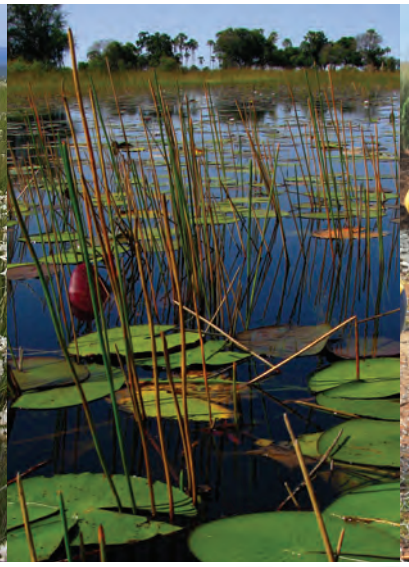
Mining and Biodiversity Guideline

Mainstreaming biodiversity into the mining sector



Environmental Affairs
Mineral Resources

CHAMBER OF MINES OF SOUTH AFRICA
Putting South Africa First

SOUTH AFRICAN MINING AND BIODIVERSITY FORUM

SANBI
Biodiversity for Life

grasslands
LIVING IN A WORKING LANDSCAPE

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Developed by

Environmental Affairs
Mineral Resources

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Putting South Africa First

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The Mining and Biodiversity Guideline has had a long history. The need for a good practice guideline that focuses on providing practical guidance to the mining sector on how to address biodiversity issues in the South African context was identified by the South African Mining and Biodiversity Forum (SAMBF), a forum facilitated by the Chamber of Mines with participation by mining companies, government departments and conservation organisations. This forum provided the catalyst and funding for the Guideline's initial development. The South African National Biodiversity Institute's Grasslands Programme has supported the revision and editing process, and has funded the design of the Guideline. Printing costs have been covered by the Department of Environmental Affairs and the Chamber of Mines.

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Foreword

In pursuit of South Africa's developmental pathway, a shared vision and common goal of sustainability has emerged as a strong driver of industry values and societal behaviour. In recent times, significant changes in attitude and practice demonstrate that even high impact industries are increasingly considering their ecological footprint in their business operations and management.

Mining is one such sector that has come a long way by voluntarily pursuing actions that seek to limit and mitigate harmful impacts on sensitive ecosystems and associated biota. However, the journey is not over. South Africa's mineral endowment implies that mining and the environment will continue to interact and will need to walk this path together to achieve prosperity in a sustainable environment – it is therefore in the spirit of cooperation that this guideline has been developed such that South Africa's incredible biodiversity and life supporting ecological processes are not compromised and neither is its ability to derive sustainable growth and development from its incredible mineral wealth.

This guideline is the brainchild of an innovative platform called the South African Mining and Biodiversity Forum (SAMBF) which brings together stakeholders from industry, conservation organisations and government. The forum promotes cross-sectoral interaction and cooperation, aimed at improving biodiversity conservation and management in the mining industry. The SAMBF was established at a crucial point in our fast tracked developmental pathway when the need for urgent dialogue on the accelerating loss of natural capital, the concomitant risk to the integrity of ecosystems, and the role of the mining sector in contributing to this loss, was critical.

Our challenge as a nation in a developing state context is to find a balance between economic growth and environmental sustainability. We need to be mindful of the fact that without the integrity of our natural systems, there will be no sustained long-term economic growth or life. In our pursuit of this common goal, this publication is an important step forward. Not only does it reflect that industry values are changing but, more importantly, it shows the potential for improvement in industry practice. This guideline provides the mining sector with a practical, user-friendly manual for integrating biodiversity considerations into planning processes and managing biodiversity during the developmental and operational phases of a mine, from exploration through to closure. This Guideline does not exempt the user from complying with the relevant pieces of legislation and should be used as a guideline.

Companies that demonstrate responsibility and leadership in respect of biodiversity are those companies who are committed to their own sustainability for the future. These companies are forward thinking and understand the cost-saving aspects of comprehensive planning and the sensitivities associated with resource extraction in areas of biodiversity importance. Bearing in mind this long term vision of sustainability, the mining industry should invest in clean and green technologies that limit their impact. Good environmental management at mining operations located in areas of high biodiversity value, can provide opportunities that achieve biodiversity conservation goals without economic costs, and can generate benefits for people and enterprises. These intentions are in the spirit of competing mandates in pursuit of growth and development.

Our vision is that this guideline will foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector. Finally, we must also recognise that some places are sacrosanct – they have such high conservation value that we together commit not to disturb!

Bomo Edith Edna Molewa,
MP: Minister of Water and Environmental Affairs

Susan Shabangu,
MP: Minister of Mineral Resources

Synopsis

The mining industry plays a vital role in the growth and development of South Africa and its economy. Since the earliest discoveries of minerals in the region, this rich endowment of mineral resources has been a key driver of South Africa's social and economic development. Mining continues to be one of the most significant sectors of our economy, providing jobs, growing our GDP and building relations with international trading partners.

On par with this mineral wealth are exceptional endowments of biodiversity and ecosystems. South Africa is globally renowned as a megadiverse country that harbours an exceptional number of species in relation to most other countries. This rich biodiversity and ecological infrastructure underpin and support our social and economic development in numerous direct and indirect ways. It is currently impacted upon by mining and other land uses in ways that are not sustainable. Sustaining the goods and services that flow from our ecosystems, and the benefits that these provide over the long term, will require limits in mining and other activities in certain areas. South Africa's Constitution and the laws stemming from it recognise the vital role of both ecological and mineral resources in a development path built upon the socially just, environmentally sustainable and economically efficient use of these resources. These are not necessarily opposing objectives, and if pursued carefully, enable us to strive towards the principles and progressively realise the rights outlined in our Constitution.

How then, can we develop both our mineral and ecological resources to grow our economy create more jobs and improve human well-being – now and into the future? Taking stock of what we have and where, allows us to be proactive and make informed decisions about future land-use planning at various scales for South Africa's optimal growth path.

This Guideline provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user-friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure.

From a business perspective, the Guideline explains the value for mining companies of adopting a risk-based approach to managing biodiversity. The early identification and assessment of mining impacts on biodiversity provides an opportunity to put in place environmental management plans and actions that reduce risks to biodiversity, people and business.

This Guideline 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. The 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 in these areas.

It gives direction on how to avoid, minimise or remedy mining impacts, as part of a thorough environmental impact assessment and robust environmental management programme. The mitigation of negative impacts on biodiversity and ecosystem services is a legal requirement and should take on different forms depending on the significance of the impact and the area being affected. Mitigation requires proactive planning that is enabled by following the mitigation hierarchy. Its application is intended to avoid disturbance of ecosystems and loss of biodiversity, and where they cannot be avoided altogether, to minimise, rehabilitate or offset significant residual negative impacts on biodiversity.

This approach lays the groundwork for integrating relevant biodiversity information into decision making at every stage of the mining life cycle about how best to avoid, minimise or remedy biodiversity impacts to support sustainable development. The Guideline offers six principles that should be applied towards good decision making when addressing biodiversity issues and impacts in a mining context:

1. Apply the law
2. Use the best available biodiversity information
3. Engage stakeholders thoroughly
4. Use best practice environmental impact assessment (EIA) to identify, assess and evaluate impacts on biodiversity
5. Apply the mitigation hierarchy in planning any mining-related activities and to develop robust environmental management programmes (EMP)
6. Ensure effective implementation of the EMP, including adaptive management.

A range of tools and guidelines exist to support the application of these six principles. Considerations with respect to the six principles are described for each stage of the mining life cycle, including the implications for mining companies and decision makers.

With the primary purpose of improving consistency in dealing with biodiversity issues this Guideline assists relevant authorities in implementing and enforcing the law, and assists companies to comply with the law, implement good practice and reduce business risk. Importantly, this is a Guideline to aid the integration of biodiversity issues into the mining life cycle rather than a set of rules which can be applied unilaterally without interpretation and regard for the context.

South Africa's mineral endowment implies that mining and the environment will continue to interact and need to walk this path together to achieve prosperity and sustainability. We need to be mindful of the fact that without the integrity of our natural systems, there will be no sustained long-term economic growth or life. In our pursuit of this common goal, this publication is an important step forward.

In pursuit of South Africa's developmental pathway, a shared vision of sustainability has emerged as a strong driver of industry values and societal behaviour. This Guideline can help to ensure that mineral resource development, which is an integral component of South Africa's development future, takes place in a way that supports an optimal growth path for South Africa.

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Acronyms

ADU	Animal Demography Unit
BAP	Biodiversity Action Plan
BBOP	Business and Biodiversity Offsets Programme
BGIS	Biodiversity Geographic Information System
BSSA	Biodiversity Stewardship South Africa
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CR	Critically endangered
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioners
ECO	Environmental Control Officers
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMF	Environmental Management Framework
EMP	Environmental Management Programme
EN	Endangered
ESA	Ecosystem Support Area
FEPA	Freshwater Ecosystem Priority Areas
GDARD	Gauteng Department of Agriculture and Rural Development
GDP	Gross Domestic Product
GIS	Geographic Information System
GN	Government Notice
I&APs	Interested and Affected Parties
IAIA	International Association for Impact Assessment
ICMM	International Council on Mining and Metals
IFC	International Finance Corporation
IPIECA	International Petroleum Industry Environmental Conservation Association
IUCN	International Union for Conservation of Nature
IWUL	Integrated Water Use Licence
KZN	Kwa-Zulu Natal
LUPO	Land Use Planning Ordinance
MEA	Millennium Ecosystem Assessment
MM	Metropolitan municipality
MMSD	Mining, Minerals and Sustainable Development
MPA	Marine Protected Areas
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
MTPA	Mpumalanga Tourism and Parks Agency
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
NGO	Non-governmental organisation
NWA	National Water Act (No. 36 of 1998)
OMPA	Offshore Marine Protected Area
PAIA	Promotion of Access to Information Act
PAJA	Promotion of Administrative Justice Act
RMDEC	Regional Mining Development and Environmental Committee
SABCA	South African Butterfly Conservation Atlas
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SARCA	South African Reptile Conservation Assessment
SEMA	Specific Environmental Management Acts
UCT	University of Cape Town
WHS	World Heritage Sites

1 Introduction

1 Introduction

1-1 Background

This section describes the purpose of the Guideline, which is to integrate the relevant biodiversity information into decision making about where to mine and how best to avoid, minimise or remedy impacts on biodiversity to support sustainable development. It introduces six key principles on which the Guideline is founded, and lists the intended users of the Guideline.

1-2 Biodiversity and why it is valuable

This section describes biodiversity and discusses why it is valuable in terms of the associated ecosystem services it provides, upon which people depend, as well as its intrinsic value. The section emphasises that biodiversity priority areas have been identified for their high value to society and should be appropriately managed and conserved.

1-3 Relevance to mining operations

This section describes mining as a key driver of change in biodiversity and associated ecosystem services in South Africa. It emphasises that with mining taking place in biodiversity-rich areas it is imperative to manage the process whereby mining is authorised and in so doing reduce the impact on biodiversity.

1-4 Sustainable development and the law

This section describes the constitutional requirement for sustainable development and its application in the mining context with particular reference to the Mineral and Petroleum Resources Development Act (No.28 of 2002) and the National Environmental Management Act (No. 107 of 1998).

1-5 Mining and biodiversity: the scope and structure of this Guideline

This section provides a route map to the content of the Guideline and illustrates the conceptual approach adopted.

A note on terminology:

Biodiversity refers to the full variability of living organisms in terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part. It is the genes, species (plants and animals), ecosystems, land- or seascapes, as well as the ecological and evolutionary processes that allow these elements of biodiversity to persist over time.

This rich biodiversity underpins the diverse ecosystems that deliver **ecosystem services** that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre, as well as more complex services that regulate and mitigate our climate, protect us from natural disaster and provide us with a rich heritage of nature-based cultural traditions.

1.1. Background

The mining industry plays a vital role in the growth and development of South Africa and its economy. Since the earliest discoveries of minerals in the region, this rich endowment of mineral resources has driven South Africa's social and economic development. Mining continues to be one of the most significant sectors of our economy, providing jobs, growing our GDP and building relations with international trading partners.

South Africa's mineral and petroleum endowment is considerable. The extraction of these resources should be designed to benefit the country and its people and is governed by the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (hereafter referred to as the MPRDA). The Department of Mineral Resources (DMR), custodian of these resources on behalf of South Africans, "must seek to achieve 'orderly and ecologically' sustainable development"[1].

South Africa also has an extremely rich endowment of biodiversity and associated ecosystem services. The large variety of ecosystems and species, along with the services they provide, underpin many of South Africa's economic sectors and contribute substantially to job creation. Although the financial benefits may not immediately appear as substantial as those from mining, the country's biodiversity provides significant and often unaccounted for benefits, without which economic growth and development would not be possible. Development in an 'orderly and ecologically sustainable' manner should not be understood as opposed to social and economic development, but as fundamentally underpinning it. Unfortunately the importance of biodiversity in underpinning social and economic development is often undervalued or not reflected in market transactions and is therefore poorly integrated into decision making about sustainable development of mineral resources.

[1] McLean and Carrick (2007)

Mining can result in impacts on biodiversity and associated ecosystem services that can be considerable. These may include direct, indirect, cumulative and induced impacts. Impacts can be short term, or may last far longer for decades or centuries, or may even be permanent or irreversible which is why the assessment of environmental impact of proposed mining is necessary. If not eliminated or mitigated, these impacts pose serious risks to other economic activities, livelihoods and the ecological infrastructure that are supported by biodiversity (with poor and vulnerable communities who rely directly on this biodiversity and associated ecosystem services being most affected).

While the initial intention of this document emerged from the need of site personnel for guidance in the effective management of biodiversity, it became clear that this was only a particular part of the mining life cycle and that guidance to a variety of stakeholders on biodiversity issues was necessary throughout all the parts of the mining life cycle. Certain mining impacts may be unavoidable hence the need to provide guidance on: when such mining activities are legally prohibited; where biodiversity priority areas that may prove to be risks for mining are located; and where biodiversity considerations may result in limitations being imposed on mining. In so doing, the Guideline provides tools to understand how the sustainable development of South Africa's mineral resources can take place in a way that minimises the impact on the country's biodiversity and ecosystem services. More specific checklist processes for site-level guidelines will be developed by the SAMBF based on this guideline this Guideline.

From a business perspective, the Guideline explains the value for mining companies of adopting a risk-based approach to managing biodiversity. It recognises that certain impacts are unavoidable but provides guidance as to where mining is prohibited, where different types of biodiversity priority areas may constitute a barrier to mining, and where biodiversity considerations may limit the options for mining. This Guideline is about integrating relevant biodiversity information into decision making about mining options and how best to avoid, minimise or remedy biodiversity impacts caused by mining, and in so doing support ecologically, economically and socially sustainable development. With the primary purpose of improving consistency in decision making in dealing with biodiversity aspects, the Guideline provides assistance to relevant regulators in implementing and enforcing the law, and assists companies in complying with the law, implementing good practice and reducing business risk.

Although the guideline may serve to facilitate intergovernmental processes and improve long-term alignment between departments, this is not the primary purpose of the guideline which instead is primarily aimed at improving consistency in dealing with biodiversity issues. Importantly, this is a guideline to aid the integration of biodiversity issues into the mining cycle rather than a set of rules which can be applied unilaterally without interpretation or interrogation.

Box 1. What do we mean by mining?

The term 'mining' refers broadly to all stages of the 'mining life cycle' (described in section 2.1.). The MPRDA refers to both mineral and petroleum resources, but uses different terms for provisions as they relate to petroleum or mineral resources. For the sake of simplicity, in this Guideline the term 'mineral' or 'minerals' should be read as referring to mineral and petroleum resources and the use of MPRDA terms as they relate to mineral resources should be construed as referring to the equivalent in the petroleum provisions. That is (Section 47 of the MPRDA):

- Director-General or Regional Manager, must be construed in this document as a reference to the designated agency;
- Mining or mining operation is equivalent to petroleum production or production operation;
- Mining right is equivalent to a petroleum production right;
- Prospecting and associated rights are equivalent to petroleum exploration and associated rights; and
- Reconnaissance permission is equivalent to a reconnaissance permit for petroleum resources.

1.1.1. Founded on six fundamental principles

The Guideline is founded on six principles that should be applied when addressing biodiversity issues and impacts in a mining context:

1. Apply the law (as a minimum)
2. Use the best available biodiversity information
3. Engage relevant stakeholders thoroughly
4. Use best practice in environmental impact assessment (EIA) to identify, assess and evaluate impacts on biodiversity
5. Apply the mitigation hierarchy when planning any mining-related activities and develop robust environmental management programmes (EMP)
6. Ensure effective implementation of EMPs, including adaptive management.

Following these principles, the Guideline encourages mining companies, regulatory authorities and other mining stakeholders to use the high quality, readily accessible spatial and non-spatial biodiversity information that is available to guide thinking and decision making in respect of the mine planning process.

Box 2. What do we mean by EMP?

A detailed description of proposed mitigation and management measures identified as the result of an EIA to achieve explicit targets (i.e. impact avoidance/prevention, protection, impact minimisation, on-going impact management, rehabilitation and other remedial action, monitoring and adaptive management) are contained in what is referred to as an **environmental management programme or plan**. But the use of the word 'programme' or 'plan' varies across legislation. In NEMA , it is an environmental management programme that is required before consideration of an application for an environmental authorisation (which is required for all listed activities included in Listing Notice 1, 2 or 3 (GN No. R. 544, 545 and 546 respectively)). However in the MPRDA, management and rehabilitation of environmental impacts is contained in an environmental management plan in the case of reconnaissance permission or permit, prospecting right, exploration right or mining permit, and an environmental management programme in the case of a mining or production rights. An environmental management plan in Section 11 of NEMA applies specifically and exclusively to organs of state and refers to procedures for co-operative governance and the coordination and harmonisation of environmental policies, plans, programmes and decisions of various national departments that exercise functions that may affect the environment.

This Guideline uses the term 'environmental management programme (EMP)' to refer to the environmental management programme and environmental management plan in the MPRDA, and to the environmental management programme in the NEMA; documents detailing impact mitigation and management (i.e. it does not refer to the 'environmental management plan' as used in Section 11 of NEMA). Differences in the required content of EMPs as laid out in the MPRDA and the NEMA are discussed in section 3.1.

1.1.2. Who should use this Guideline?

This Guideline is primarily aimed at:

- Company environmental, exploration, project and mine managers.
- Environmental Assessment Practitioners (EAP).
- National government officials of DMR, DEA and Department of Water Affairs (DWA).
- Provincial government officials of Environmental Affairs, Water Affairs, and conservation authorities.

For company environmental, exploration, project and mine managers of mining companies, EAPs, specialists or project managers consulting to mining companies, this Guideline presents requirements for utilising and integrating biodiversity related information and informants into the assessment of impacts of mining on biodiversity and ecosystem services, and advises on good practice throughout the mining life cycle. A secondary audience to which the Guideline should be of interest is the investors in mining companies as well as financial institutions. From a risk management and a good governance perspective, providers of capital should seek confirmation that mining companies have followed this Guideline. Application of the guidance contained in this document will, aside from assisting with legal compliance, aid identifying risks to project success and company reputation early on in the mining life cycle.

For national and provincial regulators this document provides guidance to officials on achieving orderly and ecologically sustainable development while implementing programmes that support economic growth and the equitable distribution of benefits. This is a responsibility of the Minister of Mineral Resources, or the Regional Manager to whom the responsibility may be delegated. The Guideline identifies the biodiversity considerations that are relevant at each stage of the mining life cycle and in doing so provides DMR officials with the necessary perspective to fulfil the environmental requirements of the MPRDA.

For officials of DWA, DEA, provincial environmental affairs departments and provincial conservation authorities, this Guideline should assist with the review of environmental impact assessments, and EMPs that relate to the mining life cycle. The information contained in this document will enable the relevant officials to immediately identify biodiversity priority areas, and as a result, sound the warning of probable significant impacts and high risks early on in the project life cycle.

In the same vein, the Guideline will be useful to civil society organisations and interested and affected parties who have an important role to play in working towards sustainable development.

1.1.3. How to use this Guideline

This Guideline should be used:

- **As a decision-support tool:** The Guideline provides pointers to what biodiversity information and tools exist and how they can be used to integrate biodiversity considerations at every stage of the mining life cycle. It is not intended as a detailed 'how to' guideline and is thus generic in nature, cannot answer all possible questions, and cannot be applied without interrogation. This guideline does not have any legal standing.
- **With due consideration of applicable legislation:** The Guideline places application of relevant legislation as one of the underlying principles. It recognises that gaps between the law and its application exist but it is hoped that this document helps to bridge some of these gaps.
- **With the ecosystem approach in mind:** This Guideline adopts the 'ecosystem approach', recommended by the Convention on Biological Diversity (CBD), that looks at people and their socio-economic environment as an integral part of the broader ecosystem of living and non-living components. This approach helps to assess the interdependencies between people and nature, and thus to identify impacts and risks, thereby facilitating good decision making.
- **In conjunction with other guidelines:** This Guideline should be used in conjunction with other guiding documents on biodiversity priority areas, integrated Environmental Management and impact assessment, mitigation, mining and related activities; both nationally and internationally, such as those produced by the International Council on Mining and Metals (ICMM).

1.2. Biodiversity: Where is it, and why is it important?

Biodiversity refers to the full range of living organisms in terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are apart. It is the genes, species (plants and animals), ecosystems, land- or seascapes, as well as the ecological and evolutionary processes that allow these elements of biodiversity to persist over time.

South Africa ranks as the third most biologically diverse country in the world, and contains three of the world's 34 biodiversity hotspots. As such, South Africa is of major global importance for biodiversity management and conservation. While biodiversity is essentially everywhere, some areas are more important than others in terms of the biodiversity that occurs there. South Africa has the benefit of good spatial and non-spatial biodiversity information and experienced systematic biodiversity assessment and planning specialists, which has resulted in the identification of priority areas for biodiversity management and conservation (or biodiversity priority areas, explained later in this document).

This rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect us from natural disaster and provide us with a rich heritage of nature-based cultural traditions.

Biodiversity and ecosystem services are essential to economic activities, such as the fishing industry, rangelands that support commercial and subsistence farming, horticultural and agricultural industries based on indigenous species, tourism, aspects of our film industry, or the commercial and non-commercial medicinal applications of indigenous resources.

The contribution of biodiversity to our economies is massive. Typically, its contribution is under-valued. Conservative estimates in South Africa, which count only commodified nature, based on specific use values of ecosystems and species, are that biodiversity is worth 7% of our GDP (~R73 billion) and supports over a million jobs. This includes formal sector contributions from conservation management, expanded public works programmes in environmental management, fisheries, forestry, and hunting sectors.

Biodiversity also forms the foundation of ecological infrastructure. Ecological infrastructure is the ecosystems or habitats which deliver the ecosystem services that underpin economic and social development and are increasingly recognised as having market value[2]. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding by coastal dunes and wetlands. Ecological infrastructure also assists in responding cost effectively to the impacts of climate change. The World Bank estimates that every dollar invested in disaster reduction measures, including appropriate investment in ecological infrastructure, saves seven dollars in losses from natural disasters.

Biodiversity also has an important role to play in addressing South Africa's priorities of sustainable rural communities, service delivery and job creation. This is because protecting biodiversity and the services provided by healthy ecosystems helps reduce the vulnerability and risk of society and communities to climate change whilst providing multiple benefits, including creating jobs through biodiversity-based green economic activities (e.g. Working for Water Programme and Working for Wetlands Programme)[3]. Biodiversity-based green economic activities support the use of ecological infrastructure and natural capital for economic purposes, while ensuring ecosystems function properly and deliver services that benefit society.

Loss of biodiversity puts aspects of our economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods[4]. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment, which established a scientific basis for the need for action to enhance management and conservation of biodiversity[5].

Pressures on biodiversity are numerous and increasing. Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world[6]. Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted in the identification of spatial biodiversity priorities, or biodiversity priority areas, explained later in this document.

[2] TEEB (2010)
[3] South Africa's New Growth Path, released in 2010, is one of the policy documents guiding job creation in this regard.
[4] Driver et al. (2005)
[5] MEA (2005)
[6] Maze et al. (2004)
[7] Taken from the Millennium Ecosystem Assessment Framework for Ecosystem services, which provides a sound and internationally accepted definition of ecosystem services (MEA 2003).

Box 3. Ecosystem services can be classified into four categories[7]

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water.
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment.
- Regulating services are the benefits obtained from an ecosystem's control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards.
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

1.3. Relevance to the mining industry

On a par with South Africa's rich biodiversity is its mineral wealth. The mining industry is a long-standing and pivotal driver of South Africa's economy. But mining and related activities have had significant impacts on biodiversity and ecosystem services (e.g. delivery of high quality water); often potentially causing irreversible and often large scale habitat loss, at times across large areas or areas important to the provision of important ecosystem services, particularly water-related services.

Although the legacy of the mining industry is not always good when it comes to social and environmental impacts, opportunities exist at every stage of the mining life cycle to reduce the impacts of mining on land use, greenhouse gas emissions, water and biodiversity, and increase the benefits to nearby communities.

The mining industry is itself dependent on key resource inputs such as water, the provision of which depends on the health and integrity of ecosystems. Additional to these often overlooked benefits, there are other opportunities for the mining sector linked to investing in biodiversity. Green mining initiatives and more environmentally-friendly projects are likely to become more economically viable as investors continue to examine the sustainability of companies and mines more carefully. Furthermore, opportunities to invest in renewable energy, alternative land-use options, and partnerships with neighbouring communities and other stakeholders could improve the sustainability of a mine, and offer future business opportunities. Non-compliance with environmental legislation is not only potentially costly, but poses risks such as the directors of offending companies being held legally accountable, expensive operational delays or stoppages, licences being revoked or loss of investment. Failure on this score can pose a risk to maintaining a social licence to operate, which is a significant risk to the mining and metals industry.

1.4. Sustainable development and legislation

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act (No. 10 of 2004) (hereafter referred to as the Biodiversity Act), and is fundamental to the notion of sustainable development. International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa[8] .

DMR, as custodian of South Africa's mineral resources, is tasked with enabling the sustainable development of these resources. This includes giving effect to the constitutional requirement to "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"[9] .

The primary environmental objective of the MPRDA is to give effect to the 'environmental right'[10] contained in the South African Constitution. The MPRDA further requires the Minister to ensure the sustainable development of South Africa's mineral resources, within the framework of national environmental policies, norms and standards, while promoting economic and social development.

[8] Such as the Johannesburg Plan of Implementation, agreed at the World Summit on Sustainable Development in 2002, the Mining, Minerals and Sustainable Development (MMSD) reports and the National Strategy for Sustainable Development (2011 - 2014).

[9] Constitution of the Republic of South Africa (No. 108 of 1996).

[10] Section 24 of the Constitution states that "everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures 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."

[11] Section 2(4)(e) and Section 2(4)(p) NEMA

With regard to the environment, Section 37(1) of the MPRDA provides that the environmental management principles listed in Section 2 of the National Environmental Management Act (No. 107 of 1998) (NEMA) must guide the interpretation, administration and implementation of the environmental requirements of the MPRDA, and makes those principles applicable to all prospecting and mining operations. The NEMA principles apply throughout South Africa to the actions of all organs of state that may significantly affect the environment, and thus to decision making on mining applications. These principles require that impacts on biodiversity and ecological integrity are avoided, and if they cannot altogether be avoided, are minimised and remedied. They also specify 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 must be paid for by those responsible for harming the environment[11]. Moreover the responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle. NEMA principles of particular relevance to biodiversity are listed in Box 4. Since these principles underpin decision making, it benefits mining companies to be aware of, and comply with, them in planning mining projects.

Furthermore, Section 37(2) of the MPRDA states that "any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations".

Box 4. NEMA principles of particular relevance to biodiversity

- Section 2(4)(a)(i): the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- Section 2(4)(a)(ii): pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- Section 2(4)(a)(vi): the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised.
- Section 2(4)(a)(vii): a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.
- Section 2(4)(e): responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
- Section 2(4)(o): The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- Section 2(4)(p): 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 must be paid for by those responsible for harming the environment.
- Section 2(4)(r): Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal habitats including dunes, beaches and estuaries, reefs, wetlands, and similar ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

1.5. Mining and biodiversity: the scope and structure of this Guideline

This Guideline describes the principles, tools and information that should inform the consideration of biodiversity in the mining life cycle to support the sustainable use of the country's mineral resources. This Guideline takes into account the multitude of laws that govern the impacts of mining on the environment (and in particular, biodiversity) and, secondly, provides information on how to factor biodiversity into the life cycle of a mining project.

