecological processes start breaking down – which, in turn, can be hastened by inappropriate fire regimes, bush encroachment, infestation by invasive alien species and pollution.
* South Africa has made some progress towards increasing the amount of land in protected areas since 2004 (when the first national biodiversity assessment was undertaken), from just less than 6% of the total proportion of land in 2004 to 6.5% in 2011. However, numerous ecosystems have little or no protection, especially in the Grassland, Thicket and Nama-Karoo biomes. Forest, Desert and Fynbos are the best protected biomes. However, even in biomes that enjoy relatively good levels of ecosystem protection, such as the mountains of the Fynbos Biome, there are still numerous examples of ecosystem types that are either poorly protected, or not protected at all. Many of these ecosystems, especially in intensively farmed lowlands, are also threatened, which makes their conservation a major priority. Due to the fact that it is highly unlikely that such land will ever be incorporated into the network of statutory nature reserves and national parks, innovative strategies are necessary to secure this biodiversity for conservation purposes. Conserving rivers is particularly challenging in this regard, where a whole-catchment approach to management represents the most desirable option for looking after aquatic ecosystems.

**The Aichi Biodiversity Targets and biodiversity mainstreaming**

Many of South Africa's most pressing conservation priorities are located outside the boundaries of protected areas. For this reason, spatial planning, impact assessment and official decision making represent enormous opportunities for safeguarding biodiversity. **This is what 'biodiversity mainstreaming' is about, and where these minimum requirements fit in** – facilitating the integration of outcomes of systematic conservation planning into land-use planning policy and practice (Pierce et al., 2005).

The principles and objectives of biodiversity mainstreaming have strong international endorsement from the Convention on Biodiversity, as demonstrated by the adoption of a *Strategic Plan for Biodiversity 2011-2020* by the 10th meeting of the CoP (Decision X/2) in Nagoya, Japan, between 18 - 29 October 2010. The strategic plan includes 20 headline targets for 2015 or 2020 (the 'Aichi Biodiversity Targets'), organized under five strategic goals:

*Strategic Goal A*: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

*Strategic Goal B*: Reduce the direct pressures on biodiversity and promote sustainable use

*Strategic Goal C*: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

*Strategic Goal* D: Enhance the benefits to all from biodiversity and ecosystem services

*Strategic Goal E*: Enhance implementation through participatory planning, knowledge management and capacity building.[[3]](#footnote-3)

There is a strong legislative basis for 'mainstreaming' biodiversity into spatial planning, land-use control and environmental regulation, which is backed by excellent and up to date resources on biodiversity and conservation priorities. The Department of Environmental Affairs (DEA) and South African National Biodiversity Institute continues to play a leading role in this regard, as do universities, research institutes, bioregional programmes, provincial nature conservation agencies and non-governmental organisations.

The IEM and planning sectors can make a major contribution to reconciling biodiversity conservation imperatives with development that is to the lasting benefit of the country's people and the ecosystems that underpin our collective wellbeing. Many tools are at its disposal: the best available scientific information and maps on biodiversity conservation priorities, authoritative ecosystem guidelines and sound terms of reference for biodiversity assessment. These minimum requirements explain how legislation, biodiversity plans and IEM best practice are related to each other, and they can be put to best effective for the sake of ecologically sustainable development.

## BIODIVERSITY PATTERN AND PROCESS

To conserve biodiversity, it is important that representatives of the full variety of **biodiversity pattern** of (living organisms and habitats) are safeguarded as well as the essential **ecological processes** on which they depend for persistence.

Biodiversity 'pattern' and 'process' effectively represent two sides of the same coin, where:

Biodiversity **pattern** generally refers to species and their habitats, but also extends to larger components such as ecosystems and vegetation types. Biodiversity pattern is **structured** or organised across a wide range of spatial or geographical **scales**, which can vary from micro-sites or highly restricted habitats (e.g. a patch of moss, quartz pebbles or, at a broader scale, an isolated peak) to entire vegetation types or even biomes.

Biodiversity **process** is ‘shorthand’ for ecological processes that operate over relatively short time scales, while evolutionary processes operate over much longer time scales to maintain and generate biodiversity. Biodiversity processes may also **function** at widely divergent **scales.** Whereas a patch of vegetation less than 5 ha in extent may be able to support specialist pollinator relationships, processes such as migration or predation involving large predators and herbivores may require tens or hundreds of square kilometres to persist. The concept of ‘**landscape**’ or ‘**riverscape**’ is useful for bringing a functional, ecological perspective to bear on activity or project-specific impacts that may extend in space and time beyond the boundaries of an individual site or property.

Both biodiversity pattern and ecological processes may be determined or supported by environmental '**drivers**' such as rainfall, tidal flux, flooding or fire which, if altered, may result in adverse changes to the composition, structure or functioning of biodiversity.

Conservation science has developed useful **spatial surrogates** to predict the potential presence of particular types or combinations of biodiversity pattern or the geographical extent at which specific ecological processes function. Examples of the former include ‘broad habitat units’ and ‘spatial components of ecological processes' that are either fixed or flexible..

**'Fixed' spatial components of ecological processes** refer to geographical or landscape features that are essentially immovable, such as soil or geological interfaces, or river and sediment movement corridors). **'Flexible' spatial components of ecological processes** can be selected by human choice, depending on the relevant biodiversity objective. Examples include decisions about where best to establish 'mega-corridors' to link mountains and the coast, or maintain environmental gradients that would permit organisms to migrate and adapt in response to climate change.

Conserving processes requires a significantly larger proportion of the landscape than is needed to represent biodiversity pattern. The sound management of land use in the vicinity of areas set aside for conserving pattern (e.g. protected areas) is therefore essential. It is crucial that planning and impact assessment are informed by the **geographical scale** at which key environmental or ecological processes occur, and with what **frequency** and **seasonal variation**.

**Failure to consider either biodiversity pattern or ecological processes at the appropriate functional and spatial scales during planning, environmental assessment and decision making would mean that ‘biodiversity’ has not been adequately considered.**

##### Aspects of biodiversity pattern and process that potentially need to inform planning and impact assessment are summarised below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Pattern** | | | **Process** | | |
| **Composition** | **Structure** | Examples of scales at which biodiversity pattern may occur and therefore may need to be assessed | **Environmental** (abiotic) | **Ecological** (biotic) | Examples of scales at which ecological processes may occur and therefore may need to assessed |
| Genes  Species  Populations | Habitats  Communities  ‘Patches, remnants’  Ecosystems  Catchments  Vegetation types  Biomes, etc | Sites  Properties  Landscapes  Catchments  Regions  Provinces, etc | Fire  Tidal flux  Sand movement  Soil disturbance)  Floods and droughts | Recruitment  Pollination  Migration  Herbivory  Predation  Reproduction  Plant species diversification | Vegetation patches  Soil interfaces  Riverine and sediment corridors  Ridges  Upland-lowland interfaces and gradients |

For more information on biodiversity pattern and process, and environmental and spatial surrogates for biodiversty pattern and process, see:

South African National Biodiversity Institute (SANBI) (2013) *Grasslands Ecosystem Guidelines: Landscape interpretation for planners and managers*. Compiled by Cadman M, de Villiers C, Lechmere-Oertel R and D McCulloch. South African National Biodiversity Institute, Pretoria.

Noss RF (1990) Indicators for Monitoring Biodiversity: A Hierarchical Approach. *Conservation Biology*, Vol 4 No 4, pp 355-364

Cowling RM and CE Heijnis (2001) The identification of Broad Habitat Units as biodiversity entities for systematic conservation planning in the Cape Floristic Region. *South African Journal of Botany* 67(1), pp 15-38

De Villiers CC, Brownlie S, Clark B, Day EG, Driver A, Euston-Brown DIW, Helme NA, Holmes PM, Job N, Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Pierce SM, Cowling RM, Knight AT, Lombard AT, Rouget M and Wolf T (2005) Systematic conservation planning products for land-use planning: Interpretation for implementation. *Biological Conservation* **125**, 441-458.

Slootweg R, Kolfhoff A, Verheem R and R Höft (2006) *Biodiversity in EIA and SEA – Background Document to CBD Decision V111/28: Voluntary Guidelines for Biodiversity-inclusive Impact Assessment*. Secretariat of the Convention on Biological Diversity and Netherlands Commission for Environmental Assessment, The Netherlands.

Rouget M, Cowling RM, Pressey RL and Richardson DM (2003) Identifying spatial components of ecological and evolutionary processes for regional conservation planning in the Cape Floristic Region, South Africa*. Diversity and Distribution* **9**, 191-210.

United States Environment Protection Agency (1999) *Considering Ecological Processes in Environmental Impact Asessment*s <http://www.epa.gov/compliance/resources/policies/nepa/ecological-processes-eia-pg.pdf> (29.10.2013)

## ECOLOGICAL INFRASTRUCTURE AND ECOSYSTEM GOODS AND SERVICES

Biodiversity – or 'ecological infrastructure' – generates escosystem goods and services that are necessary for its own maintenance, but also underpin human wellbeing.

Ecosystem goods and services are defined variously as ‘components of nature, directly enjoyed, consumed or used to yield human wellbeing’ (Landers and Nahlik, 2013)[[4]](#footnote-4), or as ‘the benefits people obtain from ecosystems’[[5]](#footnote-5). Biodiversity is not itself an ecosystem service. Rather, it underpins the supply of ecosystem goods and services. The value some people place on biodiversity for its own sake is captured under the cultural ecosystem services.

Another way of viewing biodiversity is to re-cast it as 'ecological infrastructure' or the stock of ecosystems and species, or natural capital, that provides a flow of essential goods and services to society. Ecological infrastructure is nature's equivalent of built infrastructure: mountain catchments, rivers, wetlands, coastal dunes, spawning grounds, and nodes and corridors of natural habitat (Cumming, 2014). Networks of ecological infrastructure may take the form of large tracts of natural land or ocean, or small remaining patches or ecological corridors embedded in farmland.

Like built infrastructure, ecological infrastructure is crucial for providing services and underpinning socio-economic development. Well-managed ecosystems can remain productive as long as their utilisation remains within sustainable thresholds and their natural ability to absorb and adapt to pressure. However, if ecosystem resilience is stretched beyond the point of recovery, changes are liable to occur to the composition, structure and functioning of the affected system – in other words, ecological infrastructure has become degraded and so has its ability to yield a predictable supply of ecosystem goods and services to society (Cadman et al., 2013).

It follows that if ecological infrastructure is degraded or lost the flow of ecosystem services available to society will dimish – with effects that can range, depending on the location and type of the affected ecosystems, from food and water shortages, repeated wildfires and floods to desertification and potentially cataclysmic coastal erosion. It is often vulnerable or poor communities that rely most heavily on ‘free’ goods and services obtained from ecological infrastructure for their lives and livelihoods. Any loss or deterioration in these services has a profound impact on people who have least resilience or coping capacity (e.g. WRI 2005). Human migration, especially of vulnerable groups who have limited capacity to cope with environmental change, will be an inevitable consequence of large-scale degradation of ecological infrastructure which, by its definition, is very difficult to replicate artificially, if at all. In extreme cases, deterioration of ecological infrastructure can result in water shortages (e.g. poorly managed catchments that result in accelerated run-off, erosion and dams being silted up), devastating fires caused by a build-up of highly inflammable invasive vegetation or poorly managed indigenous vegetation, or major flood damage as a result of development encroaching into floodplains, artificial (and ineffectual) attempts at stabilising naturally dynamic watercourses and hardening of catchments.

The quest for ‘multifunctional landscapes’ in which the persistence and maintenance of ecological infrastructures can exist side-by-side with more intensive human use of the biophysical environment is a key objective of biodiversity mainstreaming and ecologically sustainable development (see, for example, Driver et al., 2003; World Resources Institute, 2008; and O’Farrell and Anderson, 2010). Critically, impact assessment, planning and decision making must actively promote development that does not perpetuate unsustainable trade-offs between economic benefits and the productivity and resilience of ecological infrastructure and its vital societal services.

An important facet of development planning and environmental assessment therefore entails encouraging decisions that would support the maintenance of functioning ecological infrastructure and, where this natural capital or stock has become degraded, to invest in its rehabilitation.

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# 

# PART B: OVERVIEW OF THE LEGAL FRAMEWORK FOR ADDRESSING BIODIVERSITY IN LAND-USE PLANNING AND IEM

Legislation and policy lay a sophisticated groundwork for ‘biodiversity’ in our system of government and South Africa’s record of biodiversity assessment, planning and ‘mainstreaming is unparalleled in world terms.

Whereas this chapter focuses on ‘biodiversity’ in a regulatory context – e.g. in terms of legal definitions, empowering legislation and principles – it is important to appreciate that laws and regulations represent but the tip of the iceberg when it comes to a scientifically and ethically defensible evaluation of the role of ‘biodiversity’ in planning, environmental assessment and decision making processes.

Because ‘biodiversity’ is such a complex (and evolving) concept, the informed treatment of biodiversity as a precondition for ‘sustainable development’ means that practitioners and officials need a wide range of knowledge and conceptual skills that include but are not limited to:

* Understanding what is meant by ‘biodiversity’ and its embodiment and role in legislation and the principles of ‘sustainable development’;
* An ability to analyse and assess ‘biodiversity’ in relation to its fundamental contribution to maintaining the integrity and resilience of socio-ecological systems;
* Comprehending and applying an ‘ecosystem approach’ to development planning, impact assessment and decision making; and
* Rigorous application of a risk-averse and precautionary approach where decisions may result in the irreversible loss of irreplaceable or otherwise highly significant biodiversity.

In practice, all these aspects that relate to and define the ‘adequate consideration’ of biodiversity in development planning are highly integrated and difficult to tease apart. These guidelines attempt to ‘unpack’ such an integrated understanding of ‘biodiversity’ in its legal and applied contexts.

**IMPORTANT NOTE REGARDING THE LEGAL AUTHORITY OF THESE GUIDELINES**

**These guidelines are written from a lay perspective, as an informal aid to practitioners, managers and decision makers: they do not hold to be an authoritative interpretation of legislation. Users of this guideline must be mindful of this limitation. If there is any uncertainty about the interpretation or application of legislation to an action or circumstance, it is imperative that professional advice be sought.**

## LAW AND BIODIVERSITY ASSESSMENT IN PRACTICE

It is practically impossible to sketch all the circumstances where a legal permission may be required before a development may proceed (more than one approval may, in fact, be necessary), what the biodiversity circumstances of such a process would be, and how they ought to be addressed.

**Table 1** presents laws, and the authorities that are responsible for their administration, that may typically apply to development and land-use management throughout South Africa.

Note that although a primary activity, such as mining or cultivation, may be regulated by one law, other legal obligations may also need to be met before such an activity may commence – such as obtaining environmental authorisations for associated infrastructure or work within 32 m of a watercourse, water use licences or even planning permission where mining would not correspond with an existing land-use zonation or cultivation may go hand-in-hand with a subdivision and rezoning application.

The list is not exhaustive. It is incumbent upon each project proponent and professional advisers to be fully appraised of the legal requirements that may apply to a proposed development or change in land use, and to ensure that the relevant measures are complied with.

**Table 1**

**Please note that the impacts of many of the following activities will depend on the specific development proposal. For this reason, while types of development are included, it is essential to ‘unpack’ the development into its component activities and aspects in order to check likely legal implications.[[6]](#footnote-6)**

| Activity | NEMA | NEMBA/ NEMPAA | CARA | NWA | MPRDA | NHRA | NVFFA | SALA | SPLUMA & other planning laws | NFA | Provincial con-servation ordinances (various) | MLRA | NEMICMA |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cultivation of ‘virgin land’ | **✓** |  | **✓** |  |  | **✓** |  |  |  |  |  |  |  |
| Clearing of natural/ indigenous vegetation or natural forest | **✓** |  |  |  |  |  |  |  |  | **✓** |  |  |  |
| Alteration of drainage, extraction or inter-basin transfer of surface water | **✓** |  |  | **✓** |  |  |  |  |  |  |  |  |  |
| Abstraction of groundwater |  |  |  | **✓** |  |  |  |  |  |  |  |  |  |
| Construction and expansion of dams, reservoirs, impoundments | **✓** |  | **✓** | **✓** |  | **✓** |  |  | **✓** |  |  |  |  |
| Construction of bridges, slipways, jetties | **✓** |  |  | **✓** |  |  |  |  |  |  |  |  |  |
| Anti-erosion measures | **✓** |  | **✓** | **✓** |  |  |  |  |  |  |  |  |  |
| Clearance of flood channels and river banks | **✓** |  | **✓** | **✓** |  |  |  |  |  |  |  |  |  |
| Disturbance/ destruction of wetlands, floodplains, estuaries | **✓** |  | **✓** | **✓** |  |  |  |  |  |  |  |  |  |
| Disturbance/or stabilisation of sand dunes/ soils | **✓** |  | **✓** |  |  | **✓** |  |  |  |  |  |  | **✓** |
| New roads or railway lines | **✓** |  | **✓** |  |  | **✓** |  |  | **✓** |  |  |  |  |
| New powerlines | **✓** |  |  |  |  | **✓** |  |  |  |  |  |  |  |
| Treatment and discharge/ disposal of, waste water | **✓** |  |  | **✓** |  |  |  |  |  |  |  |  |  |
| Sewage disposal | **✓** |  |  | **✓** |  |  |  |  | **✓** |  |  |  |  |
| Solid or hazardous waste disposal |  |  |  | **✓** |  |  |  |  |  |  |  |  |  |
| Firebreaks and controlled burns |  |  | **✓** |  |  |  | **✓** |  |  |  |  |  |  |
| Activity involving or affecting threatened or protected species of plant and/ or animal |  | **✓** |  |  |  |  |  |  |  | **✓** | **✓** |  |  |
| Control of invasive alien plants |  | **✓** | **✓** | **✓** |  |  |  |  |  |  |  |  |  |
| Rezoning |  |  |  |  |  | **✓** |  |  | **✓** |  |  |  |  |
| Sub-division of agricultural land | **✓** |  |  |  |  | **✓** |  | **✓** | **✓** |  |  |  |  |
| Excavation of borrowpits | **✓** |  |  |  | **✓** | **✓** |  | **✓** | **✓** |  |  |  |  |
| Prospecting and mining/ exploration and production | **✓** |  |  | **✓** | **✓** | **✓** |  | **✓** | **✓** |  |  |  |  |
| Construction of renewable energy facilities | **✓** |  |  | **✓** | **✓** | **✓** |  | **✓** | **✓** |  |  |  |  |
| Aquaculture | **✓** | **✓** |  | **✓** |  |  |  |  |  |  |  |  |  |
| Mariculture |  |  |  |  |  |  |  |  |  |  |  | **✓** | **✓**  **)** |
| Protecting natural areas |  | **✓**  ) |  |  |  |  |  |  |  |  |  |  |  |

1. Mostly provincial environmental departments, but the Department of Minerals and Energy for mining-related environmental authorisations
2. National Department of Agriculture, Forestry and Fisheries (regional offices)
3. Department of Water Affairs (regional offices)
4. Department of Mineral Resources (regional offices)
5. SA Heritage Resources Agency or provincial heritage agency
6. Provincial conservation agency
7. Provincial department of agriculture and national Department of Agriculture, Forestry and Fisheries
8. Mostly provincial environmental authorities but also local authorities

## STRUCTURE OF CHAPTER

The chapter serves an overview of ‘biodiversity’ in a regulatory and administrative (i.e. decision-making) context. It covers:

* Definitions of ‘biodiversity’ and biodiversity-related concepts in legislation;
* The Constitution, the basic features of South Africa’s constitutional order and the environmental right;
* The broad distinction between:
  + Laws that assign or control development rights (i.e. in relation to activities, land and resources); and
  + Laws that provide strategic, spatially-based guidance to planning and decision making but do not control, award or deny use rights.
* The **National Environmental Management Act 107 of 1998** as framework legislation that embraces all three fields of environmental concern, namely the conservation and exploitation of resources, pollution control and waste management, and land-use planning and development (Glazewski 2000, p 166) and *inter alia*:
  + Fleshes out the right to “reasonable legislative measures” for environmental protection;
  + Lays down “bed-rock” national environmental management principles that apply to all administrative actions by organs of state that may significantly affect the environment, thereby provide a justiciable basis for ‘ecologically sustainable development’;
  + Prescribes a ‘Duty of Care’ towards the environment; and
  + Establishes general objectives for integrated environmental management (which, in turn, provides the basis of the environmental assessment and management regime in South Africa).
* The **Spatial Planning and Land Use Management Act 16 of 2013** aims to provide a uniform, effective and comprehensive system of spatial planning and land use management throughout South Africa. It emphasises redressing spatio-developmental imbalances of the past, while promoting the sustainable and efficient use of land. The Act inter alia provides for:
  + A nested hierarchy of spatial development frameworks, from the national to the provincial and the local spheres respectively;
  + The management and facilitation of land use by means of means of legally-binding land use schemes;
  + Aligning land use measures with environmental management instruments;
  + Strategic assessments of environmental pressures and opportunities within municipal areas; and
  + A 20-year spatial development perspective for municipal planning.
* The **National Environmental Management: Biodiversity Act 10 of 2004** which, among others:
  + Gives legislative effect to South Africa’s obligations under the Convention on Biological Diversity;
  + Outlines the legal framework for systematic biodiversity planning and ‘mainstreaming’ of biodiversity priorities into municipal planning;
  + Establishes legally-binding opportunities to manage land in support of biodiversity considerations outside the boundaries of statutory protected areas;
  + Provides for the definition and gazetting of threatened ecosystems, and threatened and protected species;
  + Provides for the listing of invasive alien species and their control and eradication; and
  + Seals the relationship between the achievement of national biodiversity conservation priorities and the ‘NEMA’ system of environmental regulation.
* The **National Environmental Management: Protected Areas Act 57 of 2003** which, with the National Environmental Management: Integrated Coastal Management Act 24 of 2008, supplements NEMA and NEMBA with:
  + Expanded definitions of the components of biodiversity and environmental goods and services respectively;
  + Specific assessment and environmental reporting measures relating to various categories of protected areas and coastal management entities; and
  + Additional mechanisms (such as Protected Environments and various tiers of coastal management plans) for balancing and guiding development in relation to biodiversity and, more broadly defined, environmental considerations.
* The **National Environmental Management: Integrated Coastal Management Act 24 of 2008** (‘the coastal management Act’) aims to secure co-ordinated and integrated management of the coastal zone, its protection and equitable enjoyment of its benefits.The coastal management Act develops many of the principles and concepts found in NEMA. Local government is assigend a crucial role in the conservation and sustainable use of the coastal environment. This Act among others:
  + Defines different types of coastal areas for planning, authorisation and management purposes;
  + Explains how the high water mark is to be delimited;
  + Makes provision for coastal set-backs;
  + Provides for a *National Estuary Management Protocol* to guide the formulation and implementation of estuary management plans; and
  + Establishes institutions, procedures and mechanism for coastal planning, land use control and management across all three spheres of government.
* The **National Water Act 36 of 1998**, which comprehensively addresses the sustainable use, protection and management of water resources from an integrated, catchment-based perspective that assigns absolute primacy to access to water as a basic human and ecological right and sets in place novel systems of resource governance. This is a highly complex law and its coverage by this guideline is therefore limited to:
  + Summarising how the Act gives effect to promoting environmental values;
  + Introducing the concept of the Reserve;
  + Providing an overview of water use licensing and general authorisations; and
  + Alignment of the Act with the EIA regime.
* The **National Forests Act 84 of 1998 (NFA)** definess and promotes the sustainable management and development of forests. It emphasises an ecosystem-based approach to the management of forests as sources of environmental goods and services. The NFA provides for the listing of protected trees and protection of forests. The NFA:
  + Establishes principles for sustainable forest management;
  + Prescribes controls relating to the protection of forests and trees;
  + Defines forest protected areas that constitute protected areas in terms of section 9 of the NEMPAA;
  + Prohibits prospecting and mining in forests protected in terms of section 8 of the NFA;
  + Prescribes that environmental impact assessment may be required before undertaking proposed activities in the proximity of a protected forest area; and
  + Provides for regulations that prescribe controls the establishment and management of plantations, feeling of trees, removal of forest produce, and the use of land for various types of development, such as agricultural and roads.
* The **Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA)** which promotes and regulates the development of mineral resources in South Africa. The environmental requirements of the MPRDA must be guided by the National Environmental Management Principles which apply to all prospecting, exploration and mining operations. The environmental implications of mining-related activities are addressed via prescribed environmental assessment procedures that must inform the drafting of environmental management programmes (for mining rights) and environmental management plans for reconnaissance permissions, prospecting rights or mining permits. Aspects covered include:
  + The Mining and Biodiversity Guideline (DEA et al., 2013) and its relevance to applications for mining-related rights or permissions;
  + The applicability of the National Environmental Management Principles and the objectives of IEM to mining and its regulation;
  + The 'cradle-to-grave-approach' with regard to responsibility for the environmental impacts of mining; and
  + Environmental objectives and rehabilitation goals.
* The **Conservation of Agricultural Resources Act 43 of 1983 (CARA)**, which predates NEMA by some 15 years and is currently subject to comprehensive revision with other agriculture-related legislation, regulates the sustainable use of agricultural resources (soil, water and vegetation). Its objects include the maintenance of the production potential of land by combating erosion and weakening or destruction of water resources. CARA is enforced through regulations that *inter alia* control:
  + The cultivation of virgin land (i.e. soil that has not been cultivated for 10 years);
  + The regulation and control of run-off water;
  + The utilisation of vleis, watercourses and water sources;
  + The use and protection of veld that has burnt; and
  + The control of weeds and invader plants.

The chapter is concluded with a summary of laws that regulate activities or changes in land use that may have potentially significant implications for biodiversity.

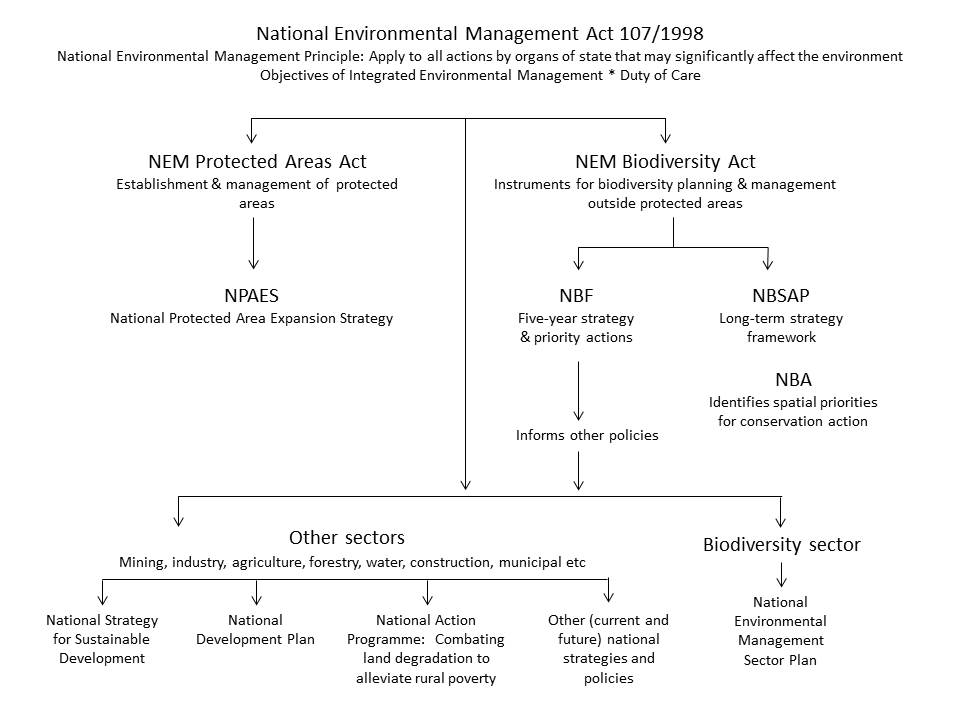
Examples are given of development scenarios that may require more than one approval, and where biodiversity considerations potentially would need to be considered in terms of legislation and these guidelines.

## POLICY INSTRUMENTS FOR BIODIVERSITY CONSERVATION IN SOUTH AFRICA

There is a plethora of international and domestic policies that address a comprehensive range of environmental concerns such as sustainable development (e.g. the National Development Plan and the National Strategy on Sustainable Development), protection of regions (such as the Antarctic Treaty) or species (Convention on the Conservation of Migratory Species of Wild Animals), and specific ecosystems (the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat).

Section C introduces the Convention on Biological Diversity (CBD) the National Biodiversity Strategy and Action Plan (NBSAP) and the National Biodiversity Framework (NBF). The NBSAP and NBF define the policy and strategic framework for pursuing South Africa's obligations under the CBD insofar as these have been written into South Africa legislation.

Figure 1 outlines the legal and policy framework for biodiversity conservation and mainstreaming in South Africa.



**Fig 1: Key policy tools for biodiversity management in South Africa, in support of sustainable development**

(Adapted from Cadman et al., 2010, p 35)

## DEFINITIONS OF ‘BIODIVERSITY’ IN LAW

‘Biodiversity’ is codified in legislation that takes its cue from the Constitution, South Africa’s international obligations and a highly sophisticated body of science and strategic planning that has developed over the past decade in support of ‘biodiversity mainstreaming’ (or biodiversity-inclusive planning and environmental assessment).

Formal, statutory definitions of ‘biodiversity’, ‘ecosystems’ and the like are provided by the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) (also see sections **xyz**).[[7]](#footnote-7) However, ‘biodiversity’ does not fall within the exclusive preserve of NEMBA and, in fact, enjoys wide if disguised reference across our legislative landscape (**Table 2**).

One of the main aims of this chapter, therefore, is to highlight, from an applied perspective, where and to what end ‘biodiversity’ features in legislation, the requirements that this may place on development planning and decision making, and opportunities that are provided in law for safeguarding biodiversity outside the boundaries of formally protected areas.

### Legislative expression of key ‘biodiversity’-related concepts

This guideline follows a broad definition to ‘biodiversity’ that hinges on a nested hierarchy of biological organisation, ranging from genes to ecosystems, which, depending on the organisational unit or component in question, can have a strong spatial dimension to its definition. These concepts are also embedded in law. Examples follow below. Note that the sections dealing with the respective laws and regulations address references to ‘biodiversity’ in more detail.

The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) defines ‘biodiversity’ as

the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems…[[8]](#footnote-8)

The ‘components’ of biodiversity, in turn, include species, ecological communities, genomes, ecosystems, habitats and ecological processes.[[9]](#footnote-9)

Each level of biological organisation can, in turn, be defined in terms of its composition and structure (also referred to collectively as ‘pattern’) and its ecological function (also referred to as ‘process’) (cf. Noss 1990, p 355; Slootweg 2010a, pp 41 and 42). The twin notions of ‘biodiversity pattern and process’ provide a useful conceptual ‘short hand’ by which to define ‘biodiversity’. Environmental (i.e. ecosystem) goods and services are also recognised in legislation, but primarily as a motivation for declaring protected areas.[[10]](#footnote-10)

As indicated, reference to ‘biodiversity’ and its components is not limited to the two laws that deal most directly with the conservation and sustainable use of the country’s natural estate, NEMBA and NEMPAA.

Corrections to the 2010 NEMA EIA regulations, for example, define the meaning of an ‘estuary’ and ‘wetland’ respectively, each of which would constitutes an ‘ecosystem’ characterised by ‘biodiversity’ that occurs across a hierarchy of compositional, structural and functional scales. The National Environmental Management: Integrated Coastal Management Act 24 of 2008 refers to ‘dynamic coastal processes’ such as wind and tidal actions. These may – as abiotic ‘drivers’ of coastal environments – not constitute ‘biodiversity’ per se, but play a crucially important role in maintaining littoral communities, habitats and food webs and, if disturbed or altered, can have devastating effects on ‘biodiversity’.

The National Water Act 36 of 1998 provides an outstanding example of legislation that is contingent upon a functional understanding of the close and dynamic inter-dependencies of biodiversity pattern and process in a freshwater context – but without making express reference to these concepts. A case in point is the definition of ‘resource quality’ which refers to the quality of *all* aspects of a water resource, including ‘system drivers’ such as assurance of in-stream flows and the characteristics and condition of in-stream habitats.[[11]](#footnote-11) The implication here is that the components of aquatic biodiversity are closely related and can only be adequately understood from a functional – i.e. catchment-based or ecosystem – perspective.

It follows from the above that although a law or regulation may not specifically refer to ‘biodiversity’ *per se*, or its components, or aspects such as ecological goods and services, it does not mean that the subject matter of such legislation, or the objectives of a legal instrument, are not concerned with the conservation and sustainable use of ‘biodiversity’.

There is a strong likelihood that the terminology of earlier, pre-NEMA legislation, and laws that pre-dated the international Convention on Biological Diversity (to which South Africa became a signatory in 1995) and which are still in force, will not be couched in the language of ‘biodiversity’ or ‘ecosystems’ or, more latterly, ‘ecosystem goods and services’. For example, the objects of the Conservation of Agricultural Resources Act 43 of 1983 (CARA) are to….

(Provide) for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and combating of weeds and invader plants…[[12]](#footnote-12)

Normatively, the objects of CARA contain traces of the utilitarian ‘resource conservation ethic’ (Fuggle, 1996, p 8; Primack, 1998, p 15). The objects of the Act also anticipate the language of ‘sustainable development’ adopted by ‘Brundtland Report’ of the World Commission on Environment and Development in 1987 – and, with hindsight, strong hints of the relationship (underscored by the Millennium Ecosystem Assessment) between human and ecosystem wellbeing can also be detected, albeit from a sectoral, agricultural, perspective. It would take little adjustment to align the objectives, terminology and approach of CARA with those of ‘biodiversity, ‘ecosystems’ and ‘sustainable use of ecological infrastructure’.. In terms of its objectives, CARA represents a well-intentioned if somewhat dated attempt at aligning agricultural development with the unfolding principles of environmentally sustainability insofar as these enjoyed theoretical and legal currency in the early Eighties.

These guidelines set out the broad legal framework that regulates or guides development planning and resource utilisation, with a particular emphasis on indicating when and how biodiversity considerations must – by law (and in terms of the principles of professional best practice) – inform project planning and assessment.

There is a plethora of authoritative publications on the definition of biodiversity and its application to environmental assessment and development planning. Practitioners need to be alert to this body of resources which include peer-reviewed scientific literature,[[13]](#footnote-13) international and domestic policy and strategies[[14]](#footnote-14), semi-official[[15]](#footnote-15) and technical[[16]](#footnote-16) guidelines and specialised individual knowledge.

### Applying these concepts to environmental assessment and development planning

Environmental assessment and spatial or development planning would typically need to address biodiversity at the species, habitat and ecosystem levels.

To this can be added the ‘regional’ or ‘landscape’ dimension (Noss, 1990) – or, in the case of aquatic ecosystems – catchments or ‘riverscapes’ (Ward, 1998) – which serve as a useful point of departure for addressing particularly the structural (e.g. heterogeneity, connectivity and fragmentation) and functional (e.g. disturbance regimes, resilience, pollination or, in the case of aquatic systems, environmental flow regimes and sediment processes) aspects of biodiversity at an ecologically meaningful scale.

## How values about ‘biodiversity’ are reflected in law

One’s view of ‘biodiversity’ can have important implications for the manner in which it is valued and addressed in professional practice.

From a philosophical viewpoint, two schools of thought can be identified in this regard: ‘compositionalism’ and ‘functionalism’ (Callicott et al., 1999). It suffices to say that one rarely finds ‘pure’ forms of these world views which, in practice, are often used in a complementary fashion and have achieved a new synthesis in concepts and strategies around ‘biodiversity mainstreaming’, ‘ecosystem goods and services’, ‘ecological infrastructure’ and ‘ecosystem resilience’.

‘Compositionalism’ would view humans as being separate from nature. It emphasises the preservation of biodiversity or biological integrity. It promotes ecological restoration and the selection of new biodiversity reserves is guided by factors such as the presence of high, endemic species and unique biotic communities (Callicott et al., 1990, pp 31 and 32). The ‘compositionalist’ world view is particularly –but not exclusively – represented by the National Environmental Management: Protected Areas Act 57 of 2003 and the NEM Biodiversity Act 10 of 2004. Both of these laws (and, for example, provincial nature conservation ordinances) are directly concerned with the protection of ‘biodiversity’ – primarily through the establishment of statutory protected areas in the case of the former and, in terms of the latter, prescribing mechanisms to prevent and control loss of ‘biodiversity’ in contexts where strict reservation is not an option.

‘Functionalism’ gives rises to the “functionalist ideal” in which human economies are understood as being embedded in “the larger and more enduring economy of nature” (Callicott et al., 1990, p 32). Functionalism emphasises ecosystem health, ecological services, ecological rehabilitation, adaptive management, ecosystem management, ecological sustainability and sustainable development. The ‘biodiversity mainstreaming’ provisions in NEMBA (see xyz below) and, particularly NEMA, and legislation such as the Marine Living Resources Act 18 of 1998, the NEM Integrated Coastal Management Act and the National Water Act 36 of 1998 are strongly embedded in a functionalist ethic that acknowledges that human wellbeing depends on nature, and seeks to balance ‘sustainable use’ with the conservation of productive and resilient ecosystems for current and future generations (WRI, 2008).

From a resource economist’s perspective, biodiversity can broadly be described as having either ‘intrinsic/ existence/ option (non-use)’ value, or direct or indirect use value (e.g. EFTEC/RIVM, 2000); the former resonates with the ‘compositionalism’ viewpoint, and the latter with the ‘functionalism’ one.

South African legislation situates ‘biodiversity’ (and ‘the environment’) in the context of constitutionally-founded imperatives relating to the achievement of human dignity, equality and freedom as a cornerstone of democracy in the post-apartheid dispensation.[[17]](#footnote-17) Besides a strong emphasis on the conservation *and* sustainable use of ‘biodiversity’,[[18]](#footnote-18) legislation unambiguously prescribes that environmental management “must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably...”[[19]](#footnote-19) It also states that development must be socially, environmentally and economically sustainable.[[20]](#footnote-20) Official decisions must be consistent with these principles while demonstrating a reasonable balance with other, appropriate and relevant, considerations (Nicholas Smith and Associates, 2006).

As previously noted, legislation gives useful descriptive effect to ‘biodiversity’ but has very little to say about how ‘biodiversity’ is to be conceptually and practically dealt with in the context of development planning and environmental assessment. One needs to look elsewhere, beyond laws and regulations, for guidance on the latter (these matters form the overall object and substance of these guidelines).

##### **Table 2**: How biodiversity is reflected in legislation

| **Component of biological diversity and related forms of organisation** | **NEMA** | **NEMBA** | **NEM PAA** | **NEM ICMA** | **EIA**  **regulations** | **NWA** | **CARA** | **NFA** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Environment** | 1 |  |  | 1 |  |  |  |  |
| **Biodiversity/Biological diversity** |  | 1 | 1 | 1 |  |  |  | 2(1)(i) |
| **Genes/ Genetic resources/**  **Genetic material** |  | 1 |  |  |  |  |  |  |
| **Species** |  | 1 |  |  |  |  |  |  |
| Indigenous |  | 1 |  |  |  |  |  |
| Threatened/ protected |  | 1; 56(1) |  |  |  |  |  |  |
| Alien/invasive |  | 1 |  |  |  |  | 1,  GN R. 1048. 25 May 1984 |  |
| **Communities (ecological)** |  | 1 |  |  |  |  |  |  |
| **Ecosystems** | 1 | 1 | 1 |  |  | 1(i)  (xviii)(b);  2(g); Part 3 |  | 2(1)(ix) |
| Threatened/ protected |  | 52(2) |  |  |  |  |  |  |
| Sensitive, Vulnerable, Highly Dynamic, Stressed  (e.g. coastal shores, estuaries, wetlands and similar systems) | 2(4)(r) |  |  |  |  |  |  |  |
| **Ecological integrity** |  |  | 1 | 17(e) |  |  |  |  |
| **Ecological processes** |  |  |  |  |  |  |  |  |
| Dynamic coastal processes |  |  |  | 1 |  |  |  |  |
| Resource quality |  |  |  |  |  | 1(1)(xix) |  |  |
| **Ecological Reserve** |  |  |  |  |  | 1(1)  (xviii) |  |  |
| **Habitat** |  |  | 1 |  |  |  |  | 2(1)(xvi) |
| Riparian |  |  |  |  |  | 1(1)(xxi) |  |  |
| **(Indigenous) vegetation** (also see ‘threatened ecosystems’), **forests, natural forests** and **grazing capacity** |  |  |  |  | LN1, LN3 |  | 1. 3   GN R. 1048. 25 May 1984 | 2(1)(x)  2(1)(xx) |
| **Soil** |  |  |  |  |  |  | 3,  GN R. 1048. 25 May 1984 |  |
| **Water (resource)**  (Incl a watercourse, surface water, an estuary or aquifer) |  |  |  |  |  | 1(1)(xvii) |  |  |
| **Catchment** |  |  |  |  |  | 1(1)(iii) |  |  |
| **Wetlands** |  |  |  | 1 | LN1,  LN 3 | 1(1)(xxix) | GN R048, 25 May 1984 |  |
| Coastal |  |  |  | 1 |  |  |  |  |
| **Estuaries** |  |  |  | 1 | LN1, LN2, LN3 | 1(i)(ix) |  |  |
| **Watercourses** |  |  |  |  | LN1, LN3 | 1(1)(xxix) | 1,  GN R. 1048. 25 May 1984 |  |
| **Aquifer** |  |  |  |  |  | 1(1)(i); |  |  |
| **Littoral active zone** |  |  |  | 1 | LN2  (2)(d) |  |  |  |
| **Environmental goods and services** |  |  | 1 |  |  |  |  |  |

## LAWS THAT CONTROL, AND LAWS THAT GUIDE, DEVELOPMENT PLANNING

Responsibility for land-use regulation in South Africa is apportioned between all three spheres of government (municipal, provincial and national), and can be categorised in terms of:

* Laws that *reactively* *control* development by means of enforceable restrictions on the use of land or natural resources (and, broadly, ‘the environment’); and
* Laws that *proactively* *guide* development planning or provide a spatially-based, normative framework to guide decision making but do not confer or take away rights in land.
* A third set of legal mechanisms makes provision for dedicated *biodiversity management* outside the boundaries of formally protected areas.

As a general principle, ‘upstream’ consideration of biodiversity in higher level, strategic planning frameworks has significant advantages over addressing biodiversity in a piecemeal and reactive manner at the level of individual projects and applications (Brownlie *et al*., 2005, p 224); that is, the former, ideally, should inform the latter. This breakdown of regulatory measures is presented with this principle in mind.

However, it is important to note that, regardless of the type or purpose of the legislation in question, any official decision taken in terms of these instruments, and which may significantly affect the environment, must demonstrate consistency with the National Environmental Management Principles. This obligation by definition includes taking close account of the principles that speak to the ecological dimensions of sustainable development (e.g. the mitigation hierarchy, maintaining ecological thresholds and adopting special measures in vulnerable and otherwise sensitive ecosystems). (see sections **xyz** and **xyz**)

Tables 3.1 and 3.2 respectivelysummarise a selection of the main regulator and forward planning instruments in terms of which biodiversity would need to be considered, and the responsible sphere (‘level’) of government for each. There are a wide variety of provincial and municipal regulations or ordinances which are not reflected here but which can be obtained from the relevant government offices and agencies. A third category relates to provisions for off-reserve biodiversity management.

‘Mechanisms’ refer to the type of legal control or plan, such as zoning scheme regulations, cultivation permits or structure plans. ‘Function’ refers to the type of control and its objectives. ‘Law’ refers to the relevant statute, e.g. the National Environmental Management Act 107 of 1998.

