



Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa

As part of IAIA's Capacity Building in Biodiversity and
Impact Assessment project

Compiled by:

The Southern African Institute for Environmental assessment



In association with deVilliers Brownlie Associates



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INTRODUCTION

The Capacity Building in Biodiversity in Impact Assessment (CBBIA) project is a three-year global project managed by the International Association for Impact Assessment (IAIA) and funded by the Netherlands government. The CBBIA project aims to integrate biodiversity conservation with impact assessment and develop capacity among stakeholders in developing countries in several regions, including southern Africa, Central America and Asia.

Under the coordination of the Southern African Institute for Environmental Assessment (SAIEA), the project in the southern African sub-region is focussing on building capacity within decision-making authorities on biodiversity issues. It aims to provide training, posters, case studies, and other capacity building tools to assist authorities in the region in making sound decisions about development.

This document provides guidance for decision-makers on a range of biodiversity principles and issues which confront decision-makers every day when they evaluate impact assessments. It is based on the findings of a Situation Assessment conducted as part of this project during 2005¹. The Situation Assessment made use of the input received from authorities and conservation agencies from the southern African region² in response to questionnaire surveys and structured workshops. It also drew heavily from 24 case studies on impact assessment and decision making from four SADC countries.

The key findings of the Situation Assessment can be broadly divided into two categories: those relating to the biodiversity information provided to the authorities in impact assessment reports; and those relating to how the decision-makers interpret and make use of the biodiversity information provided to them in impact assessment reports.

The Situation Assessment found that there are a number of weaknesses in the way that biodiversity issues are addressed in impact assessment reports. These include:

- The timing of biodiversity input is often too late in the impact assessment process to influence the proposal;
- The relevance of biodiversity information provided in EIA reports is not made explicit, leaving

¹ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

² Questionnaires were completed by 33 stakeholders from 9 SADC countries and by 11 Authorities from 7 SADC countries.

the non-specialist with the question “so what?”

- Lack of sufficient information on biodiversity, either due to lack of data, or lack of effort to find existing data;
- The implications of gaps in information, uncertainty and/or risks are often not made explicit in terms of irreversibility of impacts, irreplaceable loss of resource, etc;
- Biodiversity input is often focused on the affected site and at species-level, rather than addressing broader, landscape-scale effects on ecosystems and processes;
- There is little consideration of indirect or cumulative effects;
- The economic value of ecosystem goods and services is seldom addressed;
- The Terms of Reference for many impact assessments and specialist studies are often poorly defined;
- The criteria used to determine the significance of impacts are often questionable. They are often not linked to a broader strategic context (e.g. policy objectives, spatial frameworks, conservation plans).
- The linkages between biodiversity, ecosystem services and human wellbeing, including the dependence on resources by vulnerable communities, are seldom clearly articulated. Consequently, the effects of development on these linkages – and ultimately communities – are not addressed.
- There is inappropriate reliance on environmental management plans and programmes for effective mitigation; the so-called ‘proper management will fix all ills’ approach.

It is small wonder, therefore, that authorities find it difficult to make informed decisions when the information being supplied to them is inadequate. However, there are many cases where the information on biodiversity in an impact assessment report is adequate, but decision making does not seem to support sustainable development. There are several possible reasons:

- The development imperative in most SADC countries requires short-term socio-economic benefits to be realized;
- There is a general lack of clear guidance or criteria on which to base decisions. This often results in inconsistencies in decision making e.g. the lack of clarity about sustainability principles and how to apply them, such as the Precautionary Principle;
- Inadequate consultation and cooperation between authorities;
- Lack of experience within the government departments to properly review environmental reports;
- Cumulative effects are seldom addressed at project-level EIA and therefore developments are approved on a piecemeal basis, without the bigger picture being considered;
- Records of decision or letters of authorization are vague and the associated conditions of approval are often impossible to implement or audit, and are vulnerable to legal challenge;

An additional issue highlighted in the Situation Assessment is that the implementation of conditions of authorization is seldom, if ever, followed up by authorities.

Purpose of the guidance document

The purpose of this guidance document is:

- To define what is meant by the terms 'environment', 'biodiversity' and 'human wellbeing' and how they are inter-related.
- To explain how biodiversity impacts on, and is impacted by, human activities.
- To provide guidance on how biodiversity should be considered in an impact assessment.
- To provide guidance on how to make decisions on biodiversity issues, especially in the face of major capacity and data constraints.
- To provide guidance on how to 'steer' the SEA and EIA processes to get the answers/information needed to make an informed decision.
- To provide information on the key biodiversity issues in different development sectors.

Who should use this guidance document?

This document is primarily intended to provide guidance for all those who have to make decisions on biodiversity issues through the impact assessment process, namely:

- National, provincial/state and local authorities who make decisions about the environment and development, and comment on impact assessment reports. These authorities include, but are not limited to: departments or ministries of environment, planning and land use, mines, energy, water, agriculture, forestry, housing, roads, tourism, heritage and health.

However, although it is targeted at decision makers, several other stakeholder groups will find this useful as a reference document:

- Conservation authorities such as parks boards, national or provincial conservation authorities and wildlife agencies, who are the custodians of the nation's wildlife and flora, and who often have to comment on, and provide input to impact assessment reports.
- Non-governmental and community-based organisations who have an interest in, or could be affected by proposed development, and who participate in impact assessment processes.
- Consultants who manage and coordinate impact assessment reports, including writing Terms of Reference for specialist studies, managing the outputs of the specialist studies and integrating the results of specialist reports into the overall impact assessment findings.

- Specialists who provide expert input on biodiversity issues for impact assessment reports.

The guidance document is also a useful reference document for academics (the trainers), students (trainee decision-makers and consultants), as well as politicians who would like to implement sustainability policies.

Why is this guidance document needed?

Important to note:

The focus of this guidance document is not on protected areas or protected species. It is not about biodiversity being more important than people: the '*conservation or development*' argument. In fact, the guideline is about people: us, you and me. It is of utmost importance that all decision makers should use it as an essential reference text.

Why?

Quite simply, because people's lives and livelihoods are inextricably linked to the natural environment: the '*conservation for development*' approach. Looking after biodiversity and ecosystems means looking after our own life support systems and wellbeing.

The term 'sustainable development was coined by the World Commission on Environment and Development in 1987, in an attempt to capture the concept that economic development, the natural environment and people are entirely inter-dependent. This concept seeks to ensure that social and economic development follows a path that enhances the quality of life of humans whilst ensuring the long-term viability of the natural systems (resources) on which that development depends³.

The concept of sustainable development has been taken up at all levels and particularly in Africa. There is now rapidly growing agreement amongst African governments that socio-economic wellbeing and a healthy biophysical environment cannot be separated. Indeed, the fifth session of the African Ministerial Conference on the Environment (1993) recognised the need for African countries to look at emergency and disaster issues from a new perspective and shift away from *ad hoc* short-term approaches to medium and long-term planned policies and strategies.

In southern Africa, acceptance of the concept of sustainable development has been marked by the ratification of international conventions by most countries, particularly the Convention on

³ United Nations Conference on Environment and Development, in Rio de Janeiro, Brazil 1992

Biological Diversity, Ramsar Convention and CITES, as well as the development of SADC-based protocols on environmental issues. However severe capacity constraints in most countries have made it difficult to translate these policies and concepts into practice.

In recent years, increasing attention has been focused on the role of biodiversity in sustainable development at a global scale:

- Global studies such as the Millennium Ecosystem Assessment (2001-2005) have highlighted the significant role played by our ecosystems in supporting our lives and livelihoods.
- Recognition has been given to the fact that conservation of biodiversity and ecosystem services is fundamental to achieving the Millennium Development Goals, which are respected as a framework for sustainable development.
- Global bodies such as the UNDP are investing resources in developing countries, helping them to integrate biodiversity considerations and commitments in terms of international conventions into national policies and programmes, and into key sectors of their economies.
- International funding bodies and banks have incorporated sustainable development and the associated use of renewable natural resources and protection of biodiversity into their policies, performance standards and principles since 2003 (e.g. International Finance Corporation, World Bank and other Development Finance Institutions that have adopted the Equator Principles).
- The International Council on Mining and Metals has produced “Good practice guidance for mining and biodiversity” (May 2005).
- The International Association for Impact Assessment has produced a Special Publication on “Biodiversity in Impact Assessment” (July 2005).
- The Eighth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity (Curitiba, Brazil in March 2006) endorsed the voluntary guidelines on biodiversity-inclusive impact assessment as being one of the major tools to include biodiversity in holistic decision making.

In spite of the global uptake of sustainable development as a concept, and of the growing recognition of the critical role that biodiversity plays in human wellbeing, most politicians and administrators have failed to make the link between conservation of biodiversity, social and economic development, and human wellbeing.

This guideline document thus responds to international and regional trends in promoting the consideration of biodiversity in impact assessment and decision making for sustainable development linked to the natural environment.

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| How to use the guidance document |
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Terminology

This guidance document is meant to be used throughout the SADC region. While most countries within the region have EIA legislation, which broadly follows a similar process of studies and approvals, the terminology applied to these studies and approval processes is slightly different. In order to avoid confusion, Box 1 provides a listing of equivalent terms for each country in SADC, together with the World Bank definitions for each stage. This guidance document will use the World Bank terminology and the reader is referred to Box 1 to check the equivalent terms for his/her country.

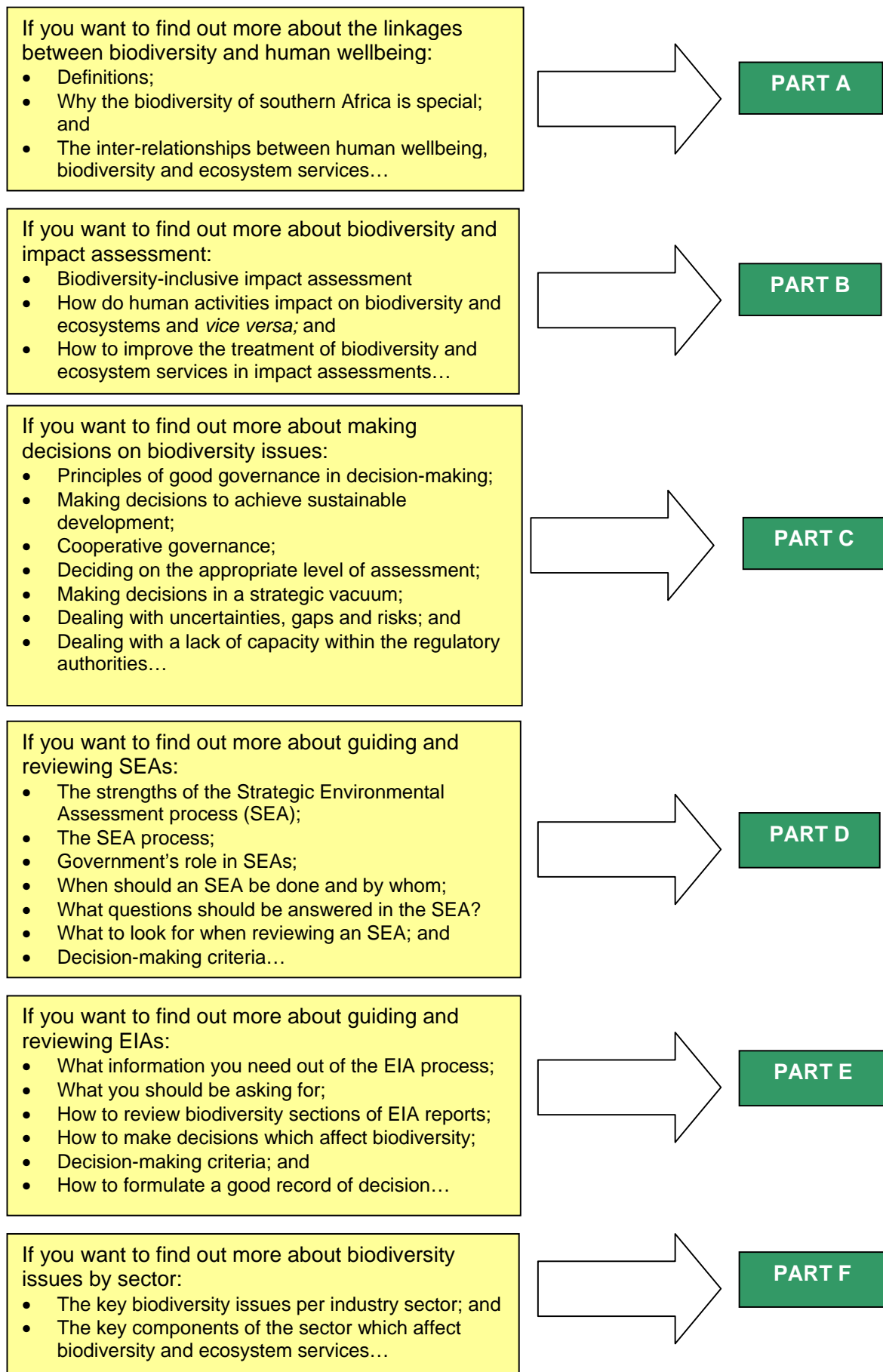
The reader is referred to Appendix 1 for a glossary of terms.

Structure of the guidance document

This guidance document is to be used as a reference text. Each part therefore deals with different aspects of biodiversity and the decision-making process. Parts A to C provide a theoretical background, while Parts D to E provide specific guidance for decision makers for guiding and reviewing the impact assessment reports and for making decisions on biodiversity issues at SEA and EIA levels respectively. Part F provides sectoral guidelines on biodiversity issues. The text has been kept to a minimum and use has been made of text boxes throughout. Text boxes coloured green signify aspects that are 'important, or interesting, to note' and those coloured yellow denote a matter of interest. Boxes coloured blue provide examples and case studies.

| Box 1: EIA Terminology Used by Each SADC Country and the World Bank | | | | | | |
|--|---|---|------------|--|--------------|------------------------------------|
| COUNTRY | EIA STAGE | | | | | |
| | Screening | Scoping | EIA | Permit, Licence Authorisation | EMP | Follow up |
| World Bank | Screening | Scoping | EIA | - | EMP | |
| Angola | Screening | Scoping | EIA Report | Letter of approval | EMP | |
| Botswana | Application | Preliminary EIA | EIS + EMP | Environmental Authorisation | Incl in EIA | Post EIA monitoring and auditing |
| Lesotho | Authority consultation | Project Brief | EIS + EMP | EIA Licence | Incl in EIA | Audit |
| Malawi | Screening | Project Brief OR Scoping | EIAR + EMP | EIA Certificate | Incl in EIAR | Monitoring of EIA implementation |
| Mauritius | Project document | - | EIAR | EIA Licence | - | Post-EIA monitoring |
| Mozambique | Screening | Pre-assessment, OR Scoping | EIA + EMP | Environmental Licence | Incl in EIA | Environmental audit and inspection |
| Namibia* | Registration and screening | Scoping | EA + EMP | Environmental Contract | Incl in EA | Monitoring and auditing |
| Seychelles | Application | Appraisal Report, OR Scoping | EIA | Environmental Authorisation | EMP | Monitoring of EIA implementation |
| South Africa | Lists of activities which trigger level of assessment | Basic Assessment, OR Scoping | EIA + EMP | Record of Decision for Environmental Authorisation | Incl in EIA | |
| Swaziland | Screening | Initial Environmental Evaluation (IEE) OR Scoping | EIA | Environmental Compliance Certificate | - | Project Completion Certificate |
| Tanzania* | Registration and Screening | Preliminary EIA, OR Scoping | EIS | Environmental Permit | - | Environmental Auditing |
| Zambia | Project Brief | EIA Scoping | EIA + EMP | Decision Letter | Incl in EIA | Post-EIA Audit |
| Zimbabwe* | Prospectus | - | EIA + EMP | EIA Acceptance | Incl in EIA | Monitoring and Auditing |

* These countries have only got draft EIA legislation



PART A: THE ENVIRONMENT, DEVELOPMENT, BIODIVERSITY AND HUMAN WELLBEING

In this Part of the guidance document, you will find the following sections:

- A.1** What is meant by ‘the environment’?
- A.2** What are natural resources, biodiversity, ecosystem and ecosystem services?
- A.3** Why is biodiversity in southern Africa special?
- A.4** What is meant by ‘development’ and ‘sustainable development’?
- A.5** What is human wellbeing and how is it dependent on biodiversity and ecosystem services?
 - A.5.1 Human dependence on biodiversity and ecosystem services*
 - A.5.2 The economics of biodiversity and ecosystem services*
 - A.5.3 Biodiversity, ecosystem services and poverty reduction*
 - A.5.4 Ecosystem services, social justice and equity*

A.1 What is meant by ‘environment’?

The term ‘**environment**’ broadly covers our surroundings and the characteristics of those surroundings that influence our health and wellbeing. That is, the environment includes all living organisms (plants, animals and other life), the physical environment (land, water and air), as well as social, economic and cultural conditions. Sometimes we speak of ‘the natural environment’ and ‘the built environment’, to differentiate between natural and man-made systems.



A.2 What are natural resources, biodiversity, ecosystems and ecosystem services?

- **Ecosystems** include living (e.g. plants, animals) **and** non-living (e.g. minerals, soil, water) components, which can be defined in terms of distinguishing characteristics (e.g. a wetland ecosystem, a freshwater ecosystem, a terrestrial ecosystem, a forest ecosystem, etc.). Figure A-1 shows the inter-relationships between living and non-living natural resources.

- **Ecosystem services** are a wide range of services⁴ provided predictably, reliably and regularly for people by the natural environment (Figure A-2).
- **Natural resources** include living and non-living materials *that can be exploited or used by people*. Natural resources form part of ecosystems, and our living natural resources contribute to biodiversity. Some people use '*natural resources*' to mean the same thing as *biodiversity or ecosystem services*.

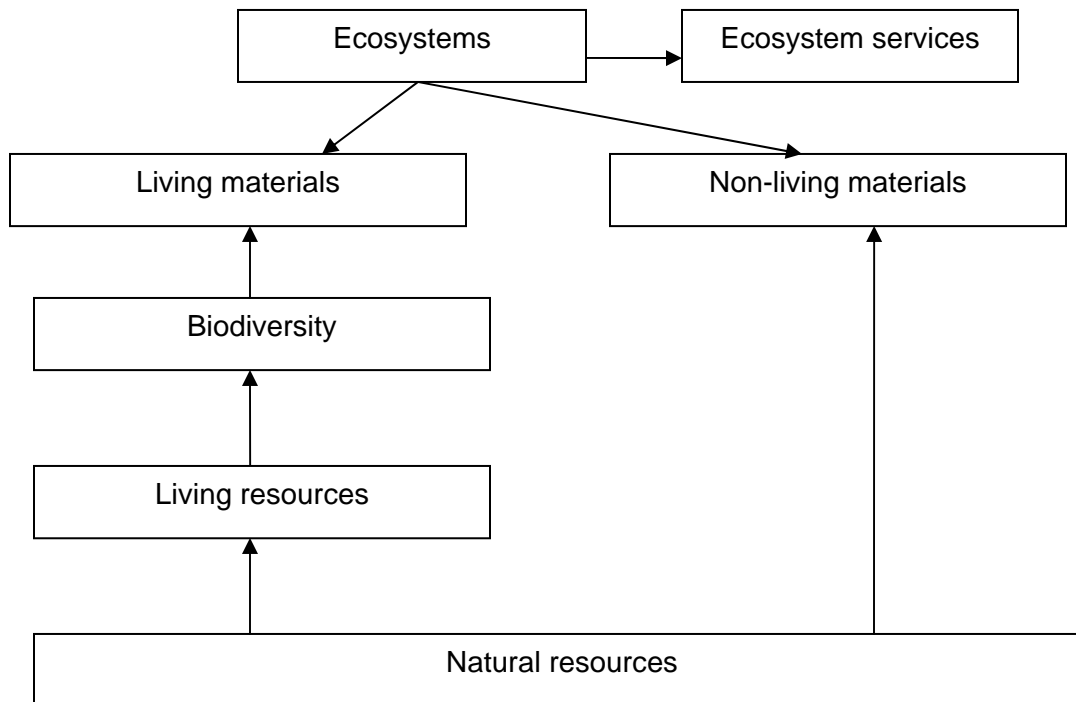


Figure A-1: Natural resources, biodiversity, ecosystems and ecosystem services



Southern Africans rely extensively on natural resources for both their livelihoods and income. There is thus a direct correlation between environmental health and human wellbeing. © P.Tarr

⁴ Millennium Ecosystem Assessment (2003) *Ecosystems and Human Well-being: A Framework for Assessment*. Island Press, Chicago, USA.

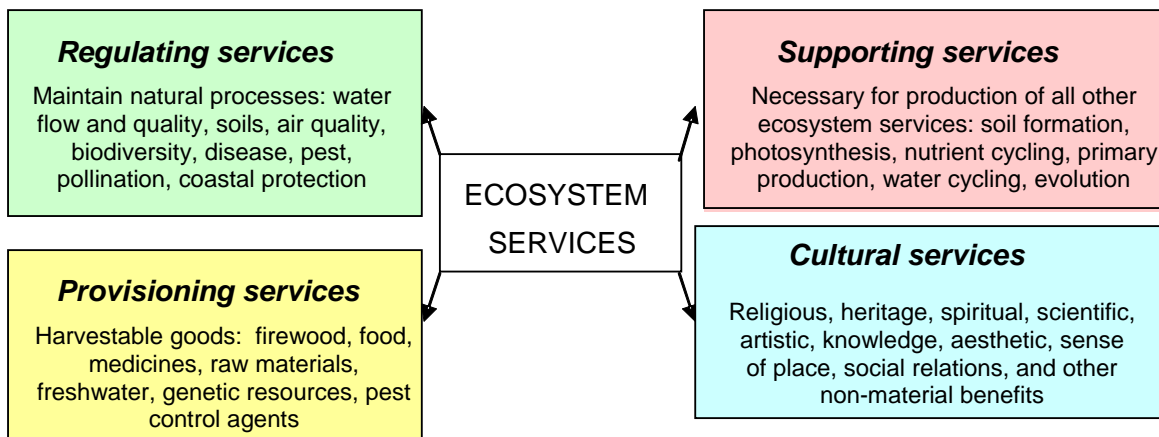


Figure A-2: Ecosystem Services



Thatching grass and wood on sale at a roadside stall in northern Namibia. As long as these resources are harvested sustainably, they can form the basis of a small scale industry for people in remote areas. © P.Tarr

- **Biodiversity** is defined⁵ as ‘the variability among living organisms from all sources and the ecological complexes of which they are part.
 - It covers the **pattern and process** of living organisms and ecosystems (Box A-1).
 - It covers the **genetic diversity** within a species (within populations or strains of the same species), the **diversity of different species** (plant and animal species, micro-organisms), and the **diversity of ecosystems** (e.g. different ecosystems on land, freshwater ecosystems, marine ecosystems).
 - It can focus on a spectrum of **spatial scales**, from localised small sites in an urban environment, to catchments, regional landscapes, to global level.
 - The diversity of life in an ecosystem helps that ecosystem to cope with, and recover after disturbance. As a general rule, biodiversity gives **resilience** to ecosystems.
 - Box A-2 gives the various terms that are used to describe the **status** of species and ecosystems.
- **Natural capital** comprises natural resources and, together with human capital and human-made capital, provides all of the capital that we use and transform for development.

⁵ Convention on Biological Diversity (1992)

Box A-1: Biodiversity pattern and process

- **'Pattern'** covers biodiversity *structure* and *composition*. It refers to genetic variability, and the number and distribution in space and time of populations and species, communities, ecosystems and landscapes.
- **'Process'**, refers to 'what happens' between living organisms, populations, species and communities, which allows the biodiversity pattern to persist. There are *spatially fixed* processes (e.g. linked to physical features such as soil or geological interfaces) and *spatially flexible* processes (e.g. not dictated by specific physical features). Pollination, breakdown and recycling of nutrients, predator-prey interactions, evolution of new sub-species or species, carbon fixing, and primary production are just some of these processes.
- *Biodiversity function* is another term used, that describes the role played by a living organism in the ecosystem (e.g. a top predator).
- *Conserving processes* requires a significantly larger proportion of the landscape than is needed to represent biodiversity pattern. So, the sound management of land use in the vicinity of areas set aside for conserving pattern (e.g. protected areas) is essential.