South Africa has the benefit of some of the best biodiversity science in the world and is at the forefront of developing spatial and non-spatial information and tools for the management and conservation of biodiversity. These tools assist in identifying and addressing impacts on biodiversity at the level of ecosystems and habitats. While management and conservation of biodiversity is often associated with formal reserves or protected areas, and protected areas are a key component of biodiversity management, **the majority of important remaining biodiversity is found outside protected areas,on private or communal land in production landscapes and seascapes**. Numerous opportunities and tools exist to integrate the management and conservation of biodiversity into production sectors (mining, forestry, agriculture etc) to reduce impacts on biodiversity and ensure ecosystem integrity. This Guideline helps to facilitate the use of these tools by the regulatory authorities and companies in the mining sector.

2 Overview

2 Overview

2-1 Life cycle of a mining project

The section outlines the main stages of the mining life cycle. It illustrates the increasing effort and investments made as a mining project progresses and highlights the potential impacts on socio-ecological systems in the process. It goes on to argue, from a business perspective, why mining companies benefit from a risk-based approach to managing biodiversity.

2-2 Impacts on biodiversity typically associated with mining

This section provides a brief summary of the biodiversity impacts associated with mining. There are different types of biodiversity impacts through the life cycle of a mining project which have different effects that vary across space and time, can be cumulative and may interact with other impacts in unexpected ways.

2-3 Biodiversity and risk

This section draws attention to the fact that impacts on biodiversity have wider socio-economic ramifications. By taking an ecosystems approach, the effects of mining on ecosystem services become evident. These impacts present real risks to human health, safety and livelihoods, as well as to sustainable economies. They also represent a spectrum of risks to companies.

2-4 Proactive planning: the mitigation hierarchy

This section discusses the mitigation hierarchy, a fundamental tool for impact mitigation. The mitigation hierarchy is inherently proactive and illustrates the steps to be followed to firstly avoid, then minimise, then rehabilitate, and finally offset the negative effects of any development on biodiversity.

2-5 Towards good decision making about biodiversity and mining

Six principles to guide good decision making about biodiversity and mining are introduced.

2.1. Life cycle of a mining project

The life cycle of a mining project consists of several stages, moving from a discovery or reconnaissance stage, to exploration or prospecting stage, the development and production stage of mining, and finally the decommissioning and closure stage (referred to as the mining life cycle). These stages are identified as such because they align with the activities contemplated in terms of the MPRDA which may require authorisation, and thus broadly align with the mining life cycle followed by mining companies[12]. The stage at which these legal requirements fit into the planning horizon of mining companies varies, but no operation may commence without the appropriate authorisations, including where associated activities trigger the need for environmental authorisations or water use licences.

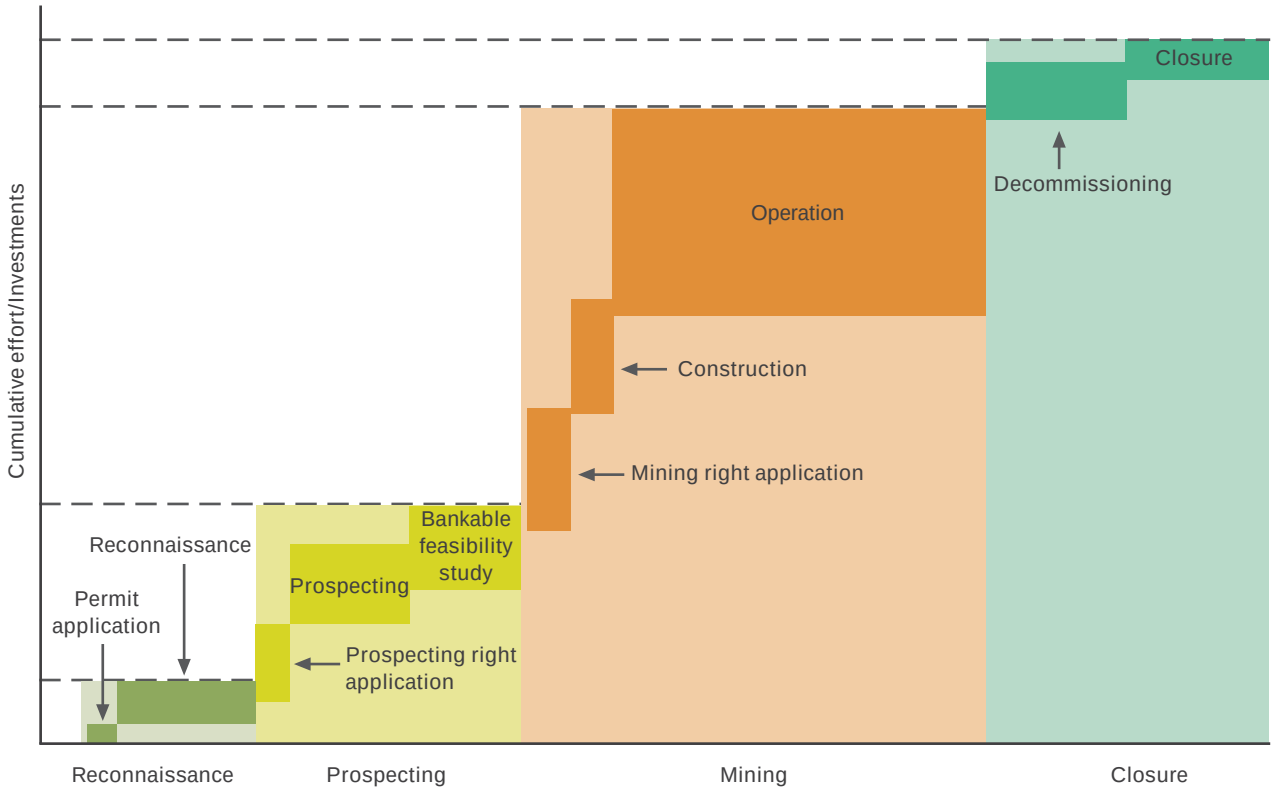
As a mining project progresses through these stages of feasibility, increasing levels of time and resources are needed, including greater level of detail and confidence in the economic feasibility of a particular mineral resource up to the point of the decision to build a mine. The cumulative effort and investment into a mining operation during the mining life cycle is represented graphically in Figure 1.

[12] There can be variability in the mining life cycle planning stages amongst mining companies.

Until the mine is operating, decisions to invest additional money at each stage of the mining life cycle are based on the findings of impact and risk assessments undertaken during the previous stage, which speak to the viability of a mine. The prospecting stage is therefore important, as it is near the end of this stage, that a mining company will aim to develop a bankable feasibility study based on their findings. Individual mining companies may expand on a mining project stage in which conceptual desktop, pre-feasibility and feasibility studies may be undertaken by investing incrementally in each stage before assessing investment in the next stage and determining whether or not the mining project will be feasible. At this project stage, where the critical decision as to whether a mining project is feasible is taken, is essential that fatal flaws to the project going ahead have been identified or that the full rehabilitation costs are factored into the economics of the project. It is at this stage – before the decision to apply for a mining right or not – where the consideration of biodiversity information, the interrelationships between social and biophysical components of the environment, and their integration with engineering and financial planning and decision making about a mining project is especially important. The assessments include not only the size and nature of the mineral resource, but also the costs of developing, operating, managing and closing the mine, including post-closure commitments such as rehabilitation.

The mining stage represents the largest relative effort and investment required, not only for the mining company, but for authorities responsible for authorisations, monitoring and compliance enforcement, and for key stakeholders involved in public participation, cooperative agreements, and monitoring. There is also increasingly greater effort in the decommissioning and closure stage, which likewise has costs associated with it. It is therefore most cost-effective to identify key biodiversity issues for project development early in the mining life cycle; the cost of fixing problems during implementation are inevitably greater than avoiding or preventing those problems through early detection.

Figure 1. Summary of the mining life cycle indicating the relative levels of investment and effort in the four stages of the mining life cycle.



Key biodiversity issues could include potentially significant impacts on biodiversity and ecosystem services. The types of impacts typically associated with mining are summarised in section 2.2. Determining these impacts should be considered part of the project proponent's risk identification process, particularly as the identification of these impacts at an early stage - based on proper consideration of biodiversity information - can streamline decisions about where to or where not to develop, and how to develop. The early assessment of biodiversity impacts helps to:

- Reduce risk to biodiversity if appropriate mitigation action is taken.
- Avoid delay in authorisations, and reduce delays caused by appeals.
- Reduce risk to the company by avoiding reputational damage and unexpected costs, and/or difficulty in accessing finance.
- Obtain 'buy in' from local communities (or a 'social licence to operate'[13]).
- Reduce risk to society of deteriorating ecosystem services and loss of biodiversity, from local to national scale, over the short and long term.

2.2. Impacts on biodiversity typically associated with mining

The impacts on biodiversity typically associated with mining vary significantly depending on the type of mining, the scale and extent of mining, the environmental management approach adopted (detailed in an EMP), and the area and type of biodiversity being affected. Different types of mining include opencast, underground, and alluvial mining for each example, each of which has very different levels of impact on biodiversity. Additionally, each stage of the mining project can have adverse effects on the environment and biodiversity. The impact is likely to increase in severity as a mining project develops through reconnaissance, to prospecting and then mining. When the mine closes activities that result in biodiversity impacts may draw to an end and the disturbance footprint of the mine needs to be rehabilitated. There may be long-term or latent impacts that continue to impact on biodiversity and ecosystem services after mine closure. Impacts of mining and related activities on biodiversity can be grouped into four broad categories. Impacts may be direct, indirect, induced or cumulative, as described below:

- **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).
- **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).
- **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).

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 the surface water or groundwater regime, and/or the loss of biodiversity where mitigation measures are inadequate.

[13] Where a company starts operating in a sensitive area it may face strong objection or legal challenge, incurring reputational damage.

The principal impacts of mining on biodiversity comprise:

- The loss and/or degradation or conversion of land, marine and other aquatic habitats (removal of natural vegetation and destruction of habitat) and associated loss of species.
- Significant alteration of ecological processes, sometimes irreversibly (e.g. the breaching of aquitards[14], changes in the water table, disruption of species movement patterns, disruption of the local hydrological cycle and permanent alteration of flow).
- Pollution (including noise and light pollution) and migration of pollutants in air, soils, surface water, groundwater or the ocean.
- Introduction of invasive alien species.
- Changes in demand for, or consumption of, natural resources (either directly or through indirect or induced changes as a consequence of mining activities).

In many cases, the impacts on biodiversity affect a range of ecosystem services, which translate into implications for human well-being (livelihoods, safety, security and health). It is often these critical interdependencies between the impact of mining, biodiversity, and people that are overlooked in the assessment of impacts and risks associated with a proposed mining project. The implications for human well-being of a mining project often become 'external' costs to society. According to the NEMA principles, the mining company is responsible for these external costs, in addition to the direct impacts on biodiversity[15].

The significance of impacts on ecosystem services and socio-economic benefits enjoyed by different communities (sometimes located considerably downstream of a mined area) is often not assessed and/or taken into consideration. Balancing the estimated costs of altered ecosystem service delivery with the suite of socio-economic benefits that mining brings, requires the right team of professionals with the right skills, asking the right questions and applying appropriate tools. This can require the involvement of specialists from more than one organisation or discipline.

2.3. Biodiversity and risk

Mining companies are generally aware of the possible obstacle that areas of high biodiversity value can pose to mining projects, but even in cases where direct biodiversity risks are assessed, failure to fully consider the interdependencies between mining, biodiversity and society into the assessment of impacts can result in a failure to identify significant risks associated with a proposed mining project. Concern over what may be perceived as incompletely addressed biodiversity issues and impact on biodiversity and ecosystem services can become a driver for increased regulations (e.g. laws and strengthened liability regimes), pressure and activism by non-governmental organisations and civil society, shifting consumer preferences and changed shareholder interest[16]. Hence, mining companies often have to go beyond just compliance to avoid facing significant opposition from interested and affected parties, to gain what is increasingly being referred as a 'social licence to operate'. Maintaining a social licence to operate is considered the fourth most significant risk to the mining and metals industry according to an Ernst and Young report on Business risks facing mining and metals from 2011 to 2012[17]. The report shows that the issue of maintaining a social licence to operate, which can be affected by environmental performance, safety and land disputes, has become a more significant risk than it was previously. Environmental performance relates to impacts on biodiversity, water extraction and pollution, soil contamination, air emissions, and waste management. Also, the report states that "it doesn't matter if it happened a long time ago, at another mine, or even to another company...[the] public want to hold companies responsible and this can affect investment confidence".

[14] A geological term for sediment or rock with low permeability adjacent to an aquifer; may serve as a storage unit for groundwater, but does not yield water readily.
[15] Section2(4)(p) NEMA.
[16] Mulder (2007)
[17] Ernst and Young (2011)

Investors examine the overall sustainability (triple bottom line) of companies and mines. This is indicative of a general shift, which should emphasise the importance of understanding the impacts of mining on biodiversity and recognising the risks faced by companies that potentially have high impacts on biodiversity. The types of risk to companies include regulatory risk (non-compliance with environmental legislation which is not only costly but poses additional risks such as operation delays or stoppages, licences being revoked or loss of investment), reputational risk, liability risk (directors of offending companies can be held liable for non-compliance), credit risk, and reduced shareholder value[18].

Globally, there are moves towards demanding greater transparency and accountability from companies, not least those involved in mining. A number of initiatives, including the South African King Committee's Report on Corporate Governance (King III), demand that companies look beyond traditional ideas of risks and sustainability to develop a more comprehensive understanding of the impacts of businesses and, in turn, the risks these entities face with regard to issues such as biodiversity, climate change, and water availability.

It is therefore becoming good business practice to incorporate appropriate scientific methodologies that encompass all levels of assessment of impact on biodiversity and ecosystem services, stakeholder engagement, and comprehensive economic valuation of the affected areas into business decision making. It makes good business sense to follow this 'good practice' approach; the business opportunities of so doing are also increasingly recognised [19].

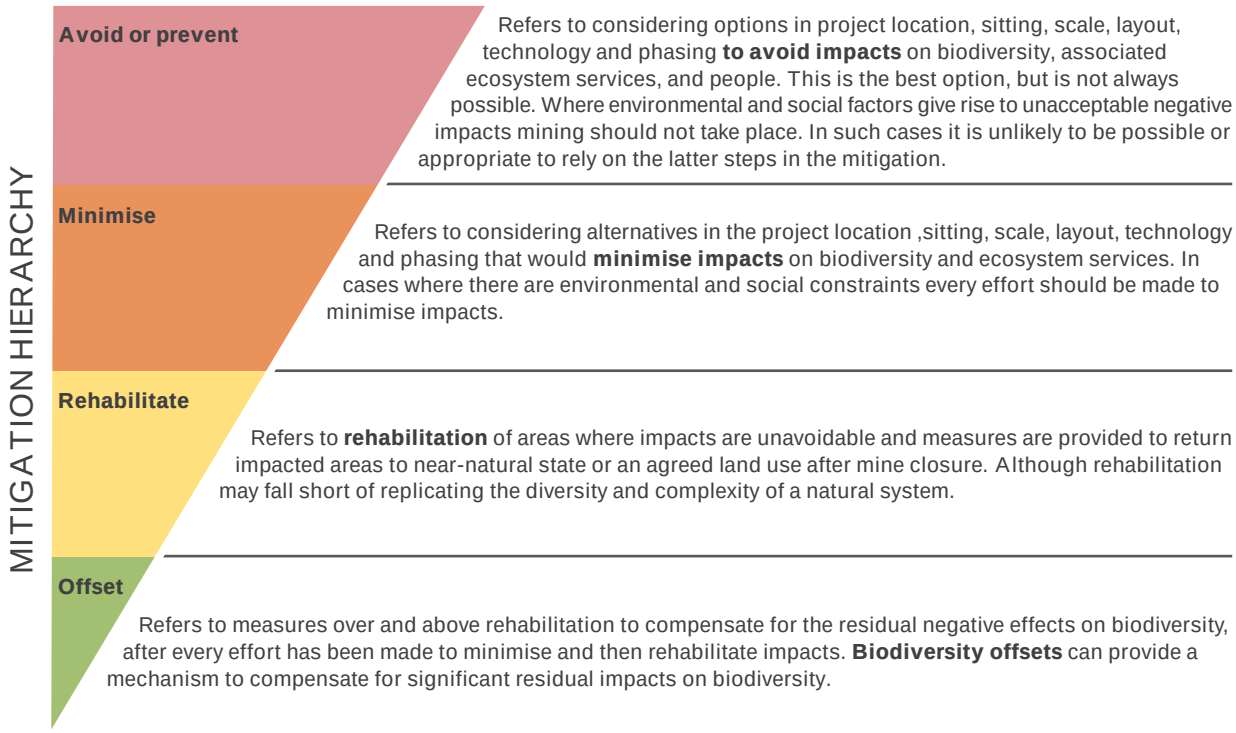
[18] Mulder (2007) describe the increasing number of tools available that guide financial institutions of assessing how biodiversity has been integrated into risk management procedures and other business operations. These encourage financial institutions and the companies they finance to look at potential biodiversity risks (and opportunities).
[19] Mulder (2007), World Business Council for Sustainable Development (2011)

2.4. Proactive planning: the mitigation hierarchy

The mitigation of negative impacts on biodiversity and ecosystem services is a legal requirement for authorisation purposes and must take on different forms depending on the significance of the impact and the area being affected. Mitigation requires proactive planning that is enabled by following the mitigation hierarchy, illustrated in Figure 2. Its application, is intended to strive to first avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally offset any remaining significant residual negative impacts on biodiversity, where:

- **Avoiding or preventing impacts** – refers to considering options in project location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people. This is the best option, but is not always possible if mining is to take place. However, there are areas where the environmental and social constraints are too high and mining should not take place. Such areas are best identified early in the mining life cycle, so that impacts can be avoided and authorisations refused. In the case of areas where environmental constraints might be limiting, this includes some ecosystems, habitats, ecological corridors, or areas that provide essential ecosystem services and are of such significant conservation value or importance that their loss cannot be compensated for (i.e. there is no substitute). In such areas it is unlikely to be possible or appropriate to rely on the latter steps in the mitigation hierarchy (e.g. rehabilitating or offsetting impacts) to provide effective remedy for impacts on biodiversity or ecosystem services. Information about the location of many such areas is available, often making it possible to avoid them (see sections 3.2).

Figure 2. The mitigation hierarchy for dealing with negative impacts on biodiversity. Its application is intended to require companies to first strive to avoid disturbance of ecosystems and loss of biodiversity, and where they cannot be avoided altogether, to minimise, rehabilitate or offset any residual negative impacts on biodiversity.



- **Minimising impacts** – refers to considering alternatives in the project location, siting, scale, layout, technology and phasing that would minimise impacts on biodiversity and ecosystem services. Even in areas where the environmental and social constraints are not particularly high for mining to proceed/take place every effort should still be made to minimise impacts.
- **Rehabilitate impacts**[20] – refers to the rehabilitation of areas where impacts were unavoidable and measures are taken to return impacted areas to a condition ecologically similar to their 'pre-mining natural state' or an agreed land use after mine closure. Although rehabilitation is important and necessary, unfortunately even with significant resources and effort, rehabilitation is a limited process that almost always falls short of replicating the diversity and complexity of a natural system. Instead rehabilitation helps to restore some resemblance of ecological functioning in an impacted landscape, to avoid on-going negative impacts, and/or to provide some sort of aesthetic fix for a landscape. Rehabilitation should occur concurrently or progressively with the proposed activity, and/or on cessation of the activity.
- **Offset impacts** –refers to compensating for remaining and unavoidable negative effects on biodiversity. When every effort has been made to minimise and then rehabilitate remaining impacts to a degree of no net loss of biodiversity against biodiversity targets, biodiversity offsets can provide a mechanism to compensate for significant residual negative impacts on biodiversity[21].

The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives of project location, siting, scale, layout, technology and phasing until the proposed development best 'suits' and can be accommodated without significant negative impacts in the receiving environment. In cases where the receiving environment cannot support the development (e.g. there is insufficient water) or where the project will destroy the natural resources on which local communities are wholly dependent for their livelihoods or eradicate unique biodiversity, the development may not be feasible; the earlier the mining company knows of these risks, and can plan to avoid them, the better. In the case of mining, where biodiversity impacts can be severe, the guiding principle should be "anticipate and prevent" rather than "assess and repair"[22].

The proper application of the mitigation hierarchy (discussed further in section 3.5 and 4) is essential and requires a team of people with the relevant skills and knowledge (including consulting with specialists who might sit outside of a core project team) asking the right questions and applying the appropriate science and methods.

2.5. Towards good decision making about biodiversity and mining

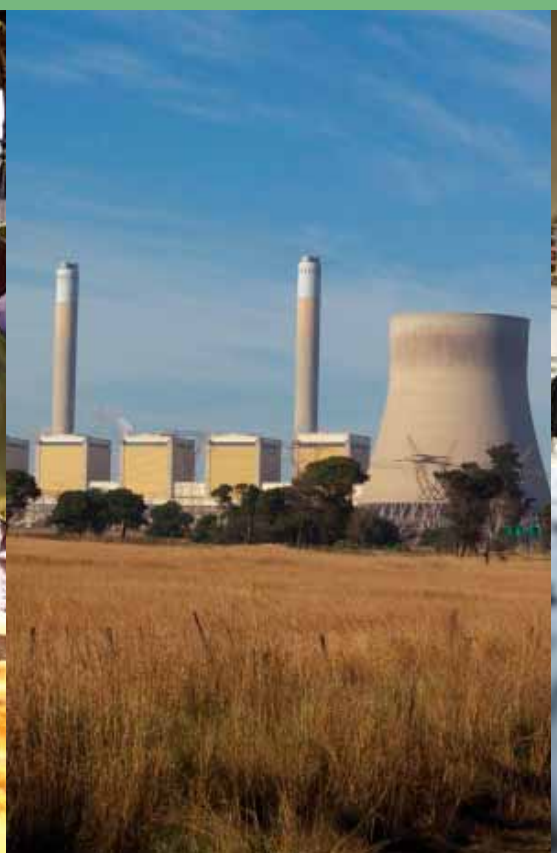
This section has outlined the life cycle of the mining project, the potential impacts on biodiversity that may occur throughout this life cycle, and the linkages between these impacts on biodiversity and risk to mining companies. There are a growing number of reasons, related to good business practice and business risk, for mining and other companies to 'invest' in the integration of biodiversity information into proper assessment and good decision making. The next section will describe the tools and information available to integrate biodiversity and mining in a manner that supports good decision making, addressing each of the six principles.

[20] Rehabilitation, in the context of the mitigation hierarchy, has to refer to reducing residual impact on biodiversity. In which case, the goal of rehabilitation would be the restoration to some pre-existing reference point, the biotic integrity in terms of species composition and community structure, as well as the reparation of ecosystem processes, productivity and services. However caution is required in incorporating rehabilitation in reducing residual impact calculations, given that the likelihood of success is limited. A distinction in the intent of rehabilitation can be made: (a) to repair of the affected area to what, within the regional context, is considered to be a useful purpose through the stabilisation of the terrain, assurance of public safety, aesthetic improvement; (b) to restore an affected area or ecosystem to where it can sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (see Cooke and Johnson (2002) for more on distinction between rehabilitation and restoration). The feasibility of rehabilitating biodiversity to a desired level should be determined during the scoping phase of a project with input from specialists. With growing concern of the likelihood of failing to rehabilitate, the precautionary principle should apply in biodiversity priority areas.

[21] Biodiversity offsets are defined as measurable conservation actions intended to compensate for this residual impact so as to achieve no net loss of biodiversity and preferably a net gain on the ground (BBOP 2009)

[22] Proceedings of Workshop on Impact Assessment, Biodiversity and the Extractive Industries, Beijing, China. ICMM, IPIECA, CNOOC, IAIA conference, 24-26 March 2009.

3 Integrating biodiversity and mining: better decision making



3 Integrating biodiversity and mining: better decision making

This section discusses six principles to guide decision making on mining and biodiversity.

3-1 Apply the law: administrative requirements and approvals

This section outlines the administrative requirements, stipulated by South African law, in relation to the stages of the mining life cycle and outlines where and how biodiversity should be considered.

3-2 Best available biodiversity information

This section describes the best available biodiversity information. It focuses on biodiversity priority areas, the different types of values associated with them and the desired outcomes (e.g. no impact allowed, limited impact and emphasis on rehabilitating, minimising and providing for biodiversity offsets). It also discusses other non-spatial information about biodiversity and available tools to inform decisions.

3-3 Biodiversity stakeholder engagement

In this section, stakeholder engagement is defined and guidance provided on identifying relevant biodiversity stakeholders, the timing and scope of engagement for integrating biodiversity concerns into the process. It also provides advice on the formation of partnerships to address biodiversity issues.

3-4 Environmental impact assessment

Here, the use of best practice in the (EIA) process to identify, assess and evaluate impacts on biodiversity is discussed. The section describes tools aimed at helping to anticipate and mitigate significant risks and impacts on biodiversity. It also describes some of the limitations of conventional EIAs and suggests how they may be overcome to provide a stronger basis for avoidance of the impacts on biodiversity, mitigation, management and conservation.

3-5 Robust environmental management that applies to the mitigation hierarchy

Application of the mitigation hierarchy in planning any mining-related activities and in developing robust EMPs is the focus of this section. It describes tools aimed at helping to secure important biodiversity (i.e. biodiversity stewardship). It also describes tools aimed at mitigating and managing residual impacts (i.e. rehabilitation, EMPs, and biodiversity offsets).

3-6 Effective implementation

This section provides guidance on ensuring the effective implementation throughout the mining cycle, including the application of adaptive management principles.

The Guideline offers six principles that should be applied towards good decision making when addressing biodiversity issues and impacts in a mining context:

1. Apply the law (as a minimum)
2. Use the best available biodiversity information
3. Engage all relevant stakeholders thoroughly
4. Use best practice EIA to identify, assess and evaluate impacts on biodiversity
5. Apply the mitigation hierarchy in planning any mining-related activities and in developing robust EMPs.
6. Ensure effective implementation of the EMP, including adaptive management.

These are outlined in the sections that follow.

3.1. Apply the law: administrative requirements and approvals

South Africa has sound environmental legislation aimed at achieving sustainable development, including laws that support public participation, impact assessment and environmental management.

The Mineral and Petroleum Resources Development Act (No. 28 of 2002), referred to in this Guideline as the MPRDA, is the main piece of legislation governing all stages of the mining and petroleum production process in South Africa, primarily through the granting of regulatory authorisations for mining and mining-related activities. The MPRDA is part of a network of legislation geared towards sustainable development and the conservation and management of South Africa's rich biodiversity.

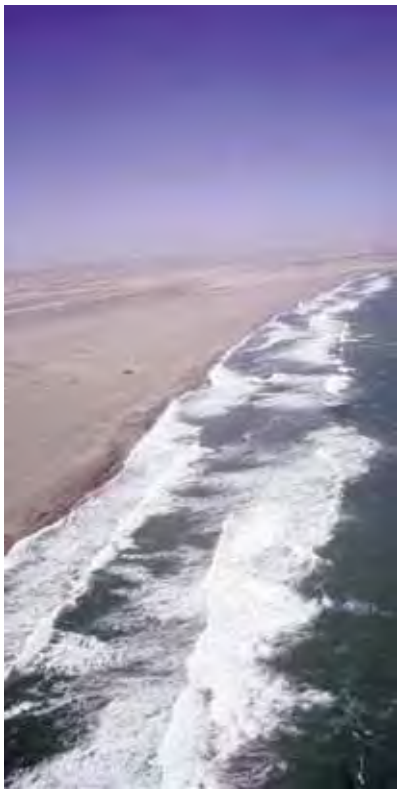
The Minister of Mineral Resources is the authority responsible for granting any reconnaissance permission, prospecting right, mining right or mining permit (here forward shortened to permission/right/permit). In practice this authority is often delegated to the relevant Regional Manager in DMR. The Minister is specifically tasked to "ensure the sustainable development of South Africa's mineral and petroleum resources within a framework of national environmental policy, norms and standards while promoting economic and social development"[23] .To ensure this, the MPRDA stipulates that:

- the NEMA principles apply to all mining and serve as guidelines for the interpretation, administration and implementation of the environmental requirements of the MPRDA (Section 37(1)).

- the holder of a permission/right/permit (Section 38):
  - must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment
  - must manage all environmental impacts
  - must – as far as is reasonably practicable, rehabilitate the environment to its natural or predetermined state, or to a land use which conforms to the generally accepted principle of sustainable development
  - is responsible for environmental damage, pollution or ecological degradation as a result of reconnaissance, prospecting or mining operations which may occur inside and outside the boundaries of the areas to which such right, permission or permit relates.

- the permission/right/permit may be issued if the Minister is satisfied that it will take place within the framework of national environmental management policies, norms and standards (Section 48(2)).

[23] Section 3(3) of the Mineral and Petroleum Resources Development Act.