##### **Table 3.1**: Examples of laws that reactively control use of land and/or resources

|  | MECHANISM | FUNCTION | LAW |
| --- | --- | --- | --- |
| **Municipalities** | * Land-use schemes * Zoning scheme regulations | Determine land use and development rights. Control rezoning, sub-divisions, departures, etc.  ***Binding on organs of state, municipalities and landowners. Confer rights in land***  ***Planning approval required.*** | Spatial Planning and Land Use Management Act 16 of 2013  Provincial and municipal planning ordinances. |
| **Provincial government\***  **\***May be acting in terms of devolved powers | EIA regulations   * listed activities * geographic areas and specified activities | Give effect to general objectives of integrated environmental management  ***Listed activity may not commence without environmental authorisation***  ‘Rectification’ applications and fines for listed activities undertaken without authorisation (NEMA s 24G) | National Environmental Management Act 107 of 1998, as amended  Regulations and listing notices (read with s 52 of the NEM Biodiversity Act 10/2004):   * GN R.543, GN R. 544, GN R. 545 and GN R. 546 of 18 June 2010 as corrected. |
| Heritage impact reports  Regulation of activities that:   * affect the National (heritage) Estate [s 3] * exceed specified thresholds [s 38(1)] | Regulation of the management of heritage resources  Identification of activities that have to be reported to the provincial heritage authorities for a decision on whether a ***heritage impact report*** is necessary | National Heritage Resources Act 25 of 1999 |
| **National government\***  \*Laws may be administered by regional offices or, in case of NWA 36/1998, Catchment Management Agencies | Agricultural permits   * cultivation of virgin soil * protection of vleis etc. * regulating run-off of water * grazing carrying capacity * alien invasive vegetation, etc. | Conservation of agricultural resources   * maintaining productive potential of land, * combating erosion * protecting vegetation * combating weeds and invader plants.   ***Permit required to undertake controlled activity*** | Conservation of Agricultural Resources Act 43 of 1983  Regulations  (GN R. 1048, 25 May 1984) |
| Water use licences  General authorisations   * Impeding, diverting flows [s 21(c)] * Changing characteristics of a watercourse [s 21(i)] | Protection and management of water resources  Control of water use  Enforcement of ecological and social Reserves.  ***Licence (maybe also EIA) required for effluent discharge and taking, storing, impeding or diverting flow of water in watercourse*** | National Water Act 36 of 1996  Regulations:  Use of water for mining (GN 704, 4 June 1999)  Registration of water use (GN 1352, 12 November 1999)  Generational authorisations [s 21(c) and 21(i)]:   * Rehabilitation of wetlands for conservation purposes (GN 1198, 18 December 2009) * GN 1199, 18 December 2009 |
| Prospecting rights and mining permits | Control of prospecting, mining by mandatory environmental management programme reports, EMPs.  ***Permit required.*** | Mineral and Petroleum Resources Development Act 28 of 2002  Regulations:  GN R.26275, 23 April 2004 |

##### **Table 3.2**: Examples of laws that proactively guide development but do not award or deny rights

|  | MECHANISM | FUNCTION | LAW |
| --- | --- | --- | --- |
| **Municipalities** |  | Interpret and represent spatial development vision of organs of state. Provide general direction to guide decision making. Spatial, integrated expression of Integrated Development Plans. Guided by principles for sustainable use and development of land. ***Land use schemes must be consistent with municipal SDF.*** | Spatial Planning and Land Use Management Act 16 of 2013  Municipal Systems Act 32/2000 |
| **Provincial government** | Provincial spatial development frameworks | As above. Co-ordination, integration and alignment of development plans and policies. ***All provincial policies, plans and programmes must be consistent with national and provincial SDFs.*** | Spatial Planning and Land Use Management Act 16 of 2013  Municipal Systems Act 32/2000  Provincial land-use and planning ordinances |
| Structure plans/ municipal SDFs | Guideline for future spatial development.  ***Do not confer or take away rights in land.*** | Provincial planning ordinances |
| Environmental management frameworks (EMFs) | ***Informs decision-making on environmental authorisations.*** EMFs use environmental informants to identify desired development options against which to assess applications for environmental authorisation. EMFs straddle land use control and planning in that sensitive areas identified in EMFs can also serve as a 'trigger' for environmental authorisation in terms of Listing Notice 3. | GN R. 547, 18 June 2010 |
|  | Protected Environments | Conservation and co-management of biodiversity/ecosystems on private land outside protected areas. ***Regulations may control land-use.*** | National Environmental Management Protected Areas Act 57/2003 |
| Bioregional plans, biodiversity plans, biodiversity agreements, and biodiversity management plans | Measures for strategic mainstreaming of biodiversity priorities and management of biodiversity outside statutory protected areas.  ***Bioregional plan may not be in conflict with IDP/SDF, and* vice versa*.******Critical Biodiversity Areas depicted in formally adopted Bioregional Plans may trigger requirement for environmental authorisation.*** | National Environmental Management Biodiversity Act 10/2004 |

## THE CONSTITUTION, ACT 108 OF 1996

The interpretation and application of environmental legislation is governed by the Constitution of the Republic of South Africa Act 108 of 1996.

The Constitution entrenches South Africa’s status as a constitutional democracy, governed by the rule of law. It provides for: public accountability, the separation of powers between the legislative, executive and judicial branches of government; co-operative government; and the devolution of power.

Chapter 2 of the Constitution constitutes a Bill of Rights that includes an environmental clause. Section 24 of the Bill of Rights states that “everyone has the right to have the environment protected through reasonable laws or other means that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.

Constitutional provisions relating to the promotion of administrative justice[[21]](#footnote-21) and promotion of access to information[[22]](#footnote-22) have a direct bearing on the environmental regulatory dispensation, which obtain statutory expression through framework legislation in the form of the National Environmental Management Act 107 of 1998, as amended.

## NATIONAL ENVIRONMENTAL MANAGEMENT (NEMA) 107 OF 1998

NEMA is enforced by the national Department of Environmental Affairs, but many of its powers have been assigned to provincial environmental departments that act as ‘competent authorities’ on behalf of the national department.

### NEMA Chapter 1: The National Environmental Management Principles

Chapter 1 of NEMA (the National Environmental Management Principles) lays down principles that apply the actions of all organs of state that may significantly affect the environment. These principles serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of NEMA or any statutory provision concerning the protection of the environment.

It follows that all official decision that may significantly affect the environment (such as decisions taken in terms of water, mining, agricultural or land-use planning legislation) must be consistent with the National Environmental Management Principles (such as the mitigation hierarchy or the precautionary principle). Official decisions that do not demonstrate consistency with the National Environmental Management Principles may be reviewed and set aside by a court.

NEMA requires that environmental management must pursue the so-called ‘best practicable environmental option’ in relation to development planning, namely:

the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as the short term...[[23]](#footnote-23)

The primary mechanism for doing so is through the identification and examination of alternatives that provide a basis for choice among options available to the decision-maker (Preston et al., 1996, p 755).

The National Environmental Management Principles place people and their needs at the forefront of environmental management,[[24]](#footnote-24) and require that development must be socially, environmentally and economically sustainable.[[25]](#footnote-25) They also promote the right of all interested and affected parties to participate in environmental governance. [[26]](#footnote-26)

The principles that would have particular relevance to decisions relating both to the transformation of priority areas for biodiversity conservation and to impacts on ecosystem goods and services are those that require that environmental management must (in paraphrased format):

* Ensure that use of environmental resources serves the public interest and that the environment is protected as the people’s common heritage;[[27]](#footnote-27)
* Sequentially and deliberately avoid, and only if impacts cannot be entirely avoided or prevented, minimise and/or remedy disturbance of ecosystems and loss of biodiversity (the ‘mitigation hierarchy’);[[28]](#footnote-28)
* Avoid degradation of the environment (cf. The Duty of Care);[[29]](#footnote-29)
* Avoid jeopardising ecosystem integrity (a corollary to the Duty of Care);[[30]](#footnote-30)
* Ensure equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being;[[31]](#footnote-31)
* Apply a risk-averse and cautious approach, which takes into account the limits of current knowledge about the consequences of decisions and actions;[[32]](#footnote-32)
* Ensure that responsibility for environmental health and safety exists throughout the project/ plan’s life cycle;[[33]](#footnote-33)
* Ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects, are paid for by those responsible for harming the environment;[[34]](#footnote-34)
* Pursue the best practicable environmental option by means of integrated environmental management (see above with reference to alternatives);[[35]](#footnote-35)
* Pursue environmental justice so that adverse environmental impacts are not unfairly distributed and do not discriminate against vulnerable and disadvantaged persons;[[36]](#footnote-36) and
* Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems (which could include habitats with low resilience to disturbance, threatened ecosystems, dune systems, wetlands, estuaries and areas degraded by over-grazing).[[37]](#footnote-37)

In terms of section 24M of NEMA, the Minister of Environmental Affairs or an MEC may grant exemption from any provision of the Act except from the mandatory procedures that apply to environmental assessments in support of applications for environmental authorisation.[[38]](#footnote-38)

NEMA Chapter 5: Integrated Environmental Managem**ent**

One of the primary objectives of integrated environmental management is to promote the integration of the National Environmental Management Principles into all decision making that may significantly affect the environment. [[39]](#footnote-39)

Section 24(4(a) of NEMA, in turn, lays down minimum, non-discretionary procedures that apply to every application for an ‘environmental authorisation’, i.e. a listed or specified activity.

‘Listed activities’ refer to activities listed or specified in terms of, respectively, NEMA s 24(2)(a) or (b) that may not be commenced without environmental authorisation issued in terms of section 24(1) of NEMA. Listed activities are defined by Listing Notices that are published with the NEMA EIA regulations. 'Activities' may also mean policies, programmes, processes, plans and projects if identified in terms of sections 24(2) (a) and (b) of the Act.

#### Linking the authorisation regime to specified activities and identified geographical areas

Note that NEMA does not only regulate individual activities that may not commence without environmental authorisation.[[40]](#footnote-40) The Act also provides that geographical areas may be identified in which certain 'specified activities' may not commence without environmental authorisation[[41]](#footnote-41) – or, alternatively, in which the Minister or an MEC for environmental may exclude[[42]](#footnote-42) a specified activity from the requirement for environmental authorisation.

Such 'geographical areas' would be based on 'environmental attributes' and 'specified in spatial tools or environmental management instruments' adopted in the prescribed manner by the Minister of Environmental Affairs or, if to be adopted by an MEC for Environmental Affairs, with the concurrence of the national Minister.[[43]](#footnote-43) It is important to note that NEMA specifies that 'geographical areas' and the 'spatial tools' that would give them regulatory effect can only be adopted by the Minister for Environmental Affairs, or an MEC for Environmental Affairs.

This would seem to suggest that, for example, municipal spatial development frameworks would not constitute 'spatial tools' as defined by NEMA s 24(2), and therefore cannot be used to delineate 'geographical areas'.

Conversely, Bioregional Plans adopted in terms of Chapter 3 of the National Environmental Management: Biodiversity 10 of 2004 would seem to satisfy the definition of 'spatial tools'[[44]](#footnote-44) insofar as bioregional plans[[45]](#footnote-45) entail:

* A spatial description of environmental attributes ('bioregions');
* Developmental activities and developmental patterns ('land and resource uses'); and
* Their relation to each other ('consistency with long-term ecological functioning and health').

As such, gazetted bioregional plans may well serve as the basis for delineating the 'geographical areas' to which NEMA section 24(2) refers. It is not clear if a formally adopted spatial development frameworks that is demonstrably consistent with a bioregional plan gazetted in terms of section 40 of the NEMBA 10 of 2004 would amount to a 'spatial tool' for the purposes of NEMA section 24(2).

In some instances, specified activities that have been excluded from the requirement for environmental authorisation because they are located in identified 'geographical areas' must comply with prescribed norms and standards.[[46]](#footnote-46) NEMA also provides for situations where no conditions could apply to such excluded activities if these are based on an environmental management instrument that has been adopted in the prescribed manner.[[47]](#footnote-47)

The Minister of Environmental Affairs may delist activities or geographical areas defined in terms of 24(2) of NEMA.[[48]](#footnote-48) Such delisted activities and/or areas must be published in the Government Gazette, with the date on which the list is to come into effect.[[49]](#footnote-49)

#### Mandatory and discretionary procedures relating to applications for environmental authorisation

The mandatory and discretionary procedures relating to environmental assessment in support of applications for environmental authorisation are summarised as follows:

|  |  |
| --- | --- |
| *NEMA s 24(4)(a)*  Minimum, non-discretionary requirements that apply to every application for environmental authorisation: | *NEMA s 24(4)(b)*  Minimum, discretionary requirements that *may* apply with respect to every application for environmental authorisation: |
| There must be co-ordination and co-operation between organs of state where an activity may fall under the jurisdiction of more than one organ of state.  Any decision by an organ of state must take into account:   * The findings and recommendations flowing from an environmental assessment; * The general objectives of integrated environmental management as provided for in Chapter 5 of NEMA; and * The national environmental management principles (section 2, NEMA).   The public and all organs of state with jurisdiction over any aspect of the activity must be given a reasonable opportunity to participate in public information and participation procedures.  An application must contain a description of the environment likely to be significantly affected by the proposed activity. | All applications for an environmental authorisation (see below) must include, *where applicable* (own emphasis):   * Investigation of the potential consequences or impacts of alternatives to the activity on the environment; and * Assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity.   *Where applicable*, measures must be investigated to mitigate adverse consequences or impacts to the minimum.  *Where applicable*, potential impacts on heritage resources (the ‘national estate’ in terms of section 3(2) of the National Heritage Resources Act 25 of 1999) must be investigated, assessed and evaluated.  There must be an investigation of:   * The potential environmental consequences for, or impacts on, of the activity; and * The significance of those potential consequences or impacts.   Where applicable, gaps in knowledge, the adequacy of predictive methods and underlying assumptions and uncertainties arising from the compilation of information must be reported.  Where applicable, arrangements for monitoring and managing environmental consequences and impacts must be investigated and formulated, as must the effectiveness of such arrangements.  Where applicable, applications must consider information and maps that specify the attributes of the environment in particular geographic areas where such information and maps have been complied by either the national Minister of Water and Environmental Affairs or a provincial MEC |

#### Environmental impact assessment regulations

NEMA section 24(5) provides for regulations that lay down procedures for applications for environmental authorisations. These, and their accompanying listing notices of activities that may not commence without environmental authorisation in terms of NEMA s 24(1), are generally known as the ‘EIA regulations’. See section **xyz** below.

#### Illegal activities and their rectification

NEMA section 24F(1) specifies that no-one may undertake a listed or specified activity without environmental authorisation and, in terms of NEMA s 49A it is an offence to do so.

NEMA, through s 24G, provides a process that can lead to the rectification of unauthorised, unlawful activities. The ‘rectification process’ entails submission of an environmental impact assessment to the competent authority that, in turn, can have two potential outcomes:

* An instruction to ceased the activity, either wholly or in part, and to rehabilate the environment;[[50]](#footnote-50) or
* Authorisation, subject to conditions, of the activity/ies that had been commenced unlawfully.[[51]](#footnote-51)

It is a defence to a charge in terms of NEMA s 24F(2) to show that the activity was commenced or continued in response to an emergency so as to protect human life, property or the environment.

#### External specialist review

Competent authorities may appoint an external specialist reviewer in instances where:

* The technical knowledge required to review any aspect of an assessment is not readily available to the competent authority; or
* A high level of objectivity is required which is not apparent in the documents submitted so as to establish whether information in environmental reports and supporting material is adequate for decision-making.[[52]](#footnote-52)

The competent authority may recover the costs of appointing a specialist reviewer from the applicant.

This provision is particularly relevant to applications where defensible environmental reporting on the biodiversity aspects of proposed activities may be complicated by predictive difficulties or complex, inter-disciplinary issues. In this regard, see the *Guideline for the review of specialist input in EIA processes* (Keatimilwe and Ashton, 2005).

#### Environmental Management Programmes

Section 24N of NEMA stipulates the minimum requirements for environmental management programmes (EMPs) that must be developed as a compulsory component of the mandatory basic assessment or scoping and EIA procedures (see below).

An EMP must (in summary) contain:

* Measures for management, mitigation, protection and remediation
* Particulars and expertise of the drafter of the EMP;
* Description of aspects of the activity that are covered by the EMP;
* Persons responsible for implementing the EMP;
* Monitoring measures and compliance reporting;
* Environmental rehabilitation (or, alternatively, restoration) measures;
* Actions to modify, stop or otherwise control processes or activities that may cause pollution or environmental degradation;
* Actions to remedy such pollution or environmental degradation;
* Steps for complying with prescribed environmental management standards or practices
* An implementation schedule; and
* Environmental awareness-raising about risks and preventative measures

With specific regard to mining: in terms of Section 24N, EMPs must contain measures ‘regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question’.

**Remediation: ‘Rehabilitation’ or ‘restoration’?**

Environmental management interventions are defined and shaped by their intended objectives.

‘Mitigation’ covers a spectrum of measures, from avoidance through impact minimisation, rehabilitation or restoration, to compensation or offsets. It is understood in part to be guided by the objective of preventing further environmental degradation and rehabilitation of some of the original, pre-disturbance (‘reference’) condition of the affected environment or ecosystem.

Impact minimisation can ‘soften’ some of the negative effects of a particular set of disturbances, and rehabilitation can, to some extent, restore an element of environmental functionality or amenity such as visual integrity or a use value such as grazing; full ecological recovery to a prior reference condition in this instance would not be the objective. ‘Rehabilitation’ thus seeks to repair damaged ecosystem functions with the primary goal of securing ecosystem productivity for human benefit (Aronson *et al*., 1993). Rehabilitation attempts to adopt the original ecosystem’s structure and functioning that, in the long-term, can be self-sustaining. Ecological restoration is not, however, the primary objective.

‘Restoration’ is defined as management to return a damaged ecosystem to its pre-disturbance condition, functionally, structurally and in terms of species composition. That is, restoration aims to restore the full complement of biodiversity and its supporting ecological processes.

It is recognised, though, that in many – if not most – instances, complete restoration is unlikely (cf. Cairns, 1993, p 193) and that a reinstatement of appropriate ecosystem functions (such as bank stabilisation in the case of degraded watercourses, or re-establishing an ecological corridor) may be the most realistic goal (cf. Holmes *et al.*, 2008). However, areas restored in support of reclaiming an element of ecological functionality could, if effectively managed, contribute to structural and compositional changes towards a desired reference condition.

## THE NEMA EIA REGULATIONS

Biodiversity considerations are highly likely to come to the fore in the context of applications for environmental authorisation.

This section only deals with amended regulations promulgated in 2010 and corrected in December of that year. For guidance on the interpretation of the 2010 NEMA EIA regulations, see GN 805 of 10 October 2012 (*Companion Guideline on the Implementation of the Environmental Impact Assessment Regulations, 2010)*.

### Listed activities and listing notices

Activities are generally defined by quantitative thresholds (e.g. diameters, concentrations, distances or volumes), or the proximity of – or impact on - a mapped environmental feature such as a threatened ecosystem or Critical Biodiversity Area or a ‘sensitive area’ identified in an Environmental Management Framework.

Depending on the type of activities that may be triggered by a proposed development, the EIA regulations provide for two types of application procedure:

* The basic assessment (for activities reflected in Listing Notice 1 and Listing Notice 3); and
* The more comprehensive Scoping and EIA process for activities on Listing Notice 2.

Under the 2010 NEMA EIA regulations, Listing Notices 1 and 3 define activities for which a basic assessment must be undertaken (with the option, of apply for a basic assessment to be ‘upgraded’ to a full scoping and EIA process if deemed necessary). Listing Notice 2 described activities subject to the mandatory scoping and EIA process. Whereas Listing Notices 1 and 2 are largely concerned with prescribed activities, Listing Notice 3 links specific activities to specified geographical areas (e.g. expansion of infrastructure beyond a prescribed threshold in a watercourse within 5 km of a provincial nature reserve in a specified province).

Biodiversity features extensively as a ‘receiving environment ‘ trigger; e.g. Listing Notice 3 of the NEMA EIA regulations provides for more than 40 situations in which proposed activities may, depending on the province and/or defined thresholds, require prior environmental authorisation because they coincide with critical biodiversity areas (CBAs) or ecological support areas (ESAs) as “identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans...”.

Listing Notice 3 of the 2010 NEMA EIA regulations also specifies activities that, depending on the prescribed thresholds, may result in the loss of vegetation in any Critically Endangered or Endangered ecosystem listed in terms of section 52 of the National Environmental Management Biodiversity Act 10 of 2004 (see below at **xyz**).[[53]](#footnote-53)

### Biodiversity, need and desirability

The NEMA EIA regulations require that all prescribed forms of environmental assessment reporting – namely basic assessment, scoping and environmental impact reports – describe the “need and desirability”[[54]](#footnote-54) of proposed activities for which authorisation is being sought. These concepts are exceedingly important when applied in relation to biodiversity, the identification of trade-offs and the selection of the best practicable environmental alternative for a proposed development.

‘Need’ is understood to mean requiring something because it is essential or very important, and not just desirable. ‘Desirability’, in turn, refers to wanting or wishing for something owing to its attractiveness, utility or necessity (cf. The New Oxford Dictionary of English, 1998). The DEA&DP guideline on need and desirability (2010) suggests that ‘need’ refers to the ‘timing’ of a proposed development, and ‘desirability’ to place/ location. Jointly, the concepts raise critical questions about the contextual appropriateness of development, and the “wise use of land” – so, for example, could the impacts associated with a proposed project be reconciled with the ecosystem status or biodiversity management objectives of a particular area, or would it be desirable to move or otherwise revisit the project so that it would not come into conflict with the biodiversity context?

### Biodiversity – cumulative impacts and impact mitigation

The NEMA EIA regulations expressly require all forms of environmental impact reporting to address potential **cumulative** impacts, and to indicate the degree to which negative impacts can be **mitigated and reversed**, as well as the degree to which impacts ‘may cause **irreplaceable loss of resources**’.[[55]](#footnote-55)

Extinction is forever. In addition, restoration or reinstatement of many – if not most- of the ecosystems and biodiversity in South Africa is not possible and, where technically feasible, may be prohibitively expensive and take many generations to succeed. For this reason, these considerations constitute a key focus of the information to be given to decision makers. It is important to remember that in all cases where there is uncertainty in evaluating these considerations, a **risk-averse and cautious** approach must be taken according to the National Environmental Management Principles.

### Maintenance plans and setback lines

Maintenance-related activities in the littoral active zone, or affecting rivers, wetlands and estuaries, do not require environmental authorisation if they are undertaken in accordance with a management plan agreed to by the relevant environmental authority, or if they occur behind a development setback line.[[56]](#footnote-56) This relief from the regulations only applies to the activities which make specific reference to maintenance. In all other cases where proposed developments may entail listed activities, environmental authorisation must be applied for.

### Environmental Management Framework Regulations (2010)

Regulations published as GN R. 547 on 18 June 2010 provide for the development of Environmental Management Frameworks (EMFs). EMFs serve as support mechanism to the environmental impact assessment process by:

* Providing significant and detailed information about an area prior to the generation of activity proposals;
* Anticipating potential impacts and providing early warnings in respect of thresholds, limits and cumulative impacts, and identifying existing impacts which need to be addressed;
* Anticipating the scope of potential impacts and information needs;
* Delineating geographical areas in which additional specified activities are to be identified in terms of NEMA; and
* Delineating geographical areas in which listed activities in terms of NEMA may be excluded.

EMFs must be considered by Competent Authorities when reviewing applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply. EMFs do not assign or control existing property or land-use rights. However, where development affects a ‘sensitive’ area identified in an EMF, a Basic Assessment may be triggered in terms of Listing Notice 3.

### NEMA Chapter 7: The Duty of Care

Chapter 7 of the National Environmental Management Act 107 of 1998 prescribes a general ‘duty of care’ and requirement to remediate environmental damage. Section 28(1) of NEMA states:

Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, insofar as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment....

The Duty of Care can, inter alia, be enforced through directives issued by the competent authority.

## THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT 16 OF 2013

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) was gazetted on 5 August 2013.[[57]](#footnote-57) It has far-reaching implications for the direction and type of spatial development planning, especially at the local, municipal, sphere of government wherenumerous important decisions are taken about development planning and the granting of land-use rights.

It sets out to provide for a uniform, effective and comprehensive system of spatial planning and land use management in South Africa. Key objectives include promoting social and economic inclusion, redressing imbalances of the past and ensuring equity in the application of spatial development planning and land use management systems.[[58]](#footnote-58)

The SPLUMA also provides for the sustainable and efficient use of land, development principles, norms and standards and co-operation among all three spheres of government.

## Strategic opportunities for aligning municipal planning with biodiversity conservation priorities

The SPLUMA is based on a spatial planning system that entails:

* Spatial development frameworks to be prepared and adopted by the national, provincial and regional spheres of government;[[59]](#footnote-59)
* Development principles and norms and standards that must guide spatial planning and the development and management of land;
* The management of and facilitation of land use by means of land use schemes;
* Procedures and processes for the preparation, submission and consideration of land development applications.[[60]](#footnote-60)

All these plans, principles, norms and standards entail administrative actions – i.e. administrative procedures and decisions – that would have to be consistent with the National Environmental Management Principles insofar as they may significantly affect the environment, including biodiversity and ecosystems.[[61]](#footnote-61) More broadly, though, spatial planning and land-use management provide an important strategic opportunity for incorporate biodiversity information into decisions relating to the location of development, the provision of services, environmental management and economic activities that provide employment and alleviate poverty (Cadman et al., 2010, p 49).

Because development is such a major driver of habitat loss, the 'mainstreaming' of biodiversity priorities and considerations into municipal and other levels of spatial planning is a key strategic objective of the National Biodiversity Strategy and Action Plan (DEA, 2005). In this regard, the NBSAP states that:

Biodiversity considerations must be factored into land-use decisions at a local level. It is essential that spatial biodiversity priority areas are integrated into spatial plans and policies that guide development at provincial and local government level. This includes Spatial Development Frameworks, municipal zoning schemes, permits for land use change and environmental assessment... (DEA, 2005, p 38).

It is crucial that municipalities and other agencies that are tasked with drafting SDFs must consult the latest biodiversity plans for their areas of jurisdiction, and involve provincial biodiversity agencies, bioregional programmes and, if necessary, the South African National Biodiversity Institute in the formulation and execution of their planning processes. The same goes for the development of mechanisms to monitor implementation of SDFs and status and condition of priority biodiversity within the relevant spatial planning domain.

## Principles relating to the sustainable use and development of land

The SPLUMA is based on development principles that apply to all organs of state and other authorities responsible for the implementation of legislation regulating the use and development of land.

In particular, the 'principle of spatial sustainability'[[62]](#footnote-62) requires among others that spatial planning and land use management must:

* Ensure that special consideration is given to the protection of prime and unique agricultural land (which, especially in the case of areas that are valuable for grazing, can also serve as regionally important ecological corridors);[[63]](#footnote-63)
* Uphold consistency of land use measures in accordance with environmental management instruments (such as environmental management frameworks, bioregional plans, coastal management plans, biodiversity management plans and estuary management plans);[[64]](#footnote-64) and
* Promote land development in locations that are sustainable and limit urban sprawl (this closely accords with the principle of positive planning which seeks to proactively guide development towards areas that are not important for biodiversity conservation purposes; limiting urban sprawl is a key strategy for securing highly threatened biodiversity in and around cities such as Johannesburg and Cape Town).[[65]](#footnote-65)

The 'principle of efficiency', in turn, requires that decision-making procedures must minimise negative financial, social, economic or environmental impacts.[[66]](#footnote-66) This requires a deliberate, strategic approach to planning that is premised on pre-empting such impacts from arising in the first place. Adherence to the 'mitigation hierarchy' and the principle of 'no net loss' are as relevant to municipal, provincial and national spatial planning as to project-level impact assessment.

The 'principle of spatial resilience' refers to spatial plans, policies and land use management systems that are sufficiently flexible to ensure sustainable livelihoods for communities most likely to suffer the impacts of economic and environmental shocks (condoning the settlement of vulnerable people in floodplains, or areas with high seasonal water tables, would, for example, be at odds with this principle).[[67]](#footnote-67)

The SPLUMA development principles also promote an integrated approach to planning, led by the spatial planning and land-use management systems embodied in the Act.[[68]](#footnote-68) All government departments must provide their sector inputs (which would include the environmental, biodiversity, water and agricultural mandates in the state), and planning must be premised on transparent processes of public participation.[[69]](#footnote-69)

## Spatial development frameworks

SPLUMA requires that the national and provincial spheres of government, and each municipality, must prepare Spatial Development Frameworks (SDFs).

SDFs must, among others,

* Be informed by a long-term spatial development vision and plan (that ideally should include sustainability objectives and the maintenance of thresholds in support of ecological resilience and the sustained delivery of key ecosystems goods and services);[[70]](#footnote-70)
* Represent the integration of trade-offs of all relevant sector policies and plans (particularly relevant when seeking to guide development that is consistent with the principle of 'no net loss');[[71]](#footnote-71)
* Identify the long-term risks of particular spatial patterns of growth and development, and the policies and strategies necessary to mitigate those risks; and
* Take cognisance of any environmental management instrument adopted by the relevant 'environmental management authority'.[[72]](#footnote-72)

National and provincial SDFs must indicate desired patterns of land use at the national and provincial scales respectively, and provincial SDFs must delineate areas in which development in general, or particular types of development would not be appropriate. [[73]](#footnote-73) The latter requirement closely resonates with the purpose of environmental management frameworks and the identification of geographical areas in terms of NEMA section 24(2). Co-ordination of these respective instruments in terms of planning and environmental legislation offers valuable opportunities for preventing duplication and promoting integrated and efficient planning and land management.

#### Regional spatial development frameworks

Regional spatial development frameworks can be declared in any geographical areas in South Africa in order to give effect national land use policies or priorities. They have similar objectives to their provincial and national counterparts.[[74]](#footnote-74)

#### Municipal spatial development frameworks

Municipal spatial development frameworks must be prepared as part of a municipality's integrated development plan (i.e., which is drafted and adopted in terms of Chapter 5 of the Municipal Systems Act 32 of 2000).[[75]](#footnote-75) Municipal SDFs must represent the spatial form of development in the municipality over a five-year planning horizon, as well as a longer-term spatial development vision statement that presents a desired spatial growth and development pattern for the next 10 to 20 years.[[76]](#footnote-76)

Having a longer (five to 20-year) timespan against which to plan, direct, manage and monitor the spatial unfolding of development in a municipality helps to counter the time horizons of political office-bearers and officials which, relative to the rate at which social and environmental change occur, are generally short, (Folke et al., 2007). Longer-term planning, across the full municipal area, means being able to plan for the anticipated effects of climate change and curb cumulative impacts on ecosystem condition that are otherwise difficult to predict and respond to when time horizons are restricted, or smaller areas are being assessed.

### Strategic assessments of environmental pressures and opportunities

Municipal SDFs must also include a strategic assessment of environmental pressures and opportunities within the municipal area, as well as the location of:

* 'Environmental sensitivities';
* High potential agricultural land; and
* 'Coastal access strips'.[[77]](#footnote-77)

Whether and how an SDF must respond to these pressures and opportunities is not made explicit. In comparison, regulations published in terms of the Local Government: Municipal Systems Act 32 of 2000 required that a municipal SDF must contain a 'strategic assessment' of the environmental impact of the SDF.[[78]](#footnote-78)

In neither case, do these provisions relating to the assessment of the environmental (and biodiversity) context of municipal development planning grab the nettle of strategic environmental assessment (SEA) which, broadly speaking, aims to address the environmental effects and consequences of plans, policies and programmes. In terms of international best practice, this implies that a strategic approach to environmental assessment should take place before decisions are made (or economic and spatial plans are finalised), and major alternatives are still available. As noted by Dalal-Clayton and Sadler (2005, p 10),

Preferably (SEA) should make a contribution to their formulation and development, rather than focusing only on the impact(s) of their implementation...

By proactively 'foregrounding' biodiversity priorities sufficiently early ('upstream') in municipal and other spatial planning processes, there is a better chance of safeguarding biodiversity than if left to the project development phase or, in the least desirable case, to the actual ('end-of-pipe') impact assessment phase (Brownlie et al., 2005, p 224; Treweek et al, 2005, p 175; Ramsar Convention Secretariat, 2010, p 42; Slootweg, 2010b, p 205). Plans – and development proposals – rapidly solidify, meaning that it becomes increasingly difficult to motivate for changes that may have contributed to avoiding or softening impacts on biodiversity had they been raised much earlier in the planning processes. Changes to plans also become much more costly the further advanced they are – financially, and politically.

Inasmuch as the biodiversity-related limitations of project-level EA can be countered by adopting an ecosystem or landscape-based approach to screening, scoping and impact assessment, these benefits for biodiversity can be significantly amplified by using SEA to inform municipal planning. Wider spatial and time horizons mean that SEA can capture or explain (Treweek et al, 2005, p 175):

* Longer-term trends to biodiversity and ecosystems;
* Ecosystem processes and interactions that function at a multiplicity of scales;
* The full range of cumulative threats and pressures acting on biodiversity resources;
* The implications of spatial planning choices, and types of development, for current and traditional uses of biodiversity; and
* Monitoring data needed to understand baseline trends or predict impacts at the appropriate spatial, functional and temporal scales.

### Land use schemes

Municipalities must, after public consultation, adopt a land use scheme for their entire areas of jurisdiction within five years of commencement of the SPLUMA.[[79]](#footnote-79) Such a land use scheme must take cognisance of any environmental management instrument adopted by the relevant environmental management authority, and must comply with environmental legislation. A municipal land use scheme may be prepared by a district municipality for the constituent municipalities within the district municipality.[[80]](#footnote-80) An adopted municipal land use scheme must promote minimal impact on public health, the environment and natural resources.[[81]](#footnote-81)

A land use scheme must include:

* Scheme regulations setting out the procedures and conditions pertaining to the use and development of land in any zone (i.e. a defined category of land use);
* A map indicating the zoning of the municipal area into land use zones; and
* A register of amendments to such a land use scheme.[[82]](#footnote-82)

An adopted and approved land use scheme has the force of law. It is binding on land owners and users of land, including a municipality, a state-owned enterprise and organs of state within the municipal area. Such a scheme provides for land and development rights, and land may only be used for the purposes permitted by a land use scheme.[[83]](#footnote-83) A municipality may pass by-laws aimed at enforcing its land use scheme.[[84]](#footnote-84)

### Regulations

The SPLUMA provides for the promulgation of regulations which prescribe procedures for the lodging, consideration and decision of applications. This may include procedures relating to the submission of additional information, explanations and environmental impact assessments.[[85]](#footnote-85)

## THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, ACT 10 OF 2004

One of the main functions of the National Environmental Management: Biodiversity Act, 10 0f 2004 (NEMBA) is to give effect to South Africa’s binding obligations under the international Convention on Biological Diversity (‘the CBD’).

The CBD, Ramsar Convention and Convention on Migratory Species all recognise impact assessment as an important instrument to ensure that development is planned and implemented with biodiversity ‘in mind’ (Slootweg et al., 2006, p 13). As such, biodiversity is relevant to all types of impact assessment and should be addressed at all levels of planning: from individual projects and their alternatives, to plans, policies and programmes.

The objectives of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA) *inter alia* provide for the:

* Management and conservation of South Africa’s biodiversity within the framework of NEMA (Act 107 of 1998);
* Protection of species and ecosystems that warrant national protection;
* Sustainable use of indigenous biological resources;
* Fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; and
* Establishment and functions of a South African National Biodiversity Institute.

NEMBA is particularly relevant to the EIA and spatial planning regimes by defining the concepts ‘biodiversity’, ‘ecosystems’ and ‘bioregions’, and providing a legal basis for:

* Bioregional plans and biodiversity management plans (Chapter 3);
* The listing of threatened ecosystems and threatening processes (Chapter 4); and
* The listing of threatened species (Chapter 4);
* The listing, reporting, monitoring, control and eradication of invasive species (Chapter 5).

## Relationship with other legislation

NEMBA obtains its status as a substantive trigger for environmental authorisation via reference to bioregional plans and listed threatened ecosystems in Listing Notice 3 of the 2010 NEMA EIA regulations. In addition, bioregional plans may not be in conflict with a range of spatial plans regulating land use management and land development.

Each of these aspects of NEMBA and their relevance for EIA and spatial planning are presented in separate sections below.

## Chapter 1: 'Biodiversity' and 'Ecosystems'

In terms of NEMBA, ‘biological diversity’ or ‘biodiversity’ means the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.

This definition corresponds with the notion that “biodiversity encompasses multiple levels of biological organisation” that are embedded in a nested hierarchy representing regional landscapes, communities and ecosystems, species and populations, and genes (Noss 1990, p 355). Each level of this hierarchy of biodiversity can, in turn, be explained in terms of its biological composition, structure and functioning (Franklin *et al*., 1981).

By defining the components of biodiversity in terms of composition, structure and key ecological processes, and at the appropriate hierarchical level, it becomes possible to assess the potential impacts of human activities on ‘biodiversity’ in terms of its definitive components and across a range of ecological and geographical scales (cf. Slootweg and Kolhoff, 2003; De Villiers *et al*., 2005, pp 78-86; Brownlie *et al*., 2009, p 11).

‘Ecosystems’, in turn, mean a dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit. A ‘bioregion’ contains whole or nested ecosystems, and is characterised by its landforms, vegetation cover, human culture and history.

The South African National Biodiversity Institute (SANBI) has developed an applied definition of ‘ecosystems’ for the purpose of defining, identifying and listing threatened terrestrial ecosystems (see below). According to SANBI (2006), ‘ecosystems’ can be equal but not smaller in scale than:

* Vegetation types identified by the Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2006);
* National forest types recognised by the Department of Agriculture, Forestry and Fisheries
* Priority areas identified in a provincial systematic biodiversity plan; or
* High irreplaceability forests patches or clusters systematically identified by the Department of Agriculture, Forestry and Fisheries.

Areas smaller than ecosystems are regarded as ‘habitat’.

#### Defining ‘ecosystems’ for the purposes of environmental assessment

For the purposes of environmental assessment and planning, an ‘ecosystem’ can be taken to represent biodiversity organised at a broad geographical and functional scale – i.e. at a scale which exceeds the boundaries of specific sites or properties, but which simultaneously connects them to the broader landscape. Ecological processes are the ‘connective tissue’ which bind the constituent elements of biodiversity at a landscape or supra-property scale (See xyz).

More narrowly, an ‘ecosystem’ can be defined by legislation or an administrative decision. An ‘ecosystem’ can also epitomise an *approach* to understanding the effects of human interaction with the ‘natural’, biophysical environment, in which case the concept serves as an interpretive device and method for framing questions about potential biodiversity opportunities in the course of impact assessment or spatial planning.

From an environmental assessment perspective, it may be useful to regard people as an integral part of ‘the ecosystem’ and to define an ‘ecosystem’ as a geographical area in which the degradation or disruption of key ecological ‘drivers’ (e.g. fire, habitat connectivity, flooding or sand movement) and/or ecological processes (e.g. pollination, migration or resilience to climate change) can be attributed to distinct human activities or other causes of environmental degradation, such as infestation by alien plants.

#### The 'ecosystem approach'

In this regard, the ‘ecosystem approach’ of the CBD lays particular emphasis on identifying and addressing the causes of negative environmental change at the appropriate functional and spatial scales, devolved to the most effective level of management. The CBD’s operational guidelines for the application of the ecosystem approach invite environmental managers and the like to:

* Focus on the functional relationships and processes within ecosystems;
* Enhance benefit-sharing;
* Use adaptive management practices;
* Carry out management actions at the scale appropriate for the issue being addressed, with decentralisation to lowest level, as appropriate; and
* Ensure inter-sectoral cooperation.

As noted by SANBI’s *Grasslands Ecosystem Guidelines* (Cadman et al., 2013, p 11),

Taking a broad ecosystem approach to planning, management and conservation means that:

* Action can be focused on ecological processes that operate across a range of geographic scales and areas that are important for ecosystem-based adaptation to climate change, and not only on individual species as often was the case in the past.
* Best environmental assessment practice can be achieved by addressing issues at the appropriate ecological scale, as opposed to site-based decision-making, which often fails to consider the ecological value of a site within its broader landscape and regional context.

This theme is supported throughout these Minimum Requirements.

#### Ecosystems as ‘ecological infrastructure’

‘Ecosystems’ are not only a means of providing a functional definition to the inter-actions between the non-living and living components of the biophysical environment and how they are organised in space and time. Well-functioning ecosystems also make a fundamental contribution to human wellbeing in the form of ‘ecological infrastructure’ that provides a flow of essential ecosystem goods and services to society.

The ecosystem services that are generated and maintained by intact and healthy ecological infrastructure include climate regulation, the provision of fresh water, disaster risk reduction and soil formation. The monetary value of these services is difficult to quantify, but their contribution to the South African economy has been estimated at some R9.7-billion per annum (Cadman et al., 2013, p 10). The *Green Jobs Report* by the Development Bank of South Africa (Maia, et al., 2011) has indicated that the bulk of employment opportunities relating to the ‘green economy’ are likely to come from natural resource management.

The use of natural resources embedded in ecological infrastructure has contributed to 486 000 jobs in environmental rehabilitation programmes since 1995, 15 000 work opportunities in protected areas, 27 000 jobs supported by the fishing industry, and 70 000 posts in game ranching and ecotourism (SANBI, 2013).

### Chapter 3:, Bioregional Plans and Biodiversity Management Plans

Chapter 3 of NEMBA provides that the Minister or MECs for environmental affairs may publish bioregional plans that contain measures for the effective management of biodiversity and the components of biodiversity in a specified region. [[86]](#footnote-86)

A province or municipality may also request the Minister of Environmental Affairs to publish a bioregional plan for a bioregion. [[87]](#footnote-87) Alternatively, an MEC for Environmental Affairs may identify a region as a bioregion and, provided that there is concurrence with the national Minister of Environmental Affairs, publish a bioregional plan.[[88]](#footnote-88)

NEMBA, on the face of it, provides little clue as to what would distinguish a bioregional plan from, for example, an environmental management framework that *inter alia* ‘contains measures for the effective management of biodiversity.... in a specified region’. Conceptual clarification is to be found in the *Guideline Regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans* (GN 291 of 16 March 2009).

#### Systematic biodiversity plans: The foundation of bioregional plans

The NEMBA does not define ‘systematic biodiversity planning’ or require that bioregional plans must be drafted in terms of the goals and principles of systematic biodiversity planning. Systematic biodiversity planning obtains its regulatory status from the previously mentioned *Guideline Regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans* (GN 291 of 16 March 2009) which states that a bioregional plan must be based on a *systematic biodiversity plan*.

Systematic biodiversity planning is defined as a “rigorous, data-driven approach for assessing the location, status and importance of a range of biodiversity features (representing) the best available science for identifying spatial biodiversity priority areas...”.

A systematic biodiversity plan identifies priority areas for biodiversity conservation based on internationally recognised systematic biodiversity planning principles, methodologies and techniques. In South Africa, systematic biodiversity plans have been done at the national scale, the biome scale, the provincial scale and the local (municipal) scale. They contain a portfolio of critical biodiversity areas (CBAs) – terrestrial and aquatic features in the landscape - required to meet biodiversity pattern and ecological process targets. In addition, they include spatially explicit ecological corridors that need to be managed to ensure connectivity of natural habitat in the landscape and ecological functioning.

The key characteristics of a systematic biodiversity plan are:

* The principle of representation – the plan identifies areas needed to conserve a representative sample of all biodiversity pattern (including species, habitats and ecosystems).
* The principle of persistence – the plan identifies areas needed to maintain ecological and evolutionary processes that allow biodiversity to persist in the long term (these areas are also referred to as ‘spatial components of ecological processes’ (see Rouget et al., (2003); Pierce et al. (2005); and De Villiers et al. (2005) pp 78-86 on environmental surrogates for ecological processes).
* Biodiversity targets – Quantitative targets are set for biodiversity features, indicating how much of each feature is required in order to conserve a representative sample of biodiversity pattern and key ecological processes.
* Efficiency and conflict avoidance – The configuration of priority areas identified in the plan is designed to be spatially efficient (i.e. to meet biodiversity targets as efficiently as possible in terms of the amount of land required) and where possible to avoid conflict with other land uses where these are known to exist.

A biodiversity sector plan (as a component and precursor to a bioregional plan) must set out the land and resource uses which are consistent with the long-term ecological functioning and health of these CBAs, and the land and resource uses which should be avoided In these areas. It may also provide information on other measures for effective management of biodiversity and the components of biodiversity in the region.

A systematic biodiversity plan that forms the basis for a published bioregional plan must:

* Be undertaken at a spatial scale meaningful for land-use planning and decision-making. The scale should ideally be 1:50 000 or finer. Include terrestrial and aquatic biodiversity features.
* Identify a portfolio of critical biodiversity areas (CBAs) required to meet biodiversity pattern and ecological process targets. Such CBAs should include spatially explicit ecological corridors that need to be managed to ensure connectivity of natural habitat in the landscape.
* Use the most up-to-date and accurate fine-scale GIS input layers available, paying particular attention to the accuracy and scale of the vegetation map and transformation layer. Input layers, particularly for biodiversity features, should conform to accepted guidelines or standards where these exist (for example, guidelines for vegetation mapping standards for GIS metadata).
* Use appropriate, scientifically sound, up-to-date methodology and techniques, including software and analyses, for identifying critical biodiversity areas.
* Include a technical report that sets out in detail the technical aspects of how the systematic biodiversity plan was undertaken, and its limitations.

According to the guideline on bioregional plans, the basic elements of such a plan are as follows:

* A bioregional plan must be a spatial plan showing terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. These areas are referred to as critical biodiversity areas, and are those that should remain in their natural state. A bioregional plan must include guidelines for avoiding loss or degradation of natural habitat in critical biodiversity areas.
* A bioregional plan must include a map with accompanying land-use guidelines. It must provide information and guidance on:
* The location of critical biodiversity areas, identified based on best available science; and
* The land and resource uses which are consistent with the long-term ecological functioning and health of these critical biodiversity areas, and the land and resource uses which should be avoided in these areas.
* A bioregional plan may also provide information on other measures for effective management of biodiversity and the components of biodiversity in the region.

**Further reading on systematic biodiversity planning, development planning and EIA**

Brownlie S, De Villiers C, Driver A, Job N, Von Hase A and Maze K (2005) Systematic Conservation Planning in the Cape Floristic Region and Succulent Karoo, South Africa: Enabling Sound Spatial Planning and Improved Environmental Assessment. *Journal of Environmental Assessment Policy and Management*, Vol 7 No 2, 201-228.

Cadman M, Petersen C, Driver A, Sekhran N, Maze N and Munzhedzi S (2010) Tools for mainstreaming in land-use planning and decision-making. In Cadman (et al.) *Biodiversity for Development: South Africa’s Landscape Approach to Conserving Biodiversity and Ensuring Ecosystem Resilience*. SANBI, Pretoria, pp 46-65.

Cowling RM and Pressey RL (2003) Introduction to systematic conservation planning in the Cape Floristic Region. *Biological Conservation* **112**, 1-13.

Driver A, Cowling RM and Maze K (2003) *Planning for Living Landscapes: Perspectives and lessons from South Africa*. Centre for Applied Biodiversity Science, Washington DC, and Botanical Society of South Africa, Cape Town.

Margules CR and RL Pressey (2000) Systematic conservation planning. *Nature* **405**, 243-253.

Pence, G. Q.K. (2008) *C.A.P.E. Fine-Scale Systematic Conservation Planning Assessment: Technical Report*. Produced for CapeNature as part of the GEF-funded C.A.P.E. Fine-Scale Biodiversity Planning Project. Cape Town, South Africa

Pierce SM, Cowling RM, Knight AT, Lombard AT, Rouget M and Wolf T (2005) Systematic conservation planning products for land-use planning: Interpretation for implementation. *Biological Conservation* **125**, 441-458.

Ralston S, de Villiers C, Manuel J, te Roller K and Pence G (2009) Where are we going? Fine Scale Systematic Conservation Plans and their Contribution to Environmental Assessment. In *IAIAsa 2009 National Conference Proceedings*, 23-26 August 2009, Wilderness

Reyers B, Rouget M, Jonas Z, Cowling RM, Driver A, Maze K and Desmet P (2007) Developing products for conservation decision-making: lessons from a spatial biodiversity assessment for South Africa. *Diversity and Distributions*, 1-11.