Box A-2: Terms used to describe the status of species and ecosystems

- A **'threatened'** species or ecosystem is one that is at risk of going extinct in its natural range. It may be 'critically endangered' at extremely high risk, 'endangered' at very high risk, or 'vulnerable' at high risk. Species or ecosystems at low or no risk are not 'threatened', and fall into the 'near threatened' or 'least concern' categories⁶ (see Figure A-3).
- An **endemic** or range-restricted species or ecosystem is one whose distribution is confined to a particular and often very limited geographical region.
- A **protected** species or ecosystem is one that is protected by law from particular activities and land uses.
- A **'Red Data Book' or 'Red List'** provides information on threatened species.
- An ecologically **sensitive** ecosystem is one where relatively minor disturbances may result in substantial and significant changes.
- A **dynamic** ecosystem is one which is highly mobile (e.g. driftsands or dunefields) or prone to change (e.g. mouth of an estuary, floodplains, areas of subsidence).
- A **resilient** ecosystem is one that can absorb disturbance and reorganize fairly rapidly after change, to restore its pre-disturbance structure, composition and function. Its converse is a **vulnerable** ecosystem, that takes a long time to recover – if it can recover at all.

⁶ These terms are based on the IUCN's revised (1997) categories. The previous (1994) system used the term 'rare' to denote species with small populations at risk with either restricted distributions or scattered over an extensive range.

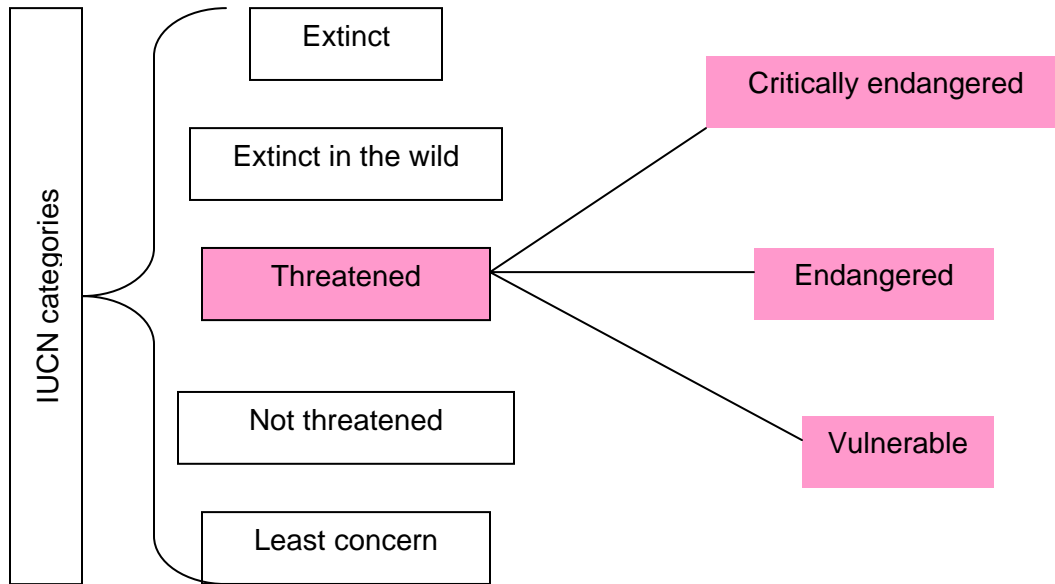


Figure A-3: The IUCN's system of determining the status of species

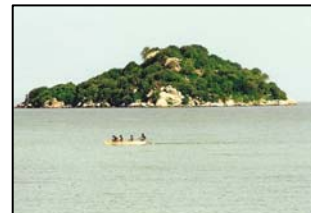
A.3 Why is biodiversity in southern Africa special?

Africa south of the equator has a disproportionately high fraction of global biodiversity:

- We have **eight different biomes**: forest, savanna, grassland, arid shrubland, desert, fynbos, wetlands and lakes, as shown in Figure A-4



Illustrations of southern Africa's biomes. From top left to bottom right: forest, savanna, grassland, arid shrubland, desert, fynbos, wetlands and lakes. © B.Walmsley and P.Tarr



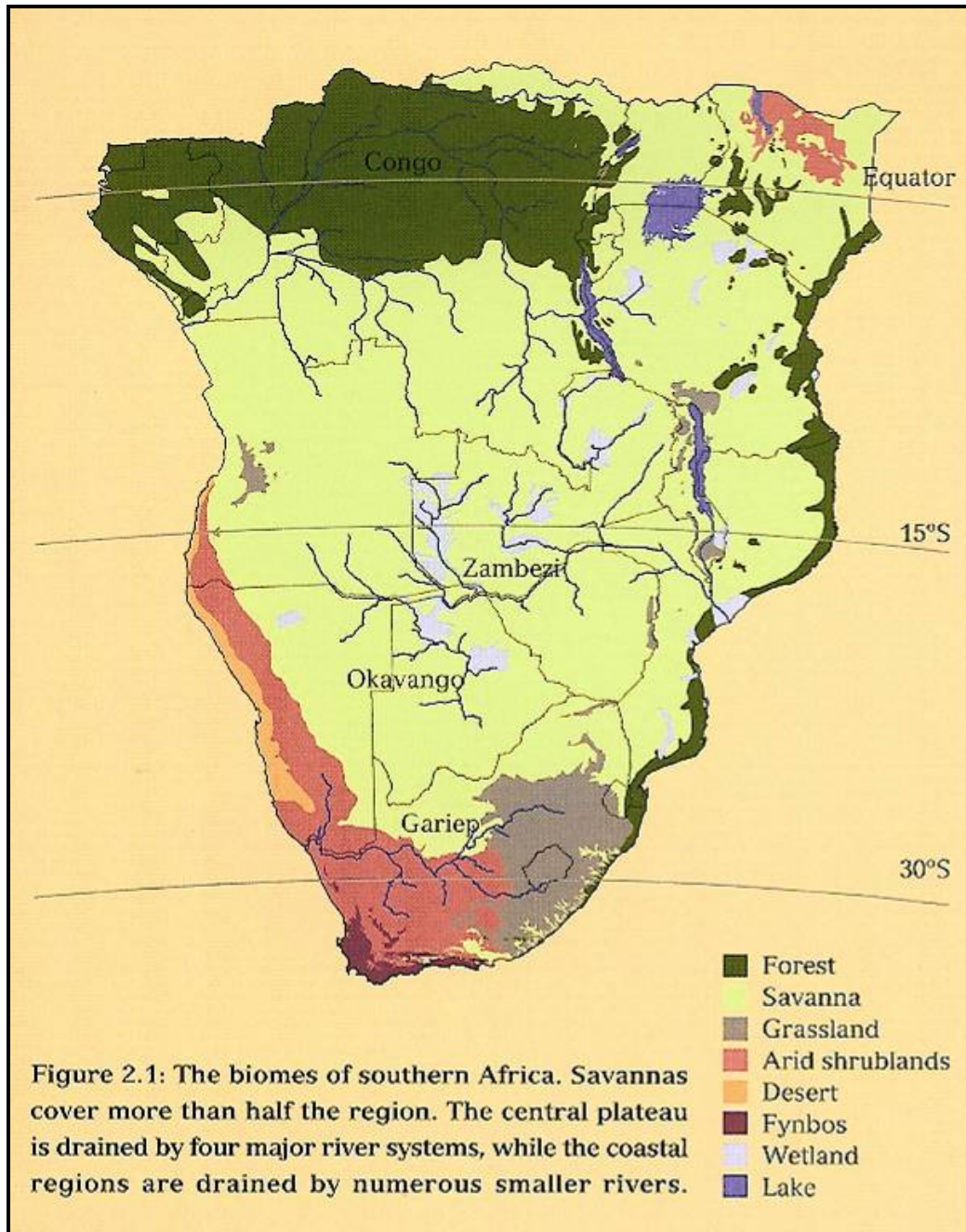


Figure A-4: The biomes of southern Africa⁷

- We have **six international biodiversity 'hotspots'**: These hotspots are:
 - The Cape Floristic Region (South Africa)
 - The Succulent Karoo (South Africa)
 - Madagascar and the Indian Ocean islands (including the Seychelles Islands)
 - The coastal forests of Eastern Africa (including Tanzania)

⁷ Extracted from Scholes RJ and R Biggs (eds). (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. The Regional-scale Component of the Southern African Millennium Ecosystem Assessment 2004. Council for Scientific and Industrial Research, Pretoria, South Africa.

- The Eastern Afromontane hotspot (extending into Zimbabwe)
- The Maputaland-Pondoland-Albany hotspot (South Africa, Swaziland, Mozambique).
- There are numerous registered (natural) **World Heritage Sites** in southern Africa (e.g. five sites in the Democratic Republic of Congo, one in Malawi, one each in Madagascar and Mozambique, two in the Seychelles, three in South Africa, four in Tanzania, three in Zimbabwe and one trans-boundary site in Zambia/Zimbabwe).
- Most southern African countries have designated more than one **Ramsar site**, and Botswana has the world's largest Ramsar wetland site (Okavango).
- A large proportion of the population is fully or partially dependent on natural resources for their livelihoods, subsistence and survival.
- Nature-based tourism, or 'ecotourism', is one of the fastest growing sectors and comprises a major part of the economy in many countries e.g. Botswana, Namibia, Seychelles, Mauritius, Mozambique, South Africa, Tanzania and Zambia.



Victoria Falls (left) is a World Heritage Site shared by Zambia and Zimbabwe. Southern Africa's numerous and diverse natural splendors form the basis for a rapidly growing and potentially sustainable tourism industry. Tourist accommodation ranges from campsites to up-market lodges (above) © P.Tarr

A.4 What is meant by 'development' and 'sustainable development'?

Development: The World Commission on Environment and Development defines development as any kind of "development that aims to promote harmony among human beings, and between humanity and nature". That is, development isn't necessarily economic development or growth orientated development, it can be qualitative forms of development.

Sustainable development can be defined as follows:

- "Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations" – the definition of the World Commission on Environment and Development (1987).
- "Improving the quality of human life while living within the carrying capacity of supporting ecosystems" – the definition given in a publication called "Caring for the Earth: A Strategy for Sustainable Living" by the World Conservation Union (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

Box A-3: Sustainable development

Sustainable development places value on:

- a) The integrity of the natural environment and social equity alongside economic development,
- b) Future, as well as current generations, and
- c) The poor as well as the rich.

For development to be sustainable, we need to **avoid loss of natural capital** where at all possible. Where only a proportion of natural capital is conserved, such as essential life-support services or 'critical natural capital', sustainability is described as '**weak**'.

Figure A-5 shows how the natural system supports our social and economic systems, all of which are influenced by the political system and governance. Figure A-6 shows how these different and interacting systems need to work together to promote movement towards the vision of sustainable development.

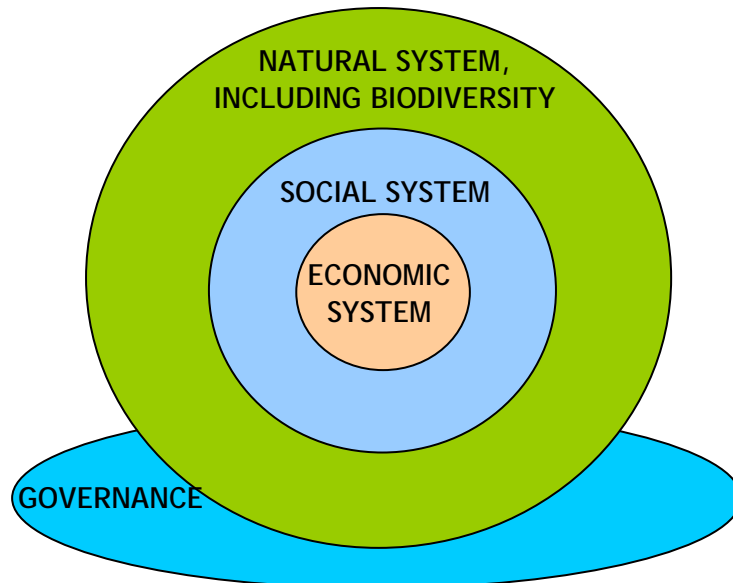


Figure A-5: Natural systems support social and economic systems

Important to note:

In terms of the international Convention on Biological Diversity, conservation of biodiversity supports sustainable development in general, and safeguarding the integrity of the natural environment and social equity specifically, by giving an obligation to member countries to:

1. *Protect species and ecosystems that warrant national or local protection, including:*

- (a) ecosystems that are threatened, important for maintaining key ecological or evolutionary processes and/or functions (i.e. ecosystem services), ecosystems that contain rich biodiversity or large numbers of threatened or endemic species, with social, economic, cultural or scientific value;
- (b) species and communities of species that are threatened, related to domesticated or cultivated species, and/or have medicinal, agricultural or other economic, social, cultural or scientific significance;
- (c) genotypes with social, scientific or economic significance.
2. Use indigenous biological resources sustainably; and
 3. Share the benefits of biodiversity fairly and equitably.

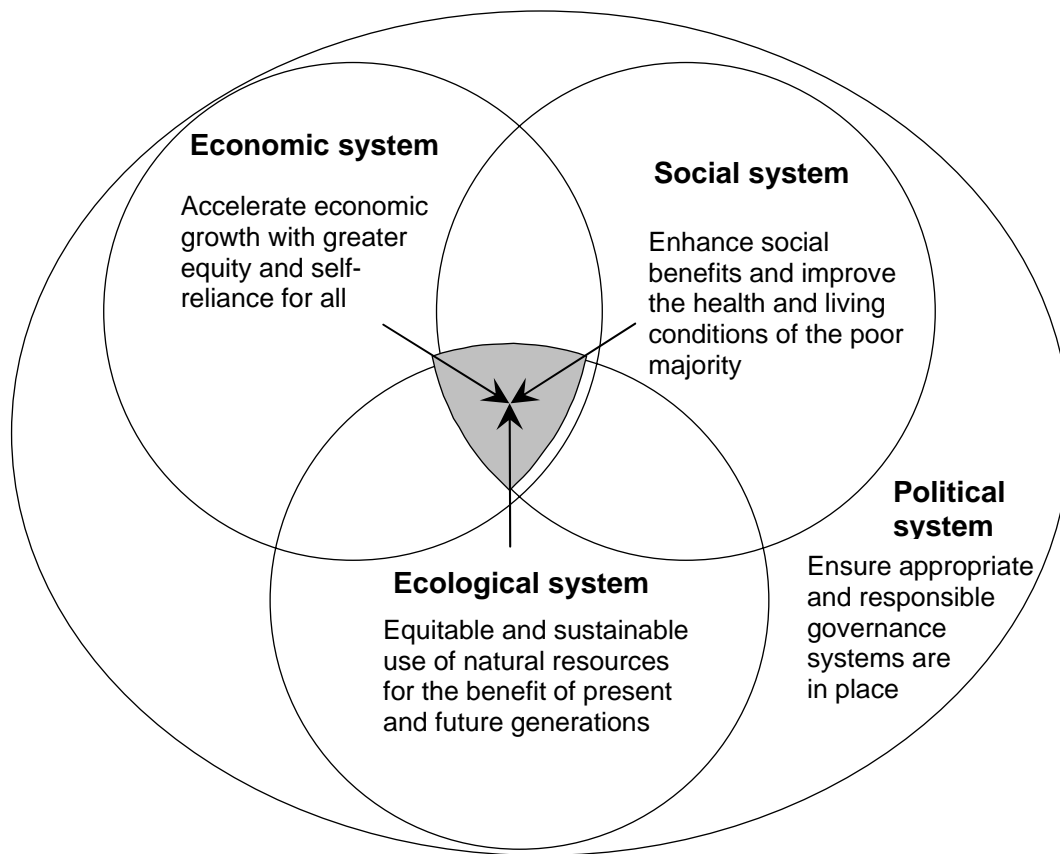


Figure A-6: Working towards the ideal of sustainable development in the SADC countries (shaded)⁸

⁸ Figure redrawn from Ashton PJ and Chonguica E (2003). Issues and trends in the regional harmonization of EIA processes in southern Africa. Chapter 2, In: (E Chonguica & R Brett, Eds), *Assessing the Need for a Regional Approach to Environmental Impact Assessment in Southern Africa*. Harare: IUCN-Regional Office for Southern Africa. Pages 26-59. [ISBN: 1-77931-006-4]. Taken from Ashton PJ (2006). The role of good governance in sustainable development. In: AR Turton, DR Roux, M Claassen & J Hattingh (Eds.) *Governance as a Dialogue: Government-Society-Science in Transition*. Berlin: Springer-Verlag. 17 pages. (In press).

An example of biodiversity conservation and ecotourism-based tourism supporting socio-economic growth and contributing to sustainable development is given in Box A-4 below.

Box A-4: An example of biodiversity supporting socioeconomic growth

The Eastern Cape, South Africa, has high levels of poverty and a threatened resource base. In changing from commercial livestock farming to game-based ecotourism, ten privately owned farms in the Eastern Cape showed the following results⁹:

- An increase of 450% in employment. Since each employee supports on average 3.5 dependents, this increase is highly significant.
- A 480% increase in the average annual salary of full-time employees.
- Opportunities to provide a spectrum of skills training in various fields, linked to the hospitality and ecotourism industries, to local communities.
- Gross revenues and revenues per hectare have increased over the past 4 years, and continue to rise.
- Protection of an average of 11,661 ha per farm, representing 6 of South Africa's 8 biomes and an immense diversity of plants and animals.

A.5 What is human wellbeing, and how is it dependent on biodiversity and ecosystem services?

Important to note:

The following sections show that, instead of thinking about choices such as:

“Biodiversity and Ecosystem Services OR Development”,

we should rather think of

“Biodiversity and Ecosystem Services FOR Sustainable Development”

That is, biodiversity and ecosystem services that enable sustainable development.

Human wellbeing is related to security, having the basic material for a good life, health, good social relations, and freedom of choice and action¹⁰.

⁹ Langholz JA and GIH Kerley (2006). *Combining Conservation and Development on Private Lands: An Assessment of Ecotourism-Based Private Game Reserves in the Eastern Cape*. Centre for African Conservation Ecology, Report No. 56. Nelson Mandela Metropolitan University, Port Elizabeth.

¹⁰ Millennium Ecosystem Assessment Synthesis Report (2005). www.millenniumassessment.org (accessed March 2006)

Ecosystem services influence many of these factors, playing a key role in providing materials for a good life, health, secure access to resources and security from disasters (Figure A-7).

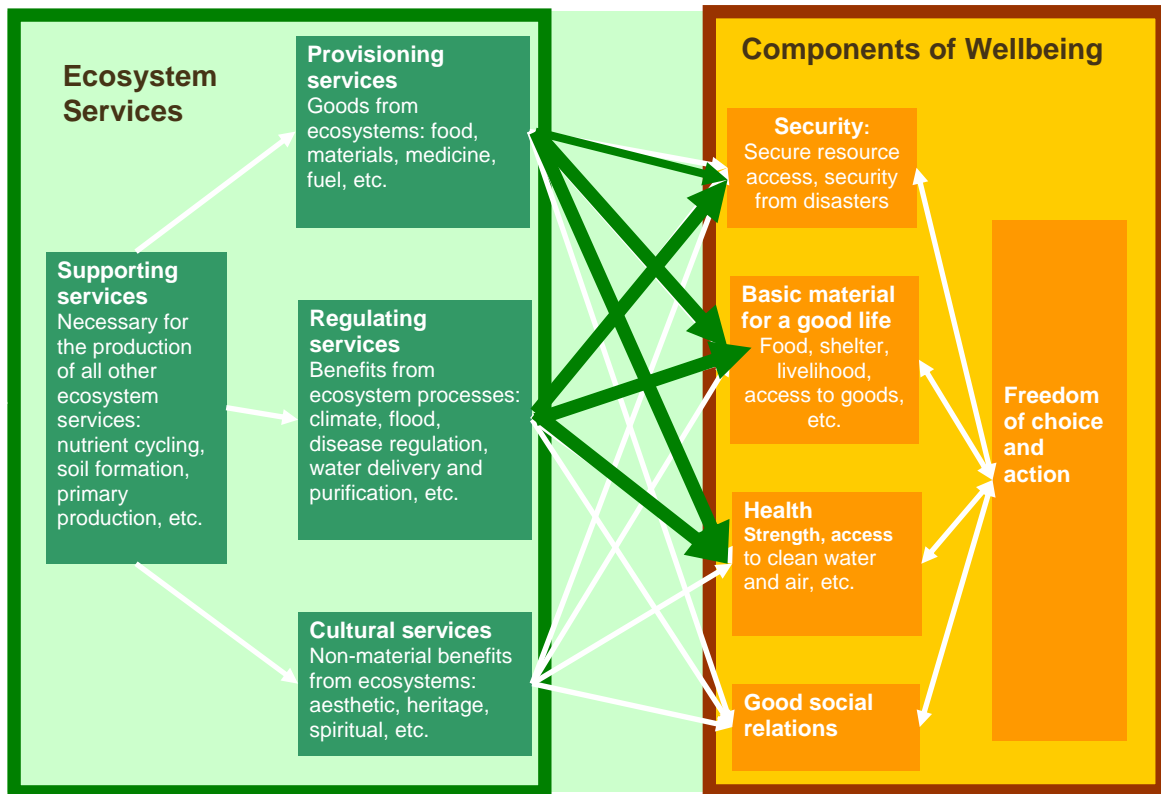


Figure A-7: Links between human wellbeing and ecosystem services¹¹

Biodiversity matters to everyone. Its loss impoverishes the environment and reduces its capacity to support people now and in the future.

The Millennium Ecosystem Assessment was a world-wide study (2001-2005) that assessed the consequences of change in our global ecosystems for human wellbeing, and determined what needs to be done to ensure the sustained contribution of those ecosystems to our wellbeing. The main findings of this study, that highlight the dependence of people on ecosystems, are given in Box A-5.

¹¹ Strongest links shown in green arrows

Box ? : The Millennium Ecosystem Assessment: strengthening capacity to manage ecosystems sustainably for human wellbeing

The main findings are:

- Over the past 50 years we have changed ecosystems faster than ever before in human history. *About 60% of ecosystem services are being degraded or used unsustainably.* This has led to major and irreversible loss in the diversity of life on Earth.
- These changes have meant large gains in economic development and human wellbeing, but also degradation in many ecosystem services and the worsening of poverty for some. *In many cases, our activities have shifted the burden of degrading ecosystem services from one group of people to another, more vulnerable group, or to future generations.* Also, *indications are that our actions are increasing the chances of non-linear, abrupt, and potentially catastrophic changes that have huge consequences for human wellbeing* (e.g. shifts in regional climate, collapse of fisheries, and alteration or disruption of ocean currents).
- The continued deterioration of ecosystems could grow significantly worse in the next 50 years, and is a barrier to achieving the Millennium Development Goals. The harmful effects of degrading ecosystem services are being borne disproportionately by the poor, increasing poverty and social conflict. *Particularly in sub-Saharan Africa, the condition and management of ecosystem services is a major factor influencing prospects for reducing poverty.*
- The challenge to stop degrading our ecosystems can be met but will need major changes to the way we currently operate. It will mean changes to policies, institutions and practices.



Many parts of southern Africa are becoming increasingly deforested and desertified – exacerbating poverty and resource degradation. The root cause of some inappropriate land use practices are misguided policies. © P.Tarr.

Box A-6 presents the findings of the southern African component of the Millennium Ecosystem Assessment¹².

Box A-6: Southern African Millennium Ecosystem Assessment

- There is a high correlation between environmental sustainability and human wellbeing.
 - *Human health depends on clean water and air.*
 - *Water resources are unevenly distributed in southern Africa.*
 - *Poor water quality is linked to diseases.*
 - *Air pollution causes health problems.*
 - *The ability to fight infection is linked to nutrition and the environment.*
 - *Protein nutrition is particularly serious in the region.*
- Climate change projections for southern Africa point to a far drier region, with mean annual temperatures 2-5°C warmer in 2050 than in 1990 (Figure A-8). The changing conditions will have major impacts on natural vegetation, water, agriculture, fisheries and forestry.
- Forests and woodlands are being cleared at a rate exceeding re-growth.
- Overstocking and overfishing are major problems in the region.
- The greatest potential for limiting biodiversity loss is through preventing degradation of semi-natural ecosystems used outside of protected areas.
- At least 4 of the 8 Millennium Development Goals will not be met in the region unless attention is given to stabilizing ecosystem services. These Goals are: reducing hunger; reducing child mortality; combating diseases; and ensuring environmental sustainability.
- Livelihoods are often linked directly or indirectly to ecosystem services:
 - *Water is central to livelihood security;*
 - *Fisheries (both freshwater and marine) are a main source of income and protein;*
 - *Game meat and wild plants provide medicine and food;*
 - *Natural vegetation provides grazing for livestock;*
 - *Wood provides fuel and building materials;*
 - *Nature-based tourism generates income;*
 - *Soils underpin agriculture;*
 - *Seas, coastlines and coastal ecosystems provide food and protect the shoreline.*
- Biodiversity has direct economic and wellbeing value through the provision of medicines.
- Maintaining ecosystem services requires effective institutions and governance.
- Nature-based tourism, dependent on unspoiled landscapes, is growing three times faster than agriculture or forestry and forms a significant part of the regional economy.