To ensure this, the MPRDA includes some key legal and regulatory mechanisms:

- **EMP**: this is the main tool used to mitigate and manage environmental impacts, detailing the proposed measures to be undertaken. The requirements of an EMP in the MPRDA (and dependent on the permission/right/permit to which it will be applied) are slightly different to those prescribed in Section 24N of NEMA (Amendment Act 62 of 2008), but generally both are giving effect to similar general objectives of integrated environmental management laid down in Section 23 of NEMA. The MPRDA requires mining operators to obtain environmental approval in advance of operations. It also imposes on-going environmental management and mitigation obligations throughout the mining life cycle. The EMP requires the applicant to undertake an EIA (see section 3.4 for more detail) and to set out the applicant's financial provision for mitigation. The MPRDA (Regulation 51(a)(i)) also requires that environmental objectives and goals for closure are included in the EMP, highlighting the need to plan with closure in mind.

- **MPRDA Pollution Control and Waste Management Regulations**: provide that water management and pollution control comply with the provisions of the National Water Act. It further provides that control of erosion and soil pollution control comply with applicable legislative requirements[24].

- **Prohibition or restriction of mining or prospecting**: in terms of Section 49 of the MPRDA, the Minister of Mineral Resources may completely prohibit or restrict the granting of any permission/permit/right if the land is residential area, public road, railway or cemetery, being used for public or government purposes or reserved in terms of any other law. This provision allows the Minister, in consultation with other relevant Departments, to prohibit or restrict granting permission/right/permit in certain areas of critical biodiversity, heritage and hydrological importance.

In addition to the MPRDA, mining companies also need to comply with a range of other laws which regulate mining impacts on the environment. These include:

- **Constitution of Republic of South Africa, 1996**: Section 24(a) of the Constitution states that everyone has the right 'to an environment that is not harmful to their health or well-being'. Mines must comply with South African constitutional law by conducting their activities with due diligence and care for the rights of others.

- **NEMA**: Environmental management principles set out in NEMA, and other Specific Environmental Management Acts (SEMAs) should guide decision making throughout the mining life cycle to reflect the objective of sustainable development[25]. Mining is prohibited in protected areas defined in the National Environmental Management Protected Areas Act (No. 57 of 2003; hereafter referred to as **Protected Areas Act**). One of the most important and relevant principles is that disturbance of ecosystems, loss of biodiversity, pollution and degradation of environment and sites that constitute the nation's cultural heritage should be avoided, minimised or as a last option remedied. This is supported by the **Biodiversity Act** as it relates to loss of biodiversity.

[24] Humby (2000)
[25] Section 2 of NEMA

- **EIA Regulations (GN No. R. 543)** published in terms of NEMA trigger the need for applicants to undertake either a Basic Assessment or Scoping and Environmental Impact Assessment if the proposed activity is included in one or more of the three Listing Notices[26]; and Listing Notice 3 (listing activities and sensitive areas per province, for which a Basic Assessment process must be conducted) (GN No. R. 546). In some cases both the MPRDA and NEMA require the identification, assessment and evaluation of impacts, and the determination of appropriate mitigation measures. An EMP may be required for activities subject to an EIA under NEMA.
- **Water Use Authorisations**: the **National Water Act (No. 36 of 1998)** requires that provision is made both in terms of water quantity and quality for 'the reserve', namely to meet the ecological requirements of freshwater systems and basic human needs of downstream communities. It is essential in preparing an EMP that any impacts on water resources, be they surface water or groundwater resources, and/ or impacts on water quality or flow, are carefully assessed and evaluated against both the reserve requirement and information on biodiversity priorities. This information will be required in applications for water use licenses or permits and/or in relation to waste disposal authorisations.
- **Mine-water regulations (Government Notice (GN) No. R. 704)** are aimed at ensuring the protection of water resources through restrictions on locality, material, and the design, construction, maintenance and operation of separate clean and dirty water systems. Detailed regulations on the use of water for mine-related activities were issued in 1999 under the National Water Act framework.
- **Liability for any environmental damage, pollution, or ecological degradation**: arising from any and all mining-related activities occurring inside or outside the area to which the permission/right/permit relates is the responsibility of the rights holder. This liability continues until such time as a closure certificate is issued by the Minister of Mineral Resources[27]. Company directors or members of a close corporation are jointly and individually liable for any unacceptable impact on the environment, regardless of whether it was caused intentionally or through negligence[28]. The National Water Act[29] and NEMA[30] both oblige any person to take all reasonable measures to prevent pollution or degradation from occurring, continuing or reoccurring (polluter pays principle). Where a person/company fails to take such measures, a relevant authority may direct specific measures to be taken and, failing that, may carry out such measures and recover costs from the person responsible[31].
- **Public participation**: Public consultation and participation processes prior to granting licences or authorisations can be an effective way of ensuring that the range of ways in which mining's impact on the environment, social and economic conditions are addressed, and taken into account when the administrative discretion to grant or refuse the licence is made[32]. Further, under Section 10 of the MPRDA, which requires that interested and affected parties be made aware that an application has been accepted and are given 30 days to submit comments, any objections should initiate the establishment of a Regional Mining Development and Environmental Committee (RMDEC).

[26] Listing Notice 1 (listing activities for which a Basic Assessment process be conducted) (GN No. R. 544); Listing Notice 2 (listing activities for which a Scoping/EIR process must be conducted) (GN No. R. 545)
[27] Section 43 Mineral and Petroleum Resources Development Act; additionally, provision for the transfer of environmental obligations is made in the Mineral and Petroleum Resources Development Act Regulations.
[28] Section 38(2) Mineral and Petroleum Resources Development Act
[29] Section 19 (2) National Water Act outlines what these reasonable measures are.
[30] Section 28 NEMA
[31] Section 19(4)-(8) National Water Act and Section 28 (7)-(11) NEMA.
[32] Humby (2010)

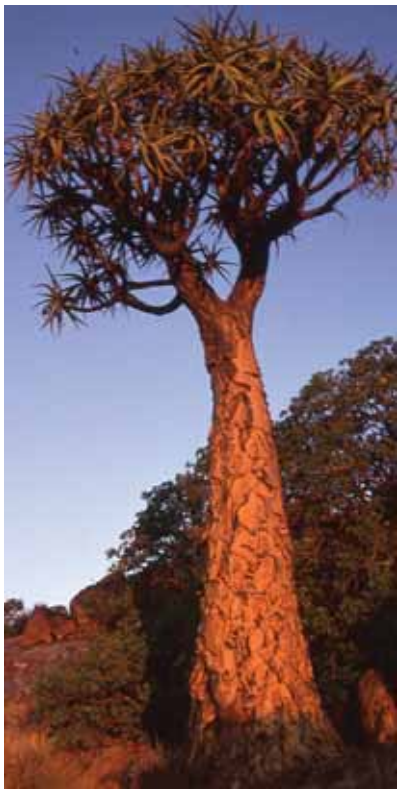
- **Provincial legislation, such as the Land Use Planning Ordinance (No. 15 of 1985) (LUPO) the Orange Free State's Townships Ordinance (No. 9 of 1969), and the Transvaal Province's Town-Planning and Townships Ordinance (No. 15 of 1986) which applies in Gauteng, Limpopo and Mpumalanga**: to regulate land use and to provide for matters incidental thereto. Zoning schemes may have implications for mining and mining associated activities. Where mining is not permitted within a zoning scheme, the holder of a mining right or permit will need to apply for these areas to be rezoned in order to allow mining.
- **National Heritage Resources Act (No. 25 of 1999)**: describes the importance of heritage in the South African context, and designates the South African Heritage Resource Agency (SAHRA) as guardian of the national estate which may include heritage resources of cultural significance that link to biodiversity, such as places to which oral traditions are attached or which are associated with living heritage, historical settlements, landscapes and natural features of cultural significance, archaeological and paleontological sites, graves and burial grounds, or movable objects associated with living heritage. Further, formal protections under the Natural Heritage Resources Act include: national heritage sites and provincial heritage sites (some recognised globally under the World Heritage Convention), and protected areas amongst others.

3.2. Best available biodiversity information

The South African National Biodiversity Institute (SANBI) is legally mandated to collect, generate, coordinate and disseminate information about managing South Africa's biodiversity[33]. The effective management of information underpins research, decision making, policy advice and monitoring[34]. Over the past few decades, this information has been used in producing spatial biodiversity plans that are based on best available science and relate directly to policy and legislative tools. Such plans can be enormously valuable in focusing the limited available resources for conserving and managing biodiversity on the geographic areas that make the most difference.

Spatial biodiversity plans have evolved considerably in South Africa since the 1990s and South Africa has emerged as a leader in producing these spatial biodiversity plans. They have remained grounded in the principles of the systematic approach to biodiversity planning, the key objectives of which are to facilitate the adequate representation of biodiversity in a region, to plan for its persistence, and to do this in a way that makes efficient use of limited resources[35]. Spatial biodiversity planning has supported the identification of **biodiversity priority areas** that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services.

[33] Section 11(1)(j) Biodiversity Act
[34] SANBI's Biodiversity Information Management Directorate administers a number of websites that store and disseminate biodiversity and related information. A summary of these websites and the freely available information contained therein can be found in the resources section of this document.
[35] Margules and Sarkar (2007)



Biodiversity priority areas are areas in the landscape or seascape[36] that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. The biodiversity priority areas identified take a range of forms, each with a different purpose and different implementation mechanisms. The significance of some of these areas in terms of their conservation value is such that there is little flexibility in their location and their management and conservation is critical to securing a representative sample of biodiversity. These areas are configured as efficiently as possible to take up the smallest possible area. Biodiversity priority areas include the following categories[37], all shown in Figure 3:

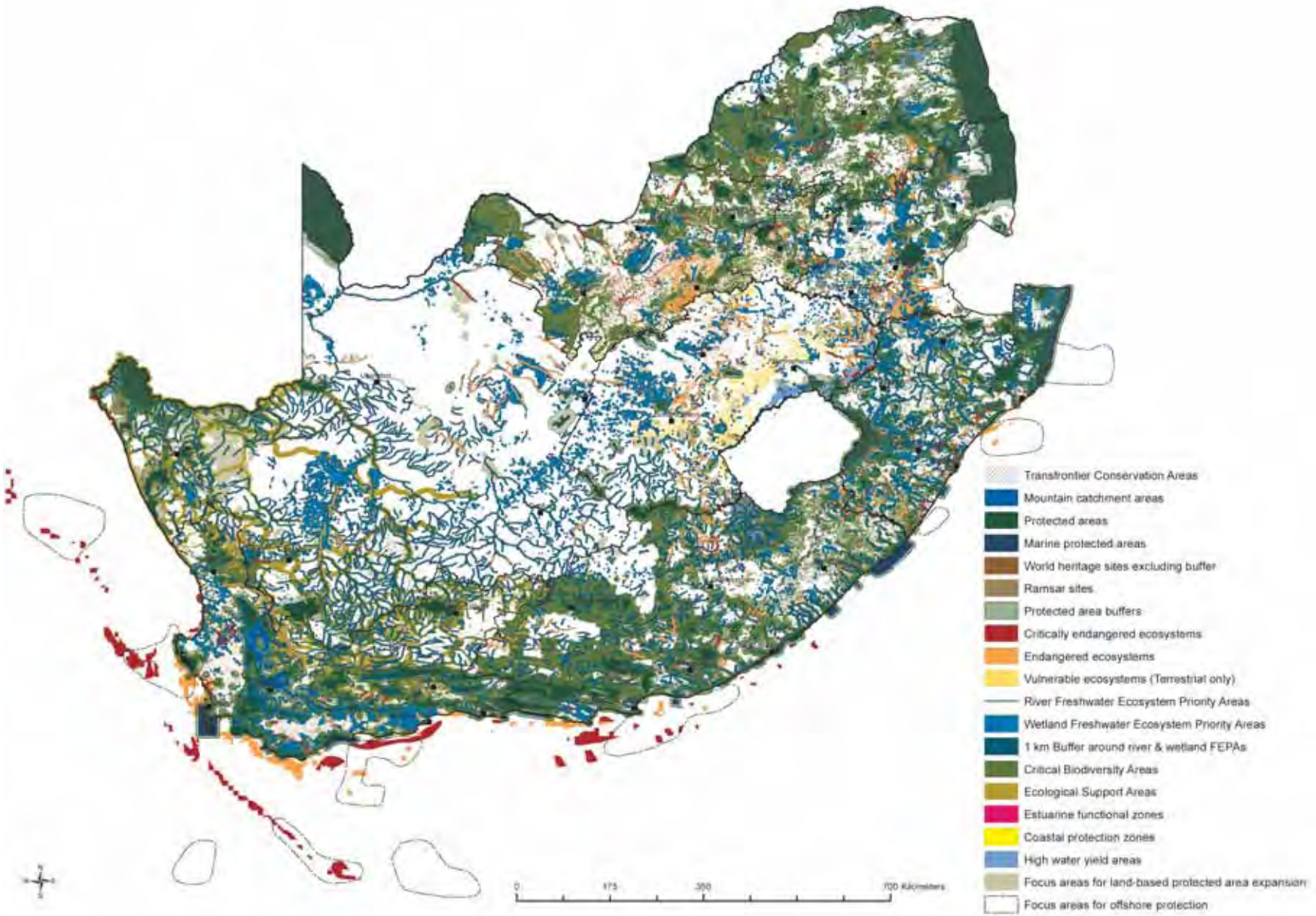
- Protected areas
- World Heritage Sites and their legally proclaimed buffers
- Critically endangered and endangered ecosystems
- Critical Biodiversity Areas
- River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and 1km buffer of river and wetland FEPAs
- Ramsar Sites
- Protected area buffers
- Transfrontier Conservation Areas (remaining areas outside of formally proclaimed PAs)
- High water yield areas
- Coastal Protection Zone
- Estuarine functional zones
- Ecological support areas
- Vulnerable ecosystems
- Focus areas for land-based protected area expansion and focus areas or offshore protection.

These biodiversity priority areas are important for conserving biodiversity that supports the provision of ecosystem services vital to people and economic activities downstream of ecosystem service flows. Their loss would be difficult or in some cases impossible to compensate or offset; there are no cost-effective substitutes for many of the services they deliver. Therefore, the impacts of mining, which can be significant, both over the short and long term, should to a greater or lesser extent be limited by biodiversity constraints in biodiversity priority areas. This Guideline has grouped biodiversity priority areas into four categories according to their biodiversity significance and implications for mining.

[36] Coastal ecosystem priority areas and marine ecosystem priority areas have yet to be identified across the country, and are the missing elements in this set of biodiversity priority areas. In some provinces and regions coastal and marine planning has taken place, but a national coastal biodiversity plan is an urgent priority.

[37] Note that not all these categories have formal legal status. This issue is dealt with in detail later in the guideline.

Figure 3. Biodiversity priority areas important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services.



3.2.1. Categories of biodiversity priority areas

Biodiversity priority areas should inform and influence spatial land use policies and plans, including policies and plans for mineral development. Because the biodiversity features in these biodiversity priority areas are likely to be sensitive to the impacts of mining activities, such activities may be prohibited by law or will be subject to scrutiny and potentially limited because of biodiversity considerations. This Guideline distinguishes between **four categories of biodiversity priority areas** in relation to their importance from a biodiversity and ecosystem services point of view, listed in Table 1 and illustrated in Figure 4.

For mining companies, the table and map can be used to assess the level of risk for investment in new mining projects and implications for current mining operations in any of these biodiversity priority areas. The table should also inform the application of the mitigation hierarchy to reduce impacts on biodiversity in these areas. For regulatory authorities, this table should be used to apply the law in areas where mining is prohibited (Category A); and in the other categories to ensure rigorous evaluation of the biodiversity content of applications, as well as the application of the mitigation hierarchy to reduce impacts on biodiversity in these areas. For both, this table should ensure the best available biodiversity information is used to appropriately identify, assess, evaluate and manage potential biodiversity impacts.

The full explanations of each biodiversity priority area, including their legal standing and/or recognized importance are given in Chapter 3.2.1. More detailed, higher resolution maps and underlying data will be made available on the SANBI spatial biodiversity information website B-GIS[38].

[38] http://bgis.sanbi.org

Box5 . Systematic biodiversity planning

Systematic biodiversity planning is a strategic and scientific approach to identifying those areas that are most important for biodiversity management and conservation. Three key principles underpin systematic biodiversity planning:

1. The need to conserve a **representative** sample of biodiversity pattern, such as species and habitats (the principle of representation).
2. The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of **persistence**).
3. The need to set quantitative **biodiversity targets or thresholds** that tell us how much of each biodiversity feature (vegetation type/unit/habitat) should be conserved in order to maintain functioning landscapes and seascapes. Biodiversity targets should ideally be based on best current available science and may be refined as new information becomes available. 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.

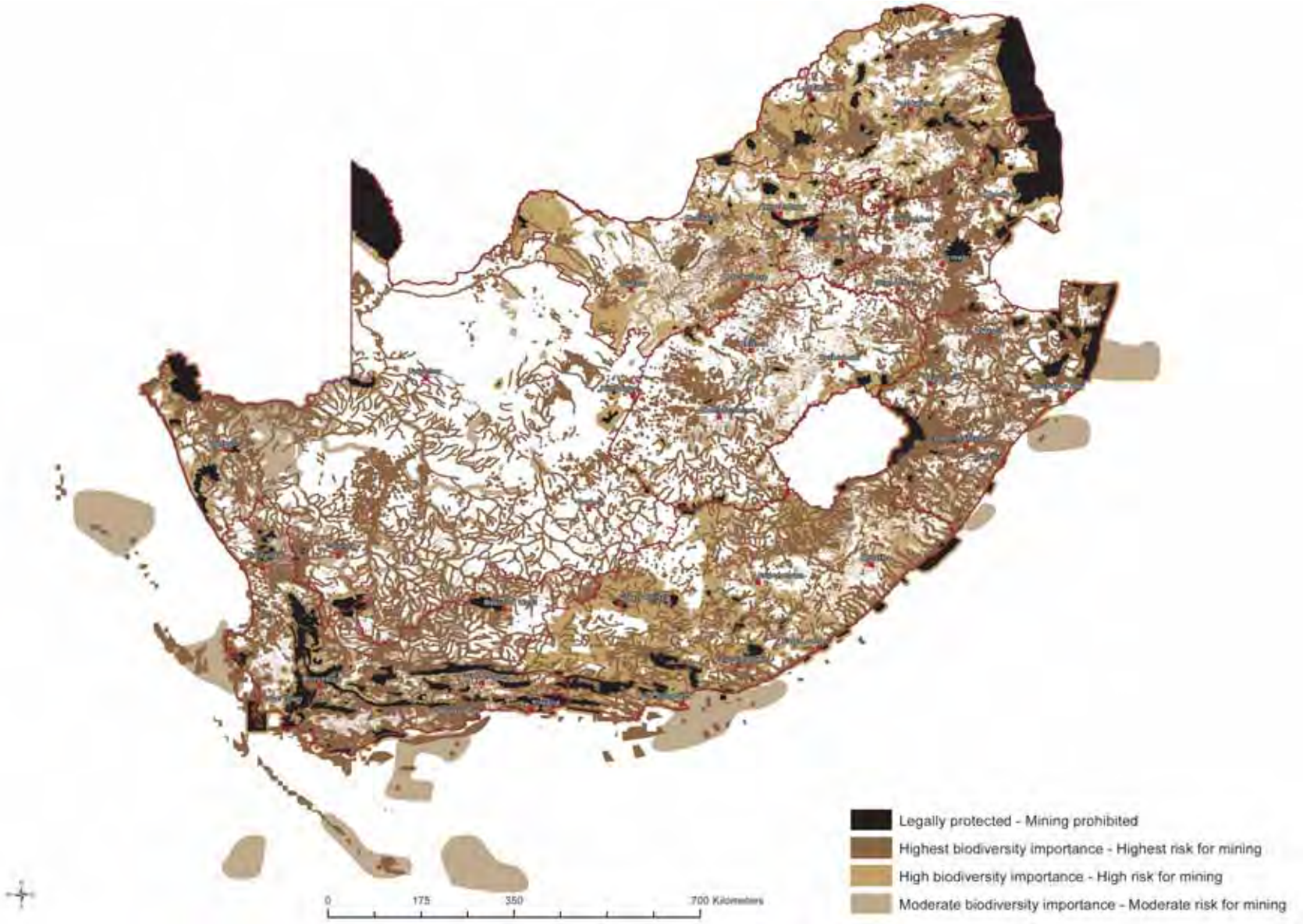
There are three further principles that guide the process of systematic biodiversity planning:

1. **Efficiency** or striving to meet biodiversity targets in the smallest area possible. Efficiency goes together with **complementarity**, which is the extent to which an area contributes to biodiversity features not represented elsewhere in a region (i.e. the extent to which it sensibly complements the choice of other areas).
2. **Conflict avoidance**, or where possible avoiding identifying biodiversity priority areas in places where there are high levels of conflict or potential conflict with other land uses that are not compatible with biodiversity conservation. This does not mean that a high conflict area can't be identified as biodiversity priority areas if there is no other option or location for meeting the required biodiversity targets.
3. **Transparency** or documenting clear rationale for decisions, enabling them to be repeated and/or critically reviewed.

Table 1. Four categories of biodiversity priority areas in relation to their biodiversity importance and implications for mining.

Category	Biodiversity priority areas	Risk for mining	Implications for mining
A. Legally protected	• Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected Environments, Nature Reserves) Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002)	**Mining prohibited**	Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if both the Minister of Mineral Resources and Minister of Environmental Affairs approve it. In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.
B. Highest biodiversity importance	• Critically endangered and endangered ecosystems • Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans • River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and a 1km buffer around these FEPAs • Ramsar Sites	**Highest risk for mining**	Environmental screening, environmental impact assessment (EIA) and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and enviromental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being. An EIA should include the strategic assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country. Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts, and may specify biodiversity offsets that would be written into licence agreements and/or authorisations.
C. High biodiversity importance	• Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) • Transfrontier 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 zone *Note that the status of buffer areas of World Heritage Sites is subject to a current intra-governmental process.	**High risk for mining**	These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for particular communities or the country as a whole. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.
D. Moderate biodiversity importance	• Ecological support areas • Vulnerable ecosystems • Focus areas for protected area expansion (land-based and offshore protection)	**Moderate risk for mining**	These areas are of moderate biodiversity value. EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

Figure 4. Biodiversity priority areas sensitive to the impacts of mining categorised into four categories.More detailed, higher resolution maps and underlying data will be made available on the South African National Biodiversity Institute B-GIS website.



Overall, proponents of a mining activity in biodiversity priority areas should demonstrate that:

- There is significant cause to undertake mining – by commenting on whether the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit. Reference should also be made to whether alternative deposits or reserves exist that could be exploited in areas that are not biodiversity priority areas or are less environmentally sensitive areas.
- Through the process of a rigorous EIA and associated specialist biodiversity studies the impacts of the proposed mining are properly assessed following good practice. It is critical that sufficient time and resources are budgeted to do so early in the planning and impact assessment process, including appointing appropriate team of people with the relevant skills and knowledge as required by legislation.
- Cumulative impacts have been taken into account.
- The mitigation hierarchy has been systematically applied and alternatives have been rigorously considered.
- The issues related to biodiversity priority areas have been incorporated into a robust EMP as the main tool for describing how the mining or prospecting operation's environmental impacts are to be mitigated and managed.
- Good practice environmental management is followed and monitoring and compliance enforcement is ensured.

A. Biodiversity priority areas which are legally protected-mining prohibited

There are some biodiversity priority areas in which mining is legally prohibited. These are summarised in Table 2. In addition, although this is generally not a biodiversity issue, mining is prohibited in residential areas, on public roads, along railways and in cemeteries, and on land being used for public or government purposes.

Table 2. Biodiversity priority areas which are legally protected and mining is prohibited.

Biodiversity priority area	Description and relevant legislation	Information source
Protected areas	Protected in terms of the Protected Areas Act and includes Special Nature Reserves, National Parks and Provincial and local Nature Reserves[39]; World Heritage Sites; Marine Protected Areas; Specially Protected Forest Areas; and Mountain Catchment Areas.	**Data**: National coverage (2008) developed for the National Protected Area Expansion Strategy and available on http://bgis.sanbi.org for download; check for any updated data from DEA and provincial conservation authorities. **Associated legislation**: As designated under Protected Areas Act (No. 57 of 2003) and areas deemed Protected Areas under the Protected Areas Act; Marine Protected Areas in terms of the Marine Living Resources Act (No. 18 of 1998); specially protected forest areas, Forest Nature Reserves and Forest Wilderness Areas declared in terms of the National Forests Act (No. 84 of 1998); and Mountain Catchment Areas declared in terms of the Mountain Catchment Areas Act (No. 63 of 1970).
World Heritage Sites (WHS)	Managed and conserved in terms of the World Heritage Convention Act (No. 49 of 1999). WHS are recognised as protected areas in the Protected Areas Act (No. 57 of 2003).[40]	**Data**: National coverage (2008) developed for the National Protected Area Expansion Strategy and available on http://bgis.sanbi.org for download Associated Legislation: Protected Areas Act (No. 57 of 2003); World Heritage Convention Act (No. 49 of 1999)
Areas where mining is declared prohibited or restricted under Section 49 of the MPRDA	Section 49 of the MPRDA allows the Minister of Mineral Resources to prohibit or restrict granting permissions/rights/permits in certain areas of biodiversity priority, heritage and hydrological importance. The declaration is not permanent - the Minister can withdraw it at any time, although she/he should exercise reasonable discretion and some level of consultation on the decision should be undertaken.	**Data**: DMR **Associated legislation**: MPRDA (No. 28 of 2002)

[39] Protected Environments Mining is prohibited unless both the Minister of Mineral Resources and Minister of Environmental Affairs approve it.

[40] Note that the status of buffer areas of WHS is subject to a current intra-governmental process. If this recognises buffers areas as having the same status as the core areas in terms of mining, then the guidelines will need to be revised. The implications for existing mines would also need to be clarified.

B. Biodiversity priority areas which have highest biodiversity importance and are highest risk for mining

This category (summarized in Table 3) includes biodiversity priority areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning)[41] that mining projects will be significantly constrained or may not receive necessary authorisations. These areas include:

i. Critically endangered (CR) and endangered (EN) ecosystems, recognised as threatened ecosystems in terms of the Biodiversity Act.
ii. Critical Biodiversity Areas (CBAs), (or areas of equivalent status such as irreplaceable and highly significant areas) from provincial spatial biodiversity plans.
iii. River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and a 1km buffer of these specific river and wetland FEPAs.
iv. 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. Mining in such areas may be out of place within the framework of national environmental management policies, norms and standards[42].

Environmental screening, EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations.

Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts, and may specify biodiversity offsets that would be written into licence agreements and/or authorisations.

Given the very high biodiversity importance, mining activities are likely to have an impact of high to very high significance on biodiversity in these biodiversity priority areas. An environmental impact assessment should include the strategic assessment of optimum, sustainable land use for a particular area, and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country.

This assessment should inform whether or not mining is acceptable, including potentially limiting specific types of prospecting or mining which may be deemed not acceptable due to the impact on biodiversity and associated ecosystem services found in the priority area. Alternatively, prospecting or mining may be deemed permissible, but within a clearly defined spatial area, provided that a particular method is used (e.g. underground rather than surface mining), or according to specific conditions with regard to mitigating impacts on biodiversity or ecosystem services. There may be a requirement to secure biodiversity offsets or other forms of compensation for curtailed ecosystem services where it is not possible to mitigate impacts.

[41] Section 49 of the MPRDA may be the appropriate tool to enact this prohibition.
[42] Such as those laid out in Section 48(2) MPRDA.

The assessment needs to identify whether mining is the optimal land use, whether it is in the national interest for that deposit to be mined in that area, and whether the significance of unavoidable impacts on biodiversity are justified. It is important that a risk-averse and cautious approach[43] is adopted. This implies strongly avoiding these biodiversity priority areas, given the importance of the receiving environment and the probability that the proposed activity would have significant negative impacts.

When considering mining activities in these biodiversity priority areas, the following set of filters should be sequentially applied and mining should only be considered if:

a) It can be clearly shown that the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit.

b) There are no alternative deposits or reserves that could be exploited in areas that are not biodiversity priority areas or less environmentally sensitive areas.

c) It can be demonstrated that there are spatial options in the landscape that could provide substitute areas of the same habitat for conservation, to ensure that biodiversity targets would be met[44].

d) A full economic valuation[47] of mining compared with other reasonable/ feasible alternative land uses, undertaken as a necessary component of the EIA, shows that mining would be the optimum sustainable land use in the proposed area.

e) A detailed assessment and evaluation[45] of the potential direct, indirect and cumulative impacts of mining on biodiversity and ecosystem services shows that there would be no irreplaceable loss or irreversible deterioration, and that minimizing, rehabilitating, and offsetting or fully compensating for probable residual impacts would be feasible and assured, taking into account associated risks and time lags.

f) A risk-averse and cautious approach, taking into account the limits of current knowledge about the consequences of decisions and actions, can be demonstrated both in the assessment and evaluation of environmental impacts, and in the design of proposed mitigation and management measures.