#### Bioregional plans and municipal spatial planning

Inasmuch as formally adopted bioregional plans provide a vital layer of interpreted information by which to align spatial development frameworks with mapped biodiversity priorities, such bioregional plans may not be in conflict with any integrated development plans (IDPs) adopted by municipalities in terms of the Local Government: Municipal Systems Act, 32 of 2000

Bioregional plans also may not be in conflict with any spatial development frameworks (SDFs) in terms of legislation regulating land-use management, land development and spatial planning administered by the national minister responsible for land affairs , and any other plans prepared in terms of national or provincial legislation that may be affected.

By the same token, any municipality that must adopt an IDP must align it with any applicable bioregional plan, incorporate applicable provisions of the bioregional plan into the IDP, and demonstrate how the bioregional plan would be implemented.

These provisions of the NEMBA give municipal planning a vital role in biodiversity mainstreaming. SDFs, in particular, would not only provide high-level, indicative guidance to development on the basis of biodiversity opportunities and constraints but, potentially, would also dictate the assignment of land use rights on the basis of zoning schemes that are consistent with the biodiversity objectives of spatial plans.

#### Bioregional plans and biodiversity mainstreaming

The purpose of a bioregional plan is to:

* Provide a map of biodiversity priorities with accompanying land-use planning and decision-making guidelines; and
* Inform land-use planning, environmental assessment and authorisations, and natural resource management by a range of sectors whose policies and decisions impact on biodiversity (DEA, 2009, p 9).

Bioregional plans formalise biodiversity ‘mainstreaming’ strategies that aim to equip all those whose decisions may affect land and natural resources with information about spatial biodiversity priorities, and to enable them to use this information as a safeguard to biodiversity when planning or managing projects. The logic behind biodiversity ‘mainstreaming’ – through devices such as bioregional plans – is to encourage planning which actively responds to ecological constraints and opportunities in a landscape by proactively steering development to areas that hold less risk to important biodiversity features (cf Brownlie et al., 2005, pp 214-220; Cadman et al., 2013, pp 17-24; Cadman et al., 2010, pp 48-65).

Once formally gazetted in terms of section 40(1) of NEMBA, a bioregional plan becomes a potential ‘trigger’ for the requirement to obtain environmental authorisation (see below).

#### The NEMA EIA regulations: Systematic biodiversity plans and bioregional plans

All but four of the 26 activities that appear on Listing Notice 3 refer to the potential presence of critical biodiversity areas (CBAs) as a potential 'trigger' for environmental authorisation.

For this 'trigger' to be activated, however, a CBA – or, in some instances, ecological support areas – must either have been identified in:

* Systematic biodiversity plans ‘adopted’ by the competent authority; or
* Bioregional plans.

The definition of 'systematic biodiversity plans' in Listing Notice 3 basically distils the information provided in the guideline on bioregional plans (DEA, 2009). A 'bioregional plan', in turn, means... he bioregional plan contemplated in Chapter 3 of the NEMBA...

#### Listing of activities in relation to CBAs in identified geographic areas

Listing Notice 3 of the 2010 NEMA EIA regulations gives effect to sections 24(2) and 24D of NEMA which empower the Minister of Environmental Affairs to identify and publish a list of geographical areas in which specified activities may not commence without environmental authorisation or, alternatively, identify geographical areas where specified activities may be excluded from the requirement for prior authorisation.

The key elements of listing under these provisions of NEMA generally entail:

* An activity (e.g. construction, conversion, clearance or expansion) potentially linked to a threshold (e.g. distance from a specified feature);
* A province; and,
* In all cases, location of the activity of a CBA or ESA identified as such by a systematic biodiversity plan adopted by a competent authority or a bioregional plan.

**Interpretation of systematic biodiversity plans**

There may well be situations where the assignment of a particular biodiversity category – CBA, ESA or 'Other natural area' – to a specific area may be questioned on grounds such as habitat condition or the (mis-identification of a particular vegetation type. The NEMA EIA regulations do not make provision for the settlement of differences of opinion relating to the veracity or accuracy of systematic biodiversity plans (or, for that matter, vegetation in ecosystems that are listed as threatened) and it can be assumed, as these plans come into wider use, that such situations are likely to increase. Conciliation and/or investigation of these questions in terms of sections 17 and 20 of NEMA respectively may be advised if such interpretive disputes frustrate effective, administratively fair protection of the environment. In the meantime, see Box 18 (p 132) of the *Grasslands Ecosystem Guidelines* for frequently asked questions about the interpretation and function of CBA maps.

#### When would activities be triggered by the presence of a CBA identified by a bioregional plan?

In the case of proposed development that may intrude into a CBA identified by a bioregional plan, the test as to whether this may entail an application for environmental authorisation is straightforward:

* Has the 'bioregional plan' in question been gazetted in terms of the procedures and requirements prescribed by sections 40 and 41 of NEMBA respectively; and
* Was the adoption of the 'bioregional plan' preceded by a process of intra-governmental consultation (section 99, NEMBA) and public participation (s 100, NEMBA)?

If the answer to both questions is 'yes', the activity and the requirement for environmental authorisation would appear to be triggered, and a basic assessment would be necessary. Conversely, if the answer to either of the questions is 'no', then the plan cannot be defined as a 'bioregional plan', suggesting that the proposed activity does not require environmental authorisation.

#### When would activities be triggered by the presence of a CBA identified by a systematic biodiversity plan that has not been adopted as a bioregional plan?

The EIA regulations also make provision for CBAs that have not been incorporated into a gazetted bioregional plan to serve as potential triggers for environmental authorisation. It is not clear, however, precisely how these scenarios would play out in practice.

Currently, there are more than 40 references in Listing Notice 3 that refer to:

* CBAs identified in systematic biodiversity plans adopted by the competent authority (a qualification that applies to most of the listed activities entailing CBAs); or, in one case,
* CBAs adopted by the competent authority (this wording only applies to the expansion of resorts etc. in the Western Cape; cf. Activity 18(d)(ii) of LN 3).

At issue here is what is meant by "adoption" of a systematic biodiversity plan other than via the mechanism of a 'bioregional plan' as provided for in Chapter 3 of NEMBA. The NEMA EIA regulations do not provide any guidance in this regard besides giving a definition for 'systematic biodiversity planning'. In the absence of clear definitions and official guidance on this score, it tentatively could be suggested that a systematic biodiversity plan (as long as such a plan corresponds to the definition provided by the NEMA EIA regulations, and the scientific method and technical content prescribed by the *Guideline Regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans* (GN 291 of 16 March 2009), could be "adopted" in various ways by a competent authority.

In general, caution is advised about jumping to conclusions as to the status of mapped CBAs as 'triggers' for environmental authorisation where such CBA maps or systematic biodiversity plans have been "adopted" by a competent authority via any others means besides the procedures prescribed by Chapter 3 of NEMBA. If in doubt, obtain legal advice so as to clarify the regulatory status of these provisions of Listing Notice 3 in relation to a proposed project or administrative action. If not, one runs the risk of taking a potentially misguided decision that either may result in a project proponent launching into an unjustified application, or highly important biodiversity being denied the protection offered by NEMA and the basic assessment process.

What follows presupposes that a competent authority (but not, for example, a municipality or any other organ of state that is not empowered to grant environmental authorisations as prescribed by NEMA s 24C) will be responsible for "adopting" all or parts of systematic biodiversity plan via any of the following mechanisms in terms of powers and responsibilities assigned to it by law. The list does not claim to be exhaustive. It is also, at this stage, speculative.

#### Opportunities for competent authorities to 'adopt' systematic biodiversity plans

Competent authorities (i.e. authorities empowered to issue environmental authorisations) conceivably could use, as appropriate, any of the following mechanisms as a vehicle by means of which to 'adopt' a systematic biodiversity plan for a particular geographical region or more localised area

* Environmental management frameworks (GN R. 547 of 18 June 2010);
* Implementation guidelines published in terms of NEMA s 24J;
* Proclamation of Protected Environments in terms of s 28 of the NEM Protected Areas Act 57 of 2003;
* Approval of maintenance management plans for coastal areas and watercourse in terms of Activity 18 of Listing Notice 1; and
* The preparation, adoption and review of coastal management programmes in terms of Chapter 6 of the National Environmental Management: Integrated Coastal Management Act 24 of 2008.[[89]](#footnote-89)

#### Biodiversity Management Plans and Biodiversity Management Agreements

Chapter 3 of NEMBA makes it possible for any person, organisation or organ of state to submit a draft management plan to the national minister of environmental affairs that aims at ensuring the long-term survival in nature of specific species or ecosystems.

The state, through the national Minister of Environmental Affairs, may enter a 'Biodiversity Management Agreement'[[90]](#footnote-90) on the implementation of a biodiversity management plan. The responsible custodians of such a plan form the other party to a Biodiversity Management Agreement.

Biodiversity management plans (cf NEMBA sections 43-46) can apply to:

* An ecosystem listed in terms of section 52 of NEMBA;
* An ecosystem which is not listed but which does warrant special conservation attention;
* Both listed and unlisted indigenous species that are threatened or in need of protection; and/or
* Migratory species.

A biodiversity management plan must designate which person or institution is responsible for its implementation, and provide for monitoring and reporting on progress with the implementation of the plan.[[91]](#footnote-91)

*Norms and standards for biodiversity management plans for ecosystems* were published in the Government Gazette on 7 February 2014.[[92]](#footnote-92) They chiefly apply to terrestrial and aquatic ecosystems; the National Estuarine Management Protocol[[93]](#footnote-93) provides guidance on the development of estuary management plans for individual estuaries. See Government Notice 214 of 2 March 2004 for *Norms and standards for biodiversity management plans for species*.

Biodiversity management plans for ecosystems would mostly be developed for ecosystems of special concern outside the boundaries of protected areas. Their purpose is to ensure the long-term survival in nature of the ecosystem to which the plan applies. This would be achieved by drawing on the interest and action of landowners (private, communal and state) who want to improve and formalise the management of an ecosystem that occurs on their properties. Biodiversity management plans for ecosystems are not aimed at excluding people from land or preventing the sustainable use of biodiversity and ecosystem goods and services. Restrictions could, however, could be agreed to by stakeholders.

Biodiversity Management Agreements are entered between the Minister of Environmental Affairs and any suitable person or institution regarding the implementation of a biodiversity management plan.[[94]](#footnote-94) A Biodiversity Management Agreement can only be entered into for an ecosystem or part of an ecosystem for which there is a biodiversity management plan.

Biodiversity Management Agreement as provided for in Chapter 3 of the NEMBA 10/2004 must not be confused with 'biodiversity agreements' that are concluded in terms of stewardship programmes. A 'biodiversity agreement' entails a private landowner and a conservation agency entering a voluntary contract for the conservation of biodiversity on the private party's land. Such an agreement does not affect property rights but a biodiversity management would be required. (DEA et al., 2013, p 95). A landowner who has entered a Biodiversity Management Agreement may qualify for tax relief in terms of fiscal incentives provided for in the Revenue Laws Amendment Act 60 of 2008. These measures relating to Biodiversity Management Agreements came into effect in the 2009/2010.[[95]](#footnote-95)

#### Biodiversity management plans and spatial planning

Existing biodiversity management plans can relate to environmental assessment and spatial planning in a number of ways:

* As a 'cautionary flag' during pre-application screening and scoping that should be proactively responded to in project design, the selection of the best practicable alternatives, planning of the environmental assessment process, and refining criteria for impact evaluation;
* By providing critical, ecosystem or species-specific input to environmental management programmes, ecological management objective and practices, and monitoring and reporting protocols; and/or
* Offering an opportunity for project proponents to contribute to the formalised management of biodiversity in off-reserve contexts, either at an ecosystem, habitat or species scale. In this regard, an EMP prepared in terms of s 24N of NEMA may – in appropriate circumstances and if consistent with the prescribed contents of biodiversity management plans (NEMBA s 45) – be put forward for approval as a biodiversity management plan. Large-scale users of land such as mining or agriculture, or development sectors whose areas of operation coincide with the distribution range of threatened species, may individually or collectively be able to make an important contribution to biodiversity management via these provisions of NEMBA and their promotion by EIA practitioners.

### Chapter 4: Listing of Threatened Ecosystems and Species

The second major link between the NEMA EIA regulations and NEMBA (besides CBAs identified in bioregional or systematic biodiversity plans) is to be found in the listing of ecosystems that are threatened or in need of protection.

Such listing in the Government Gazette would take place in terms of section 52 of NEMBA, and can entail either national or provincial lists of threatened ecosystems. A *National List of Ecosystems That Are Threatened and In Need Of Protection* (the 'national list of threatened ecosystems') was published as Government Notice 1002 of 9 December 2011.

The national list of threatened ecosystems provides a measure of the degree to which ecosystems are still intact or losing vital aspects of their composition, structure and function – and, hence, their ability to provide ecosystem services (Driver et al., 2012, p 3). Note that the 2011 list of threatened ecosystems supersedes ecosystems were found to be threatened by the National Spatial Biodiversity Assessment (NSBA) (Driver et al., 2005).

This measure of ecosystem integrity is provided by the twin concepts of 'ecosystem threat status' and 'ecosystem protection level'. Each is briefly explained below.

#### Biodiversity targets and ecosystem threat status

The National Biodiversity Assessment (NBA) (2011), which updates the NSBA of 2005, reflects the results of among others an analysis of the ecosystem threat status of 567 terrestrial ecosystems, which were largely but not exclusively defined by national vegetation types (Mucina et al., 2006).

The assessment of ecosystem threat status is based on a quantitative biodiversity target for each defined ecosystem. The biodiversity target sets out to answer the question: "How much is enough to ensure the long-term persistence of biodiversity, and hence, a living landscape...?" (Driver et al., 2003, p 32). A biodiversity target basically represents the minimum proportion of each ecosystem that must be kept in a natural or near-natural state in order to maintain viable representative samples of:

* All ecosystem types; and
* The majority (viz. 75%) of species associated with those ecosystems (Pence, 2008, p 21; Driver et al., 2012;

Biodiversity targets are inter alia based on the species richness and ecological characteristics of each ecosystem. Using species-area relationships, conservation planners can calculate the percentage of the original extent of ecosystems that need to be retained in order to achieve the goal of representivity. The conservation targets for terrestrial ecosystems in South Africa range between 16% and 36% of the original extent of each ecosystem type. Higher targets are often associated with ecosystems characterised by high species richness, great habitat diversity and rapid turnover of species along environmental gradients. Targets for aquatic ecosystems have been set at 20%.

Ecosystem threat status is a measure of how much of the original extent of an ecosystem remains relative to its target: the greater the difference between the target and the amount of extant or remaining habitat, the less threatened the system. Conversely, an ecosystem will move towards a higher category of threat as it is reduced in extent relative to the target, species are lost and ecosystem functioning is disrupted (cf, Reyers et al., 2007, p 5).

In South Africa, ecosystem threat status is reflected by four categories, defined in terms of the proportion of each ecosystem type that remains in good ecological condition relative to their respective targets and a series of associated thresholds (Driver et al., 2011, p 39). Ecosystem threat status is indicated by the following categories:

|  |  |
| --- | --- |
| *Critically Endangered ecosystems* | **CR** |
| *Endangered ecosystems* | **EN** |
| *Vulnerable ecosystems* | **VU** |
| *Least Threatened ecosystems* | **LT** |

Section 52(2) of NEMBA defines the respective categories of ecosystem threat as follows (also see the NBA 2011 (Driver et al., 2012) and the national list of threatened ecosystems (DEA, 2011) for an explanation of how threatened ecosystems are classified):

* **Critically Endangered (CR**) ecosystems have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation. Remaining habitat in these ecosystems either equals the biodiversity target for the ecosystem, or has dropped below it. Few natural or near-natural examples of these ecosystems therefore remain and any further loss of habitat must be strenuously avoided. Remaining healthy examples of these ecosystem types should be the focus of urgent conservation action;
* **Endangered (EN)** ecosystems have undergone degradation of ecological structure, function or composition as a result of human intervention and are close to becoming CR. The threshold that places an ecosystem in the EN category is the biodiversity target plus 15%. Any further loss of habitat must be avoided and the remaining healthy examples should be the focus of conservation action;
* **Vulnerable (VU)** ecosystems have lost at least 40% of their original extent but are still above threshold for EN ecosystems. VU ecosystems are still largely in a natural or near-natural condition. The ecological persistence of VU ecosystems becomes increasingly compromised and degraded with unchecked loss of habitat and the resulting fragmentation and isolation of remaining natural and near-natural areas. Maps of biodiversity priority areas (i.e. systematic biodiversity plans or, where promulgated, bioregional plans) should guide planning, decision making, development and management in these ecosystem types.
* **Protected** ecosystems are of high conservation value or of high national or provincial importance, but have not been listed as CR, EN or VU.
* **Least threatened (LT)** ecosystems are not considered threatened. They have experience limited loss of habitat or ecological condition and principles of sound, biodiversity-responsive land use planning and development should be applied in these ecosystems.

The NBA 2011 (Driver et al., 2012, pp 52 and 53) identifies the following key pressures on terrestrial and aquatic ecosystems, many of which are regulated in terms of environmental, agricultural and water legislation:

* Loss of natural habitat is the single greatest cause of loss of biodiversity and disturbance to ecosystems in terrestrial contexts. Key economic sectors in this regard include agriculture, plantation forestry, mining, and infrastructure and urban development all of which – on paper – are closely regulated in South Africa.
* Degradation of natural habitat as a result of over-grazing or inappropriate fire regimes is another major driver of biodiversity loss and ecosystem deterioration. Arid ecosystems are particularly vulnerable to processes of degradation and may never be able to fully recover their pre-disturbance composition, structure or functioning. Land uses that contribute to ecosystem degradation rather than outright transformation and physical loss of habitat are less rigorously controlled by legislation than, for example, infrastructure development or mining. Technical extension services, developing markets for trading in ecosystem services, and incentives are possibly also more effective instruments for encouraging sustainable ecosystem utilisation than relying on haphazard regulatory enforcement. This is a particularly relevant observation in a country where agriculture represents more than 80% of land use, of which approximately 13% is potentially arable (DAFF, 2012).
* Invasive alien species (especially plants) are a major problem in the terrestrial environment. Besides displacing indigenous species and invading commercially valuable habitats such as grasslands, they contribute to ecological degradation by increasing the intensity of fires and disrupting critical regulatory processes such as infiltration and the control of run-off.
* Pollution arising from waste generation contaminates and degrades water resources (e.g. acid mine drainage or irrigation return flows), soil and local and regional atmospheres (e.g. 'brown haze' associated with emissions by trucks, coal-fired power stations and large-scale burning of wood or coal for household purposes which is particularly exacerbated by temperature inversions).
* Climate change is a critical factor to consider when assessing the cumulative effects of loss and degradation of natural habitat in relation to the health, productivity and resilience of terrestrial ecosystems. Climate change is liable to exacerbate the impacts of existing, often-interacting, pressures of habitat loss and the large-scale fragmentation and deterioration of terrestrial ecosystems and the ecological and evolutionary processes by which they are maintained.

These drivers of habitat loss and ecosystem degradation are reflected in the criteria that guide the classification of threatened ecosystems. It is strongly recommended that they be used to assign significance ratings to impacts that would increase the ecosystem threat status of affected habitats or areas.

The following criteria are used to identify threatened ecosystems (see Driver et al., 2012, p 52 or Section 4.3, pp 36-43, of the national list of threatened ecosystems for further explanation):

| **Selection criteria** | | **Explanation** | **Implications for development planning and environmental assessment** |
| --- | --- | --- | --- |
| **A1** | ***Irreversible loss natural of habitat*** | Ecosystems that have undergone loss of natural habitat, impacting on their structure, function and composition. | A strictly risk-averse approach should be following in project planning, with avoidance being the primary strategy for impact mitigation. In **CR** and **EN** ecosystems, further loss of habitat in particularly natural or near-natural remnants should be assigned the highest negative significance rating, subject to a specialist assessment. A similar approach should apply to habitat loss in **VU** ecosystems that are approaching the **EN** threshold. |
| **A2** | ***Ecosystem degradation and loss of integrity*** | Ecosystems that are significantly degraded (currently only applied to forests due to data constraints) | Firstly establish the major drivers of ecosystem degradation. Ensure that these are not perpetuated or aggravated by a proposed development or change in land use. Then identify and, if within a project proponent's powers and means, remove the causes of such degradation. This means conducting screening, scoping and planning at a scale that is relevant to the functional, spatial and temporal scales at which ecosystem degradation takes place. |
| **C** | ***Limited extent and imminent threat*** | Ecosystems of small geographic extent that are faced with an imminent threat (currently only applied to forests, due to data constraints) | Although these ecosystems may not have experienced significant transformation, they can tolerate very little loss of habitat owing to their naturally limited extent. Mangrove, milkwood and swamp forests, amongst others, fall within this category of threat. Impact avoidance, retention of spatial and functional connectivity, and effective buffering of remaining examples of these vegetation types should be the mitigation strategy of choice. |
| **D1** | ***Threatened plant species associations*** | Ecosystems that contain a high number of threatened species, indicating that the ecosystem itself is threatened, even if it has not been identified as threatened under the other criteria | It is the high occurrence of threatened plant species rather than habitat transformation that underpins the listing of ecosystem types in terms of this criterion. Only ecosystems in the Fynbos Biome meet the high thresholds set for Criterion D1. Specialist botanical assessments, undertaken in Spring, must be mandatory when undertaking environmental assessments in areas that host indigenous vegetation listed on the basis of Criterion D1 |
| **F** | ***Priority areas for meeting explicit biodiversity targets as defined by a systematic biodiversity plan.*** | Ecosystem types listed in terms of Criterion F are derived from provincial systematic biodiversity plans that have been developed at a fine enough scale and with sufficient consistency between them to provide a strong basis identifying national threatened ecosystems. Derived from DAFF's detailed systematic biodiversity planning for forest areas, and systematic provincial biodiversity plans for Gauteng, Mpumalanga and KwaZulu-Natal; also numerous fine-scale biodiversity plans in the Western Cape. | Remnants of these ecosystems should be managed in a natural condition and, if degraded, restored to a natural or near-natural condition. |

#### Regulations controlling activities involving threatened or protected species

NEMBA provides for the listing of threatened species in terms of the same categories that are used to assign a threat status to ecosystem, namely CR, EN or VU. Species may also be listed as 'protected' although they are not listed in terms of the other categories of threat.

The definition of each category of threat does differ, however, from those relating to threatened ecosystems. For example, a CR species refers to an "(indigenous) species facing an extremely high risk of extinction in the wild in the immediate future..." (NEMBA, s 56(1)).

**Unlike threatened ecosystems, the actual or potential occurrence of a listed threatened species does not trigger the requirement for environmental authorisation.**

The so-called TOPS ('Threatened or protected species') regulations (cf. Reg 2 of GN R. 152 of 23 February 2007)[[96]](#footnote-96) control a wide range of biodiversity-related activities in terms of Section 57 of NEMBA, including:

* Further regulating the permit system set out in Chapter 7 of NEMBA as that system applies to restricted activities involving specimens of listed threatened or protected species;
* The registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;
* The regulation of hunting as a specific restricted activity;
* The prohibition of specific restricted activities involving specific listed threatened or protected species; and
* The protection of wild populations of listed threatened species.

An issuing authority may require that an applicant appoints an environmental assessment practitioner to undertake a risk assessment prior to a permit application being considered (Regs 15 and 16, GN R. 152 of 23 February 2007). In such an event, the environmental assessment practitioner must be independent and among others have expertise in conducting risk assessments. Reg 3 of the TOPS regulations specifies when the Minister of Environmental Affairs, a provincial MEC for environmental affairs, or officials (subject to delegated powers) constitute "issuing authorities" to whom all permit applications must be made.

#### Listed threatened species as a 'red flag' in development planning

A national list of threatened species or species in need of protection was gazetted in two instalments in 2007 (GN R. 151 on 23 February 2007 and GN R. 1187 on 14 December 2007). These regulations provide protection to a number of threatened invertebrates (e.g. all species of stag beetle), reptiles (e.g. the giant girdled lizard), fish (e.g. the Clanwilliam yellowfish), birds (e.g. the Lappet-faced Vulture), mammals (e.g. the Samango monkey) and plants such as various cycads and the yellow arum lily.

The listing of threatened species or species in need of protection has immense relevance to environmental assessment, even though such listing does not have any implication in terms of section 24 of NEMA.

For example, the 'Category A' screening criteria for biodiversity-inclusive impact assessment as promoted by the Secretariat of the Convention on Biological Diversity (Slootweg et al., 2006) state that EIA should be mandatory in areas known to be habitat for threatened species. This perspective is also shared by the International Association for Impact Assessment, which notes that pre-scoping screening is crucial in areas that support protected species.

However, it is incumbent upon all environmental assessment and planning processes to establish if threatened species may be present and at risk from proposed developments or changes in land use. Sources of information on threatened species, or species inscribed in Red Data Books, are provided below.

The presence of threatened species should serve as a vivid red flag to exercise maximum caution in project planning and, if there were to be any risk of irreparable loss of such species or their habitats, to seek alternatives that would prevent such impacts from occurring. The IAIA (2005, p 4) recommends that impact assessments must determine if a proposal will have the following consequences at the species level:

* Alter the species-richness or species-composition of habitats in the study area;
* Alter the species-composition of communities;
* Cause some species to be lost from the area;
* Affect species identified as priorities in NBSAPs and/or sub- national biodiversity plans; and/ or
* Increase the risk of invasion by alien species.

For more information on undertaking species-level screening and impact assessment in South African contexts, see:

* Part B of the *Guideline for involving biodiversity specialists in EIA processes: Edition 1* (Brownlie, 2005) – Triggers for specialist involvement in environmental assessment and planning; and
* Section 9.4 of the *Grasslands Ecosystem Guidelines* (Cadman et al., 2013), 'Basic Terms of Reference for Biodiversity Assessment'.
* Table 6 in the *Mining and Biodiversity Guideline* (DEA et al., 2013) - resources on threatened flora and fauna.

#### Uncertainty and the presumed but unconfirmed presence of threatened species

**Box xyz: Balancing uncertainty and biodiversity red flags in EIA ... no easy answers**

Examples of where these considerations may have to be brought to the fore in environmental assessment and project planning could include:

* Selecting mountain peaks on which to erect telecommunications infrastructure where there is a strong correlation between habitats above a certain altitude and the occurrence of small, isolated populations of range-restricted – and threatened – endemic plants (in, for example, Kogelberg Sandstone Fynbos, a CR ecosystem listed on the basis of Criterion D1) – it would be critical, for example, to include a botanist in all stages of site selection, micro-siting of infrastructure and construction management. In the event that it cannot be conclusively demonstrated the plant species in question is, in fact, present – although its habitat is – project planning would have to be guided by close and careful interpretation of the mitigation hierarchy, the Duty of Care and the National Environmental Management Principles that demand precaution and special care in management where development may affect sensitive and highly vulnerable ecosystems.
* Designing a power line corridor that potentially traverses Blue Swallow (CR) nesting sites in Mpumalanga's high altitude grasslands. Would it be sufficient to reduce the potential significance of the species as a factor in planning and decision making because no breeding activity has been observed in the vicinity in preceding years, although the affected habitat provides superb nesting opportunities?
* Constructing a renewable energy facility in a region believed to be frequented by sub-escarpment populations of South Africa's most highly threatened terrestrial mammal, the riverine rabbit (CR). Food preferences and habitat requirements about the distribution of 'escarpment' or Karoo populations of riverine rabbit cannot readily be applied to sub-escarpment populations in the Fynbos Biome. The latter population is also considered to be genetically distinct from the Karoo population. What degree of empirical certitude would be necessary to be able to confirm, with a sufficiently high degree of confidence, that the area earmarked for the renewable energy facility is not frequented by riverine rabbit although independently corroborated sightings of the species had been made within 5 km of the site? As with the first and second examples, an impact assessment would have to convincingly demonstrate close and applied allegiance to the normative standards set by the Duty of Care, the National Environmental Management Principles and international professional best practice.

Screening, scoping and impact assessment must be particularly mindful of the cautionary reminder that 'absence of evidence does not necessarily imply evidence of absence' in relation to threatened species.

Given the immense negative significance attached to the loss of a threatened species, it may be prudent to adopt a strictly risk-averse approach if it cannot be conclusively demonstrated on the basis of best available empirical evidence that a proposed project would not hold adverse consequences for the persistence of a threatened species or its habitat. In these circumstances, particularly close attention needs to be paid to explaining the probability why an impact may or may not occur, and the confidence of such prediction.

The rating of impact probability should include an 'unknown' category. Similarly, an impact assessment should also allow for an 'unsure' category with respect to reporting the confidence of predictions.

### Chapter 5: Species and organisms that may threaten biodiversity

One of NEMBA's primary purposes is the conservation of indigenous species, habitats and ecosystems in a natural, non-invaded condition. Preventing the unauthorised introduction and spread of alien and invasive species into ecosystems where they do not naturally occur is therefore a key focus of the Act.[[97]](#footnote-97) Likewise, where such introductions have occurred, they need to be controlled and managed.

Section 65(1) of NEMBA prohibits the carrying out of restricted activities involving specimens of alien species without a permit, and imposes an enforceable duty of care on persons who are permitted to conduct such restricted activities.[[98]](#footnote-98)

***National list of invasive species***

NEMBA also provides for the listing of invasive alien species in the *Government Gazette* by either the national Minister of Environmental Affairs or provincial MECs for environmental affairs and restricted activities involving such listed invasive species may not be carried out without a permit.[[99]](#footnote-99) National lists of alien species have been gazetted as follow:

* A *National List of Alien Specie*s was gazetted in mid-2013 which specifies invasive (Category 1a) species for which control is compulsory, and Category 1b invasive species must be controlled by means of an invasive species management programme. [[100]](#footnote-100)
* *Draft Alien Invasive Species Lists* and *Draft Alien Invasive Species Regulations* were published for comment early in 2014.[[101]](#footnote-101)

With regard to the control and eradication of listed invasive alien species, NEMBA *inter alia* stipulates that control methods must be:

* Appropriate for the species concerned and the environment in which it occurs;[[102]](#footnote-102)
* Conducted with caution and in a manner that may cause the least possible harm to biodiversity and the environment;[[103]](#footnote-103) and
* Directed at preventing such a targeted species from producing off-spring, forming seed, regenerating or re-establishing itself in any manner.[[104]](#footnote-104)

All organs of state in all spheres of government – i.e. not only managers of protected areas – must prepare an invasive species monitoring, control and eradication plan for land under their control as part of their environmental plans in accordance with Section 11 of NEMA. The Minister of Environmental Affairs may instruct SANBI to assist municipalities in this regard.[[105]](#footnote-105) NEMBA also prescribes that the Minister or MEC for environmental affairs in a province must prepare a status report on any listed invasive species that occurs in that area.[[106]](#footnote-106)

#### Genetically modified organisms

The Minister may require that an environmental assessment be conducted before genetically modified organisms may be released into the environment in terms of a permit issued under the Genetically Modified Organisms Act 15 of 1997.[[107]](#footnote-107)

## THE NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT 57 OF 2003

The primary purpose of the National Environmental Management: Protected Areas Act 57 of 2003 (NEMPAA) is to provide for the protection and conservation of ecologically viable areas that are representative of South Africa’s biodiversity.

The NEMPAA provides the legal foundation for declaring and managing such statutory protected areas, makes important conceptual additions to the official biodiversity lexicon, and establishes a system of protected environments for conserving biodiversity outside nature reserves and national parks.

### Relationship with other legislation

The NEM PAA is directly relevant to development planning in terms of all the above aspects, and is tied into the NEMA EIA system by, among others, defining ‘protected areas’,[[108]](#footnote-108) a concept that features prominently in the definition of listed activities in Listing Notice 3.[[109]](#footnote-109)

The NEMPAA binds all organs of state.[[110]](#footnote-110) Its provisions prevail in the event of conflict with other national legislation pertaining the management or development of protected areas, and municipal by-laws are subordinate to the NEM PAA.[[111]](#footnote-111)

Section 48(1) of the NEMPAA prohibits prospecting and mining in a wide range of protected areas.[[112]](#footnote-112) Existing mining and prospecting in these areas must be reviewed by the Minister of Environmental Affairs, after having consulted with the Minister of Mineral and Energy Affairs, with the objective of prescribing conditions under which these activities may continue.[[113]](#footnote-113) Such conditions must reduce or eliminate the impact of such activities on the environment or the protection of the environment.[[114]](#footnote-114)

### The NEMPAA and the NEMA EIA regulations

Listing Notice 3 includes a large number of activities (construction, expansion, etc.) that may trigger the requirement for environmental authorisation owing to the proximity of a:

* ‘Protected area’;
* World Heritage Site; or
* Focal areas for the National Protected Areas Expansion Strategy (NPAES). Conservancies are excluded from the definition of ‘protected areas’. The section on the NEMBA dealt with proposed listed activities in Critical Biodiversity Areas.

### ‘Protected areas’

Listing Notice 3 defines ‘protected area’ as “those protected areas contemplated in terms of section 9 of the NEMPAA and the core area of a biosphere reserve and shall include their buffers…”,[[115]](#footnote-115) namely:

* Special nature reserves, national parks, nature reserves (including wilderness areas) and protected environments;
* World Heritage Sites;
* Marine protected areas;
* Specially protected forest reserves, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act 84 of 1998 (see below); and
* Mountain Catchment Areas declared in terms of the Mountain Catchment Areas Act 63 of 1970.[[116]](#footnote-116)

The Minister of Environmental Affairs must maintain a register of protected areas that *inter alia* lists all protected areas and the kind of listed protected area.[[117]](#footnote-117)

Protected areas declared in terms of provincial legislation must be included in the Register as ‘nature reserves’ or ‘protected environments’, depending on the purpose for which such area was declared.[[118]](#footnote-118) It follows that provincial nature reserves that existed prior to the promulgation of the NEMPAA must be given the appropriation designation under the NEMPAA, and recognised as ‘protected areas’ in terms of the provisions of this Act.

Environmental assessment practitioners must be alert to the presence of protected areas that, owing to their proximity to a proposed development site, may serve as a trigger to obtain mandatory environmental authorisation. Repairs to flood-damaged road infrastructure in rural areas, which entail 'construction' and or/'expansion' within 32 m of a watercourse, serve as a case in point (see (activities 16 and 24 on LN1).

Such work could be listed if the activity took place within:

* Ten kilometres of a national park or world heritage site; and/or
* Five kilometres from any other protected area of the core area of biosphere reserve.[[119]](#footnote-119)

Only Chapter 1 (‘Interpretation, objectives and application of Act’) and Chapter 2 (‘System of protected areas in South Africa’) of the NEMPAA apply to World Heritage Sites declared in terms of the World Heritage Convention Act 49 of 1999.

#### The National Protected Area Expansion Strategy (NPAES)

The NPAES is South Africa's national strategy for expansion of the protected area network, led by the Department of Environmental Affairs and developed in collaboration with national and provincial conservation authorities. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. Focus areas for protected area expansion are identified in the NPAES. They are large, intact, un-fragmented areas of high importance for land-based protected area expansion, suitable for the creation or expansion of large protected areas.[[120]](#footnote-120)

#### World Heritage Sites

World Heritage Sites are declared in terms of the World Heritage Convention Act 49 of 1999 and means any place in South Africa which:

* Has been included on the World Heritage List;[[121]](#footnote-121) or
* Is on the tentative list referred to in the Operational Guidelines (WHC, 2013) for the implementation of the World Heritage Convention;[[122]](#footnote-122) or
* Has been proclaimed as a special heritage site for management in accordance with the World Heritage Convention Act.

Environmental and planning processes for proposed projects in or near to declared World Heritage Sites (WHS) must be particularly alert to any aspect of the project that may adversely affect any quality of the WHS that qualified inscription of the site in terms of the World Heritage Convention’s *Criteria of Outstanding Universal Value* (cf. Section II.D of the Operational Guidelines for the Implementation of the World Heritage Convention). These criteria include cultural-historical, aesthetic and biodiversity-related values.

Watch out for activities in Listing Notice 3 that are triggered either because they would take place:

* Within 10 kilometers from national parks or World Heritage Sites, or
* Within 5 kilometers from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.

Maps depicting protected areas can be downloaded from the SANBI B-GIS website <http://bgis.sanbi.org>. It is advisable to contact the relevant provincial conservation agency or the Department of Environmental Affairs in Pretoria to obtain the most up-to-date information on the location of protected areas that may trigger the requirement to obtain environmental authorisation.

#### Ramsar Sites, wetlands of international importance, particularly for wildfowl

Numerous wetlands in South Africa have been declared Ramsar sites[[123]](#footnote-123). Although there is no legislation specifically covering Ramsar sites, these sites must be taken into consideration when undertaking activities or projects in close proximity to, on, or that could indirectly affect, their Ramsar status. Degradation of Ramsar sites may result in their being placed on the Montreux Record and, should the cause of degradation persist, removal of their international status.

#### Protected environments

Systematic biodiversity planning provides a scientifically rigorous method for identifying areas that should be prioritised for conservation action (see section **xyz**). For the plans to have the desired effect, however, they need to be implemented, which forms the core focus of ‘biodiversity mainstreaming’ (Cadman et al., 2010). Such ‘mainstreaming’ can be exceedingly challenging, not least of which is the critical question of how to secure such prioritised land so that it can be managed in support of biodiversity conservation objectives.

Because ‘mainstreaming’ largely takes place on private land, innovative methods are needed to reconcile private property rights with the prerogatives of biodiversity conservation. Legislation offers a number of useful options in this regard, including:

* Biodiversity management plans (NEMBA Chapter 3);
* Biodiversity Management Agreements (NEM BA Chapter 3);
* Estuary management plans (NEMICMA Chapter 4); and
* Protected Environments declared in terms of section 28 of the NEM PAA.

Any area – excluding[[124]](#footnote-124) a special nature reserve, national park or (proclaimed) nature reserve – can be declared (i.e. gazetted) as a protected environment in order to:

* Regulate the area as a buffer zone for the protection of a special nature reserve, national park, world heritage site or nature reserve;[[125]](#footnote-125)
* Enable owners of land to take collective action to conserve biodiversity on their land and to seek legal recognition therefor;[[126]](#footnote-126)
* Protect the area if the area is sensitive to development due to its
  + biological diversity;
  + natural characteristics;
  + scientific, cultural, historical, archeological or geological value;
  + scenic and landscape value; or
  + provision of environmental goods and services;[[127]](#footnote-127)
* Protect a specific ecosystem outside of a special nature reserve, national park, world heritage site or nature reserve;[[128]](#footnote-128)
* Ensure that the use of natural resources in the area is sustainable;[[129]](#footnote-129) or
* Control change in land use in the area if the area is earmarked for declaration as, or inclusion in, a national park or nature reserve.[[130]](#footnote-130)

The owner’s consent must be obtained before a notice can be issued that declares land to be part of a protected environment,[[131]](#footnote-131) and a public participation process must be followed prior to declaration.[[132]](#footnote-132)

Protected environments offer an important strategic opportunity for private land to be given formal, statutory recognition as a protected area without forfeiting the affected landowner’s title in land. See section xyz for legal prohibitions on mining in protected areas.

#### Biodiversity Stewardship programmes

The NEMPAA provides a useful vehicle for certain levels of stewardship programme, namely Nature Reserve and Protected Environments, of particular use in securing biodiversity offsets preferably managed by the developer as landowner and management authority (Part? of this guideline).

## THE NATIONAL ENVIRONMENTAL MANAGEMENT: INTEGRATED COASTAL MANAGEMENT ACT 24 OF 2008

The National Environmental Management: Integrated Coastal Management Act 24 of 2008 (‘the coastal management Act’) aims to secure co-ordinated and integrated management of the coastal zone, its protection and equitable enjoyment of its benefits.The coastal management Act develops many of the principles and concepts found in NEMA, and foresees a crucial role for local government in the conservation and sustainable use of the coastal zone.

The coastal management Act assigns specific responsibilities to municipalities with coastal jurisdictions. These responsibilities include:

* Demarcating coastal access land and set-back lines;
* Establishing coastal management programmes and committee; and
* Enforcing their coastal obligations through by-laws and spatial development frameworks.

Coastal management plans and land use schemes provide valuable opportunities for mainstreaming biodiversity conservation priorities into provincial and municipal development planning, providing contextual guidance to environmental assessments.

### The coastal zone, boundaries and set-back lines

The coastal management Act divides the coast, and the area inland of the coast, into several management zones that have different regulatory implications. These include:

* Coastal public property;[[133]](#footnote-133)
* Coastal protection zones;[[134]](#footnote-134)
* Coastal access land;[[135]](#footnote-135)
* Coastal protected areas;[[136]](#footnote-136)
* Special management areas;[[137]](#footnote-137) and
* Coastal setback lines.[[138]](#footnote-138)

Each of these zones or management areas is summarised below. The Act lays down procedures that must be followed when delineating the boundaries of these respective spatial component of the coastal zone. Factors that need to be taken into account when delineating and adjusting these boundaries include the dynamic nature of the coastline, the importance of maintaining environmental and ecological processes on the coast, and the need to avoid risks to people, the environment and property.

### Coastal public property

This consists of *inter alia*:

* Coastal waters
* Land submerged by coastal waters
* Any island within coastal waters that has not been lawfully alienated or excluded from coastal public property
* The sea-shore, except parts of the sea-shore below the high water mark (HWM) that had been alienated before or by the Sea Shore Act 21 of 1935
* The sea-shore of any privately owned island in coastal waters
* Any admiralty reserve owned by the state (the admirarty reserve is any strip of land directly inland of the HWM was state land reserved or designated on an official plan, deed of grant, etc as ‘admiralty reserve’, ‘government reserve’, ‘beach reserve’, ‘coastal forest reserve’ or other similar reserve)
* Any state land declared under section 8 of the Act to be coastal public property
* Any natural resources on or in coastal public property, the exclusive economic zone or any harbour, work or installation in coastal public property that is owned by the state.

Coastal public property can be extended, via a prescribed procedure, to inter alia:[[139]](#footnote-139)

* Improve public access to the shoreline;
* Protect coastal ecosystems;
* Secure the natural functioning of dynamic coastal processes;
* Faciliate achievement of any of the objectives of the Act; or
* Protect people and property from dynamic coastal processes, including sea level rise.

Coastal public property places an obligation on the state, as the public trustee of all coastal public property, to:[[140]](#footnote-140)

* Ensure that coastal public property is used, managed, protected, conserved and enhanced in the interest of the whole community; and
* Take whatever reasonable legal and other measures it considers necessary to conserve and protect coastal public property for present and future generations.

Any natural person in South Africa has a right to reasonable public access to coastal public property.[[141]](#footnote-141) The state can prohibit or restrict access to coastal public property if forms part of a protected area, to protect the environment, including biodiversity, if it is in the interest of the whole community.

#### The high water mark

The high water markmeans the highest line reached by coastal waters, but excludes any line reached as a result of:

* Exceptional or abnormal floods or storms that that occur no more than once in 10 years; oor
* An estuary being closed to the sea.[[142]](#footnote-142)

Section 14 defines how the position of the high water mark must be determined. This is a highly technical, consultative process that needs professional survey assistance.

#### Prohibition on preventing erosion or accretion ('growth') of the shoreline

No person or occupier of land may require any organ of state or any other person to take steps to prevent erosion or accretion of the seashore, or coastal public property, or land adjacent to coastal public property. The only exception is where the erosion is caused by an intentional act or omission by an organ of state or other person. It is illegal to construct, maintain or extend any structure, or to take other measures on coastal public property to prevent or promote erosion or accretion, except as provided for in the Act.[[143]](#footnote-143)

### The coastal protection zone

The coastal protection zone can comprise any of the following areas:

* Land proclaimed as Sensitive Coastal Areas in terms of the former Environment Conservation Act 73 of1989
* Any part of the littoral active zone that is not coastal public property
* Any coastal protection area that is not coastal public property
* Any land unit within 1 km of the high water mark and which, when the Act came into force:
  + Was zoned for agricultural or undetermined use; or
  + Was not zoned and was not part of a lawfully established township, urban area or other settlement.
* Any other land situated wholly or partly within 100 m of the high water mark
* Any coastal wetland, lake, lagoon or dam on agricultural or unzoned land, or within 100 m of the high water mark
* All privately owned land below the high water mark
* Any admiralty reserve
* Any land that would be inundated by a 1:50-year flood or storm event.[[144]](#footnote-144)

The purpose of the coastal protection zoneis to enable use of land in areas abutting coastal public property or which have a significant role in a coastal ecosystem by among others managing, regulating or restricting such uses to:

* Protect the ecological integrity, natural character and the economic, social and aesthetic value of coastal public property;
* Avoid increasing the effect or severity of natural hazards in the coastal zone;
* Protect people and property from risks arising from dynamic coastal processes, including the risk of rising sea levels;
* Maintaining the natural functioning of the littoral active zone; and
* Maintaining the productive capacity of the coastal zone by protecting the ecological integrity of the coastal environment.[[145]](#footnote-145)

Any decisions about designating coastal access land, or withdrawing such access, must be preceded by an environmental impact assessment and public participation.[[146]](#footnote-146) Coastal boundaries must be marked on municipal zoning maps.[[147]](#footnote-147)

#### Coastal setback lines

The provincial MEC responsible for enforcing the coastal management Act must make regulations to establish or change coastal set-back lines.[[148]](#footnote-148) A set-back line demarcates areas beyond which certain types of development may not occur, or are subject to some form of regulation or restriction.

The purpose of coastal set-back lines is twofold:

* To protect the various spatial, legally defined components of the coastal zone; and
* To prohibit or restrict specified developments such as building or extending structures that are wholly or in partially seaward of a particular coastal set-back line.

Local authorities with coastal set-back lines within their area of jurisdiction must delineate the set-back line on maps that form part of **z**oning schemes.[[149]](#footnote-149)

#### Estuaries

A *National Estuarine Management Protocol* was gazetted by the Minister of Environmental Affairs in terms of section 33 of the coastal management Act in May 2013.[[150]](#footnote-150) The protocol:

* Determines a strategic vision and objectives for managing estuaries;
* Sets standards for the management of estuaries;
* Defines how estuary management responsibilities are to be exercised by different organs of state; and
* Sets minimum requirements for estuary management plans.