¹² Scholes RJ and R Biggs (eds). (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. The Regional-scale Component of the Southern African Millennium Ecosystem Assessment 2004. Council for Scientific and Industrial Research, Pretoria, South Africa.

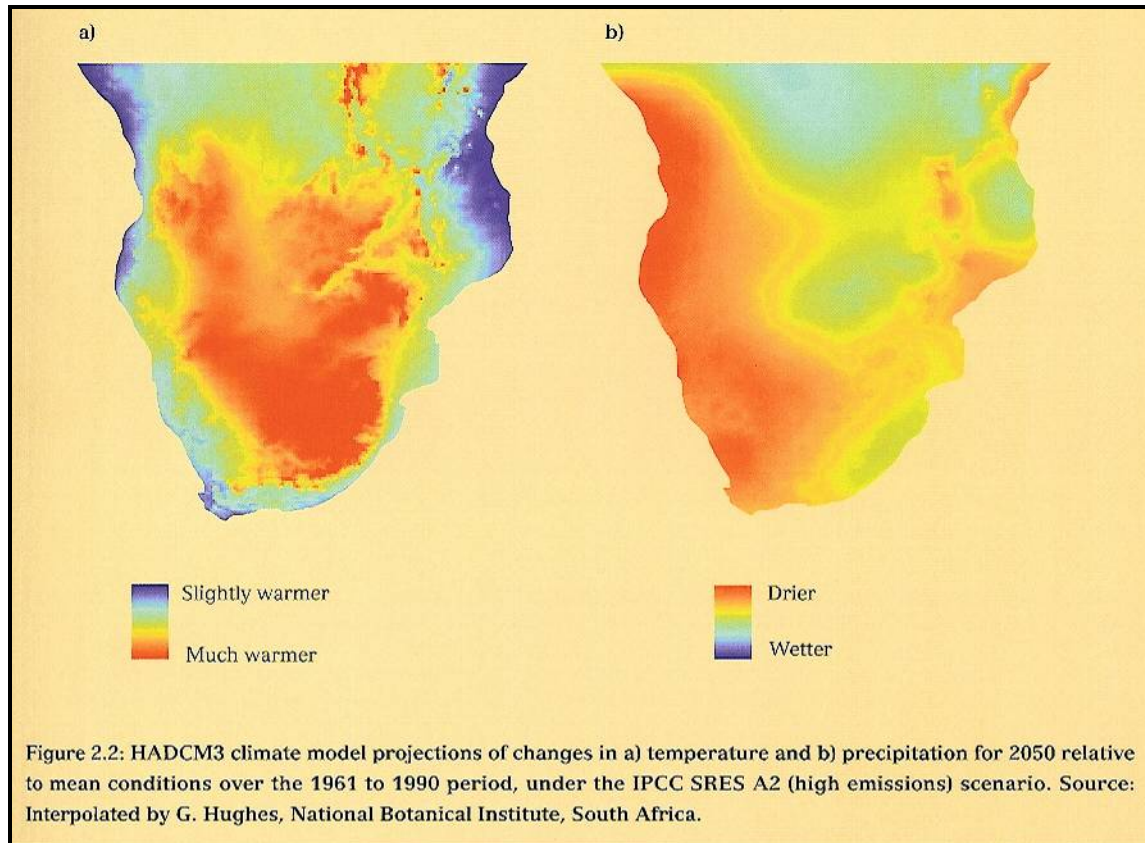


Figure A-8: Projected climate change in southern Africa¹³

A.5.1 Human dependence on biodiversity and ecosystem services

We all depend fundamentally on ecosystems and the natural goods and services they provide.

Important to note:

Whether we are relatively wealthy or poor, live in urban or rural areas, access natural resources directly (e.g. through subsistence or commercial exploitation of these resources) or indirectly (e.g. through supermarkets and services provision by government), we rely heavily on ecosystem services for our wellbeing. People who live in urban areas rely on ecosystems beyond those urban areas for the food, water and energy, and to treat and dispose of their wastes; their so-called 'ecological footprint'¹⁴. The global average ecological footprint per person is 2.2ha, but, there are only 1.8ha of productive area available per person on the planet; i.e. our demands on the planet are exceeding the earth's capacity to deliver, resulting in deterioration in these services (see Figure A-9).

¹³ Extracted from Scholes RJ and R Biggs (eds). (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. The Regional-scale Component of the Southern African Millennium Ecosystem Assessment 2004. Council for Scientific and Industrial Research, Pretoria, South Africa.

¹⁴ www.footprintnetwork.org

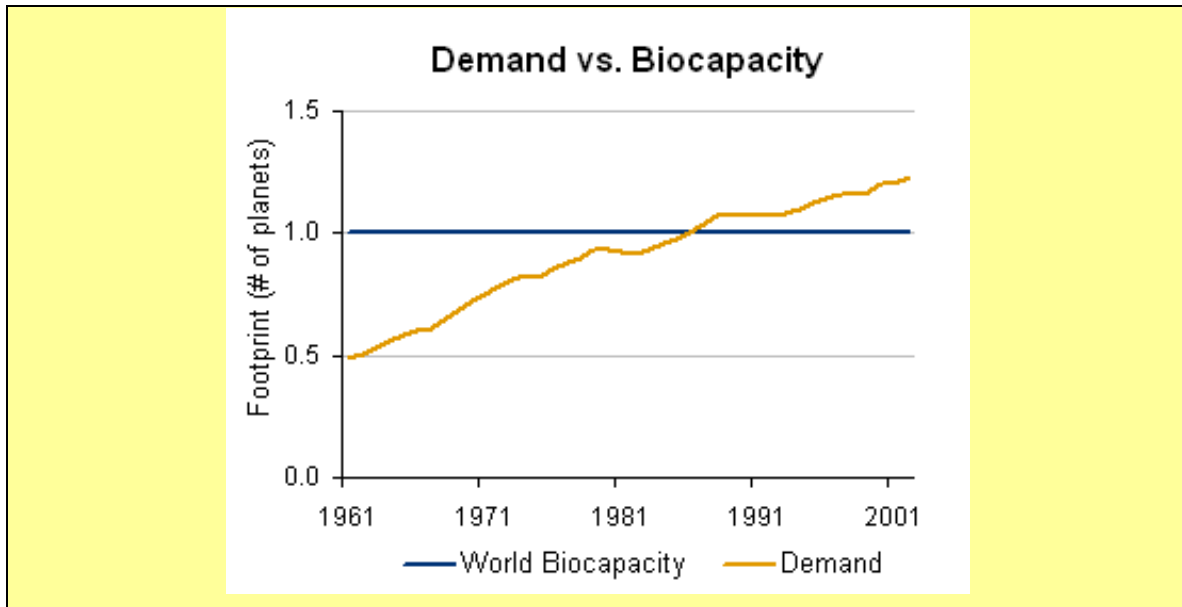


Figure A-9: World demand for Ecosystem Services vs Biocapacity

Natural resources are valued by us in many different ways:

- For their **direct use** (e.g. food, materials, medicines, fuel, fibre, commercial goods)
- For their **indirect use** (pollination services for crops, water purification services, grazing for livestock, coastal protection)
- For their **existence** (aesthetics, spiritual or cultural value)
- For the **options** that they provide (future use), and for their **ability to evolve and adapt** to changing conditions, thus giving us some 'insurance' against changing climate.



Harvesting wildflowers (left) in the Cape Floristic Region¹⁵

Wetlands (right) play an important role in improving the quality of water¹⁶



¹⁵ Taken from photograph by Colin Paterson Jones in the Fynbos Forum's *Ecosystem Guidelines for Environmental Assessment in the Western Cape (2005)*. Editor: C de Villiers, Botanical Society of South Africa, Cape Town.

¹⁶ Taken from photograph by Colin Paterson Jones in the Fynbos Forum's *Ecosystem Guidelines for Environmental Assessment in the Western Cape (2005)*. Editor: C de Villiers, Botanical Society of South Africa, Cape Town.



Dung beetles (top left) provide important ecosystem services as they help to break down waste and recycle nutrients. Similarly, bees (bottom left) pollinate plants, ensuring their persistence. Whilst feared by some people, spiders should be regarded as "mans best friend" as their sticky webs trap hundreds of flies, mosquito's and other pests in our gardens and homes!
© S.Brownlie, B.Walmsley and P.Tarr.



The examples of the 'Rivet Poppers' (Box A-7) and the 'Tragedy of the Commons' (Box A-8) portray the links between people and ecosystem services in a different but interesting way.

Box A-7: The Rivet Poppers¹⁷

Suppose you are about to board an aircraft, and you notice a man on a ladder busily popping rivets out of the wing. Curious, you approach him and ask what he's doing.

"I'm taking these rivets out of the wing," he replies.

"Why?"

"Growthmania Airlines, which own the plane, sells them for US\$1.00 each and I get US\$0.50 from them for each one I pop."

"Are you crazy? The wing will be weakened and sooner or later it'll fall off!"

"Don't worry, I've popped out a lot of rivets, and nothing has happened yet."

The impact that we are having on Earth's ecosystems is in many ways the same as popping the rivets out of an aircraft's wing. The precise role of each species or population in an ecosystem is usually unknown, just as is the precise role of each rivet in an aircraft's wing. Equally, the results of popping a single rivet or deleting a single population cannot be easily predicted, especially since future stresses on the system are unpredictable. But what is known with certainty is that the end result of popping all the rivets or destroying natural habitat will inevitably be a failure - of the aircraft's wing in the first case; of the ecosystem in the second.

Conversion and fragmentation of natural habitat is the main threat to biodiversity and ecosystems. Shrinking habitat causes a decrease in the populations and numbers of species. At some point, declining populations reach a 'threshold' beyond which they 'crash' and become

¹⁷ *Extinction: The Implications of the Loss of our Biological Heritage*. The Third Keith Roby Memorial Lecture in Community Science, Murdoch University, Australia (1985), by Paul Ehrlich.

extinct (Figure A-10). This threshold varies from about 20%-70% of habitat remaining¹⁸, and depends on the particular organism, the landscape, and the ability to link up with other populations of the same species.

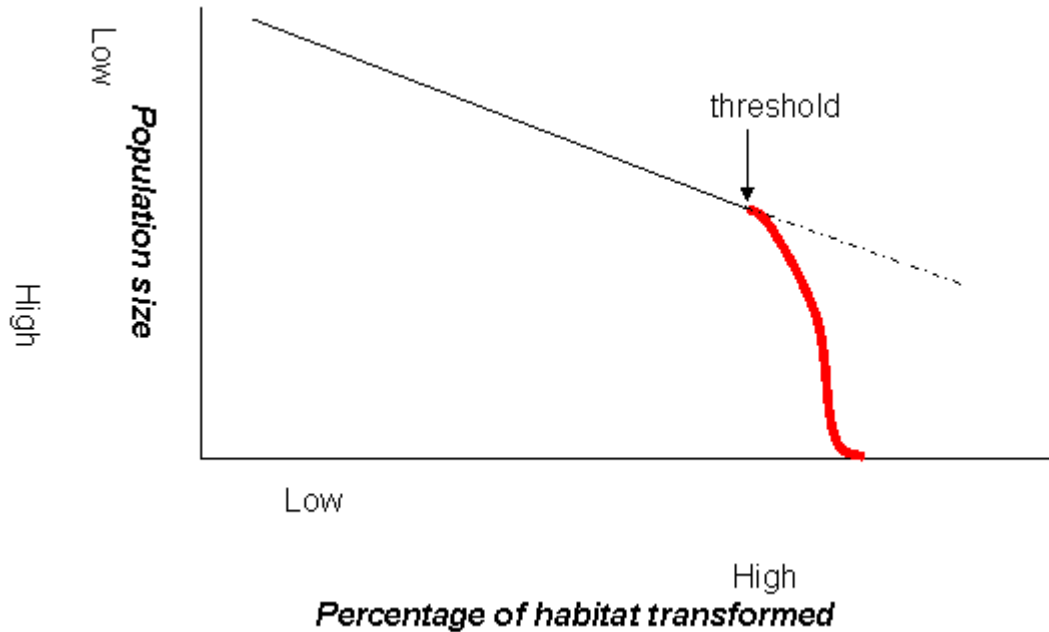


Figure A-10: Non-linear behaviour of populations in response to habitat loss

That is, the behaviour of populations is not linear in response to impacts. Extinction of populations or species can result in major changes in the resilience of the ecosystem and in the services they can provide. In many cases it is extremely difficult to predict these extinction thresholds, and thus to predict the behaviour of ecosystems in response to impacts. So, ecosystems on which we depend may collapse without much warning if the impacts on them exceed an often poorly-defined threshold.

Box A-8: The Tragedy of the Commons¹⁹

Many of our natural resources such as air, water, the sea, rivers and biodiversity are not owned by any one party. Rather, they are 'common property' goods that benefit society as a whole. Where access to and use of these goods is not managed or controlled, it 'pays' the individual user to extract as much benefit from the resource as possible, regardless of the negative effect on that resource. Quite simply, whatever benefit is obtained goes to the individual, while the costs of over-exploitation are distributed amongst all of the users of that resource. So, the net effect is that common property goods tend to be degraded or ultimately doomed.

¹⁸ Desmet P and RM Cowling (in prep). *Targeting ecological processes: a top down approach*. Leslie Hill Institute for Plant Conservation, University of Cape Town.

¹⁹ The Tragedy of the Commons. Garrett Hardin. Article in *Science* (1968)

The depletion of our biodiversity and deterioration of many natural systems can be seen as a 'tragedy of the commons'.

Very often the use of public goods over which there is no control leads to a deterioration in their availability and quality. On the other hand, where use of the commons is strictly regulated according to the dictates of a market economy, prices often rise and the people most dependent on those common property goods for their livelihoods tend to be excluded, increasing their vulnerability. The main challenge is to ensure that these common property goods are equitably allocated and managed for the benefit of the common good.



This fish market provides income for the fisherman, but is this shared with other people in the community? Safeguards are needed to ensure that a few do not exploit common property resources at the exclusion of the poor and vulnerable © P.Tarr.

A.5.2 The economics of biodiversity and ecosystem services, and their value

Economics is the study of how the forces of supply and demand allocate scarce resources. Unfortunately, some of these forces – particularly those associated with 'free' ecosystem services - are not adequately recognised or reflected in conventional economics. That means that the allocation of scarce, and often irreplaceable, natural resources is not always optimal.

Given that biodiversity and ecosystem services are likely to become increasingly scarce and stressed in future, their value can only increase. If thresholds are passed for irreplaceable ecosystem services, their value may quickly jump to infinity²⁰.

Important to note:

- *Ecosystem management, democratic governance and poverty reduction are essential to economic growth in southern Africa.*
- *The most important factors underlying changes in ecosystem services in the southern African region are population growth, the economy and political governance²¹.*
- *Productive ecosystems are the basis of a sustainable income from nature. Income is derived from ecosystem goods and services, both as 'wild income' from unspoiled natural systems or as 'agricultural income' from agricultural lands²².*

²⁰ Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill RV, Paurelo J. (1997). The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.

²¹ Scholes RJ and R Biggs (eds). (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. The Regional-scale Component of the Southern African Millennium Ecosystem Assessment 2004. Council for Scientific and Industrial Research, Pretoria, South Africa.

- *The absence of market prices does not mean that ecosystem services have no value to people²³.*
- *It is difficult to find perfect artificial alternatives for ecosystem services²⁴.*
- *Investing in ecosystem services can be an excellent strategy to reduce costs and increase returns²⁵.*

Evaluation of the way our economy works shows that:

- Conventional economic indicators don't show depletion of ecosystems or ecosystem services as loss of a capital asset. The indirect values of conserving biodiversity are often not taken into account; often the value of a lost ecosystem is greater than the benefits of a converted ecosystem (e.g. the benefits of conserving wetlands and mangroves generally exceed the benefits obtained through their conversion to other use²⁶; converting primary forest to anything other than high value timber extraction or agro-forestry is likely to fail a cost-benefit test).
- Common property resources provide 'free' goods and services to local communities and society. However, if these resources are destroyed the costs of providing substitutes are often high. That is, there is an **opportunity cost** associated with activities that destroy or degrade ecosystem services. An 'opportunity cost' is defined by economists as the net benefit to society that could be obtained by the 'next best' development alternative.

An example relevant to opportunity costs is given below²⁷.

EXAMPLE: OPPORTUNITY COSTS OF INTRODUCING NILE PERCH INTO LAKE VICTORIA

The Nile perch, a large predatory fish, was introduced into Lake Victoria in the 1960s to boost the fishing industry. Little if any consideration was given to the effects of introducing this fish on the ecosystem of the lake, or to linkages between changes in that ecosystem and the broader socioeconomic environment.

The effects of introducing the Nile perch have been:

Societal benefits:

- *An increase in the lake fishery to four times that in the 1960s and 1970s.*
- *Development of a commercial industry for the Nile perch that has created 2400 jobs.*
- *Export of about 400 tonnes of fresh fish to Europe and Asia earned almost US\$5 billion in taxes in 2000/1.*

Societal costs:

²² World Resources Institute in collaboration with United Nations Development Programme, United Nations Environment Programme, and the World Bank (2005). World Resources 2005: *The Wealth of the Poor – Managing Ecosystems to Fight Poverty*. Washington DC: WRI.

²³ Emerton L and E Bos (2004). *Value: Counting Ecosystems as an Economic Part of Water Infrastructure*. IUCN, Gland, Switzerland.

²⁴ Emerton L and E Bos (2004). *Value: Counting Ecosystems as an Economic Part of Water Infrastructure*. IUCN, Gland, Switzerland.

²⁵ Emerton L and E Bos (2004). *Value: Counting Ecosystems as an Economic Part of Water Infrastructure*. IUCN, Gland, Switzerland.

²⁶ The Poverty Environment Partnership (2005). *Sustaining the Environment to Fight Poverty and Achieve the MDGs: the Economic Case and Priorities for Action. A Message to the 2005 World Summit*. Prepared by the UNDP, IIED, IUCN and the World Resources Institute. UNEP, New York.

²⁷ From JK Turpie and H van Zyl (2002). Valuing the environment in water resources management. Chapter 4 in: Hirji R, P Johnson, P Maro and T Matiza Chiuta (eds). *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*. SADC, IUCN, SARDC, World Bank: Maseru/Harare/Washington DC.

- *The extinction of about 200-300 indigenous and endemic fish species, many of which were the basis for local fisheries. The loss of species is irreversible and constitutes the loss of an irreplaceable resource.*
- *Displacement of about 15,000 jobs, including thousands of women who were previously engaged in fish processing.*
- *Overfishing and degradation of the natural environment now threatens the Nile perch industry: there has been a severe shortage of Nile perch since 2001 when the catch dropped by 75%; a dozen commercial fish processing plants are threatened with closure.*
- *Some 32,000 fishermen and another 3 million people in Tanzania who depend on fishing-related industry are negatively affected by the demise of the Nile perch industry.*

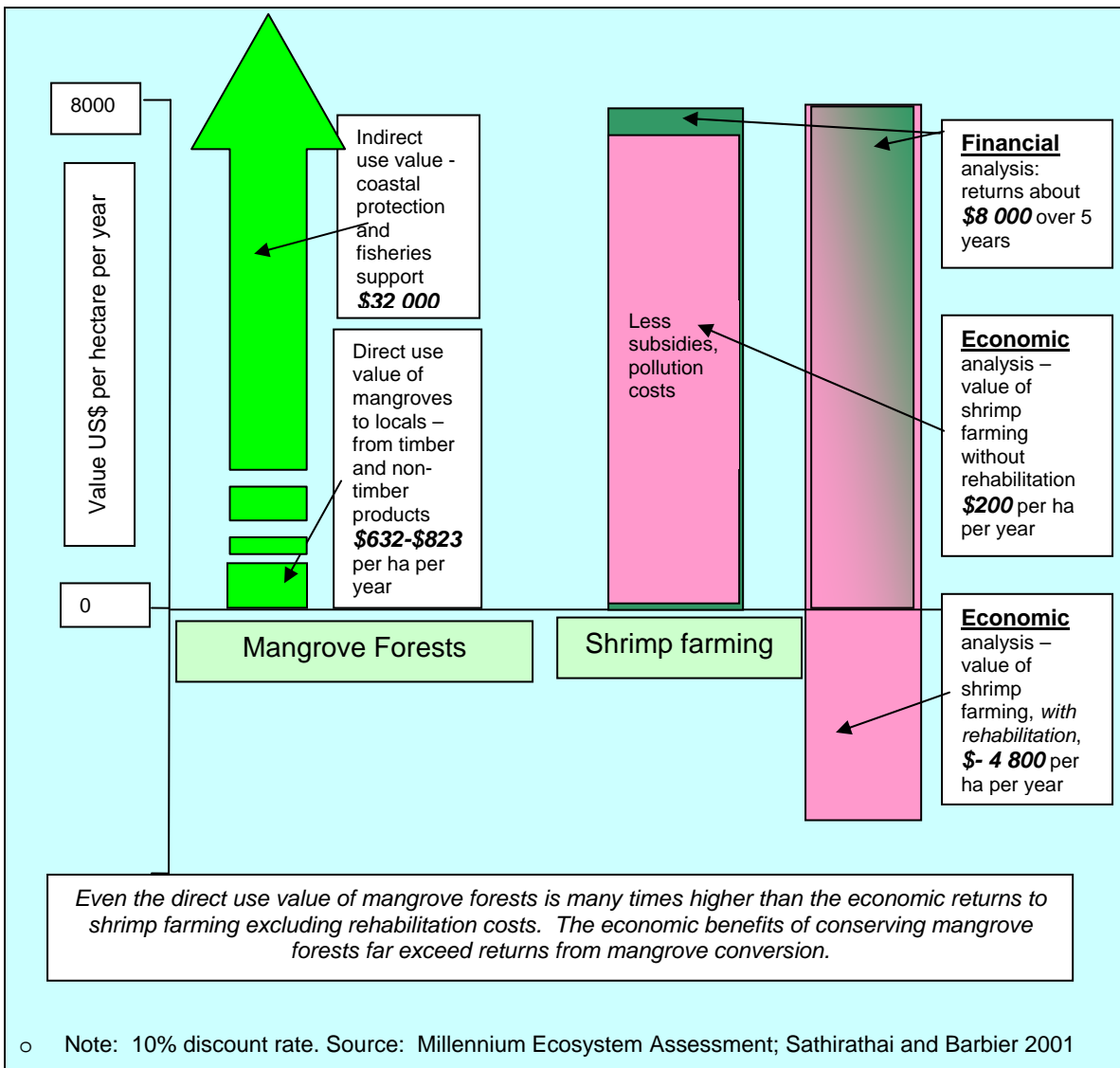
It appears that the opportunity costs of introducing the Nile perch were substantial. Had the potential effects of the proposed activity been thoroughly investigated using an ecosystem approach, it is possible that a precautionary approach would have been taken and the Nile perch would not have been introduced to Lake Victoria.

- Many ecosystem services don't flow directly through markets, lack markets altogether, or aren't priced according to their full economic value. That means that the importance of ecosystems is not recognised until they are degraded or lost. Also, there is no incentive to use these services wisely or efficiently. For example, over 30% of the world's food crops rely on insect pollinators, and another 10% on other animal pollinators²⁸. No pollination means no seeds or fruit; the consequences are serious. Yet the value of pollinators is not widely recognised.
- The benefits of ecosystem services often go unmeasured, appear as items in other sectors (e.g. the benefits of wetlands are reflected in higher profits in water-use sectors), or can be misleading (e.g. 'successful' fishing catch is a short-term bonus if the rates of fishing exceed natural rates of replenishment of fish stocks).

An interesting example of the economics of shrimp farming relative to that of conserving the mangrove ecosystem in its current state is given below. Without considering the value of ecosystem services, shrimp farming would seem to offer major economic rewards; when the ecosystem service value is built in, it is clear that conserving the mangroves is the best alternative:

EXAMPLE: ECOSYSTEM SERVICES OF MANGROVES – STATUS QUO OR SHRIMP FARMING?

²⁸ Economics for the Environment Consultancy (2005). *The Economic, Social and Ecological Value of Ecosystem Services: a Literature Review*. London. www.eftec.co.uk (accessed March 2006)



- With the failure of economic systems to reflect adequately the value of ecosystem services, many

of our natural resources are being exploited or 'cashed in' for short term benefit.

- The cost of maintaining and managing ecosystems that provide valuable services is often far less than the benefits received from that system. That is, the investment makes sound economic sense.
- Decisions on the use of biodiversity or ecosystem services often foreclose other options for their use. In some instances, the 'lost opportunity' comes at a relatively high cost.