The above filters should form the basis for deciding on whether or not, and how and where, to permit mining. This means that based on the significance of the impact, some authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts, and may specify biodiversity offsets that would be written into licence agreements and/or authorisations.

[43] As required by S2 of NEMA

[44] CBAs are selected to be the most efficient configuration of areas in the landscape that would meet conservation targets. That is, there may be alternative configurations that could meet these targets. If there are no options, however, then the given CBAs must be considered to be 'irreplaceable'.

[45] i.e. an economic valuation that addresses the values of biodiversity and ecosystem services that conventional economic analysis excludes, since their value is not traded or priced in the marketplace. A full economic valuation may show that the value of the intact ecosystem to local communities and society exceeds the value of a proposed land use (e.g. Millennium Ecosystem Assessment, TEEB).

Table 3. Biodiversity priority areas which have highest biodiversity importance, and are hence highest risk for mining.

Biodiversity priority area	Description	Information sources
Critically endangered and Endangered ecosystems[46], listed as threatened ecosystems in terms of the Biodiversity Act	Threatened ecosystems listed in terms of the Biodiversity Act[47] have protection under law and particular activities within these areas require authorisation in terms of the EIA regulations of NEMA. Further loss and degradation of natural habitat in critically endangered and endangered ecosystems should be avoided. **Critically endangered** ecosystems (CR) are ecosystem types that have very little of their original extent left in natural or near-natural condition. National biodiversity targets for these habitat types cannot be met, and further loss would hence be unacceptable. **Endangered ecosystems** (EN)are ecosystems that are close to becoming critically endangered. Any further loss of natural habitat or deterioration of condition in CR or EN ecosystem types should be avoided, and the remaining healthy examples should be the focus of conservation action. Critically endangered and Endangered ecosystem types are included in Listing Notice 3 of NEMA (GN No. R546 of 2010). Threatened terrestrial ecosystems were listed in terms of the Biodiversity Act in December 2011. Over time, marine, estuarine, river and wetland types will also be listed in terms of the Biodiversity Act.	**Data**: Terrestrial CR and EN ecosystems are currently viewable on http://bgis.sanbi.org River, wetland and marine CR and EN ecosystems will be available as part of the National Biodiversity Assessment (NBA) 2011 and are viewable on http://bgis.sanbi.org **Associated legislation**: Section 52 of the Biodiversity Act, 2004 (No. 10 of 2004)
Critical Biodiversity Areas (CBAs), or areas of similar value such as irreplaceable and highly significant areas from provincial spatial biodiversity plans	CBAs are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Some provinces use different terms for areas equivalent to CBAs, such as 'irreplaceable areas' or 'highly significant areas'. CBAs are terrestrial (land) and aquatic (water) features (e.g. vleis, rivers and estuaries) in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning in the long term (which is particularly important in the face of climate change). The desired management objective for CBAs is for them to remain in a natural or near- natural ecological condition, i.e. to prevent further loss or degradation of natural habitat inareas these areas. Therefore CBAs are biodiversity priority that must be afforded special attention in assessing and evaluating impacts of prospecting or mining. Although CBAs have been identified at a very fine spatial scale in some provinces (Gauteng, Western Cape, Kwazulu Natal), in other areas they have been identified more at a broader scale (Eastern Cape, Northwest, Limpopo and the Namakwa district of the Northern Cape). All CBAs require field verification, but this is particularly the case for broad scale CBAs where it is only in the intact areas of the CBA that mining should be prohibited. Over time, CBAs will be identified in the Free State, and remaining areas of the Northern Cape, and may be identified at a finer scale in additional provinces. Marine ecosystem priority areas are under development, Ezemvelo KZN Wildlife has identified Critical Biodiversity Areas in the seascapefor the inshore and offshore area adjacent to KZN's coastline.	**Data**: Most provinces have developed or are in the process of developing provincial spatial biodiversity plans that provide maps of CBAs. CBA maps for the Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), are available on http://bgis.sanbi.org for download. CBA maps for Gauteng are available from GDARD on request; and for KZN is available from EKZN Wildlife on request. Some metropolitan municipalities have developed CBA maps (Nelson Mandela Bay and City of Cape Town) or are in the process of developing them (City of Johannesburg, City of Tshwane, Ekurhuleni and eThekwini. **Associated legislation**: These gain legal recognition when they are published in bioregional plans (in terms of the Biodiversity Act), or are taken up into municipal Spatial Development Frameworks (Section 26(e) Municipal Systems Act (No.32 of 2000)), and Environmental Management Frameworks (EMF; in terms of Sections 24(5) and 44 NEMA and EMF regulations (R547 of 2010).

[46] This reflects ecosystem threat status throughout South Africa and also informs the National Biodiversity Assessment 2011.

[47] Note that Vulnerable ecosystems are also defined as threatened ecosystems, but are not included at this category of biodiversity priority area.

Biodiversity priority area	Description	Information sources
River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and 1km buffer of river and wetland FEPAs	FEPAs are rivers and wetlands required to meet biodiversity targets or freshwater ecosystems. River FEPAs are an essential part of a sustainable water resource strategy. Buffers of healthy natural vegetation should be maintained around river and wetland FEPAs to maintain a good ecological condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. FEPAs are not formally protected in terms of law but are areas that are considered to be strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources, and should be maintained in good ecological condition. Because of the importance of these freshwater ecosystems to lives and livelihoods, and the likelihood that their ecological condition would deteriorate if mining activities took place in or close to them (i.e. within a 1km buffer of river and wetland FEPAS), it is recommended that mining should be avoided in these areas.	**Data**: Atlas of Freshwater Ecosystem Priority Areas for South Africa (Nel et al 2011); available on http://bgis.sanbi.org **Associated legislation**: Not currently protected by law.
Ramsar sites	Ramsar sites are internationally recognised by the Convention on Wetlands of International Importance (or Ramsar Convention). Ramsar sites have global significance.	**Data**: DEA: Enterprise Geospatial Information Management **Associated legislation**: Although many Ramsar sites fall inside protected areas, some Ramsar sites do not currently have any legal status in terms of South African legislation.

[48] Note that the status of buffer areas of WHS is subject to a current intra-governmental process. If this recognises buffers areas as having the same status as the core areas in terms of mining, then the guidelines will need to be revised. The implications for existing mines would also need to be clarified.

C. Biodiversity priority areas which have high biodiversity importance and are high risk for mining

Biodiversity priority areas which have high biodiversity importance and may limit mining options are summarized in Table 4. Mining should be tightly controlled as these areas are important for conserving biodiversity, for supporting or buffering the biodiversity priority areas, for maintaining important ecosystem services for particular communities or the country as a whole.

Biodiversity priority areas of high biodiversity importance include:

i. Buffer zones of protected areas (including buffers around National Parks, World Heritage Sites[48], and Nature Reserves).
ii. Trans-Frontier Conservation Areas (remaining areas outside of formally proclaimed protected areas).
iii. Other identified priorities from provincial spatial biodiversity plans
iv. High water yield areas.
v. Coastal Protection Zone.
vi. Estuarine functional zones.

As in category B, given the high biodiversity importance of these biodiversity priority areas, mining should be subject to an EIA which should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country, and whether or not the minerals could be extracted from deposits outside of these biodiversity priority areas.

Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

Table 4. Biodiversity priority areas which have high biodiversity importance and are high risk for mining.

Biodiversity priority area	Description	Information sources
Protected area buffers[49] (including buffers around National Parks, World Heritage Sites, and Nature Reserves)	10km wide buffers around National Parks and World Heritage Sites (or alternatively specifically defined buffers approved by the Minister according to DEA's buffer zone policy for National Parks or gazetted under the World Heritage. Convention Act) and 5km buffers around other protected areas, excluding Gauteng where there are no buffers around protected areas. In these areas environmental impact assessments should be required for a range of activities that impact on biodiversity value, sense of place, visual sensitivity of the natural landscape and cultural value of Nature Reserves.	**Data**: Protected areas and buffers layer available on SANBI B-GIS **Associated legislation**: Buffer areas defined in Listing Notice 3 of the NEMA EIA Regulations (GN No. R546 of 2010), as relevant to sections 24(2), 24(5), 24D and 44 of NEMA (No. 107 of 1998); World Heritage Convention Act (No. 49 of 1999).
Transfrontier Conservation Areas (those parts of the area that do not fall within formally protected areas)	Portions of the country have been identified as Transfrontier Conservation Areas.	**Data**: DEA: Enterprise Geospatial Information Management **Associated legislation**: No current legal status. Portions of TFCAs proclaimed as Protected Areas have legal status under the Protected Areas Act.
Other identified priorities from provincial spatial biodiversity plans	Although priorities have been identified at a very fine spatial scale in some provinces (Gauteng, Western Cape, Kwazulu Natal), in other provinces they have been identified at a broader scale (such as Eastern Cape, Northwest, and Limpopo). These plans sometimes identify broader areas of biodiversity importance, even though these areas may have a relatively low level of irreplaceability (i.e. there are reasonably high levels of choice in terms of where targets are met for ecosystems, species and ecological processes). Alternatively, the conservation plans may have identified a second tier of CBAs (CBA2). In both cases (i.e. broader and generally lower irreplaceability priority areas or second tier CBA s) these areas have been included as "Other identified priorities from provincial spatial biodiversity plans".	**Data**: Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), available on http://bgis.sanbi.org for download. Gauteng, available from GDARD on request; KZN available from EKZN Wildlife on request. Some metropolitan municipalities have developed CBA maps (Nelson Mandela Bay and City of Cape Town) or are developing them (City of Johannesburg, City of Tshwane, Ekurhuleni and eThekwini). **Associated legislation**: These areas gain legal status when published in a bioregional plans (in terms of the Biodiversity Act), or taken up into municipal Spatial Development Frameworks (Section 26(e) Municipal Systems Act (No. 32 of 2000)), and Environmental Management Frameworks (EMF; in terms of Sections 24(5) and 44 NEMA and EMF regulations (R547 of 2010)).
High water yield areas	High water yield areas generally occur in mountain catchment areas, and are the "water factories" of the related primary catchment, generating a large proportion of the water for human and ecological use. Maintaining these areas in a healthy state plays a vital role in water provision, supporting growth and development needs that are often far away. Mining in these areas has the potential to significantly impact on national freshwater resources, and therefore potential impacts need to be carefully assessed to ensure that the project is in fact in the national interest. High water yield areas were identified by the NFEPA project.	**Data**: Atlas of Freshwater Atlas of Freshwater Ecosystem Priority Areas for South Africa (Nel et al 2011); available on http://bgis.sanbi.org **Associated legislation**: Not currently protected by law.

[51] Note that the status of buffer areas of WHS is subject to a current intra-governmental process. If this recognises buffers areas as having the same status as the core areas in terms of mining, then the guidelines will need to be revised. The implications for existing mines would also need to be clarified.

Biodiversity priority area	Description	Information sources
Coastal Protection Zone	The Coastal Protection Zone, as defined by the Integrated Coastal Management Act (No. 24 of 2008), includes but is not limited to areas within 1000m landwards of the high-water mark in rural areas and 100m of the coast in urban areas. Coastal habitats (e.g. dunes) often extend well beyond this distance. The Integrated Coastal Management Act makes provision for the formal delineation of the coastal protection zone. In the absence of a delineated coastal protection zone the 1km and 100m distances apply as a default.	**Data**: Available at http://bgis.sanbi.org **Associated legislation**: Integrated Coastal Management Act (No. 24 of 2008)
Estuarine functional zones	The estuarine functional zone means the area in and around an estuary which includes the open water area, estuarine habitat (e.g. mudflats) and the surrounding floodplain area (the default definition is the area between the 5 m above mean sea level). Estuarine functional zones are critical for the ecological functioning of estuaries, and for the continued provision of the many ecosystem services linked to estuaries, such as nursery areas for fish, recreation and leisure, channelling of nutrients and freshwater to the marine and coastal environment, and absorbing pollution and other impacts from settlements. They have high biodiversity and social value that underpins important economic activities. Their ecological integrity, biodiversity and functioning needs to be retained, and therefore must be accorded special attention in assessing and evaluating impacts of prospecting or mining.	**Data**: National Coverage (2010) produced as part of the NBA 2011 (Driver et al. 2012) available on http://bgis.sanbi.org **Associated legislation**: Not currently protected by law.

D. Biodiversity priority areas which have moderate biodiversity importance and are of moderate risk for mining

These biodiversity priority areas have moderate biodiversity importance in which mining options may be constrained. They are summarized in Table 5. The areas include:

i. Ecological Support Areas.

ii. Vulnerable ecosystems in areas (provinces or municipalities) where CBAs have not yet been identified.

iii. Focus areas for protected area expansion (land-based and marine).

Although these areas are neither legally protected nor do they represent features which are likely to be considered to be a fatal flaw for a mining or prospecting project, they are areas where biodiversity constraints may limit mining projects. In ecological support areas mining activities will need to take place in a way which minimises impacts on ecological processes and delivery of ecosystem services. In focus areas for the expansion of protected areas mining is likely to come into conflict with new and expanding protected areas and the underlying biodiversity features which resulted in these areas being identified as focus areas. In intact areas of vulnerable habitats there is a high likelihood of occurrence of threatened species.

EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

Table 5. Biodiversity priority areas which have moderate biodiversity importance and are of moderate risk for mining.

Biodiversity priority area	Description	Information sources
Ecological support areas	These are areas identified in spatial biodiversity plans areas that play an important role in supporting the ecological functioning of Critical Biodiversity Areas or protected areas and/or in delivering ecosystem services. The management objective for these areas is to keep them in a functional state.	**Data**: Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), are available on http://bgis.sanbi.org for download. Gauteng, available from GDARD on request; KZN available from EKZN Wildlife on request
Vulnerable ecosystems	Threatened ecosystems are identified in the NBA and may be listed in terms of the Biodiversity Act[55]. Vulnerable ecosystem types have experienced significant loss of natural area but are not yet critically endangered or endangered. In areas where biodiversity planning has occurred, the best areas to meet targets for vulnerable ecosystem types are generally included in CBAs. However, where this planning has not yet occurred (e.g. Free State, and part of the Northern Cape), remaining intact areas of vulnerable habitat types should be avoided where possible.	**Data**: Terrestrial vulnerable ecosystems are currently viewable on http://bgis.sanbi.org Marine vulnerable ecosystems are available as part of the NBA 2011 and will also be viewable on http://bgis.sanbi.org **Associated legislation**: Section 52 of the Biodiversity Act, 2004 (No. 10 of 2004)
Focus areas for land-based protected area expansion and focus areas for offshore protection	Focus areas for land-based protected area expansion are large, relatively intact (in terms of natural vegetation cover) and unfragmented areas of high biodiversity importance, suitable for the creation or expansion of large protected areas, were identified by the Offshore Marine identified in the National Protected Area Expansion Strategy 2008. They were identified through a systematic biodiversity planning process, taking into account the need to represent both terrestrial and freshwater biodiversity in the protected area network as well as to contribute to climate change resilience. They represent the best remaining large areas of natural habitat that still have low levels of fragmentation and form a key part of our ecological infrastructure network. Focus areas for offshore protection were identified through a systematic biodiversity planning process to direct MPA expansion and other types of spatial management to ensure sustainable resource use and a representative protected area network. They identify spatial priorities for representing offshore biodiversity, protecting sensitive ecosystems, contributing to fisheries sustainability and reducing by-catch. These areas will be refined in the future.	**Data**: Focus areas for land-based protected area expansion available at http://bgis.sanbi.org. Focus areas for offshore protection Protected Area project (OMPA; Sink et al. 2011). Contact SANBI Marine Programme for more information. **Associated legislation**: These areas support further implementation of the Protected Areas Act and the Marine Living Resources Act (No. 18 of 1998)

[53] Note that Vulnerable ecosystems are also defined as threatened ecosystems, but are not included at this category of biodiversity priority area.

3.2.2. Other sources of biodiversity information

Biodiversity priority area data layers are not comprehensive, and there may be additional biodiversity features that are only identified at a site level. For example, a red listed species identified at a site at which it had not been previously recorded. For this reason it is important that other sources of biodiversity information be drawn on.

The following tools, guidelines and other useful resources on biodiversity are pertinent to planning and decision making about mining and how best to avoid, minimise or remedy biodiversity impacts mining may cause, in order to support ecologically, economically and socially sustainable development. These data sources are particularly important for site level planning, and can guide specialist studies required for environmental authorisations.

Additional sources of information are summarised below.

1. **Threatened species:** The strength and quality of biodiversity planning relies on available information, although species information is taken into account, the localities of all species are not known, and so one might find species of significance (either because they are threatened or have particular social value, such as medicinal plants) on site that warrant conservation or special management. This is something that should inform a mining decision. Threatened species are captured on Red Data lists (the IUCN Red List is the world's standard for evaluating the conservation status of species), which determines the risk of extinction to species. Species that are of high risk of extinction are placed in one of the three categories, namely Critically Endangered, Endangered and Vulnerable, and their presence in areas that will be affected by mining will increase the significance of impact of mining on biodiversity. Table 6 summarises the available information sources.

2. **Biodiversity specialists**: Spatial data should be confirmed at a site level by appropriate specialists who are familiar with the ecosystems of the region concerned and able to assess the likely biodiversity impacts on site. In biodiversity priority areas in particular, more detailed investigation of biodiversity is going to require the input of biodiversity specialists. Much can be done through desktop study, but a site assessment is often required to reveal the full picture, given the limitations of mapped information. The South African Council for Natural Scientific Professions (www.sacnasp.org.za) has a list of all natural scientific professionals registered in South Africa, however the recently established Environmental Assessment Practitioners Association of South Africa (EAPASA), will apply to the Minister of Water and Environmental Affairs to be recognised as a Registration Authority in terms of Section 24H of the NEMA. Once EAPASA is recognised, the Minister will publish a date by which all EAPs practicing in terms of NEMA must be registered; all consulting natural scientists are legally required to be professionally registered in order to practice.

Table 6. Resources that describe threatened fauna and flora

Taxa	Threatened assessments	Source
Plants	All national assessments of South African indigenous plants are published online and managed by the SANBI Threatened Species Programme. It provides detailed information on the distribution, habitat and threats to South African plants. It is updated biannually and is the most reliable and up to date source of information on South African threatened plants, and includes threatened plant statistics for the country and guidelines for EIA reports.	http://redlist.sanbi.org/ ; contact SANBI Threatened Species Programme for more information
Mammals	The national assessments for South African mammals were last updated in 2004, 'Red Data Book of the Mammals of South Africa: A Conservation Assessment'. An update of this assessment will be coordinated by the Endangered Wildlife Trust (EWT). The global status of mammals was updated in 2008 as part of the IUCN's Global Mammal Assessment project, and is available on the IUCN website (www.iucnredlist.org).	Friedman and Daly (2004); for data and information about threatened mammal species contact the EWT for more information and provincial conservation authorities (GDARD, MPTA and EKZNW)
Birds	Red List assessments of South African birds are coordinated by BirdLife South Africa, in cooperation with BirdLife International, who is responsible for the global bird assessments published on the IUCN Red List (www.iucnredlist.org). The global bird assessments are updated frequently.	National and global status of South African birds available from BirdLife SA http://www.birdlife.org.za
Reptiles	Red Data reptile assessments for the southern African region were undertaken as a partnership between SANBI and the Animal Demography Unit (ADU), the South African Reptile Conservation Assessment (SARCA) will be available soon.	http://sarca.adu.org.za/index.php
Amphibians	The updated national conservation status of South African frogs was published in 2011. This publication however contains only frog assessments where the status have changed since the 2004 Atlas, and should therefore still be used in conjunction with the atlas, although taxonomic changes may make this difficult. This update was done in close collaboration with the IUCN's Global Amphibian Conservation Assessment, and all assessments were also published on the IUCN website www.iucnredlist.org.	Measy, G.J. (ed). 2011. Ensuring a future for South Africa's frogs: a strategy for conservation research. SANBI Biodiversity Series 19. SANBI, Pretoria; Minter *et al.* 2004.'*Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland*'
Invertebrates	Limited data are available. • South African National Survey of Arachnidae (SANSA) is producing a spider atlas, but not a conservation assessment. • South African Butterfly Conservation Atlas (SABCA) will be available soon. Provinces have identified taxa that are perceived as having conservation importance and the provincial conservation authorities should be consulted. The NBA 2011 (Driver et al. 2012) lists threatened marine species in South Africa. IUCN Red List assessments on other vertebrates, such as dragonflies and damselflies.	SANBI Biodiversity Advisor: http://biodiversityadvisor.sanbi.org/nichemodel/scourcing.asp; Provincial conservation authorities; IUCN Red List (www.iucnredlist.org); and contact SANBI Threatened Species Programme
Fish	Comprehensive information on the status of South African freshwater ecosystems and indigenous fish species was compiled as part of the IUCN Global Freshwater Assessment, and a summary document is available. The NBA 2011 (Driver et al. 2012) lists threatened marine species in South Africa.	Freshwater: visit http://data.iucn.org/dbtw-wpd/edocs/RL-67-001.pdf and www.iucnredlist.org Marine: contact the SANBI Marine Programme
Other taxa	No Red Data assessment has been conducted for the other taxa in South Africa, which might include fungi, lichens, algae and mosses. At a provincial level, EKZN have assessed some of their marine algae.	EKZNW: www.kznwildlife.com

[51] DWAs Working for Water webpage - http://www.dwaf.gov.za/wfw/default.aspx and http://sites.google.com/site/wfwplanning/assessment
[52] Agricultural Research Council's Southern African Plant Invaders Atlas (SAPIA) - http://www.agis.agric.za/wip/
[53] De Villiers et al. (2005)

3. **Alien invasive species**: Naturalised and invasive species tend to thrive in disturbed areas (such as those that have been mined) and thus mining can encourage the growth and spread of invasives. Further, some species used to stabilise soils after mining can also become a problem if not chosen wisely. The risk of introducing or spreading non-indigenous species should be carefully considered in environmental management and decommissioning for the mining sector as introduced and invasive species can have serious biodiversity and economic impacts. Alien invasive species can cause a decline in biodiversity and the local extinction of indigenous species. They can decrease the productivity of agricultural land and rangeland, increase agricultural input costs, reduce stream flow in rivers, submerged aquatic invaders can cause oxygen deficiencies in water, and marine invasive species which can impact biodiversity and escalate operating costs. Conservation of Agricultural Resources Act (No. 43 of 1983) deals with invasive alien plants specifically, and the Biodiversity Act provides for the control of alien and invasive fauna and flora species. The draft list of exempted alien species, prohibited alien species and invasive species for which a permit is required appears in Government Notice 348, 349 and 350 of 2009. Information on invasive species is available from the DWA[51], and SANBI[52].

3. **Ecosystem guidelines**: ecosystem-specific guidelines have been prepared to assist stakeholders in certain provinces or ecosystems who are involved in land-use planning and environmental assessment to take biodiversity concerns into consideration. They add value to the deliberations of decision-makers on the environmental implications of development or land-use change. They are best used early on in the planning process so that they inform the project activities. Ecosystem guidelines in South Africa include:
    a. Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape[53]
    b. Grassland Ecosystem Guidelines for land use planning and environmental assessment (available soon).

3.3. Biodiversity stakeholder engagement

Engaging thoroughly with appropriate biodiversity stakeholders is the third principle guiding good decision making. Stakeholder engagement on biodiversity issues is central to the integration of biodiversity and ecosystem services into the impact assessment process (the identification, assessment, evaluation and mitigation of impacts) and should begin early on, particularly when biodiversity priority areas are to be affected. Note that many of these processes are part of, and embedded in, existing legal processes and requirements such as EIAs and EMPs.

Mines can often obtain a wealth of input from biodiversity stakeholders, and should consider them as important sources of information, stewards and potential partners integral to the assessment and management of impacts on biodiversity. Early and effective stakeholder engagement (see Box 6 for more on timing and scope of engagement) should enable mining companies to:

- Clarify the objectives of a proposed mining activity in terms of community needs and concerns, and company commitments to biodiversity.
- Clarify the main issues and concerns of interested and affected parties in relation to the proposed activities.
- Gather local traditional/ indigenous knowledge of the area, and identify local values and levels of dependence on ecosystem services.
- Clarify the objectives of the proposed mining activity in terms of government policy directions, strategic plans and statutory or planning constraints.
- Identify and evaluate feasible alternatives.
- Identify and evaluate potential biodiversity offset sites (if relevant).

Relevant stakeholders include those individuals, groups, communities, organisations, associations or authorities whose interests may be positively or negatively affected by a proposal or activity (e.g. local and downstream users of ecosystem goods and services) and/or who are concerned with a proposal or activity and its consequences[54].

The MPRDA[55], National Water Act[56] and NEMA[57] all stipulate stakeholder engagement as part of the relevant authorisation processes. To ensure effective stakeholder engagement, there should be broad public participation, community empowerment, and the integrated management of environmental issues. A phased approach allows stakeholders to make representations at different stages of the project development process. Any objections and representations received from stakeholders at the initial participation phase must be considered by the applicant in preparing the report. These parties also have an opportunity to review one another's submissions.

Stakeholders bare a burden in terms of the costs that might be involved in getting to meetings, time away to take part in meetings and review often lengthy documents, getting advice from specialists and so on. This can be an impediment to their involvement and is something that should be flagged potentially for, to the extent that it is reasonable, a government initiative to facilitate stakeholder involvement in the public participation process and independent review of the EIA and EMP.

There is growing recognition of the business and reputational risks associated with poor stakeholder relations resulting in legal challenges. This should drive commercial entities towards better engagement practices and thorough stakeholder engagement as part of sound risk management.

[54] Consultative Forum on Mining and the Environment (2002).
[55] Sections 10, 16, 22, 27 Mineral and Petroleum Resources Development Act
[56] Section 41 (4) National Water Act
[57] NEMA: various guidance provided in regulations for example GN R 385 in GG 28753 of 21 April 2006

The preparation of guidelines on public participation for stakeholders in the mining industry was coordinated by the Consultative Forum on Mining and the Environment (2002) and should be used. Where mining is likely to affect biodiversity priority areas, there may be a greater number of stakeholders who are concerned with the proposal or activity and its consequences, as well as more local and downstream users of ecosystem goods and services who might be affected. Not only would a failure to tackle stakeholder engagement properly in such areas pose an almost certain risk to the mining company and its proposal or activity, but thorough stakeholder analysis is also the key to identifying potential conservation partners in addressing biodiversity issues, managing impacts effectively and implementing biodiversity offsets.

3.3.1 Partnerships to address biodiversity issues

The importance of partnerships to achieve biodiversity management and conservation is increasing, in particular where biodiversity issues are complex and require intensive negotiations to resolve, and/or where partnerships provide ways of passing on benefits from mining to local stakeholders. Stakeholder involvement throughout a project and operation may be part of the partnership building process and it can enhance transparency and credibility of biodiversity management.

Additionally, as a result of the often substantial landholdings of mining companies and where this land includes biodiversity priority areas, mining companies are encouraged to contribute to biodiversity conservation through voluntary biodiversity stewardship[58] arrangements. In other cases stewardship arrangements may be entered into a result of a biodiversity offset requirement in a Record of Decision associated with an environmental approval process.

[58] Biodiversity stewardship is a programmatic approach implemented by conservation authorities with the voluntary participation of landowners/users. Biodiversity stewardship provides a structured system for protecting important ecosystems; enabling sustainable use of natural resources; and effectively managing pressures on natural systems and biodiversity. Landowners/users that enter into these agreements are supported by government.

Box 6. Timing and scope of engagement

It is important that engagement begin early in the decision making process, and continue throughout the project lifespan. This is not least because the time frames for consideration of permission/right/permit applications are often limited. Forging good relations early on in the planning and design of a mine can be beneficial to all parties involved. This does not necessarily mean though that the mining company, authorities, and stakeholders are always in agreement, but that there is a solid basis for communication and mutual understanding and accountability. Delayed stakeholder engagement can create a feeling of mistrust (e.g. where landowners are only notified a few days before the end of the mandatory notification period), and limits the flexibility to address and accommodate concerns, issues and alternative solutions.

Stakeholders should be given the opportunity (and adequate time) to give input on the following:

- **The scope of the impact assessment** and the key issues that need to be addressed. These issues should include the values stakeholders attach to biodiversity that may be negatively affected by the activity, be they intrinsic, use or cultural values. The key issues should in turn inform the need and terms of reference for specialist studies to assess potentially significant impacts.
- **Alternatives to the proposed activity** that would be feasible and should be investigated to avoid or minimise possible adverse effects.
- **The significance of impacts**, based on stakeholder input to the EIA and review of associated draft documentation; ways to mitigate negative impacts, either through avoiding or minimizing them, by rehabilitating or restoring them, and/or by providing substitutes, in-kind or other form of compensation, or biodiversity offsets.
- **The management and monitoring of environmental impacts during operation.**
- **The selection and management of biodiversity offset areas**, where biodiversity offsets are required.