An estuary management plan may form part of a municipal coastal management programme.[[151]](#footnote-151)

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### Institutional arrangements for coastal planning and management

The coastal management Act provides for a tiered institutional framework to give effect to its objectives. The framework accommodates all three spheres of government.[[152]](#footnote-152) Coastal management, in turn, is to be given effect through coastal management programmes and municipal coastal planning and land use schemes.

#### Coastal management programmes

*Provincial coastal management programmes*must be consistent with the national coastal management programme and the national estuarine management protocol. Provincial coastal management programmes must also:

* Define objectives for the coastal zone in province, and its parts; and
* Design priorities and strategies with respect to:
  + The achievement of coastal management objectives of the province;
  + To assist with the achievement of the national coastal management objectives as applicable to the province; and
  + To develop estuarine management plans for estuaries in the province.[[153]](#footnote-153)

*Municipal coastal management programmes* must be a coherent municipal policy directive for the management of the coastal zone within the jurisdiction of the municipality.[[154]](#footnote-154) They must be consistent with the national and provincial coastal management programmes and the national estuarine management protocol.

A municipal coastal management programme can be prepared and adapted as part of an integrated development plan and spatial development framework adopted in terms of the Municipal Systems Act 32 of 2000.[[155]](#footnote-155)

Municipal coastal management programmes must also include priorities and strategies that:

* Address the high percentage of vacant plots and low occupancy rates of residential dwellings;
* Equitably designate zones for the prupose of mixed cost housing that takes into account the needs of historically disadvantaged individuals;
* Address coastal erosion and accretion;
* Address access to the coast;
* Describe specific areas within the coastal zone that require special coastal management and management strategies for these areas; and, where appropriate,
* Estuarine management plans.[[156]](#footnote-156)

#### Environmental impact assessment and coastal protection

Environmental authorities that must decide on applications for environmental authorisation must *inter alia*, with respect to applications that apply to coastal activities, take into account:

* Whether coastal public property, the coastal protection zone or coastal access land will be affected and, if so, to what extent the proposed development would be consistent with purpose for establishing and protecting those areas; and
* Estuarine management plans, coastal management programmes and coastal management objectives applicable to the area.[[157]](#footnote-157)

Environmental authorisations may not be issued if the proposed development or activity:

* Is situated in coastal public property, a coastal protection zone or coastal access land and is not consistent with the objectives or purpose of each of these components of the prescribed system of integrated coastal management;
* Is likely to cause irreversible or long-lasting adverse effects to any aspect of the coastal environment that cannot satisfactorily be mitigated;
* Is likely to be significantly damaged or prejudiced by dynamic coastal processes;
* Would substantially prejudice the achievement of any coastal management objective; or
* Would be contrary to the interests of the whole community.[[158]](#footnote-158)

No person may occupy any site, or construct any structure in coastal public property without a coastal lease awarded by the Minster of Environmental Affairs.[[159]](#footnote-159)

#### Discharge of effluent into coastal waters

Effluent may not be discharged from the land into coastal waters or estuary without a general authorisation or a coastal waters discharge permit issued by the Minister of Environmental Affairs. [[160]](#footnote-160) The Minister of Water Affairs must be consulted in the event that effluent may be discharged into an estuary.

Section 69 of the coastal management Act gives clear instructions as to what must be done with regard to legalising unauthorised discharge of effluent in coastal waters. The following steps apply:

* An application must be made to the national Department of Environmental Affairs within 24 months of the date of commencement of the coastal management Act if the discharge is in terms of a licence or authorisation under the National Water Act; or
* Within 36 months of the date of commencement of the Coastal Management Act if the discharge is a continuation an existing lawful water use within the meaning of sections 32 or 33 of the National Water Act.

## THE NATIONAL WATER ACT 36 OF 1998

The availability of water, and its fitness for human use, are vital issues for sustaining human wellbeing and sustainable development in South Africa that are intrinsically bound up with the health of aquatic ecosystems – and, by direct implication, good land management practices within catchments (DEAT, 2006).

**The context of water use regulation in South Africa**

South Africa is a water-stressed country which is fast approaching the limits of exhaustible surface water yields and running out of options for building new dams. The state of South Africa's water resources poses exceedingly challenging choices for future development options:

There is no surplus water in South Africa. Available water resources are at their limit and climate change will worsen the situation... (Department of Water Affairs, 2013, p 68).

As noted by WWFsa’s ‘Water Balance Programme’,

Water supply issues cannot be solved by simply building more dams or creating more infrastructure, but rely heavily on rehabilitating, maintaining and conserving the natural areas which form the critical catchments and “water factories” for the country. Furthermore, climate change models also predict significant changes to both rainfall and temperature in southern Africa, which will affect water storage negatively.  
  
South Africa needs to think innovatively about ways of reducing water demand and making water available, outside of the traditional engineering solutions of infrastructure development, if it wishes to sustain economic growth and maintain healthy freshwater ecosystems…[[161]](#footnote-161)

Overall, freshwater ecosystems (i.e. comprising the country’s rivers and wetlands) are under massive pressure which is reflected in the alarming incidence of threat to these critically important elements of the natural estate:

* A total of 57% of rivers ecosystems are threatened (of which 25% are Critically Endangered); and
* Altogether 65% of wetlands are threatened (48% being Critically Endangered) (Driver et al., 2012, pp 4-8).

The major pressures on river ecosystems are over-abstraction, flow alteration, pollution and destruction of riparian habitat. More than half of South Africas’ rivers are not protected at all. The condition of wetlands nationally is no better. Wetlands provide critical regulatory services such as water purification, control of run-off and moderation of flood peaks. More than 70% of the country’s surviving wetlands have no protection at all. Key pressures on these ecoystems include cultivation, urban development, mining, dam contruction and poor managemente of catchments (e.g. over-grazing, flow disruption and excessive release of sediments) (Driver et al., 2012, pp 6 and 7).

Irrigation accounts for about 60% of South Africa’s water use, followed by muncipal/domestic consumption (27% in total; of which 24% constitutes urban use) and, in roughly equal proportions, power generation, mining and industrial use (4.3%, 3.3% and 3% respectively) (Department of Water Affairs, 2013). South Africa is one of the world's 30 driest countries and annual rainfall is about half of the world average of 860 mm per annum. Surface water accounts for 77% of water usage, groundwater 9% and another 14.4% is reclaimed from return flows. Climate change modelling predicts less and more variable rainfall in the west of the country, and more extreme events in the east.

In these circumstances, environmental assessment and strategic spatial planning are key adjuncts to sustainable water resource management as they are specifically aimed at indluencing and controlling the major drivers of resource degradation.

With NEMA, the National Water Act 36 of 1998 (‘the NWA’) represents the flagship law with respect to the conservation of aquatic ecosystems in support of sustainable social and economic development. As previously indicated, the NWA is premised on a strong functional understanding of the hydrological cycle and the intrinsic inter-dependencies of environmental, ecological and resource quality. The maintenance and sustainable use of biodiversity pattern and process, together with the prerogative of meeting basic human needs with regard to water use, are the twin cornerstone of the NWA: the ecological and social Reserves.[[162]](#footnote-162)

**Purpose of the NWA**

The National Water Act (NWA) Act 36 of 1998 has the purpose to ensure that South Africa’s water resources are protected, used, developed, conserved, managed and controlled in ways which *inter alia*:

* Promote equitable access to water;
* Redress past racial discrimination;
* Facilitate social and economic development;
* Protect aquatic and associated ecosystems and their biological diversity;
* Reduce and prevent pollution and degradation of water resources; and
* Manage floods and droughts.[[163]](#footnote-163)

'Water resources' include wetlands, surface water, estuaries or aquifers.[[164]](#footnote-164)

**Protection of water resources**

Chapter 3 of National Water Act lays down a series of measures which, together, are intended to ensure the comprehensive protection of all water resources. These measures are to be developed progressively within the context of the national water resource strategy[[165]](#footnote-165) and catchment management strategies provided for in Chapter 2 of the National Water Act.

The protection of water resources hinges on four inter-related components:

* A classification system for water resources;
* Classification of water resources and resource quality objectives;
* The Reserve;
* Pollution prevention; and
* Emergency incidents.

**Classification system for water resources**

Classification of water resources aims to ensure that a balance is reached between the need to protect and sustain water resources on one hand and the need to develop and use them on the other. The South African Water Resource Classification Procedure[[166]](#footnote-166) comprises seven steps:

* Delineation of catchments and description of the status quo;
* Linking economic and social value to the condition of ecosystems and water use – this determines how the different levels of water use, ecosystem condition and ecosystem goods and services affect economic value and social wellbeing;
* Quantification of the ecological water requirements of each node of analysis, at various levels of ecological integrity;
* Setting a baseline configuration for ecological sustainability, which gives the lowest feasible level of protection required for the sustainable use of the entire catchment. The base condition for each water resource is at minimum established as either a 'D' ('largely modified') category or whichever higher category is required to maintain all downstream nodes in at least a D category. However where the ecological condition requires it, a higher ecological category needs to be set;
* Evaluating various scenarios of possible configurations of ecosystem condition for the entire catchment, as well as the economic, social and ecological implications of maintaining different categories of ecosystem condition;
* Holding stakeholder workshops at which scenarios are evaluated, and a shortlist of configurations is agreed to; and
* Selecting the preferred sustainable configuration of ecosystem protection levels in relation to economic and social objectives. This step precedes gazetting of a legally-binding class configuration for the entire catchment.

**Classification of water resources and resource quality objectives**

The Minister of Water Affairs must use the water resource classification system to determine the class and resource quality objectives (RQOs) of all or part of water resources considered to be significant.[[167]](#footnote-167) RQOs establish clear goals relating to the quality of the relevant water resources. A balance must be sought between the need to protect and sustain water resources, and the need to develop and use them. Once the class of a water resource the RQOs have been determined, they are binding on all authorities and institutions when exercising any power or performing any duty under the National Water Act.

*Regulations for the establishment of a water resource classification system* were published in the *Government Gazette* as GN R. 810 on 17 September 2010.

In summary, the regulations identify the following classes of water resources:[[168]](#footnote-168)

|  |  |
| --- | --- |
| **Class I** | * Water resource is **minimally used**; and. * The overall condition of that water resource is **minimally altered** from its pre-development condition. |
| **Class II** | * Water resource is **moderately used**; and * The overall condition of that water resource is **moderately altered** from its pre-development condition. |
| **Class III** | * Water resource is **heavily used**; * The overall condition of that water resource is **significantly altered** from its pre-development condition. |

The regulations also prescribed procedures for determining the Reserve and resource quality objectives.

**The ecological Reserve**

The requirement to make provision for the ‘ecological reserve’ is a core requirement of the NWA, namely to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource.[[169]](#footnote-169) The Reserve refers to both the quantity and quality of the water in the resource, and varies depending on the class of the resource. The Minister is required to determine the Reserve for all or part of any significant water resource.

If a resource has not yet been classified, a preliminary determination of the Reserve may be made before use of water may be authorised, and later superseded by a new one. Once the Reserve is determined for a water resource it is binding in the same way as the class and the resource quality objectives. The potential impact of development on the ecological reserve – both in terms of quality and quantity of water affected – must be addressed in environmental assessment.

**‘Wetlands’ and ‘Watercourses’**

The regulation of activities that may adversely after the resource quality of wetlands and watercourses is key object of the NWA, and it is therefore important to understand how these closely inter-related concepts are dealt with by the NWA itself, SANBI’s national wetland classification systems and best practice guidelines. The NWA defines ‘watercourses’ and ‘wetlands’ (i.e. ‘aquatic ecosystems’ for the purposes of these minimum requirements) as follows:

|  |  |
| --- | --- |
| **Definition of ‘watercourse’**[[170]](#footnote-170) | **Definition of ‘wetland’**[[171]](#footnote-171) |
| “Watercourse” means –   (a) a river or spring;   (b) a natural channel in which water flows regularly or intermittently;   (c) a wetland, lake or dam into which, or from which, water flows; and   (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a water-course includes, where relevant, its bed and banks... | “Wetland” means –  land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil... |

For the purposes of environmental assessment and spatial planning, the definitions of ‘watercourses’ and ‘wetlands’ should be read in tandem with the following guidelines:

* *Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems* (Ollis et al., 2013);
* *Implementation Manual for Freshwater Ecosystem Priority Areas* (Driver et al., 2011); and
* *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas* (DWAF, 2008);
* Ecosystem guidelines for wetlands and rivers, in the *Grasslands Ecosystem Guidelines* (Cadman et al, 2013, pp 83-102).

The NWA also regulates the use of groundwater. For further guidance on understanding the different types and functioning of aquifers, and how these may be impacted, see:

* *Guideline for involving hydrogeologists in EIA processes: Edition 1* (Saayman, 2005)*.*

As a rule-of-thumb, impacts on aquatic ecosystems can be conceptualised as changes that may adversely affect:

* Hydrological aspects (water quantity, water quality and environmental requirements);
* Erosion and sedimentation; and
* Habitat and ecological connectivity (cf. Job et al., 2008; Driver et al., 2011).

**The Regulation of ‘Water Use’: Water Use Licenses and General Authorisations**

Chapter 4 of the National Water Act lays the basis for regulating water use. The definition of 'water use' is broad, and includes:

* Taking and storing water;
* Activities which may reduce stream flow (such as forestry);
* Waste discharge and disposal;
* Controlled activities which may have a detrimental impact on a water resource (for example, irrigation with treated effluent or hydro-electric infrastructure);
* Impeding flows and/or altering the characteristics of watercourse;
* Removing water found underground for certain purposes; and
* Recreation.[[172]](#footnote-172)

Water uses that are potentially subject to compulsory licensing include:

* The construction of impoundments for taking and storing water (note that the NWA, unlike the NEMA EIA regulations, does not specify quantitative thresholds in the definition of controlled activities) such as berms, weirs or in-stream dams;[[173]](#footnote-173)
* Excavations or other activities that may influence flows or result in changes to the morphological characterises of a watercourse, which could include mechanical removal of flood debris, laying of drifts across channels, or bulldozing river banks to accelerate flood run-off;[[174]](#footnote-174) or
* Disposing waste that may have a detrimental impact on a water resource.[[175]](#footnote-175)

**Compulsory licensing and permissible use of water**

In general, a water use must be licensed unless such use of water is defined as a 'permissible water use' in terms of section 22 of the National Water Act.[[176]](#footnote-176)

A person may only use water without a licence if that water use is permissible—

|  |  |
| --- | --- |
| * Under **Schedule 1** of the National Water Act;[[177]](#footnote-177) | **Schedule 1 uses** cover "reasonable domestic use", storing and using run-off from a roof, using water in emergency situations for human consumption or fire-fighting, recreational purposes and discharge of waste water or storm water subject to the approval of the person controlling the relevant conduit storm water outlet etc. |
| * As a continuation of an **existing lawful use**;[[178]](#footnote-178) or | **'Existing lawful use'** of water permits the continuation, under certain conditions, of an existing water use derived from a law repealed by the NWA. An existing water use may continue only to the extent that is not limited, prohibited or terminated by the NWA. No licence is required unless a responsible authority[[179]](#footnote-179) requires that a licence be applied for.[[180]](#footnote-180) |
| * In terms of a **general authorisation** issued under section 39 of the NWA.[[181]](#footnote-181) | A responsible authority, may after public consultation, permit the use of water by publishing **general authorisations** in the *Government Gazette*. The use of water under a general authorisation does not require a licence, until the general authorisation has been revoked (See below). [[182]](#footnote-182) The water use may, however, have to be registered.[[183]](#footnote-183) It may also be necessary to submit a water management plan for approval.[[184]](#footnote-184) |

A water use licence would also not be required if:

* The water use is already licensed in terms of sections 21, and 40 to 42 of the NWA;[[185]](#footnote-185) or
* The responsible authority has dispensed with a licence requirement under subsection 22(3) of the NWA (see below).[[186]](#footnote-186)

**Other permissions that may serve as water use licences**

The Department of Water Affairs need not necessarily be the only licensing authority for the purposes of section 21 of the National Water Act. Section 22(3) of the NWA provides that a responsible authority may dispense with the requirement for a water use licence if it is satisfied that the purpose of the National Water Act will be met by the granting of a licence, permit or authorisation under any other law. Arrangements may also be "promoted" with other organs of state to combine their respective licence requirements into a single licence requirement.[[187]](#footnote-187)

**Applicability of EIA regulations to applications for water use licences**

Section 41of the National Water Act prescribes procedures for applications for water use licences. Subsection 41(2)(a)(ii) states that a responsible authority may require that the effect of the proposed licence on water quality be investigated. The responsible authority may direct that such an impact assessment complies with the EIA regulations published in terms of the former Environment Conservation Act 73 of 1989.[[188]](#footnote-188)

Read with sections 24K[[189]](#footnote-189) and 24L[[190]](#footnote-190) of NEMA, section 41 of the NWA potentially could strengthen attempts to co-ordinate the reporting requirements of NEMA and the NWA, thereby facilitating the transition to a system of integrated authorisations or approvals. This is strongly suggested by the incorporation of the NWA in the definition of ‘specific environmental management Acts’.[[191]](#footnote-191)

For further guidance on the prescribed procedures relating to the water licensing provisions of the NWA, see:

* *Guide to the National Water Act* (DWAF, Undated);[[192]](#footnote-192) and
* *External Guideline: Water use authorisation application process* (DWAF, 2007).[[193]](#footnote-193)

It is strongly advised to consult with the Department of Water Affairs on the potential applicability of the NWA to a proposed project or change in land use as the NWA is a complex and multi-faceted law that is administered via a number of directorates and units within the Department of Water Affairs, each of which holds responsibility for implementing specific aspects of the Act.

The following sections deal exclusively with the two general authorisations that potentially waive the requirement to obtain a water use licence with respect to activities that may affect flows or result in physical changes to watercourses, namely the water uses defined by sections 21(c) and (i) of the National Water Act.

### Sections 21(c) and (i): ‘Impeding, diverting and altering’

As a rule-of-thumb, it must be assumed that any proposed excavations – including ‘maintenance’ carried out in terms of a ‘maintenance management plan’ in terms of Activity 18 of Listing Notice 1 of the NEMA EIA regulations – or development affecting flows in a watercourse would constitute a water use under the National Water Act. As such, these water uses would have to be licensed – unless, that is, the activities in question constitute a permissible water use as defined by section 22 of the NWA.

Section 21(c) and (i) both constitute water uses in terms of the NWA, where:

* Section 21(c) includes impeding or diverting the flow of water in a watercourse; and
* Section 21(i) includes altering the bed, banks, course or characteristics of a watercourse.

However, both of these water uses would constitute permissible uses insofar as the specified activities (impeding, altering, diverting etc) are demonstrably compliant with the conditions[[194]](#footnote-194) specified in either of the two general authorisations that apply to sections 21(c) and (i) of the National Water Act.

A person undertaking either of these activities may be required to prepare a water management plan for approval by the Department of Water Affairs or a catchment management agency.

The first general authorisation, published as GN 1198 of 18 December 2009, exclusively applies to organs of state intending to rehabilitate wetlands for conservation purposes. The relief offered by this GA does not apply to private individuals or entities.

The second GA (GN 1199 of 18 December 2009) is potentially applicable to private individuals or organisations. The latter GA replaces the GA dated 26 March 2004 (GN 398). Note that GN 1199 does not apply to the:

* Vaal River downstream of the Kimberley waterworks to the confluence with the Orange River;
* Riet River downstream of the Kalkfontein Dam to the conluence with the Vaal River;
* Whole of the Kraai River;
* Lower Orange River downstream of the Augrabies Falls in respect of mines, and mining operations and activities;
* Crocodile (West) and Marico Water Management Area (WMA); and
* Harts River upstream of the Taung Dam in the Middle Vaal WMA.[[195]](#footnote-195)

**Government Notice 1198 (18 December 2009): General Authorisation for the purpose of rehabilitating a wetland for conservation purposes**

In summary, this GA **only applies to organs of state for the purpose of rehabilitation a ‘wetland’ for conservation purposes**.[[196]](#footnote-196) It does not apply to any activity that may have a potential to impact a wetland in terms of NEMA (presumably meaning that it does not exempt an agency from having to obtain an environmental authorisation prior to undertaking wetland rehabilitation).[[197]](#footnote-197)

**Definitions**

The GA specifies that the reference to ‘wetland’ regards the latter as being the same as a ‘watercourse’ as defined by the NWA.

‘Rehabilitation’ entails the process of reinstating natural ecological driving forces within part or the whole of a degraded watercourse to recover former or desired ecosystem structure, function, biotic composition and associated ecosystem services. It follows that the formulation of ‘rehabilitation’ objectives would, at the least, have to be premised on ‘reinstating natural ecological driving forces’ (what would need to be defined more closely) but that the outcome of such ‘rehabilitation’ would not necessarily be coupled to trying to achieve a pre-disturbance, reference state for the affected wetland.

The Department of Water Affairs expects that rehabilitation must aim to achieve an ecosystem status of at least ‘D’, [[198]](#footnote-198) or ‘largely modified’ condition (see **Table 4**).

**Table 4**

| **Ecological Category** | **PES % Range** | **Description of the Ecological Category** |
| --- | --- | --- |
| A | 90-100% | **Unmodified, natura**l. |
| B | 80-90% | **Largely natural** with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged. |
| C | 60-80% | **Moderately modified**. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. |
| D | 40-60% | **Largely modified**. A large loss of natural habitat, biota and basic ecosystem functions has occurred. |
| E | 20-40% | **Seriously modified**. The loss of natural habitat, biota and basic ecosystem functions is extensive. |
| F | 0-20% | **Critically / Extremely modified**. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. |

The definitions of ‘altering’, ‘diverting’ and ‘impeding’ are important for framing the assessment of potential biodiversity implications (in terms of substantive impacts, and the functional scale at which they may occur) of undertaking wetland rehabilitation and are therefore included in full.

‘Altering the bed, banks, course or characteristics of a watercourse’ means any change affecting the resource quality or flow components within the riparian habitat or 1:100 year floodline, whichever is the greater distance from the watercourse….

‘Diverting the flow’ means a temporary or permanent structure causing the flow of water to be rerouted in a watercourse for any purpose….

‘Impeding the flow’ means the temporary or permanent obstruction or hindrance to the flow of water in a watercourse by a structure built either fully or partially in or across a watercourse….[[199]](#footnote-199)

**Conditions**

The GA specifies a range of conditions that need to be satisfied in order for an applicant to come into contention for the relief provided by the GA. As these would have a relatively narrow application to government agencies undertaking wetland rehabilitation for conservation purposes, the full range of conditions is not reflected here. However, the conditions pertaining to rehabilitation plans in the context of water resource management potentially have wide application.

**Rehabilitation plans**

The prescribed contents of a rehabilitation plan are of direct relevance to the formulation of management objectives and interventions for many types of development watercourses and are therefore included as a key biodiversity reference.[[200]](#footnote-200) These requirements therefore should be read with the prescribed, minimum requirements for environmental management programmes in the NEMA and the abovementioned guidelines (**see xyz**).

In terms of the GA for wetland rehabilitation, a rehabilitation plan must be drafted which reflects the following information:

* Rehabilitation objectives
* Rehabilitation problems
* Rehabilitation strategy
* Wetland assessment report
* Draft rehabilitation design drawings
* Final rehabilitation plans
* Rehabilitation intervention
* Maintenance details
* Monitoring and evaluation data
* Construction notes
* Environmental authorisation (if applicable, under NEMA)
* Authorisation, if applicable under any other legislation.

**Registration of water use**

All water uses carried out in terms of the GA must be registered with the Department of Water Affairs (or a catchment management agency, where applicable).[[201]](#footnote-201)

**Government Notice 1199 of 18 December 2009: Impeding or diverting the flow of water in a watercourse [section 21(c)], and Altering the bed, banks, course or characteristics of a watercourse [section 21(i)]**

This GA applies to all persons who intend using water in terms of sections 21(c) and (i) of the NWA who have lawful access to the land on which the proposed water use is to take place.

**Definitions**

The definitions ('altering', 'diverting' and 'impeding') contained in this GA are identical to those in the GA dealing with wetland rehabilitation, except that the GN 1199 makes no reference to 'rehabilitation'. See below.

**Exclusions**

GN 1199 does not apply to 'water uses' defined by sections 21(c) and (i) in the case of:

* Wetland rehabilitation (which, in terms of GN 1198, can only be undertaken by organs of state); and
* Use of water within a 500 m radius from the boundary of any wetland.

The implications are that private individuals or organisation wishing to rehabilitate wetlands for conservation purposes can only do so under the authority of a water use licence, and that any excavations or similar disturbances within or affecting a watercourse that would take place within 500 m of a wetland are also subject to mandatory water use licensing.

A practical implication is that activities that may result in any of the disturbances defined by sections 21(c) and (i) would automatically be subject to mandatory water use licensing if within 500 m of a wetland, even if the wetland were not to be affected by the proposed activities and/or its condition were to remain unchanged. This raises considerable challenges for environmental assessment and planning where projects would be within 500 m of a delineated wetland, but with no evident impact on the condition or functioning of such a wetland. There are also numerous farm dams, for example, that have been identified as 'FEPA wetlands' whereas the structures have negligible biodiversity value. This adds another layer of complexity to establishing the applicability of GN 1199 to developments that may trigger the s 21(c) and (i) licensing requirements of the National Water Act.

**Conditions**

GN 1199 specifies conditions that must be met in order to qualify for the relief that is provided by this particular general authorisation.[[202]](#footnote-202) These conditions are largely defined by biodiversity considerations, which are presented in summary below:

* Water use must not cause detrimental impact on characteristics of watercourse;
* Water use must not have a detrimental impact on....
  + use of water or land by others
  + public health or safety
* Structures and hardened surfaces must not...
  + be erosive
  + be structurally unstable
  + induce any flooding
  + be a health and safety hazard
* Water use must not result in detrimental....
  + change in stability of a watercourse
  + change in physical structure of a watercourse
  + scouring, erosion or sedimentation
  + decline in diversity of communities, composition of natural indigenous vegetation
* Water use must not result in detrimental change in quantity, velocity, pattern, timing, water level and assurance of flow in a watercourse
* Water use must not result in detrimental change in water quality characteristics of watercourse
* Water use must not result in detrimental change to...
  + breeding, feeding and migratory patterns of aquatic biota, including migratory species
  + level of composition of biotopes and communities of animals and micro-organisms
  + condition of aquatic biota
* Upon completion of water use...
  + watercourse must be restored to condition prior to commencement of the water use
  + all disturbed areas must be re-vegetated with indigenous vegetation suitable for the area
  + an active campaign of alien clearance and control must be implemented upon completion of the water use
  + water user must undertake a habitat assessment study annually for three years to ensure that rehabilitation is stable; if not, remedial action must be taken to rectify any impacts.

Overall, the conditions that must be met in order for a water use to qualify for 'exemption' in terms of GN 1199 provide an exceedingly useful framework for guiding any environmental and specialist assessments where wetlands may be present. This equally applies to the drafting of maintenance management plans in terms of Activity 18 of LN1.

#### Application procedures relating to GN 1199

The system of General Authorisations provides a potentially highly efficient alternative, where justified, to the comprehensive process of apply for water use licences. Even though a licence may not be necessary because the water use meets the GA's specified conditions, the proposed works (i.e. 'water use') still need to be registered and rigorous management and ecological monitoring provisions would still be expected of any applicant.

As already indicated, it highly advisable to consult the Department of Water Affairs about the regulatory implications, and reporting requirements, before embarking on an environmental assessment or planning process that may involve wetlands and watercourses.

The *External Guideline: Section 21(c) and (i) water use authorisation process* produced by the Department of Water Affairs sets out the procedural, administrative and information requirements relating to the applicable licensing provisions (and GAs).[[203]](#footnote-203)

## THE NATIONAL FORESTS ACT 84 OF 1998

The primary purpose of the National Forests Act 84 of 1998 (NFA) is to "promote the sustainable management and development of forests for the benefit of al..."[[204]](#footnote-204) As such, it is firmly embedded in a functionalist, 'sustainable utilisation' paradigm which emphasises an ecosystem-based approach to the management of forests as sources of environmental goods and services.[[205]](#footnote-205)

The NFA defines 'forest' as including:

* A natural forest, a woodland and a plantation;
* The forest produce in it; and
* The ecosystems which it makes up.[[206]](#footnote-206)

To date, 26 national forest types have been identified.[[207]](#footnote-207)

The use, management and conservation of forests are covered by three Chapters, viz.

* Chapter 2 Sustainable Forest Management;
* Chapter 3 Special Measures to Protect Forests and Trees; and
* Chapter 4 Use of Forests.

This section of the minimum requirements focuses on Chapters 2 and 3 of the NFA as they have the closest bearing on development or changes in land use that may have a negative impact on indigenous forests.

### Sustainable Forest Management (Chapter 3): Relevance to EA and spatial planning

A set of fundamental principles serve to guide decisions affecting forests so as to ensure that they are sustainably managed.[[208]](#footnote-208) These principles apply to the implementation of the NFA as well as any action, undertaken in terms of other legislation, that may impact on a natural forest or woodland.[[209]](#footnote-209) In effect, these principles must be applied in parallel to the National Environmental Management Principles by officials when taking decisions that may impact on a natural forest or woodland.

The sustainable forest management principles set out in Chapter 2 of the NFA must also be considered and applied by anyone undertaking an environmental impact assessment in respect of any activity that may have an effect on natural forests or woodlands.[[210]](#footnote-210)

The principles are that:

* Natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits;
* A minimum area of each woodland type should be conserved: and
* Forests must be developed and managed so as to—
  + conserve biological diversity, ecosystems and habitats;
  + sustain the potential yield of their economic, social and environmental benefits:
  + promote the fair distribution of their economic, social, health and environmental benefits;
  + promote their health and vitality;
  + conserve natural resources, especially soil and water;
  + conserve heritage resources and promote aesthetic, cultural and spiritual values; and
  + advance persons or categories of persons disadvantaged by unfair discrimination. [[211]](#footnote-211)

The Minister may publish binding criteria, indicators and standards with regard to the promotion of sustainable forest management. [[212]](#footnote-212) These criteria and indicators may include those for determining:

* The level of maintenance and development of—
  + forest resources:
  + biological diversity in forests:
  + the health and vitality of forests:
  + the productive functions of forests:
  + the protective and environmental functions of forests; and
  + the social functions of forests:
* The level of provision of socio-economic benefits; and
* The status and appropriateness of the policy and the legislative and institutional framework for forest management.[[213]](#footnote-213)

A forest owner who is in breach of a prescribed standard may have committed an offence.

### Special measures to protect forests and trees (Chapter 3)

There are a number of situations where proposed development or a change in land use may require a licence in order to fell or otherwise damage indigenous living trees.

For example, it is prohibited to cut, disturb, damage or destroy any indigenous, living trees in, or remove or receive any such tree, from a natural forest, unless:

* A licence to do so has been issued under subsection 7(4) or section 23 ('Activities which may be licensed in State forests') of the NFA; or
* An exemption has been published in the *Government Gazette* on the advice of the National Forests Advisory Council.[[214]](#footnote-214)

The Minister may, on scientific advice, declare a natural forest or group of indigenous trees whose crowns are not largely contiguous, or where there is doubt about this, to be protected in terms of Part 1 of Chapter 3 of the NFA.[[215]](#footnote-215)

Certain forests may be declared as protected areas and managed to this end. Such protected forest areas include State forests[[216]](#footnote-216) (which still form the basis of many statutory protected areas managed by provincial conservation authorities) and land that, with the consent of the land owner, has been declared as a:

* Forest nature reserve;
* A forest wilderness area; or
* Any other type of protected area which is recognised in international law or practice.[[217]](#footnote-217)

All these categories of protected forest areas constitute protected areas in terms of section 9 of the NEM Protected Areas Act 57 of 2003. Prospecting and mining are prohibited in forests protected in terms of Section 8 of the NFA.[[218]](#footnote-218) Proximity of proposed activities to such a protected forest area may also trigger the requirement to obtain environmental authorisation.

The Minister of Water and Environmental Affairs is responsible for managing forest protected areas.[[219]](#footnote-219)

It is an offence to cut, disturb, damage, destroy or removed any protected tree declared in terms of section 12 of the NFA. Neither may one collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of a protected tree.[[220]](#footnote-220)

The Minister may declare a particular tree, a particular group of trees, particular woodland or trees belonging to a particular species to be a protected, group of trees, woodland or species[[221]](#footnote-221)

A well-known example of woodland protected in terms of these provisions of the NFA is the Kathu camelthorn forest north of Kathu in the Gamagara Local Municipality in the Northern Cape. The DAFF has announced that it wants to re-declare the Kathu Protected Woodland in terms of section 21(i)(c) of the NFA in order to establish a wide buffer to protect the 4 000 ha forest against "constant encroachment of various developments...".[[222]](#footnote-222)

The Minister must publish a list of species protected in terms of section 12 ('Declaration of trees as protected') of the NFA, as well an appropriate warning of this prohibition annually in the *Government Gazette* and in two newspapers with national circulation.[[223]](#footnote-223)

See the *Notice of the List of Protected Tree Species under the National Forests Act, 1998 (Act no 84 of 1998)* published by the Minister of Agriculture, Forestry and Fisheries in December 2012.[[224]](#footnote-224)

### Regulations in terms of the National Forests Act 84 of 1998

Regulations published by the former Department of Water Affairs and Forestry in 2009 give effect to a number of provisions of the NFA.[[225]](#footnote-225)

The regulations *inter alia* stipulate licensing procedures relating to aspects such as:

* Establishment and management of plantations;
* Felling of trees, removal of timber and cutting and removal of other forest produce;
* Use of land, structures or buildings for agricultural, domestic, residential, industrial, communication, transportation or commercial purposes;
* Use of roads in State forest;
* Use of and for cultivation purposes, etc.

The regulations can be obtained at <http://www.dwaf.gov.za/Documents/Forestry/NFA1998Regulations29April2009.pdf>

## MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT 28 OF 2002

See the *Mining and Biodiversity Guideline* (produced by DEA and mining industry and conservation partners) for a comprehensive and authoritative introduction to biodiversity best practice in the context of exploration, prospecting, mining, closure and rehabilitation. The guideline can be downloaded at: <<http://bgis.sanbi.org/mining/project.asp>>

The objectives of the Mineral and Petroleum Resources Development Act 28 of 2002 ('the MPRDA') include "ensuring that the nation’s mineral and petroleum resources are developed in an orderly and ecologically sustainable manner..."[[226]](#footnote-226)

### Environmental regulation of mining

No person may prospect, mine, explore or produce without:

* An approved Environmental Management Programme or Environmental Management Plan (EMP);
* A permission, permit or right, as the case may be, granted in terms of the MPRDA; and
* Notifying and consulting with the land owner or lawful occupier of the land in question.[[227]](#footnote-227)

The environmental aspects of mining-related activities are addressed through the following mechanisms and procedures in the MPRDA (**Table 5**):

**Table 5:** Environmental reporting requirements of the MPRDA

|  |  |  |
| --- | --- | --- |
| **Permission or right applied for in terms of Ch 4 of the MPRDA** | **Requirements i.t.o. section 39 of the MPRDA** | **MPRDA Regulations**  **(GN R. 527 of 23 April 2004)** |
| Mining right | * An environmental assessment (effectively a full EIA) must be conducted in terms of s 39(3) of the Act | Reg 48 (EIA required): scoping (Reg 49) and EIA reports (Reg 50) |
| * An Environmental Management Programme (EMPr) must be submitted | Reg 51: Contents of EMPr |
| Reconnaissance permission, prospecting right or mining permit | * An environmental assessment must be conducted in terms of s 39(3) of the Act |  |
| * An Environmental Management Plan (EMP) must be submitted | Reg 52: Contents of EMP |

Mining-related activities may also require approval in terms of other laws, such as section 24 of NEMA, the National Water Act 36 of 1998 or provincial or municipal planning ordinances. The Minister of Minerals and Energy may, with regard to "the need to promote sustainable development", prohibit or restrict prospecting or mining in a specific area.[[228]](#footnote-228)

Note that a legislative process has commenced which will result in the Minster of Minerals and Energy taking on the powers and functions as the competent authority for environmental matters insofar they relate to prospecting, exploration, mining or production of mineral and petroleum

resources. The Minister for Water and Environment will define the environmental regulatory framework, and norms and standards, whereas the Minister responsible for Mineral Resources will have responsibility for implementing the provisions of environmental legislation that relate to mining. The Minister of Water and Environment will be the appeal authority with respect to environmental authorisations for mining-related activities. All environmental provisions are to be repealed from the MPRDA. [[229]](#footnote-229) Proposed amendments to the NWA, in turn, provide for an integrated water use licensing system between the departments of mineral resources, environmental affairs and water affairs.[[230]](#footnote-230)

### Biodiversity assessment and the MPRDA

Every stage of a proposed mining activity or operations should be informed by the good practice guide to assessing impacts on biodiversity and ecosystem goods and services (Part F) of this guideline.

The mitigation hierarchy (**see xyz**) must be strictly applied, and needs to be closely guided by the mining-biodiversity compatibility scale recommended by the *Mining and Biodiversity Guidelines* (DEA et al., 2013, pp 29-41). Biodiversity constraints on mining-related activities, and the potential impacts of these activities on biodiversity, need to be screened and assessed in relation to the full spectrum of aspects of a proposed prospecting programme or mining operation that may interact with biodiversity. This includes transport networks, waste and effluent disposal, housing infrastructure and minerals' extraction and beneficiation facilities.

The *Mining and Biodiversity Guideline* (DEA et al., 2013, p 29) reflects the relative compatibility of biodiversity with mining as follows (**Table 6**):

**Table 6:** Potential compatibility of mining and categories of biodiversity

|  |  |  |
| --- | --- | --- |
| **Category of risk** | **Biodiversity priority areas** | **Implications for mining** |
| 1. Mining prohibited | * Protected Areas (including national parks, nature reserves, world heritage sites, protected environments, nature reserves) * An area proclaimed in terms of s 49 of the MPRDA 28 of 2002 | * No mining allowed. * Mining may be permitted in Protected Environments if ministers of environmental and mining and energy affairs agree to this. * Lawful mining may be allowed in protected areas, subject to environmental conditions. |
| 1. Areas with the highest risk for mining | * CR and EN ecosystems * CBAs or equivalent areas in provincial spatial plans * River and wetland FEPAs, plus a 1km buffer * Ramsar sites | * Screening etc must confirm presence of priority biodiversity, and its significance. Site-specific considerations must inform mitigation hierarchy. Presence of priority biodiversity potentially a fatal flaw. EIA must include strategic assessment of optimum, sustainable land uses, etc. Off-sets may be condition of authorisation. |
| 1. Areas with a high risk for mining | * Buffers around protected areas. * Trans-frontier conservation areas. * Areas identified as priorities by provincial biodiversity plans. * High water-yield areas. * Coastal Protection Zone. * Estuarine functional zone (open water, mud flats, floodplain, etc: ≤5 m above mean see level) | * EIA must include strategic assessment of optimum, sustainable land uses, etc. * Off-sets may be condition of authorisation. |
| 1. Areas with a moderate risk for mining | * Ecological Support Areas * VU ecosystems * Focus areas for protected area expansion (land-based and off-shore) | * Screening etc must confirm presence of priority biodiversity, and its significance, and identify biodiversity features not on existing data sets. * Site-specific considerations must inform mitigation hierarchy. * Authorisations may set limits on mining etc and prescribe biodiversity off-sets. |

### Applicability of national environmental management principles and objectives of IEM

Section 37(1) of the MPRDA provides that the environmental management principles listed in Section 2 of NEMA must guide the interpretation, administration and implementation of the environmental requirements of the MPRDA, and makes those principles applicable to all prospecting/ exploration and mining operations.

Section 38(1) (a), in turn, prescribes that all holders of mining-related permissions must "at all times" give effect to the general objectives of integrated environmental management.

Section 38(1) (b) obliges all holders of such permissions to "consider, investigate, assess and communicate" the impacts of the specific mining-related activity on the environment. Section 38 of the MPRDA also imposes a responsibility to

"rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development..."

### Cradle-to-grave approach

The MPRDA provides a cradle-to-grave approach to responsibility for impacts from mining by planning with mine closure in mind and comprehensively considering the social, environmental and economic costs and benefits of mining to achieve sustainable development of South Africa’s mineral and natural resources.

### Environmental objectives and rehabilitation goals

Environmental objectives and specific goals for rehabilitation and mine closure and the implementation plan to achieve these goals (closure plan) are a requirement in the EMP.

In applying for a prospecting right, mining right or permit, financial provision for rehabilitation, management and closure of environmental impacts is a requirement; mining companies are legally required to plan the likely mine closure requirements and costs upfront in the project feasibility stage.

Regulation 54 of the MPRDA directs that the financial quantum must include a detailed itemisation of actual costs required for premature closing, decommissioning and final closure, as well as post-closure management of residual and latent environmental impacts (‘residual’ here means environmental impact remaining after a closure certificate has been specified).

Depending on the range of measures required by the mine to mitigate its negative impacts on biodiversity to acceptable levels, biodiversity offsets may need to be included in the financial provision for managing the negative impacts; not only during operation but also as part of the closure and post-closure stages. During closure planning, the costs of biodiversity rehabilitation must be re- assessed and included in the financial provision calculations.

An accurate determination of the likely costs of anticipated mitigation (including for biodiversity offsets, both the costs of securing and managing biodiversity offset sites), for the time required to achieve near-restoration, and including provision for escalation of projected costs is crucial.

## CONSERVATION OF AGRICULTURE RESOURCES ACT 43 OF 1983

Agriculture represents the single largest land-use in South Africa (DAFF, 2012). It is also inherently dependent on the modification and use of ecological infrastructure for the purposes of crop production, grazing and irrigation (Cadman et al., 2010). As such, agriculture (both pre- and, much more rapidly, post-industrially) has had a major historical influence on the shaping of the natural environment in South Africa.

The most notable form of agricultural land transformation is vegetation clearance and expansion of fields into floodplains and wetlands. Changes also occur indirectly, through factors such as grazing pressure and other cumulative impacts that have contributed to long-term ecological changes (cf. Hoffman, 1997, pp 507-534; Le Maitre et al., 2007, pp 260-270; De Villiers and Hill, 2008, pp 333-360).

Until the publication of the NEMA EIA regulations in August 2006, agricultural land use was primarily controlled by regulations issued in terms of the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and, if water users were involved, the National Water Act 36 of 1998 (De Villiers, 2007; De Villiers and Hill, 2008).

CARA is enforced via the regional offices of the national Department of Agriculture, Forestry and Fisheries, assisted with advisory services and recommendations by provincial departments of agriculture (De Villiers, 2007).

### 'Conservation and sustainable use of agricultural resources'

The broad objective of CARA is the conservation of agricultural resources which includes maintaining the production potential of land, combating erosion, protecting vegetation and combating weeds and invader plants.[[231]](#footnote-231)

CARA provides for prescribed Control Measures,[[232]](#footnote-232) enforced through regulations.[[233]](#footnote-233) A directive also may be issued in order to compel landowners to comply with a Control Measure.[[234]](#footnote-234) Control Measures, inter alia, apply to the cultivation of ‘virgin soil’, where ’virgin soil’ means:

…land which in the opinion of the executive officer has at no time during the preceding ten years been cultivated.[[235]](#footnote-235)

The regulations also deal with other aspects of agricultural resource conservation, including cultivation of land with a slope, protection of cultivated land against erosion through the action of water and wind, and utilisation and protection of vleis, marshes, water sponges and water courses. Permits for the cultivation of virgin soil are issued in terms of regulation 2, R1048 of 25 May 1984.

In terms of regulation 2(1), an applicant may be directed to dig soil pits and undertake other, unspecified, “steps (for) the purpose of an investigation deemed necessary to consider an application (for a cultivation permit)”. Permit conditions typically could provide for interventions such as soil conservation works to divert run-off, the establishment of fields perpendicular to the dominant wind direction, and the planting of cover crops.

### Control Measures (CARA s 6, enforced through regulations)

The Control Measures enforced by the Directorate: Land Use and Soil Management in the Department of Agriculture, Forestry and Fisheries apply to a range of farming-related activities that may affect the conservation and sustainable use of agricultural resources. These include:

|  |  |
| --- | --- |
| *Control measure (GN R. 1048 of 25-05-1984)* | *Explanation* |
| The cultivation of virgin soil (Regulation 2) | A permit is needed in order cultivate soil which has not been mechanically disturbed in the preceding 10 years |
| Cultivation of land with a slope (Regulation 3) | Prohibits cultivation of sleeps steeper than 20% or 12% in certain areas |
| Protection of cultivated land against the action of water and wind (Regulations 4 and 5) | Requires that steps be taken to prevent or control erosion, e.g. by means of soil conservation works |
| Prevention of waterlogging and salinisation of irrigated land (Regulation 6) | Impermeable water storage, avoidance of excessive use of water or water with a high salt content, construction of soil conservation works to draw off excess surface and sub-surface water, etc. |
| Utilisation and protection of vleis, marshes, water sponges and watercourses (Regulation 7) | Prohibits removal of vegetation within a watercourse or within 10 from the edge floodplains. Requires that vegetation must be removed from a watercourse if it will contribute to erosion |
| Regulating the flow pattern of run-off water (Regulation 8), etc. | No run-off may be diverted from a watercourse without permission unless approved by a run-off control plan, etc. |

It is an offence to refuse to comply with a Control Measure or Directive issued under s 7 of the Act.

These regulations among others require that soil conservation works be constructed to control erosion by water, that watercourses be kept clear of vegetation that may obstruct floods, and that vleis maynot be drained or cultivatedwithout a permit.

Control of weeds and invasive plants

The CARA regulations provide for four categories of weeds and invasive plants that are subject to varying degrees of control:[[236]](#footnote-236)

|  |  |
| --- | --- |
| Category 1 | Prohibited weeds – these include hakea, long-leaf wattle, cactuses with spines, Spanish reed and lantana |
| Category 2 | Plant invaders that must be controlled outside demarcated areas – these include Black wattle, sisal, old man saltbush, beefwood, several pine species, Port Jackson, white and grey poplars |
| Category 3 | Potentially problematic invasive plants, such as syringa and manatoka |
| Category 4 | Bush encroachment in which indigenous plants such as soetdoring become invasive because of poor veld management practices |

Land owners ought not to attempt to clear alien plantswithout an appropriate alien plant management plan.[[237]](#footnote-237)

### Integrating biodiversity considerations into CARA permits

As explained above, CARA is aimed at promoting sustainable use of agricultural resources which, in effect, amount to ecological infrastructure and its constituent biodiversity. 'Sustainable use' is couched narrowly, however, in terms of maintaining the productive potential of land and associated resources and not of 'agroecosystems' or 'biodiversity'.