Box A-9 gives some values of ecosystem goods and services at a global scale, and in southern Africa. The costs to society if these ecosystem services were to be lost, and/or had to be substituted, would be enormous.

Box A-9: Value of biodiversity and ecosystem services

- In 1997 the total value of ecosystem services on earth was estimated at between US\$16 trillion and US\$54 trillion per year, with a central estimate of US\$33 trillion²⁹.
- The annual values (per km) of offshore reefs is estimated at US\$100,000 – 600,000 and of mangroves US\$200,000 – 900,000³⁰. Where destroyed, the 'costs' are felt both locally and many kilometres away through reduced fish catches and tourism revenue, malnutrition and loss of food security, and increased coastal erosion. Investing in environmentally sustainable management and development of the coast will be more cost effective than restoring livelihoods and ecosystems after a catastrophe.
- Wetland marshes, mangroves and coral reefs protect beaches, control floods and storm damage on the Seychelles coast. The cost of providing substitutes for these ecosystem services is estimated at about 4 million rupees per year (US\$0.8 million).
- In the Cape Floristic Region, a global biodiversity hotspot in South Africa, the harvest of marine resources and indigenous vegetation (fynbos) products is valued at over R1,300 million and R78 million per year respectively. The annual value of pollination services and honey production by bees is estimated at R594 million (2000 figures).
- The total annual value of ecosystem services in the Cape Floristic Region is estimated to be about R10 billion (2000 figures), equivalent to over 10% of South Africa's Gross Geographic Product³¹.
- The total annual value of ecosystem services within the city of Mhlatuze, KwaZulu-Natal province, South Africa, is estimated at R1.76 billion³². Ecosystem services cover water

²⁹ Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill RV, Paurelo J. (1997). The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.

³⁰ UNEP World Conservation Monitoring Centre, International Coral Reef Action Network (ICRAN) and IUCN (2006). *'In the Frontline. Shoreline Protection and Other Ecosystem Services from Mangroves and Coral Reefs'*. Cambridge Printers, United Kingdom

³¹ Turpie J., BJ Heydenrych and SJ Lamberth. (2003). Economic value of terrestrial and marine biodiversity in the Cape Floristic Region: implications for defining effective and socially optimal conservation strategies. *Biological Conservation* 112:233-273.

supply and regulation, flood and drought management, food production, pollination, nutrient cycling, disease and pest control, refugia for wildlife and fisheries, atmospheric regulation, and cultural/recreation (amongst others).

- The total value of ecosystem goods alone (i.e. not services) provided by the Zambezi wetlands in Zambia and the Lake Chilwa wetland in Malawi, is estimated at between US\$6,700-8,800/km² per year (2002 figures)³³.
- In Namibia, the value of the eastern Caprivi wetlands is estimated at US\$840,000 for crop and livestock production³⁴.
- The informal market value of indigenous herbal remedies in southern Africa is estimated to be between US\$75-150million p.a; the formal market trade is estimated at about US\$25million³⁵.

The concept of 'total economic value' best captures the many benefits of ecosystem services and is increasingly being used to inform improved decision making. A wide range of tools are available and being developed for this purpose³⁶. This concept is described below:

Important to note: Looking at the total economic value of ecosystems

*The total economic value embraces both **use values** and the **non-use values**.*

Use values

- **Direct use value** covers outputs that can be consumed or processed directly, like wood, fish, meat, medicines, wild foods, etc.
- **Indirect use value** covers ecosystem services like flood regulation, nutrient retention, etc.
- **Option use value** covers the value placed on keeping future options open for direct or indirect use of biodiversity and ecosystems in future, bearing in mind that some uses may not yet be known (e.g. medicinal or food properties of plants).

Non-use or existence values refer to the intrinsic, aesthetic or cultural values of natural landscapes, ecosystems and biodiversity, irrespective of their use.

³² Jordan T, N Diederichs, M Mander, T Markewicz (2005). "Integrating biodiversity in strategic environmental assessment and spatial planning – a case study of the Umhlatuze municipality, Richards Bay, South Africa. Paper presented at IAIA's SEA conference in Prague

³³ Schuijt K (2002). *Land and Water Use of Wetlands in Africa: Economic Values of African Wetlands*. International Institute for Applied Systems Analysis, Austria. www.iiasa.ac.at/Publications/Documents/IR-02-063.pdf (accessed March 2006)

³⁴ From JK Turpie and H van Zyl (2002). Valuing the environment in water resources management. Chapter 4 in: Hirji R, P Johnson, P Maro and T Matiza Chiuta (eds). *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*. SADC, IUCN, SARDC, World Bank: Maseru/Harare/Washington DC.

³⁵ Mander M and M McKenzie (2005). *Southern African Trade Directory of Indigenous Natural Products*. Commercial Products from the Wild Group, Stellenbosch University, South Africa.

³⁶ Emerton L and E Bos (2004). *Value: Counting ecosystems as an economic part of water infrastructure*. IUCN, Gland, Switzerland.

More and more, decision makers are beginning to realise that investing in conservation and wise use of ecosystems makes good economic sense, as the rates of return on these investments are high.

Interesting to note: Findings of the Poverty Environment Partnership³⁷

- *Investment in improving access to water supply and sanitation yields a benefit:cost ratio of from 4 to 14, mainly through time savings and improved health;*
- *Investment in conserving soils can be very high, taking into account increased food security, time savings, enhanced credit worthiness and access to finance, amongst others;*
- *Investment in conserving and restoring natural systems such as forests (important for carbon sequestration and for timber and non-timber products), wetlands and mangrove systems (important for coastal protection, regulating water yield and quality, etc.), and wildlife (important for tourism) can yield substantial benefits, mainly to the poor.*

A.5.3 Biodiversity, ecosystem services and poverty reduction

The Millennium Development Goals: In 2000, at the United Nations Millennium Summit, all member states agreed to try to achieve eight goals for reducing poverty and improving lives by 2015. Goal 7 is to 'ensure environmental sustainability'³⁸. This Goal is cross-cutting, since the other goals depend to a greater or lesser extent on, or are affected by, ecosystem services (Box A-10).

Box A-10: Links between the Millennium Development Goals and Ecosystem Services³⁹

| Millennium Development Goal | Links to Ecosystem Services |
|--------------------------------------|---|
| Eradicate extreme hunger and poverty | <ul style="list-style-type: none"> ○ <i>Food, materials, livelihoods of the poor often depend directly on ecosystems and the diversity of goods and services they provide</i> ○ <i>Insecure rights of the poor to natural resources, markets, and decision-making limit capacity to protect the environment and improve livelihoods and wellbeing</i> |
| Achieve universal primary education | <ul style="list-style-type: none"> ○ <i>Children spend time collecting water, wood (etc.) that can reduce study time</i> ○ <i>Income from sustainable management of natural resources can be spent on education</i> |
| Promote gender equality and | <ul style="list-style-type: none"> ○ <i>Women and girls spend time collecting water, wood (etc.) rather</i> |

³⁷ Poverty Environment Partnership (2005). Investing in environmental wealth for poverty reduction: environment for the MDGs. www.povertyenvironment.net/pep (accessed May 2006).

³⁸ By incorporating sustainable development into policies and programmes, reverse the loss of environmental resources, reduce the number of people without access to safe drinking water and achieve significant improvement in the lives of slum dwellers

³⁹ Adapted from UN Millennium Project (2005). *Environment and Human Wellbeing: a Practical Strategy*. Summary version of the report of the Task Force on Environmental Sustainability. The Earth Institute at Columbia University, New York, USA.

| | |
|--|---|
| empower women | <p><i>than generating income</i></p> <ul style="list-style-type: none"> ○ <i>Lack of secure rights limits access to decision-making and resources</i> |
| Reduce child mortality | <ul style="list-style-type: none"> ○ <i>Water and sanitation-related diseases, vector borne diseases, parasites, and respiratory infections caused by indoor pollution are leading causes of child mortality</i> |
| Improve maternal health | <ul style="list-style-type: none"> ○ <i>Indoor air pollution, disease, sanitation</i> |
| Combat HIV/Aids, malaria and other diseases | <ul style="list-style-type: none"> ○ <i>Environmental risk factors account for up to 20% of the total burden of disease in developing countries. Preventive environmental health measures are at times more cost-effective than health treatment</i> |
| Develop a global partnership for development | <ul style="list-style-type: none"> ○ <i>Integrated approaches, partnerships between developed and developing countries, collaboration</i> |

In the context of southern Africa, the following is pertinent:

- The people of the southern African region are among the most disadvantaged on the planet. Human wellbeing shows significant variation. Many elements of wellbeing are directly dependent on the products of ecosystems: food, water and energy are prime examples. The ability to earn an income that permits access to the basic material for a good life is often linked to ecosystem services⁴⁰.
- Economic growth must ensure that poor, vulnerable people are given a stake in their future in a way that encourages responsibility for managing their natural resources as a long-term asset. That is, they must have a say in how resources are used, and their dependence on them must be taken into account.
- Natural resources provide the base on which the majority of the poor depend directly for lives and livelihoods. Common property resources (e.g. grazing land, water bodies, forests, coasts, the sea, wetlands, and associated organisms) are a key source of subsistence, especially when times are tough.
- The poor make substantial use of free, common property goods provided by the natural environment (ecosystem goods and services) to supplement their assets base (Boxes A-11 and A-12).

| Box A-11: Poverty and the role of ecosystem goods and services^{41,42} | |
|---|--|
| <i>Low income countries</i> | <i>High income countries</i> |
| Natural assets make up to 26% of total wealth. | Natural assets make up to 2% of total wealth. |
| Renewable natural resources make up to 83% of total natural wealth. | Renewable natural resources make up to 60% of total natural wealth. |

⁴⁰ Scholes RJ and R Biggs (eds). (2004). *Ecosystem Services in Southern Africa: A Regional Assessment*. The Regional-scale Component of the Southern African Millennium Ecosystem Assessment 2004. Council for Scientific and Industrial Research, Pretoria, South Africa.

⁴¹ World Resources Institute in collaboration with the UNDP, UNEP and the World Bank (2005). *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. World Resources Institute, Washington DC.

⁴² UNDP, UNEP, IIED, IUCN, World Resources Institute (2005). *Environment for the MDGs – Investing in Environmental Wealth for Poverty Reduction*

| | |
|--|---|
| <p>On average 54% of workforce in developing countries, and over 80% in many sub-Saharan countries, are employed in agriculture, fisheries and forestry.</p> | <p>7% of workforce in developed countries are employed in agriculture, fisheries and forestry.</p> |
|--|---|

Box A-12: Poverty and the role of common property ecosystem goods

- In southern Malawi, income from forest goods and services amounts to 30% of total income. In the Chimaliro Forest Reserve in Malawi, food crops contributed between 45-55% of household income.⁴³
 - In Botswana the poorest 20% of the population earn 51% of their household income from common property resources.⁴⁴
 - In south-east Zimbabwe, households (rich and poor) get 35-40% of income from common property resources.⁴⁵
 - In the Barotse wetland, Zambia, resources from the wetland accounted for 40% of the total income accruing to households.⁴⁶
- In southern Africa, the spiralling AIDS pandemic cannot be ignored. Families without other resources or income fall back on common property natural resources to survive.
 - Ecosystem services available to the poor are often under threat and/or of poor quality. In Sub-Saharan Africa, 39% of people live on fragile lands with limited ability to sustain growing populations.
 - Women make a significant contribution to the conservation of the natural environment, but their situation is often characterized by lack of control or ownership of, and access to, resources.
 - Deteriorating ecosystem services lead to an increase in disease, e.g. through poor water quality or sanitation, and/or poor air quality. Increase in disease in turn leads to deterioration in livelihoods.
 - There may be no substitutes available to the poor if those natural assets are taken away, or substitutes may not be affordable (e.g. paraffin instead of firewood for fuel).
 - As ecosystems degrade, poverty worsens. The poor are most vulnerable to a deteriorating natural environment.
 - The poor often exercise little control over the use of the natural resources on which they depend. Particularly where large, powerful and/or wealthy extractive industries come into play, the poor have little say in how 'their' resources are used.
 - Transparent and accountable governance, that gives local people a strong say in, secure rights to, and responsibility for, managing natural resources, is critical to safeguarding natural wealth. This approach would empower the poor and ensure access to income from ecosystem goods and services.

⁴³ World Resources Institute in collaboration with the UNDP, UNEP and the World Bank (2005). *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. World Resources Institute, Washington DC.

⁴⁴ World Resources Institute in collaboration with the UNDP, UNEP and the World Bank (2005). *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. World Resources Institute, Washington DC.

⁴⁵ World Resources Institute in collaboration with the UNDP, UNEP and the World Bank (2005). *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. World Resources Institute, Washington DC.

⁴⁶ From JK Turpie and H van Zyl (2002). Valuing the environment in water resources management. Chapter 4 in: Hirji R, P Johnson, P Maro and T Matiza Chiuta (eds). *Defining and Mainstreaming Environmental Sustainability in Water Resources Management in Southern Africa*. SADC, IUCN, SARDC, World Bank: Maseru/Harare/Washington DC.

A.5.4 Ecosystem services, social justice and equity

- Every development results in benefits and environmental impacts that affect our own and others' wellbeing. These benefits and impacts can be felt locally by individuals or communities (e.g. fuelwood, food), or at a regional level (e.g. changes in flood and water regulation, food availability), or even at a global level (e.g. carbon storage, pharmaceuticals and genetic material, tourism).
- The distribution of costs and benefits from development are also felt at different scales by different parties. For example, the benefits of mining a natural landscape are often experienced mainly by government at a national level, and by the mining company at national or even international level. The direct and indirect negative impacts of mining are experienced by rural communities at the local level.
- Gains for many people through loss of biodiversity in the past have meant increasing poverty for other groups of people, through degradation of ecosystem services and loss of biodiversity. Poor people have historically lost access to biodiversity and ecosystem services in a disproportionate manner as demands for these services have grown (e.g. coastal development); many groups haven't benefited from global trade in local natural products (e.g. pharmaceuticals).
- So, in many cases, the distribution of benefits and impacts is unfair, in that those who suffer most from the negative impacts of development, benefit the least. A social welfare 'rule of thumb' in this regard is that a proposed development should only be approved if those that benefit are able to compensate the 'losers' and still have benefits left over.
- Poor communities are thus particularly vulnerable to changes in their access to, use of, and the quality of, these services. When poor or vulnerable people are negatively affected by development, the adverse effects on their wellbeing are disproportionately high, since they can't 'buy' or don't have access to substitutes. In many instances, common property goods and ecosystem services are affected by development, but these impacts are not taken into account. The overlooked impacts may be experienced by poor or vulnerable communities – leaving them worse off.



Projects such as large mines and other infrastructure developments are often extremely important nationally, but good planning is necessary to ensure that those who suffer the costs (usually local communities) also enjoy some benefits © G.Batchelor



Hot tips!

- **Look after biodiversity pattern and the ecological processes** that support ecosystem health in the long term.
- **Protect our ecosystem services:** they support human wellbeing in general, and play a particularly important role in the livelihoods and lives of poor communities. The cost of conserving existing ecosystem services is far less than the costs of finding substitutes for lost biodiversity or ecosystems that no longer deliver valuable services!
- **Determine the full value of biodiversity and ecosystem services, not just the market value** – biodiversity and ecosystem services have a wide range of use and non-use values that must be considered.
- **Always ask the question: “what biodiversity or which ecosystem services support this socioeconomic benefit?”** It is important to consider the natural systems that underpin our lives and livelihoods, which could be affected by development.
- **Use precaution** in decisions that may affect biodiversity and ecosystem services: many of the effects of our actions on biodiversity and ecosystem services are not known and may be unpredictable.
- **Ensure that society as a whole, and poor communities in particular, are not made more vulnerable** by negative impacts on ecosystem services.

PART B: BIODIVERSITY, ECOSYSTEM SERVICES AND IMPACT ASSESSMENT

In this Part of the guidance document, you will find the following sections:

- B.1** Why do we do impact assessment, and what is meant by 'biodiversity-inclusive' impact assessment?
- B.1.1 Why do we do impact assessment?*
- B.1.2 What is meant by biodiversity-inclusive impact assessment?*
- B.1.3 Science, values, regulatory tools and biodiversity*
- B.2** How do human activities impact on biodiversity and ecosystem services, and vice versa?
- B.2.1 What can cause impacts on biodiversity and ecosystem services?*
- B.2.2 How can natural processes impact on development and human wellbeing?*
- B.3** Good practice impact assessment, and consideration of biodiversity and ecosystem services
- B.3.1 Use the ecosystem approach*
- B.3.2 Apply positive planning, looking at opportunities and constraints*
- B.3.3 Always consider alternatives*
- B.3.4 Ensure sustainable use*
- B.3.5 Use the hierarchy in considering mitigation measures*
- B.3.6 Always apply the precautionary principle*
- B.3.7 Ensure equitable sharing*
- B.3.8 Apply these other common principles in SEA and EIA*

B.1 Why do we do impact assessment, and what is meant by 'biodiversity-inclusive' impact assessment?

B.1.1 Why do we do impact assessment?

Impact assessment is carried out to enable us to 'look before we leap' into development. Its purpose is both to influence the policy-making and/or planning process, and to inform decision making on development proposals.

Its purpose is to anticipate and prevent, minimize and/or manage, potentially significant negative impacts of development that may:

- Cost us money to rectify in future;
- Pose risks to lives, livelihoods or health of current and future generations; and
- Result in irreplaceable loss of resources and reduced options for future wellbeing.

It also helps to seek opportunities to optimize potential benefits of development.

Impact assessment is either done voluntarily, or in response to legal requirements.

B.1.2 What is meant by 'biodiversity-inclusive' impact assessment?

Biodiversity and ecosystem services play a critical role in supporting sustainable development. If impact assessment is to achieve its purpose, it is essential that biodiversity and ecosystem services are taken into account during the impact assessment process. Both the science and society's values regarding biodiversity and ecosystem services need to be addressed: applicable laws, policies, plans and strategies for biodiversity must be considered, relevant scientific information needs to be gathered and considered, and stakeholders need to be involved and their values incorporated.

This 'biodiversity-inclusive' impact assessment should be applied to projects through Environmental Impact Assessment (EIA) and to policies, plans and programmes through Strategic Environmental Assessment (SEA). The CBD Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment (2006) reflect this position⁴⁷.

B.1.3 Science, values, regulatory tools and biodiversity

Impact assessment and decision making are influenced by international conventions, SADC (and other regional) protocols, and the regulatory framework of a country or geographic area within that country. Both are informed by information gathered during the impact assessment process, both scientific information and local or traditional or indigenous knowledge (Figure B-1).

Broadly speaking, society's values at different scales are reflected in conventions, protocols and other regulatory frameworks. As the value systems of society change in response to new information and evolving cultures, they will – over time - influence these frameworks.

It is of the utmost importance that impact assessment, through the evaluation of the significance of impacts, draws both on science and value systems; stakeholder participation plays a key role in finding out the values of an affected society. Similarly, decision makers, in satisfying regulatory requirements, must draw on both science and values; by ensuring that stakeholder participation during the impact assessment has been adequate, and by good co-operative governance with other affected departments, ministries or governments.

B.2 How do human activities impact on biodiversity and ecosystem services, and vice versa?

Humans, with their cultural diversity, are an integral part of ecosystems. For this reason, our activities can affect different components of our ecosystems, and those ecosystems in turn can have a variety of effects on human activities and associated wellbeing.

⁴⁷ Convention on Biological Diversity (2006): *Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment*. Adopted at the COP-8 meeting, March 2006, Curitiba, Brazil.

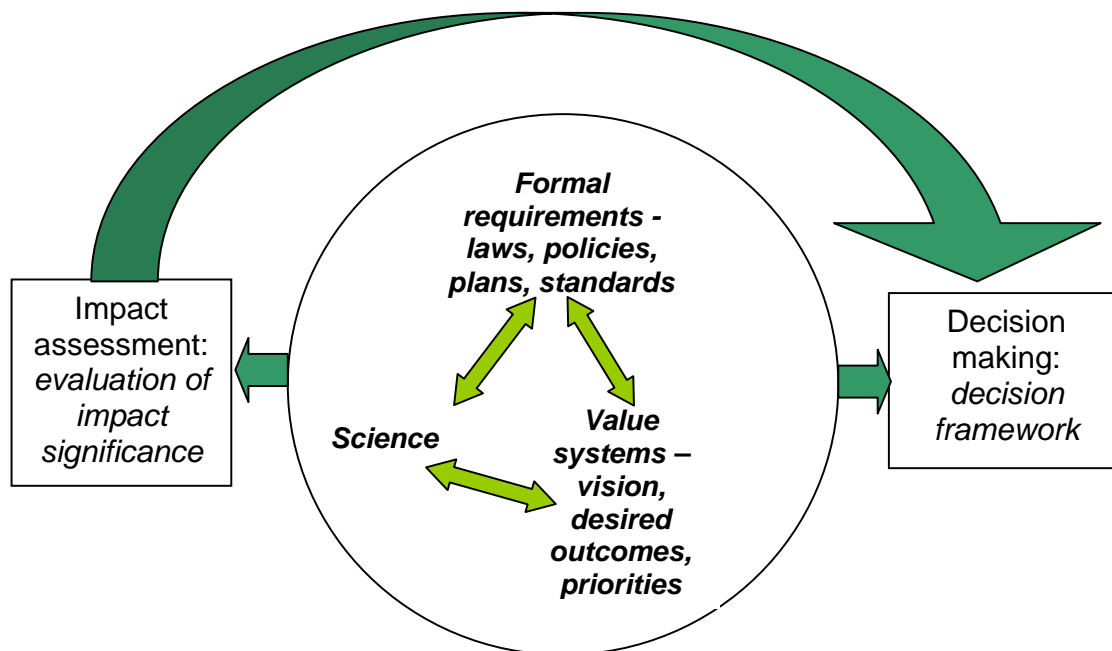


Figure B-1: Science, values and regulatory frameworks

B.2.1 What can cause impacts on biodiversity and ecosystem services?

Human activities can be **direct drivers** of change to biodiversity and ecosystem services, either by causing changes in the natural environment, or as a result of social and micro-economic changes that are known to affect the natural environment (Activity 1 in Figure B-2)⁴⁸. Impacts common to specific sectors are highlighted in Part F of this guidance document.

In addition, human activities can be **indirect drivers** of change through changes in social, cultural and economic policies or practices (Activity 2 in Figure B-2).

Of particular importance with regard to human activities impacting on biodiversity are the following points:

- Conversion of natural habitat is the main cause of loss of biodiversity world-wide.
- Alien organisms, once introduced, can invade local ecosystems, ousting the indigenous plants and/or animals and changing these ecosystems. Invasion of natural or semi-natural habitat by alien organisms is the second biggest culprit responsible for loss of biodiversity and degradation of ecosystems
- The fragmentation of natural habitat interferes with ecological processes at a landscape scale, isolates living communities, and can lead both to loss of biodiversity and a reduction in the viability of ecosystems in the long term.

⁴⁸ Adapted from the UNEP Convention on Biological Diversity (2006): Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment. Adopted at COP-8, March 2006, Curitiba, Brazil.