A list of possible conservation partners, based on the stakeholder analysis, can be compiled. Forming effective partnerships can be beneficial if the following are considered: identifying where particular partners can play a leadership role in the biodiversity stewardship arrangements and where partners have shared mandates/interests; listing potential partners identified as having common interests and capacities with the mining operation; approaching potential partners with a view to reaching agreement on exploring ways of addressing priority conservation initiatives through partnership; and drawing up agreements with partners, making their respective roles and responsibilities of each partner clear.

Useful resources are emerging from the Biodiversity Stewardship Programme (BSP), an initiative of the National DEA in partnership with key conservation organisations.

3.4. Environmental impact assessment

Using good practice EIA to identify, assess and evaluate impacts on biodiversity is the fourth principle important for integrating biodiversity information into decision making about mining. EIA is the process of evaluating the likely impacts of a proposed project or development on the environment, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. The effective engagement with relevant stakeholders is a precondition for a good practice EIA.

The fundamental components of an EIA involve the following stages[59]:

- Screening to decide on the need for an EIA based on listed activities.
- Scoping, critical to identifying: the key issues and impacts on biodiversity and associated ecosystem services; reasonable and feasible alternatives (the consideration of alternatives is critical); the appropriate nature and extent of investigation for the EIA; and the involvement of relevant biodiversity specialists.
- Description of existing or baseline environment, drawing on key sources of information on biodiversity (amongst others).
- Identification and assessment of likely impacts and risks for each alternative, and an evaluation of their significance.
- Determination of appropriate mitigation measures.
- Re-evaluation of the likely significance of residual impacts, once mitigation measures have been 'built into' the design and management of the proposed activity.
- Reporting on the findings of the EIA.
- Review of the findings of the EIA.
- Decision making, stipulating any conditions that would need to be met where authorisation is granted.
- Implementation, including monitoring and adaptive management, compliance, enforcement and environmental auditing.

[59] Slootweg et al. (2006)

These stages broadly correspond with the scoping and EIA requirements set out in the MPRDA regulations and the NEMA EIA Regulations. However, the time frames in the MPRDA process are different from those in the NEMA EIA process, and often constrain the level of information gathering and impact assessment, and unduly limit stakeholder engagement. Commenting authorities should receive the mining right decisions in order to ensure that monitoring of compliance is possible and effective. Best practice should involve mining companies, or the consultants they hire, integrating the processes to the best of their ability and making appropriate documentation available.

The EIA is a fundamental input into the EMP, which we mention here as this becomes the main tool for managing environmental impacts. It is important that the proponent integrate biodiversity information into the three broad requirements for the EIA and development of the EMP[60]:

1. **Establish baseline information** on the affected environment to determine protection, remedial measures and environmental management objectives.

2. **Investigate, assess and evaluate the impact** of mining on the environment, socio-economic conditions and national heritage.

3. Describe how actions/activities/ processes which cause pollution or environmental degradation and migration of pollutants are to be **mitigated** (modified, remedied, controlled or stopped).

3.4.1. Establish baseline information

Baseline information must be sufficient to enable the reliable identification of biodiversity priority areas, as described above, that might be impacted during the mining life cycle. Baseline information records the 'pre-mining' environmental condition. In order to assess and evaluate the potential significance of impacts on biodiversity and ecosystem services, it is also important to consider any background trends that may be affecting their conservation status or integrity[61]. For example, mining companies may plan to operate in contexts where there is an increase in settlement, land conversion for agriculture or forestry, and/or illegal poaching, collection or harvesting; the cumulative impacts of mining may be highly significant when viewed against these trends.

For the purposes of a good assessment of impacts and risks, and to help define closure objectives and criteria, the baseline information should note:

- The presence of and category of biodiversity priority areas.
- The condition of ecosystems or habitat.
- Vegetation type and ecosystem status.
- The presence of any species of special concern[62].
- The presence of any unique or special features.
- Important spatial components of ecological processes (e.g. ecological corridors).
- Any key ecological processes and/or functions.
- Any valued ecosystem services.
- Any known or projected trends in both biodiversity and/or ecosystem services.
- Contextual analysis of the site/surrounding environment.

[60] Section 39(3) Mineral and Petroleum Resources Development Act

[61] In some areas, such as in marine ecosystems, extensive baseline information is not available. Biodiversity specialists will play an important role in these cases

[62] Species of special concern include Red List taxa in threatened or conservation concern categories, endemic taxa, locally threatened taxa, taxa of special management concern, taxa that were monitored in the past (Rebelo et al. 2011).

3.4.2 Assessment of impacts

The assessment and evaluation of impacts on biodiversity and ecosystem services[63] must be carried out using qualified and registered specialists[64] appropriate to the job and who are familiar with the area in question. It is crucial that all reasonable and feasible alternatives (locations, sites, layouts, phasing, technology options) are assessed and evaluated, balancing environmental, social and technical aspects, to ensure that the best practical environmental option.

Ground-truthing (i.e. a baseline survey) of the biodiversity features in the affected area (receiving environment) is the preliminary requirement to identify environmental constraints; Additional detailed specialist investigations should be carried out on site and in the wider area as appropriate and proportional to the levels of risk and significance of potentially impacted biodiversity and ecosystem services. The assessment and evaluation must:

- Take into account any Spatial Development Frameworks approved by the provincial environmental authorities, any Environmental Management Frameworks, bioregional plans and/or other biodiversity plans prepared for the affected area.
- Enable differentiation between biodiversity priority areas and other natural areas, and areas where little to no natural habitat remains[65] at a site scale. The type of biodiversity priority area and natural habitat remaining is important to informed application of the mitigation hierarchy later on.
- Demonstrate that it has considered all potential impacts on biodiversity - direct impacts (occurring at the same time and in the same place as the prospecting or mining itself) as well as indirect impacts (occurring beyond or downstream of the prospecting or mining area within the 'area of influence' of the activity, and/ or may be manifest sometime after the activity e.g., groundwater pollution, acid mine drainage).
- Show that the potential impacts of this activity on biodiversity, particularly in biodiversity priority areas and on threatened species, have been evaluated in light of other similar activities that have been authorised and/ or are reasonably foreseeable in the area (i.e. cumulative impacts).
- Identify the current beneficiaries of ecosystem services, identify the biodiversity and ecosystems that underpin those services and any trends affecting them, and show that impacts on both the services and the beneficiaries have been addressed. Capturing the contribution of ecosystem services is important in the comparative evaluation of the significance of impacts (including cumulative impacts) of alternative development/land use activities. This requires understanding how mining impacts on ecosystem services, who and where are the beneficiaries of those services who are likely to suffer a cost as a result of the mining (local communities and society), and evaluate the socio-economic implications.Costs associated with the loss of ecosystem services should be added onto the project costs. The appointment of experienced biodiversity specialists and resource economists is essential. Measures to mitigate impacts on ecosystem services must cover all steps of the mitigation hierarchy, giving particular attention to what may be irreplaceable or 'non offsetable' ecosystem services. It is essential also to take into account the mining activity's dependence on ecosystem services, and the risks associated with a change in the quality or availability of these services during the life of the project[66].
- Consider both the normal operating conditions of the mine and ancillary facilities/activities, as well as emergency or upset conditions (e.g. involving hazardous wastes, fire, toxic materials, accidental spillage of biocides, etc); the latter require particular mitigation and management responses that should be incorporated into the EMP.

[63] O'Farrell et al. (2011)

[64] All natural scientific professionals employed as consultants must be professionally registered with SACNASP in terms of the Natural Scientific Professions Act (No. 27 of 2003)

[65] Sometimes referred to as 'transformed' land, referring to land that has been transformed from natural to another land use.

[66] World Business Council for Sustainable Development (2008)

The above steps enable a reliable assessment of the significance of impacts of mining on the receiving environment. Although the NEMA principles[67] are the benchmark against which the significance and acceptability of impacts on biodiversity are measured in the EIA process and subsequent decision making, the assessment and evaluation of impacts on biodiversity and ecosystem services is extremely challenging. This challenge is further complicated by the inherent uncertainties and gaps in information on the way that complex ecosystems work. In complex or controversial cases, such as that which may arise in the case of mining in biodiversity priority areas, independent peer review of the EIA, resource economics assessment, and proposed mitigation measures is recommended. Knowledge gaps, assumptions and uncertainties must be made explicit. In the case of mining operations that will span several decades, an attempt should be made to take increasing variability associated with climate and environmental change into account.

The significance rating of impacts will vary depending on the scale at which impacts are evaluated, and the values attached to the impacts: impacts at site level (considered to be 'site-specific' and thus of low significance) may have global repercussions should an international Red List species be affected; similarly, impacts of transformation of local 'least threatened' ecosystems may be highly significant should levels of dependence of local communities on them be high or watercourses be polluted and contaminated. In general, where the level of importance of biodiversity is high (e.g. high threat status or represents a key area needed to meet biodiversity targets), and/or the level of dependency on that biodiversity is high (e.g. to deliver crucial ecosystem services) then the significance of impacts on that biodiversity would be 'high' to 'very high'. In particular[68]:

- If a proposed development impacts on a biodiversity priority area, such as a Critical Biodiversity Area, this impact would be likely to be of 'very high' significance, regardless of the current condition of the affected habitat, unless it can be clearly demonstrated that options in the landscape remain to meet biodiversity targets and could/would be secured, and/or that the underlying information was patently incorrect[69]. In this case, disputed information would need to be motivated and demonstrated by a relevant competent specialist.
- Impacts on threatened species or their known habitat would be of *'medium' to 'very high'* significance depending on their conservation status. Areas of known concentrations of threatened and/or local endemic species would similarly be regarded as 'high' or 'very high'.
- Impacts on spatial components of ecological processes (e.g. ecological corridors) may be from *'low' to 'very high'* significance, depending on whether or not there are options in the landscape to conserve these processes. Moreover, the significance rating would be informed by the value attached to the impacted processes.
- Impacts on ecosystem services may be from *'low' to 'very high'* significance, depending on the level of dependence of beneficiaries on those services, the likely influence of probable trends (including climate change) and whether or not there are other resources that could be used as acceptable and affordable substitutes (i.e. if they are replaceable).

It is standard practice in EIA to evaluate the significance of impacts without mitigation, and then their significance taking into account mitigation (i.e. the 'residual' impacts). In determining the significance of residual negative impacts on biodiversity and ecosystem services, it is important to assess the probable success or effectiveness of the mitigation measures proposed and, where there is any doubt or uncertainty, to take a precautionary approach, and opt for avoidance. The scale and significance of residual impacts provides a key indication of whether or not additional mitigation (i.e. biodiversity offsets) is required to meet the NEMA principles.

[67] These principles must be adhered to by decision makers responsible for taking decisions in terms of either the MPRDA or the NEMA EIA legislation.

[68] E.g. Ezemvelo KZN Wildlife. 2010.

[69] CBAs are identified through the use of a number of different attributes; the fact that an area is degraded does not mean that it has no value – it may serve as an essential landscape link.

3.4.3. Mitigation

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy'. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining. The aim is to prevent adverse impacts from happening or, where this is unavoidable, to limit their significance to an acceptable level.

Informed by the use of the biodiversity priority area maps and other sources of information to determine the importance or sensitivity of the receiving area, mitigation should include measures in the following order of priority:

- Avoid or prevent loss to biodiversity and ecosystem services.
- Minimise impacts on biodiversity and ecosystem services.
- Rehabilitate concurrently or progressively with the proposed activity, and/or on cessation of the activity.
- Offset significant residual negative impacts on biodiversity or ecosystem services.

It is important to note that the mitigation hierarchy is applied to any stage of mining activity in the context of the biodiversity priority areas identified in Figure 4. The following subsections will describe the four measures in the mitigation hierarchy listed above, introduce the notion of enhancement, and establish the boundaries of responsibility for mitigation and enhancement.

Avoiding or preventing impacts

If the biodiversity (an ecosystem, habitat for threatened species, ecological corridor or area that provides essential ecosystem services) is of conservation value or importance, it is best to plan to avoid or prevent impacts altogether by changing the location, siting, method or processes of the mining activities and related infrastructure.

For many of these features, avoidance presents the only mitigation option, particularly where impacts could result in irreplaceable loss of biodiversity. The highest biodiversity value areas generally contain biodiversity that is irreplaceable or not possible to offset. Impacts of mining should be avoided or prevented in these areas without question of considering other mitigation options. Avoidance and prevention of mining impacts remains first prize however on all biodiversity priority areas. 'Set asides' of terrestrial or marine habitat, setbacks from priority freshwater habitat and/or retention of critical ecological corridors are often used on the mining site to this end.

Minimising impacts

Minimising impacts of mining is a mitigation measure that applies to the environment in general. In areas where the biodiversity to be affected is of conservation value or importance, then every effort should be made to minimise those impacts that cannot be avoided or prevented. Mining companies should strive to minimise impacts on biodiversity by[70]:

- Minimizing land clearing by using technologies and mining practices that minimise habitat disturbance, and delineating working zones.
- Using proven pollution prevention, control and treatment measures (e.g. treatment of acid mine drainage or leachate from mine waste/dumps).
- Implementing appropriate measures to prevent or manage the introduction and spread of potential invasive species.
- Using effective erosion control measures.
- Avoiding road building wherever possible by using helicopters (during the early stages of the mining life cycle in particular) or existing; and if roads are to be constructed, useing existing corridors and building away from steep slopes or waterways.
- Using lighter and more energy efficient equipment to reduce impacts on biodiversity.
- Positioning drill holes and trenches away from sensitive biodiversity features where possible.
- Capping or plugging of drill holes to prevent animals becoming trapped or injured.
- Removing and rehabilitating roads and tracks that are no longer needed.
- Avoiding fouling or discharge of pollutants into aquatic/marine ecosystems.
- Avoiding the introduction of alien species.
- Using indigenous vegetation to re-vegetate land on an on-going basis as part of rehabilitation measures.

It should be noted that in some cases, where the habitat of highly threatened or local endemic species will be negatively impacted, 'search, rescue and relocation' measures are over-emphasised as a means of 'minimising' impact. This measure is not an acceptable form of mitigation. These measures are no substitute for *in situ* conservation and, although they may appear to be effective in the short term, they have a net effect of shrinking the distribution of the species and increasing their vulnerability to extinction through loss of habitat.

In areas where the biodiversity (or ecosystem services) to be affected are of conservation value or importance, such as in biodiversity priority areas, it is especially important that mitigation should not stop at minimizing impacts; implementing measures to remedy remaining impacts through rehabilitation/ restoration and/or biodiversity offsets should become an imperative as reflected in the national environmental management principles (Section 2 of NEMA).

[70] The points below are drawly mainly from ICMM (2006)

Rehabilitating impacted areas

Rehabilitation refers to the measures that are undertaken to "as far as it is reasonably practicable, 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"[71].

Rehabilitation can occur as an on-going and integral activity with the mining operation, and/or after the end of mine production to achieve closure. However, from the perspective of minimizing impacts on biodiversity and ecosystem services, where possible on-going rehabilitation of areas once they have been mined is recommended rather than waiting for mine production to cease.

A closure plan has to be developed based on the establishment of the closure objectives and criteria. Where the pre-mining biodiversity is of conservation value and/or delivers ecosystem services to local communities, then remediation should attempt to restore the indigenous biodiversity of the area to its natural (indigenous vegetation cover) state rather than simply to 're-vegetate'[72].

Unfortunately, even with significant resources and effort directed at rehabilitation, efforts almost always fall short of restoring the full diversity and complexity of a natural system[73].

Where it is likely that rehabilitation will not fully compensate for the loss of biodiversity and ecological function, or there are major uncertainties as to its outcomes, a risk-averse approach should be taken to determining residual impacts, and remaining impacts on biodiversity and ecosystem services should be compensated through biodiversity offsets.

Biodiversity offsets

Biodiversity offsets are defined as measurable conservation gains to balance any significant biodiversity losses that remain after actions to avoid, minimise and restore negative impacts have been taken. They are the last stage of mitigation and should be considered after appropriate avoidance, minimisation, and rehabilitation/restoration measures have been applied. Biodiversity offsets generally target the same biodiversity as that residually impacted by development, but may target biodiversity of higher conservation significance.

By iteratively considering location, design, phasing and technology options in the EIA to minimise residual impacts, it may be possible to avoid the need for significant biodiversity offsets. Biodiversity offsets are required when there are significant residual impacts on biodiversity or ecosystem services. Where residual negative impacts are likely to remain after realistic rehabilitation efforts have been implemented, ways to address the need for, and strategies to provide biodiversity offsets, should be explored in the EIA process as part of determining appropriate mitigation.

[71] Section 38(1)(d) of Mineral and Petroleum Resources Development Act

[72] Where the intention of rehabilitation is ultimately to return the affected ecosystem to its pre-mining biodiversity, the rehabilitation objective may read: 'to establish a self-sustaining, indigenous ecosystem that is similar to or better than, the pre-mining ecosystem and that can be achieved within the environmental, technical and financial limits of rehabilitation techniques and the post-mining environment'. Such an objective acknowledges that some unavoidable aspects may limit the extent of what can be achieved while committing the mining operator to rehabilitation that follows good practice.

[73] For instance, in spite of post mining rehabilitation attempts to rehabilitate grassland ecosystems, success has been limited to regaining grass structure and basic ecosystem functioning but has fallen short of true ecological restoration of primary grasslands. Cooke and Johnson (2002) provide a review of ecological restoration of land with particular reference to the mining of metals and industrial minerals.

Proposed biodiversity offset areas must be formally protected[74] or secured[75] and effectively managed and they should preferably contribute to achieving protected areas expansion programmes. They should be designed and implemented to achieve measurable conservation outcomes. The engagement of stakeholders is important in the identification and selection of biodiversity offset areas. It is also important to make financial provision for securing and managing biodiversity offsets, allowing for escalating costs over time.

Although increasingly required by governments and financial institutions elsewhere, and informing multinational companies' internal policies[76], biodiversity offsets are relatively new in South Africa and their implementation is complex. A national biodiversity offsets policy framework[77] is currently being drafted in South Africa, two provinces (Western Cape, KwaZulu-Natal) have developed draft guidelines for using biodiversity offsets, and a third is in the pipeline (Gauteng). Wetland offset guidelines have also been developed.

3.4.4. Defining boundaries of responsibility for mitigation

In terms of Section 2 and Section 28 of the NEMA, mining companies are responsible for any environmental damage, pollution or ecological degradation caused by their activities "inside and outside the boundaries of the area to which such right, permit or permission relates". For this reason, it is important that the identification, assessment, evaluation and mitigation of impacts are robust and defensible. Mitigation measures required of companies may comprise:

- Avoidance, minimisation and rehabilitation (primarily on the site and in areas of ancillary activities or facilities, but may involve monitoring and adaptive management in areas downstream or in the area of influence of the activity).
- Biodiversity offsets (beyond the site).

Over and above these clear responsibilities, it is appropriate to note that mining companies may plan to operate in highly sensitive biodiversity settings where there are external (non-mining) threats to biodiversity and ecosystem services, where they run the reputational risk of being associated with these bigger drivers of biodiversity loss. In these situations, it may be beneficial to the mining company to engage with local communities and conservation organisations/agencies to seek collective ways of addressing on-going threats through supporting local or regional initiatives, thereby helping to minimise the proponent's cumulative impacts.

3.5. Robust environmental management that applies the mitigation hierarchy

As explained above, the EIA provides key inputs into the EMP, and supports applying the mitigation hierarchy in planning any mining-related activities. The EMP is the main tool for specifying how the mining or prospecting operation's environmental impacts are to be mitigated and managed. The EMP must therefore meet good practice standards[78] and satisfy legal requirements. The primary tools for managing impacts on biodiversity and ecosystem services are the measures contained in the EMP required of the MPRDA, the water use licence and the EMP required in terms of the NEMA EIA regulations. The EMP, once accepted by the relevant authorities, becomes an enforceable blueprint for managing impact on the environment.

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 and mining operations.

[74] Refers to areas where a legal action related to the declaration of a protected area according to the Protected Areas Act exists (the system of protected areas recognised is described in section 3.2.1).

[75] The term secured is intended to include those areas of land that are legally secured for biodiversity conservation under legislation other than those recognised by the Protected Areas Act. Other legal mechanisms through which land can be secured for biodiversity conservation include:

- **Biodiversity Management Agreements**, which have legal status by virtue of a legal contract entered into between the Minister or MEC with a suitable person, organisation or organ of state, in terms of the Biodiversity Act (Section 44).
- **Biodiversity Agreements**, which have legal status in terms of South African contract law, and are entered into between the landowner and the conservation authority for the conservation of biodiversity in the short to medium term.
- **Title deed restrictions/conservation servitudes**, where a notarial deed drawn up for a property is voluntarily altered to restrict activities in favour of biodiversity conservation and creates a legally enforceable agreement, both through South African contract law and property law.
- **Rezoning the property** to Public Open Space or a Conservation-related zoning which emphasize the use of the site for the public benefit (i.e. not private open space).
- **Restrictions put in place through planning conditions.**

These mechanisms may be used separately or in conjunction with each other. More detail on each of these terms is provided in the glossary.

[76] For example, BBOP (2009), IFC (2006).

[77] Development of the national biodiversity offsets policy was required by the 2009 National Biodiversity Framework, set to be in place by 2012

[78] Such as those defined in DEAT (2004), Lochner(2005), ICMM (2006).

Both the MPRDA[79] and associated regulations specify the requirements and contents of an EMP. The NEMA EIA Regulations[80] stipulate the requirements and contents of an EMP.

Taking both the MPRDA and NEMA into account, there are a number of generic requirements of the EMP, namely:

- Establish baseline information on the affected environment to determine its importance and sensitivity. Identify appropriate mitigation measures and environmental management objectives.
- Investigate, assess and evaluate the impacts of the proposed activity on the environment, socio-economic conditions and national heritage.
- Identify appropriate mitigation measures for potentially significant impacts.
- Develop a schedule to implement mitigation measures for prevention, management and remediation of impacts (describing how pollution, environmental degradation and/or migration of pollutants are to be controlled, contained or remedied).
- Cover all stages of the proposed activity (including environmental objectives and specific goals for rehabilitation and mine closure).
- Develop an implementation action plan (including specific responsibilities and timelines) to achieve goals and objectives of environmental management during mining construction, operation and closure.
- Monitor and report on performance and compliance.
- Provide an estimate of costs for rehabilitation and management of negative environmental impacts (the latter may include provision for securing and managing biodiversity offsets).
- Prepare an environmental awareness plan for employees, addressing impact and risk management.

To ensure that biodiversity is considered properly, an EMP must meet the above requirements. Any EMP prepared in terms of the MPRDA (or an EMP prepared for a Basic Assessment or Scoping and Environmental Impact Assessment in terms of the NEMA EIA Regulations) must show that 'environmental degradation' – including impacts related to the biodiversity of the receiving area – would be managed to satisfy the NEMA principles. This involves the application of the mitigation hierarchy in planning any mining-related activities. It also requires details of proposed closure costs and the financial provision for monitoring, mitigation and enhancement, and closure management. Robust EMPs require taking a risk-averse and cautious approach to identifying residual negative impacts, gauging the effectiveness of proposed rehabilitation measures, and making provision for biodiversity offsets where required.

[79] Section 38-43 of the Mineral and Petroleum Resources Development Act refers, with particular reference to Section 39(3)

[80] Regulation 33 NEMA EIA regulations, 2010, refers. It should be noted that Section 24N of the amended NEMA (No. 62 of 2008) provides for details of requirements of EMPs that would come into operation 18 months after the date on which the provisions relating to prospecting, mining, exploration and production and related activities come into operation in terms of s.14(2) of that Act

3.5.1. Planning with the end in mind

The MPRDA, NEMA and NWA all provide 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[81]. As such 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[82].

Some of the requirements of a closure plan, as contemplated in section 43(3)(d) of the MPRDA, are detailed in Regulation 62 and are included below together with considerations of how biodiversity aspects should be addressed:

- **A description of the closure objectives and how these relate to prospecting or mine operation and its environmental and social setting**: The outcome of closure planning should be the determination of explicit objectives and measurable targets for desired biodiversity outcomes, including the identification (where appropriate) of specific indicators, to give the mining operator a framework on which to base rehabilitation efforts. An important point in establishing objectives and targets for biodiversity rehabilitation is that the resulting ecosystem should be self-sustaining in the long-term within the context of the EMP and conditions for closure negotiated and documented therein (Regulation 62 (c). The objectives and targets should be achievable, realistic and financially viable.
- **A summary of the results of the environmental risk report and details of identified residual and latent impacts**: The environmental risk report as required by Regulation 60 must contain the management measures to be implemented for the potentially significant risks, where those risks relate to failure of rehabilitation measures to meet the desired biodiversity outcomes within specific time frames the steps are outlined in Regulation 60.
- **A description of methods to decommission each prospecting and mining component and the mitigation or management strategy to avoid, minimise and manage residual or latent impacts**: Follow best practice in the application of the mitigation hierarchy related to biodiversity.
- **Details of any long-term management and maintenance expected**: Mitigation and management of residual or latent impacts in as far as biodiversity aspects are concerned can be labour-intensive activities. Opportunities exist to provide employment for local communities, and present opportunities to combine aspects of the social and labour plans for closure with environmental rehabilitation.
- **Details of proposed closure costs and financial provision for monitoring, maintenance and post closure management**: In applying for a prospecting right, mining right or permit (and possibly for an environmental authorisation related to prospecting, mining, exploration, production or related activities), financial provision for rehabilitation, management and closure of environmental impacts is a requirement. 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.
- **Record of interested and affected persons consulted**: Biodiversity stakeholders can support development of closure objectives. Engagement with stakeholders can identify opportunities for collaboration, partnerships and benefits for local communities, in achieving environmental objectives and specific goals for rehabilitation and mine closure should be explored.

[81] Swart (2003)
[82] Section 43(3)(d) of the Mineral and Petroleum Resources Development Act, Section 24N of NEMA.

An important component of closure is adequate financial provision for managing latent and residual environmental impacts[83], closure plans must specifically address the financial provisions for monitoring, maintenance and post closure management, which should include amongst others, rehabilitation costs associated with commitments on restoring impacted ecosystems[84].

The costs associated with the required rehabilitation and management of negative environmental impacts may be substantial, particularly if impacts on the affected biodiversity or ecosystem services are significant and mitigation is required through rehabilitation and biodiversity offsetting. 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 achieving near-restoration, and including provision for escalation of projected costs is thus crucial. In some cases the costs of remediation of environmental damage may be significant enough to alter project decisions. Mining companies are legally required to plan the likely mine closure requirements and costs upfront in the project feasibility stage. Comprehensive environmental planning and costing for this at the stage of the feasibility assessment could affect the financial feasibility of a project.

Where the proposed site for a mining activity falls in a biodiversity priority area, review by qualified and registered specialists and resource economists of the full economic valuation of mining and alternative land uses, and of the impact assessment and/or biodiversity studies is advisable to give assurance both to the competent authority and to the mining company that key risks have been identified as part of the EIA process.

[83]Regulations promulgated under the Mineral and Petroleum Resources Development Act direct 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 (Mineral and Petroleum Resources Development Act Regulation 54). Here 'residual' means environmental impact remaining after a closure certificate has been specified.

[84]Golder Associates (2004) provides guidance to DMR personnel responsible for reviewing the quantum (monetary value of the financial provision) for rehabilitation and closure of mining sites. This covers both the financial provision for premature closure at any time (the current environmental liability) and the financial provision for end-of-mining closure (the future environmental liability).

3.6. Effective implementation

The final principle in making good decisions regarding mining and biodiversity is to ensure effective implementation throughout the mining cycle, including adaptive management. This section focuses on the implementation of the EMP but is equally relevant for other components such as implementation of closure plans.

To be effective with regard to managing biodiversity and ecosystem services, it is legally required that the EMP must be rigorously implemented by the rights holder, and enforced by the competent authority(ies). It is important to note that often the scale and/or significance of impacts of mining only become evident once construction or operation begins. To this end, it is important that measurable performance indicators are used and clear management targets and timeframes are specified in the EMP.

As legally required, Performance Assessment must be done to check implementation of the EMP on a regular basis to evaluate performance. Monitoring, together with progress reporting towards reaching the desired outcomes, enable changes to be made both to the practical management actions and the associated financial provision for management, as needed. The timing of progress reports and performance assessments vary, but ideally should be undertaken on an annual basis as required by the MPRDA and as specified in the EMP. The use of independent audits to check performance is advised as these audits are useful in helping mining companies to minimise risks and liabilities for environmental harm.