Notwithstanding the limitations of CARA as a biodiversity safeguard in its current form or interpretation, the implementation of the prescribed Control Measures[[238]](#footnote-238) provides considerable opportunity for mainstreaming biodiversity considerations into the adjudication of permit applications and the management of developed agricultural land its undeveloped adjacent ecosystems.

In practice, the biodiversity aspects of CARA permit applications would be addressed via the NEMA application process or the licencing requirements of the National Water Act. CARA does, however, provide for farm plans[[239]](#footnote-239) that – through area-wide planning – can serve as the basis for a more integrative approach to agroecosystem management that aligns multiple farms with biodiversity and other sustainability objectives.[[240]](#footnote-240)

# PART C:  BIODIVERSITY POLICY, INFORMATION AND GUIDELINES

South Africa is well-equipped with an evolving growing body of world class policy, information and guidelines in support of biodiversity mainstreaming in IEM.

Biodiversity mainstreaming in South Africa hinges on three inter-related concepts: 'Products, people and processes', where –

* Products relate to maps and guidelines on biodiversity priority areas and ecosystem management;
* People are the focus on institutional strengthening and training; and
* Process is concerned with influencing government policy and integrating biodiversity priorities into spatial planning and land-use regulation (Cadman et al., 2010, p 49).

Seated in the background, however, is a sophisticated body of international policy on biodiversity and sustainable development that has been tightly integrated into the South African legal framework and, so doing, provides a firm basis from which biodiversity priorities must be mainstreamed into development via the broad IEM process.This section follows on, and supplements, the introduction to the regulatory aspects of biodiversity and IEM by:

* Sketching the international and domestic policy framework for biodiversity mainstreaming;
* Reiterating the key precepts and objectives of systematic conservation planning and the identification of biodiversity conservation priorities;
* Providing an overview of the main strategies for biodiversity mainstreaming in South Africa;
* Highlighting important sources of information on biodiversity priorities; and
* Introducing gazetted planning instruments and guidelines (both official and unofficial) that have direct relevance to shaping best practice with regard to biodiversity mainstreaming in IEM and, more broadly, ensuring that biodiversity is given adequate consideration – in terms of definition, functional scale and timing – in development planning, environmental assessment and decision making.

## BIODIVERSITY MAINSTREAMING: POLICY FRAMEWORK

The Convention on Biological Diversity (CBD) became legally binding on the South African state when it was ratified by the South African Government on 2 November 1995.[[241]](#footnote-241)

The CBD has gained legal expression in the mainstreaming domain via the National Environmental Management: Biodiversity Act 10 of 2004, the national biodiversity assessment and provisions for bioregional plans and listed threatened ecosystems, which were presented in the previous chapter. NEMBA, however, also entails strategic off-shoots that play an exceedingly important role in defining a national agenda for biodiversity mainstreaming and initiating a wide range of programmes and activities in its support.

The broad 'mainstreaming agenda' is defined by the National Biodiversity Strategy and Action Plan (NBSAP) which was published by the Department of Environmental Affairs in 2005. The strategic goals and objectives of the NBSAP, in turn, are translated into a five-year implementation plan called the National Biodiversity Framework (NBF), which appeared in 2009. They are described below.

### The Convention on Biological Diversity

The CBD represents a comprehensive international policy instrument, governed by the Conference of Parties (CoP), which has generated numerous and wide-ranging procedural and substantive decisions pertaining to the achievement of the CBD's principle objectives, namely the conservation and sustainable use of biological diversity, and the fair and equitable sharing of benefits arising from its utilization. The Convention recognizes that the key to maintaining biological diversity depends on using this diversity in a sustainable manner (Secretariat of the Convention on Biodiversity, 2001).

The CBD imposes binding commitments on signatories with regard to provisions such as the conservation of biodiversity, incentives for sustainable use, and assessing the impacts of projects on biodiversity (Secretariat of the Convention on Biodiversity, 2001). The CBD has been translated into domestic policy in South Africa – through the 1997 White Paper on the Conservation and Sustainable Use of Biodiversity – which, in turn, obtained legislative effect through laws such as National Environmental Management: Biodiversity Act 10 of 2004 and the National Environmental Management: Protected Areas Act 57 of 2003.

Only those Articles on the CBD that have a close relevance to the establishment of policy and strategies that have direct relevance to environmental assessment and development planning practice are summarised here.

#### Article 6: General measures for conservation and sustainable use

The CBD requires all contracting parties to develop national strategies, plans or programmes for the conservation and sustainable use of biodiversity.[[242]](#footnote-242) Contracting parties must also integrate, as far as possible and as appropriate, the conservation and sustainable use of biodiversity into plans, programmes and policies.[[243]](#footnote-243) Additional guidance to contracting parties by the CoP encourages the setting of measurable targets to achieve biodiversity conservation and sustainable use objectives.

#### Article 8: In-situ conservation

Article 8 of the CBD encourages contracting parties to undertake a range of actions relating to *the in situ* conservation of biodiversity. *In situ* conservation means:

* The conservation of ecosystems and natural habitats where they occur in the landscape;
* The maintenance and recovery of viable populations and species in their natural surroundings; and,
* In the case of domesticated or cultivated species, maintenance and recovery of viable populations and species in the surroundings where they have developed their distinctive properties.

In practice, *in situ* conservation ranges from the management of protected areas, to 'mainstreaming' biodiversity conservation into EIA and development planning, and the development of legislation to this end.[[244]](#footnote-244) One of the key functions of the **National Biodiversity Assessment** is to prioritise ecosystems for conservation action, while the **National Protected Areas Expansion Strategy** (DEAT, 2010)seeks to achieve cost-effective protected areas expansion that enhances ecological sustainability and resilience to climate change (Cadman et al., 2010, pp 36-41).

#### Article 14: Impact assessment and minimizing adverse impacts

In terms of the CBD, contracting parties should introduce appropriate procedures requiring environmental impact assessment (EIA) for projects that are likely to have significant adverse effects on biodiversity, with a view of avoiding or minimising impacts. Similarly, measures are required to ensure that the likely consequences of programmes and policies for biodiversity are taken into account.[[245]](#footnote-245)

In addition, the Conference of Parties invites governments and relevant organisations to:

* Address loss of biological diversity and the interrelated socio-economic, cultural and human-health aspects relevant to biological diversity when carrying out EIAs;
* Consider biological diversity concerns from the early stages of the drafting process, when developing new legislative and regulatory frameworks;
* Ensure the involvement of interested and affected stakeholders in a participatory approach to all stages of the assessment process, including governmental bodies, the private sector, research and scientific institutions, indigenous and local communities and non-governmental organizations, including by using appropriate mechanisms, such as the establishment of committees, at the appropriate level;
* Use strategic environmental assessments to assess the impacts of regional and sectoral plans, and to evaluate the cumulative and global effects of multiple projects, incorporating biological diversity considerations at the decision-making and/or environmental planning level; and
* Include the development of alternatives, mitigation measures and consideration of the elaboration of compensation measures in environmental impact assessment.

#### The ecosystem approach

The 'ecosystem approach' serves as the "fundamental paradigm" for the CBD's activities (Secretariat of the Convention on Biodiversity, 2001, p xxiv). [[246]](#footnote-246)

The 12 principles of the ecosystem approach amount to a strategy for the integrated or holistic management of resources through modern, scientific, adaptive management practices. The principles (which in many respects overlap with the National Environmental Management Principles)[[247]](#footnote-247) are:

|  |  |
| --- | --- |
| 1. *The objectives of management of land, water and living resources are a matter of societal choice.* 2. *Management should be decentralised to the lowest possible level.* 3. *Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.* 4. *Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:* 5. *Reduce those market distortions that adversely affect biological diversity;* 6. *Align incentives to promote conservation and sustainable use;* 7. *Internalise costs and benefits in the given ecosystem to the extent feasible.* 8. *Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.* 9. *Ecosystems must be managed within the limits of their functioning.* | 1. *The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.* 2. *Recognising the varying temporal scale and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.* 3. *Management must recognise that change is inevitable.* 4. *The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.* 5. *The ecosystem approach should involve all relevant sectors of society and scientific disciplines.* 6. *The ecosystem approach should involve all relevant sectors of society and scientific disciplines.[[248]](#footnote-248)* |

A key element of the ecosystem approach that has central relevance to environmental assessment and planning – and which addresses many of the major shortcomings of these processes with respect to safeguarding biodiversity – is its injunction that the scale of analysis and action should be determined by the ecological scale at which an environmental impact may have effect.

The CBD, through Decision V/6 of the Conference of Parties (May 2000), provides practical, operational guidance for the application of the ecosystem approach, namely:

1. Focus on the functional relationships and processes within ecosystems;
2. Enhance benefit sharing;
3. Use adaptive management practices;
4. Carry out management actions at the scale appropriate for the issue being addressed, with decentralisation to lowest level, as appropriate; and
5. Ensure inter-sectoral cooperation.

#### Voluntary guidelines on biodiversity-inclusive impact assessment

The CBD's *Voluntary guidelines on biodiversity-inclusive impact assessment* (Slootweg et al., 2006)[[249]](#footnote-249) are structured in accordance with the internationally accepted sequence of procedural steps characterising good-practice environmental impact assessment.

The guidelines reflect the CBD's ecosystem approach and provide recommendations on when and how best to address biodiversity considerations through EIA or SEA.

Key features of these guidelines include:

* Presenting impact assessment in an ecosystem context, and ensuring that appropriate attention is given to the functional attributes of biodiversity and potential impacts on ecological processes;
* Emphasising the importance of screening and scoping as critical stages for identifying biodiversity opportunities and constraints in EIA, and for early and effective mitigation; and
* Guidance on identifying and assessing potential impacts on ecosystem goods and services.

### The National Biodiversity Strategy and Action Plan

In South Africa, the **National Biodiversity Strategy and Action Plan** (NBSAP) (DEAT, 2005), in the process of being updated and revised, provides a comprehensive framework for achieving the CBD objectives. It sets out the strategic objectives, outcomes and activities that are necessary for achieving the overarching goals of the CBD. The NBSAP included a spatial component – the NSBA (SANBI, 2005)—to determine the national threat status of terrestrial and aquatic ecosystems, and to identify broad national priority areas for biodiversity conservation action (Cadman et al., 2013, 36).

An updated version of the NSBA, which was based on systematic conservation planning techniques was published as the 2011 **National Biodiversity Assessment** (Driver et al., 2012).

Strategic Objective 1 of the NBSAP ('An enabling policy and legislative framework integrates biodiversity management objectives into the economy') directly addresses the integration of biodiversity considerations in strategic environmental assessment, integrated environmental management and environmental impact assessment. The NBSAP recognises EIA as having an important role in guiding land-use changes, but also highlights a number of deficiencies that inhibit EIA's contribution to "effective decision-making for long-term sustainability" (DEAT, 2005, p 39).

According to the NBSAP, the following aspects of EIA and decision making need to be improved in order for it to be an effective safeguard to biodiversity:

* The full social, economic and environmental implications, including future impacts, should be included in decisions about important biodiversity, especially where impacts are like to be significant and irreversible;
* Impact assessment needs to be strategic rather than project-specific;
* Strategic environmental assessment could be used at a landscape scale to guide and inform project-specific EIAs so as to address cumulative impacts;
* The National Environmental Management Principles, which are meant to guide EIA, are open to interpretation and should be made more specific by introducing quantitative targets and thresholds, especially in biodiversity priority areas where further loss of biodiversity should prevented; and
* There should be improved compliance monitoring to ensure that authorised developments contributed to the conservation and sustainable use of biodiversity.

### The National Biodiversity Framework

The **National Biodiversity Framework** was published in 2009.[[250]](#footnote-250) One of its six priority actions entails developing tools for integrating biodiversity considerations in land-use planning and decision making. Examples of such 'mainstreaming tools' include:

* Ecosystem guidelines for environmental assessment and management in the Western Cape (De Villiers et al., 2005) and grasslands (Cadman et al., 2013);
* Generic terms of reference for biodiversity specialist studies in EIAs (e.g. in Gauteng, KwaZulu and the Western Cape); and
* The development of the National Biodiversity Offsets Policy Framework (SANBI) and an Environmental Offsets policy (DEA) (J Manuel, pers comm., 25-02-2014).

### Other initiatives that promote or create mainstreaming opportunities

Other high-level policy initiatives that either promote biodiversity mainstreaming in IEM, or provide strategic opportunities for mainstreaming to take place, include:

* The National Strategy for Sustainable Development and Action Plan;
* The National Development Plan (NDP);
* Strategic Infrastructure Plan No 19, Ecological Infrastructure for Water Security (SIP 19); and
* The Project for Ecosystem Services (ProEcoServ).

#### The National Strategy for Sustainable Development and Action Plan

The NSSD[[251]](#footnote-251) presents an understanding of sustainable development and explains the route that is being taken. It presents an action plan and indicators for the implementation of the strategy. It is not prescriptive, but is enabling in orientation and will be used to review sustainability programmes.

The NSSD recognises that the maintenance of healthy ecosystems and natural resources are preconditions for human wellbeing. It also recognises that there are limits to the goods and services that can be provided. In other words, ecological sustainability acknowledges that human beings are part of nature and not a separate entity. Strategic priorities of the NSSD include ‘Sustaining our ecosystems and using natural resources efficiently’, ‘Towards a Green Economy’ and ‘Responding effectively to Climate Change’.

For each strategic priority, a number of goals, interventions and indicators are presented. NSSD1 spans from 2011-2014; NSSD2 covers the years 2015-2020.

See: <https://www.environment.gov.za/documents/strategicdocuments?q=content/documents/strategic\_docs/national\_strategy\_sustainable\_development/>

#### The Project for Ecosystem Services (ProEcoServ)

ProEcoServ is a GEF-funded umbrella project aiming at piloting the bundling of ecosystem services and the integration of ecosystem services approaches into resource management and decision making. The overall goal of the project is to better integrate ecosystem assessment and scenario development into sustainable national development planning. As one of five participating countries, South Africa will focus on site-specific assessment, close involvement of stakeholders and tools, models and methods for decision makers and policy implementation to mainstream ecosystem management approaches into national development policies.

See: http://www.proecoserv.org/

#### SIP 19: Ecological Infrastructure for Water Security

SIP 19 is a proposed Strategic Integrated Project aimed at improving South Africa’s water resources and other environmental goods and services through the conservation, protection, restoration, rehabilitation and/or maintenance of key ecological infrastructure. The latter is broadly defined as:

*the substructure or underlying foundation on which the continuance or growth of a community or state depends. Similarly, ecological infrastructure is the networks of natural lands, working landscapes and other open spaces that are the substructure or underlying foundation on which the continuance or growth of essential ecosystem goods and services depends...*

SIP 19 provides a framework for the integration of a number of impactful water-related ecological infrastructure investments and interventions into a coordinated, coherent and focussed project specifically aimed at improving South Africa’s water resource quality and quantity. The purpose of SIP 19 is to contribute to the overall goal of ensuring a sustainable supply of fresh, healthy water to equitably meet South Africa’s social, economic and environmental water needs for current and future generations through the integrated, implementation of projects within identified priority water catchments.

See:

http://reference.sabinet.co.za/webx/access/electronic\_journals/waterb/waterb\_v12\_n4\_a8.pdf

#### The National Development Plan

The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The plan sets out six interlinked priorities:

* Uniting all South Africans around a common programme to achieve prosperity and equity;
* Promoting active citizenry to strengthen development, democracy and accountability;
* Bringing about faster economic growth, higher investment and greater labour absorption;
* Focusing on key capabilities of people and the state;
* Building a capable and developmental state; and
* Encouraging strong leadership throughout society to work together to solve problems.

Chapter 5 of the NDP addresses environmental sustainability and resilience. Objectives in this regard include developing a indicators for natural resources, accompanied by publication of annual reports on the health of identified resources to inform policy. The NDP also advocates targets for the amount of land and oceans to be protected. The NDP strongly emphasises research and strategies to support adaptation to climate change. One of the guiding principles to a low carbon economy is recognition that that human wellbeing is dependent on the health of ecosystems.

See:

http://www.npconline.co.za/ http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf

http://reference.sabinet.co.za/webx/access/electronic\_journals/waterb/waterb\_v12\_n4\_a8.pdf

## IDENTIFYING PRIORITIES FOR BIODIVERSITY CONSERVATION

Biodiversity in South Africa is under severe stress from habitat loss and ecosystem degradation attributed to factors such as invasive alien species, over exploitation, pollution and the effects of climate change (Cadman et al., 2010, p 14). This situation is partly explained – and exacerbated – by the skewed distribution of protected areas in South Africa in favour of marginal landscapes which, previously, were perceived as having little economic value (Rebelo 1997, p 571; Cowling and Pressey (eds), 2003, pp 3 and 4).

Altogether 40% of terrestrial ecosystems, 57% of the main river system types and 58% of marine ecosystem types in South Africa are threatened (Driver et al., 2012). Coupled with the lack of adequate representation of biodiversity pattern, a massive shortfall in the conservation of ecologically functional landscapes and limited resources for protected areas expansion means that the conservation of biodiversity by and large needs to take place on privately-owned land, in in parallel with existing economic activities

This imperative places biodiversity conservation directly in the realm of land use planning and impact assessment.

It is impossible to protect all biodiversity everywhere, which means that conservation actions need to be prioritised (Driver et al., 2003). Whereas the strict legal protection of all prioritised biodiversity pattern and process would be ideal, this is neither feasible nor affordable and strategies are therefore needed to safeguard important biodiversity in tandem with justifiable social and economic development.

In South Africa, priorities for conservation are identified by means of systematic biodiversity planning.

### Systematic biodiversity planning

The goals and principles that distinguish systematic biodiversity planning from other methods of prioritising conservation action are explained in Section B....

In summy, systematic biodiversity planning refers to a scientific method for calculating how much habitat is required, relative to quantitative targets and thresholds, for conserving a representative sample of a region's biodiversity and the ecological and evolutionary process that ensure its persistence (Margules and Pressey, 2000; Cowling et al., 2003; Driver et al., 2003; DEA, 2009; Cadman et al., 2010).

The key characteristics of a systematic biodiversity plan are (Cadman et al., 2010, p 43):

* The principle of **representation** – the plan identifies areas needed to conserve a representative sample of all biodiversity pattern (including species, habitats and ecosystems).
* The principle of **persistence** – the plan identifies areas needed to maintain ecological and evolutionary processes that allow biodiversity to persist in the long term (these areas are also referred to as ‘spatial components of ecological processes’.
* **Biodiversity targets** – Quantitative targets are set for biodiversity features, indicating how much of each feature is required in order to conserve a representative sample of biodiversity pattern and key ecological processes.
* **Efficiency and conflict avoidance** – The configuration of priority areas identified in the plan is designed to be spatially efficient (i.e. to meet biodiversity targets as efficiently as possible in terms of the amount of land required) and where possible to avoid conflict with other land uses where these are known to exist.

As previously stated, biodiversity mainstreaming is the process of aligning spatial plans and proposed projects with biodiversity conservation objectives that have been identified by means of systematic biodiversity planning. See **section xyz** for an explanation of the legal aspects of biodiversity mainstreaming. Section **xyz** details systematic biodiversity planning outputs that can be used in support of biodiversity-inclusive development and environmental assessment.

### Hierarchy of biodiversity importance

The following breakdown of biodiversity priority areas (outside proclaimed conservation areas) into a hierarchy of highest, high and moderate importance for biodiversity conservation is provided by the *Mining and Biodiversity Guidelines* (DEA et al., 2013, pp 33-41).

An evaluation of an area's biodiversity significance for the purposes of development planning must be informed by ground-truthing by a specialist if the area has been flagged as important by any of the plans listed below. See the section on pre-application biodiversity screening for guidance on how to interrogate and apply systematic biodiversity plans to actual planning processes and projects.

#### Highest biodiversity importance:

* *Critically Endangered (CR) and Endangered (EN) ecosystems*, recognised as threatened ecosystems in terms of section 52 of the NEM Biodiversity Act.
* *Critical Biodiversity Areas (CBAs),* (or areas of equivalent status such as irreplaceable and highly significant areas) from provincial spatial biodiversity plans.
* *River and wetland Freshwater Ecosystem Priority Areas (FEPAs*), and a 1km buffer of these specific river and wetland FEPAs.
* *Ramsar sites*. The importance of the biodiversity features in these areas and the associated ecosystem services (e.g. water flow regulation and water provisioning) is sufficiently high that, if their existence and condition are confirmed, the likelihood of a fatal flaw for new mining projects is very high.

These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being.

**High biodiversity importance:** Biodiversity priority areas of high biodiversity importance include:

* *Buffer zones of protected are*as (including buffers around National Parks, World Heritage Sites, and Nature Reserves)
* *Trans-Frontier Conservation Areas* (remaining areas outside of formally proclaimed protected areas).
* *Other identified priorities from provincial spatial biodiversity plans*
* *High water yield areas.*
* *Coastal Protection Zone*.
* *Estuarine functional zones*.

**Moderate biodiversity importance**: These biodiversity priority areas have moderate biodiversity importance:

* *Ecological Support Areas*.
* *Vulnerable ecosystems* in areas (provinces or municipalities) where CBAs have not yet been identified.
* *Focus areas for protected area expansion* (land-based and marine).

## BIODIVERSITY MAINSTREAMING STRATEGIES AND IEM

In practice, biodiversity mainstreaming has been taking place over a wide range of initiatives in the past 10 years or so. These include:

* The development of enabling legislation and policy in support of biodiversity mainstreaming (such as provisions for the adoption of bioregional plans, cross-linking listed threatened ecosystems to the NEMA EIA regulations and providing for the promulgation of protected environments);
* Bioregional programmes co-ordinated by the South African National Biodiversity Institute (e.g. the Fynbos Programme, which evolved from the Cape Action Plan for People and the Environment, and the national Grasslands Programme, which address mainstreaming from ground-level projects, via institutional co-ordination, to engaging with the development of national policy and legislation);
* Multi-stakeholder landscape or corridor initiatives, such as the Greater Cederberg Biodiversity Corridor;
* Conservation stewardship conducted by provincial biodiversity conservation agencies;
* Environmental public works programme, including the Water-for-Water, Working for Wetlandsand Working-for-Fire programmes, that are geared towards ecosystem rehabilitation and job creation; and
* The development of guidelines for environmental assessment practitioners (e.g. on ecosystem-scale impact assessment and management, birds and wind energy projects, and wetland rehabilitation, to name a few) and training on their use (Cadman et al., 2010).

#### INFORMATION ON BIODIVERSITY PRIORITIES

Information on biodiversity priorities is derived from a variety of inter-related sources, chief of which is the NBA which was first published in 2005 (Driver et al., 2005) and has been updated as the 'NBA 2011' (Driver, et al., 2012). Section **xyz** introduces the NBA and its relationship, among others, with the NEMA system of environmental regulation.

Other sources of updated information on biodiversity priorities include:

|  |  |
| --- | --- |
| ***NBA 2011:* *An assessment of South Africa’s biodiversity and ecosystems. Synthesis Report***  Driver A, Sink, KJ, Nel, JN, Holness, S, Van Niekerk, L, Daniels, F, Jonas, Z, Majiedt, PA, Harris, L and K Maze (2012)  See also see technical reports:  Terrestrial ecosystems (Vol 1), Freshwater ecosystems (Vol 2) and Estuaries (Vol 3). | http://bgis.sanbi.org/nba/NBA2011\_SynthesisReport\_lowres.pdf |
| ***The National Freshwater Ecosystem Priority Areas' (NFEPA) project: Technical Report***  Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver AL, Hill L, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L, Nienaber S and H van Deventer (2011) | http://bgis.sanbi.org/nfepa/NFEPA\_Technical\_Report.pdf |
| ***Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources***  Nel JL, Driver AL, Strydom WF, Maherry AM, Petersen C, Hill L, Roux DJ, Nienaber S, van Deventer H, Swartz ER and LB Smith-Adao (2011) | http://www.wrc.org.za/Pages/DisplayItem.aspx?ItemID=9576&FromURL=%2FPages%2FDefault.aspx%3F |
| ***Maps of Critical Biodiversity Areas and municipal biodiversity sector plans*** | See http://bgis.sanbi.org for a comprehensive list of biodiversity plans |
| ***Red List of South African Plants***  (SANBI Threatened Species Programme) | http://redlist.sanbi.org/ |
| **IUCN's *Red List of Threatened Species*** | http://www.iucnredlist.org/) |
| **South African Red Data Book: Butterflies** | http://www.biodiversitysa.com/sites/default/files/documents/documents/biodiversity13butterflies.pdf |
| **BirdLife South Africa: Important Bird Areas (IBA) Map** | http://www.birdlife.org.za/conservation/important-bird-areas/iba-map |

##### The SANBI Biodiversity-GIS website and 'Biodiversity Advisor'

SANBI's Biodiversity GIS (B-GIS) website should be the first port-of-call when embarking on project planning, undertaking pre-application screening, scoping or developing terms of reference for biodiversity specialists. This applies equally to spatial or town and regional planners, or anyone undertaking strategic planning.

The SANBI B-GIS website makes spatial biodiversity information available for planning and decision making. The spatial information can be used online in an interactive map or downloaded from the website to be used locally. The use of this information is free-of-charge.

The SANBI 'Biodiversity Advisor' helps you use SANBI's online biodiversity information resources for decision-making, planning and research. It consists of four sections:

* [Environmental assessments](http://biodiversityadvisor.sanbi.org/?2nd_level_items=environmental-assessments).
* [Land-use planning](http://biodiversityadvisor.sanbi.org/?2nd_level_items=land-use-planning).
* [Systematic biodiversity planning](http://biodiversityadvisor.sanbi.org/?2nd_level_items=what-us-bioregional-planning).
* [NBA 2011](http://biodiversityadvisor.sanbi.org/?2nd_level_items=national-biodiversity-assessment-nba-2011).

All the products hosted by SANBI can be downloaded and used free-of-charge.

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| --- | --- | --- |
| **SANBI Biodiversity GIS**  **Inquiries** | **http://bgis.sanbi.org**  **BGISHelp@sanbi.org.za** | Ph 021 799 8738 Fax 021 7971940   Biodiversity GIS  Kirstenbosch Research Centre  Private Bag X7  CLAREMONT 7735 |
| **SANBI Biodiversity Advisor**  **Inquiries** | **http://biodiversityadvisor.sanbi.org/?**  **BAHelp@sanbi.org.za** |

The publication *Biodiversity for Development: South Africa's landscape approach to conserving biodiversity and promoting ecosystem resilience* (Cadman et al., 2010), provides the most up-to-date summary of biodiversity mainstreaming in South Africa.

It can be downloaded at <https://cmsdata.iucn.org/downloads/primer\_11\_2\_mb.pdf>

## GUIDELINES ON ADDRESSING BIODIVERSITY IN LAND USE PLANNING AND IEM

This section introduces three broad suites of guidelines that support biodiversity mainstreaming in development planning and environmental assessment.

* The first set of guidelines constitutes **formally gazetted instruments** (**Table 7**)
* The second set includes examples of **international 'best practice' guidelines** dealing with themes such as the ecosystem approach and environmental assessment, sector-specific best practice guidelines (e.g. mining) or guidelines that address environmental assessment in specific biodiversity settings, such as estuaries and wetlands (**Table 8**).
* The third set of guidelines provides examples of **best practice guidelines** that have been **developed by government departments, bioregional programmes and non-governmental organisations**. They do not have formal, statutory status in terms of section 24J of NEMA, but are believed to provide a best practice yardstick for the consideration of biodiversity in development planning and environmental assessment in South Africa (**Table 9**).
* **Ecosystem guidelines** are listed in **Table 10**.

**Table 7: Statutory (gazetted) notices and guidelines relating to biodiversity mainstreaming and the consideration of biodiversity in land use planning and IEM**

|  |  |  |
| --- | --- | --- |
| ***National list of ecosystems that are threatened and in need of protection***  GN 1002, 9 December 2011  (Department of Environmental Affairs) | * Lists terrestrial threatened ecosystems (i.e. vegetation types identified by the *Vegetation Map of South Africa, Lesotho and Swaziland*, and provincial biodiversity assessments) in terms of s 52 of the National Environmental Management: Biodiversity Act 10/2004 * Listed threatened ecosystems may trigger requirement for environmental authorisation (cf. Listing Notice 3, GN R. 546 of 18-06-2010) | http://cer.org.za/wp-content/uploads/2013/02/National-List-of-Ecosystems-that-are-Threatened-and-in-Need-of-Protection-Dec-2011.pdf  Also see:  http://bgis.sanbi.org/ecosystems/project.asp  http://bgis.sanbi.org/ecosystems/searchecosystem.asp |
| ***Guideline regarding the determination of bioregions and the preparation of and publication of bioregional plans***  GN 291, 16 March 2009  (Department of Environmental Affairs) | * Defines principles, objectives and process for drafting systematic biodiversity plans. * Provides guidance on the identification of bioregions, drafting and adoption of bioregional plans in terms of Chapter 3 of the National Environmental Management Biodiversity Act: 10/2004 | https://www.environment.gov.za/sites/default/files/legislations/nemba\_guideline\_g32006gon291.pdf  Also see the following sections of this document  **xxx** |
| ***Norms and standards for biodiversity management plans for ecosystems***  GN 83 of 7 February 2014  (Department of Environmental Affairs) | * Sets out objectives and emphasises need for integrated, adaptive and participation management to ensure long-term survival of the relevant ecosystem in nature. * Drafted in terms of sections 9(1) and 43(1)(a) of NEMBA | https://www.environment.gov.za/sites/default/files/gazetted\_notices/nemba\_biodiversitymanagement\_normsstandards\_g37302gn83.pdf  Also see the following sections of this document **xxx** |
| ***Policy Principles and Guidelines for Control of Development affecting Natural Forests***  (Department of Agriculture, Forestry and Fisheries) | * Specifies mitigation hierarchy, positive planning, etc. * Also introduces offsets/ compensation and burden of proof:   + ‘The potential impacts of development or land use change must be considered pro-actively as early in the proposed activity’s planning stages as practicable’, and   + ‘The onus to prove exceptional circumstances and that no uncertainties or risks to the forest will ensue, lies with the developer’ | http://www2.dwaf.gov.za/webapp/Documents/PolicyGuideNaturalForestsDev.pdf?action=search&searchType=advanced&category=report |

**Table 8: International best practice guidelines on biodiversity mainstreaming and the consideration of biodiversity in land use planning and IEM**

|  |  |  |
| --- | --- | --- |
| Convention on Biodiversity  ***Voluntary guidelines on biodiversity-inclusive impact assessment***  (Slootweg R, Kolhoff A, Verheem R and R Höft (2006) | * International best practice standard for applying ecosystem approach to screening, scoping, impact and strategic environmental assessment * Emphasises importance of predicting and assessing impacts on ecosystem goods and services | http://www.cbd.int/doc/publications/imp-bio-eia-and-sea.pdf |
| International Association for Impact Assessment  ***Biodiversity in Impact Assessment***  IAIA (2005) | * Promotes principles and objectives of biodiversity-inclusive impact assessment for projects (EIA) and plans, policies and programmes (SEA) | http://www.iaia.org/publicdocuments/special-publications/SP3.pdf |
| Ramsar Convention on Wetlands  ***Impact assessment: Guidelines on biodiversity-inclusive environmental impact assessment and strategic environmental assessment*.**  Ramsar Convention Secretariat (2010) | * Expands on CBD's provisions for biodiversity-inclusive EIA * Promotes cautionary, strategic consideration of biodiversity in development planning | http://www.ramsar.org/pdf/lib/hbk4-16.pdf |
| IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 1, 2012 | * Specifies requirements of lenders regarding treatment of biodiversity in environmental assessment and mitigation | http://www.ifc.org/wps/wcm/connect/bff0a28049a790d6b835faa8c6a8312a/PS6\_English\_2012.pdf?MOD=AJPERES |
| Business and Biodiversity Offsets Programme (BBOP)  ***BBOP Standard on Biodiversity Offsets***  BBOP (2012) | * Guideline presents an international standard on biodiversity offsets, intended to help determine whether an offset has been designed and subsequently implemented in accordance with the BBOP Principles. * Principles include close adherence to the mitigation hierarchy, only offsetting residual impacts and promoting 'no net loss' | http://bbop.forest-trends.org/guidelines/Standard.pdf |
| CBBIA-IAIA and SAIEA  ***Guidance Document on Biodiversity and Impact Assessment and Decision Making in Southern Africa***  Brownlie S, Walmsley and P Tarr (2009) | * Identifies and provides practical remedies to weaknesses in biodiversity reporting * Offers guidance on how biodiversity should be approached in EA * Provides guidance to decision makers * Highlights key biodiversity issues in major development sectors | http://www.saiea.com/cbbia/html/guidance/main.html |
| International Council on Mining and Metals  ***Good Practice Guidance for Mining and Biodiversity***  ICMM (2006) | * International best practice perspective on addressing biodiversity proactively in mining * Defines biodiversity policy statements for prospecting and mining * Provides guidance on biodiversity management and post-mining rehabilitation Considers challenges and opportunities for biodiversity offsets | http://www.icmm.com/document/13 |
| IUCN  ***Ecosystem Impacts of Large Dams***  McCartney MP, Sullivan C and MC Acreman (2001) | * Provides rationale for predicting and assessing impacts of dams in the context of ecosystems * Provides baseline data on upstream and downstream impacts * Highlight different impacts with variation in geographical location. | http://intranet.iucn.org/webfiles/doc/archive/2001/iucn852.pdf |
| Royal Society for the Protection of Birds  ***Biodiversity and Environmental Impact Assessment: A Good Practice Guide for Road Schemes***  Byron H (2000) | * Provides systematic framework for identifying and address potential biodiversity impacts arising from road projects * Identies best practice remedies to typical weaknesses relating to biodiversity in EIA (e.g. site vs ecosystem perspective, cumulative impacts, precaution and 'no net loss'). | http://www.rspb.org.uk/Images/BiodiversityImpact\_tcm9-257019.pdf |
| World Resources Institute  ***Weaving Ecosystem Services into Impact Assessment***  Landsberg F, Treweek J, Stickler MM, Henninger N and O Venn (2013) | * Provides six steps to address project impacts and dependencies on ecosystem services as part of the environmental and social impact assessment process. | http://www.wri.org/publication/weaving-ecosystem-services-into-impact-assessment |

**Table 9: South African best practice guidelines on biodiversity mainstreaming and the consideration of biodiversity in land use planning and IEM**

|  |  |  |
| --- | --- | --- |
| Department of Environmental Affairs  ***Mining and Biodiversity Guideline***  Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute (2013 | * Provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining. * Guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining. | http://www.bgis.sanbi.org/mining/MiningandBiodiversityGuideline.pdf |
| Department of Environmental Affairs and Development Planning  ***Guideline for Involving Biodiversity Specialists in EIA Processes***  Brownlie S (2005) | * Part of best practice series on involving specialists in EA processes * Promotes ecosystem approach to biodiversity in environmental assessment * Strong emphasis on precautionary, proactive planning, mitigation hierarchy and principle of 'no net loss' * Provides triggers for involving biodiversity specialists at different stages of project planning | http://biodiversityadvisor.sanbi.org/wp-content/uploads/2012/04/Involving\_Biodiversity\_Specialists.pdf  For other guidelines on involving specialists in EIA processes, see:  http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines |
| SANBI Red List of South African Plants  ***Guidelines for Environmental Impact Assessment***  Driver M, Raimondo D, Maze K, Pfab MF and NA Helme NA (2009) | * Guidelines for environmental assessment practitioners on how botanical specialists should be chosen and when and how should be conducted. * Guidelines for botanical specialists on the specific recommendations that should be made if a species of conservation concern is found on a site as well as general recommendations for the habitat conservation of such species. | http://redlist.sanbi.org/eiaguidelines.php |

**Table 10: Ecosystem guidelines for land use planning, environmental assessment and biodiversity management**

|  |  |  |
| --- | --- | --- |
| Fynbos Forum and Botanical Society of SA  ***Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape***  De Villiers CC, Brownlie S, Clark B, Day EG, Driver A, Euston-Brown DIW, Helme NA, Holmes PM, Job N and AB Rebelo (2005) | * Describe major ecological drivers and vulnerabilities of the major coastal, terrestrial and aquatic ecosystems of the Western Cape * Explains how to approach environmental assessment in ecological corridors etc * Provides guidance on pre-application biodiversity screening | http://bgis.sanbi.org/FF\_Ecosystem\_Guidelines.pdf |
| SANBI and the National Grasslands Programme  ***Grassland Ecosystem Guidelines***  Cadman M, de Villiers C, Lechmere-Oertel R and D McCulloch (2013) | * Describe major ecological drivers and vulnerabilities of the major terrestrial and aquatic ecosystems of the grasslands * Provides guidance on managing rangelands for grazing in support of biodiversity objectives * Provides guidance on pre-application biodiversity screening | <http://www.grasslands.org.za/document-archive/category/21-grassland-ecosystem-guidelines> |
| National Freshwater Ecosystems Priority Areas (NFEPA) Project  ***Implementation Manual for Freshwater Ecosystem Priority Areas***  Driver AL, Nel JL, Snaddon K, Murray KM, Roux DJ, Hill L, Swartz ER, Manuel J and N Funke (2011) | * Explains different types of FEPA and reasons for their selection * Includes management objectives and guidelines for   + Wetland FEPAs and wetland clusters   + River FEPAs   + Sub-quaternary catchments associated with river FEPAs and upstream management areas | http://bgis.sanbi.org/nfepa/NFEPA\_Implementation\_Manual.pdf |

# PART D: GOOD PRACTICE GUIDE TO ASSESSING IMPACTS ON BIODIVERSITY AND ECOSYSTEM GOODS AND SERVICES

This section introduces different types of impact on biodiversity, how they should be identified, assessed and, if residual negative impacts are unavoidable, mitigated. It covers:

* The definition of impacts on biodiversity;
* Categories of impacts on biodiversity;
* Defining the scope of assessments with respect to biodiversity
* Mitigation hierarchy
* Dealing with potentially irreversible impacts, irreplaceable loss and ‘non-offsetable’ impacts
* Using the right specialist at the right time
* Assessing risks and impacts, and evaluating their significance
* Mitigation assurance and Environmental Management Programmes
* Biodiversity offsets and tradeoffs

The CBD's *Voluntary guidelines on biodiversity-inclusive impact assessment* (Slootweg et al., 2006) and the *Guideline for involving biodiversity specialists in EIA processes* (Brownlie, 2005) provide a robust, applied overview of defining biodiversity in the context of IEM and spatial planning, and how it is best safeguarged through these processes.

## DEFINING IMPACTS ON BIODIVERSITY

Impacts on biodiversity can arise from numerous sources, occurring either in isolation or cumulatively, and, potentially, with hugely divergent effects over a range of functional, spatial and temporal scales, such as:

* Physical changes in the use of land (e.g. cultivation, mining or property development) which degrades or destroys natural habitats and can have a cascade of negative effects for biodiverity pattern and process, potentially to the extent that ecological processes collapse and extinctions take place;
* Changes to aquatic ecosystems (e.g. dams, inter-basin transfers, channelisation, reclamation of floodplains, draining of wetlands or abstraction) that impact negatively on the availability or quality of water, modify hydrological regimes (e.g. seasonal floods and drying), promote erosion and sedimentation, and transform in-stream and riparian habitat and ecological connectivity;
* Physical changes to the atmospheric environment (e.g .structures such as wind turbines or powerlines, or through atmospheric pollution). In the former case, birds and bats may be at risk from collision with vertical structures and their supports, whereas atmospheric pollution may precipitate a host of impacts, ranging from insect mortalities to the pollution of water resources and posing risks to human and animal health.
* The introduction of non-native species (which can be either 'natural' invaders such as indigenous pioneer species that move into over-grazed rangeland or aquatic organism that are artifically introduced from one catchment to another, or alien organisms introduced from outside South Africa), or removal of keystone species and tertiary productors that maintain ecosystem and/or trophic structures;
* External inputs of chemicals or materials (e.g. fertilisers, emissions, irrigation or oil spills); and
* Climate change which can accelerate the decrease in resilience of degraded ecosystems, create conditions conducive for migration by pest or alien introductions, aggravate the incidence and intensity of wildfires and, coupled to catchment modification, increase the frequency, intensity and damage of floods.

Whatever the circumstances, environmental assessment and spatial planning must be geared toward ensuring that proposed projects or changes in land use:

* Avoid loss of irreplaceable biodiversity;
* Reflect the best practicable option for sequentially avoiding and minimising loss of biodiversity or disturbance to ecosystems;
* Actively remedy loss of biodiversity where this cannot be avoided;
* Compensate for unavoidable loss by providing an appropriate biodiversity offset; and
* Contribute to the rehabilitation of degraded habitats and ecosystems.

Section **xyz below** elaborates on direct, indirect and cumulative impacts on biodiversity, and how these questions need to inform planning and environmental assessment.

## CATEGORIES OF IMPACTS: TERRESTRIAL, AQUATIC, ESTUARINE AND MARINE ECOSYSTEMS

As emphasised throughout these minimum requirements, it takes a comprehensive and integrated process of applying scientific knowledge and principles to actual, substantive conditions in order to make defensible predictions about potential impacts of proposed developments on biodiversity.

The following section 'frames' the minimum set of questions that need to be applied to potential impacts on biodiversity, and the potential implications of biodiversity for proposed development.

Impacts that cause changes to biodiversity can be categorised as follows:

#### 1.2 IMPACTS ON TERRESTRIAL ECOSYSTEMS THAT MAY RESULT IN CHANGES TO:

* **Composition and structure (i.e. pattern) of biodiversity**
* **Ecological processes**

Changes to the above will in all likelihood lead to changes in ecosystem goods and services.

Note that adverse change to the components of biodiversity pattern may only become evident over time, and are not necessarily confined to the spatial extent at which the impact originally occurred – loss of habitat may translate into localised extinction of species and/or degradation of ecological processes that function at a landscape or regional scale.

* + 1. Impacts on the c**omposition** and **structure** of biodiversity (pattern) can be:
* Direct, as would arise from brute, mechanical destruction of indigenous vegetation
* Indirect, such as when biodiversity pattern starts changing owing to altered disturbance regimes (e.g. fire, flooding or stream flows), altered physico-chemical properties of habitat (e.g. upstream pollution), or altered ecological processes (e.g. the loss of a pollinator, or keystone predator).
* Induced, such as increased access to a previously inaccessible area, with an increase in habitat loss and off-take of specific species.

1.2.2 Impacts on **ecological processes** at various scales that may translate into disturbances to:

* Specialist pollinator relationships
* Predator-prey processes
* Social organisation and reproductive dynamics
* Diversification of plant lineages
* Faunal seasonal migration
* Resilience to climate change, etc.

1.2IMPACTS ON FRESHWATER ECOSYSTEMS THAT MAY RESULT IN CHANGES TO:

* **Hydrological functioning**
* **Geomorphological processes**
* **Biodiversity pattern and process**

Note that, in aquatic contexts, 'impacts' are defined as:

* Negative change ('degradation') in relation to the reference condition of freshwater ecosystem, if known; or
* A deterioration in the Present Ecological State (PES) of freshwater ecosystem; or
* No improvement to the condition of aquatic ecosysems with a PES of 'D' (largely modified) or lower.

Crucially,potential impacts on aquatic ecosystems must be defined and assessed across a range of hydrological and geomorphological scales that are not restricted to single sites; river reaches must be the smallest unit of analysis.

1.2.1 Impacts on **hydrological functioning** can arise from changes to:

* Flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes)
* Base flows (too little/too much water in terms of characteristics and requirements of system)
* Quantity of water (typically over-abstraction)
* Quality of water (chiefly because of increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication)

1.2.2 Impacts on **geomorphological processes** can arise from changes to:

* Scour and erosion patterns
* Sedimentation patterns
* Structural/morphological stability of watercourses

1.2.3 Impacts on **biodiversity** and **ecological processes** can arise from changes to:

* The condition of in-stream, riparian and floodplain habitat
* The composition, structure or presence of specific species
* Ecological connectivity (laterally and longitudinally).

#### 1.3 IMPACTS ON ESTUARINE AND MARINE ECOSYSTEMS THAT MAY RESULT IN CHANGES TO:

* **Hydrological functioning**
* **Geomorphological processes**
* **Biodiversity pattern and process**

1.3.1 Impacts on **hydrological functioning** can arised from changes to:

* Flood and flow regimes (e.g. artifical closure/opening of estuaries to the sea, suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes)
* Changes in storm surges or offshore flow patterns
* Base flows (too little/too much water in terms of characteristics and requirements of esutarine system)
* Quality of water (undesirable changes to the salinity of estuarine waters, increased sediment loads, contamination by chemical and/or organic effluent, and/or eutrophication of upstream river systems and/or the marine environment)

1.3.2 Impacts on **geomorphological processes** can arise from changes to:

* Scour and erosion patterns both within the estuary and in the marine environment
* Sedimentation patterns through natural process changes and/or human-induced changes (e.g. building of breakwaters or removal of vegetation cover in catchments)
* Structural/morphological changes to estuaries (e.g. natural shifts in position of estuary mouth limited by changes in e.g. dune position and/or building infrastructure such as a railway or road)

1.3.3 Impacts on **biodiversity** and **ecological processes** can arise from changes to:

* Changes in the condition of upstream river systems and/or marine habitat
* The composition, structure or presence of specific species

### Scope of assessment

1. **Considering direct, indirect, induced and cumulative impacts:**

* ***Direct impacts*** are those impacts directly linked to the project (e.g. clearing of land, extraction of water, contamination of water bodies, blasting, sedimentation, change in water table levels, resettlement of households).
* ***Indirect impacts*** are those impacts resulting from the project that may occur beyond or downstream of the boundaries of the project site and/or after the project activity has ceased (e.g. migration of pollutants from waste sites, reduced flow in downstream rivers, edge effects related to spillover of activities from resettlement).
* ***Induced impacts*** are impacts that are not directly attributable to the project, but are anticipated to occur because of the presence of project (e.g. impacts of associated industries, establishment of residential settlements with increased pressure on biodiversity).
* ***Cumulative impacts*** are those impacts from the project combined with the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity or natural resources (e.g. a number of mines in the same catchment or ecosystem type collectively affected water quality or flow, or impacting the same local endemic species).