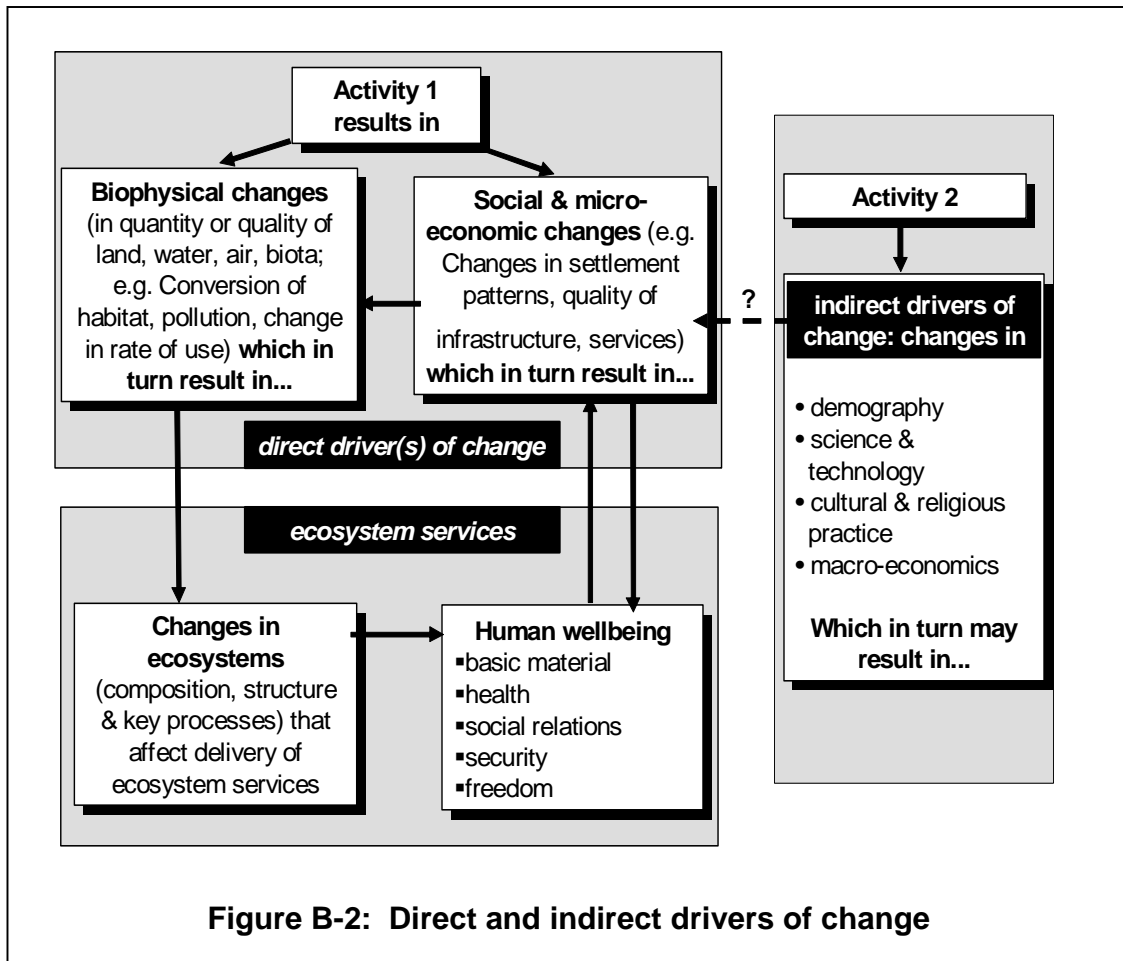


Figure B-2: Direct and indirect drivers of change



Mega-infrastructure projects such as bulk water supply, dams and highways can radically change land use in both the immediate and distant areas © P.Tarr and B.Walmsley

EXAMPLE: DIRECT DRIVERS OF CHANGE

- *Agriculture, mining, commercial forestry, housing and infrastructure development invariably results in clearing of natural vegetation, changes in drainage patterns, and destruction of habitat for wildlife. The clearing of vegetation could in itself destabilise soils, change local water balances, encourage the spread of alien organisms, or result in the loss of pollinators that are important for local crop production.*
- *Industrial development often results in water pollution that affects a range of organisms and ecosystems, and may change the quality or quantity of available drinking water.*
- *Damming or extraction of surface water within a catchment can drastically reduce the water available to downstream users and ecosystems. The reduced water flows can in turn result in changes in water quality, and changes in the structure, composition and processes in fresh water ecosystems.*
- *Pumping of groundwater can lead to a drop in the water table, in turn leading to drying up of boreholes and wetlands and, when close to the coast, intrusion of salt water into the fresh water aquifer.*
- *Development in remote areas may open up previously inaccessible natural resources to people, introducing an entirely new set of demands on the affected ecosystems.*
- *Development may place constraints on the type of ecological processes that can occur in an area, thus affecting the long-term structure and composition of affected ecosystems. For example, large mammals play a key role in determining the structure and composition of savanna ecosystems and their exclusion would have a major effect. Similarly, fire is essential to maintain fynbos ecosystems; where development excludes fire, those ecosystems will not be maintained.*

Any or all of these effects could lead to a reduction in livelihood security or quality of life.

EXAMPLE: INDIRECT DRIVERS OF CHANGE

- *Collapse of national or local economies and/or the breakdown of infrastructure and services can force people to 'mine' ecosystem goods and services (e.g. deforestation, overfishing, etc.) as a last resort to ensure their survival.*
- *The spread of HIV/AIDS has a number of consequences, not least amongst these being an increase in the number of people who leave formal employment and rely increasingly on subsistence agriculture or fisheries for their livelihoods. The resulting shift in demand on ecosystem goods and services can result in a suite of effects on biodiversity.*
- *Changes in trade agreements between countries can lead to incentives to switch crops or increase production of certain goods; these changes in turn will lead to different pressures on biodiversity and ecosystem services.*

B.2.2 How can natural processes impact on development and human wellbeing?

Different ecosystems provide a range of different opportunities for, and constraints to, development. In order for development to be sustainable, we need to respect, and live within the boundaries set by, these opportunities and constraints. Stated another way, we need to '**design with nature**'. Highly mobile and dynamic ecosystems pose a particular challenge to

development: shifting dunefields, floodplains, and the changing position of a river mouth are but some examples of these systems.

In some cases, natural processes can have a major impact on human wellbeing: floods, erosion of coastlines, outbreaks of disease, landslides and dust-storms are a few examples. In many instances, human interference with ecological processes has increased the severity of their impact.

THE CONSEQUENCES OF INTERFERING WITH ECOLOGICAL PROCESSES

EXAMPLE: HURRICANE KATRINA, NEW ORLEANS⁴⁹

Background: *The city of New Orleans in the state of Louisiana, USA, was built on marshland in the floodplain of the Mississippi River. The first part of the city was built on natural river levées along the river. Then, drainage of the formerly marshy ground allowed the city to expand. However, this drainage resulted in subsidence, making those areas more prone to periodic flooding. Indeed, since 1878 the city has sunk by 4.6m, meaning that nearly 80% of New Orleans lies below sea level—more than 2.5m below in places. The main causes of subsidence were pumping of groundwater, dewatering of marshland, soil compaction, building levées on the Mississippi River and reducing sediment supplies to coastal areas. Furthermore, significant areas of Louisiana’s coastal wetlands have been reclaimed or developed for oil and gas exploration and production activities, thus reducing their ability to act as sponges and flood regulators. In addition to man-made perturbations, Louisiana is losing its protective fringe of marshes and barrier islands faster than any place in the U.S.A: since the 1930s some 4,900 square kilometres of coastal wetlands have vanished beneath the Gulf of Mexico. Despite nearly half a billion dollars spent over the past decade to stem the tide, the state continues to lose about 65 square kilometres each year, making the coast and its inhabitants particularly vulnerable to storm surges and extreme weather conditions.*

Consequences: *Against this background, it is hardly surprising that when Hurricane Katrina hit the city on the 29 August 2005, about 80% of the city of New Orleans was flooded, with some parts of the city under 6m of water. Over 1,100 deaths were recorded. The flood was called "the largest civil engineering disaster in the history of the United States". Although the magnitude and intensity of Hurricane Katrina would have undoubtedly wreaked havoc along the coastline even under pristine conditions, the severity of the impacts would not have been so devastating if human beings had not interfered with the natural coastal protective systems and built in such a dynamic environment as a river delta.*

EXAMPLE: INTERFERING IN COASTAL SYSTEMS IN SOUTH AFRICA

Along many parts of the South African coast, large areas of coastal sand dunes have been stabilized for residential or other infrastructure development. The stabilization of these dunes has effectively starved downstream ecosystems of their sand supply – the sand that would normally move along the coast and maintain wide sandy beaches popular with visitors and tourists, has been ‘tied up’ in the dunes. In some areas, e.g. Cape St Francis in the Eastern Cape, consideration is being given to establishing artificial reefs to ‘nourish’ the beaches with sand, at considerable cost.

⁴⁹ http://en.wikipedia.org/wiki/Effect_of_Hurricane_Katrina_on_New_Orleans (accessed May 2006)

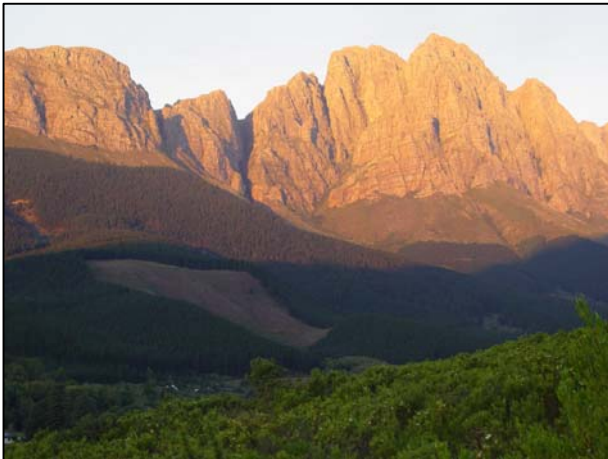
In other coastal areas, development has been allowed within the mobile dune systems, often with disastrous consequences: in Still Bay, on the south coast of South Africa, holiday houses have been buried in moving sand; some coastal roads are continually being inundated with moving sand.

Estuaries are amongst our most productive ecosystems. Development within the flood plains and/or on wetlands associated with these ecosystems has led to flooding in some instances, and reduction in the abundance of bait organisms and fisheries in others.

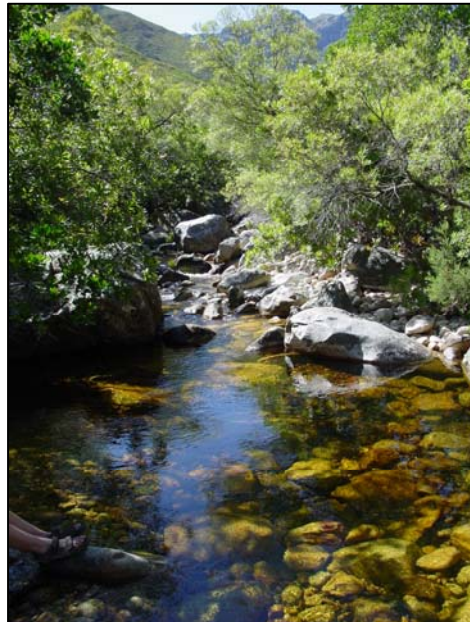
EXAMPLE: INTRODUCTION OF ALIEN INVASIVE ORGANISMS

The introduction of alien organisms into our indigenous systems can have major consequences if these organisms 'invade' local systems. They can change the structure, composition and ecological processes in affected ecosystems, and thus the ecosystem services that they provide. In South Africa, around seven percent of mean annual run-off is being lost to invasive alien plants that were introduced largely for commercial forestry purposes but have spread into catchments and drainage lines. These alien plants increase the risks of fire, soil erosion and flooding. These invasions can have a major negative impact on the economy. For example, in the Cape Floristic Region, the costs of lost ecosystem services due to alien invasive plants are estimated at about R700 million per annum (2000 figures).⁵⁰

Similarly, alien water plants such as the water hyacinth can reduce the quality of drinking water, increase flood damage, interfere with water-based transport, clog water pipes, interfere with hydroelectricity generation, and promote water-borne diseases, amongst others.



South Africa's Western Cape Province has been severely impacted by alien plants. These have displaced indigenous species and slowed the flow of countless rivers. © P.Tarr



⁵⁰ Turpie JK and BJ Heydenrych (2000). Economic consequences of alien infestation of the Cape Floral Kingdom's Fynbos vegetation. In *The Economics of Biological Invasions*. Eds C Perrings, M Williamson and S Dalmazzone. Edward Elgar, Cheltenham, UK.

B.3 Good practice impact assessment, and consideration of biodiversity and ecosystem services

The following principles should be applied during impact assessment at either strategic or project levels (refer to Part D on Strategic Environmental Assessment, and Part E on Environmental Impact Assessment, for more detailed information). The Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment give valuable information on this and related respects⁵¹.

B.3.1 Use the ecosystem approach

The ecosystem approach is advocated by the Convention on Biological Diversity. It recognizes that people and biodiversity are part of the broader ecosystems on which they depend, and that they should thus be assessed in an integrated way⁵². The main principles for implementing the Ecosystem Approach are given in Box B-1.

Box B-1: Principles of the Ecosystem Approach

- The objectives of ecosystem management are a matter of societal choice.
- Ecosystem managers should consider the effects of their activities on adjacent and other systems.
- Conservation of ecosystem structure and functioning, to maintain ecosystem services, should be a priority target.
- Ecosystems must be managed within the limits of their functioning.
- The approach must be undertaken at appropriate spatial and temporal scales.
- Objectives for ecosystem management should be set for the long-term.
- Management must recognise that change is inevitable.
- The approach should seek an appropriate balance between, and integration of, conservation and use of biodiversity.
- All forms of relevant information should be considered.
- All relevant sectors of society and scientific disciplines should be involved.

⁵¹ <http://www.eia.nl/ncea/pdfs/biodiversityeisea.pdf>

⁵² Shepherd G (2004). *The Ecosystem Approach: Five Steps to Implementation*. Ecosystem Management Series No 3. IUCN Commission on Ecosystem Management. IUCN, Cambridge.

B.3.2 Apply 'positive planning', looking at opportunities and constraints

Ideally, biodiversity pattern and process, and ecosystem services, should be considered proactively at *the earliest possible stage of planning*, be it at strategic or project level (Box B-2). The more advanced the planning, the less flexibility there is for considering alternatives that would best meet sustainable development objectives. In other words, one should strive to plan and 'design *with nature*'⁵³. The opposite of 'positive planning' is shown in Figure B-3 below⁵⁴.

| Box B-2: Positive Planning |
|--|
| <p>Positive planning encourages:</p> <ul style="list-style-type: none"> ○ An early analysis of the opportunities and constraints posed by the natural environment. ○ The early identification of alternatives that could avoid or prevent significant impacts on biodiversity and ecosystem services. ○ The early identification of alternatives that could enhance and secure benefits for safeguarding biodiversity and ecosystem services. |



Figure B-3: The opposite of 'positive planning'

B.3.3 Always consider alternatives

Good planning and impact assessment should clearly identify and select those alternatives that offer the greatest overall benefits and avoid undesirable impacts for the good of society. Decision making, too, should strive to this end. That is, the ***evaluation of alternatives is an essential part of impact assessment and decision making.***

⁵³ Ian L McHarg (1969). *Design with Nature*.

⁵⁴ Source: Tandberg (1990). In: Bryant M (ed). *Turn Over a New Leaf – Green Cartoons for CARE*. Earthscan, London.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁵⁵

- *There seemed to be a fairly low level of awareness amongst both authorities and key stakeholders of the need to consider alternatives in impact assessment.*
- *Alternatives are frequently poorly addressed, or considered too late in the process to be meaningful.*

Where reasonable alternatives are not considered in impact assessment and decision making, these decisions are invariably flawed and open to challenge by stakeholders, leading to delays and costs. Where there is thorough consideration of alternatives, stakeholder buy-in is achieved and an optimum proposal emerges. Two examples, both involving the development of a golf course and residential estate, are given below to illustrate these points.

EXAMPLE: POOR CONSIDERATION OF ALTERNATIVES, SOUTH AFRICA

Proposed development: *A golf course with residential and tourism components, on the banks of a major river and next to a nature reserve and conservancy. The site of development contained sensitive components, in that it is classified as a 'biodiversity hotspot' by the provincial environmental authority. It lies partly within the Cradle of Humankind World Heritage Site, and contains a number of Red Data Book species of birds, mammals, invertebrates and flora.*

Potential significance of impacts on biodiversity: *All of the specialists involved in the EIA identified negative impacts with a 'very high' and 'high' significance. They stated that these ratings could be reduced if the site layout were changed to protect the areas of high ecological sensitivity. No changes were made. The draft scoping report concluded that impacts would be 'low' in spite of the fact that the site layout was not altered at all.*

The impact assessment: *The environmental authority stated early on in the planning process that the EIA would have to clearly address, amongst other issues, the need and desirability of the development, loss of habitat, loss of migration corridors, open space connectivity, impacts on fauna and flora, with particular attention to Red Data species. The authority requested a sensitivity map which would show the sensitive areas in relation to the layout of the proposed development.*

The decision: *The authority approved the development, in spite of the fact that many of its own requirements were not met by the EIA. The Record of Decision was appealed on the basis of, amongst others, lack of consideration of alternatives, inconsistency with government policy, and inadequate information on biodiversity.*

Key lesson/s: *Poor consideration of alternatives led to appeals on the decision and development delays.*

EXAMPLE: GOOD CONSIDERATION OF ALTERNATIVES, SOUTH AFRICA

Proposed development and potential significance of impacts on biodiversity: *A golf course, with residential and commercial/tourism components. The site of development contained sensitive components, namely a seasonal wetland and seepage area, and an area of Critically Endangered indigenous vegetation within the global biodiversity hotspot of the Cape Floristic Region.*

⁵⁵ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

The impact assessment: Five alternatives were considered, informed by input from the environmental authority, local authorities, the biodiversity agency, agriculture and water authorities, and key non-government organizations. The final scale, layout and design of the proposed development responded fully to the opportunities and constraints of the natural environment.

The decision: The authority approved the development. Stakeholders responded positively to the outcome of the impact assessment.

Key lesson/s: Good consideration of alternatives at the outset, and throughout the process, resulted in a positive outcome for the proponent and stakeholders.

B.3.4 Ensure sustainable use

Sustainable use of biodiversity means that harvests of renewable natural resources can be maintained over time. That is, the rate of harvest (or fishing or culling) is either the same as, or less than, the rate of replenishment or regeneration of that resource.

Sustainable use of ecosystem services means that essential life-support systems can be maintained over time. That is, the biodiversity underpinning the ecosystem service is safeguarded to ensure that both the quality and quantity of that service does not deteriorate.

The sustainable use of biodiversity and ecosystem services is essential for securing sustainable livelihoods. The example of the introduction of the Nile perch into Lake Victoria (Section A.5.2) highlights the unsustainable use of an ecosystem and its biodiversity.

B.3.5 Use a hierarchy in considering mitigation measures

There is a hierarchy of possible mitigation that can be used to avoid or reduce negative impacts (Box B-3). The emphasis in this hierarchy is on avoiding or preventing impacts, and/or reducing or minimizing them – the positive planning approach (described in B.3.2) is important here.

Box 3-2: The mitigation hierarchy

- **Avoiding or preventing** the impact through the early consideration of opportunities and constraints and development alternatives (positive planning) and by modifying the proposal accordingly;
- **Reducing or minimizing** negative impacts and maximising benefits, by considering alternatives and modifying the proposal;
- **Rectifying** negative impacts by restoring the affected environment to its previous condition, or rehabilitating it for a different land use; and
- As a 'last resort', **providing an offset to compensate** for the residual negative impact on biodiversity or ecosystem services, by replacing or providing 'like for like or better' substitutes for these impacts. *In cases where residual impacts affect threatened, unique or irreplaceable biodiversity, offsets are not an option as substitutes do not exist.*

Unfortunately, it seems that both consultants and decision makers in the SADC region often ignore this hierarchy.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁵⁶

- *The consideration of biodiversity 'too late' in the impact assessment frequently means that mitigation focuses on damage limitation rather than avoiding or preventing the impact.*
- *Mitigation measures recommended in impact assessments are often no more than ambitious and vague statements of intent, on the basis of which the potential significance of impacts is reduced. In many cases the authorities do not appear to critically evaluate the substance of the proposed mitigation measures, and accept the residual significance ratings without question.*
- *In some cases, reference was made to offsets as motivation for allowing loss of biodiversity, whilst mitigation options higher up in the mitigation hierarchy had been effectively ignored.*

Examples of appropriate and inappropriate use of offsets are given below.

EXAMPLE: INAPPROPRIATE USE OF OFFSETS AS MITIGATION

Proposed development and potential significance of impacts on biodiversity: *A film studio plus housing development that would result in the loss of significant urban wetland. The lost wetland potentially plays an important role in flood regulation and water cleansing in the area, and it forms part of a 'priority' biodiversity corridor in the city. Its loss could increase downstream flooding, affecting poor and vulnerable downstream communities, and could result in the loss to the city of significant biodiversity.*

The impact assessment: *Did not consider alternative locations for the proposed development, but looked at development alternatives on the site that would be 'financially viable' to the proponent. The socioeconomic benefits of the project were emphasized.*

The decision: *Development was authorized on condition that a monetary offset was provided to compensate for the loss of wetland habitat.*

Key lesson/s: *There are no opportunities to re-create the lost wetland within the city, and its loss is thus considered to be irreplaceable in that context. The monetary offset is inappropriate; it would not satisfy the objective of avoiding loss of biodiversity. Alternative locations for the proposed development should have been investigated within the city's limits.*

EXAMPLE: APPROPRIATE USE OF OFFSETS AS MITIGATION

Proposed development and potential significance of impacts on biodiversity: *A proposed resort and housing development that would have an unavoidable residual negative impact on Endangered vegetation on the affected property.*

⁵⁶ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

The impact assessment and decision: *The development would have substantial benefits in terms of uplifting local communities. It was authorized on condition that a trust fund be set up to protect and manage the same Endangered vegetation on three other sites within the municipal area.*

Key lesson/s: *The type of offset would make a assured and positive contribution to protecting threatened biodiversity and attaining conservation targets for the affected vegetation.*

Important to note

- *The consideration of alternatives – from the start of the planning and impact assessment process and throughout that process – is of the utmost importance in effective mitigation.*
- *Mitigation measures themselves may have impacts that need to be assessed and evaluated. For example, securing an area of natural habitat as an acceptable offset for an area to be mined may affect the use of, and/or access or rights to that land by local communities who rely on it for their livelihoods.*
- *Mitigation measures proposed by one specialist may themselves present as impacts in another field, which then need to be addressed (e.g. a proposal by the engineer to fill in a wetland to increase the area for development is likely to have significant biodiversity effects).*

B.3.6 Always apply the Precautionary Principle

The Precautionary Principle states that “where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation”⁵⁷.

Simply stated, if we are not sure what’s going to happen as a result of doing something, and the effects could be severe and irreversible, and could compromise our future, we should avoid taking any risks. Action to avert serious or irreversible environmental damage may be required before scientific certainty of the harm exists, and by the time we have gathered enough evidence to be certain, it may be too late to act⁵⁸.

The combination of **uncertainty** and the **risk of irreversible effects** or **loss of irreplaceable resources** summarises the challenge to decision-makers with regard to the sustainable use and development of natural systems⁵⁹.

⁵⁷ The Rio Declaration (1992) and the preamble to the Convention on Biological Diversity (1992).

⁵⁸ The Precautionary Principle Project: www.pprinciple.net (accessed July 2006) A joint initiative of Fauna & Flora International, IUCN–The World Conservation Union, TRAFFIC–the wildlife monitoring programme, and Resource Africa.

⁵⁹ Sadler B (1996). *International Study of the Effectiveness of Environmental Assessment*. Final Report. Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance. CEAA and IAIA.

Important to note:

- An **irreversible impact** is one that arguably cannot be reversed in time (e.g. decrease in area of a specific vegetation type, loss of genetic diversity through reduction in size of populations of a particular species). Some, but not all, irreversible impacts will lead to irreplaceable loss of biodiversity. They may, or may not, be acceptable to society or stakeholders in terms of their current values.
- An impact causes **irreplaceable loss** when it results in the loss of a resource without substitute, and which cannot be replaced. An impact leading to irreplaceable loss of biodiversity is, by definition, irreversible.

Box B-4 describes the terms 'risk', 'hazard', 'uncertainty'. Society as a whole, or affected parties in particular, choose the level of risk and/or hazard that they are prepared to accept. Where there is uncertainty and the probabilities of impacts - or their significance - cannot be determined with confidence, and/or the opportunity costs of choosing a particular path could be high, it is wise to apply caution in decision making.

Box B-4: Risk, Hazard, Uncertainty, and the Precautionary Principle

- **Risk:** The likelihood of a significant impact, a hazardous impact, an irreversible impact, or impact leading to irreplaceable loss, occurring.
- **Hazard:** Anything that has a known potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was.
- **Uncertainty:** The inherent unpredictability of response of the environment to an impact, the lack of knowledge and/or understanding of cause-effect-impact relationships between the activity and the environment, and/or gaps in information that don't allow confidence in predictions of impacts. Uncertainty is inevitably linked to an unprecedented activity (i.e. something that has not been done before). Also, it is common in complex ecosystems (e.g. the Okavango Delta).