Assessment of environmental liability and revision of financial provisions for rehabilitation and environmental management is a legal requirement. The performance reports will provide valuable input to adjustments to financial provisions.

Monitoring and compliance enforcement is important[85] especially where biodiversity priority areas are concerned. The mining industry by valuing high standards of compliance and recognising its usefulness in minimising risks and liabilities for environmental harm, can contribute to its credibility. Similarly, civil society's involvement as a key stakeholder on issues of biodiversity (for example by being represented on environmental management committees) can also contribute to improved acceptance.

It is recommended that the composition of the environmental management committee include biodiversity stakeholders, and that this be written into the restrictions or conditions of the mining right or permit. This should include giving those stakeholders powers to have access to the monitoring reports and environmental audit.

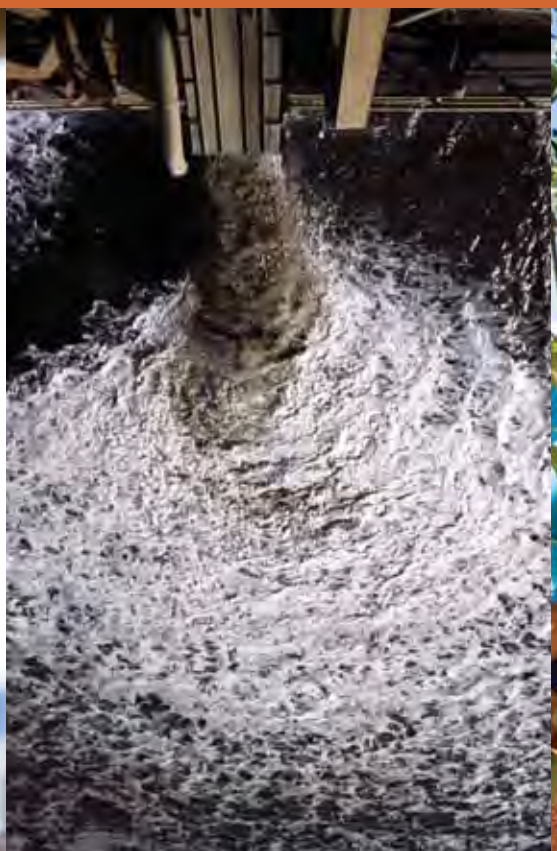
Where an EMP Performance Assessment finds measures to manage impacts to be ineffective or insufficient to achieve the stated outcomes, then the EMP must be updated and additional or different actions incorporated to rectify these shortcomings. This adaptive management approach can ensure that the most effective and efficient approach to management is implemented. Through regular monitoring and assessments, the company can respond swiftly – and cost effectively – to poor performance.

If the rights holder 'fails to rehabilitate or manage, or is unable to undertake such rehabilitation or to manage any negative impact on the environment', the Minister of Mineral Resources may access the financial provision to rehabilitate or manage the negative environmental impact in question.

The next section describes how each of these six principles should be applied at each of the stages of the mining life cycle.

[85] O'Beirne (2011)

4 Managing impacts on biodiversity at different stages of the mining life cycle



4. Managing impacts on biodiversity at different stages of the mining life cycle

This section discusses the application of the six principles at each stage of the mining life cycle. The potential impacts of mining on biodiversity, the administrative requirements, the principles that should underpin consideration of biodiversity at each stage, and the biodiversity tools available to limit impacts and reduce risk to biodiversity are discussed for each stage. The section focuses on the implications for mining companies and regulators.

4-1 Reconnaissance

4-2 Prospecting

4-3 Mining or production

4-4 Decommissioning and closure

This section describes considerations with respect to the six principles for good decision making regarding biodiversity at each stages of the mining life cycle and the implications for mining companies and decision makers.

Biodiversity should be considered at each of these stages of the regulatory process and mining life cycle. Whether biodiversity impacts are addressed as part of preparing an EMP in terms of the MPRDA, or a Basic Assessment Report or Scoping and Environmental Impact Assessment in terms of the NEMA EIA regulations, the scope and issues, and the key sources of information pertaining to biodiversity that need to be consulted remain essentially the same. The level of detail of the investigation and application of biodiversity information will, however, differ depending on the stage of the mining proposal, and the nature of the receiving environment. In particular, more detailed and vigorous investigation will be required in biodiversity priority areas.

As a project proceeds through successive stages of a mining life cycle resourcing capacity needs to increase, and an increasing level of detail and confidence in the economic viability of exploiting the particular resource is required.

4.1. Reconnaissance

4.1.1. Description

Reconnaissance refers to a general examination or survey of a region that is of interest for its mineral or petroleum resource. It is usually executed rapidly and at relatively low cost. The intention is to locate mineral or petroleum resources that are worthy of more detailed investigation in the hope of finding commercially viable reserves. Reconnaissance is primarily based on results of geological studies and mapping, regional geological mapping, indirect methods (e.g. seismic surveys), geological inference and geological extrapolation. No description of the impacts on biodiversity is given at this stage since impacts are limited.

4.1.2. Implications for mining companies

It is at this early stage that mining companies, aware of the possible risk that areas of high biodiversity value can pose to mining projects, should rapidly assess the biodiversity significance of the area under investigation before expensive and time-consuming detailed impact assessments are conducted. This will have the combined benefit of reducing the risk of:

- Negative impacts on biodiversity.
- Unnecessary mitigation costs.
- Delays in authorisation and/ or the risk of having the application turned down.
- Difficulty in accessing finance.
- Community or public resistance.
- Reputational (and other) consequences for the mining company.

Table 7 below highlights reconnaissance stage specific consideration with respect to the six principles.

4.1.3. Implications for decision makers

It is the responsibility of government officials of DMR, DEA, and DWA to ensure that the requirements of legislation relevant to the application for a reconnaissance permit/permission, environmental authorisation or water use licence are met.

They should ensure mining companies consider biodiversity priority areas in developing reconnaissance applications and make use of most appropriate and up to date information on biodiversity in arriving at their conclusions.

Table 7. Reconnaissance stage specific considerations with respect to the six principles for good decision making regarding biodiversity

Principles	Stage specific considerations	Mining companies...*
Apply the law	For reconnaissance the MPRDA requires that permission (in the case of minerals) and a permit (in the case of petroleum) is obtained. Necessary environmental authorisations or water use licences must be applied for if any activities associated with reconnaissance trigger the need for these.	Must comply with all applicable legislation.
Use best available biodiversity information	Best available biodiversity tools and information should be used to determine the biodiversity significance of the area(s) under consideration by: • Identifying whether or not the site or surrounding area falls in or near to a biodiversity priority area, • Checking the available information on biodiversity to determine if the site or surrounding area has particular species that may be threatened, and • Identifying the environmental and social context, and levels of dependence on ecosystem services that are underpinned by the affected ecosystems.	Should conduct a rapid desktop evaluation, and preferably a site visit, to establish the biodiversity context prior to submission of reconnaissance application. Should clearly indicate (spatially) the location of the proposed reconnaissance site in relation to biodiversity priority areas and habitat for threatened species. Should be aware of the probable scope of specialist impact studies and levels of mitigation that would be required should the project be in a biodiversity priority area.
Engage stakeholders thoroughly	While significant stakeholder engagement is not necessary or feasible at this stage, if the mining area of interest falls inside, adjacent to or upstream of a biodiversity priority area, it could be in the interests of the mining company to engage with key biodiversity stakeholders at this early stage.	Should consider best practice in terms of stakeholder engagement. Should undertake a preliminary stakeholder identification process to determine the key parties with an interest in, responsibility for and/or likely to be affected by mining activities so as to garner their their initial input, or for engagement in subsequent stages.
Use best practice in EIA to identify impact	While there is no specific requirement for an EIA in the MPRDA, if the proposed activities trigger a listed activity in terms of the NEMA EIA regulations or the NWA, then the impact assessment requirements linked either to a Basic Assessment or a Scoping and Environmental Impact Report must be satisfied. Impacts on biodiversity are generally limited in comparison to other mining stages, but will depend on the approaches used for reconnaissance (for instance seismic testing in marine environment can havesignificant impacts on marine mammals).	Should apply best practice to identify potentially significant impacts on biodiversity priority areas, threatened species and crucial **s**ecosystem services, and show that – and how – they have planned to avoid these impacts.
Apply mitigation hierarchy in a robust EMP	The MPRDA requires an EMP be submitted for a reconnaissance permission (Section 39)2) or permit (Section 75). The permission/permit application must contain a reconnaissance work programme, which requires proof of the applicant's technical ability to 'mitigate and rehabilitate relevant environmental impacts' and an estimate of the expenditure that will be incurred including "costs pertaining to rehabilitation and management of environmental impacts"[86].	Must submit an EMP and reconnaissance work programme with proof of technical ability to mitigate and rehabilitate relevant environmental impacts, and estimate costs for rehabilitation and management of environmental impacts. Should follow best practice in applying the mitigation hierarchy and developing a robust EMP, which shows how unavoidable impacts will be minimised, areas rehabilitated and biodiversity offsets/ compensation provided (as relevant).
Ensure effective implementation and adaptive management	The holder of a reconnaissance permit must provide progress reports to the Regional Manager (DMR) every 12 months, including on compliance with an EMP. These progress reports should cover compliance with the approval and all mitigation measures in relation to biodiversity and ecosystem services.	Must provide progress reports to the Regional Manager (DMR) every 12 months, including on compliance with an EMP.

** The words 'must' and 'should' are used deliberately to make a clear distinction between what is mandatory and what constitutes good practice.*

[86] Contemplated in terms of Reg 20 Mineral and Petroleum Resources Development Act Regulations, R7949 of 2004.

4.2. Prospecting or exploration: integrating biodiversity

4.2.1. Description

Prospecting[87] (or exploration[88] in the case of petroleum resources) is the systematic and iterative process of locating a mineral deposit by narrowing down areas of promising mineral potential with the aim of identifying and defining a financially exploitable ore body or mineral resource. Prospecting can include excavation, trenching, pitting and drilling, bulk sampling and testing, and any other prospecting method [89].

For the prospecting/mining company, it is in this stage that the indicative resource is more fully assessed to quantify the measurable resource upon which a bankable/economic feasibility study can be based. Towards the end of the prospecting/exploration stage of the project, the focus shifts from narrowing down areas of most exploitation potential to reserve determination and financial evaluation. This generally involves an intensification of on-site prospecting and activities such as drilling and bulk sampling[90].

4.2.2. Implications for mining companies

The prospecting stage is an important one for mining companies, as it is generally near the end of this stage that a mining company is determining whether or not a mining project will be feasible and will aim to develop a bankable feasibility study based on their findings. A prospecting EMP is required as part of the rights approval process.

Relevant information on the potentially significant impacts on biodiversity and ecosystem services must be gathered as the basis for assessing impacts and providing adequate and appropriate mitigation measures, need to be included in a prospecting EMP, which is a required part of the rights approval process.

It is important that this information is used to prepare or revise prospecting plans in order to avoid impacts on key biodiversity features, particularly in biodiversity priority areas with highest (category B) or high (category C) biodiversity importance, and/or to minimise and remedy impacts on other biodiversity in accordance with the mitigation hierarchy. Likely costs associated with biodiversity mitigation and mine closure objectives, especially in these biodiversity priority areas are easily under-estimated and result in an overestimate of the financial viability of the project.

It is essential that in this stage any fatal flaws to the project going ahead have been identified or that the full rehabilitation costs are factored into the economics of the project. It is at this critical stage where the consideration of biodiversity information, the interrelationships between social and biophysical components of the environment, and their integration with engineering and financial planning and decision making about a mining project is especially important. The assessments include not only the size and nature of the mineral resource, but also the costs of developing, operating, managing and closing the mine, including post-closure commitments such as rehabilitation.

Table 8 below highlights prospecting stage specific consideration with respect to the six principles for good decision making regarding biodiversity.

[87] Prospecting means intentionally searching for any mineral by means of any method (a) which disturbs the surface or subsurface of the earth, including any portion of the earth that is under the sea or under other water; or (b) in or on any residue stockpile or residue deposit, in order to establish the existence of any mineral and to determine the extent and economic value thereof; or (c) in the sea or other water on land (Mineral and Petroleum Resources Development Act).

[88] Exploration operation means the re-processing of existing seismic data, acquisition and processing of new seismic data or any other related activity to define a trap to be tested by drilling, logging and testing, including extended well testing, of a well with the intention of locating a discovery (Mineral and Petroleum Resources Development Act).

[89] Chapter 2, part 1, Section 7 (1)(g) Mineral and Petroleum Resources Development Act

[90] Note that legislation does not regulate the scale of bulk sampling, which can sometimes take place at a scale which has impacts similar to that of mining. Licence conditions for bulk sampling should quantify the scale of bulk sampling operations in more detail than is required in the legislation.

Table 8. Prospecting stage specific considerations with respect to the six principles for good decision making regarding biodiversity

Principles	Stage specific considerations	Mining companies...*
Apply the law	Prospecting or exploration right applications must include an EMP. Prospecting activities may: trigger more than one listed activities in terms of the NEMA EIA regulations, necessitating the need for an environmental authorisation; require the acquisition of a water use licence or permits and/or in relation to waste disposal authorisations.	Must comply with all applicable legislation.
Use best available biodiversity information	Best available biodiversity tools and information should be used to determine the biodiversity significance of the area(s) under consideration. Additional to the recommendations in reconnaissance stage are: site visit by biodiversity specialist if the area is a biodiversity priority area.	Should demonstrate that they have used best available information and conducted a site visit to establish the biodiversity context prior to applying for a right. Should take into consideration biodiversity priority areas (indicating, spatially, the location of the proposed prospecting site in relation to these areas) and the underlying key biodiversity features. Should employ biodiversity specialists to help understand the likelihood of fatal flaws or restrictions in biodiversity priority areas.
Engage stakeholders thoroughly	Mining companies will be required to comply with the legal requirement to engage landowners in order to gain access to properties for prospecting. Depending on the biodiversity importance of the area, the project proponent should engage local, provincial and/or national conservation agencies if biodiversity priority areas are to be affected. In biodiversity priority areas it may be important to involve local communities whose ecosystem services might be affected and who may have important local or indigenous knowledge about the biodiversity of the target area, and may raise issues unique to a particular area.	Should consider best practice in terms of stakeholder engagement. Should demonstrate that they have engaged key biodiversity stakeholders in determining the significance of, and levels of dependence on, biodiversity and ecosystem services.
Use best practice in EIA to identify impacts	Depending on the specific nature of prospecting activities and the importance and sensitivity of the receiving environment, impacts on biodiversity and ecosystem services may arise. The activities associated with prospecting and exploration may result in destruction of habitat. In addition, prospecting may involve the extraction of water resources, and the generation of wastes (in liquid, gaseous or solid form). An influx of employees involved in prospecting or exploration activities may increase these impacts on biodiversity and ecosystems. With respect to the MPRDA, although an EIA is only required by the MPRDA for mining right applications, the information that must be provided be the applicant fo a prospecting or exploration right (Section 39 of the MPRDA), essentially follows the sequence of steps required in an EIA (defining the baseline environment, investigating, assessing and evaluating the impacts, and describing proposed mitigation measures).	Must assess and evaluate the potential impacts of prospecting or exploration activities on the environment. Should apply best practice to identify potentially significant impacts on biodiversity priority areas, threatened species and crucial ecosystem services. Should demonstrate that they have visited the proposed prospecting site and, where the site has areas where natural habitat remains, have appointed specialists to undertake baseline surveys in sufficient detail to be able to determine the significance of biodiversity to be affected.

Principles	Stage specific considerations	Mining companies...*
Apply mitigation hierarchy in a robust EMP	Prospecting or exploration right applications must include an EMP for prospecting activities. All of the mitigation measures determined in the impact assessment should be incorporated in the EMP, with specific management objectives, actions and responsibilities, and timing. This EMP must meet the requirements of the MPRDA and should be developed following best practice. This includes showing the capacity to undertake the necessary mitigation measures effectively and the financial provision for rehabilitation and management of negative environmental impacts. In addition to the instances identified in the EMP, the mining or petroleum companies will want to assess the potential costs that biodiversity risks pose to their prospective mining operations. These costs may include lost production/mineral extraction through having to avoid particular areas, and the costs of rehabilitation and/or offsetting residual impacts. The greater the significance of the impact the greater the need for mitigation measures. The costs of mitigation should be factored into the evaluation of financial viability[91].	Should follow best practice in applying the mitigation hierarchy and developing a robust EMP, which shows that – and how – they have explored reasonable and feasible alternatives to avoid impacts on biodiversity, and minimise, rehabilitate and/or offset unavoidable impacts. Should employ biodiversity specialists to help understand the possible mitigation measures that will be required in the mine construction and operations stage and forecast costs of environmental mitigation and biodiversity offset actions both during operation and at closure so as to include them into the feasibility study.
Ensure effective implementation and adaptive management	The holder of a prospecting/exploration right must provide progress reports to the Regional Manager (of DMR) every 12 months, including on compliance with the EMP. In addition, holders of prospecting rights must conduct monitoring 'on a continuous basis' and submit performance assessments in respect of compliance with the approved EMP. These assessment reports, to be prepared every two years or as agreed to in writing by the Minister, must contain information pertaining to the scope, procedure and evaluation criteria used for the assessment[92]. Where measures to manage impacts are ineffective or insufficient to achieve the stated outcomes, then adaptive management and additional control measures may be needed, and the EMP amended to reflect these shortcomings.	Must provide progress reports to the Regional Manager (DMR) every 12 months, including on compliance with the EMP. Must assess environmental liability annually, including evaluating the performance of rehabilitation in terms of meeting desired outcomes, and the financial provisions made should be adjusted to the satisfaction of the Minister of Mineral Resources where necessary.

** The words 'must' and 'should' are used deliberately to make a clear distinction between what is mandatory and what constitutes good practice.*

[91] Tools such as the World Business Council for Sustainable Development and World Resources Institute's Ecosystem Services Review which provides important guidance on co nsidering these issues (Landsberg et al. 2011).

[92] Reg 55(3) Mineral and Petroleum Resources Development Act Regulations

4.2.3. Implications for decision makers

Government officials of DMR, DEA, and DWA must ensure that the requirements of legislation relevant to the application for a prospecting or exploration rights, environmental authorisation or water use licence are met before the mining company begins with prospecting activities.

According to the MPRDA, the Minister of Mineral Resources must approve the EMP if it contains the statutorily prescribed content, and if the applicant has made the requisite financial provisions for remediation of environmental damage and has shown the capacity, or have provided for the capacity, to rehabilitate and manage negative impacts on the environment[93]. DMR should seek evidence of consideration of best available biodiversity information and best practice in environmental impact assessment, implementation of the mitigation hierarchy and evaluation of financial provision required for remediation of environmental damage. DMR should consult with provincial agencies and/or departments responsible for biodiversity management and conservation to ensure that the information provided by the applicant is sufficient, relevant and reliable. The DMR is in a position to reject non-compliant EMPs[94], if information supplied is insufficient on which to make a defensible decision. DMR must receive progress reports, including compliance with the EMP, from the proponent every 12 months. DMR they should receive performance assessments in respect of compliance with the approved EMP every two years or as agreed to in writing by the Minister. Compliance with, and outcomes in relation to the EMP requirements for biodiversity and ecosystem services must form an integral part of this performance assessment. EMP conditions can include cooperative agreements between the mining company and others. In the case of bulk sampling authorisations, detailed quantification of the scale of bulk sampling could be stipulated in the authorisation.

If application is being made to renew a prospecting right, the decision maker must consider whether the applicant has complied with the requirements of the previously approved EMP[95].

Where DMR is the decision maker, DEA, provincial environmental authorities and/or DWA must ensure that any comments these department may have on reports submitted to them by DMR are provided within the allotted timeframes.

[93] Reg 5(h) Mineral and Petroleum Resources Development Act Regulations

[94] Current practice suggests that the quality of EMPs varies significantly, with the information contained in some being insufficient both for the DMR to fully evaluate the reported impact of the proposed activity on biodiversity, and for the applicant's subsequent actions to be measured against the Plan content (McLean and Carrick 2007).

[95] Section 19 Mineral and Petroleum Resources Development Act

4.3. Mining or production: integrating biodiversity

4.3.1. Description

The mining or production stage in the mining life cycle is where the greatest environmental impacts are likely to occur. This stage is sometimes dealt with as two separate stages, construction and operation, but are treated together here because by the time construction begins, all necessary authorisations must have been approved as have the EMP that will direct the management of impacts on biodiversity and ecosystem services. The adequacy of the mitigation measures committed to in the EMP, having been approved by DMR and/or DEA, will be tested during this stage.

It is a legal requirement that this stage commences only once all of the required authorisations have been approved, including the water use license and any environmental authorisations for associated activities.

4.3.2. Implications for mining companies

The mining stage represents the largest relative effort and investment for the mining company. By now, potential limitations for project development should have been identified, including the likelihood of potentially significant impacts on biodiversity priority areas. If a mining company is to be exercising rights in a biodiversity priority area the necessary planning preparation should be done to apply best practice in the necessary scoping, EIA, biodiversity stakeholder engagement, and application of the mitigation hierarchy in development of a robust EMP.

The mining company should be applying for the mining right with full appreciation of the biodiversity context in the area in which it will be mining, the potential fatal flaws or restrictions that that might impose, the financial implications thereof (both in terms of financial provisions for rehabilitation and closure), and other risks that may come with mining in biodiversity priority areas of very high biodiversity importance (discussed in section 2).

Where the mining area or part thereof falls in a biodiversity priority area, the EIA should have ensured independent peer review by qualified and registered specialists and resource economists of the full economic valuation of mining and alternative land uses, and of the impact assessment and/or biodiversity studies is advisable to give assurance both to the competent authority and to the mining company that key risks have been identified. Where impacts on biodiversity and/or ecosystem services are probable and could be significant, it would be appropriate to involve a resource economist to inform the need for, and the feasibility and costs of, providing biodiversity offsets or other compensation, and to guide financial decisions on the associated implications.

Table 9 below highlights mining construction and operation stage specific consideration with respect to the six principles for good decision making regarding biodiversity.

Table 9. Mining construction and operation stage specific considerations with respect to the six principles for good decision making regarding biodiversity

Principles	Stage specific considerations	Mining companies...*
Apply the law	Based on the results of the prospecting or exploration, a mining company will decide to apply to mine in terms of Section 22 or Section 27 (mining right or permit), or in terms of Section 83 of the MPRDA (petroleum production). A mining operation can take place under a mining permit[96] or a mining right. Mining may trigger more than one listed activities in terms of the NEMA EIA regulations, necessitating the need for an environmental authorisation, and possibly requiring an integrated water use licence under the NWA.	Must make themselves aware of the legal requirements for all aspects of this mining stage. Should be aware that mining activities and the development of ancillary infrastructure cannot begin until all authorisations required have been approved. Should be aware that the application process for other authorisations/ permits/licences can take longer (a year or more) than the mining right application process and plan accordingly. Should be aware that failure to plan accordingly can result in delays and pose business risks as mining rights holders must commence mining operations within one year from the date on which the right becomes effective (Section 25 of the MPRDA).
Use best available biodiversity information	Best available biodiversity information should be used to determine the biodiversity significance of the area(s) under consideration. This must include using biodiversity specialists to undertake necessary biodiversity studies.	Should take into consideration biodiversity priority areas (indicating, spatially, the location of the proposed mining site in relation to these areas) and the underlying key biodiversity features. Should demonstrate that they have sufficient up-to-date information on the baseline or benchmark environment and its biodiversity against which impacts and the performance of mitigation measures can be evaluated. To this end, it is crucial that biodiversity issues and concerns are identified and clearly defined during scoping, and that appropriate specialists are appointed to investigate them, based on explicit Terms of Reference during the EIA.
Engage stakeholders thoroughly	Following good practices, biodiversity stakeholders should have been engaged in the process from an early stage. This is important for developing high quality EMPs and mitigation measures for residual impacts on biodiversity and ecosystem services. It is especially important in biodiversity priority areas where sufficient time and effort is needed to reduce the risk to biodiversity (of inadequate mitigation measures, this includes avoidance where necessary) and risk to business (of delays, non-compliance, and reputation). Where biodiversity offsets are required to compensate for unavoidable residual negative impacts, additional focused stakeholder engagement is needed to inform and guide the identification, design and implementation of potential biodiversity offset sites and activities[97]. Even after a mining right has been granted, stakeholder engagement through dedicated forums can be used for discussing negative impacts on biodiversity and ecosystems and their management and/or mitigation.	Must undertake stakeholder engagement Should follow best practice Should demonstrate that they have engaged key stakeholders in identifying, assessing and evaluating the significance of and levels of dependence on, ecosystem services and associated biodiversity. Should have approved systems and processes in place to govern engagement during mining construction and operation. Relationships with biodiversity stakeholders can be actively cultivated through regular communication via newsletters, updates and/or meetings. Should engage stakeholders in the mining stage with regard to their vision and aspirations for a post-mining landscape.

[96] Mining permits, as distinct from mining rights, may be issued for areas that do not exceed 1.5 hectares and which can be mined optimally within a two-year period. Mining rights are issued for larger areas to be mined over longer time periods.
[97] BBOP (2009)

Principles	Stage specific considerations	Mining companies...*
Use best practice in EIA to identify impacts	Mining construction and operations during this stage can result in negative impacts on terrestrial, marine and other aquatic biodiversity and ecosystem services. As can the ancillary infrastructure, such as roads, conveyors, power lines, pipelines and railways that support mining construction and operation. Examples of these impacts are described in Box 7. Because the impacts on biodiversity can be so much greater in this stage, and generally take place over much longer periods, adequate consideration of the long-term and cumulative impacts on biodiversity and ecosystem services is crucial. EIA is a requirement in the application of a mining right or permit and best practice in this regard should be followed. Ideally, the company would have undertaken diligent and comprehensive scoping and assessment of potential impacts of the mining operations during prospecting stage; identified and engaged with biodiversity stakeholders; and have established a good idea of the context, time, resources and specialists required for adequate impact assessment, development of mitigation measures and robust EMP. If this is not the situation, the scoping phase, which is limited to 30 days for a mining right, has to quickly: assess and describe the necessary scope of specialist investigations that must be undertaken in the EIA, and develop real alternatives, for investigation. In the case of the EIA and EMP for the mining right, the timeline is limited to 180 days with little provision for extension. This may not allow sufficient time to collect, assess and report adequately on any complex environmental or biodiversity issues in the region, considering also the seasonality associated with some biodiversity issues.	Must apply best practice in EIA. Should quickly assess the extent to which scoping has been adequately undertaken and resource the scoping team appropriately to undertake adequate scoping. Should show that they have explored reasonable and feasible alternatives that could avoid irreplaceable biodiversity, minimise impacts on biodiversity priority areas/ habitat for threatened species and the ecological integrity/ functioning of areas that provide important ecosystem services. Should describe, where mining is proposed in biodiversity priority areas of highest (category B) and high (category C) biodiversity importance, the strategic context of the proposal and the site as the EIA must evaluate mining and alternative land uses in terms of the optimum sustainable use of the proposed mining site. Should be aware that the statutory timeline for preparing and submitting a scoping and EIA report is potentially problematic from the perspective assessing impacts on biodiversity and ecosystem services, particularly if this investigation into these impacts did not begin in preceding stages. Should ensure that the comparative evaluation of alternative development/land use activities takes into account the socio-economic consequences on other economic activities and livelihoods of impacts on biodiversity and ecosystem services over multi-decadal time periods (including taking long term variability into account). Should consider getting independent review of EIA.
Apply mitigation hierarchy in a robust EMP	An EMP is a requirement of the mining or production right or permit. Environmental management considerations should extend to the mitigation of impacts linked to ancillary or associated facilities and activities, and be built into the EMP. This EMP must clearly describe explicit outcomes required, together with appropriate key indicators for measuring performance and timelines for achieving these outcomes. It is not enough simply to list mitigation actions. The financial implications of all mitigation, which may include a biodiversity offset, and management measures must be incorporated in the financial provision for remediation of environmental damage and mine closure. Defining the post-mining landscape early on, to inform mine planning and operation accordingly is important and will help to inform the kind of baseline information that should be gathered from the site before mining operations commence. The desired landscape and its biodiversity after mining should be closely tied to the level of mitigation required to remedy impacts on biodiversity; this level will, in turn, depend on the importance of the biodiversity to be affected by mining and the potential role of the site for biodiversity management and conservation at a landscape level.	Must submit an EMP with 'detailed documentary proof' of the technical ability, or access to that ability, to rehabilitate and manage negative impacts on the environment[98]. Should take a risk-averse approach to determining residual negative impacts and designing mitigation where there is uncertainty or high risk in relation to the assessment of impacts and/or to the likely success of rehabilitation. Where residual negative impacts on biodiversity require biodiversity offsets, offset site(s) and actions must be incorporated into the wider EMP. Should follow good practice in ensuring a robust environmental management that applies the mitigation hierarchy. Should capture the mitigation measures (including explicit outcomes and timelines) prescribed in the EIA to avoid, minimise, rehabilitate and/or offset negative impacts on biodiversity and ecosystem services in the EMP. Must include a closure plan in the EMP and should develop and incorporate explicitbe ecological criteria and measurable targets for biodiversity, as well as timelines for achieving those targets. The criteria should provide the best assurance of ecological and land- form resilience in the long term, which will require the input of specialists and that they be tailored for different biodiversity/ecosystems. Should seek opportunities to combine aspects of the social and labour plans for closure with environmental rehabilitation.