1. **Impacts during normal operating conditions, and during upset or emergency conditions**

For potentially polluting activities or activities (e.g. mining, industry, transport of hazardous or toxic materials), impacts on biodiversity and ecosystem services of both normal and upset conditions should be addressed. Appropriate and timely responses to the latter, as well as management of the former, must be covered in an EMP for the project.

1. **Associated activities, infrastructure**

These activities and/or infrastructure are considered to be ‘associated’ with the project when their viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project. When they impact on the same biodiversity and ecosystem goods and services as the project itself, then they must be taken into account when assessing cumulative impacts as they are sure to happen.

1. **Ecosystem goods and services**

In assessing and evaluating impacts on ecosystem goods and services, it is necessary to determine:

* What are the benefits from nature, and who benefits
* What is likely to change – i.e. background trends (changes in land use, pollution levels, invasive alien organisms, changes in levels of reliance on ecosystem goods and services, changes in upstream environment which could affect downstream...predicted climate change effects, etc.)
* Impacts of project/ plan on the availability, quantity and/or quality of ecosystem goods and services, including increases or decreases in the risk of natural disasters
* Vulnerability of beneficiaries and dependants to changes in ecosystem goods and services
* Vulnerability of the proposed development to changes in ecosystem goods and services (taking into account likely background trends and the effects of the development)
* Proposed mitigation and residual negative impacts
* Implications with regard to changes in vulnerability of affected parties, duration of impacts, availability of substitutes that would be accessible, affordable and acceptable to beneficiaries.

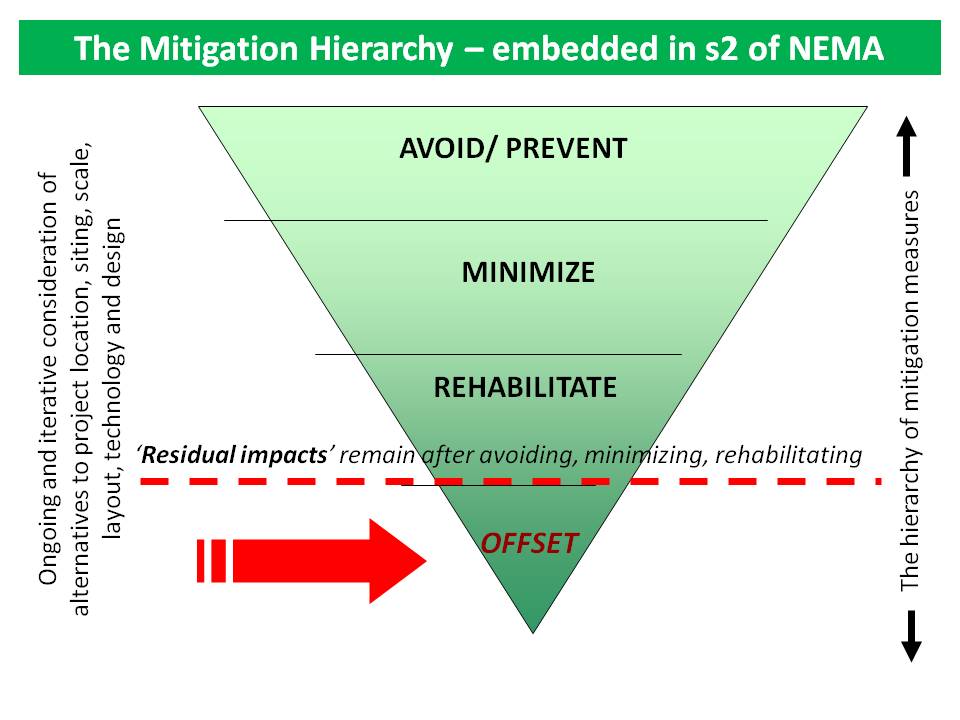
### Mitigation hierarchy

The 2010 NEMA Regulations (GN R. 543, 18 June 2010) stipulate that both a BAR and a Scoping and EIR must report on the degree to which the impact can be mitigated.

This legal requirement relates to the national environmental management principles that stipulate that impacts on biodiversity and ecosystems must be **avoided**, and if they cannot altogether be avoided, must be **minimised and remedied**. These principles reflect the **mitigation hierarchy**.

**Mitigation** of negative impacts on biodiversity and ecosystems is thus a legal requirement. The form of mitigation will depend on the significance of the impact and the area being affected. As a first step, reasonable and feasible project alternatives should be considered to avoid or prevent the disturbance of ecosystems and loss of biodiversity. Where avoidance is not altogether possible, impacts must be minimised, and then measures must be taken on site to restore, rehabilitate or repair remaining impacts. Where negative impacts on biodiversity still remain – so called ‘**residual impacts**’ – biodiversity offsets may be required to reduce the effects of development still further. Biodiversity offsets are a ‘**last resort**’ and should, where at all possible, be avoided by concentrating on earlier steps in the hierarchy.

The appropriate level of emphasis given to ‘**avoidance or prevention’** in the mitigation hierarchy depends on the conservation importance and status of affected biodiversity: the greater the conservation priority of the impacted biodiversity, the more strenuous should be the effort to avoid impacts altogether and to minimise them and rehabilitate on-site habitat, prior to considerations of an offset. Avoidance might be the only appropriate solution for biodiversity which is Critically Endangered or extremely limited in range, and/or on which local communities are highly dependent for their livelihoods and wellbeing; an important part of applying the mitigation hierarchy is open discussion with stakeholders in order to gain agreement on when it is appropriate to move to the next level of the hierarchy.



### Dealing with potentially irreversible impacts, irreplaceable loss and ‘non-offsetable’ impacts

The 2010 NEMA Regulations stipulate that both a BAR and a Scoping & EIR must report on the degree to which the impact:

* can be reversed; and
* may cause irreplaceable loss of resources.[[252]](#footnote-252)

Impacts may endure in the short term (e.g. during construction only), or may last for decades or centuries, and may effectively be ***irreversible***. Examples of the latter might include permanent changes in vegetation cover or the quality or flow of surface water or groundwater. Where these changes lead to permanent loss of a resource which is highly valued, essential or important for lives, health and livelihoods now and in future, and for which there is no substitute (or cost-effective substitute) – i.e. compensation for their loss is impossible - then they would lead to ***irreplaceable loss of resources***.

Where impacts on biodiversity would result in targets for biodiversity conservation (as determined through systematic biodiversity planning[[253]](#footnote-253)) being undermined, they would constitute ***irreplaceable loss of resources***, because they would jeopardise the health, functioning and resilience of landscapes and seascapes on which we – and sustainable development -depend.

Biodiversity targets define what resource planners and managers should aim for and provide a basis for the monitoring that is important for good environmental management. Where there is uncertainty or high risk in the evaluation of impacts, a risk-averse and cautious approach to the assessment and planning of mitigation must be adopted.

* When impacts would lead to ***irreplaceable loss of resources***, avoidance or prevention of impacts is the only acceptable form of mitigation. These impacts would be seen as ‘non offsetable’.
* When impacts would lead to ***irreversible loss*** of resources, and/or when significant negative impacts remain after measures to avoid/ prevent and minimise them have been taken into account, **biodiversity offsets or compensation for loss of ecosystem goods and services** must be provided.

### Using the right specialist at the right time

**Table 11** identifies circumstances where it may be advisable to appoint a biodiversity specialist and, depending on conditions at the site or in the vicinity, what type of specialist.

#### During the Pre-Application and Basic Assessment stages

Biodiversity specialists would contribute in a *reflective and advisory* way, and give specialist input.

#### During the Scoping stage of a Scoping and Environmental Impact Assessment study

Biodiversity specialists would contribute in a *reflective and advisory* way, and give specialist input. Whilst the specialist may be asked to provide a written professional opinion, it generally would not be appropriate to commission detailed specialist studies as part of scoping – except if any of the 'red flags' identified in the screening guideline are present and detailed specialist input would be necessary to inform decisions on impact avoidance and alternatives.

In scoping, the specialist could be asked to:

* Identify key issues for biodiversity;
* Identify alternatives – including the ‘no-go’ option - that could avoid or minimize impacts on biodiversity (the ‘no-go’ option also serves as the baseline against which impacts of other alternatives are assessed);
* Respond to and evaluate biodiversity-related issues raised by I&APs;
* Identify measures to reduce these impacts, and/or measures to optimise or enhance possible benefits to biodiversity;
* Advise on whether or not there is sufficient information to determine reliably the likelihood of unavoidable significant impacts at this stage, and/or the need for additional specialist studies;
* Advise on the need for additional specialists to investigate specific ecosystem components and the scope and extent of the information required from such studies;
* Assist in drawing up the Terms of Reference for involvement of biodiversity specialists in the Environmental Impact Assessment stage, should these be required.

#### Environmental Impact Assessment stage

Biodiversity specialists would contribute in an *investigative, analytical and advisory* way, and carry out a specialist assessment.

### What is a 'biodiversity specialist'?

There is no one ‘*biodiversity specialist*’. Rather, the term is used to cover a range of specialists in the field of biodiversity, from

* broad areas of expertise (e.g. plant or terrestrial ecologist, marine ecologist, estuarine ecologist, or freshwater ecologist) to
* narrow areas of expertise (e.g. mammalogist, herpetologist, avian specialist, ichthyologist, wetland specialist, specialist in marine algae, invertebrate specialist or entomologist, etc.). The term also covers specialists with expertise in the functional attributes of ecosystems (e.g. wetland function, ecological connectivity or corridors).

The choice of **biodiversity specialist** is of the utmost importance in EIAs. In addition, the role of that specialist is critical in knowing about, drawing on, and providing enough reliable and relevant information on biodiversity to inform the evaluation of significance or residual negative impacts on that biodiversity.

Biodiversity specialists must[[254]](#footnote-254):

* Be competent at interpreting and evaluating information and answering the "so what" and “to whom” questions, not simply providing descriptive information (e.g. species lists);
* Be independent and have appropriate formal training in his/her field of expertise;
* Have sufficient practical experience working in the specific ecosystems of the affected region, and preferably local area, to make him/her respected by peers;
* Be able to think beyond his/her immediate discipline, able to trace impact pathways and identify indirect or cumulative impacts, and think of biodiversity/human wellbeing interfaces (ecosystem goods and services);
* Have good knowledge relating to assessment techniques and to relevant legislation, policies, plans and guidelines; and
* Be registered with the South African Council for Natural Scientific Professions (SACNASP[[255]](#footnote-255)), and could also be certified by a professional body registering specialists in particular fields of biodiversity and/or ecology.

An ecologist is best involved in the pre-application planning and earlier stages of an EIA process, given their broad, holistic perspective on ecosystems and biodiversity. Where specific components of biodiversity need to be addressed in greater detail in the later stages of the process, and/or during the investigation of offsets, specialists in relatively narrow fields of biodiversity pattern (e.g. particular threatened species or special habitat) or process (e.g. width of ecological corridor required to enable persistence of particular ecological process) should be appointed.

The Terms of Reference for specialists should specifically require that all four components of biodiversity that inform the rating of significance, as described below, are explicitly addressed. They should also ensure that the specialist considers direct (‘footprint’), indirect (experienced beyond the development site and/or at some future date), and cumulative (additive) impacts on biodiversity.

##### **Table 11**: Appropriate specialist involvement[[256]](#footnote-256)

| **Affected biodiversity/ ecosystem goods & services** | **Potential impact** | **Specialist involvement**  Varies, depending on type of ecosystem, habitats and species at risk and/or potential significance of impacts on biodiversity (e.g. in protected area or CBA) |
| --- | --- | --- |
| CBA, ESA | Aquatic CBAs and ESAs   * Changes to river, wetland hydrological functioning, availability and quality of water, flood regimes * Enhanced erosion and sedimentation (adverse effects for hydrology, river stability, water and habitat quality) * Loss, degradation of in-stream, riparian and floodplain habitat, and ecological connectivity * Extinction of RDB species owing to the above * Loss of ecosystems services (particularly provisioning and regulating services) | * An aquatic ecologist must be appointed to, as a minimum, assess the condition and potential biodiversity conservation value of aquatic CBAs that may be impacted by development.   Potentially,   * Hydrogeomorphologist * Riparian/wetland botanist * Zoologist |
| Terrestrial CBAs   * Loss, degradation of habitat (impacts on habitat availability/suitability for important plant and animal species) * Fragmentation, isolation of remnants * Changes to fire regimes * Breakdown of ecological processes, quality and viability of habitat, negative impacts on availability and suitability of habitat for plant and animal species * Increased risk of invasion by alien/undesirable species * Loss of ecosystem goods and services | A terrestrial ecologist must be appointed to assess the condition and potential biodiversity conservation value of terrestrial CBAs that may be impacted by development.  Potentially,, depending on the type of species or habitats present, it may be necessary to appoint a:   * Botanist * Zoologist (either a generalist or someone specialised in a particular taxonomic discipline, e.g. a herpetologist, ornithologist or an expert on a particular specie).. |
| FEPA, Ramsar site | * As for aquatic CBAs. * Loss of habitat for migrant birds | As above.  Potentially,   * Estuarine ecologist * Ichthyologist * Ornithologist |
| Protected areas | * As above. * Impacts compromise compliance of protected area management with international, legal and other obligations | As above.  Potentially,   * Protected areas planner |
| CR, EN, VU terrestrial ecosystems | * As for CBAs (aquatic and terrestrial) * Reduction in extent of available habitat relative to biodiversity targets propels affected ecosystems towards a higher degree of threat * Undermining of SA's ability to meet national and international targets and obligations with respect to *in situ* conservation of biodiversity * Loss of ecosystem goods and services | As above. |
| Natural vegetation/ habitat | * As for terrestrial CBAs | As above |
| Estuarine functional zone | * As for aquatic CBAs | As above.  Potentially,   * Estuarine ecologist * Estuarine hydrologist * Ichthyologist * Ornithologist |
| River system, estuary | * As for aquatic CBAs | As above. |
| Protected area expansion strategy | * As above | As above. Potentially,   * Protected areas planner |
| Coastal protection zone, mobile sand dunes | * Destabilisation of foredunes * Acceleration of coastal erosion * Mobilisation of wind-blown sand * Destruction of dune habitat and ecological gradient between low water mark and terrestrial 'mainland' ecosystems * Degradation of coastal corridors * Disturbances to important breeding, foraging etc habitat for threatened and near-threatened species * Potentially irreversible loss of ecological regulatory services (sand stabilisation, buffering against storm surges and rising sea levels) | As above. Potentially,   * Geomorphologist * Restoration ecologist * Botanist * Zoologist * Ornithologist, etc. |
| Threatened mammals | * Habitat loss, reduced population sizes, in-breeding depression, vulnerability to hunting and feral cats, dogs, etc aggravate conservation status of affected species * Illegal trade * Over-harvesting for traditional medicinal purposes | Potentially,   * Conservation biologist/ecologist * Zoologist specialising in conservation of species of concern, etc |
| Threatened Bats | * Habitat loss * Adverse changes to food web * Fatal collisions with wind turbines | As above. |
| Threatened Birds | * Habitat loss (including 'stepping stone' habitat for migrant species) * Adverse changes to food web * Fatal collisions with powerlines, wind turbines and stays * Over-harvesting for traditional medicinal purposes * Poisoning, hunting | As above. |
| Threatened Reptiles | * Habitat loss * Adverse changes to food web * Poisoning, pollution * Illegal trade | As above. |
| Threatened Amphibians | * Habitat loss * Adverse changes to food web * Poisoning, pollution * Illegal trade | As above. |
| Threatened fish | * Detrimental hydrological changes (availabiity and quality of water) * Habitat loss * Invasive species * Over-harvesting * Poisoning, pollution * Illegal trade | As above. Also,   * Aquatic ecologist |
| Threatened Invertebrates | * Habitat loss * Adverse changes to food web * Poisoning, pollution * Illegal trade | * As above. |
| Ecological corridors | * Degradation and loss of habitat (corridors are eventually 'all edge, no core') * Fragmentation and physical isolation of separate corridor remnants * Changes to fire and other disturbance regimes * Ecological processes supported by corridor start breaking down. * Invasive species and bush encroachment * Over-grazing, excessive fires, illegal hunting, trapping and dumping, etc | * Landscape ecologist * Species' specialists if impacts on corridor would negatively affect specific species and their habitat |
| Ecosystem goods and services | Degradation or loss of:   * Regulating services, e.g. flood attenuation, coastal protection and stability of river channels * Provisioning services, e.g. grazing, fish stocks, medicinal plants * Supporting services which maintain all other ecosystem services (such as soil formation, seed dispersal or pollination) * Cultural or life-fulfilling services, such as aesthetic beauty, cultural or religious meaning, or scientific value | Social / livelihoods specialist together with terrestrial ecologist, freshwater/ wetland ecologist, marine ecologist (as appropriate). May also be appropriate to involve a resource economist to evaluate the economic implications of risks and impacts on ecosystem goods and services, and if a project were to have more complex economic repercussions |

### Assessing risks and impacts, and evaluating their significance

Evaluating the potential significance of impacts (e.g. ‘low’, ‘moderate’ or ‘high’ significance), takes into account both the scientific/technical assessment and the social context and values of affected resources. Typically, the evaluation looks at magnitude, duration and extent of impacts in arriving at a significance rating; this approach – unacceptably - often ignores the values of resources to society and the related strategic goals, however.

**The significance of an impact depends on its magnitude at a defined scale, its extent, duration and irreplaceability**

***Magnitude*** of an impact is its intensity **at defined spatial scales** (e.g. total transformation of an area would be an impact of high intensity at a local scale; overgrazing could be an impact of low to moderate intensity at a regional scale)

***Extent*** is the **proportion** of the population or range of a given biodiversity feature, inversely related to viability of the remaining portion of that feature (e.g. if the last population of a threatened locally endemic plant species were to be lost, the extent would be global; if one or two individuals of a common species were to be lost, the extent would be local or site-specific; if populations of a threatened species were to be reduced, the extent would be national).

***Duration*** is the time period for which the impact would endure (e.g. short term, long term or permanent/ irreversible)

***Irreplaceability*** is a measure of the value of, and level of dependence on, impacted resources to society and/or local communities, as well as of consistency with policy (e.g. conservation) targets or thresholds.

#### Normative frameworks for valuing biodiversity

To evaluate the significance of impacts on biodiversity adequately, the impacts need to be interpreted within the context of international conventions; national, provincial and local laws, policies, plans and strategies, which reflect the values of broader society, and levels of human dependence on affected biodiversity. The evaluation of impact significance should thus take into account not only the current biodiversity and known trends in the affected area that are likely to affect biodiversity, but also:

* Objectives and targets for biodiversity conservation, and ecosystem status, derived from the NBA, listed threatened terrestrial ecosystems, biodiversity or bioregional plans (e.g. CBAs, ESAs, FEPAs), as well as the threatened status of species from Red Data Books, IUCN Red List and other sources (see section xyz); The vision, objectives and targets for biodiversity conservation contained in local plans, policies and strategies;
* Levels of public concern about, dependence on, or interest in, biodiversity, through scoping, which reflects societal values.[[257]](#footnote-257)

#### Stakeholder values

Local stakeholders and communities may attach specific direct or indirect use values to biodiversity which could be affected by a proposed project. These values may be different from the values of society as a whole. In determining the significance of impacts on biodiversity, therefore, it is important that the biodiversity specialist works closely with social and economic specialists, to ensure that these values are incorporated in the EIA[[258]](#footnote-258).

#### Biodiversity specialist

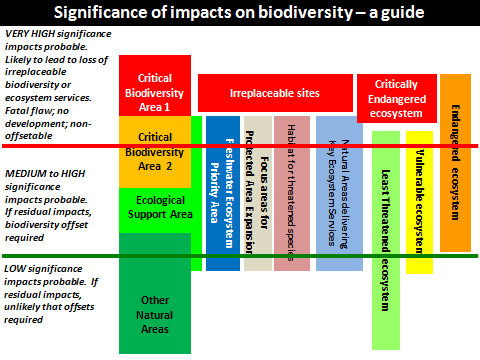
The biodiversity specialist should use **Figure xyz** as a guide to determine *thresholds of significance*, or changes in effects on biodiversity which would change a significance rating, e.g. from low to medium, or medium to high[[259]](#footnote-259). These thresholds are often linked to current societal values which determine what would be acceptable or unacceptable to society. When deciding on significance thresholds, it is important to take into account:

* Any trends with regard to biodiversity loss;
* The status of ecosystems and species;
* Conservation targets or goals; and
* Levels of dependence on affected biodiversity.

#### Biodiversity management objectives

Assessing potential impacts of alternatives relative to the **biodiversity management objectives** for CBAs, ESAs and other natural vegetation potentially provides a more relevant method of assessing impact significance than the conventional 'extent-magnitude-duration' method as it directly relates significance to the persistence of biodiversity. For example, if an impact that may lead to loss of habitat in a CBA means that the biodiversity management objectives for CBAs (manage land in support of biodiversity, prevent degradation, restore to a natural or near-natural condition) cannot be achieved, that impact must be viewed as highly significant – especially if the affected vegetation or plant species are classified as threatened, or the affected habitat forms an irreplaceable linkage in a highly fragmented landscape.

Assessing the potential significance on **ecosystem goods and services** requires an understanding of the range of benefits affected and the level of dependence of the beneficiaries on the affected ecosystem goods and services. It is essential, therefore, to engage interested and affected parties to find out what they use, consume and enjoy or value.



##### Figure ?: Thresholds of significance; a guide. *Acknowledgements: Jeff Manuel, SANBI*

### Mitigation assurance and Environmental Management Programmes

The Basic Assessment or Scoping and EIA provides key inputs into the EMPr and is the main tool for specifying how environmental impacts are to be mitigated and managed. The EMP must therefore meet good practice standards and satisfy legal requirements stipulated in the NEMA (Part B).

Once accepted by the competent authorities, the EMPr becomes an enforceable blueprint to manage impacts on biodiversity and ecosystem goods and services.

Comprehensive and timely implementation of mitigation measures, adaptive management, planning to respond quickly and effectively to upset or emergency conditions, and monitoring and evaluation are crucial ingredients of the Environmental Management Programme (EMPr), giving assurance that the intended outcomes of mitigation would be achieved.

In many cases, the scale and/or significance of impacts only become evident once construction or operation begins. It is thus essential to stipulate clear management targets, timeframes and measurable performance indicators in the EMPr.

### Biodiversity offsets and trade-offs

**Tradeoffs** occur when conflicting objectives are being pursued and a negative outcome in one area is exchanged for a positive outcome in another area (e.g. accepting biodiversity loss for an increase in jobs and revenue).

**Offsets** or **compensation** are measures taken to counterbalance the loss of something by providing gains equivalent to the loss; the purpose of offsets is to achieve a ‘no net environmental loss’ or a ‘net environmental benefit’ outcome. These gains must be **of the same type,** and **in the same time and space as the loss**. That is, loss of biodiversity cannot be offset by providing employment or infrastructure.

**Biodiversity offsets** are defined[[260]](#footnote-260) as ‘*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people’s use and cultural values associated with biodiversity’*.

In some situations, where resources are not limited, tradeoffs would be acceptable. However, in other situations, allowing additional negative impacts on resources that are important to us or on which we depend, would be unacceptable. In these situations, it is essential that:

* We do not permit loss of resources which cannot be fully compensated or offset because of their irreplaceability or vulnerability (e.g. highly threatened biodiversity or ecosystem goods and services for which there is no substitute); these impacts are termed ‘non offsetable’;
* Either ***biodiversity offsets*** (for biodiversity impacts) or biodiversity offsets and compensation (for ecosystem goods and services) are provided for negative impacts remaining after measures to avoid/ prevent, minimise and rehabilitate/ restore impacts have been taken into account.

Impacts on biodiversity that are likely to be ‘non offsetable’ must be identified at the earliest possible stage of the planning process by biodiversity specialists, and impacts on ecosystem services for which adequate compensation is improbable must be identified collaboratively by social and biodiversity specialists, engaging stakeholders to ensure that their values are taken into consideration.

‘Non-offsetable’ impacts, and impacts on ecosystem services that cannot be compensated, constitute ‘non-negotiables’ that must be excluded from tradeoffs. They must be avoided or prevented, or, if this is not possible and they are of sufficient magnitude, they should determine that the ‘no go’ alternative is selected[[261]](#footnote-261).

# PART E: BIODIVERSITY IMPACTS ASSOCIATED WITH DIFFERENT TYPES OF DEVELOPMENT

**NOTE on source of information**: This section draws heavily on the comprehensive ***Guidance Document on Biodiversity, Impact Assessment and Decision Making***, compiled by Susie Brownlie, Bryony Walmsley and Peter Tarr (2009) on behalf of the CBBIA-IAIA and SAIEA. The compilers of the guidance document are acknowledged as the primary reference for drafting of the following section.

## **INTRODUCTION** TO IMPACTS OF DEVELOPMENT ON BIODIVERSITY

It is practically impossible to predict how a particular development may impact on biodiversity without knowing anything about the receiving environment, or which aspects of the development may directly, indirectly or cumulatively translate into impacts on biodiversity pattern and process, and with what effect for the persistence of biodiversity across a range of ecological, spatial and temporal scales.

The potential impacts on biodiversity presented here in relation to specific types of development, and development contexts, are notional: they are offered as a guideline only. Each proposed development or change of land use must be informed by substantive screening, scoping and assessment, with specialist involvement where necessary, as explained in Part D.

## FLAGGING BIODIVERSITY IN SECTOR-SPECIFIC CONTEXTS

This section summarises potential impacts on biodiversity that may be associated with specific types of development, i.e.

|  |  |
| --- | --- |
| **Bounded or place-restricted infrastructure development**  **(pp x-y)** | * Mining and quarrying (prospecting, exploration, production and borrow pits) * Renewable energy * Peri-urban and urban fringe * Thermal power stations * Oil/gas wells |
| **Linear development**  **(pp x-y)** | * Powerlines, power transmission * Transport infrastructure: Roads, ppipelines; railways; bridges |
| **Coastal development**  **(pp x-y)** | * Ports, harbours, marinas; jetties, shipping; water-based recreation |
| **Agriculture, forestry and fisheries**  **(pp x-y)** | * Irrigation, dry land cultivation, animal production, grazing, plantations, orchards, vineyards * Agri-industrial processing * Aquaculture |
| **Development, use of water resources**  **(pp x-y)** | * Dams, reservoirs, pipelines, canals, inter-basin transfers, desalinisation plants * River maintenance * Inter-basin transfer of surface Channelisation * Hydropower * Groundwater exploration and abstraction |
| **Marine/ offshore development**  **(pp x-y)** | * Oil and gas |
| **Ecotourism**  **(pp x-y)** | * Lodges, trails, safaris, fly fishing, canoeing, rafting, game viewing, bird watching, camping, conservation areas, diving, snorkelling |
|  |  |

#### GENERIC BIODIVERSITY IMPACTS: BOUNDED OR PLACE-RESTRICTED INFRASTRUCTURE DEVELOPMENT

**MINING AND QUARRYING: Open cast, open pit and underground**

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| --- | --- |
| **Main Exploration and Prospecting Activities**   * Survey and mapping * Establishment of cut lines * Trenching, pitting, drilling and bulk sample collection * Trial mining * Pilot plant construction and operation * Exploration camp * Servicing vehicles and equipment (fuel and lubricant   management)   * Waste disposal | **Main Potential Impacts of Exploration and Prospecting on Biodiversity**   * Temporary disturbance of species at local level * Local degradation and loss of habitat * Road collisions * Dust smothering of vegetation * Poaching and firewood collection by workers * Introduction of alien species * Sediment runoff * Increased fire hazard * Opening up remote areas which could result in biodiversity impacts   **Main Impacts of Location, Planning and Design of Mines and Quarries on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during planning in order to try and avoid or minimise many of the impacts during later project stages:   * Proximity to proclaimed conservation areas; * Proximity to, or effect on priority ecosystems/ critical biodiversity areas identified in the relevant biodiversity, conservation or bioregional plan; * Proximity to surface water and aquifers * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Overburden removal and blasting * Access roads and tracks * Fence construction * Contractor’s camp, yard and workshops * Waste dump establishment and waste disposal * Bulk earthworks * Concrete batch plant * Building and plant construction * Installation of temporary and permanent services (water, sewage, power, telecoms, etc) * Laying of pipes and conveyors * Stormwater drainage and effluent management * Labour force * Construction traffic | **Main Potential Impacts of Construction on Biodiversity**   * Temporary and permanent loss of habitat (terrestrial, aquatic and/or coastal) * Habitat fragmentation, barriers to movement and loss of ecological corridors * Local loss of species * Introduction of alien species e.g. through seeds on vehicles and equipment, and disturbance of top soil * Road collisions with animals, birds * Dust smothering of vegetation along access roads * Interference with environmental flows (i.e. water) and ecosystem functioning * Scouring and erosion of wetlands and watercourses * Sedimentation of streams, rivers and wetlands * Contamination of water bodies by oil, cement and other products * Poaching and firewood collection by workforce and itinerant job seekers * Providing access to remote areas; influx of work seekers places pressure on ecosystem goods and services * Loss of access to ecosystem goods and services by local communities with resultant impacts on livelihoods (e.g. land for cultivation, grazing and harvestable materials) * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Indirect impacts on biodiversity due to resettlement of local communities to other areas |
| *\*Note: Activities and impacts associated with water supply, transmission lines and roads are addressed in the respective sector guidelines* | |
| **Main Operational Activities\***   * Drilling and blasting * Waste rock dumps * Ore conveyance (road, conveyor, cableway) * Processing plant * Smelter or refinery * Heap leach, bioreactors * Acid plant * Tailings and/or slimes disposal * Slag and/or process waste dumps * Water abstraction and use * Effluent disposal * Hazardous materials storage and disposal * Industrial waste disposal * Traffic * Workshops, offices, accommodation etc * Powerlines | **Main Potential Impacts of Mine Operations on Biodiversity**   * Direct loss and degradation of terrestrial, aquatic and/or coastal habitat * Habitat fragmentation, barriers to movement, loss of ecological corridors * Interruption and/or loss of migration corridors and disturbance of source-sink relationships * Direct loss of species in the area * Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower species resilience * High risk of pollution of land and water resources * Direct and indirect loss of terrestrial and aquatic habitat through pollution of surface and ground water and/or acid mine drainage where sulphide minerals interact with water and oxygen , siltation, dust smothering, , air pollution, reduction in river flows, soil contamination * Impact on vegetation and freshwater features due to lowering of water table resulting from groundwater abstraction * Dust smothering of vegetation along access roads and downstream of tailings (especially in arid regions) * Interference with environmental flows * Scouring and erosion of wetlands and watercourses * Sedimentation of streams, rivers and wetlands * Road collisions with birds and animals * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Alien species invasion (plants, pests, vermin, water weeds) |
| **Main Decommissioning and Closure Activities**   * Presence of open pit * Rehabilitation of dumps * Removal of all structures and waste * Water pollution control measures | **MainPotential Impacts of Mine Closure on Biodiversity**   * Re-colonisation of disturbed areas by invasive/opportunistic fauna and flora * Creation of new/different/degraded habitats * Transmission of polluted groundwater * Physical traps for wildlife e.g. open pits, shafts, trenches. |

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**THERMAL POWER GENERATION: Oil, coal, gas, biogas**

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| **Main Planning and Design Activities**   * Site selection * Secondary effects relating to the sourcing of energy (mines, gas wells, biodiesel plant production etc) * Choice of technology * Operational parameters (base load, peaking power) * Site layout and design | **Main Impacts of Planning and Design on**  **Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Proximity to proclaimed conservation areas; * Proximity to, or effect on priority ecosystems/ critical biodiversity areas identified in the relevant biodiversity, conservation or bioregional plan; * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services |
|  | |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Access roads and tracks * Fence construction * Contractor’s camp, yard and workshops * Waste dump establishment and waste disposal * Bulk earthworks * Concrete batch plant * Building and plant construction * Installation of temporary and permanent services (water, sewage, power, telecoms, etc) * Laying of pipes and conveyors * Storm water drainage and effluent management * Labour force * Construction traffic | **Main Impacts of Construction on Biodiversity**   * Temporary and permanent loss of habitat * Habitat fragmentation and loss of ecological corridors * Local loss of species * Introduction of alien species e.g. through seeds on vehicles and equipment, and disturbance of top soil * Road collisions with animals, birds * Dust smothering of vegetation along access roads * Sedimentation of streams, rivers, wetlands * Poaching and firewood collection by workforce and itinerant job seekers * Increased fire risk * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Introduction of alien species through seed transfer from vehicles and equipment |
|  | |
| **Main Operational Activities\***   * Combustion of raw materials to generate heat * Turbines and generators * Cooling units * Exhaust stacks * Switchyard * Compressors and boilers * Liquid fuel storage tanks * Cooling water intake and outlet structures * Water storage facilities * Waste water treatment plant * Hazardous materials storage and disposal * Industrial waste disposal * Workshops * Powerlines | **Main Impacts of Thermal Power Station Operations on Biodiversity**   * High risks of pollution and contamination of atmospheric, water resources and land * Direct loss of habitat and species in the area * Habitat fragmentation; * Interruption and/or loss of migration corridors and source-sink relationships; * Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower species resilience; * Alien species invasion into disturbed, areas; * Road collisions with animals and birds * Impact of heated effluent discharge to receiving waters on aquatic fauna and flora * Indirect loss of habitat through water utilisation (for cooling), pollution, dust smothering, acid rain, air pollution (CO2, SOx, NOx, heavy metals), reduction in river flows, soil contamination, etc * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns. |
|  | |
| **Main Decommissioning and Closure Activities**   * Removal of all structures and waste * Water pollution control measures * Rehabilitation of all waste dumps | **Main Impacts of Power Station Closure on Biodiversity**   * Re-colonisation of disturbed areas by opportunistic fauna and flora * Creation of new/different/degraded habitats * Potential for invasive species |

*\*Note: Activities and impacts associated with mining, oil and gas production, water supply, transmission lines and roads are addressed in the respective sector guidelines.*

**RENEWABLE ENERGY: Solar power, wind power (also see POWER TRANSMISSION)**

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| --- | --- |
| **Main Planning and Design Activities**   * Site selection * Erection of wind monitoring masts * Choice of technology * Operational parameters (base load, peaking power) * Site layout and design options | **Main responses of planning and design to biodiversity**  Site and corridor screening must be informed by the 'no net loss' and precautionary principles, i.e. significant impacts on biodiversity must be anticipated and prevented by means of positive planning and adapting designs to accommodate key biodiversity concerns. |
|  | |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Access roads and tracks * Power lines and sub stations * Development of borrow pits * Fence construction * Contractor’s camp, yard and workshops * Waste disposal * Bulk earthworks * Building and plant construction * Concrete batch plant * Installation of temporary services * Traffic * Labour force | **Main Impacts of Construction on Biodiversity\*\***   * Temporary and permanent loss of aquatic, terrestrial and/or coastal habitat * Habitat fragmentation, loss of connectivity, loss of ecological corridors * Bird, bat strikes involving pre-construction wind monitoring masts * Interruption of migration routes * Local loss of species * Road collisions with animals, birds * Effects of blasting on animal behaviour * Dust smothering of vegetation * Erosion of cleared areas * Sedimentation of watercourses and wetlands * Poaching and firewood collection by workforce and itinerant job seekers * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Providing access to remote areas; influx of work seekers places pressure on ecosystem goods and services; |
|  | |
| **Main Operational Activities\***   * Power generation * Powerlines | **Main Impacts of Operations on Biodiversity**   * Permanent loss of habitat (foundations, lay-down areas and roads) * Collisions of birds and bats with powerlines and/or wind turbines and central receiver towers (solar 'PV' facilities) * Collisions of birds with mirrors used to concentrate sunlight at PV plants * Birds suffer burns in proximity of central receivers or standby focal points (PV plants) * Electrocution of birds, bats resulting from collisions with powerlines * Habitat fragmentation, loss of connectivity, loss of ecological corridors * Interruption of migration routes * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Alien species invasion (terrestrial and aquatic weeds) |
| **Main Decommissioning and Closure Activities**   * Removal of all structures | **Main Impacts of Closure on Biodiversity**   * Re-colonisation of disturbed areas by opportunistic fauna and flora * Creation of new/different/degraded habitats * Potential for invasive species. |

*\*Note: Activities and impacts associated with quarries, water supply, transmission lines and roads are addressed in the respective sector guidelines.*

*\*\* See also sector guidance on water development infrastructure*

**PERI-URBAN AND URBAN FRINGE DEVELOPMENTS: Housing, golf courses, water treatment works, landfills, commercial**

|  |  |
| --- | --- |
| **Main Planning and Design Activities**   * Zoning applications * Land purchase * Design and layout alternatives * Provision for bulk services (water, power) * Infrastructure requirements (roads) * Site selection processes * Market demand studies | **Main Impacts of Planning and Design on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Extension of urban edge into undeveloped, 'green field' areas and agricultural land; * High demand for limited water resources places stress on existing schemes and requires possible development of new schemes with all the related impacts on biodiversity; * Unsustainable water use could compromise downstream environments and other users; * Proximity to proclaimed and future conservation areas; * Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers, ridges and any priority area identified in the relevant biodiversity, conservation or bioregional plan; * Temporary and permanent loss of aquatic, terrestrial and/or coastal habitat * Habitat fragmentation, loss of connectivity, loss of ecological corridors * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services. |
|  | |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Construction and/or upgrading of roads * Fence and wall construction * Contractor’s camp, yards and workshops * Concrete batch plant * Waste disposal * Bulk earthworks * Installation of bulk services (water, sewerage, power, telecoms) * Site development and building construction * Transportation of all raw materials to site * Construction traffic * Labour force | **Main Impacts of Construction on Biodiversity**   * Temporary and permanent loss of habitat * Habitat fragmentation * Local loss of species * Loss of ecological corridors * Introduction of alien species, especially plants and animals (pets) * Road collisions with animals, birds * Dust smothering of vegetation * Sedimentation of streams, rivers * Contamination of water resources by oil, cement and other compounds * Poaching and firewood collection by workforce and itinerant job seekers * Loss of access to ecosystem goods and services by local communities with resultant impacts on livelihoods * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Indirect impacts on biodiversity due to resettlement of local communities |
|  | |
| **Main Operational Activities\***   * High water consumption * Increased storm water runoff, sewage volumes and return flows * Application of fertilisers, pesticides, herbicides and fungicides in gardens, parks, golf courses etc * Groundwater abstraction * Greater energy requirements * Increased traffic and noise * Landscaping with alien species and irrigation * Increased waste production * Powerlines | **Main Impacts of Urban Fringe Developments on Biodiversity**   * Direct loss of habitat and/or habitat transformation * Habitat fragmentation * Direct loss of species in the area due to loss of habitat, road and power line collisions * Indirect loss of habitat through water pollution, dust smothering, air pollution, reduction in river flows, soil contamination * Erosion and sedimentation * Interruption and/or loss of migration corridors and perturbation of source-sink relationships * Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower species resilience * Alteration in predator-prey relationships * Reduction in river flows resulting in impacts on fish migration and breeding and other aquatic organisms * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Lowering of the groundwater table will impact on rooting depths of plants, especially trees * Alien species invasion (plants, birds, pets, pests, vermin, water weeds) |

#### GENERIC BIODIVERSITY IMPACTS: LINEAR DEVELOPMENT

**POWER TRANSMISSION: Overhead and underground**

|  |  |
| --- | --- |
| **Main Planning and Design Activities**   * Route selection * Substation site selection | **Main Impacts of Planning and Design on**  **Biodiversity**  Corridor must be informed by the 'no net loss' and precautionary principles, i.e. significant impacts on biodiversity must be anticipated and prevented by means of positive planning and adapting the selection of transmission corridors to accommodate key biodiversity concerns. The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Proximity to proclaimed and future conservation areas; * Proximity to sensitive ecosystems, especially pans, dams, rivers, lagoons, estuaries, cliffs and ridge lines where birds congregate to roost, breed and feed; * Proximity to, or effect on priority ecosystems/ critical biodiversity areas identified in the relevant biodiversity, conservation or bioregional plan; * Areas of high botanical importance; * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services. |
|  | |
| **Main Construction Activities**   * Vegetation clearance or trimming along the route * Access roads and tracks * Foundation excavation and concreting * Pylon erection * Line stringing and tensioning * Contractor’s camp, yard and workshop * Waste disposal * Labour force | **Main Impacts of Construction on Biodiversity**   * Dust smothering of vegetation * Erosion of stream- and river banks * Sedimentation of watercourses and wetlands * Erosion of hillsides during access road construction * Poaching and firewood collection by construction workforce * Increased fire hazard * Local and temporary disturbance of species due to the presence of people, vehicles and helicopters * Possible introduction of alien species through the introduction of seeds by vehicles |
|  | |
| **Main Operational Activities**   * Routine line inspections * Occasional maintenance | **Main Impacts of Transmission Lines on Biodiversity**   * Habitat fragmentation and, potentially, changes to vegetation community structure and the local occurrence of Red List plant populations owing to intensive management (particularly brush-cutting) in powerline corridors -- which may also increase the risk of infestation by invasive plants. * Bird mortalities resulting from collisions with the lines during flight * Bird mortalities resulting from electrocution. This occurs when bird droppings touch a live wire while the bird is perched on the pylon * The pylons provide good perching spots for raptors and there is often increased predation along transmission line routes, especially in arid areas with few natural perches, leading to changes in predator-prey relationships * Pylons provide attractive nesting sites for several species of birds * Indirect effects of increased access to remote areas along power line routes and subsequent loss of species through settlement, hunting, habitat destruction and transformation * Ongoing erosion of access roads * Possible increase in veld fires |
| * Main Decommissioning Activities * Removal of all structures and waste | **Main Impacts of Transmission Line Decommissioning on Biodiversity**   * Re-colonisation of disturbed areas by fauna and flora * Potential for invasive species |

**TRANSPORT INFRASRUCTURE: Roads, railways, pipelines, conveyor belts and bridges**

|  |  |  |
| --- | --- | --- |
| **Main Planning and Design Activities**   * Route selection * Gradient design * Surface design and geometry * Bridge and causeway site selection | **Main Impacts of Planning and Design on**  **Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Condition and stability of watercourses directly related to catchment health, land-uses upstream and functional connectivity between channels and floodplains: Planning must respond to off-site drivers of environmental change * Proximity to proclaimed and future conservation areas; * Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers, coastal zones, estuaries and any area identified in the relevant biodiversity, conservation or bioregional plan; * Habitat fragmentation, barriers to migration, loss of ecological corridors; * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services. * Minimise the need for cut and fill; * Minimise number of river crossings * Avoid creating nick-points in watercourses * Maximise hydraulic capacity of culverts * Ensure structures accommodate base flows | |
| **Main Construction Activities\***   * Vegetation clearance along the route * Topsoil removal and storage * Laying of temporary by-passes * Development of borrow pits and quarries * Blasting of cuttings * Fill operations * Excess spoil disposal * Grading, earthmoving, laying of base course and sub-base layers * Construction of river crossings including river diversion works, earthworks, brick and concrete work, etc * Installation of culverts and construction of storm water drains * Establishment of temporary access roads and tracks * Site establishment including construction of contractor’s camp, yard and workshop areas, fencing, establishment of water supply * Waste disposal (hazardous and non-hazardous) * Temporary ablution facilities * Creosoting yard * Asphalt plant and application of wearing course * Diesel tanks and refuelling point * Concrete batch plant * Aggregate stockpiles * Toll plaza construction (if a toll road) * Labour force | | **Main Impacts of Construction on Biodiversity**   * Temporary deflection of flows * Erosion of stream- and river banks * Sedimentation of streams * Alteration of drainage lines and perturbation of wetlands * Temporary and permanent loss of vegetation * Dust smothering of vegetation * Erosion of hillsides during cut and fill activities * Poaching and firewood collection by construction workforce and itinerant job seekers * Local and temporary disturbance of species due to the presence of people and vehicles and blasting activities * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns * Possible introduction of alien species and scavengers * Contamination of water courses from sediment, bitumen waste, general waste and litter, hydrocarbon spills from vehicles and equipment * Soil contamination from hydrocarbon spills * Soil compaction * Temporary or permanent disruption of ecological corridors and migration routes * Increase in road kills due to construction traffic |
| **Main Operational Activities**   * Occasional maintenance * Traffic flow * Secondary developments * Toll gate operation (if a toll road) | | **Main Impacts of Roads and Bridges on Biodiversity**   * Altered hydrological functioning and environmental flows * Increased scour, erosion and destabilisation of downstream reaches * Loss of habitat and associated species * Permanent disruption of ecological corridors and migration routes linking different ecosystems or across altitudinal gradients * Animal and bird collisions * Indirect effects on biodiversity and ecosystem services due to increased access to remote areas along new roads and subsequent land use impacts including settlements, habitat clearing, hunting, etc. * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high latitudes) * Secondary development along road * Introduction of invasive species |
| **Main Decommissioning Activities**   * Removal of all construction facilities * Ripping, grading and contouring * Landscaping, topsoil replacement and rehabilitation | | **Main Impacts of Road and Bridge Decommissioning on Biodiversity**   * Re-colonisation of disturbed areas by fauna and flora * Potential for invasive species |

*\* Activities relating to the development of borrow pits and quarries are covered under Mining. Secondary impacts resulting from road construction e.g. agriculture, tourism are addressed under the relevant sectors.*