Interesting to note: Findings of the Situation Assessment, Southern Africa⁶⁰

- *Gaps in information, uncertainty and risks to biodiversity are seldom taken into account in impact assessment or decision making.*
- *There is little if any explicit attention directed at linking uncertainty and risk to the potential for irreversible effects or irreplaceable loss of biodiversity.*
- *The failure of impact assessment to spell out the implications of uncertainties, gaps in information, and risks, is rated as one of its main shortcomings.*
- *Terms of reference for EIA and SEA must ensure that uncertainties, risks, gaps in information, and the implications for decision making, are clearly spelt out.*

The following points are pertinent:

- Loss of biodiversity is frequently irreplaceable; extinction is forever. Negative impacts on ecosystem services are also often irreplaceable, or replaceable only at great cost.
- Changes in biodiversity can affect how an ecosystem works. While some of these impacts can be predicted, others can't. As biodiversity decreases, ecosystem services deteriorate.
- Climate change is altering the face of our region, and with it, many of the ecosystems and associated services on which we depend.
- Loss of biodiversity pattern and process undermines the resilience of ecosystems and their ability to evolve and adapt to changing conditions. Our own ability to adapt to such things as climate change would be compromised should we allow loss of biodiversity.

Clearly, the penalties for taking decisions that allow for loss of biodiversity and negative impacts on ecosystem services could be substantial. In addition, they could be contrary to the goal of sustainable development, namely not to compromise the ability of future generations to meet their own needs.

Box B-5 gives guidance on the application of the precautionary principle in practice⁶¹. ***When risk and uncertainty levels are both high, it is essential to apply the precautionary principle strictly.***

⁶⁰ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

⁶¹ Brownlie S (2005). *Guideline for Involving Biodiversity Specialists in EIA Processes: Edition 1*. CSIR Report No ENV-S-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

Box B-5: Applying the precautionary principle

The following considerations should be applied:

| | |
|--|---|
| <p>For a critically endangered or endangered ecosystem or species, a protected ecosystem or species, a previously un-recorded species or species about which little is known, and/or for ecosystems or species that play a significant role in supporting lives or livelihoods, where impacts could be of high significance, irreversible, lead to irreplaceable loss of natural capital, and/or there is little prior experience or scientific confidence about the outcome:</p> | <p>Follow the strict precautionary principle.</p> <p>Impacts should be confined within the realm of complete reversibility, and only those activities which have been shown to pose negligible risks to biodiversity should be permitted. Mitigation, including offsets should totally and reliably compensate for impacts on biodiversity to ensure no change in conservation status, providing for a margin of error where there may be uncertainty as to the effectiveness of mitigation.</p> |
| <p>For a vulnerable ecosystem and/or species, and/or for ecosystems or species that play a role in supporting lives or livelihoods where impacts could be long-term and significant:</p> | <p>Only those human-induced activities which pose low risk to biodiversity should be permitted. Impacts should be mitigated in full and, in a 'worst case' scenario, residual impacts should be offset to ensure that there would not be a change in status to 'endangered'. Where there is uncertainty as to the likely effectiveness of mitigation, a margin of error should be provided.</p> |
| <p>For an ecosystem and/or species which is currently not threatened and/or not known to play a role in supporting lives or livelihoods:</p> | <p>Human-induced activities which pose some risk to biodiversity should be permitted. However, impacts must be mitigated and offset as far as practicable.</p> |

The examples below illustrate the need for a precautionary approach when there are gaps in information and alternatives have not been addressed.

EXAMPLE: GAPS IN INFORMATION, LACK OF PRECAUTION, SOUTH AFRICA

Proposed development: Housing estate within the buffer zone of a UNESCO Biosphere Reserve.

Potential significance of impacts on biodiversity: About 80% of the site constituted a well-established wetland/seepage area of importance to biodiversity, and a main drainage route to a significant wetland system downstream.

The impact assessment: A specialist study as part of the impact assessment focused on vegetation only. This study made a number of recommendations as to the need for more detailed studies on hydrology, threatened plant species, and the role of the site in the broader wetland system, in order to evaluate reliably likely impacts. No such studies were commissioned. The proposed development places housing in areas of 'high' to 'extreme' sensitivity, that were specifically recommended for exclusion from housing development by the specialist. Two of the three alternatives proposed by the specialist as development options were not addressed. A previous study for the proposed development, undertaken by a geohydrologist/ecologist, was effectively ignored in the impact assessment. This study concluded that the site should not be developed.

The decision: *The development was initially approved, but authorization was subsequently denied on appeal.*

Key lesson/s: *Major gaps in information, disregard of specialist input and recommendations with regard to alternative proposals, as well as disregard for indications that additional specialist studies were necessary to produce a reliable EIA, led to the proposed development being turned down.*

EXAMPLE: INADEQUATE CONSIDERATION OF GAPS IN INFORMATION - CASE STUDY FOR HYDROPOWER SCHEME, TANZANIA⁶²

Proposed development: *The hydropower scheme comprises three hydropower turbines to generate electricity in the Kihansi Gorge, with provision for an additional two turbines in future. Infrastructure comprises a gravity dam (25m high) with a storage volume of 1 million m³ taking up about 26ha, a vertical intake shaft connecting to the headrace tunnel and the underground power house. Most of the water is diverted from the falls in the Gorge, and then channeled back to the river.*

Potential significance of impacts on biodiversity: *The Kihansi Gorge lies in the Eastern Arc Forests, of global and national importance for biodiversity conservation. The large cloud of spray from the falls in the Gorge creates a unique habitat near the base of the falls; a new species of toad (Kihansi Spray Toad) with an extremely restricted distribution (about 4ha in total) was discovered in late 1996 during planning for long-term environmental monitoring. Several new or endemic species were found in the Gorge, including 4 new species of plant and a range of threatened species. Fish species in the river are significant from a biodiversity perspective. A number of NGOs and the scientific community raised concerns about the potential irreversible loss of biodiversity in the Kihansi Gorge as a result of the project; in particular, the unique toad population was at risk of extinction through a 95-99% loss of spray-maintained habitat.*

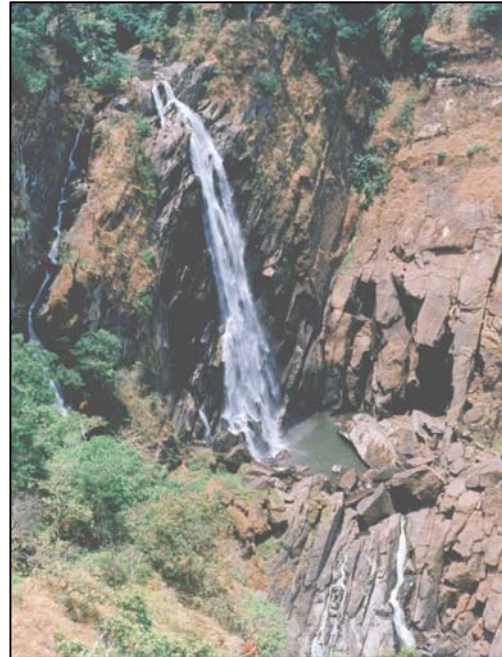
The impact assessment: *Not legally required, but carried out to meet donor funding requirements. The original impact assessment (1990) was largely a desk study and failed to pick up important issues; the limited on-site investigation was based mostly on hear-say evidence from local villagers and omitted any survey of the most environmentally sensitive region (the Kihansi Gorge) downstream of the proposed dams. An additional impact assessment (1991) relied to a large extent on desk studies, interviews of local inhabitants and an extremely limited field survey which dealt only with trees, birds and mammals; no survey was undertaken in Kihansi Gorge itself. A more comprehensive EIA (1994) provided more detailed information and included surveys within the Gorge, but time constraints prevented it from adequately covering the vulnerability of the spray wetland ecosystems in the Gorge.*

The decision: *No formal decision linked to EIA. Construction of the Lower Kihansi Hydropower Project started in 1994, it was officially opened in July 2000.*

Key lesson/s: *There was inadequate information to inform the decision on the proposed hydropower project from a biodiversity / ecosystem services perspective. This case study also highlights the importance of addressing alternatives - had probable impacts of the Lower Kihansi Hydropower project within the Kihansi Gorge been identified earlier, the Upper Kihansi Hydropower project (proposed in conjunction with the former) could have been selected for construction first to allow*

⁶² Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

time for detailed studies in the Kihansi Gorge to be carried out prior to further development of the Lower Kihansi project. The Upper scheme would have had far lower impacts on the Kihansi Gorge ecosystems, as the water used for power generation would be returned to the Kihansi River upstream of the Gorge.



Main Kihansi Falls from the Mhalala viewpoint late in the dry season. left: 14 October 1998, right: 8 October 2000, once all three turbines were operational (courtesy: Peter Hawkes, AfriBugs cc)

B.3.7 Ensure equitable sharing

The Convention on Biological Diversity and the Ramsar Convention require that development ensures the fair and equitable sharing of benefits arising from the use of biodiversity. In line with sustainable development, the needs of future as well as current generations must be considered, and alternatives must be sought that don't irreversibly 'cash in' biodiversity capital to meet short-term needs.

Where the negative impacts of development lead to an increase in vulnerability of poor people, and/or where society as a whole is left worse off with regard to ecosystem services as a result of development that benefits a few relatively wealthy parties, the condition of equitable sharing is not met.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁶³

- *Distributional effects of impacts on biodiversity and/or ecosystem services are seldom explicitly or specifically addressed in impact assessment or decision making.*

⁶³ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

Equitable sharing also applies to the fair access to natural resources. It has been shown that insecure tenure or access to natural resources discourages sustainable natural resource management⁶⁴. (Please also refer to A.5.4 with regard to social justice and equity.)

B.3.8 Apply these other common principles in SEA and EIA

In addition to the above points, the following principles should be applied during impact assessment at either strategic or project levels (refer to Parts D and E for more detailed information):

- **Involving all relevant stakeholders**, particularly those authorities responsible for biodiversity conservation, those groups with an interest in biodiversity and those parties who currently use or have access to, directly or indirectly rely on or benefit from, affected ecosystems.
- **Using all available and relevant information, including local, traditional and indigenous knowledge**. As well as scientific information, other types of information about, and values of, the affected biodiversity and ecosystem services, must be gathered and used.
- **Defining time and space boundaries of the study**. It is essential to 'set the scene' and the scope of the SEA or EIA, to ensure that it is sufficient to enable the impacts within and between ecosystems to be addressed, and to allow both long and short term impacts on biodiversity and ecosystem services to be considered.
- **Drawing up good Terms of Reference**. Good Terms of Reference are essential to ensure that answers to questions about impacts on biodiversity, ecosystem services and associated human wellbeing will be answered in the impact assessment and related specialist studies⁶⁵. Where the Terms of Reference are inappropriate (e.g. focus only a specific site rather than the broader landscape, or on a specific stretch of river excluding downstream impacts), the impact assessment will not be reliable or useful as a planning and decision making tool.



Hot tips!

- **Plan and design with nature**, striving to avoid or minimize negative impacts on biodiversity, natural processes and valued ecosystem services through adopting 'positive planning'.
- **Remember that we are part of ecosystems** and rely on them for our lives and livelihoods.
- **If natural systems are not respected, they can 'bite back'**.
- **Enable and ensure participation of key stakeholders** who have an interest in, or depend on, biodiversity and/or ecosystem services.
- **Use good science and all relevant information, but don't forget values** attached to biodiversity and ecosystem services.

⁶⁴ World Resources Institute in collaboration with the UNDP, UNEP and the World Bank (2005). *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. World Resources Institute, Washington DC

⁶⁵ http://www.capegateway.gov.za/Text/2005/10/deadp_biodiversity_guideline_june05_final.pdf

- **Apply the mitigation hierarchy** where *avoiding* impacts is better than *reducing* impacts.
- **Consider alternatives continually** as the best strategy to reach the best development.
- **Always think about the risks and consequences of impacts where there are gaps in information or uncertainty, and where there may be a lot (irreversibly) to lose!**
- **Make sure that society as a whole, and vulnerable people in particular, don't 'lose' from development,** particularly where those that benefit are few and relatively well off.

PART C: AIMS AND OBJECTIVES OF DECISION MAKING, TAKING INTO ACCOUNT BIODIVERSITY AND ECOSYSTEM SERVICES

In this Part of the guidance document, you will find the following sections:

- C.1** Good governance and administrative justice in decision making
 - C.1.1 Principles of good governance*
 - C.1.2 Administrative justice in decision making*
- C.2** Making decisions to achieve sustainable development
- C.3** Criteria and desired outcomes for decision making to support the objectives of sustainable development
- C.4** Cooperative governance at SADC and national levels
- C.5** Deciding on the appropriate level of impact assessment – SEA or EIA
 - C.5.1 Definitions*
 - C.5.2 SEA and EIA as complementary tiers of impact assessment*
 - C.5.3 Dealing with cumulative effects*
- C.6** Decision making in a strategic vacuum
- C.7** Dealing with uncertainties, gaps in information and risks
- C.8** Dealing with lack of capacity within regulatory authorities

C.1 Good governance and administrative justice in decision making

Good governance is especially important in the context of biodiversity because the biophysical environment cannot speak for itself. Thus governments have a responsibility to adopt a long-term view for a nation's development as the principal custodians of the environment. As noted in Part A.3, southern Africa has a disproportionate fraction of global biodiversity, and it also has a very high direct human dependency on ecosystem services. Thus any decision which affects biodiversity, could also have a long-term effect on the nation's development and human wellbeing.

C.1.1 Principles of good governance

The term 'governance' is a complex and multi-dimensional concept since it incorporates 3 key components⁶⁵, namely:

- A guiding **philosophy** or core set of agreed operating principles, i.e. public administration must be governed by the democratic values and principles enshrined in a country's constitution e.g. the right to an environment that is not harmful to health and wellbeing;

⁶⁵ Ashton, P. (2006). *The role of good governance in sustainable development*. In: AR Turton, DR Roux, M Claassen and J Hattingh (Eds.) *Governance as a Dialogue: Government-Society-Science in Transition*. Berlin: Springer-Verlag. 17 pages. (In press)

- The preferred '**process**' that guides the way people interact with each other and with administrative authorities, i.e. the country's legal framework relating to, for example, the Acts that govern impact assessment, biodiversity and natural resources; and
- A desired set of '**products**' or outcomes which are articulated in a country's hierarchy of conventions, protocols, policies, plans and strategies. For example, by signing the Convention on Biological Diversity the country is accepting a range of obligations to ensure certain outcomes relating to biodiversity management.

So what is 'good' governance? The five common principles of good governance are generally accepted to be:⁶⁶

1. **Openness and transparency:** where government institutions work in an open and transparent manner, communicating freely about what they do, and the decisions they take, using language that is accessible and understandable by the general public.
2. **Participation:** where the quality, relevance and effectiveness of policies, legislation, regulation and practice depend on wide public participation from conception to implementation. More to the point is that public opinion and comment is given due consideration both in the development of such documents, and in making decisions on projects which will affect public interests.
3. **Accountability:** where every person responsible for making decisions, from the Minister to the general public, takes full responsibility for what they do. There must be clear and explicit demonstrations of honesty by participants and leaders at all levels, human rights and freedoms must be protected, and the processes and decisions adopted are consistent with agreed policy outcomes and goals.
4. **Effectiveness:** to achieve the efficient, economic and effective use of resources, based on policies that are appropriate, as well as clear and agreed objectives, taking into account past experience and potential future impacts.
5. **Coherence and consistency:** where both policies and implementation actions are clearly aligned and well understood by all participants, and are consistent with other related initiatives within a complex system.

Sustainable development can only be achieved if all sectors of society co-operate and contribute to a common future. That is, it is important that there is strong collaboration between government, science (specialists), and society (including the business sector), as shown in Figure C-1. Decision making must draw on reliable information as well as the values of society and the socio-economic development imperatives of developing nations; impact assessment processes strive to ensure that the 'trialogue' between society, decision makers and specialists is adequate.

⁶⁶ European Union, 2001. Adapted from Ashton, P (2006). Op. Cit.

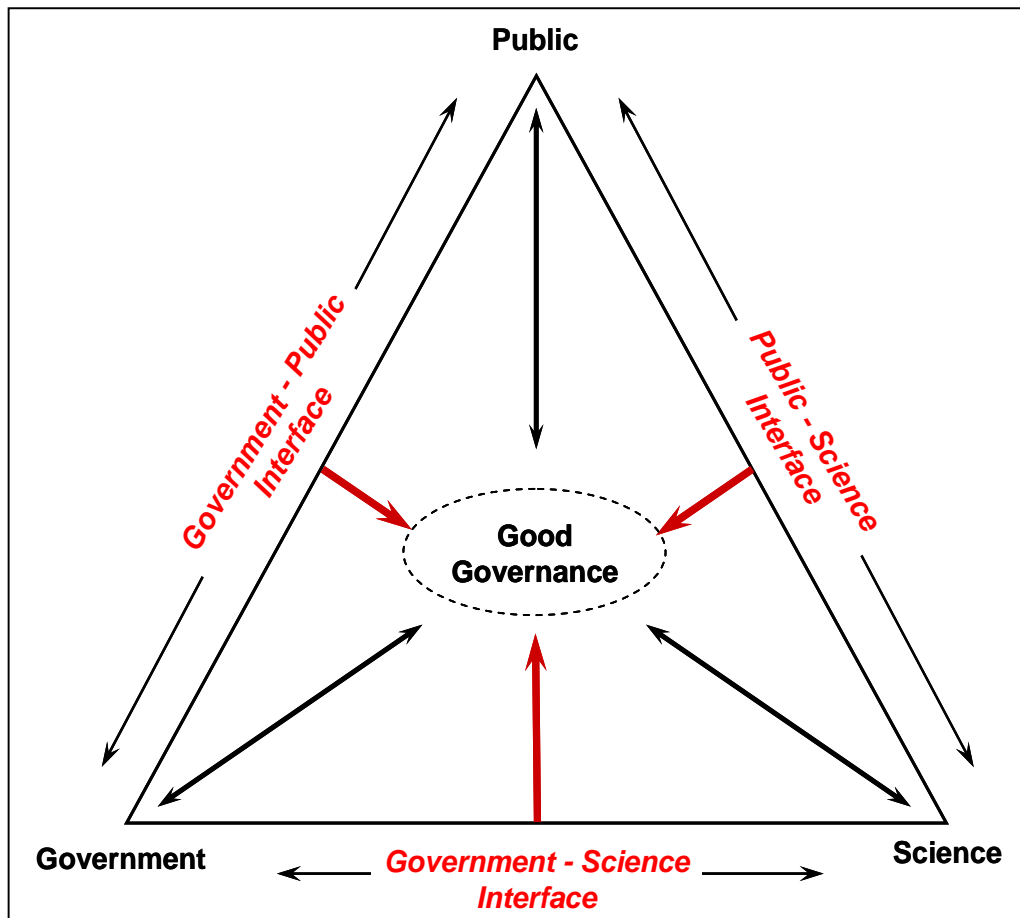


Figure C-1: Conceptual diagram illustrating the linkages and interfaces between the public, government and science, and their collective contribution to 'good governance'⁶⁷.



If Interested and Affected persons are not adequately consulted during development planning, they might resort to street protests in an attempt to be heard. Well designed public participation programmes channel energy into constructive dialogue that usually improves project design and implementation. © P.Tarr.

⁶⁷ Figure from Ashton PJ (2006). *The role of good governance in sustainable development*. In: AR Turton, DR Roux, M Claassen and J Hattingh (Eds.) *Governance as a Trialogue: Government-Society-Science in Transition*. Berlin: Springer-Verlag. 17 pages. (In press). This figure is modified and re-drawn from an earlier version of this figure in Turton AR, Hattingh J, Claassen M, Roux DR and Ashton PJ (2006). *Towards a model for ecosystem governance: An integrated water resource management example*. In: AR Turton, DR Roux, M Claassen and J Hattingh (Eds), *Governance as a Trialogue: Government-Society-Science in Transition*. Berlin: Springer-Verlag. 18 pages. (In press)

C.1.2 Administrative justice in decision making

Interesting to note:

Environmental conflicts often arise as a result of the incorrect or unjust use of administrative decision making powers.⁶⁸

In most democratic countries, the national constitutions afford citizens the right to administrative action that is **lawful, reasonable and procedurally fair**. Anyone whose rights have been adversely affected by administrative action has the right to be given a written response for the decision.

So, what are the requirements of lawfulness, procedural fairness and reasonableness?⁶⁹

- **Lawfulness:** when the state has a legal duty to act in a certain way and fails to do so, it is acting unlawfully.
- **Procedural fairness:** The procedure that the government follows in making an administrative decision must be fair. If there is a set of established rules that the government must follow in coming to the decision, then these must be properly adhered to, including the need to provide written reasons for making the decisions (see Part E.7). The decision can be challenged if the rules are not followed.

Interesting to note: Procedural Fairness Rule

*There is one rule that decision makers must always follow, even if there are no other established procedures in place. This rule requires that a person whose rights stand to be affected by an administrative decision, must be allowed to state his or her concerns before the decision is made. Decisions that are made without the affected parties being allowed to state their concerns is thus **an unfair decision**.*

- **Reasonableness:** Whether an administrative action is reasonable or not depends on the circumstances surrounding the decision e.g. environmental considerations against which the decision was taken. The questions that a court will ask to test if the decision was reasonable or not are:
 - Was the decision the most suitable one to make in the circumstances of the case?
 - Was the decision necessary?
 - Was the decision proportional? In other words, does it balance the requirements of all the people who will be affected by the decision i.e. the right to administrative or environmental justice.

⁶⁸ www.paralegaladvice.org.za

⁶⁹ www.paralegaladvice.org.za

C.2 Making decisions to achieve sustainable development

Over and above satisfying the principles of good governance and administrative justice in decision making, decision makers must take into account the overarching goal of sustainable development in making decisions.

Interesting to note:

A 'business as usual' attitude to decisions that affect the natural environment is making it difficult to change course to a more sustainable development orientated future⁷⁰.

Decision making for sustainable development requires critical examination of purposes and alternatives, needs to take into account the applicable regulatory framework, indirect and cumulative, as well as direct and immediate effects, uncertainties and risks, and scientific facts and societal values. It should seek to identify alternatives that offer the greatest overall benefits and avoid undesirable trade-offs, rather than merely enhancing or mitigating the effects of the already chosen options. It also needs an effective means of monitoring effects and enabling adaptive implementation of approved activities.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁷¹

In the SADC countries, consideration of biodiversity and ecosystem services in decision making is generally inconsistent. Decision makers do not seem to use any explicit decision criteria or criteria for making trade-offs in decision making. Neither the Records of Decision nor the outcome of appeals on Records of Decision reflected any clear rationale. In many instances it seems as if environmental consultants and decision makers are asking different questions of the environmental assessment process.

The **problem** with current decision making is that it frequently fails to adhere to the principles of sustainable development, due to a number of possible reasons as highlighted in the Situation Assessment:

- Decision makers' personal and/or professional opinions often count heavily in decision making.
- Decision making is often characterized by being 'short-term and reactive', ignoring the long-term consequences of irreversible and irreplaceable impacts on ecosystem services. That is, undesirable trade-offs are made between short-term socio-economic gains and long-term

⁷⁰ Goodland R and H Daly (1995). *Environmental sustainability*. In: Vanclay F and D A Bronstein (eds) *Environmental and Social Impact Assessment*, Chapter 14. John Wiley and Sons, USA.

⁷¹ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

impacts on those ecosystem services that support human wellbeing (see Example).

EXAMPLE: UNDESIRABLE TRADE-OFFS, SOUTH AFRICA

Case Study 1: *The decision maker on a proposed development noted numerous inconsistencies with spatial planning and land use policy, impacts on the natural environment, the fact that the development changes the predominantly rural and conservation nature of the area, and that the development is not a sustainable land use. In spite of these considerations, the development was authorized on grounds that it would have a desirable socio-economic outcome because there would be benefits to the families residing on the site and nearby. Clearly, the decision did not support the objectives of sustainable development or meet the criteria given in Box C-1. Short term socioeconomic gains were pursued at the expense of significant impacts on both the natural and cultural environment and the social context in the long term, given inconsistencies with strategic planning.*

In this instance, no alternative layouts for the proposed development were considered in the EIA. Most of the specialists involved in the EIA recommended that an amended layout plan of the proposed development would avoid or minimize potential negative impacts on biodiversity and ecosystem services, and contribute to an improved proposal. However, the decision maker did not ask for an amended plan.

Case Study 2: *A proposed development on the coast was initially turned down since it was in a National Lake Area of possibly international importance, was inconsistent with spatial plans in the area, inconsistent with the coastal zone policy, and was not supported by local authorities.*

An appeal on the decision by the proponent resulted in the development being approved. Reasons given were the 'potential' for tourism development, foreign investment, and 'several' job opportunities, especially during the construction phase. None of these reasons was justified or motivated with facts. Here too, the decision did not support the objectives of sustainable development or meet the criteria given in Box C-1. Short term socioeconomic gains and perceived longer term gains for the economy were pursued at the expense of significant impacts on both the natural environment and the social context in the long term, given inconsistencies with strategic planning and the value of the affected site.