** The words 'must' and 'should' are used deliberately to make a clear distinction between what is mandatory and what constitutes good practice.*

[98] Reg 10(h) Mineral and Petroleum Resources Development Act Regulations.

Principles	Stage specific considerations	Mining companies...*
Ensure effective implementation and adaptive management	Once the right is granted, the holder of that right must implement the EMP. Regular performance/compliance monitoring and enforcement thereof is legally required to ensure the on-going implementation and applicability of the EMP. Close monitoring of actual impacts is essential to check the accuracy and appropriateness of the EMP in practice; often the exact significance of impacts is only known once construction or operation begins. Where measures to manage impacts are in effective or insufficient to achieve the stated outcomes, then adaptive management and additional control measures may be needed, and the EMP amended to reflect these shortcomings. Currently amendments to EMPs can be made at the discretion of the Minister of Environmental Affairs, Minister of Mineral Resources, an MEC or identified competent authority. In addition to conducting monitoring 'on a continuous basis', the MPRDA requires holders of mining rights to submit performance assessments respecting compliance with the approved EMP. These assessment reports, to be prepared every two years or as agreed to in writing by the Minister, must contain information pertaining to the scope, procedure and evaluation criteria used for the assessment[99]. Compliance with, and outcomes in relation to the EMP requirements for biodiversity and ecosystem services will form an integral part of this performance assessment. Environmental audits are an important requirement. While they are scheduled to ensure regular internal evaluations of environmental performance, in biodiversity priority areas in particular, they should be audited externally and be automatically available to the public. Environmental audits may benefits for mining operators, including potentially decreasing the yield broader risk of liability for environmental harm, established in both the MPRDA and NEMA. Ideally best practice would require the incorporation of environmental management commitments into all contracts with large service providers[100] .	Should clearly define the roles and responsibilities for biodiversity mitigation, as well as for monitoring and adaptive management. This requires continuous alignment of mine planning with rehabilitation planning. Should stipulate the biodiversity/ecosystem services management obligations and required outcomes in the contract documents and performance agreements of contractors, senior employees and service providers, Should seek opportunities to contribute to biodiversity management and conservation through enhancing biodiversity on the mine site, in the area of influence of the mine and in collaboration with local communities, local or regional initiatives and conservation environmental rehabilitation. Should appoint an independent competent person(s) to conduct a performance assessment and compile a performance assessment report (Section 55(4) of MPRDA Regulations). Should involve key stakeholders and local communities in monitoring and checking the performance of the mining operation in relation to the requirements of the EMP, as approved by the decision maker. Must develop an environmental awareness plan intended to inform employees of the manner in which environmental risks must be dealt with in order to avoid pollution or environmental degradation. This plan should specifically include biodiversity.

** The words 'must' and 'should' are used deliberately to make a clear distinction between what is mandatory and what constitutes good practice.*

[99] Reg 55(3) Mineral and Petroleum Resources Development Act Regulations.

[100] For example the Ruggie Principles on Business and Human Rights which provides a blueprint for companies to know and show that they respect human rights, reduce the risk of causing or contributing to human rights harm, and set benchmarks for stakeholders to assess business respect for human rights. This includes failure to enforce existing law that directly or indirectly regulate business respect for human rights, include environmental laws

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Box 7. Possible impacts on biodiversity during mining construction and operations

Mining construction and operations can result in a range of negative impacts on terrestrial, marine and other aquatic ecosystems if not properly managed, such as:

- Damage to or clearing of natural habitat, fencing off of areas and/or increased vehicular traffic, leading to loss of ecological communities, habitat for species, changes to ecosystem services, and fragmentation or isolation of habitats.
- Changes in the availability of surface water and groundwater as a result of increased extraction for use by the mine and associated activities.

  Pollution of surface water and groundwater resources from:
  - runoff from disturbed land leading to soil erosion and increased turbidity, and siltation
  - runoff or seepage from stockpiles and waste dumps into the surface and groundwater
  - exposure of acid generating or other leachable materials that leads to the dispersion of acids and mobilisation of metals
  - infrastructure and services to support the mining operation (e.g. fuel storage areas, sewage treatment facilities);
- Introduction or spread of alien invasive species, feral fauna (including agricultural and commercial exotic species) and diseases of native flora and fauna.
- Alteration of groundwater levels through mine dewatering impacting on hydrological regimes, groundwater-dependent ecosystems and water users.
- Air emissions from processes such as roasting and smelting and dust generation from operations and transport;
- Increased risk of fire may interfere with natural fire regimes and adversely affect biodiversity.
- Accidental releases of process chemicals and tailings disposal from hydrometallurgical processing or spillages of hazardous materials on site.
- Influx of employees and other people into the area can result in increased utilisation of natural resources and could exacerbate other pressures (such as pollution, illegal collection, or poaching) on biodiversity and ecosystems.

Mining operations are supported by ancillary, often linear, infrastructure, such as roads, conveyors, power lines, pipelines and railways, which can impact on biodiversity and ecosystem services in multiple and significant ways:

- Habitat fragmentation, the disruption of migratory routes of faunal species or ecological corridors enabling ecological or evolutionary processes, collisions and road kills, dust generation and fallout.
- Linear infrastructure which transports hazardous substances poses a threat to biodiversity and ecosystem services should a spill occur.
- The transport and accommodation arrangements for personnel can have direct and indirect impacts on biodiversity (e.g. clearing of land for housing, increased pressure on natural systems for water supplies, receiving wastes, etc).
- Maintenance activities need to be undertaken to maintain infrastructure in good working order. These activities can however also cause impacts on biodiversity, and must be managed to prevent vegetation disturbance, chemical pollution, weed and pest invasion and fires.
- Open access to remote areas by provision of mine services, can facilitate other indirect impacts with significant effects on biodiversity and ecosystem services, such as spread of alien invasive species.

4.3.3. Implications for decision makers

Once accepted by the relevant authorities, the EMP is the enforceable blueprint for managing impact on the environment and should capture the mitigation measures to avoid, minimise, rehabilitate and/or offset negative impacts on biodiversity and ecosystem services. It is therefore imperative that the EMP is of an adequate standard and quality. Government should display due diligence in:

- Confirming that the information required in the Scoping Report, EIA and EMP has been provided by the applicant and is sufficient and reliable. Proposed mitigation measures should be proportional to the level of impact significance or risk to biodiversity (i.e. where impacts are likely to be irreplaceable, impacts must be avoided; where impacts will be significant, impacts should be minimised and appropriately remedied).

- Ensuring that where there are concerns that the information base may be insufficient and/or unreliable, proponents are demonstrating a risk-averse and cautious approach in designing and implementing mitigation and management.
- Ensuring that the feasibility and risks associated with minimizing, rehabilitating and offsetting/compensating for residual impacts on biodiversity and on ecosystem services have been adequately addressed, and that there would be no irreplaceable loss of biodiversity or ecosystem services.
- Considering the use of independent peer review in cases that are complex and controversial, and/or where there may be concerns about the objectivity and technical standard of the EMP, EIA or specialist reports. Independent peer review is beneficial and advisable to give assurance to the proponent, the competent authorities and stakeholders. Such review mechanisms are provided for in the NEMA[101] at the expense of the state regulator, and in National Water Act (Section 41) may conduct its own investigation, or, to the extent that it is reasonable to do so, require the applicant, at the applicant's expense, to obtain an independent review.
- Scrutinising the financial provision for mitigation measures, which should be sufficient and based on a defensible and rigorous breakdown of the likely costs of mitigation measures proposed. Provincial agencies and/or departments responsible for biodiversity management and conservation should be consulted to ensure that the information provided by the applicant is adequate, and whether or not there is a need for biodiversity offsets to remedy likely residual negative impacts of significance on biodiversity and ecosystem services.
- Considering applications that target biodiversity priority areas of highest (category B) or high (category C) biodiversity importance.

Where DMR is the decision maker, DEA, provincial environmental authorities and/or DWA must ensure that any comments they may have on reports submitted to them by DMR are provided within the allotted timeframes. Following the approval of the relevant and necessary rights, authorisations and licences, government should enforce compliance and monitoring through full and proper use of the provisions of all applicable legislation in this regard. This includes levying appropriate administrative fines on mining companies that transgress legal requirements. Currently amendments to EMPs can be made at the discretion of the Minister of Environmental Affairs, Minister of Mineral Resources, an MEC or identified competent authority.

Areas where mines are interconnected or their impacts are integrated to such an extent that the interconnection results in cumulative impact should be identified by DEA in consultation with DMR.

[101] Section 24I NEMA, as amended.

4.4. Decommissioning and closure: integrating biodiversity

4.4.1. Description

'Closure' refers to the process for ensuring that mining operations are closed in an environmentally responsible manner, usually with the dual objectives of ensuring sustainable post-mining land uses and remedying negative impacts on biodiversity and ecosystem services.

The decommissioning and closure stage is the culmination of the closure plan implementation, which was dealt with earlier. It is the period to remedy adverse impacts of mining on biodiversity and/or to improve ecosystem services for local communities where these have not been done as concurrent with mining. Part of closure involves rehabilitating the mined environment, presenting an opportunity to remedy negative impacts on biodiversity and contribute to local and regional conservation initiatives, and to help improve ecosystem services.

4.4.2. Implications for mining companies

For the mining company, planning for closure begins during the project feasibility stage before the decision to apply for a mining right has been made. This is because comprehensive environmental planning and costing for this stage should be built into the feasibility assessment, financial provisions for rehabilitation and closure must be made during prospecting and mining, and these should be continually updated through the life of the mine.

Details of the closure plan, which formed part of the EMP in the mining stage, should be updated during the life of the mine so as to contain increasingly accurate and detailed information as the mine nears the end of its productive life. The final use of rehabilitated areas after mining should be compatible with – or complemented by – adjacent land uses, which may have changed over time.

It is worth noting that rehabilitation can occur as an on-going and integral activity with the mining operation, and/or after the end of mine production to achieve closure. The former is recommended from the perspective of minimizing impacts on biodiversity and ecosystem services. This is because it effectively reduces the time lag during which cumulative negative impacts endure.

The rights holder remains liable and responsible for complying with the relevant provisions of the MPRDA as well as all other applicable legislation until they receive a closure certificate. For the mining company, the intent of this stage is to ultimately obtain that closure certificate. Mining companies should comply with the six principles to ensure biodiversity is adequately addressed.

Table 10 below highlights decommissioning and closure stage specific consideration with respect to the six principles for good decision making regarding biodiversity.

Table 10. Decommission and closure stage specific considerations with respect to the six principles for good decision making regarding biodiversity

Principles	Stage specific considerations	Mining companies...*
Apply the law	The holder of a prospecting right, mining right or mining permit is responsible for any environmental liability, pollution or ecological degradation resulting from their operations, and the management thereof, until a closure certificate is issued by the Minister[102]. The application for the closure certificate includes an environmental risk report, a final performance assessment report, and a closure plan[103]. Decommissioning of certain activities may itself trigger listed activities and require an EIA.	Should be aware that they are liable for any pollution and environmental degradation resulting from operations, including residual negative impact on biodiversity and ecosystem services, in terms of the MPRDA until the Minister has issued a closure certificate.
Use best available biodiversity information	Biodiversity tools and information are upgraded regularly and best available biodiversity tools and information should inform the update to the closure plan.	Should use best available biodiversity tools and information to update the closure plan, including the environmental risk report and details of residual and latent impacts, and the mitigation or management strategy to mitigate these. Should where appropriate involve biodiversity specialists input into aspects such as the design of mine waste dumps, tailings dams,mitigation water management structures, surface topography, fences and other structures necessary for closure.
Engage stakeholders thoroughly	Engagement with biodiversity stakeholders around closure plans, management of biodiversity offsets and implementation of closure objectives may serve to identify opportunities for collaboration, partnerships and benefits for local communities.	Should engage relevant stakeholders in reviewing the feasible post-mining land uses. Should explore opportunities for collaboration, partnerships and benefits for local communities, in achieving environmental objectives and specific goals for rehabilitation and mine closure.
Use best practice in EIA to identify impacts	EIA is not separately required at this stage of the mining life cycle as the assessment of impact and mitigation and management of impacts is covered in the EMP developed in earlier stages. But there may be a need for more detailed assessment of unforeseen residual or latent impacts picked up in monitoring of rehabilitation and closure interventions through the environmental risk assessment. It is important that pollution (especially of surface water and groundwater, and soil), post-closure migration of contaminants (especially toxic or hazardous pollutants), or the stability of mining waste storage facilities such as waste rock dumps and tailings facilities, does not prevent or undermine the rehabilitation effort. These have the potential for far reaching, direct and indirect consequences for biodiversity and ecosystem services at some distance from the source of contamination in the medium to long term.	Must address environmental liabilities, risks, pollution and ecological degradation through the risk assessment process needed for the environmental risk report to the satisfaction of the decision maker. Should investigate impacts of unforeseen residual or latent impacts following best practice in EIA. Should implement pollution prevention and/or treatment measures to ensure that post-closure objectives are achieved. Should ensure that if decommissioning of facilities necessitates additional authorisations, that these are obtained.
Apply mitigation hierarchy in a robust EMP	Applying the mitigation hierarchy in planning adjustments to the closure plan or related activities remains important throughout the life of the mine. All necessary actions to prevent or remediate pollution and mitigate impacts on biodiversity and ecosystem services must be implemented prior to or during closure. Closure will require actions to prevent further contamination and contain existing pollution so that rehabilitation will be effective.	Should ensure that mitigation can be effectively undertaken and that a risk-averse approach is taken in dealing with residual negative impacts. Should where relevant and where offsetting has been agreed, ensure that biodiversity offsets are managed and secured.

[102] Section 43 Mineral and Petroleum Resources Development Act.
[103] Section 43(4) Mineral and Petroleum Resources Development Act.

Principles	Stage specific considerations	Mining companies...*
Ensure effective implementation and adaptive management	The success of rehabilitation may vary, influenced by climatic conditions, the type of biodiversity impacted, uncertainty about natural succession processes (e.g. a change in soil structure, pH and/or salinity as a result of mining may change or hinder succession[104]) and technical or other capacity limitations. This can affect the timeframes over which rehabilitation is implemented and the objectives achieved. Monitoring assists in the verification of the success of rehabilitation and closure activities, as well as in determining the degree and scale of possible residual and latent impacts that may remain post closure. Where rehabilitation or other measures to manage impacts are not adequately addressing the closure objectives, then adaptive management and additional control measures may be needed, and the EMP amended to reflect these shortcomings. Significant advancements have been made, and will be made, in techniques to restore biodiversity in these adverse situations.	Performance monitoring and adaptive management to meet rehabilitation and closure objectives is required by legislation. This includes updating the financial provision required for rehabilitation, and management costs associated with establishing, monitoring and maintaining a long-term biodiversity rehabilitation effort. Opportunities to contribute to biodiversity management and conservation through rehabilitation efforts should be sought in collaboration with local communities, local or regional initiatives and conservation agencies/organisations. Explicit objectives and measurable targets for desired biodiversity outcomes based on best available biodiversity information can be achieved through consultation with relevant authorities and biodiversity stakeholders.

** The words 'must' and 'should' are used deliberately to make a clear distinction between what is mandatory and what constitutes good practice.*

[104] This is often an underestimated impact in Scoping and EIA, particularly in arid areas where vegetation is extremely sensitive to any change.

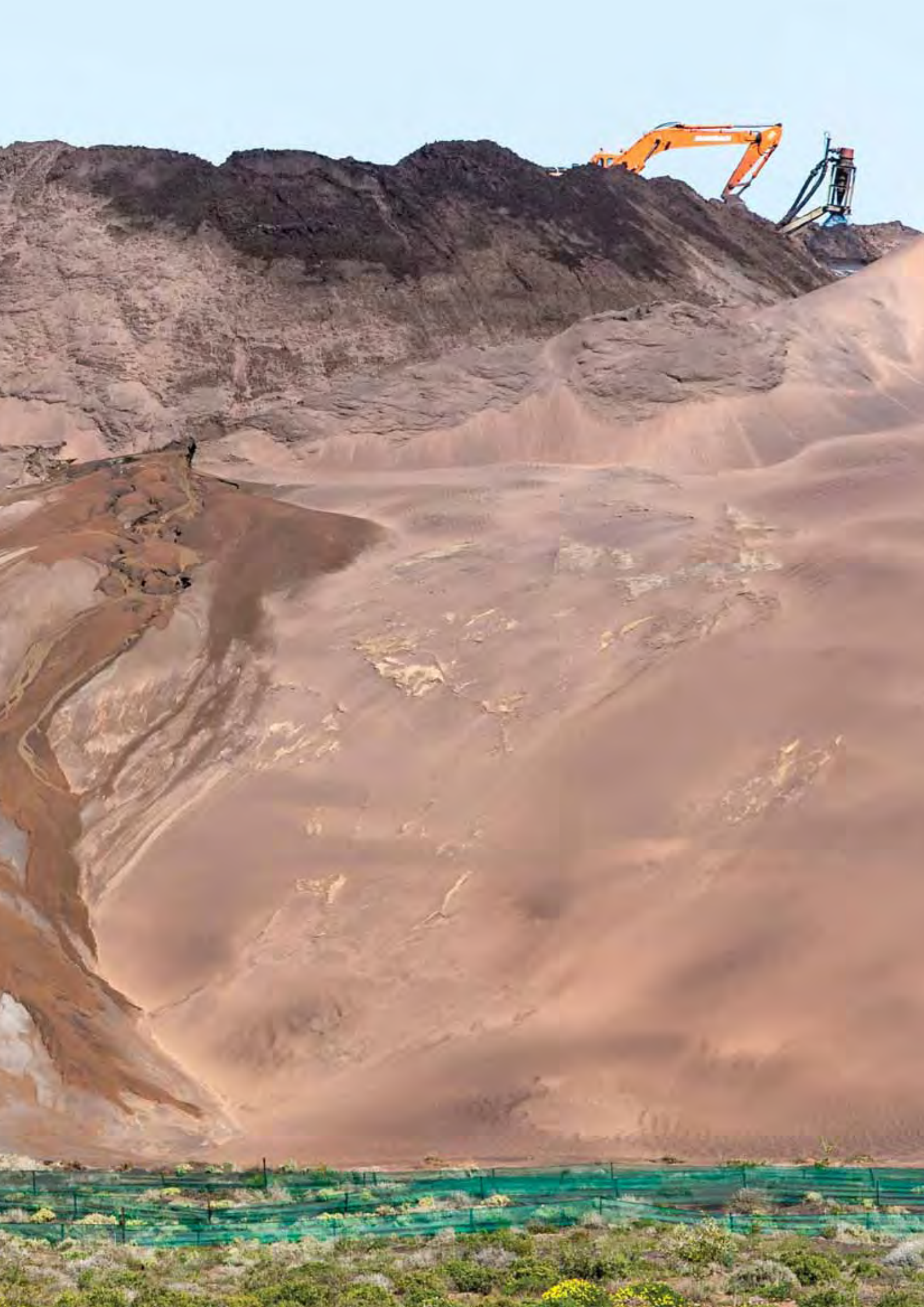
4.4.3. Implications for decision makers

The role of government is as the guardian of the environment and to serve the interests of the public in ensuring a safe and healthy environment. It is also the final inheritor of residual or latent impacts and problems where these are not managed by industry. Government officials of DMR, DEA, and DWA (at provincial or national levels as relevant) must ensure that the requirements of legislation in terms of mine closure are met. Relevant authorities should be involved in closure planning from the beginning and should, particularly in the case of municipal authorities, in defining post-mining land uses taking into consideration the development frameworks and planning of the region.

With respect to monitoring and evaluation of rehabilitation efforts, provincial agencies and/or departments responsible for biodiversity management and conservation should: confirm whether the framework for monitoring and evaluation of rehabilitation efforts provides measurable standards against which they can assess if the operator has achieved closure in terms of the legal requirements; and ensure that the provisions (including financial provision) for rehabilitation and management of biodiversity are adequate to achieve the stated objectives for rehabilitation. Where there is uncertainty as to the success of rehabilitation measures, DMR should retain appropriate financial provision to ensure that outcomes for biodiversity are reached.
If the rights holder 'fails to rehabilitate or manage, or is unable to undertake such rehabilitation or to manage any negative impact on the environment', the Minister of Mineral Resources may access the financial provision to rehabilitate or manage the negative environmental impact in question (Section 41(2) of the MPRDA).

Relevant authorities must approve the closure plan and closure objectives outlined in the EMP, as well as who will monitor and who will audit rehabilitation success after mine closure. DEA, provincial environmental authorities and/or DWA must ensure that any comments they may have on the application for a closure certificate submitted to them by DMR are provided within the allotted timeframes. But considering the significance of potential impacts over the long-term, and liability thereof, DMR should wait for written confirmation from the DWA that the provisions regarding management of potential pollution and negative impacts on water resources have been adequately addressed before issuing a closure certificate. This is a legal requirement under Section 43 (5) of the MPRDA.

Decision makers should consider the value of post-closure monitoring in evaluating the effectiveness of rehabilitation over the long-term and learning from decisions regarding rehabilitation strategies, closure plans and decisions to issue closure certificates.



5 Useful resources

5. Useful resources

5.1. Applying the law

Biodiversity and mining related legislation includes:

- Mineral and Petroleum Resources Development Act (No. 28 of 2002)
- National Environmental Management Act (No. 107 of 1998), as amended 2008
- National Environmental Management Biodiversity Act (No. 10 of 2004)
- National Environmental Management Protected Areas Act (No. 57 of 2003)
- National Environmental Management Protected Areas Act (No. 57 of 2003)
- National Environmental Management Waste Act (No. 59 of 2008)
- National Environmental Management EIA Regulations (GN No. R. 543) and Listing Notices 1,2 and 3 (GN No. 544, 545 and 546 respectively)
- National Forest Act (No. 84 of 1998)
- National Veld and Forest Fire Act (No. 101 of 1998)
- Mountain Catchment Act (No. 63 of 1970)
- National Water Act (No. 36 of 1998)
- Mine-water regulations (GN No. R. 704)
- Promotion of Administrative Justice Act (No. 3 of 2000)
- Promotion of Access to Information Act (No. 2 of 2000)
- Land Use Planning Ordinance (No. 15 of 1985)
- National Heritage Resources Act (No. 25 of 1999)
- World Heritage Convention Act (No. 49 of 1999)
- Municipal Systems Act (No. 32 of 2000)
- Integrated Coastal Management Act (No. 24 of 2008)
- Marine Living Resources Act (No. 18 of 1998)
- Conservation of Agricultural Resources Act (CARA; No 43 of 1983) (as amended 2001)

5.2. Biodiversity information

A summary of the information sources for biodiversity priority areas is provided in Table 11 below.

Table11. Summary description of biodiversity priority areas, associated legislation and information sources. Note that legal status is only attached to particular biodiversity priority areas if this is specifically indicated.

Biodiversity priority area	Description	Information sources
Protected areas	Protected in terms of the Protected Areas Act and includes Special Nature Reserves, National Parks and Provincial and Local Nature Reserves; Protected Environments[105]; World Heritage Sites[106]; Marine Protected Areas; Specially Protected Forest Areas; and Mountain Catchment Areas.	**Data**: National coverage (2008) developed for the National Protected Area Expansion Strategy and available on http://bgis.sanbi.org for download; check for any updated data from DEA and provincial conservation authorities. **Associated legislation**: As designated under Protected Areas Act (No. 57 of 2003) and areas deemed Protected Areas under the Protected Areas Act; Marine Protected Areas in terms of the Marine Living Resources Act (No. 18 of 1998); specially protected forest areas, Forest Nature Reserves and Forest Wilderness Areas declared in terms of the National Forests Act (No. 84 of 1998); and Mountain Catchment Areas declared in terms of the Mountain Catchment Areas Act (No. 63 of 1970).
World Heritage Sites (WHS)	Managed and conservedin terms of the World Heritage Convention Act (No. 49 of 1999). WHS are recognised as protected areas in the Protected Areas Act(No. 57 of 2003)[107]	**Data**: National coverage (2008) developed for the National Protected Area Expansion Strategy and available on http://bgis.sanbi.org for download **Associated Legislation**: Protected Areas Act(No. 57 of 2003); World Heritage Convention Act (No. 49 of 1999)
Areas where mining is declared prohibited or restricted under Section 49 of the MPRDA	Section 49 of the MPRDA allows the Minister of Mineral Resources to prohibit or restrict granting permissions/rights/permits in certain areas of biodiversity priority, heritage and hydrological importance. The declaration is not permanent - the Minister can withdraw it at any time, although she/he should exercise reasonable discretion and some level of consultation on the decision should be undertaken.	**Data**: DMR **Associated legislation**: MPRDA (No. 28 of 2002)
Critically endangered and Endangered ecosystems[108], listed as threatened ecosystems in terms of the Biodiversity Act	Threatened ecosystems listed in terms of the Biodiversity Act[109] have protection under law and particular activities within these areas require authorisationin terms of the EIA regulations of NEMA. Further loss and degradation of natural habitat in critically endangered and endangered ecosystemsshould be avoided. **Critically endangered (CR) ecosystems** are ecosystem types have very little of their original extent left in natural or near-natural condition. National biodiversity targets for these habitat types cannot be met, and further loss would hence be unacceptable.	**Data**: Terrestrial CR and EN ecosystems are currently viewable on http://bgis.sanbi.org River, wetland and marine CR and EN ecosystems will be available as part of the NBA 2011 and will also be viewable on http://bgis.sanbi.org

[105] Mining is prohibited unless both the Minister of Mineral Resources and Minister of Environmental Affairs approve it.
[106] Note that there is disagreement over the legal status of the buffer area of a World Heritage Site (see below).
[107] Note that there is disagreement on the legal status of the buffer area of a World Heritage Site. If the current intra-governmental process recognises buffer areas as having the same status as the core areas , then the guidelines will need to be revised.
[108] This reflects ecosystem threat status throughout South Africa and also informs the National Biodiversity Assessment 2011.
[109] Note that vulnerable ecosystems are also defined as threatened ecosystems, but are not included at this category of biodiversity priority area.

Biodiversity priority area	Description	Information sources
Critically endangered and Endangered ecosystems[111], **listed as threatened ecosystems in terms of the Biodiversity Act**	**Endangered ecosystems (EN)** are ecosystems that are close to becoming critically endangered. Any further loss of natural habitat or deterioration of condition in CR or EN ecosystem types should be avoided, and the remaining healthy examples should be the focus of conservation action. Critically Endangered and Endangered ecosystem types are included in Listing Notice 3 of NEMA (GN No. R546 of 2010). Threatened terrestrial ecosystems were listed in terms of the Biodiversity Act in December 2011. Over time, marine, estuarine, river and wetland types will also be listed in terms of the Biodiversity Act.	**Associated legislation**: Section 52 of the Biodiversity Act, 2004 (No. 10 of 2004) provides for the listing of critically endangered, endangered, vulnerable and protected ecosystems.
Critical Biodiversity Areas (CBAs), or areas of similar value such as irreplaceable and highly significant areas from provincial spatial	CBAs are areas required to meet biodiversity targets for biodiversity plans ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Some provinces use different terms for areas equivalent to CBAs, such as 'irreplaceable areas' or 'highly significant areas'. CBAs are terrestrial (land) and aquatic (water) features (e.g. vleis, rivers and estuaries) in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning in the long term (which is particularly important in the face of climate change). The desired management objective for CBAs is for them to remain in a natural or near-natural ecological condition, i.e. to prevent further loss or degradation of natural habitat in these areas. Therefore CBAs are biodiversity priority areas that must be afforded special attention in assessing and evaluating impacts of prospecting or mining. Although CBAs have been identified at a very fine spatial scale in some provinces (Gauteng, Western Cape, Kwazulu Natal), in other areas they have been identified more at a broader scale (Eastern Cape, Northwest, Limpopo and the Namakwa district of the Northern Cape). All CBAs require field verification, but this is particularly the case for broad scale CBAs where it is only in the intact areas of the CBA that mining should be prohibited. Over time, CBAs will be identified in the Free State, and remaining areas of the Northern Cape, and may be identified at a finer scale in additional provinces. Marine ecosystem priority areas are under development. Ezemvelo KZN Wildlife has identified Critical Biodiversity Areas in the seascapefor the inshore and offshore area adjacent to KZN's coastline.	**Data**: Most provinces have developed or are in the process of developing provincial spatial biodiversity plans that provide maps of CBAs, CBA maps for the Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), are available on http://bgis.sanbi.org for download. CBA maps for Gauteng are available from GDARD on request; and for KZN is available from EKZN Wildlife on request. Some metropolitan municipalities have developed CBA maps (Nelson Mandela Bay and City of Cape Town) or are in the process of developing them (City of Johannesburg, City of Tshwane, Ekurhuleni and eThekwini). **Associated legislation**: These gain legal recognition when they are published in bioregional plans (in terms of the Biodiversity Act), or until they are taken up into municipal Spatial Development Frameworks (Section 26(e) Municipal Systems Act (No. 32 of 2000)), and Environmental Management Frameworks (EMF; in terms of Sections 24(5) and 44 NEMA and EMF regulations (R547 of 2010)).
Identified river and wetland Freshwater Ecosystem Priority Areas (FEPAs), and a recommended 1km buffer around these systems	FEPAs are rivers and wetlands required to meet biodiversity targets for freshwater ecosystems. River FEPAs are an essential part of a sustainable water resource strategy. Buffers of healthy natural vegetation should be maintained around river and wetland FEPAs to maintain a good ecological condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. FEPAs are not formally protected in terms of law but are areas that are considered to be strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources, and should be maintained in good ecological condition.	**Data**: Atlas of Freshwater Ecosystem Priority Areas for South Africa (Nel et al 2011); available on http://bgis.sanbi.org **Associated legislation**: Do not currently have any legal status.