#### GENERIC BIODIVERSITY IMPACTS: COASTAL DEVELOPMENT

**Ports, harbours, marinas, jetties, shipping, water-based recreation**

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| --- | --- |
| **Main Planning and Design Activities**   * Site selection * Choice of design and layout * Alternative schemes | **Main Impacts of Planning and Design on**  **Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * The conservation status of the marine/lake/river environment * The importance of river banks and shores for habitat, erosion   protection, ecosystem functioning and provision of goods and services   * The flood and tidal regimes * Water and sediment movement and obstruction * Water quality |
|  | |
| **Main Construction Activities\***   * Shoreline vegetation clearance * Stabilisation of sand dunes * Water diversion works * Dredging and disposal of dredge spoil * Blasting (in some cases) * Bulk earthworks * Piling and concrete work including batch plant * Construction of groynes, breakwaters and other protection works * Landside construction of buildings and related infrastructure * Access roads and tracks * Contractor’s camp, yard and workshop * Waste disposal * Construction traffic * Labour force | **Main Impacts of Construction on Biodiversity**   * Direct loss of coastal/shore/bank vegetation and faunal habitat * Temporary or permanent interruption of ecological corridors * Accelerated/changed patterns of coastal erosion and accretion owing to incorrect siting of infrastructure * Destabilisation of naturally vegetated dunes and sediment corridors * Artificial stabilisation of naturally dynamic dunes and sediment corridors * Possible release of toxic substances (e.g. heavy metals) during dredging and dredge spoil disposal activities * Smothering of benthic fauna due to dredge spoil disposal * Increased turbidity due to dredging, spoil disposal, re-suspension of fines and other construction activities will affect light penetration and ecosystem functioning * Accidental hydrocarbon spills will have acute, chronic and lethal effects on marine and shoreline organisms * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Introduction of alien organisms and plants from construction equipment and machinery * Effects of blasting on marine mammals, seabirds, fish and fisheries |
|  | |
| **Main Operational Activities\***   * Arrival and departure of vessels * Loading and offloading of vessels * Boat launching * Handling, storage, conveyance and transfer of cargo including containers, break bulk cargoes, diesel and oil, liquid products and bulk materials * Marine services including boat cleaning, painting, repairing, welding etc * Ongoing dredging of channels * Commercial fishing operations and processing facilities * Solid waste disposal from wharf operations and vessels * Effluent and runoff disposal from wharf and wharf-side factories, processing plants and stockpiles * Motorised water sports including: yachting, boating, water-skiing, jet skis * Re-fuelling and provisioning of boats * Discharge of ballast water | **Main Impacts of water-based infrastructure & recreation on biodiversity**   * Introduction of alien species from boats and discharge of ballast water * Accelerated/changed patterns of coastal erosion and accretion owing to incorrect siting of infrastructure * Destabilisation of naturally vegetated dunes and sediment corridors * Artificial stabilisation of naturally dynamic dunes and sediment corridors * Erosion of banks and shorelines by boat wakes leads to loss of breeding sites for birds and other organisms * Impact of oil spills on seabirds, marine, inter-tidal and shore organisms (acute and chronic effects, mortality) * Depletion of fish stocks due to over-fishing * Indiscriminate fishing methods, exceeded quotas and illegal catch sizes affect species diversity and population sizes * Impacts of litter and waste on fish, marine mammals and shoreline fauna * Direct and indirect effects on sensitive ecosystems e.g. coral reefs, mangrove swamps, estuaries etc due to perturbations in wave, current and sediment transport regimes resulting in shoreline accretion and/or erosion * Noise and disturbance from boat-based recreation on bird breeding and feeding sites * Impacts on water quality due to erosive effects of wind and water on loose material stockpiles e.g. coal, iron ore, manganese, titanium etc * Impacts on water quality and marine organisms from runoff and effluent disposal from shore-based activities e.g. fish processing factories * Toxic effects of anti-fouling paints on aquatic/marine organisms resulting in growth and development effects * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Impact of ship movements on marine mammals e.g. dugongs, whales and other cetaceans * Bioaccumulation of toxins in edible marine organisms e.g. mussels, crabs, lobsters with indirect effects on human health * Loss of subsistence fisheries and marine harvesting areas |
|  | |
| **Main Decommissioning and Closure Activities**   * Removal of all structures | **Main Impacts of Closure on Biodiversity**   * Re-colonisation of disturbed areas by fauna and flora * Creation of new/different/destabilised/degraded habitat. * Major changes to coastal processes, landforms and environmental utility of coast. * Potential for invasive species |

#### GENERIC BIODIVERSITY IMPACTS: AGRICULTURE AND FORESTRY

**Irrigation, dry land arable, animal production, grazing, plantations, orchards, vineyards, aquaculture, fisheries, agri-industrial processing**

|  |  |
| --- | --- |
| **Main Planning Activities**   * Identification of land for cultivation * Water resource planning (identification of dam sites, location of irrigation infrastructure and drainage ditches * Installation and expansion of infrastructure (e.g. roads, employee accommodation, causeways, packing sheds, cellars, irrigation equipment) * Protection of agricultural land and property against flood damage * Decision regarding use of GMOs * Crop/animal type selection * Choice of irrigation system (if required) * Source of suitable quantity and quality of water for irrigation (surface and/or groundwater) * Location of market and transportation options * Climate and soil investigations | **Main Impacts of Planning on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Condition and stability of watercourses directly related to catchment health, land-uses upstream and functional connectivity between channels and floodplains: Planning must respond to off-site drivers of environmental change * Proximity to proclaimed and future conservation areas; * Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers and any priority area identified in the relevant biodiversity, conservation or bioregional plan; * Loss or degradation of vegetation that contributes to habitat fragmentation and disruption of ecological processes. * Unknown impacts of GMOs on local species diversity * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services; * Unsustainable water use could compromise downstream environments and other users. |
|  | |
| **Main Construction Activities**   * Clearance of vegetation * Establishment of irrigation system (pumps, pipes etc) if required * Construction of tunnels, hothouses, if required * Fencing * Construction of farm buildings, sheds, packing areas, storage, animal production facilities etc * Construction of access roads and tracks | **Main Impacts of Construction on Biodiversity**   * Permanent loss of vegetation * Habitat fragmentation * Interruption of ecological corridors and migration paths * Erosion and stream sedimentation * Draining of wetlands |
|  | |
| **Main Operational Activities**   * Tilling of soil (if required) * Sowing or planting * Fertilisation and soil conditioning * Application of pesticides, herbicides and fungicides * Irrigation (if necessary) * Cropping or harvesting * Processing and packing * Transportation of products * Disposal of animal wastes * Disposal of agri-chemical wastes | **Main Impacts of Agriculture and Forestry on Biodiversity**   * Monoculture leads to loss of species diversity * Population explosions (e.g. rodents, gramnivores) and ecosystem perturbation * Introduction of persistent organic pollutants in soils and water bodies resulting in acute and chronic effects in animals through direct and indirect uptake and bioaccumulation * Return flows from irrigated fields can lead to increased salinisation of receiving water bodies leading to ecosystem changes and loss of species diversity * Increased eutrophication of water bodies from elevated nitrogen and phosphate loads in irrigation runoff, seepage water, and effluent from feedlots, abbatoirs and cellars, resulting in the growth of algae and invasive water plants with a concomitant change in benthic species as well as physico-chemical characteristics of the water. * Potential for faecal contamination of drinking water from feedlots and stock watering points * Reduction in downstream flows due to irrigation quotas and forest uptake * Erosion and increased sediment yield from fields, overgrazed areas and clear-felling * Over-cropping may lead to soil nutrient depletion and compaction * Potential for genetically modified, invasive and alien species to displace native species * Loss of, or interruption of ecological corridors linking different ecosystems or across altitudinal gradients * Conflicts with wildlife (e.g. elephants) which may be attracted to crops |
|  | |
| **Main Decommissioning Activities**   * Cease agricultural activities, remove all fences and structures | **Main Impacts of Decommissioning on Biodiversity**   * Slow return of biodiversity |

#### GENERIC BIODIVERSITY IMPACTS: WATER RESOURCES DEVELOPMENT

**Dams, reservoirs, pipelines, canals, inter-basin transfers, desalinisation plants, and groundwater exploration and abstraction**

|  |  |
| --- | --- |
| **Main Planning and Design Activities**   * Site and route selection * Choice of design * Selection of alternative schemes | **Main Impacts of Planning and Design on**  **Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Condition and stability of watercourses directly related to catchment health, land-uses upstream and functional connectivity between channels and floodplains: Planning must respond to off-site drivers of environmental change * The conservation status of the river and dam basin * The presence of important downstream conservation   areas or priority areas identified in the relevant biodiversity, conservation or bioregional plan   * Fish migration patterns and fisheries * The importance of riverine vegetation for habitat, erosion   control, ecosystem functioning and provision of goods and services   * The flood regime and the importance of wetlands in regulating floods * Sediment movement * Water flow characteristics * Water quality and the importance of potential wetland loss on downstream water quality * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation. |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Trench excavation for pipes and canals * Blasting and tunnelling (if required) * Quarrying for fill materials * Water diversion works and coffer dams * Access roads and tracks * Fence construction * Contractor’s camp, yard and workshops * Waste disposal * Bulk earthworks * Building and plant construction * Concrete batch plant * Installation of temporary and permanent services (water, sewage, power, telecoms) * Reservoir construction * Dam filling * Traffic * Labour force | **Main Impacts of Construction on Biodiversity**   * Temporary and permanent loss of habitat * Road collisions with animals, birds * Dust smothering of vegetation * Alteration of downstream sediment dynamics in streams, rivers, wetlands * Poaching and firewood collection by workforce and itinerant job seekers * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Habitat fragmentation * Local loss of species * Introduction of aquatic alien species. * Providing access to remote areas; influx of work seekers places pressure on ecosystem goods and services * Loss of access to ecosystem goods and services by local communities with resultant impacts on livelihoods * Indirect impacts on biodiversity due to resettlement of local communities |
| **Main Operational Activities\***   * Impoundment of water * Controlled release of water to suit operational requirements * Drawdown of water level in impoundments * Dredging and disposal of silt from dams * Water transfer * Canal operation | **Main Impacts of Water Projects on Biodiversity**   * Direct loss of habitat and species * Change in habitat from flowing river to an impoundment * Indirect loss of downstream habitat and species through perturbation in river flows and flood regime, altered physical and chemical characteristics of water * Altered patterns of erosion and silt deposition downstream * Habitat fragmentation * Interruption and/or loss of migration corridors especially for fish * Canals can act as death traps for all species or barriers to movement * Changes in predator-prey relationships * Alien species invasion (terrestrial and aquatic weeds) * Possible transfer of species between catchments * Contamination of groundwater or surrounding environment by chemical or effluent used or generated by groundwater exploration * Volume of groundwater in storage or entering groundwater storage (recharge) is changed * Groundwater flow regime is changed * Saline intrusion into coastal aquifers owing to excessive abstraction rates * Groundwater abstraction can lower water table, negatively impacting on groundwater-dependent ecosystems or water availability for humans and livestock * Changes in land cover (e.g. loss of indigenous vegetation) can negatively impact on aquifer recharge and water quality * Potential land subsidence and development of sinkholes |
| **Main Decommissioning and Closure Activities**   * Removal of all structures | **Main Impacts of Closure on Biodiversity**   * Re-colonisation of disturbed areas by fauna and flora * Creation of new/different habitats * Potential for invasive species |

*\*Note: Activities and impacts associated with quarries, transmission lines, roads and water-based recreation are addressed in the respective sector guidelines.*

**Hydropower: Dams, pumped storage, run of river**

|  |  |
| --- | --- |
| **Main Planning and Design Activities**   * Site selection * Choice of technology * Positioning of turbines (above ground, underground, in the dam wall) * Operational parameters (base load, peaking power) * Site layout and design options | **Main Impacts of Planning and Design on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Condition and stability of watercourses directly related to catchment health, land-uses upstream and functional connectivity between channels and floodplains: Planning must respond to off-site drivers of environmental change * The conservation status of the river * The presence of important downstream conservation areas * Fish migration patterns and fisheries * The importance of riverine vegetation for habitat, erosion control, ecosystem functioning and provision of goods and services * The flood regime and the importance of wetlands in regulating floods * Sediment movement * Water flow characteristics * Water quality and the importance of wetland loss on downstream water quality * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation |
|  | |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Blasting * Quarrying for fill materials * Water diversion works and coffer dams * Access roads and tracks * Fence construction * Contractor’s camp, yard and workshops * Waste disposal * Bulk earthworks * Building and plant construction * Concrete batch plant * Installation of temporary and permanent services (water, sewage, power, telecoms) * Dam filling * Traffic * Labour force | **Main Impacts of Construction on Biodiversity\*\***   * Temporary and permanent loss of habitat * Road collisions with animals, birds * Dust smothering of vegetation * Alteration of sediment dynamics in streams, rivers * Poaching and firewood collection by workforce and itinerant job seekers * Habitat fragmentation * Local loss of species * Interruption of migration routes, especially fish * Loss of ecological corridors * Introduction of aquatic alien species. * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Providing access to remote areas; influx of work seekers places pressure on ecosystem goods and services; * Loss of access to ecosystem goods and services by local communities with resultant impacts on livelihoods; * Indirect impacts on biodiversity due to resettlement of local communities |
|  | |
| **Main Operational Activities\***   * Impoundment of water * Controlled release of water to suit operational requirements * Drawdown of water level in impoundments * Power generation * Dredging/sluicing and disposal of silt * Hazardous materials storage and disposal * Industrial waste disposal * Workshops * Employee accommodation | **Main Impacts of Hydropower Operations on Biodiversity**   * Direct loss of habitat and species (direct inundation and loss of flow upstream of tailrace) * Change in habitat from flowing river to an impoundment * Indirect loss of downstream habitat and species through perturbation in river flows and flood regime, altered physical and chemical characteristics of water * Altered patterns of erosion and silt deposition downstream of the installation * Habitat fragmentation * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Interruption and/or loss of migration corridors especially for fish * Changes in predator-prey relationships * Alien species invasion (terrestrial and aquatic weeds) |
|  | |
| **Main Decommissioning and Closure Activities**   * Removal of all structures | **Main Impacts of Closure on Biodiversity**   * Re-colonisation of disturbed areas by fauna and flora * Creation of new/different habitats * Potential for invasive species. |

#### GENERIC BIODIVERSITY IMPACTS: MARINE AND OFF-SHORE DEVELOPMENT

**Oil and gas**

|  |  |
| --- | --- |
| **Main Exploration, Planning and Design Activities**   * Choice of development solutions * Pipeline route selection * Shooting seismic | **Main Impacts of Exploration, Planning and**  **Design on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the exploration, planning and design stage:   * Noise and sound waves from shooting seismic * Disturbance of marine mammals and seabirds from increased vessel and helicopter activities * Waste and effluent disposal from exploration vessels * Disturbance of the seafloor and coral reefs by anchors * Risks of accidental oil spillage |
|  | |
| **Main Construction Activities\***   * Well drilling and logging from drilling rig or semi-submersible unit * Well testing and flaring (if necessary) * Pipeline laying * Construction of pipeline landfall facilities * Supply base/port facilities * Land-based contractor’s camp, yard and workshops * Helicopter operations * Service vessel activity * Waste management * Disposal of produced water | **Main Impacts of Construction on Biodiversity**   * Impacts on benthic fauna from the discharge of drilling mud and drill cuttings * Impacts on fish and fisheries due to the discharge of produced water, sewage, galley wastes, ship/rig runoff etc\*\* * Impacts on seabirds and marine life (especially crustaceans) from accidental oil spills * Disturbance of marine mammals and seabirds due to increased vessel and helicopter activity * Temporary and locally permanent loss of habitat for near shore and beach organisms during the construction of pipeline land fall structures * Possible introduction of alien species through discharge of ballast water and vessel hulls * Emission of CO2, NOx, SOx, VOCs from flares, exhaust emissions, acid rain and nitrogen fall-out * Illegal disposal of hazardous and industrial waste at sea resulting in pollution and ingestion by marine fauna leading to chronic and acute effects and mortalities * Fishing exclusion zones around well development facilities could place pressure on other fishing areas * Bioaccumulation of heavy metals in seabirds, mammals, fish and crustaceans with impacts on species physiology, food chain functioning and possible toxic health effects in humans |
|  | |
| **Main Operational Activities (platforms or sub-sea manifolds)**   * Presence of a production platform, with:   + Flare gas and recovery systems   + Power generation plant   + Flow lines and return lines   + Accommodation for platform staff   + Waste management system   + Sewage plant   + Helicopter operations   + Service and supply vessels   + Disposal of produced water and other process chemicals   + CO2 injection and storage   OR   * Remote operation of sub-sea manifolds, with:   + Flow lines, control umbilicals, gas/oil pipeline, corrosion inhibitor pipelines   + Pipeline landfall structures   + Land-based gas conditioning plant   + Effluent and waste disposal | **Main Impacts of Oil and Gas Production on Biodiversity**   * Impacts on fish and fisheries due to the discharge of produced water, sewage, galley wastes, ship/platform runoff etc\*\* * Impacts on seabirds and marine life (especially crustaceans) from accidental oil spills, blow outs * Disturbance of marine mammals and seabirds due to helicopter activity * Emission of CO2, NOx, SOx, VOCs from flares, exhaust emissions, acid rain and nitrogen fall-out * Illegal disposal of hazardous and industrial waste at sea resulting in pollution and ingestion by marine fauna leading to chronic and acute effects and mortalities * Fishing exclusion zones around well development facilities and platforms could place pressure on other fishing areas Bioaccumulation of heavy metals in seabirds, mammals, fish and crustaceans with impacts on species physiology, food chain functioning and possible toxic health effects in humans |
|  | |
| **Main Decommissioning Activities**   * Abandonment/removal of all sub-sea structures * Removal of platform * Decommissioning of wells * Demolition and removal of land-based structures | **Main Impacts of Oil and Gas Decommissioning on Biodiversity**   * Return of species to area * Return of fishing boats to area * Improvement in water quality * Risk of oil and other contamination during rig stripping, well closure and rig removal |

#### GENERIC BIODIVERSITY IMPACTS: ECOTOURISM

**Lodges, trails, safaris, fly fishing, canoeing, rafting, game viewing, bird watching, camping, conservation areas, diving, snorkelling**

|  |  |
| --- | --- |
| **Main Planning and Design Activities**   * Zoning applications * Land purchase * Site and route selection * Alternatives assessment * Opportunities and constraints analysis * Layout and design options | **Main Impacts of Planning and Design**  **on Biodiversity**  The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:   * Proximity to proclaimed conservation areas; * Proximity to, or effect on priority ecosystems/ critical biodiversity areas identified in the relevant biodiversity, conservation or bioregional plan; * The impact on the country’s, province’s or municipality’s ability to meet their obligations or targets with regard to biodiversity conservation; * Fatal flaws relating to permanent and irreplaceable loss of species, habitat or ecosystem services; * Increased demand for limited water resources places stress on existing schemes and requires possible development of new schemes with all the related impacts on biodiversity; * Unsustainable water use could compromise downstream environments and other users |
|  | |
| **Main Construction Activities\***   * Vegetation clearance * Topsoil stripping * Construction and/or upgrading of roads * Fence and wall construction * Contractor’s camp, yards and workshops * Concrete batch plant * Waste disposal * Bulk earthworks * Installation of bulk services (water, sewerage, power, telecoms) * Site development and building construction * Transportation of all raw materials to site * Construction traffic * Labour force | **Main Impacts of Construction on Biodiversity**   * Temporary and permanent loss of habitat * Road collisions with animals, birds * Dust smothering of vegetation * Sedimentation of streams, rivers * Poaching and firewood collection by workforce and itinerant job seekers * Habitat fragmentation * Local loss of species * Loss of ecological corridors * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Introduction of alien species. * Indirect impacts on biodiversity due to resettlement of local communities |
|  | |
| **Main Operational Activities\***   * Water consumption * Increased stormwater runoff, sewage volumes and return flows * Application of fertilisers, pesticides, herbicides and fungicides in gardens, landscaped areas etc * Groundwater abstraction * Energy needs * Increased traffic * Landscaping with alien species and irrigation * Increased waste production | **Main Impacts of Ecotourism Developments on Biodiversity**   * Direct loss of habitat and/or habitat transformation * Habitat fragmentation * Direct loss of species in the area due to loss of habitat, road and powerline collisions * Indirect loss of habitat through water pollution, dust smothering, air pollution, reduction in river flows, soil contamination, boat wake erosion, trampling etc * Interruption and/or loss of migration corridors and source-sink relationships due to fence construction * Water abstraction could result in a reduction in river flows resulting in impacts on fish migration and breeding and other aquatic organisms * Lowering of the groundwater table will impact on rooting depths of plants, especially trees * Introduction of alien species e.g. trout will affect native species and predator-prey relationships * Improved conservation of species and habitats * Need for game and veld management * Improved awareness of biodiversity conservation issues by the public through exposure to the environment * Noise and lights (particularly at night) may disorientate and/ or disturb fauna, and / or change behaviour patterns (especially in high southern latitudes) * Re-introduction of locally extinct species * Re-instatement of natural vegetation and removal of alien plants * Loss of access to ecosystem goods and services by local communities with resultant impacts on livelihoods |

*\*Note: Activities and impacts associated with water supply, transmission lines, water-based infrastructure development and roads are addressed in the respective sector guidelines.*

### COMPLEMENTARY INFORMATION ON SPECIFIC DEVELOPMENT TYPES

Please refer to **xyz** for minimum guidelines for considering biodiversity in screening, scoping and impact assessment. A number of guidelines and publications which may be useful in specific sector projects are listed below:

**General Biodiversity and Impact Assessment**

Brownlie S, Walmsley B and Tarr P (2009) *Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa.* CBBIA-IAIA Guidance Series. Capacity Building in Biodiversity and Impact Assessment (CBBIA) Project, International Association for Impact Assessment (IAIA), North Dakota, U.S.A.

Brownlie S. 2005. *Guideline for involving biodiversity specialists in EIA processes: Edition 1*. CSIR Report No ENV-S-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

United Nations Environment Programme (UNEP) (2006) *Voluntary guidelines on biodiversity-inclusive impact assessment*. Conference of Parties to the Convention on Biological Diversity, Eight meeting, Curitiba, Brazil, 20-31 March 2006.

**Ecosystem guidelines for environmental assessment and management**

Cadman M, de Villiers C, Lechmere-Oertel R and D McCulloch (2013) *Grassland Ecosystem Guidelines*. Grasslands Programme, South African National Biodiversity Institute, Pretoria. <http://www.grasslands.org.za/document-archive/category/21-grassland-ecosystem-guidelines>

De Villiers CC, Brownlie S, Clark B, Day EG, Driver A, Euston-Brown DIW, Helme NA, Holmes PM, Job N and AB Rebelo (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Fynbos Forum and Botanical Society of South Africa, Kirstenbosch. <http://bgis.sanbi.org/FF\_Ecosystem\_Guidelines.pdf>

Job N, Snaddon K, Day L, Nel J and L Smith-Adao (2008) Management guidelines for aquatic ecosystems of the Sandveld, Upper Breede and Riversdale coastal plain planning domains. Prepared by the Freshwater Consulting Group and Council for Scientific and Industrial Research for the C.A.P.E. fine-scale planning project. Cape Town and Stellenbosch. http://bgis.sanbi.org

**Development of water resources**

Department of Water Affairs (Undated ) Policies, procedures, guidelines and strategies relating to water quality management. Department of Water Affairs, Pretoria. http://www.dwaf.gov.za/Dir\_WQM/docsPolic.asp

Department of Water Affairs (2007) Guidelines for catchment management strategies. By SR Pollard, D du Toit, Y Reddy and T Tlou. Department of Water Affairs and Forestry, Pretoria, South Africhttp://www.dwaf.gov.za/Documents/Other/CMA/CMSFeb07/CMSFeb07Ed1.pdf

McCartney M P (2007) Decision support systems for large dam planning and operation in Africa. Colombo, Sri Lanka: International Water Management Institute. 47 p. (IWMI Working Paper 119) http://www.iwmi.cgiar.org/Publications/Working\_Papers/working/WOR119.pdf

Saayman I (2005) Guideline for involving hydrogeologists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 D. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

Water Research Commission (2009) *WetManagement Series – Integrated tools for effective management and rehabilitation of wetlands*. Water Research Commission, Pretoria.

Water Research Commission (2010) *WET-RehabPlan* – WET-Services; WET-Health; WET-Legal; WET-Rehabilitation evaluation guidelines; WET- Rehabilitation monitoring guidelines, etc. By Kotze D, Ellery W, Rowntree M, Grenfell M, Marneweck G, Nxele I, Breen C, Dini J, Batchelor A, and E Sieben . Water Research Commission, Pretoria. http://www.wrc.org.za/Pages/DisplayItem.aspx?ItemID=9374&FromURL=%2FPages%2FDefault.aspx%3F

**Mining**

Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute (2013) *Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector*. Pretoria.

International Council on Mining and Metals (ICMM)) (ed L. Starke) (2006) *Good Practice Guidance for Mining and Biodiversity*. ICMM and IUCN, London.

International Finance Corportion (2014) *A guide to biodiversity for the private sector*. [www.ifc.org/biodiversityguide](http://www.ifc.org/biodiversityguide)

**Wind farms and solar energy facilities**

Birdlife SA and the Endangered Wildlife Trust (2013) *Minimum Requirements for Avifaunal Impact Assessment for Wind Energy Facilities*. BirdLife and EWT http://www.birdlife.org.za/component/docman/doc\_download/41-minimum-requirements-for-avifaunal-impact-assessment-for-wind-energy-facilities?Itemid=200

BirdLife South Africa (2014) *A Important Bird and Biodiversity Areas Directory*. (note this resource covers all nine provinces) http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory#western-cape-province

Jenkins AR, van Rooyen CS, Smallie JJ, Harrison JA, Diamond5 M and HA Smit(2012) *BirdLife South Africa Endangered Wildlife Trust Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa*. http://www.ewt.org.za/programmes/WEP/pdf/BAWESG\_Monitoring%20guidelines\_Version%201\_04042011.pdf

Rodrigues, L., L. Bach, M.-J. Dubourg-Savage, J. Goodwin & C. Harbusch (2008): *Guidelines for consideration of bats in wind farm projects*. EUROBATS Publication Series No. 3 (English version). UNEP/EUROBATS Secretariat, Bonn, Germany, 51 pp.

Smit HA (Undated) *BirdlifeSA* *Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa.* conservation@birdlife.org.za

**Roads, gas pipelines and other transport infrastructure**

Byron, H (2000) *Biodiversity and Environmental Impact Assessment: A Good Practice Guide for Road Schemes*. The RSPB, WWF-UK, English Nature and the Wildlife Trusts, Sandy.

Esler KJ and Milton SJ (2006) Towards best practice in management of road, power line and rail reserves. *Occasional Paper Series 1*, Centre for Excellence for Invasion Biology, University of Stellenbosch, Stellenbosch.

Janicke S (2002) *Stream channel and floodplain erosion*. Water and Rivers Commission Report No RR18. The Government of Western Australia, Perth.

Keller G and Sherar J (2003) *Low-volume roads engineering: Best management practices*. United States Department of Agriculture, US Forest Service & USAID.

Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (2006) *Assessment and evaluation of proposed and existing off-road routes: A guide for environmental assessment practitioners, authorities and route planners*. DEA&DP, Cape Town.

**Coastal development**

Council for the Environment (1991) *A policy for coastal zone management in the Republic of South Africa: Part 2 – Guidelines for Coastal Land-use*. Council for the Environment, Pretoria.

Department of Environmental Affairs and Tourism (1998) *Guidelines for the control and management of activities in Sensitive Coastal Areas, Vols 1-4.* Department of Environmental Affairs and Tourism, Pretoria.

Department of Environmental Affairs and Development Planning (2010) *Development of a Methodology for Defining and Adopting Coastal Development Setback Lines*. DEA&DP, Cape Town.

Tinley KL (1985) Coastal dunes of South Africa, *South African National Scientific Programmes Report* No 109. CSIR, Pretoria.

**Agriculture, forestry and aquaculture**

Department of Environmental Affairs (2013) *Draft* *environmental impact assessment guideline for aquaculture in South Africa.* GN 101 of 2013, 11 February 2013

Food and Agricultural Organisation (1992) *Guidelines for the promotion of environmental management of coastal aquaculture development* http://www.fao.org/docrep/T0697E/T0697E00.htm

Forestry SA (2002) *Environmental guidelines for commercial forestry plantations in South Africa*. Forestry SA, Rivonia.

Hinrichsen HI (2007) *Generic Environmental Best Management Practice Guideline for Aquaculture Development and Operation in the Western Cape*. Prepared by the Division for Aquaculture, University of Stellenbosch, for the Department of Environmental Affairs and Development Planning, Cape Town.

Integrated Production of Wine (2005) *IPW Guidelines for managing waste water and solid waste.* http://www.ipw.co.za/content/guidelines/WastewaterApril05English.pdf

Integrated Production of Wine (2007) *IPW Guidelines for Cellars.*

Knight FH, Conrad J and Helme N (Undated) Biodiversity best practice guidelines for potato production in the Sandveld. Potatoes SA and CapeNature.

Kotze DC (2004) *Guidelines for managing wetlands in forestry areas*. Developed for the Mondi Wetlands Programme by the Centre for Environment and Development University of KwaZulu-Natal, Pietermaritzburg.Pretorius G (Undated) Biodiversity best practice guideline for the sustainable production of rooibos. Natura Libra Environmental Consultants cc, Malmesbury.

SA Wine and Spirits Board (2012) Integrated Production: Guidelines for Farms. Compiled by ARC Infruitec-Nietvoorbij, in consultation with the vine and wine industry. ARC Infruitec-Nietvoorbij, Stellenbosch.

Scotcher JSB (2009) *The GreenChoice Reference for Well-Managed Farms 2009/2010 version*, A. Goldblatt (ed.). Unpublished report to GreenChoice (a World Wide Fund for Nature and Conservation International partnership).

South African National Biodiversity Instittute (2014) *Grazing and Burning Guidelines: Managing Grasslands for Biodiversity and Livestock Production*. Compiled by Lechmere-Oertel, RG. South African National Biodiversity Institute,Pretoria.<http://www.grasslands.org.za/document-archive/category/5-agriculture>

**Biodiversity Offsets**

Business and Biodiversity Offsets Programme (BBOP) (2012) *Biodiversity Offset Design Handbook-Updated*. BBOP, Washington, D.C. Available from: http://bbop.forest-trends.org/guidelines/Updated\_ODH.pdf

Department of Environmental Affairs and Development Planning 2011. *Information Document on Biodiversity Offsets*. EIA Guideline and Information Document Series. Prepared by Brownlie S with assistance from Botha M, Helme N and Van Zyl H.

Ezemvelo KZN Wildlife*. Norms and Standards for Biodiversity Offsets*, KwaZulu Natal province, 2013: final draft.

GDARD 2013*. Draft Guideline on Biodiversity Offsets in Gauteng Province*. Prepared by S Brownlie and M Laros.

MacFarlane D, A von Hase and S Brownlie (2012) T*owards a best-practice guideline for wetland offsets in South Africa*. Final Report (beta version). Prepared for SANBI.

**Ecosystem services:**

DH Landers and Nahlik AM. 2013. *Final Ecosystem Goods and Services Classification* System (FEGS-CS). EPA/600/R-13/ORD-004914. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

World Resources Institute. *Ecosystem Services Review for Impact Assessment.* <http://www.wri.org/publication/weaving-ecosystem-services-into-impact-assessment>www.wri.org.

# PART F: MINIMUM REQUIREMENTS FOR BIODIVERSITY-INCLUSIVE IMPACT ASSESSMENT

## MINIMUM REQUIREMENTS: PRE-APPLICATION SCREENING[[262]](#footnote-262)

In the ***pre-application planning*** phase of a proposed project, during conceptual planning. Biodiversity specialists would contribute in a proactive and advisory way, by identifying key biodiversity considerations that should inform planning at a sufficiently early stage to influence the eventual design of projects (which may include pursuing alternatives or the option of not proceeding at all).

This phase identifies and incorporates environmental opportunities and constraints into the early stages of project planning and design, prior to the submission of an application for statutory approval. It includes:

* The identification of negative impacts potentially of such high significance that they would lead to loss of irreplaceable biodiversity; such impacts could not be compensated or offset and would constitute ‘fatal flaws’. They would thus need to be avoided or prevented to reduce the risk of the project not being authorised, through the identification of project alternatives.
* The identification of negative impacts on ecosystems potentially of such high significance that they would lead either to a loss of irreplaceable ecosystem services to current beneficiaries of those services, and/or an increase in the risk of natural disasters (e.g. floods); such impacts may not be able to be compensated or offset and could constitute ‘fatal flaws’. They would thus need to be avoided or prevented to reduce the risk of the project not being authorised, through the identification of project alternatives.
* The early identification and evaluation of conceptual alternatives (e.g. location, type and scale, design, siting, layout, technology and management) which could prevent, avoid or reduce significant impacts on biodiversity, or enhance or secure opportunities for biodiversity conservation; and
* The early identification of the need for biodiversity offsets where the project is clearly of overriding national importance but where there are no project alternatives that could avoid or prevent significant negative impacts on biodiversity.

With regard to gathering enough relevant baseline information, the following aspects should be addressed:

1. **Overview and trends**

Provide a general overview of the site and its habitat condition, as well as the ecological viability of the site in relation to the surrounding landscape.

Note any trends likely to affect biodiversity on the site; e.g., land use implications of relevant Spatial Development Frameworks, informal settlement patterns, authorised development in the vicinity, probable climate change effects (particularly on the coast and/or where natural hazards such as flooding may be exacerbated, and/or where setback lines are legally required or have been determined).

1. **Areas of strategic biodiversity significance: composite biodiversity considerations**

In terms of assessing a site’s **strategic biodiversity** **significance**, indicate if the proposed project could impact any of the following priority areas for biodiversity conservation:

***2.1 Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)***

1. Critical Biodiversity Areas (or areas of equivalent status such as irreplaceable and highly significant areas, from provincial spatial biodiversity or ‘C’ plans)
2. Ecological Support Area (ESA)
3. Other Natural Vegetation.

***2.2 Freshwater Ecosystem Priority Areas (FEPAs) and Ramsar Sites***

1. River Freshwater Ecosystem Priority Area (FEPA) and associated sub-quaternary catchment
2. Wetland or estuary FEPA
3. FEPA wetland cluster
4. FEPA fish sanctuary and associated sub-catchment
5. FEPA fish support area and associated sub-catchment
6. FEPA water or sub-water management area
7. Phase 2 FEPA
8. FEPA upstream management area
9. A free-flowing river
10. Ramsar site
11. Within 500m of any of a) – h).

***2.4 Protected areas***

Protected areas in terms of the Protected Areas Act including

1. Special Nature Reserves
2. National Parks and Provincial Nature Reserves
3. World Heritage Sites
4. Marine Protected Areas
5. Specially Protected Forest Areas; and
6. Mountain Catchment Areas
7. Buffer zones of protected areas.

***2.3 Other important areas for biodiversity conservation***

1. Trans-frontier conservation areas remaining outside formally protected areas
2. High water yield areas or ‘water towers’
3. Areas important for climate change adaptation and resilience
4. Coastal protection zone
5. Estuarine functional zone
6. Focus areas for protected area expansion (land-based and marine) in the National Protected Area Expansion Strategy.
7. **Biodiversity pattern**

In terms of **biodiversity pattern**, identify or describe:

***3.1 Ecosystem and community level***

1. For terrestrial ecosystems, the main vegetation type[[263]](#footnote-263), its aerial extent and interaction with neighbouring types, soils or topography.
2. For freshwater ecosystems, the type of system and its condition or health, and its role in the affected sub-catchment.
3. For estuarine, marine and coastal ecosystems, the type of system and its condition or health, and its role in the wider land/ seascape.
4. Listed threatened terrestrial ecosystems.
5. Other threatened ecosystems or ecosystems that are in need of protection.[[264]](#footnote-264).
6. The types of plant communities that occur in the vicinity of the site.
7. The types of animal communities (fish, invertebrates, birds, mammals, reptiles, amphibians, as relevant).

***3.2 Species level (flora and fauna)***

1. Red Data Book (RDB) or Red Listed species (e.g. see *Red List of South African Plants* http://redlist.sanbi.org/;give location if possible using GPS).[[265]](#footnote-265)
2. The estimated populations and/or number of individuals of the RDB or Red Listed species, in relation to their total range and/or as a proportion of the overall population.
3. The likelihood of other RDB or Red Listed species, undescribed species or highly localised endemics, migratory species, or species of conservation concern, occurring in the vicinity.
4. Listed threatened or protected species.
5. Species protected in terms of the National Forests Act, Marine Living Resources Act, provincial conservation laws or other relevant legislation.

***3.3 Other pattern issues***

1. Any landscape features that may have biodiversity significance or rare or important vegetation/faunal associations.
2. The condition of the site in terms of current or previous land uses.
3. The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or mining (areas where alien cover is the result of previous disturbance are generally more difficult to restore than previously undisturbed sites that are infested with aliens).
4. **Biodiversity process**

In terms of biodiversity **process**, identify or describe:

1. The key ecological “drivers” of ecosystems on the site and in the vicinity e.g. fire.
2. The current level of fragmentation of habitat on the development site and in the wider landscape, and any natural habitat buffers surrounding the site.
3. Whether or not the site forms part of any fixed (e.g. watercourses, ridges) or flexible (e.g. mountain to sea, upland to lowland) ecological corridors,
4. Any vegetation boundaries where there is a change of underlying geology or soil type, and/or where different biomes meet (e.g. fynbos and forest).
5. The Present Ecological State of wetlands, the condition and related functioning of rivers and estuaries (if present), in terms of water quantity and quality, sedimentation and erosion, flow and flood regime.
6. Whether or not the ecological reserve has been determined for any affected watercourse and/or larger receiving river system.
7. Any dynamic ecological processes that are on, or affect, or if changed would affect areas downstream of, the site, such as sand movement, meandering river mouth/ estuary, changing flooding or sedimentation patterns.
8. **Ecosystem goods and services**

In terms of biodiversity **process**, identify or describe:

1. Access to, and direct use of, the site and/or its biodiversity by local communities
2. Levels of direct dependence by local communities on biodiversity and/or ecosystems on the site and, in the case of rivers and aquifers, at the scale at which resource-dependent communities may be affected by changes to the system
3. The extent to which local communities and society as a whole rely indirectly on the site for services of value to (e.g. a reliable supply of freshwater, protection against flooding).
4. **Map**

Indicate on a topographical map or orthomap, preferably at a scale ≥ 1:10 000:

1. The area that would be impacted by the proposed development;
2. The area that would be impacted by any ‘associated’ activities or infrastructure that is essential for the success of the development, and which would impact on the same ecosystems as the development itself.
3. Areas of strategic biodiversity significance identified above.

## MINIMUM REQUIREMENTS: SCOPING

The purpose of scoping, through engagement with stakeholders and input from specialists as deemed appropriate, is to:

* identify the key biodiversity/ ecosystem goods and services issues
* identify reasonable and feasible alternatives (e.g. different locations, types of activity, layouts or designs, technology and/or phasing options) that could avoid, prevent or minimise negative impacts on biodiversity and/or ecosystem goods and services
* identify any biodiversity ‘showstoppers’, ‘fatal flaws’ and/or key risks to the outcome of the application
* identify the need for specialist studies to address potentially significant impacts on biodiversity and key ecosystem goods and services, and
* draw up appropriate Terms of Reference for specialist studies as part of the Environmental Impact Assessment phase.

The following criteria would provide triggers to involve a biodiversity specialist:

1. ***Legal triggers***, such as permit requirements (e.g. for removing or trading in protected or endangered species), existing legislation (e.g the NEMA and Biodiversity Act may require an EIA for activities to be undertaken within threatened ecosystems or involving threatened species) and future legislation, may trigger the need for specialist involvement. These legal requirements are not addressed in detail in this guideline. Where the legal trigger for EIA is biodiversity-related, it is advisable for the EIA practitioner to involve a biodiversity specialist as early as possible, either to confirm that biodiversity is indeed a potentially significant issue and to advise accordingly, or to ‘sign off’, with sound justification, that there would not be significant impacts on biodiversity.
2. ***Lack of information*** about the receiving environment to determine reliably whether impacts on biodiversity could be significant.
3. ***The presence of important biodiversity pattern,*** such as:

* A protected or threatened ecosystem, or an area recognized as important from a biodiversity perspective (e.g. centre of endemicity, core or buffer area of a Biosphere Reserve, area zoned or demarcated for protection in a Conservation Plan, Spatial Development Framework, Environmental Management Framework, Biodiversity Network or similar plans); or
* A protected or threatened species (e.g. Red Data Book or IUCN Red List species, or species listed in terms of the Biodiversity Act);
* Ecosystems or organisms known to have high levels of endemicity (e.g. freshwater systems in the Western Cape have extremely high levels of threatened and endemic fish species).

1. ***Important ecological processes***, such as:

* A local or regional ecological corridor or buffer for ecological or evolutionary processes (e.g. a component of an ecological gradient or important link to other areas or ecosystems, possibly comprising a sand movement corridor, river corridor, upland lowland gradient, coastal corridor, migration corridor, etc.;
* Tracts of indigenous habitat connecting remnants of a particular ecosystem or vegetation type, on which the viability of that ecosystem may depend;
* Important habitat for breeding, feeding, refuge, a particular stage of a life cycle, or migration for a threatened, protected, commercially valuable or declining species (e.g. habitat on which a key insect pollinator of threatened plant species is dependent for breeding);
* A highly dynamic, unstable or mobile ecosystem (e.g. sand dunes or floodplain);
* Key processes which drive and ensure persistence of ecosystems (e.g. fire in fire-dependent ecosystems), and which must be maintained.

1. ***Important ecosystem goods or services in the area***,which support lives or livelihoods, such as:

* Reserves for harvest of natural products, natural grazing areas for livestock;
* Wetlands, floodplains or flood moderation areas, groundwater recharge areas;
* Reefs or sand dunefields which buffer coastal areas;
* A landscape, area, site, species or individual of a species (e.g. tree) prized for its heritage, recreational, tourism, aesthetic, religious or other cultural value;
* Unique or significant opportunities which could enhance or influence the proposed development (e.g. ecotourism, important and harvestable species, etc.).

1. ***Potential of the proposed project***, because of its nature, to pose a significant threat either directly or indirectly to biodiversity (e.g. hazardous installation, high potential for air, soil or water pollution, disturbance of contaminated sediments, dust fallout, noise/ vibraton and light pollution, etc.). Where pollution is identified as an issue, a biodiversity specialist is invariably needed to address effects on valued or important receiving ecosystems and species.
2. ***Potential of a component of biodiversity or receiving ecosystems*** to pose a threat to the proposed project (e.g. disease vectors, flooding, waterlogging).

Whilst the specialist may be asked to provide a written professional opinion, it would not be appropriate to commission detailed specialist studies as part of scoping.

## MINIMUM REQUIREMENTS: ENVIRONMENTAL IMPACT ASSESSMENT

For ***each of the four categories of biodiversity issues set out below the text box***, the following information must be provided:

1. The **significance** of the impact, taking into account its magnitude, extent and duration, as well as implications in relation to policy or strategic goals and targets (following the approach given in this document, section ???);
2. Measures to **avoid or prevent** negative impacts;
3. Measures to **minimise** negative impacts that cannot altogether be avoided or prevented;
4. **Alternatives** that have been investigated to avoid/ prevent, and/or minimise potentially significant negative impacts;
5. Extent to which impact is **reversible** and/or wouldresult in **irreplaceable loss,** would undermine biodiversity policies or conservation targets and/or increase the vulnerability of parties dependent on affected ecosystem goods and services; and
6. Proposed measures to **remedy** negative impacts ***after*** steps to avoid/ prevent and minimise negative impacts have been taken. In the event that offsets would be required, it is essential that a reliable measure of these residual negative impacts is obtained in order to design an appropriate and adequate offset.
7. Any proposed measures to enhance or rebuild degraded ecosystems in an effort to make a net positive contribution to biodiversity and/or ecosystem goods and services.
8. **Assurances or guarantees** that the proposed mitigation measures would be effective and successful, and that adequate provision has been made for their successful implementation (particularly where biodiversity offsets are involved). It should be noted that an environmental authorisation may require the holder of that authorisation to furnish the competent authority with proof of compliance with the requirements regarding financial provision (R543, NEMA 2010 Regulations).
9. Aclear statement about the **assumptions and limitations** of the study, in particular with regard to:

* Gaps in information
* Absence of seasonal sampling where it would compromise the identification of, and assessment of impacts on, biodiversity
* Uncertainties in predicting impacts
* Uncertainties with regard to the effectiveness of measures to minimise negative impacts on biodiversity
* Uncertainties with regard to the effectiveness of proposed rehabilitation; and
* Uncertainties in predicting residual negative impacts.

Engagement with parties with an interest in or responsibility for biodiversity conservation, and/or beneficiaries of ecosystem goods and services that would be affected by the proposed development, is essential.

**Category 1: Impact on areas of strategic biodiversity significance: ability to achieve strategic biodiversity goals and conservation targets**

1. CBAs
2. FEPAs
3. Protected areas
4. Other important areas for biodiversity conservation.

Would the residual loss of habitat or environmental degradation affecting the above areas compromise their ecological management objectives or conservation targets?

**Category 2: Impact on pattern**

1. Ecosystems and community level
2. Species level (flora and fauna)
3. Other pattern issues.

Would theresidual loss of area of habitat, or of populations or individuals, result in a change in their threat or conservation status, and/or compromise their ecological management objectives or conservation targets?

**Category 3: Impact on process**

1. Ecological drivers
2. Spatial components of ecological processes, ecological corridors
3. Fragmentation and buffers
4. Present ecological state/ condition and functioning of aquatic ecosystems
5. Ecological reserve
6. Dynamic ecological processes.

Would the residual loss of area of habitat result in greater fragmentation and/or interruption of ecological corridors at landscape level, an irreversible reduction in ecological functioning, removal of key ecological drivers (e.g. exclusion of fire), and/or the inability to meet ecological reserve requirements for freshwater ecosystems?

Would dynamic ecological processes associated with natural hazards or disasters pose a risk to the project?