Additional problems with current decision making as highlighted in the Situation Assessment include:

- Personal bias in decision making is aggravated by impact assessment reports that are biased or give undue emphasis to one or other issue without providing supporting information.
- The problem of subjective decision making is that many decisions are neither in line with the objectives of sustainable development, nor are they transparent or defensible.
- Decision making is often inconsistent, leading to loss of credibility of the environmental authority by the public.
- Changes to the environment as a result of a proposed development are frequently compared

to the current situation, rather than to a desired state of the environment. The additive effects of changes are seldom considered.

- Alternatives are not always required by decision makers or addressed in the impact assessment process, undermining the basis for environmental decision making.

Interesting to note:

In the words of Jared Diamond, the author of "Collapse: How Societies Choose to Fail or Survive"⁷², if our society is to succeed, we need:

- *The courage to practice long term thinking and to make bold, courageous, anticipatory decisions at a time when problems have become perceptible but before they have reached crisis proportions. This type of thinking "is the opposite of short-term reactive decision-making that too often characterizes our elected politicians".*

The Task Force on Environmental Sustainability of the United Nations Millennium Project⁷³ echoed this thinking, noting that:

- *Achieving environmental sustainability requires dramatic changes in the ways societies and citizens manage biodiversity and the wastes and by-products of human consumption.*

Optimum decision making for sustainable development would mean that:

- Decisions would reflect the realities of the supporting ecological systems, since these systems set constraints and limits on society's activities. These constraints and limits determine whether or not a society can survive, develop and prosper⁷⁴. Good decision processes will be able to detect threats to systems, identify options to keep systems within safe ranges and allow freedom of choice among the safe decision options according to their present-day goals, values, perceptions and beliefs whilst not jeopardizing future sustainability⁷⁵.
- The comparison of alternatives forms an essential part of making good decisions. Decision making for sustainable development seeks to identify alternatives that offer the greatest overall benefits and avoid undesirable impacts, rather than merely enhancing or mitigating the effects of the already chosen options⁷⁶.
- Decision making would be based on specified goals and desired outcomes, rather than being a comparison with the *status quo*. Stated simply, if we don't know where we want to be, we will never get there.
- Decision making would make use of explicit criteria and strive to achieve particular outcomes.

⁷² 2005. Penguin Books, London.

⁷³ UN Millennium Project (2005). *Environment and human wellbeing: a practical strategy. Summary version of the report of the Task Force on Environmental Sustainability. The Earth Institute at Columbia University, New York, USA.*

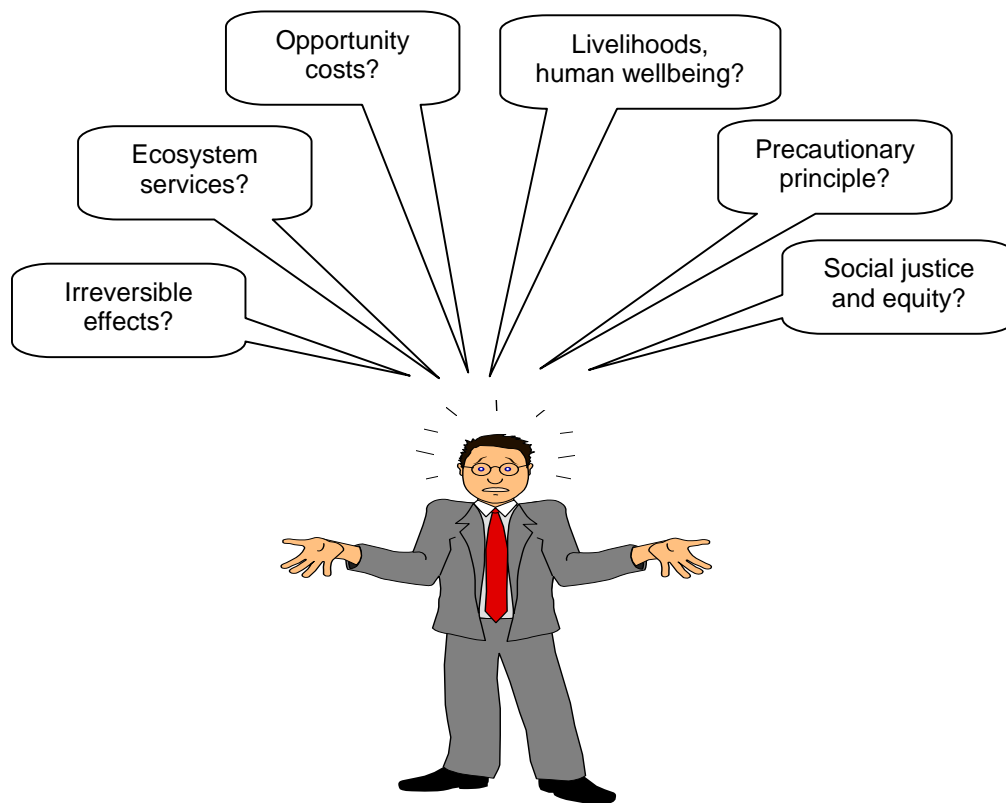
⁷⁴ Ashton PJ, MJ Patrick, HM MacKay and AvB Weaver (in press). *Integrating biodiversity concepts with good governance to support water resources management in South Africa. Water SA (October 2005 issue).*

⁷⁵ Tonn B, M English and C Travis (2000). *A framework for understanding and improving environmental decision-making. Journal of Environmental Planning and Management 43(2), 163-183.*

⁷⁶ Gibson RB (2004). *Sustainability assessment: basic components of a practical approach. Paper presented at the IAIA '04 conference, Vancouver.*

Important to note:

- Increasingly, it is being recognised internationally that explicit criteria for decision making are needed, to provide a clear, transparent and consistent basis for decisions affecting the environment.⁷⁷
- The use of explicit criteria in decision making helps focus the decision maker on internationally and locally accepted objectives for sustainable development, and obligations with regard to, amongst others, biodiversity conservation and the need to strive to achieve the Millennium Development Goals.

C.3 Criteria and desired outcomes for decision making to support the objectives of sustainable development**Figure C-2: The Decision Maker's Dilemma**

Box C-1 provides decision criteria and desired outcomes in support of sustainable development.

⁷⁷ Kemp R, S Parto and R B Gibson (2005). *Governance for Sustainable Development: Moving from theory to practice*. Int. J. Sustainable Development 8(1/2): 12-30.

Box C-1: Decision criteria and desired outcomes

Over-arching criteria and desired outcomes

Decisions should:

- Try to meet all the requirements for sustainability together as a set of interdependent parts, seeking mutually supportive benefits (e.g. gains in the local economic base will collapse if key ecological functions are not maintained).

Decisions should not:

- Accept compromises or trade-offs if they entail further decline, or risks of decline, in officially recognised areas of concern (e.g. official policies, plans, strategies, etc).
- Accept any significant long-term loss in any one of the requirements for sustainability.
- Accept enhancement of benefits as compensation against incomplete mitigation if stronger mitigation efforts are feasible.
- Make compromises or trade-offs where at all possible. Where they are made, they must be explicitly and openly described and justified.
- Justify significant negative effects on the integrity of social and ecological systems, or equity and social justice, by compensation through increased economic efficiency (or *vice versa*).

Protecting the integrity and resilience of social and ecological systems

| <i>Decision criteria</i> | <i>Desired outcomes</i> |
|---|---|
| <p>Decisions should⁹¹:</p> <ul style="list-style-type: none"> ○ Protect the integrity of social and ecological systems, and the irreplaceable life-support functions on which human and ecological wellbeing depends. ○ Ensure that livelihoods are maintained or improved. ○ Favour those actions and options that are most likely to preserve and enhance the opportunities and capabilities of future generations to live sustainably. ○ Provide and maintain a base for ensuring sustainable livelihoods for all. | <ul style="list-style-type: none"> ○ No net loss of species or ecosystems diversity. ○ Maintain and conserve natural linkages and corridors between habitats within the same ecosystem, and between ecosystems, along altitudinal and climatic gradients, to allow for ecological and evolutionary processes to continue. ○ Positive contribution to the conservation of biodiversity and integrity of ecosystems, where at all possible. ○ The quality and quantity of natural / harvestable goods and ecosystem services, on which the livelihoods and resilience of society in general - and vulnerable communities in particular - depend, should be safeguarded. |
| <p>Decisions should not:</p> <ul style="list-style-type: none"> ○ Accept any significant long term loss. | <ul style="list-style-type: none"> ○ Use of natural resources (biodiversity and ecosystem services) should be at or less than rates of replenishment or renewal, or agreed upon thresholds or limits of acceptable change. ○ Development should avoid the destruction of ecosystems that protect communities from natural hazards. (These ecosystems may not be threatened from a biodiversity perspective but have value and importance by virtue of the protection they afford local communities). |

⁹¹ The criteria in this table have been drawn from the work of Robert B Gibson (2005): ‘Sustainability Assessment Criteria, Processes and Applications’, Earthscan, London.

| Precaution and adaptation | |
|---|---|
| <p style="text-align: center;"><i>Decision criteria</i></p> <p>Decisions should:</p> <ul style="list-style-type: none"> ○ Respect uncertainty and allow for adaptation. Avoid poorly understood risks of serious or irreversible harm to the foundations of sustainability. Plan to learn, design for surprise and manage for adaptation. | <p style="text-align: center;"><i>Desired outcomes</i></p> <ul style="list-style-type: none"> ○ Development should have minimal risk of irreversible effects on, or irreplaceable loss of genetic, species or ecosystem diversity. ○ High level of confidence in predictions as to the effects on biodiversity and ecosystem services. Where confidence levels are low, and / or there are major gaps in information, a risk-averse and precautionary approach should be adopted. ○ Assurance should be provided that the required mitigation and management of impacts on biodiversity and ecosystem services could - and would - be effectively implemented. |
| Equity and social justice | |
| <p style="text-align: center;"><i>Decision criteria</i></p> <p>Decisions should:</p> <ul style="list-style-type: none"> ○ Reduce the gaps in wellbeing between the wealthy and the poor. ○ Build democratic governance. ○ Pursue the benefits of actions that would support both the immediate and long term needs for sustainable development. | <p style="text-align: center;"><i>Desired outcomes</i></p> <ul style="list-style-type: none"> ○ Decision making should be based on due consideration of all stakeholder values, and should make adequate provision for their access to impact assessment and associated decision processes. ○ The outcome of development should be an improvement in the fair distribution of rights and access to, management of, and benefits from biodiversity and ecosystem services. ○ Development should not result in a net cost to society, particularly where the “beneficiaries” of a specific development are single individuals or corporations that derive personal benefit from collective loss. ○ Development should not result in vulnerable or poor sectors of society having to bear the costs of losing biodiversity or of negative effects on ecosystem services, and any negative effects should not make them increasingly vulnerable or marginalized. ○ Development should not result in future generations having to bear the costs of lost biodiversity or impaired ecosystem services ○ Biodiversity and ecosystem services should be preserved for future generations, to optimise their capability of living sustainably. |
| <p>Decisions should not:</p> <ul style="list-style-type: none"> ○ Displace significant negative effects from the present to the future. | |

| Efficiency | |
|--|---|
| <i>Decision criteria</i> | <i>Desired outcomes</i> |
| <p>Decisions should:</p> <ul style="list-style-type: none">○ Ensure that the net overall effects of development are positive, and choose the development option that promises the greatest long-term gain overall.○ Seek to provide a larger base for ensuring sustainable livelihoods for all while reducing threats to the long term integrity of social-ecological systems. | <ul style="list-style-type: none">○ Negative effects on the natural environment should not result in a net cost for society, through having to pay to replace or substitute for lost or negatively impacted - and previously free - ecosystem services.○ Opportunities and potential benefits lost through a proposed activity should not outweigh gains from that activity. |

C.4 Co-operative governance at SADC and national levels

Governments and authorities in SADC countries must ensure that development complies and/or is consistent with a hierarchy of international conventions, regional (NEPAD/SADC) protocols, national and provincial/state laws, policies, plans, programmes and strategies. In most cases, consideration of these conventions, protocols, laws, policies, plans, programmes and strategies requires either co-operation between countries and/or co-operation between different government authorities and agencies.

Box C-2 lists those conventions, agreements, policies and statutes that are of particular relevance to this guidance.

Box C-2: Key conventions, protocols, laws, policies and plans relating to biodiversity requiring co-operative governance

International conventions

- The Convention on Biological Diversity
- The Ramsar Convention
- The Convention on International Trade in Endangered Species
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or the CMS)
- The UN Convention to Combat Desertification (CCD)

Regional protocols

- NEPAD and SADC protocols, particularly those related to the Southern Africa Sub-regional Environmental Action Plan of the Environmental Action Plan of NEPAD (currently being revised)
- The Protocol on Shared Water Resources
- The Protocol on Trade
- The Protocol on Mining
- The Protocol on the Development of Tourism
- The Protocol on Wildlife Conservation and Law Enforcement
- The Fisheries Protocol
- The Forest Protocol

National laws, policies and plans

- Impact assessment laws
- Spatial development plans and frameworks
- Land use plans



A number of SADC treaties make provision for cooperative management of resources, especially those with transboundary dimensions. A more innovative approach would be to negotiate the sharing of benefits rather than resources, so as to prevent "national projects" being implemented in places with no comparative advantage.
© P.Tarr

Four African initiatives have emphasised the importance of strong political commitment and good governance in all African countries to ensure that development does not destroy the resource base on which it is based.⁸³ The central theme that emerged from these meetings was the recognition that sustainable development was essential, but would only be achieved if African countries had sufficient institutional, technological and human capacity. Significantly, it was also recognised that this would require close cooperation from all sectors of government and civil society.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁸⁴

- *Projects which had a high degree of inter-departmental co-operation were usually more successful than those which had little or fragmented consultation with relevant line ministries.*
- *Difficulties arise when the roles and responsibilities of local and national (or provincial) government overlap e.g. in metropolitan areas where there is a lack of adequate consultation between different levels of government.*
- *Involvement of the biodiversity agency and biodiversity NGOs seem to have had a major beneficial effect on shaping proposals and optimizing decision making. Omission of these bodies from the planning and EIA / SEA process frequently led to the decision being appealed or delayed.*

⁸³ OAU, 1985, UNECA & UNEP, 1989, UNECA, 1991 cited in Ashton, P, 2006.

⁸⁴ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

It is essential to ensure co-operation and consultation with other government departments and ministries, both within countries and between neighbouring countries for a number of reasons:

- Co-operation as early as possible in the planning process allows for shared objectives, outcomes and criteria for both the impact assessment and associated decision making to be determined. In many instances, different countries or jurisdictions have different laws, policies and priorities; the early rationalisation of these different formal requirements and value systems is important to ensure an optimum outcome for sustainable development.
- Because environmental issues are cross-cutting, most project applications will involve at least one other line ministry.
- Large-scale infrastructure projects e.g. a national road, may cross provincial or state boundaries and therefore more than one environmental authority may be involved, depending on the administrative structure of the country;
- Large-scale infrastructure projects may involve more than one country, e.g. transmission lines or any water projects in a shared river basin, and then different national jurisdictions need to be consulted to ensure harmonisation in approach;
- Projects which are planned in and around an urban area may fall under both national and local authorities.

The checklist in Box C-3 provides an aide mémoire for environmental authorities to ensure that all the correct government stakeholders are consulted at the outset of a planned development.

| Box C-3: Checklist of government departments | | |
|---|--|---|
| Local Government* | Provincial/ National Dept./ Ministries* | Other Countries |
| <ul style="list-style-type: none"> ○ Housing ○ Water ○ Sewage ○ Waste ○ Roads ○ Traffic ○ Town planning ○ Parks and recreation ○ Electricity | <ul style="list-style-type: none"> ○ Energy ○ Mines and mineral resources ○ Water ○ Natural resources ○ Transport ○ Public works ○ Health ○ Trade and Industry ○ Agriculture ○ Forestry ○ Fisheries ○ Heritage ○ Conservation, wildlife and parks ○ Tourism ○ Town, regional and rural planning ○ Marine resources | <ul style="list-style-type: none"> ○ Foreign Affairs ○ All countries affected by proposed laws, policies or plans (e.g. trade) ○ All downstream countries affected by a river development project ○ All countries which may be affected by a pollution plume from the proposed project ○ All countries which may be party to a trans-frontier park or other similar development ○ All countries involved in inter-basin transfer schemes ○ All countries affected by power line inter-connectors |

* Generic titles have been given, but each country has its own nomenclature for its government Ministries or Departments.

Some biodiversity agencies may fall directly under line ministries, but in some countries they may form separate parastatal agencies e.g. parks boards, institutes, museums, aquaria, foundations, trusts and societies. These agencies must be contacted at the outset of the impact assessment process and need to be involved in the decision-making process.

Most inter-basin states have set up joint management commissions or authorities e.g. the Zambezi River Authority, which need to be consulted for any project which will affect the flow and quality of water within the affected river catchment.



It is increasingly common that different government agencies combine their capacity to consider development initiatives. Best practice has shown that the addition of civil society and experts to such fora, considerably improves transparency in decision making processes and increases technical understanding of the issues at hand. © P.Tarr

C.5 Deciding on the most appropriate level of assessment – SEA or EIA?

One of the first and most critical decisions is to determine which level of assessment is appropriate for the application – a strategic environmental assessment (SEA) or an environmental impact assessment (EIA). The following guidance is intended to help with this decision.

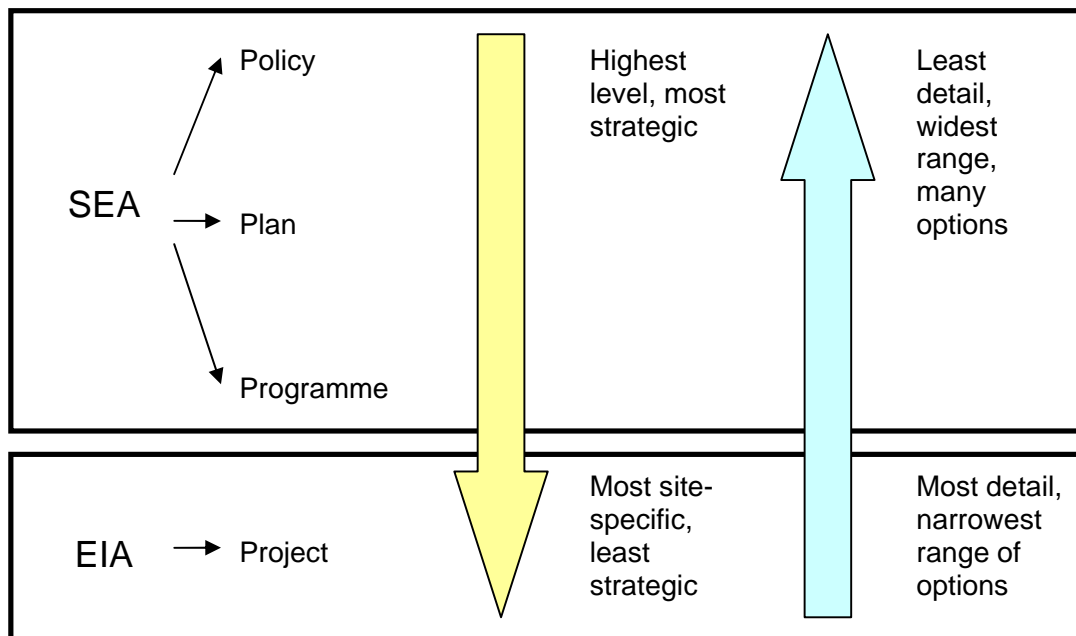
C.5.1 Definitions

- **Environmental Impact Assessment (EIA)** is the application of impact assessment to individual projects. Typically, **EIA** is not proactive in its approach, focuses on a specific project and the affected site, and seldom considers landscape scale or cumulative impacts.
- **Strategic Environmental Assessment (SEA)** is the application of impact assessment to policies, plans, and programmes. There are many different approaches to **SEA**, ranging from the 'EIA' model where the impact assessment is carried out on a policy, plan or programme once it has already been developed (i.e. reactive), to an integrated and/or 'sustainability led' approach that strives to meet sustainable development objectives, is proactive and can be 'built into' policy and planning processes. Importantly, impact assessment at strategic level encourages an 'opportunities and constraints' type approach to development, where such things as natural resources and ecosystem services at landscape

scale define the 'framework' within which development can take place and the types of development that could be sustained.

Use Box C-4 to decide whether an SEA or EIA would be the most appropriate tool to assess the impacts of a development proposal, plan, policy or programme.

| Box C-4: Characteristics of SEA and EIA⁸⁵ | |
|--|---|
| EIA | SEA |
| Is reactive to a development proposal. | Is often pro-active and informs development proposals. |
| Assesses the effect of a proposed development on the environment. | May assess the effect of existing environmental conditions on development needs and opportunities. |
| Relates to a specific project and thus seldom considers cumulative effects. | Relates to areas, regions or sectors of development and thus has to consider cumulative effects. |
| Has a well-defined beginning and end and focuses on informing a specific decision at a particular point in time. | May be a continuing process aimed at providing information at the right time. |
| Enables the identification of specific impacts. | May create a framework against which specific project types can be selected and where impacts and benefits can be measured. |
| Focuses on the mitigation of negative impacts and the enhancement of positive impacts. | May focus on maintaining a chosen level of environmental quality, e.g. through the identification of sustainability objectives and limits of acceptable change. |
| Has a narrow perspective and includes a high level of detail. | Has a wide perspective and a low level of detail to provide a vision and overall framework. |



⁸⁵ Adapted from Department of Environmental Affairs and Tourism (2004): "Strategic Environmental Assessment." Integrated Environmental Management Information Series 10, South Africa.

Figure C-3: Strategic Environmental Assessment and Environmental Impact Assessment⁸⁶

C.5.2 SEA and EIA as complementary tiers of impact assessment

To ensure that development meets the objectives of sustainable development, both SEA and EIA are desirable; the broad scope and low level of detail of the SEA being complemented by the narrow scope and relatively high level of detail of the EIA (Figure C-3). It is important that the impact assessment of a project is 'nested' within a strategic environmental assessment, thus ensuring that it is contextually sound and consistent with broader development objectives.



SEAs are especially valuable in places where many similar projects could be established alongside each other – such as linear beach development. The use of SEA is still much too slow in southern Africa. © P.Tarr

C.5.3 Dealing with cumulative effects

Where a particular geographic area is experiencing rapid development and/or additive impacts on specific biodiversity and/or ecosystem services (e.g. destruction of offshore reef habitat or coastal dune cordon that protects inland villages), a focused strategic environmental assessment should be commissioned **for that area**, with a view to providing a robust framework within which to evaluate the cumulative impacts of future development, and addressing those **specific biodiversity or ecosystem services** as being limiting factors for sustainable development in that area.

Therefore, the issue of cumulative impacts on biodiversity and/or ecosystem services is best addressed at a landscape, regional or sectoral scale through SEA, not on a project-by-project basis. Examples of the need to 'upscale' impact assessment from a project to a strategic level are given below.

⁸⁶ Adapted from the Department of Environmental Affairs and Tourism (2004): "Strategic Environmental Assessment", Integrated Environmental Management, Information Series 10. South Africa.

EXAMPLE: CUMULATIVE IMPACTS OF AGRICULTURAL ACTIVITIES IN SOUTH AFRICA

Permits for the cultivation of 'virgin land' (land that has not been cultivated in the previous 10 years) are required from the Department of Agriculture. In addition, water permits are required from the Department of Water Affairs to abstract groundwater.

In the 'Sandveld' of the Cape Floristic Region, potato farming using pivot irrigation and drawing on groundwater resources was started in the late 1980s. At that time, the Sandveld was considered not to be under threat.

Over 45,550ha of natural habitat has been approved for cultivation; about 20% was approved in 2003. About 12 million m³ of groundwater was abstracted seasonally in 1998 for the potato industry; by 2002 that figure had reached 18 million m³ per season and has increased since with the rapid growth of cultivation.

Now, all of the habitats are listed as threatened in terms of the National Spatial Biodiversity Assessment. With the pumping of groundwater, there are concerns about saltwater intrusion from the coast, as evidenced by increasingly saline borehole water. The drawdown of groundwater has had a negative impact on a coastal Ramsar wetland site of international significance.

Clearly, decision making on a project-by-project, piecemeal basis is ignoring the landscape-scale effects on ecosystem services and biodiversity. That is, decision making is not supporting sustainable development. A strategic level study is needed urgently, to address the landscape-scale effects of potato farming in the Sandveld.

EXAMPLE: CUMULATIVE EFFECTS OF TOURISM DEVELOPMENT ALONG THE GARDEN ROUTE, SOUTH AFRICA

The proliferation of golf estates along the coast on the Garden Route, South Africa, was cause for alarm on the part of the environmental authority in that province. In 2004, along a 100km stretch of coastline, at least six of these developments were proposed in addition to the 15 or so existing golf courses/estates. These developments were being evaluated on a case-by-case basis on individual merit.