Biodiversity priority area	Description	Information sources
River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and 1km buffer of river and wetland FEPAs	Because of the importance of these freshwater ecosystems to lives and livelihoods, and the likelihood that their ecological condition would deteriorate if mining activities took place in or close to them (i.e. within a 1km buffer of river and wetland FEPAS), it is recommended that mining should be avoided in these areas.	**Data**: Atlas of Freshwater Ecosystem Priority Areas for South Africa (Nel et al 2011); available on http://bgis.sanbi.org **Associated legislation**: Not currently protected by law.
Ramsar sites	Ramsar sites are internationally recognised by the Ramsar Convention on the conservation of wetland habitats and species as site of global significance.	**Data**: DEA: Enterprise Geospatial Information Management **Associated legislation**: Although many Ramsar sites fall inside protected areas, some Ramsar sites do not currently have any legal status in terms of South African legislation.
Protected area buffers (including buffers around National Parks, World Heritage Sites, and Nature Reserves)	10km wide buffers around National Parks and World Heritage Sites (or alternatively specifically defined buffers approved by the Minister according to DEA's buffer zone policy for National Parks or gazetted under the World Heritage Convention Act) and 5km buffers around other protected areas, excluding Gauteng where there are no buffers around protected areas. In these areas environmental impact assessments should be required for a range of activities that impact on biodiversity value, sense of place, visual sensitivity of the natural landscape and cultural value of Nature Reserves.	**Data**: Protected areas and buffers layer available on BGIS **Associated legislation**: Buffer areas defined in Listing Notice 3 of the NEMA EIA Regulations (GN No. R546 of 2010), as relevant to sections 24(2), 24(5), 24D and 44 of NEMA(No. 107 of 1998); World Heritage Convention Act (No. 49 of 1999).
Transfrontier Conservation Areas (those parts of the area that do not fall within formally protected areas)	Portions of the country have been identified as Transfrontier Conservation Areas.	**Data**: DEA: Enterprise Geospatial Information Management **Associated legislation**: No current legal status. Portions of TFCAs proclaimed as Protected Areas have legal status under the Protected Areas Act.
Other identified priorities from provincial spatial biodiversity plans	Although priorities have been identified at a very fine spatial scale in some provinces (Gauteng, Western Cape, Kwazulu Natal), in other provinces they have been identified at a broader scale (such as Eastern Cape, Northwest, and Limpopo).These plans sometimes identify broader areas of biodiversity importance, even though these areas may have a relatively low level of irreplaceability (i.e. there are reasonably high levels of choice in terms of where targets are met for ecosystems, species and ecological processes). Alternatively, the conservation plans may have identified a second tier of CBAs (CBA2). In both cases (i.e. broader and generally lower irreplaceability priority areas or second tier CBA s) these areas have been included as "Other identified priorities from provincial spatial biodiversity plans".	**Data**: Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), available on http://bgis.sanbi.org for download. Gauteng, available from GDARD on request; KZN available from EKZN Wildlife on request. Some metropolitan municipalities have developed CBA maps (Nelson Mandela Bay and City of Cape Town) or are developing them (City of Johannesburg, City of Tshwane, Ekurhuleni and eThekwini).

Biodiversity priority area	Description	Information sources
Other identified priorities from provincial spatial biodiversity plans		**Associated legislation**: These areas gain legal status when published in bioregional plans (in terms of the Biodiversity Act), or may be taken up into municipal Spatial Development Frameworks (Section 26(e) Municipal Systems Act (No. 32 of 2000)), and Environmental Management Frameworks (EMF; in terms of Sections 24(5) and 44 NEMA and EMF regulations (R547 of 2010)).
High water yield areas	High water yield areas generally occur in mountain catchment areas, and are the "water factories" of the related primary catchment, generating a large proportion of the water for human and ecological use. Maintaining these areas in a healthy state plays a vital role in water provision, supporting growth and development needs that are often far away. Mining in these areas has the potential to significantly impact on national freshwater resources, and therefore potential impacts need to be carefully assessed to ensure that the project is in fact in the national interest. High water yield areas were identified by the NFEPA project.	**Data**: Atlas of Freshwater Atlas of Freshwater Ecosystem Priority Areas for South Africa (Nel et al 2011); available on http://bgis.sanbi.org **Associated legislation**: Not currently
Coastal Protection Zone	The Coastal Protection Zone, as defined by the Integrated Coastal Management Act (No. 24 of 2008), includes but is not limited to areas within 1000m landwards of the high-water mark in rural areas and 100m of the coast in urban areas. Coastal habitats (e.g. dunes) often extend well beyond this distance. The Integrated Coastal Management Act makes provision for the formal delineation of the coastal protection zone. In the absence of a delineated coastal protection zone the 1km and 100m distances apply as a default.	**Data**: Available at: http://bgis.sanbi.org **Associated legislation**: Integrated Coastal Management Act (No. 24 of 2008)
Estuarine functional zones	The estuarine functional zone means the area in and around an estuary which includes the open water area, estuarine habitat (e.g. mudflats) and the surrounding floodplain area[110]. Estuarine functional zones are critical for the ecological functioning of estuaries, and for the continued provision of the many ecosystem services linked to estuaries, such as nursery areas for fish, recreation and leisure, channelling of nutrients and freshwater to the marine and coastal environment, and absorbing pollution and other impacts from settlements. They have high biodiversity and social value that underpins important economic activities. Their ecological integrity, biodiversity and functioning needs to be retained, and therefore must be accorded special attention in assessing and evaluating impacts of prospecting or mining.	**Data**: National Coverage (2010) produced as part of the NBA 2011 (Driver et al. 2012) available on http://bgis.sanbi.org **Associated legislation**: Not currently protected by law.
Ecological support areas	These are areas identified in spatial biodiversity plans areas that play an important role in supporting the ecological functioning of Critical Biodiversity Areas or protected areas and/or in delivering ecosystem services. The management objective for these areas is to keep them in a functional state.	**Data**: Western Cape, Northwest, Eastern Cape, Mpumalanga, and Namakwa District in Northern Cape (2009), are available on http://bgis.sanbi.org for download Gauteng, available from GDARD on request; KZN available from EKZN Wildlife on request

[110]The default definition isthe area below the 5 m above mean sea level.

Biodiversity priority area	Description	Information sources
Vulnerable ecosystems	Threatened ecosystems are identified in the NBA and may be listed in terms of the Biodiversity Act[111]. Vulnerable ecosystem types have experienced significant loss of natural area but are not yet critically endangered or endangered. In areas where biodiversity planning has occurred, the best areas to meet targets for vulnerable ecosystem types are generally included in CBAs. However, where this planning has not yet occurred (e.g. Free State, and parts of the Northern Cape), remaining intact areas of vulnerable habitat types should be avoided where possible.	**Data**: Terrestrial vulnerable ecosystems are currently viewable on http://bgis.sanbi.org Marine vulnerable ecosystems are available as part of the NBA 2011 and will also be viewable on http://bgis.sanbi.org **Associated legislation**: Section 52 of the Biodiversity Act, 2004 (No. 10 of 2004)
Focus areas for land-based protected area expansion and focus areas for offshore protection	Focus areas for land-based protected area expansion are large, relatively intact (in terms of natural vegetation cover) and unfragmented areas of high biodiversity importance, suitable for the creation or expansion of large protected areas, identified in the National Protected Area Expansion Strategy (GSA 2010). They were identified through a systematic biodiversity planning process, taking into account the need to represent both terrestrial and freshwater biodiversity in the protected area network as well as to contribute to climate change resilience. They represent the best remaining large areas of natural habitat that still have low levels of fragmentation and form a key part of our ecological infrastructure network. Focus areas for offshore protection were identified through a systematic biodiversity planning process to direct MPA expansion and other types of spatial management to ensure sustainable resource use and a representative protected area network. They identify spatial priorities for representing offshore biodiversity, protecting sensitive ecosystems, contributing to fisheries sustainability and reducing by-catch. These areas will be refined in the future.	**Data**: Focus areas for land-based protected area expansion available at. Focus areas for offshore protection were identified by the Offshore Marine Protected Area project (OMPA; Sink et al. 2011). Contact SANBI Marine Programme for more information. **Associated legislation**: These areas support further implementation of the Protected Areas Act and the Marine Living Resources Act (No. 18 of 1998).

Other useful resources include:

- Driver et al. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.
- GSA (Government of South Africa). 2010. National Protected Area Expansion Strategy 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria.

While national organisations such as SANBI and DEA are important repositories of spatial and non-spatial biodiversity information, it is also important to contact provincial conservation authorities and environmental departments. These contact details are provided in the biodiversity stakeholders section below.

Other important biodiversity information includes:

- Threatened species information available from a range of sources namely:
  - SANBI's Threatened Species Programme - http://redlist.sanbi.org
  - SANBI Biodiversity Advisor - http://biodiversityadvisor.sanbi.org/nichemodel/scourcing.asp
  - SANBI Marine Programme - http://www.sanbi.org/programmes/regional/sanbi-marine-programme

[111] Note that Vulnerable ecosystems are also defined as threatened ecosystems, but are not included at this category of biodiversity priority area.

- Endangered Wildlife Trust - http://www.ewt.org.za
- BirdLife SA - http://www.birdlife.org.za
- South African Reptile Conservation Assessment - http://sarca.adu.org/index.php
- IUCN Red List - www.iucnredlist.org
- EKZNW - www.kznwildlife.com

- For more information about biodiversity specialists:
  - Environmental Assessment Practitioners Association of South Africa (EAPASA), launched 7 April 2011, will apply to the Minister of Water and Environmental Affairs to be recognised as a Registration Authority in terms of Section 24H of the NEMA. Once EAPASA is recognised, the Minister will publish a date by which all EAPs practicing in terms of NEMA must be registered - www.eapsa.co.za
  - South African Council for Natural Scientific Professions - www.sacnasp.org.za
  - 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 and Development planning. Cape Town.

- Spatial and non-spatial information on alien invasive species is available through:
  - DWAs Working for Water webpage - http://www.dwaf.gov.za/wfw/default.aspx and http://sites.google.com/site/wfwplanning/assessment
  - Agricultural Research Council's Southern African Plant Invaders Atlas (SAPIA) - http://www.agis.agric.za/wip

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

5.3. Biodiversity stakeholders

Table 12 below provides contact details for provincial conservation authorities and environmental departments.

Table 12. List of provincial conservation authorities and environmental departments in South Africa (this list is not exhaustive)

Province Department	Position	Telephone (T)/ Fax (F)/ Mobile (M)	Postal Address	Website
Eastern Cape Province Department of Economic Development and Tourism	HOD CFO	T: 043 605 7004 F: 040 605 7304 T: 043 605 7020 F: 043 605 7305	Private Bag X0054 Bhisho 5605	Provincial website: www.ecprov.gov.za Departmental website: www.dedea.gov.za
Free State Province Department of Economic Development, Tourism and Environmental Affairs	HOD CFO	T: 051 400 4731 F: 051 400 4910 T: 051 400 4916 F: 051 400 9431	Private Bag X2080 1 Bloemfontein 9300	Provincial website: www.fs.gov.za Departmental website: www.edtea.fs.gov.za
Gauteng Department of Agriculture an Rural Development	HOD CFO	T: 011 355 1920 F: 011 333 0667 T: 011 355 1908 F: 086 274 7048	P.O. Box 8769 Johannesburg 2000	Provincial website: www.gautenonline.gov.za Departmental website: www.gdard.gpg.gov.za
KwaZulu Natal Province Department of Agriculture and Environmental Affairs	HOD CFO	T: 033 355 9690 F: 033 355 9293 T: 033 355 9239 F: 033 355 9122	Private Bag X9059 Pietermaritzburg 3200	Provincial website: www,kznonline.gov.za Departmental website: wwwkzndae.gov.za
Limpopo Province Department of Economic Development, Environment & Tourism	HOD CFO	T: 015 293 8648 F: 015 293 8319 T: 015 293 8578/8649 F: 015 293 8823/24	Private Bag X9484 Polokwane 0700	Provincial website: www.limpopo.gov.za Departmental website: www.ledet.gov.za
Mpumalanga Province Department of Economic Development, Environment and Tourism	HOD CFO	T: 013 766 4179 F: 086 512 2747 T: 013 766 4590 F: 013 766 4633	Private Bag X1215 Nelspruit 1200	Provincial website: www.mpumalanga.gov.za Departmental website: www.mpumalanga.gov.za/dedet
Mpumalanga Province Department of Agriculture, Rural Development and Land Administration	HOD CFO	T: 013 766 6020 F: 013 766 6020 T: 013 766 6172 F: 013 766 8245	Private Bag X11219 Nelspruit 1200	Provincial website: www.mpumalanga.gov.za Departmental website: www.dardla.mpg.gov.za
Northern Cape Province Environment and Nature Conservation	HOD CFO	T: 053 807 7306 F: 053 807 7367 T: 053 807 7308 F: 053 807 7392	Private Bag X 6102 Kimberley 8300	Provincial website: www.northern-cape.gov.za

Other important biodiversity stakeholders include NGOs such as, but not limited to, those listed in Table 13 below and organised labour such as listed in Table 14 on the following page.

Table 13. List of environmental non-governmental organisations in South Africa (this list is not exhaustive)

NGO	Position	Telephone (T)/ Fax (F)/ Mobile (M)	Postal Address	Website
Endangered Wildlife Trust (EWT)	CEO Finance Manager	T: 011 372 3600/1/2 F: 011 608 4682 T: 011 372 3600/1/2 F: 011 608 4682	Private Bag X11 Modderfontein 1609 JHB	www.ewt.org.za
The Wildlife and Environment Society of South Africa (WESSA)	CEO CFO	T: 033 330 3931 / 123 F: 033 330 4576 T: 033 393 1119 F: 033 330 4576	P. O. Box 394 Howick 3290	www.wessa.org.za
World Wildlife Fund for Nature (WWF-SA)	Cape town office Gauteng office	T: 021 657 6600 F: 086 535 9433 T: 011 447 1213 F: 011 447 0365	Po Box 23273 Claremont 7735 Presidents Place 1 Hood Avenue Rosebank 2196	www.wwf.org.za
Birdlife SA	Executive Director CFO	T: 011 789 1122 F: 011 789 5188 T: 011 789 1122 F: 011 789 5188	P. O. Box 515 Randburg 2125	www.birdlife.org.za
Botanical Society of South Africa	CEO CFO	T: 021 797 2090 F: 021 797 2376 T: 021 797 2090 F: 021 797 2376	Private Bag X 10 Claremont 7735	www.botaniclesociety.org.za
Wilderness Foundation. SA	Financial Manager Executive Director	T: 041 373 0293 F: 041 374 1821 T: 041 373 0293 F: 041 374 1821	P. O. Box 12509 Centrahil 6006	www.wildernessfoundation.co.za
Game Rangers Association	Chairman	T: 011 486 1102 M: 082 570 7597 F: 011 486 1506	P. O. Box 84420 Greenside 2034	www.gameranger.co.za

Useful references in this section include:

- Consultative Forum on Mining and the Environment. 2002. Public Participation Guidelines for Stakeholders in the Mining Industry. First Edition. Published by the Chamber of Mines of South Africa, Marshalltown. Available at http://www.environment.co.za/documents/mining-prospecting/Public-Participation-Guidelines-for-Stakeholders-in-Mining.pdf
- NEMA: various guidance provided in regulations for example GN R 385 in GG 28753 of 21 April 2006.

Table 14. Organized labour are key stakeholders in many issues affecting mining. This list of labour unions involved in the mining industry in South Africa is not exhaustive.

Organization	Position	Telephone (T)/ Fax (F)/ Mobile (M)	Postal Address	Website
National Union of Mineworkers (NUM)	Head Office	T: 011 377 2119 F: 0866 09 8313	7 Rissik Street Johannesburg 2000	www.num.org.za
Solidarity	Head Office	T: 0861 25 2423 T: 012 644 4300 F: 012 644 6493	P.O. Box 11760 Centurion 0046	www.solidariteit.co.za
UASA	Gauteng Main Office	T: 0861 00 8272 T: 011 472 3600 F: 011 674 4057	P.O.Box 565 Florida Gauteng 1710	www.uasa.co.za

5.4. Environmental impact assessment

Useful resources related to environmental impact assessment include:

- Environmental Impact Assessment Regulations (2010) including three Listing Notices and Environmental Management Framework – all available from http://www.environment.co.za/legislation-law/eia-environmental-impact-assessment-regulations-law-south-africa.html
- International Association for Impact Assessment (IAIA) 2005. Biodiversity in impact assessment. Special publication series No. 3. July 2005.
- International Association for Impact Assessment (IAIA) 2007. EIA follow up: international best practice principles. Special publication series No. 6. July 2007.
- Landsberg, F., S. Ozment, M. Stickler, N. Henninger, J. Treweek, O. Venn, and G. Mock. 2011. Ecosystem services review for impact assessment. World Business Council for Sustainable Development and World Resources Institute. Available at http://www.wri.org/publication/ecosystem-services-review-for-impact- assessment.
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- Slootweg, R., A. Kolhoff, R. Verheem and R. Hoft. 2006. Biodiversity in EIA and SEA. Background document to CBD Decision VIII/28: Voluntary Guidelines on Biodiversity-inclusive Impact Assessment. Voluntary Guidelines on Biodiversity-inclusive Impact Assessment, The Netherlands.
- World Business Council for Sustainable Development. 2008. Guidelines for Identifying Business Risks and Opportunities Arising from Ecosystem Change. World Resources Institute, Meridian Institute. Available at www.wri.org/ecosystems/esr
- World Business Council for Sustainable Development. 2011. Guide to Corporate Ecosystem Valuation: A framework for improving corporate decision making. Available at www.wbcsd.org
- EIA toolkits such as A Guide to the Environmental Impact Assessment Process available on http:www.eiatoolkit.ewt.org.za

Useful resources related to mitigation include:

- Rajvanshi A, Brownlie S, Arora R and Slootweg R. 2011. Maximizing benefits for biodiversity: the potential of enhancement strategies in impact assessment. Impact Assessment and Project Appraisal, 29(3):181–193.
- International BBOP Standard on Biodiversity Offsets at http://bbop.forest-trends.org/guidelines/Standard.pdf
- BBOP (Business and Biodiversity Offsets Programme). 2009. The Relationship Between Biodiversity Offsets and Impact Assessment: A BBOP Resource Paper. Washington, D.C.: BBOP. Available from http://bbop.forest-trends.org/guidelines/eia.pdf
- Ezemvelo KZN Wildlife. 2010. Norms and Standards for biodiversity offsets: KwaZulu-Natal Province, South Africa.
- ∑ ICMM (2005). Biodiversity offsets: a proposition paper from the International Council on Mining and Metals. International Council on Mining and Metals (ICMM), London, UK.

5.5. Environmental Management Programme

Useful resources related to Environmental Management Programmes and Plans include:

- DEAT (Department of Environmental Affairs and Tourism). 2004. Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Lochner, P. 2005. Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.
- MMSD (2002). Mining for the Future. Appendix B: Mine Closure Working Paper. International Institute for Environment and Development and World Business Council for Sustainable Development.
- TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB. Available at www.teebweb.org

5.6. Implementation of EMP

IFC (International Finance Corporation). 2006. Performance Standards on Social & Environmental Sustainability. Available at http://www1.ifc.org/wps/wcm/connect/Topics Ext Content/IFC External CorporateSite/IFC+Sustainability/Risk+Management/Sustainability+ Framework/Sustainability+Framework++2006/Performance+Standards +Guidance+Notes

5.7. Glossary and definitions

Term	Definition
Biodiversity Act	National Environmental Management: Biodiversity Act (No. 10 of 2004)
Biodiversity Agreements	Biodiversity Agreements (BA) have legal status in terms of South African contract law, and are entered into between a landowner and a conservation authority for the conservation of biodiversity in the short to medium term (for as long as the landowner or community or conservation authority wishes the designation to be valid). • A management plan is required. • This is NOT recognised as a Biodiversity Management Agreement (BMA) in terms of section 44 of the Biodiversity Act. • In some cases the BA is being used as an interim measure until the power to sign a BMA is delegated to provincial conservation authorities. In other cases, a BA will remain a legal contract between the conservation authority and landowner. • In some provinces, the BA is enabled by the provincial legislation (such as the Western Cape Nature Conservation Board Act, which allows for a contractual agreement with landowners for the purposes of biodiversity conservation to be entered into). Provinces without this enabling legislation can still use contract law to enter into an agreement with another party.
Biodiversity Management Agreements	Biodiversity Management Agreements (BMAs) in terms of section 44 of the Biodiversity Act are entered into by the Minister or MEC with a suitable person, organisation or organ of state, regarding the implementation of a BMA. • A BMA is negotiated between the conservation authority (on behalf of the MEC, if the delegation has been approved) and a landowner/user or community for conserving biodiversity in the medium term (minimum of 5-10 years). • Restrictions are not placed on the title deeds. Security is provided for the land in that should the landowner or agency not adhere to any of the terms in the contract or the management plan, then the other party can be prosecuted for breach of contract and may take any necessary measures to remedy the breach and recover costs and any damages from the offending party. Furthermore, the fiscal incentives offered through National Treasury may also be reclaimed as per the Revenue Laws Amendment Act (No. 60 of 2008). The BMA in terms of the Act, is intended to formalise the emerging relationships between government and landowners and communities, but remains an adaptable and flexible option.
Biodiversity offset	Biodiversity offsets are defined as measurable conservation gains to balance any significant biodiversity losses that remain after actions to avoid, minimise and restore negative impacts have been taken. Discussed in section 3.4.3.
Biodiversity priority areas	Biodiversity priority areas are areas in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services.
Biodiversity stewardship	Biodiversity stewardship is a programmatic approach to expanding the network of protected areas and conservation areas, involving voluntary contractual agreements between landowners/users and conservation authorities. Biodiversity stewardship provides a structured system for protecting important ecosystems; enabling sustainable use of natural resources; and effectively managing pressures on natural systems and biodiversity. Landowners/users that enter into such biodiversity stewardship agreements are supported by government, and may be eligible for income tax and property rates incentives, depending on the type of contract.

Environmental management plan	In the MPRDA, management and rehabilitation of environmental impacts of mining or prospecting and ancillary activities is contained in an environmental management plan in the case of reconnaissance permission or permit, prospecting right, exploration right or mining permit, and an environmental management programme in the case of a mining or production right only. See environmental management programme.
Environmental management programme (EMP)	This Guideline uses the term 'environmental management programme (EMP)' to refer to the environmental management programme and environmental management plan as defined in the MPRDA, and to the environmental management programme defined in NEMA (Section 24, Amendment Act 62 of 2008). In other words it refers to documents providing a detailed description of impact mitigation and management measures to achieve explicit targets (i.e. impact avoidance / prevention, protection, impact minimisation, on-going impact management, rehabilitation and other remedial action, monitoring and adaptive management). It does not refer to the 'environmental management plan' as used in Section 11 of NEMA.
Mine	When used as a verb, means any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto.
Mineral	Defined in the MPRDA as "any substance, whether in solid, liquid or gaseous form, occurring naturally in or on the earth or in or under water and which was formed by or subjected to a geological process, and includes sand, stone, rock, gravel, clay, soil and any mineral occurring in residue stockpiles or in residue deposits, but excludes water, petroleum or peat". For the sake of simplicity, in this Guideline the term 'mineral' or 'minerals' should be read as referring to mineral AND petroleum resources and the use of MPRDA terms as they relate to mineral resources should be construed as referring to the equivalent in the petroleum provisions. See 'mining'.
Mining	The term 'mining' refers broadly to all stages of the 'mining life cycle' (described in section 2.1.). The MPRDA relates to both mineral and petroleum resources, but uses different terms for provisions as they relate to petroleum or mineral resources.
Mining life cycle	Refers to the life cycle of a mining project consisting of several stages, moving from a discovery or reconnaissance stage, to exploration or prospecting stage, to the development and production stage of mining, and finally to the decommissioning and closure stage.
Mining operation	The MPRDA defines a mining operation as any operation relating to the act of mining and matters directly incidental thereto.
Mitigation	A broad term that covers all components of the 'mitigation hierarchy' namely: • Avoid or prevent loss to biodiversity and ecosystem services. • Minimise impacts on biodiversity and ecosystem services. • Rehabilitate concurrently or progressively with the proposed activity, and/or on cessation of the activity. • Offset residual negative impacts on biodiversity or ecosystem services.
Mitigation hierarchy	The mitigation hierarchy is a hierarchical approach taken to avoiding, minimising, rehabilitating or offsetting impacts on biodiversity and ecosystem services as a result of mining or other forms of development. See section 2.4.

Petroleum	Defined in the MPRDA to mean "any liquid, solid hydrocarbon or combustible gas existing in a natural condition in the earth's crust and includes any such liquid or solid hydrocarbon or combustible gas, which has in any manner been returned to such natural condition, but does not include coal, bituminous shale or other stratified deposits from which oil can be obtained by destructive distillation or gas arising from a marsh or other surface deposit".
Production operation	The MPRDA defines production operation as any operation, activity or matter that relates to the exploration, appraisal, development and production of petroleum.
Protected areas	Protected areas include any area declared as a protected area in term of the Protected Areas Act, or declared in terms of other legislation but recognised in terms of the Protected Areas Act. The Protected Areas Act recognises the following types of protected areas: - Special Nature Reserves, National Parks, Nature Reserves (including Wilderness Areas) and Protected Environments declared in terms of Chapter 2 of the Protected Areas Act (NEM:PAA, No 57 of 2003). - World Heritage Sites in terms of the World Heritage Convention Act (No. 49 of 1999). - Marine Protected Areas in terms of the Marine Living Resources Act (No. 18 of 1998). - specially protected forest areas, Forest Nature Reserves and Forest Wilderness Areas declared in terms of the National Forests Act (No. 84 of 1998). - Mountain Catchment Areas declared in terms of the Mountain Catchment Areas Act (No. 63 of 1970).
Protected Areas Act	National Environmental Management Protected Areas Act (No. 57 of 2003).
Rehabilitation	Rehabilitation, in the context of the mitigation hierarchy, has to refer to reducing residual impact on biodiversity. In which case, the goal of rehabilitation would be the restoration to some pre-existing reference point, the biotic integrity in terms of species composition and community structure, as well as the reparation of ecosystem processes, productivity and services. See section 3.4.3.
Secured	The term secured is intended to include those areas of land that are legally secured for biodiversity conservation under legislation other than those recognised by the Protected Areas Act. Other legal mechanisms through which land can be secured for biodiversity conservation include: - Biodiversity Management Agreements, which have legal status by virtue of a legal contract entered into between the Minister or MEC with a suitable person, organisation or organ of state, in terms of the Biodiversity Act (Section 44). - Biodiversity Agreements, which have legal status in terms of South African contract law, and are entered into between the landowner and the conservation authority for the conservation of biodiversity in the short to medium term. - Title deed restrictions/conservation servitudes, where a notarial deed drawn up for a property is voluntarily altered to restrict activities in favour of biodiversity conservation and creates a legally enforceable agreement, both through South African contract law and property law. - Rezoning the property to Public Open Space or a Conservation-related zoning which emphasis the use of the site for the public benefit (i.e. not private open space) - Restrictions put in place through planning conditions. These mechanisms may be used separately or in conjunction with each other.
Species of special concern	Species that have particular ecological, economic or cultural significance, including but not limited to threatened species.

5.8. References

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