**Category 4: Impact on ecosystem goods and services**

1. Access to and direct use of biodiversity/ ecosystem goods and services by local communities
2. Ecosystem services on which local communities and society as a whole rely indirectly on the site for services of value to (e.g. a reliable supply of freshwater)
3. Changes to levels of vulnerability of affected beneficiaries.

Would the residual impacts of the proposed activity result in a change in the vulnerability of affected parties over time? Are substitutes that would be accessible, affordable and acceptable to them as a replacement for ‘lost’ goods and services, for the duration of the impacts?

1. **Map**

Provide an overlay of the topographical map or orthomap, preferably at a scale ≥ 1:10 000, on which areas of strategic biodiversity significance and the area impacted by the proposed development are shown, the following:

1. The area (and ha) and condition of different ecosystem/ vegetation types that would be impacted by the proposed development;
2. The area (and ha) that would be impacted by any ‘associated’ activities or infrastructure that is essential for the success of the development, and which would impact on the same ecosystems as the development itself.
3. Areas of strategic biodiversity significance identified above.
4. Any ‘set aside’ areas of vegetation and other habitat that would not be developed or otherwise transformed in light of their conservation significance;
5. Areas that would be left intact to act as ecological corridors or ‘stepping stones’ to maintain ecological functioning, including fire in fire-prone systems;
6. Setback areas between areas of conservation concern/ significance and components of development that would be conserved in their natural state to act as buffers to potential impacts (e.g. along roads, next to dumps or sources of dust or emissions, next to sources of potentially polluting effluent, etc.)
7. Areas requiring special management attention (e.g. areas of invasive alien vegetation to be cleared, etc.).

# PART G: DECISION SUPPORT TOOL

Please refer to the interactive Excel spreadsheet.

**REFERENCES**

Aronson J, Floret C, LeFloc’h E, Ovalle C and Pontanier R (1993) Restoration and Rehabilitation of Degraded Ecosystems in Arid and Semi-Arid Lands. A view from the South. *Restoration Ecology¸* March 1993*:* 8-17.

Brownlie S (2005) *Guideline for involving biodiversity specialists in EIA processes: Edition 1*. CSIR Report No ENV-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Brownlie S, de Villiers C, Driver A, Job N, Von Hase A and Maze K (2005) Systematic conservation planning in the Cape Floristic Region and Succulent Karoo, South Africa: Enabling sound spatial planning and improved environmental assessment. *Journal of Environmental Assessment Policy and Management* 7(2): 201-228.

Brownlie S, Walmsley B and P Tarr (2009) *Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa*. CBBIA-IAIA Guidance Series: Capacity Building in Biodiversity and Impact Assessment (CBBIA)Project, International Association for Impact Assessment (IAIA), North Dakota, USA.

Cadman M, Petersen C, Driver A, Sekhran N, Maze N and Munzhedzi S (2010) Tools for mainstreaming in land-use planning and decision-making. In Cadman (et al.) *Biodiversity for Development: South Africa’s Landscape Approach to Conserving Biodiversity and Ensuring Ecosystem Resilience*. SANBI, Pretoria.

Cairns J (1993) Ecological restoration: Replenishing our national and global ecological capital. In: Saunders, Hobbs and Ehrlich (eds.) *Nature Conservation 3: Reconstruction of fragmented ecosystems*. Virginia Polytechnic Institute and State University, Blacksburg, Virgiia, pp. 193-208.

Callicott JB, Crowder LB and Mumford K (1999) Current normative concepts in conservation, *Conservation Biology* **13**: 22-35.

Cowling RM and Pressey RL (2003) Introduction to systematic conservation planning in the Cape Floristic Region. *Biological Conservation* **112**, pp 1-13.

Cowling RM, Pressey RL, Rouget M and Lombard AT (2003) A conservation plan for a global biodiversity hotspot – the Cape Floristic Region, South Africa. *Biological Conservation*, vol 112, pp 191-216.

Cumming, T (2014) Investing in Ecological Infrastructure*.* Unpubl. Presentation, National Business and Biodiversity Network, South African National Biodiversity Institute, Kirstenbosch.

Dalal-Clayton B and B Sadler (2005) *Strategic Environmental Assessment: A Sourcebook and Reference Guide to International Experience.* London: Earthscan.

de Villiers CC (2007) Threatened biodiversity, the NEMA EIA regulations and cultivation of virgin land: More of the sorry same? *Potchefstroom Electronic Law Journal*. Vol 3, pp 1-42.

de Villiers CC and Hill RC (2008) Environmental Management Frameworks as an alternative to farm-level EIA in a global biodiversity hotspot: A proposal from the Cape Floristic Region, South Africa. *Journal of Environmental Assessment Policy and Management* 10(4), pp 333-360.

de Villiers CC, Brownlie S, Clark B, Day EG, Driver A, Euston-Brown DIW, Helme NA, Holmes PM, Job N and AB Rebelo (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape,* Fynbos Forum and Botanical Society of SA, Kirstenbosch.

Department of Agriculture, Forestry and Fisheries (DAFF) (2009) *Policy principles and guidelines for control of development affecting natural forests.* DAFF, Pretoria.

Department of Agriculture, Forestry and Fisheries (DAFF) (2012) *Abstract for Agricultural Statistics 2012*. DAFF, Pretoria.

Department of Environmental Affairs and Tourism (DEAT) (2005). *South Africa’s National Biodiversity Strategy and Action Plan.* DEAT, Pretoria.

Department of Environmental Affairs and Tourism (DEAT), Republic of South Africa (2006). *South Africa Environmental Outlook: A report on the state of the environment*. Pretoria: DEAT.

Department of Environmental Affairs (DEA), Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute (2013) *Mining and Biodiversity Guideline*: *Mainstreaming biodiversity into the mining sector*. DEA and SANBI, Pretoria.

Department of Water Affairs (DWA) (2008) *Updated Manual for the Identification and Delineation of Riparian Areas*. DWA, Sub-directorate: Streamflow reduction activities, Pretoria.

Department of Water Affairs (DWA) (2013) *Strategic Overview of the Water Sector in South Africa*. DWA, Pretoria.

Driver A, Cowling RM and K Maze (2003). *Planning for Living Landscapes: Perspectives and Lessons from South Africa.* Cape Town: Botanical Society of South Africa and Washington DC: Center for Applied Biodiversity Science at Conservation International.

Driver A, Maze K, Rouget M Lombard AT, Nel J, Turpie JK, Cowling RM, Desmet P, Goodman P, Harris J, Jonas Z, Reyers B, Sink K and Strauss T (2005) National Spatial Biodiversity Assessment 2004: Priorities for biodiversity conservation in South Africa. *Strelitzia* **17**. South African National Biodiversity Institute, Pretoria.

Driver A, Nel JL, Snaddon K, Murray K, Roux DJ, Hill L, Swartz ER, Manuel J and Funke N (2011) *Implementation Manual for Freshwater Ecosystem Priority Areas*. Water Research Commission Report No 1801/1/11, South African National Biodiversity Institute, Pretoria.

Driver A, Sink, KJ, Nel, JN, Holness, S, Van Niekerk, L, Daniels, F, Jonas, Z, Majiedt, PA, Harris, L and K Maze (2012) *National Biodiversity Assessment 2011: An assessment of South Africa’s biodiversity and ecosystems. Synthesis Report*. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

Folke C, Pritchard L, Berkes F, Colding J, and U Svedin (2007) The problem of fit between ecosystems and institutions: Ten years later*. Ecology and Society* 12(1): 30. [online] URL: http://www.ecologyandsociety.org/vol12/iss1/art30/ (accessed 12/06/2013).

Franklin JF, Cromack K, Denison W, et al. (1981) *Ecological Characteristics of old-growth Douglas-fir forests*. USDA Forest Service General Technical Report PNW-118. Pacific North-west Forest and Range Experimentation Station, Portland, Oregon.

Glazewski J (2000). *Environmental Law in South Africa.* Durban: Butterworths.

Hanson, C, Ranganathan J,Iceland, C and J Finisdore (2012) *The Corporate Ecosystem Services Review: Guidelines for Identifying Business Risks and Opportunities Arising from Ecosystem Change*. Version 2.0. Washington, DC: World Resources Institute.

Hoffman MT (1997) Human impacts on vegetation. In RM Cowling, DM Richardson DM and SM Pierce (eds) *Vegetation of Southern Africa*. Cambridge University Press, Cambridge, pp 507-534.

Holmes PM, Esler KJ, Richardson DM and Witowski ETF (2008) Guidelines for improved management of riparian zones invaded by alien plants in South Africa. *South African Journal of Botany* **74**, pp 538-552.

IAIA (2005)Biodiversity-inclusive impact assessment. *Special Publication Series No 3*. IAIA, Fargo, ND.

Job, Nancy, Kate Snaddon, Liz Day, Jeanne Nel, Lindie Smith-Adao (2008) *C.A.P.E. fine-scale planning project: Aquatic ecosystems of the upper Breede River valley planning domain*. Freshwater Consulting Group and Council for Scientific and Industrial Research.

Landers DH and Nahlik AM (2013). Final Ecosystem Goods and Services Classification System (FEGS-CS). EPA/600/R-13/ORD-004914. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

Le Maitre D, Milton SJ, Jarmain C, Colvin CA, Saayman I and JHJ Vlok (2007) Linkng ecosystem services and water resources: landscape-scale hydrology of the Little Karoo. *Frontiers in Ecology and the Environment,* 5(5), 261-270.

Maia J, et al. (2011): Green Jobs: An estimate of the direct employment potential of a greening South African economy. Industrial Development Corporation, Development Bank of Southern Africa, Trade and Industrial Policy Strategies.

Margules[,](http://www.nature.com/nature/journal/v405/n6783/full/405243a0.html#a1#a1)C. R. and. Pressey, R. L (2000) Systematic conservation planning Nature **405**, 243-253

Mucina L and Rutherford MC (eds) (2006) The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* **19**, South African National Biodiversity Institute, Pretoria.

Mucina L, Rutherford MC and Powrie LM (eds.) (2005) The Vegetation Map of South Africa, Lesotho and Swaziland. *Strelitzia* **19**, South African National Biodiversity Institute, Pretoria.

Nicholas Smith & Associates (2006) *Guideline document on environmental legislation applicable to conservation bodies in the Western Cape*. Prepared for the Table Mountain Fund Capacity Building Programme, Cape Town.

Noss RF (1990) Indicators for monitoring biodiversity: A hierarchical approach. *Conservation Biology*, Vol 4 No 4, pp 355-364.

O'Farrell PJ and Anderson PML (2010) Sustainable multifunctional landscapes: A review to Implementation. *Environmental Sustainability* **2**, pp 59-65.

Ollis DJ, Snaddon CD, Job NM and N Mbona (2013) Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. *SANBI Biodiversity Series* 22. South African National Biodiversity Institute, Pretoria.

Pence GQK (2008) *C.A.P.E. Fine-Scale Systematic Conservation Planning Assessment: Technical Report*. Produced for CapeNature as part of the GEF-funded C.A.P.E. Fine-Scale Biodiversity Planning Project. Cape Town, South Africa.

Pierce SM, Cowling RM, Knight AT, Lombard AT, Rouget M and Wolf T (2005) Systematic conservation planning products for land-use planning: Interpretation for implementation. *Biological Conservation* **125**, 441-458.

Preston GR, Robbins N and Fuggle RF (1996) Integrated Environmental Management. In Fuggle, R.F. and Rabie, M.A. (eds) *Environmental Management in South Africa.* Juta and Co, Ltd, Wetton, pp 748-761.

Ramsar Convention Secretariat (2010) *Impact assessment: Guidelines on biodiversity-inclusive environmental impact assessment and strategic environmental assessment*. Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 16. Ramsar Convention Secretariat, Gland, Switzerland

Rebelo AG (1997) Conservation. In Cowling RM, Richardson DM and SM Pierce (eds) *Vegetation of Southern Africa*. Cambridge University Press, Cambridge, pp 507-534.

Reyers B, Rouget M, Jonas Z, Cowling RM, Driver A, Maze K and Desmet P (2007) Developing products for conservation decision-making: lessons from a spatial biodiversity assessment for South Africa. *Diversity and Distributions*, 1-11.

Rouget M, Cowling RM, Pressey RL and Richardson DM (2003) Identifying spatial components of ecological and evolutionary processes for regional conservation planning in the Cape Floristic Region, South Africa. *Diversity and Distribution,* 9, 191-210.

Saayman I (2005) *Guideline for involving hydrogeologists in EIA processes: Edition 1.* CSIR Report No ENV-S-C 2005 053 D. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

SANBI (2013a) *Grassland Ecosystem Guidelines: Landscape interpretation for planners and managers*. Compiled by Cadman M, de Villiers C, Lechmere-Oertel R and D McCulloch. South African National Biodiversity Institute, Pretoria.

SANBI (2013b) *Ecological infrastructure: Nature delivering services*. Produced by the Grassland Programme and SANBI, Pretoria.

Secretariat of the Convention on Biodiversity (CBD) (2001) *Handbook of the Convention on Biological Diversity.* Earthscan Publications, London.

Slootweg R (2010a) Interpretation of biodiversity. In R Slootweg, A Rajvanshi, VB Mathur and A Kolhoff (eds) *Biodiversity in Environmental Assessment: Enhancing Ecosystem Services for Human Well-Being*, Cambridge University Press, Cambridge, pp 14-58.

Slootweg R (2010b) Biodiversity-inclusive Strategic Environmental Assesment. In R Slootweg, A Rajvanshi, VB Mathur and A Kolhoff (eds) *Biodiversity in Environmental Assessment: Enhancing Ecosystem Services for Human Well-Being*, Cambridge University Press, Cambridge, pp 205-254.

Slootweg R and Kolhoff R (2003) A generic approach to integrate biodiversity considerations in screening and scoping for EIA. Environmental Impact Assessment Review, vol 23, pp 657-681.

Slootweg R, Kolhoff R, Verheem R and R Höft (2006). *Biodiversity in EIA and SEA – Background document to CBD Decision VIII/28: Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment*. The Netherlands: Commission for Environmental Assessment.

Treweek J, R Therivel, S Thompson and M Slater (2005). Principles for the use of strategic environmental assessment as a tool for promoting the conservation and sustainable use of biodiversity. *Journal of Environmental Assessment Policy and Management*, 7(2), 173-199.

Ward JV (1998) River landscapes: Biodiversity patterns, disturbance regimes, and aquatic conservation. *Biological Conservation*, 63(3), 269-278.

World Resources Institute (2013) *Weaving Ecosystem Services into Impact Assessment.* Compiled by Landsberg F, Treweek J, Stickler MM, Henninger N and O Venn. WRI, Washington, DC.

World Resources Institute (WRI), UNDP, UNEP and The World Bank (2005) *World Resources 2005: The Wealth of the Poor—Managing Ecosystems to Fight Poverty.* WRI, Washington, DC.

1. http://www.conservation.org/where/priority\_areas/hotspots/Pages/hotspots\_main.aspx (acccessed on 27 February 2014) [↑](#footnote-ref-1)
2. http://www.santam.co.za/about-us/media-centre/stay-safe/flooding-santam-calls-for-increased-precaution-ahead-of-forecasted-heavy-rainfall-months/ [↑](#footnote-ref-2)
3. http://www.cbd.int/sp/targets/ (accessed 27 March 2014). [↑](#footnote-ref-3)
4. DH Landers and Nahlik AM. 2013. Final Ecosystem Goods and Services Classification System (FEGS-CS). EPA/600/R-13/ORD-004914. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C. [↑](#footnote-ref-4)
5. Hanson, C., J. Ranganathan, C. Iceland, and J. Finisdore. 2012. *The Corporate Ecosystem Services Review: Guidelines for Identifying Business Risks and Opportunities Arising from Ecosystem Change*. Version 2.0. Washington, DC: World Resources Institute. [↑](#footnote-ref-5)
6. **NEMA** = National Environmental Management Act 107 of 1998; **NEMBA** = National Environmental Management: Biodiversity Act 10 of 2004; **NEMPAA** = National Environmental Management: Protected Areas Act 57 of 2003; **CARA** = Conservation of Agricultural Resources Act 43 of 1998; **NWA** = National Water Act 36 of 1998; **MPRD**A = Minerals and Petroleum Resources Development Act 28 of 2002; **NHRA** = National Heritage Resources Act 25 of 1999; **NVFF**A = National Veld and Forest Fire Act 101 of 1998; **SALA** = Subdivision of Agricultural Lands Act 70 of 1970; **SPLUMA** = Spatial Planning and Land Use Management Act 16 of 2013; **NFA** = National Forests Act 84 of 1998; **MLRA** = Marine Living Resources Act 18 of 1998; **NEMICMA** = National Environmental Management: Integrated Coastal Management Act 24 of 2008. [↑](#footnote-ref-6)
7. NEMBA, s 1 [↑](#footnote-ref-7)
8. NEMBA, s 1 [↑](#footnote-ref-8)
9. Section 1(1), NEMBA [↑](#footnote-ref-9)
10. Cf sections 1(1) and 17 of the NEM Protected Areas Act 57 of 2003. [↑](#footnote-ref-10)
11. Section 1(1)(xix) of the National Water Act 36 of 1998 [↑](#footnote-ref-11)
12. Section 3, CARA [↑](#footnote-ref-12)
13. See, for example, Vol 112 of *Biological Conservation* (2003) which was devoted to the process that went into developing a systematic conservation plan and implementation programme for the Cape Floristic Region, *The Red List of South African Plants 2009* (Raimondo et al., 2009), or the 2011 *National Biodiversity Assessment* (Driver et al., 2012) and its constituent technical reports. [↑](#footnote-ref-13)
14. Such as the *Millennium Ecosystem Assessment* (2005), the Global Strategy for Plant Conservation (2011-2020) (CBD, the *National Biodiversity Framework* (DEAT, 2009) or the *National Protected Areas Expansion Strategy for South Africa 2008* (DEAT, 2009) [↑](#footnote-ref-14)
15. The *Guideline for Involving Biodiversity Specialists in EIA* (Brownlie, 2005), *CapeNature’s requirements for providing comments on agricultural, environmental, mining, planning and water-use related applications* (2011) or [↑](#footnote-ref-15)
16. Examples include the *Mining and Biodiversity Guideline* (DEA et al., 2013), the *Grasslands Ecosystem Guidelines* (Cadman et al., 2013) and *Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa* (Brownlie et al., 2009). [↑](#footnote-ref-16)
17. Cf section 7 of the Bill of Rights (Act 108 of 1996). [↑](#footnote-ref-17)
18. NEMBA s 2, ‘Objectives of Act’ [↑](#footnote-ref-18)
19. Section 2(2) of NEMA [↑](#footnote-ref-19)
20. Section 2(3) of NEMA [↑](#footnote-ref-20)
21. Section 33 of Act 108 of 1996; cf. Promotion of Administrative Justice Act 3 of 2000 [↑](#footnote-ref-21)
22. Section 32 of Act 108 of 1996; cf. Promotion of Access to Information Act 2 of 2000 [↑](#footnote-ref-22)
23. Section 1, NEMA 107/1998 [↑](#footnote-ref-23)
24. Section 2(2), NEMA 107/1998 [↑](#footnote-ref-24)
25. Section 2(3), NEMA 107/1998 [↑](#footnote-ref-25)
26. Section 2(4)(f), NEMA 107/1998 [↑](#footnote-ref-26)
27. Section 2(4)(o), NEMA 107/1998 [↑](#footnote-ref-27)
28. Section 2(4)(a)(i), NEMA 107/1998 [↑](#footnote-ref-28)
29. Section 2(4)(a)(ii), NEMA 107/1998 [↑](#footnote-ref-29)
30. Section 2(4)(a)(iv), NEMA 107/1998 [↑](#footnote-ref-30)
31. Section 2(4)(d), NEMA 107/1998 [↑](#footnote-ref-31)
32. Section 2(4)(a)(vii), NEMA 107/1998 [↑](#footnote-ref-32)
33. Section 2(4)(e), NEMA 107/1998 [↑](#footnote-ref-33)
34. Section 2(4)(p), NEMA 107/1998 [↑](#footnote-ref-34)
35. Section 2(4)(b), NEMA 107/1998 [↑](#footnote-ref-35)
36. Section 2(4)(c), NEMA 107/1998 [↑](#footnote-ref-36)
37. Section 2(4)(r), NEMA 107/1998 [↑](#footnote-ref-37)
38. Section 24(4)(a), NEMA 107/1998 [↑](#footnote-ref-38)
39. Section 23(2)(a), NEMA 107/1998 [↑](#footnote-ref-39)
40. Section 24(2)(a), NEMA 107/1998 [↑](#footnote-ref-40)
41. Section 24(2)(b), NEMA 107/1998 [↑](#footnote-ref-41)
42. Section 24(2)(c), NEMA 107/1998 [↑](#footnote-ref-42)
43. Sections 24(2)(b) and (c), NEMA 107/1998 [↑](#footnote-ref-43)
44. Section 1, NEMA 107/1998 [↑](#footnote-ref-44)
45. See *Guideline Regarding the Determination of Bioregions and the Preparation of and Publication of Bioregional Plans* (GN 291 of 16 March 2009) and **section xyz below**. [↑](#footnote-ref-45)
46. Section 24(2)(d), NEMA 107/1998 [↑](#footnote-ref-46)
47. Section 24(2)(e), NEMA 107/1998 [↑](#footnote-ref-47)
48. Section 24A, NEMA 107/1998 [↑](#footnote-ref-48)
49. Section 24D, NEMA 107/1998 [↑](#footnote-ref-49)
50. s 24G(2)(a), NEMA [↑](#footnote-ref-50)
51. s 24G(2(b), NEMA [↑](#footnote-ref-51)
52. S 24I, NEMA [↑](#footnote-ref-52)
53. GN 1002 of 9 December 2011, *National List of ecosystems that are threatened and in need of protection.* [↑](#footnote-ref-53)
54. Cf Regs 22(2)(g), 28(i)(i) and 31(2)(f), GN R. 543, 18 June 2010 [↑](#footnote-ref-54)
55. Regs 22(2)(i) and 31(2)(l), GN R. 543, 18 June 2010 [↑](#footnote-ref-55)
56. Activity 18, Listing Notice 1, GN R. 544, 18 June 2010 [↑](#footnote-ref-56)
57. The SPLUMA 16/2013 repealed the following Acts: Removal of Restrictions Act 84 of 1967; Physical Planning Act 88 of 1967; Less Formal Township Establishment Act 113 of 1991; Physical Planning Act 125 of 1991; Development Facilitation Act 67 of 1995. [↑](#footnote-ref-57)
58. Section 3 'Objects of Act', SPLUMA 16 of 2013 [↑](#footnote-ref-58)
59. The Minister of Rural Development and Land Reform may, in consultation with the Premier and the relevant Municipal Councils, may establish a regional spatial development framework for any region in South Africa (sections 18 and 19 of SPLUMA 16 of 2013). [↑](#footnote-ref-59)
60. Section 4, 'Spatial Planning System', SPLUMA 16 of 2013 [↑](#footnote-ref-60)
61. Section 2, NEMA 107/1998 [↑](#footnote-ref-61)
62. Section 7(b), SPLUMA 16/2013 [↑](#footnote-ref-62)
63. Section 7(b)(ii), SPLUMA 16/2013 [↑](#footnote-ref-63)
64. Section 7(b)(iii), SPLUMA 16/2013 [↑](#footnote-ref-64)
65. Section 7(b)(vi), SPLUMA 16/2013 [↑](#footnote-ref-65)
66. Section 7(c)(ii), SPLUMA 16/2013

    [↑](#footnote-ref-66)
67. Section 7(d), SPLUMA 16/2013 [↑](#footnote-ref-67)
68. Section 7(e)(i), SPLUMA 16/2013 [↑](#footnote-ref-68)
69. Sections 7(e)(ii) and (iv), SPLUMA 16/2013 [↑](#footnote-ref-69)
70. Section 12(1)(b), SPLUMA 16/2013 [↑](#footnote-ref-70)
71. Section 12(1)(c), SPLUMA 16/2013 [↑](#footnote-ref-71)
72. Section 12(1)(m), SPLUMA 16/2013 [↑](#footnote-ref-72)
73. Sections 14(e) and 16(b), SPLUMA 16/2013 [↑](#footnote-ref-73)
74. Sections 18 and 19, SPLUMA 16/2013 [↑](#footnote-ref-74)
75. Section 20, SPLUMA 16/2013 [↑](#footnote-ref-75)
76. Sections 21(a) and (b), SPLUMA 16/2013 [↑](#footnote-ref-76)
77. Section 21(j), SPLUMA 16/2013 [↑](#footnote-ref-77)
78. Reg (2) (4) (f), GN R. 796 of 24 August 2001. [↑](#footnote-ref-78)
79. Section 24(1), SPLUMA 16/2013 [↑](#footnote-ref-79)
80. Section 24(4), SPLUMA 16/2013 [↑](#footnote-ref-80)
81. Section 25(d), SPLUMA 16/2013 [↑](#footnote-ref-81)
82. Section 25(2), SPLUMA 16/2013 [↑](#footnote-ref-82)
83. Section 26, SPLUMA 16/2013 [↑](#footnote-ref-83)
84. Section 32, SPLUMA 16/2013 [↑](#footnote-ref-84)
85. Section 54(1)(e), SPLUMA 16/2013 [↑](#footnote-ref-85)
86. Section 40, NEMBA 10/2004 [↑](#footnote-ref-86)
87. Section 40(2)(b), NEMBA 10/2004 [↑](#footnote-ref-87)
88. Section 40(3), NEMBA 10/2004 [↑](#footnote-ref-88)
89. Also see the *Biodiversity and Mining Guideline* (DEA et al., 2013, p 35) on assigning legal recognition to CBA maps. [↑](#footnote-ref-89)
90. Section 44, NEMBAA [↑](#footnote-ref-90)
91. Section 43(3)(c), NEMBA 10/2004 [↑](#footnote-ref-91)
92. GN 83 of 7 February 2014. [↑](#footnote-ref-92)
93. GN 341 of 10 May 2013 [↑](#footnote-ref-93)
94. Section 44, NEMBA 10/2004 [↑](#footnote-ref-94)
95. GN 83 of 7 February 2014, paragraph 1.5 [↑](#footnote-ref-95)
96. Note that these regulations are being reviewed (March 2014) and will be replaced by an updated version. [↑](#footnote-ref-96)
97. Section 64, NEMBA 10/2004 [↑](#footnote-ref-97)
98. Sections 65 and 69, NEMBA 10/2004 [↑](#footnote-ref-98)
99. Sections 70 and 71, NEMBA 10/2004 [↑](#footnote-ref-99)
100. GN R. 507 of 19 July 2013 [↑](#footnote-ref-100)
101. GN 78 (lists) and GN 79 (regulations) of 12 February 2014 respectively. [↑](#footnote-ref-101)
102. Section 75(1), NEMBA 10/2014 [↑](#footnote-ref-102)
103. Section 75(2), NEMBA 10/2014 [↑](#footnote-ref-103)
104. Section 75(3), NEMBA 10/2014 [↑](#footnote-ref-104)
105. Section 76(3), NEMBA 10/2004 [↑](#footnote-ref-105)
106. Section 77, NEMBA 10/2004 [↑](#footnote-ref-106)
107. Section 78, NEMBA 10/2004 [↑](#footnote-ref-107)
108. Cf ‘Definitions’ (s 1, NEMPAA) and Ch 2, ‘System of Protected Areas in South’ [↑](#footnote-ref-108)
109. GN R. 546, 18 June 2010 [↑](#footnote-ref-109)
110. Section 4, NEMPAA 57/2003 [↑](#footnote-ref-110)
111. Section 7, NEMPAA 57/2003 [↑](#footnote-ref-111)
112. Special Nature Reserves, national parks, nature reserves, protected environments, world heritage sites, marine protected areas and various categories of forest protection in terms of the National Forests Act 84 of 1998. [↑](#footnote-ref-112)
113. Section 48(1)(2) of the NEMPAA 57/2003 [↑](#footnote-ref-113)
114. Section 48(3), NEMPAA 57/2003 [↑](#footnote-ref-114)
115. Reg 2, ‘Definitions’, GN R. 546, 18 June 2010 [↑](#footnote-ref-115)
116. Section 9, NEMPAA; each kind of protected area is further defined in section 1 of the NEMPAA, ‘Definition’ [↑](#footnote-ref-116)
117. Section 10, NEMPAA [↑](#footnote-ref-117)
118. Section 10(3), NEMPAA 57/2003 [↑](#footnote-ref-118)
119. For information on the location of national parks, world heritage sites, protected areas and biosphere reserves, see:

     |  |  |  |
     | --- | --- | --- |
     | **National parks** | <http://sanparks.org.za/parks/> | Each national park has a management plan that is published on the SANParks website |
     | **Statutory protected areas** | <http://bgis.sanbi.org> | These data may be updated from time to time. Check with BGIS [BGIShelp@sanbi.org](mailto:BGIShelp@sanbi.org) or Ph (021) 799 8738 |
     | **World Heritage Sites** | <http://whc.unesco.org/en/statesparties/ZA/> | Consult provincial conservation agencies and bioregional programmes about the WHS status of protected areas as the UNESCO list may not be up to date. |
     | **Biosphere Reserves** | <http://unesdoc.unesco.org/images/0022/002205/220544M.pdf> | As above, with respect to biospheres. |

     [↑](#footnote-ref-119)
120. Cf reg 2, ‘Definitions’, GN R. 546, 18 June 2010, and DEA (2010). [↑](#footnote-ref-120)
121. See <http://whc.unesco.org/pg.cfm?cid=31&mode=table> (accessed 10 January 2014) [↑](#footnote-ref-121)
122. See <http://whc.unesco.org/en/tentativelists/> and <http://whc.unesco.org/en/guidelines/> (accessed on 10 January 2014). [↑](#footnote-ref-122)
123. |  |  |  |
     | --- | --- | --- |
     | **Ramsar sites** | http://www.ramsar.org/cda/en/ramsar-news-archives-2010-annotated-ramsar-16187/main/ramsar/1-26-45-437%5E16187\_4000\_0\_\_ | Consult DEA and provincial biodiversity conservation agencies and/ or SANParks, as relevant, about the Ramsar status of these areas. |

     [↑](#footnote-ref-123)
124. NEMPAA s 28(4) [↑](#footnote-ref-124)
125. NEMPAA s 28(2)(a) [↑](#footnote-ref-125)
126. NEMPAA s 28(2)(b) [↑](#footnote-ref-126)
127. NEMPAA s 28(2)(c) [↑](#footnote-ref-127)
128. NEMPAA s 28(2)(d) [↑](#footnote-ref-128)
129. NEMPAA s 28(2)(e) [↑](#footnote-ref-129)
130. NEMPAA s 28(2)(f) [↑](#footnote-ref-130)
131. NEMPAA s 28(3) [↑](#footnote-ref-131)
132. NEMPAA s 33 [↑](#footnote-ref-132)
133. Sections 7-15, NEMICMA 24/2008 [↑](#footnote-ref-133)
134. Sections 16 and 17, NEMICMA 24/2008 [↑](#footnote-ref-134)
135. Sections 18-21, NEMICMA 24/2008 [↑](#footnote-ref-135)
136. Section 22, NEMICMA 24/2008 [↑](#footnote-ref-136)
137. Sections 23 and 24, NEMICMA 24/2008 [↑](#footnote-ref-137)
138. Section 25, NEMICMA 24/2008 [↑](#footnote-ref-138)
139. Section 8, NEMICMA 24/2008 [↑](#footnote-ref-139)
140. Section 12, NEMICMA 24/2008 [↑](#footnote-ref-140)
141. Section 13, NEMICMA 24/2008 [↑](#footnote-ref-141)
142. Section 14, NEMICMA 24/2008 [↑](#footnote-ref-142)
143. Section 15, NEMICMA 24/2008 [↑](#footnote-ref-143)
144. Section 16, NEMICMA 24/2008 [↑](#footnote-ref-144)
145. Section 17, NEMICMA 24/2008 [↑](#footnote-ref-145)
146. Section 18, NEMICMA 24/2008 [↑](#footnote-ref-146)
147. Section 31, NEMICMA 24/2008 [↑](#footnote-ref-147)
148. Section 25, NEMICMA 24/2008 [↑](#footnote-ref-148)
149. Section 25(3), NEMICMA 24/2008 [↑](#footnote-ref-149)
150. GN 341 of 10 May 2013 [↑](#footnote-ref-150)
151. Section 34(2), NEMICMA 24/2008 [↑](#footnote-ref-151)
152. Chapter 6, NEMICMA 24/2008 [↑](#footnote-ref-152)
153. Section 46, NEMICMA 24/2008 [↑](#footnote-ref-153)
154. Section 49(1), NEMICMA 24/2008 [↑](#footnote-ref-154)
155. Section 48(4), NEMICMA 24/2008 [↑](#footnote-ref-155)
156. Section 49(2)(b) and (c), NEMICMA 24/2008 [↑](#footnote-ref-156)
157. Section 63(1), NEMICMA 24/2008 [↑](#footnote-ref-157)
158. Section 63(2), NEMICMA 24/2008 [↑](#footnote-ref-158)
159. Section 65(1), NEMICMA 24/2008 [↑](#footnote-ref-159)
160. Section 69(1), NEMICMA 24/2008 [↑](#footnote-ref-160)
161. <http://www.wwf.org.za/what_we_do/freshwater/water_balance/> (accessed on 13 January 2014) [↑](#footnote-ref-161)
162. Part 3, Chapter 3 – ‘Protection of Water Resources’ – of the NWA 36/1998 [↑](#footnote-ref-162)
163. S 2 National Water Act 36 of 1998 [↑](#footnote-ref-163)
164. Section 1(1)(xxvii), NWA 36/1998 [↑](#footnote-ref-164)
165. See http://www.dwaf.gov.za/nwrs/LinkClick.aspx?fileticket=3AVrHanrkfw%3d&tabid=91&mid=496 [↑](#footnote-ref-165)
166. http://www.dwaf.gov.za/rdm/WRCS/doc/Class%20procedures%20hq.pdf [↑](#footnote-ref-166)
167. Preface, Part 2, Chapter 3, NWA 36/1998 [↑](#footnote-ref-167)
168. Reg 2, GN R. 810, 17 September 2010 [↑](#footnote-ref-168)
169. Preface, Part 3), Ch 3, ('Protection of Water Resources'), NWA 36/1998 [↑](#footnote-ref-169)
170. S 1(1), NWA 36 of 1998 [↑](#footnote-ref-170)
171. S 1(1), NWA 36 of 1998 [↑](#footnote-ref-171)
172. Section 21 of the NWA 36/1998 [↑](#footnote-ref-172)
173. Sections 21(a) and (b) of the NWA 36/1998 [↑](#footnote-ref-173)
174. Sections 21(c) and (i) of the NWA 36/1998 [↑](#footnote-ref-174)
175. Sections 21(g) of the NWA 36/1998 [↑](#footnote-ref-175)
176. Part 1: General Principles, Chapter 4 of the NWA 36/1998 [↑](#footnote-ref-176)
177. Section 22(1)(a)(i) of the NWA 36/1998 [↑](#footnote-ref-177)
178. Section 22(1)(a)(ii) of the NWA 36/1998 [↑](#footnote-ref-178)
179. Either the Minister of Water Affairs or a catchment management agency to which the relevant powers and duties have been assigned [↑](#footnote-ref-179)
180. Sections 32 to 35 of the NWA 36/1998 [↑](#footnote-ref-180)
181. Section 22(1)(a)(iii) of the NWA 36/1998 [↑](#footnote-ref-181)
182. Preface to Part 6: General Authorisations, NWA 36/1998 [↑](#footnote-ref-182)
183. Section 29(1)(vi), NWA 36/1998 [↑](#footnote-ref-183)
184. Section 29(1)(ii), NWA 36/1998 [↑](#footnote-ref-184)
185. Section 22(1)(b), NWA 36/1998 [↑](#footnote-ref-185)
186. Section 22(1)(c), NWA 36/1998. [↑](#footnote-ref-186)
187. Section 22(4), NWA 36/1998 [↑](#footnote-ref-187)
188. Section 41(3), NWA [↑](#footnote-ref-188)
189. ‘Consultation between competent authorities and consideration of legislative compliance requirements of other organs of state having jurisdiction’ [↑](#footnote-ref-189)
190. ‘Alignment of environmental authorisation’ [↑](#footnote-ref-190)
191. NEMA s 1 [↑](#footnote-ref-191)
192. <http://www.dwaf.gov.za/documents/publications/NWAguide.pdf> (accessed on 14 January 2014) [↑](#footnote-ref-192)
193. <http://www.dwaf.gov.za/Documents/Section21/eggeneric.pdf> (accessed on 14 January 2014) [↑](#footnote-ref-193)
194. Section 29(1), NWA 36/1998 [↑](#footnote-ref-194)
195. Information on the drainage regions identified by GN 1199 can be obtained from http://www.dwaf.gov.za, under the National Water Strategy [↑](#footnote-ref-195)
196. Section 5, GN 1198 18 December 2009 [↑](#footnote-ref-196)
197. Section 6(b) [↑](#footnote-ref-197)
198. The overall Present Ecological State (PES) or ecosystem health of the water resource. It represents the totality of the features and characteristics of a river and its riparian areas that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services. The EcoStatus value is an integrated ecological state made up of a combination of various PES findings from component EcoStatus assessments (such as for invertebrates, fish, riparian vegetation, geomorphology, hydrology and water quality) (M Rountree, pers comm,) [↑](#footnote-ref-198)
199. Section 2 GN 1198 18 December 2009 [↑](#footnote-ref-199)
200. Section 7(5) GN 1198, 18 December 2009 [↑](#footnote-ref-200)
201. <http://www.dwaf.gov.za/Projects/WARMS/Registration/registration1.aspx> (accessed on 14 January 2014) [↑](#footnote-ref-201)
202. Section 7, GN 1199 of 18 December 2009 [↑](#footnote-ref-202)
203. <http://www.dwaf.gov.za/Documents/Section21/egs21ci.pdf> (accessed on 14 January 2014) [↑](#footnote-ref-203)
204. Section 1(a), National Forests Act (NFA) 84/1998. [↑](#footnote-ref-204)
205. For a government perspective on forest management in South Africa, see Bethlehem L (2002) Sustainable forest management in South Africa: Government perspective (Guest editorial). *South African Forestry Journal* **193**, pp 1-3. <http://www.nisc.co.za/abstracts_uploaded/1174652166.pdf> (accessed on 28 January 2014) [↑](#footnote-ref-205)
206. Section 2(1)(x) of the NFA [↑](#footnote-ref-206)
207. DAFF (2009) *Policy Principles and Guidelines for Control of Development affecting Natural Forests*. [↑](#footnote-ref-207)
208. Section 3, NFA [↑](#footnote-ref-208)
209. Section 3(1), NFA [↑](#footnote-ref-209)
210. Section 3(1)(e), NFA [↑](#footnote-ref-210)
211. Section 3(3), NFA [↑](#footnote-ref-211)
212. Section 4, NFA [↑](#footnote-ref-212)
213. Section 4(6), NFA [↑](#footnote-ref-213)
214. Section 7(1), NFA [↑](#footnote-ref-214)
215. Section 7(2), NFA [↑](#footnote-ref-215)
216. Section 8(1), NFA [↑](#footnote-ref-216)
217. Section 8(1)(c)(i)-(iii) NFA [↑](#footnote-ref-217)
218. Section 48(1), NEMPAA [↑](#footnote-ref-218)
219. Section 11, NFA [↑](#footnote-ref-219)
220. Section 15(1), NFA [↑](#footnote-ref-220)
221. Section 12(1), NFA [↑](#footnote-ref-221)
222. GN 408 of 26 April 2013 (Invitation to submit written comments regarding the re -declaration of the Kathu Forest as a Protected Woodland) [↑](#footnote-ref-222)
223. Section 15(3), NFA [↑](#footnote-ref-223)
224. GN 716 of 7 December 2012 [↑](#footnote-ref-224)
225. GN R. 466 of 29 April 2009 [↑](#footnote-ref-225)
226. Section 2(h) of the MPRDA 28/2002 [↑](#footnote-ref-226)
227. Section 5(4) of the MPRDA 28/2002 [↑](#footnote-ref-227)
228. Sections 48 and 49 of the MPRDA 28/2002 [↑](#footnote-ref-228)
229. Explanatory memorandum, National Environmental Management Laws Third Amendment Bill (B26B-2013). [↑](#footnote-ref-229)
230. Explanatory memorandum, National Water Amendment Bill (B3-2014) [↑](#footnote-ref-230)
231. Section 3, CARA 43/1983 [↑](#footnote-ref-231)
232. Section 6, CARA 43/1983 [↑](#footnote-ref-232)
233. GN R. 1048 of 25 May 1984 [↑](#footnote-ref-233)
234. Section 7, CARA 43/1983 [↑](#footnote-ref-234)
235. Section 1, CARA 43/1983 [↑](#footnote-ref-235)
236. Reg 15, GN R. 1048 of 25 May 1983; [↑](#footnote-ref-236)
237. Also see the Agricultural Research Council, 'Legal Obligations Regarding Invasive Alien Plants in South Africa',  http://www.arc.agric.za/arc-ppri/Pages/Weeds%20Research/Legal-obligations-regarding-invasive-alien-plants-in-South-Africa-.asp [↑](#footnote-ref-237)
238. Section 6, CARA 43/1984 [↑](#footnote-ref-238)
239. Regulations 10 and 11, GN R. 1047 of 25 May 1984 and GN 280 of 30 March 2001. [↑](#footnote-ref-239)
240. http://www.elsenburg.com/srm/landcare/areawide.html [↑](#footnote-ref-240)
241. http://www.cbd.int/convention/parties/list/default.shtml [↑](#footnote-ref-241)
242. Article 6(a) of the Convention on Biodiversity [↑](#footnote-ref-242)
243. Article 6(b) of the CBD [↑](#footnote-ref-243)
244. Article 8(a)-(b), CBD [↑](#footnote-ref-244)
245. Decision V/18 (May 2000) of the CoP on 'Impact assessment, liability and redress'. [↑](#footnote-ref-245)
246. Decisions II/8 (November 1995) and V/6 (May 2000) of the CoP [↑](#footnote-ref-246)
247. Section 2, National Environmental Management Act 107 of 1998 [↑](#footnote-ref-247)
248. Annex B, Decision V/6: Ecosystem Approach, CoP, May 2000. [↑](#footnote-ref-248)
249. <http://www.cbd.int/doc/publications/imp-bio-eia-and-sea.pdf> [↑](#footnote-ref-249)
250. GN 813, 3 August 2009. Published in terms of 38(2) of the NEM Biodiversity Act 10 of 2004 [↑](#footnote-ref-250)
251. GN 393, 14 May 2010 [↑](#footnote-ref-251)
252. Regs 22(2)(i) and 31(2)(l), GN R. 543, 18 June 2010 [↑](#footnote-ref-252)
253. Systematic biodiversity planning is a scientifically defensible way of identifying the most efficient configuration of areas in the landscape that would avoid conflict with other priority land uses and meet conservation targets, thereby ensuring conservation of representative examples of biodiversity and their persistence in the landscape. [↑](#footnote-ref-253)
254. Brownlie 2005 [↑](#footnote-ref-254)
255. This is a legal requirement in terms of the Natural Scientific Professions Act 27 of 2003; it is illegal to appoint an individual not professionally registered with SACNASP to undertake consulting work in the natural science field. [↑](#footnote-ref-255)
256. Cf. Brownlie, 2005; Slootweg et al., 2006; Le Maitre et al., 2007. [↑](#footnote-ref-256)
257. These local values reflect heritage, social and/or economic value of biodiversity. It is the responsibility of the biodiversity specialist to assess and evaluate impacts on valued biodiversity and to provide input to the social, economic and/or heritage specialist, to ensure that biodiversity-related impacts and values are adequately dressed and integrated in the EIA. [↑](#footnote-ref-257)
258. These local biodiversity values can be expressed in terms of heritage or socioeconomic value, and impacts of a proposed project on these values are principally incorporated by social, economic or heritage specialists. However, co-operation between these specialists and the biodiversity specialist is recommended, as biodiversity values are often overlooked by specialists in these other disciplines. [↑](#footnote-ref-258)
259. “Thresholds of potential concern”(TPC) is another term used, in particular by managers of river systems. The TPC belongs to the concept of having a hierarchy of targets for managing biodiversity, rather than just defining the desired final outcome or endpoint. Targets derived through systematic conservation planning effectively define the desired endpoints of management; ecosystem status acts as a TPC of adverse trends or changes. The NSBA uses thresholds of Conservation Target (***16-36%*** of remaining habitat left) for terrestrial ecosystems for ***‘Critically endangered***’, Conservation Target plus 15% for ‘***Endangered***’, more than Conservation Target plus 15%, but not more than 60% left for ‘***Vulnerable***’ and ***>60%*** for ‘***Least Threatened’***. The NFEPA uses a conservation target of 20% of wetland types. [↑](#footnote-ref-259)
260. Business and Biodiversity Offsets Programme (BBOP) 2012 [↑](#footnote-ref-260)
261. Brownlie *et al* 2012. Biodiversity tradeoffs and offsets in impact assessment and decision making: can we stop the loss? Impact Assessment and Project Appraisal, DOI:10.1080/14615517.2012.736763 [↑](#footnote-ref-261)
262. Cf. Chapter 9.3, 'Proactive incorporation of biodiversity into pre-application screening: A supplement for environmental assessment practitioners' in Cadman et al. (2013), pp 122-136. [↑](#footnote-ref-262)
263. <http://bgis.sanbi.org/vegmap/map.asp> Mucina L, Rutherford MC & Powrie LW (eds) (2005) *Vegetation Map of South Africa, Lesotho and Swaziland, 1:1 000 000 scale sheet maps*. South African National Biodiversity Institute, Pretoria. [↑](#footnote-ref-263)
264. <http://bgis.sanbi.org/mapsearch.asp> National Biodiversity Assessment [↑](#footnote-ref-264)
265. <http://www.sanbi.org/index.php?option=com_content&view=article&id=250:red-data-lists-project&catid=125:part-of-biodiversity-topics&Itemid=793> Raimondo *et al*. (2010) Red List of South African Plants. [↑](#footnote-ref-265)