At the scale of the Garden Route, however, collectively the golf courses/estates were responsible for (amongst others) conversion of large tracts of natural habitat, interruption of ecological corridors both from inland to the coast and along the coast, changes in landscape and scenic character, and substantial use of freshwater resources.

Given that freshwater is a limiting factor for development on this coast, and that many towns experience water shortages during the peak holiday season, the opportunity costs associated with diversion of freshwater resources is of major significance.

Recognizing the potential for the cumulative effects of golf courses/estates to be substantial, the provincial environmental authority commissioned consultants to carry out a 'rapid review' and to prepare guidelines for these developments.

The guidelines⁸⁷ are to act both as a decision support mechanism for the authority and to give proponents a clear sense of the criteria to be used in evaluating future applications. The implementation of these guidelines should ensure consistency and transparency in decision making.

An inter-departmental forum, with representatives of key stakeholders in the private sector, has been established to address the current issues and work towards a reasonable and effective solution.

C.6 Decision making in a strategic vacuum

Interesting to note: Findings of the Situation Assessment, Southern Africa⁸⁸

- *Many countries in southern Africa lack policies or plans at strategic level, so that decision making at project level is effectively taking place in a vacuum.*
- *It is important that a robust tiered framework of policies, plans and programmes, where each tier 'talks' to the next, is provided for biodiversity conservation within the context of impact assessment for sustainable development.*

Where there is no strategic guidance at a level above that at which project-level decisions are taken, i.e. at the relevant policy, plan or programme level, decision makers should:

- Adopt a precautionary approach so as not to foreclose future options.
- Where the need for strategic guidance is clear in terms of providing a much-needed, robust and urgent framework for decision makers, to help them decide if and where particular developments should be allowed, a strategic level study should be commissioned.
- Where thresholds for acceptable impacts on biodiversity and ecosystem services are not clear and need to be determined in line with the precautionary principle, relevant specialists should be commissioned to determine these thresholds and thus inform decision making in such a way that risks of irreversible effects and/or irreplaceable loss of natural capital are avoided.
- Involve other government departments and the agency/agencies responsible for biodiversity and ecosystem services in decision making to get clarity and agreement on the best outcome, taking into account the guidance given in Box C-1.
- Encourage other countries and the regional environmental body where impacts could cross international boundaries to conduct a regional-level SEA e.g. the Mid-Zambezi Agricultural Self-Sufficiency Project.

⁸⁷ Department of Environmental Affairs and Development Planning (2005). *Guidelines for golf courses, golf estates, polo fields and polo estates in the Western Cape.*

⁸⁸ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa.* Windhoek, Namibia.

EXAMPLE: CASE STUDY FOR DEVELOPMENT ON THE WILD COAST, SOUTH AFRICA

Background: *The Wild Coast has great natural scenic beauty and is one of the few southern African coastal areas that have not as yet been subjected to large-scale development processes. Development pressures are escalating rapidly as a result of drives to increase tourism to the area, in an effort to stimulate both the national and local economies.*

Proposed Development: *A proponent wanted to develop a resort with accommodation for about 100 people, five boat houses, a meeting hall and various minor ancillary structures such as a slipway for launching ski boats. The site of the project was outside an existing settlement area within an area which may be considered near-pristine and of outstanding natural beauty.*

The Problem: *A major problem confronting regional and local planning authorities is the lack of a spatial development framework for the Wild Coast in general and the affected area in particular. Ad hoc development proposals have the capacity to impact on future sustainable development and conservation planning.*

The Decision: *The authority denied permission for the proposed development because it fell outside draft development boundaries for the area. The authority noted that the absence of a spatial development plan meant that the proper tools for ensuring sustainable development were missing. Also that allowing the development would set a precedent for ribbon development (outside development boundaries) and might compromise the essential and most marketable feature of the Wild Coast which was its wilderness aspect.*



Because of poor spatial development planning, urban encroachment of pristine areas, especially the coastal strip, has proceeded largely unchecked. Nowadays, local authorities are much more aware of the need to maintain "biodiversity corridors" and green spaces. © B.Walmsley

C.7 Dealing with uncertainties, gaps in information, and risks

When dealing with uncertainties, gaps in information and risks, decision makers should:

- Ensure that all relevant information about the likely consequences of a proposed activity for biodiversity and ecosystem services has been provided. That means ensuring that the right specialists, who can best answer questions about biodiversity and ecosystem services and impacts on these services, have been involved in the impact assessment.
- Ask for additional studies to be commissioned by the proponent where there are gaps in information that can be addressed relatively quickly, and where that information is highly likely to influence decision making. The findings of these studies should inform the decision. That is, the actual studies should not be included as conditions of authorization.
- Ensure that all reasonable alternatives that could avoid or minimize uncertainty and the risk of irreversible impacts and irreplaceable losses have been investigated. That is, that every effort has been made to find the best option for sustainable development.
- Ensure that the gaps in information, risks and uncertainties associated with a proposed activity are clearly explained. Also, that the level of confidence in each impact prediction is clearly stated. Where there are low levels of confidence, and there is a risk of negative and irreversible impacts, a risk-averse approach must be taken.
- Consider the opportunity cost of taking a particular decision (See Examples in Part A.5.2).
- Consider the costs of replacing or providing a substitute for any resources that could be lost (see Examples in Part A.5.2)
- Apply a risk-averse approach when taking decisions where the consequences of actions are not certain but could be significant, could lead to irreversible effects or the irreplaceable loss of biodiversity and/or ecosystem services.

EXAMPLE: APPLYING PRECAUTION - CASE STUDY FOR TOURISM DEVELOPMENT, SOUTH AFRICA

Proposed Development: *Municipal land was to be sold to a developer on condition that a proposed golf estate, hotel and housing estate were authorized by planning and environmental authorities. The site was situated on the slopes of a mountain abutting a provincial nature reserve.*

Significance of Impacts on Biodiversity: *The property provides habitat for Critically Endangered vegetation of the Cape Floristic Region and a Red Data Book flowering bulb, and soils are highly productive. The region lies in a water-deficit area and increased water use over the years has had significant adverse effects on the aquatic ecology and ecosystem services of the rivers in the area.*

The EIA: *Information on the supply of water for the development was insufficient and inconclusive. Potential ecological impacts of a proposed water supply dam were not addressed in the EIA.*

The Decision: *The development was authorized first by the planning authority and then by the environmental authority. Many of the 'unanswered questions' of the EIA were incorporated in the*

conditions of authorization. For example, one of the conditions was that an EIA for the proposed water supply dam had to be carried out.

The Outcome and Lessons Learned: A key Non Government Organization (NGO) took the matter to the High Court on the basis that decision making had been incremental, and an unlawful 'cart before the horse approach' had been adopted. The judge upheld the NGO's contention that the official responsible for decision making was not empowered to make his decision conditional on further piecemeal EIAs, and that his approval of the development was therefore unlawful. It was ruled that EIAs must be completed before any consent decisions are taken, and environmental impacts of all components of a development must be identified and probed in their entirety before a decision is taken. If that did not happen, the environment would be prejudiced. Stated another way, environmental approval should not be conditional on potentially significant studies being conducted on parts of the development after the decision.

C.8 Dealing with lack of capacity within regulatory authorities

Interesting to note: Findings of the Situation Assessment, Southern Africa⁸⁹

- *Inadequate capacity within decision making authorities highlights the need to improve not only the current capacity, but also to invest resources in improving the capacity of emerging and future decision makers.*

When the decision maker receives an application for an environmental authorisation, supported by the relevant impact assessment documents, the authorities must consider the following:

- **Match skills to complexity:** the capacity of officials to evaluate the adequacy of impact assessments should be carefully matched with the complexity of the proposed activity and the likely significance of effects or impacts.
- **Ask for expert opinion:** where there are likely to be significant adverse effects on biodiversity pattern or process, or on ecosystem services, or where there is a high risk of such effects, a person with sufficient competence and experience in ecology should be given responsibility for handling that application.
- **Ask for independent review:** where the necessary capacity is lacking within the authority, and where the information provided to decision makers is inadequate, the authority should call for independent review either of the impact assessment as a whole, or specifically of the specialist input on biodiversity (see part E). Review should contribute to building of local capacity (i.e. provided that the authority and local specialists can participate in the review). An independent review or advisory panel would be preferable to individual reviewers as it introduces balance in judgment and perspective, and lends greater credibility for decision makers. Independent review should be carried out at key points throughout the impact

⁸⁹ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

assessment process rather than at the end of that process.

- **Consultation and cooperation** with other authorities that have relevant expertise, and with biodiversity agencies (where they exist), would help to evaluate impact assessments submitted to the decision making authority.
- **Proponent pays:** authorities should establish and maintain a network of experts outside its structures, and use these persons strategically to assist them. The costs of this outsourcing should always be carried by the proponent. It is important, however, that the authorities make the proponent aware that external review might be required, along with associated costs.



Hot tips!

- **Look after biodiversity pattern and the ecological processes** that maintain ecosystem health, ensure delivery of ecosystem services and support human wellbeing in general; knowing that they play a particularly important role in the livelihoods and lives of poor communities.
- **Consider the full value of biodiversity and ecosystem services, not just the market value** – and the costs of having to replace or find substitutes for lost biodiversity or ecosystem services.
- **Use precaution** in decisions that may affect biodiversity and ecosystem services: Many of the effects of our actions on biodiversity and ecosystem services are not known and may be unpredictable.
- **Ensure that society as a whole, poor communities in particular, and future generations, are not made more vulnerable** by negative impacts on ecosystem services.
- **Always consider not only the regulatory framework and all relevant information, but also the value systems of affected society.**
- **Use the decision criteria and desired outcomes** (Box C-1) as a constant guide.

PART D: STEERING THE STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) PROCESS

In this Part of the guidance document, you will find the following sections:

- D.1** The strengths of SEA
- D.2** The SEA process
- D.3** Governmental co-operation, consultation and co-ordination in the SEA process
- D.4** When should an SEA be done, and by whom?
- D.5** What questions do we want answered in the SEA and why?
- D.6** What to look for when reviewing SEA
- D.7** Decision making criteria

D.1 The strengths of SEA

Impact assessment in Southern Africa is focused at the project level. At this level, indirect effects are often ignored and potential cumulative effects are extremely difficult to evaluate.

The main advantages of SEA include:

- Its potential to address cumulative effects;
- Its ability to provide defensible 'big picture' frameworks within which a variety of projects can be assessed; and
- It's potential to inform land use planning in such a way that important areas for biodiversity and/or ecosystem services are 'red flagged' as early as possible at a strategic level.

Impacts on biodiversity and ecosystem services can be irreversible, are often unpredictable, and have repercussions across landscapes and ecosystems. So, SEA has particular importance to biodiversity.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹⁰

- *Indirect and cumulative effects are seldom taken into account in impact assessment or decision making in the SADC countries.*
- *Many decisions on projects are made in a strategic vacuum.*

The importance of a clear strategic context in which to evaluate potential effects on biodiversity and ecosystem services, and of taking into account cumulative effects, points to a need for authorities in the SADC region to give greater consideration to SEA as a potentially valuable tool. The need for biodiversity and ecosystem services considerations to be built into policy formulation

⁹⁰ Southern African Institute for Environmental Assessment (2006): *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

processes, spatial and land use planning should be a priority in SADC countries if sustainable development is to be achieved. (Please refer to Part C.5 for help in determining when SEA, rather than EIA, should be required.)

Important to note:

- *SEAs are best integrated into policy formulation and the planning process, rather than being carried out as a separate exercise or in parallel.*
- *SEAs should seek to find the specific policy, plan, programme or other strategic alternative that will **best** meet the criteria and desired outcomes for sustainable development given in Box C-1. They should thus strive not only to minimize negative effects, but should look for opportunities to maximising benefits and improve ecosystem services.*

D.2 The SEA process

Policies, plans and programmes 'set the scene' in a proactive way for sustainable development and are important tools for achieving the Millennium Development Goals (e.g. Poverty Reduction Strategy Papers, Spatial Development Frameworks and development strategies).

SEA can lead the planning process, be carried out in parallel with that process, or be integrated within the process; good practice SEA should ideally be fully integrated into a policy development or planning development process.

Typically, the SEA process can be described as shown in Figure D-1⁹¹. Each stage will vary depending on the particular context being investigated. The outcome of an SEA may be a report, or may simply be information that feeds into, and influences, the policy or planning process.

⁹¹ Adapted from the UNEP Convention on Biological Diversity (2006): *Voluntary Guidelines on Biodiversity-inclusive Impact Assessment*. Adopted at the COP-8 meeting, March 2006, Curitiba, Brazil.

Figure D-1: Typical SEA process

Initial steps to build partnerships and create transparency

- Identify and involve all relevant stakeholders
- Define clearly the need, purpose and objectives of the policy, plan or programme
- Define the time and space boundaries
- Create a shared vision of the levels of environmental quality or limits of acceptable change
- Identify issues, priorities, and alternative ways of reaching that vision
- Check consistency with existing policies and laws



Technical assessment and evaluation

- Involve the right specialists to address the key issues
- Draw up appropriate Terms of Reference
- Technical/specialist input, investigations and assessment
- Document findings
- Make the findings available to relevant stakeholders
- Check on the adequacy of the process followed and the quality of information



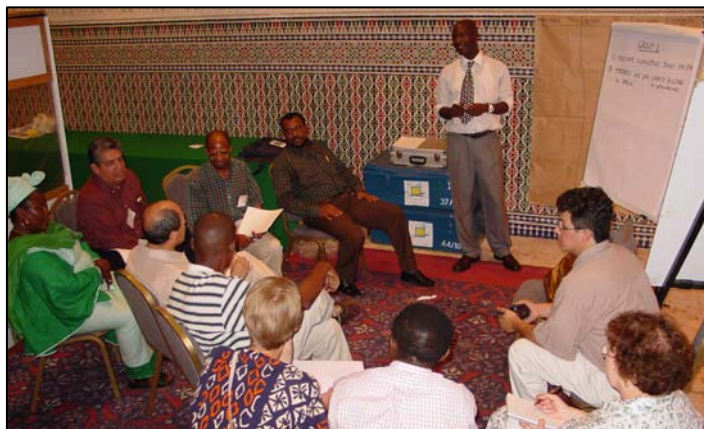
Use findings to influence the outcome of the planning process

- Bring stakeholders together to discuss findings and make recommendations
- Report back and/or feed recommendations into the planning process as appropriate
- Develop an appropriate plan for implementation, with provision for mitigation, checks, use of indicators
- Ensure that decisions are motivated in light of these findings and recommendations



Monitoring and evaluation

- Monitor the implementation of the policy, plan or programme
- Carry out any additional surveys or collection of information required to inform improved implementation and/or management
- Plan for any follow up action needed
- Make provision to review and update the SEA after an appropriate interval



Developing a common vision through consensus building is a good way to start a SEA process © P.Tarr

Critical success factors in the SEA process are given in Box D-1.

Box D-1: Critical success factors in the SEA process

- **Involving all the right people** in the planning and decision making process early in, and at regular intervals throughout, the SEA process:
 - regional representatives and relevant country representatives (where trans-boundary impacts are anticipated);
 - competent national authorities responsible for sectors or specific interests that could be affected by the proposed activity;
 - the authority responsible for biodiversity conservation;
 - interested parties from relevant sectors;
 - potentially affected parties (particularly local communities, poor and vulnerable parties); and
 - probable beneficiaries.

It is often useful to establish a forum at the start of the SEA, comprising the key authorities and interested / affected parties, to steer the SEA.

The key competent authorities should commit themselves at the start of the SEA to that SEA process, and to using the results in the planning or policy formulation process and implementation.

- **Using explicit sustainable development criteria and associated desired outcomes** as the overarching direction towards which the SEA process should strive (Box C-1).
- **Deciding on a 'vision', with explicit goals, objectives, desired outcomes and/or targets** of the strategic proposal. The competent authority/authorities must participate in this exercise. Unless we have a clear idea of what we want to achieve, we can't get there.
- **Determining appropriate time and space boundaries** for the SEA. Some policies, plans or strategies, for example, might have implications for neighbouring countries, the region and or the globe (e.g. trade or transport policies, energy generation strategies, etc.). The effects of these policies, plans or strategies might be felt almost immediately, or only by future generations (e.g. climate change). For the purposes of measuring the effectiveness of the strategic activity, clear timeframes are needed.
- **Adopting an 'ecosystem approach'** that recognizes the inter-dependencies of social and ecological systems, and explores and evaluates the implications of change on these systems against desired outcomes and/or limits of acceptable change (the upper and lower thresholds within which those ecosystems would be resilient to disturbance or change, and beyond which impacts could be irreversible or lead to irreplaceable loss of natural capital). This exercise needs to take into account possible scenarios that may influence these services. It is important to note that the key 'drivers' of the local economy

- might be dependent on biodiversity or ecosystem services (e.g. fisheries reliant on healthy water bodies).
- **Identifying the opportunities and resource constraints** of the natural environment, to enable the policy, plan, or programme to respect the capacity of the supporting ecosystem services. That is, the potential constraints that the natural environment places on the proposed activity (e.g. floodlines, dynamic or mobile sand systems, unstable areas, erosion prone soils, etc.) as well as the opportunities it provides (e.g. source of food, fibre, medicines, grazing, flood regulation, water cleansing, etc.), should inform the identification of areas most suitable for specific activities. Another way of identifying constraints is to explore any factors that may prevent the development vision or objectives from being reached (e.g. shortage of good quality drinking water, unemployment, etc.). These factors should be prioritized in the SEA process
 - **Ensuring that the proposed activity is consistent with ‘the bigger picture’** of protocols, policies, plans, programmes and strategies, as appropriate (Box D-2 gives a hypothetical example). The strategic informants should include the National Biodiversity Strategy and Action Plan, as well as any national or local biodiversity conservation plans.
 - **Identifying and evaluating alternatives** that could meet the need, purpose and objectives of the proposal. This process should be continual and iterative throughout the planning / SEA process.
 - **Involving the right independent specialists** who can address the key issues. Where appropriate, independent review of specialists’ work should be carried out to check and verify their findings, and ensure that links across disciplines have been made and tracked by relevant specialists (e.g. between ecosystem services, and social and economic factors).
 - Striving to ensure that the **full spectrum of environmental costs and benefits**, incorporating consideration of biodiversity and ecosystem services, is evaluated in an integrated way, adopting an ecosystem approach.
 - Ensuring that **not only the potential negative effects of different alternatives, but also the opportunities** presented by each alternative, should be explored to maximise potential benefits. For example, opportunities for supporting or contributing to the realisation of, amongst others, the National Biodiversity Strategy and Action Plans, should be sought.
 - Ensuring that **ways to mitigate** the likely residual effects of the proposed policy, plan or programme (or of the cumulative effects of projects within a sector or geographical area) have been explicitly stated. Provision should be made for **monitoring and feedback** loops to allow for adaptive management and continual improvement, as well as for

- changes to the policy, plan or programme, in response to any 'alarm bells' regarding significant negative effects on (amongst others) biodiversity and/or ecosystem services.
- o Providing a **robust framework for 'downstream' planning, management and impact assessment.**

Box D-2: Proposed policy on biofuels

A national department of energy affairs is considering drafting a policy to increase substantially the use of biofuels and ethanol rather than oil-based fuels.

This policy could have major implications for the expansion of cultivated land, for switching crops from food and fibre to biofuel, with complex effects on health, wellbeing, and use of water, amongst others.

The likely consistency of this policy with policies on land use and agriculture, water use, and biodiversity conservation (amongst others, must be addressed as part of the policy formulation process.

D.3 Governmental co-operation, consultation and co-ordination in the SEA process

SEA demonstrates commitment to positive planning and opens the door for close co-operation and integration between different departments with the shared objective of sustainable development. Co-operation between government departments within a country, and/or between governments of different countries where trans-boundary effects are likely, is of the utmost importance to set a firm foundation for sustainable development and for meeting the Millennium Development Goals. Co-operation enables shared objectives and desired outcomes of planning, impact assessment and decision making to be determined. These objectives and outcomes may link directly to formal regulatory requirements, or may reflect the value systems and priorities of key stakeholders. ***The involvement of the authority/ies or agency/ies responsible for biodiversity and ecosystem services is essential.*** All of these authorities and/or agencies should make a commitment to accepting, and implementing, the findings of the SEA.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹²

- *The environment is too often seen as a 'stand alone' sector, rather than a cross-cutting field of relevance to most departments; consultation generally happens only when it is required by law. Responses to sustainable development challenges need to be integrated across sectors and authorities.*
- *Early engagement of stakeholders and the early identification of biodiversity and ecosystem services issues facilitate a 'best' solution to sustainable development.*
- *An inter-departmental panel or tribunal approach to steering an SEA would have considerable merit, since it would help to integrate a spectrum of interests and promote objectives-led decision making for the shared goal of sustainable development.*



Conducting an SEA should be a team effort, with people from different authorities and disciplines combining to achieve an integrated approach towards sustainable development planning. © P.Tarr

D.4 When should an SEA be done, and by whom?

SEA should be carried out for policies, plans and programmes that have the potential to influence significantly a geographic region or area, a particular sector, and/or particular biodiversity or ecosystem services within a region/area. In addition, where there is a major risk of cumulative impacts in a sector or region/area arising from repeated projects of a similar nature, it is appropriate to take a broader view and carry out a strategic level assessment.

It is important to consider potentially significant and predictable direct effects of a proposed activity, either through obvious impacts on ecosystem services, or through impacts on social and economic systems that in turn impact on ecosystem services. Also, it is essential to consider indirect effects of a proposed activity on social or economic systems whose impacts cannot easily be predicted (Figure B.1).

⁹² Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

Important to note: Triggers for SEA

Typical triggers from a biodiversity or ecosystem services perspective for an SEA on policies, plans or programmes would include⁹³:

- *Proposals that would affect an area known for its important biodiversity (e.g. a centre of endemism, biodiversity hotspot, or identified as a priority in the National Biodiversity Strategy and Action Plan) or ecosystem services (see Example below);*
- *Proposals known for their potentially significant effects on ecosystem services, either directly (e.g. conversion of land, pollution, resource use (see Examples below,) or indirectly through social and/or micro-economic change (e.g. change in settlement patterns, opening up unspoiled natural areas);*
- *Proposals with uncertain indirect effects on ecosystem services (e.g. changes in consumption or land use patterns, changes in trade agreements or policy, changes in technology).*

In practical terms, an SEA should be required:

- *Where a particular sector or industry is expanding rapidly, or likely to do so (e.g. in response to incentives or economic climate), and repeated impacts on a range of biodiversity and/or ecosystem services are probable, a strategic environmental assessment should be commissioned with a view to providing a robust framework within which to evaluate future development **within that industry or sector**. The time and spatial scales of that SEA must be carefully determined to address the nature and scale of impacts anticipated.*
- *Where a particular geographic area is experiencing rapid development of a diverse nature, and/or additive impacts on a range of biodiversity and/or ecosystem services (e.g. water resources, natural habitat such as mangroves for fisheries, proliferation of tourism developments, etc.), a strategic environmental assessment should be commissioned **for that area**, with a view to providing a robust framework within which to evaluate future development.*
- *Where a particular geographic area is experiencing rapid development and/or additive impacts on specific biodiversity and/or ecosystem services (e.g. destruction of offshore reef habitat or coastal dune cordon that protects inland villages), a focused strategic environmental assessment should be commissioned **for that area**, with a view to providing a robust framework within which to evaluate future development, addressing **that specific biodiversity or ecosystem service** as a limiting factor for sustainable development.*

The two examples below give an idea of the variety of processes that can follow an SEA approach: the first looks at the preparation of a spatial development framework for an area known

⁹³ Adapted from the UNEP Convention on Biological Diversity (2006): *Voluntary Guidelines on Biodiversity-inclusive Impact Assessment*. Adopted at the COP-8 meeting, March 2006, Curitiba, Brazil.

for its important biodiversity and ecosystem services in South Africa; the second looks at planning with biodiversity and ecosystem services, also in South Africa.

EXAMPLE: SPATIAL DEVELOPMENT FRAMEWORK IN THE CAPE FLORISTIC REGION, SOUTH AFRICA

Proposed development: *The Spatial Development Framework (SDF) for the municipal area gives strategic guidance on the location and nature of development, spatial patterns of land use, and guidelines for land-use management. The Theewaterskloof Municipality covers an area of almost 326,000km² inland of the South-western Cape coast, about 100km east of Cape Town. The area has a population of approximately 8,000 people characterised by high levels of unemployment and poverty. Agricultural production of cereal crops in the low-lying areas forms the main economic base of the area.*

Potential significance of impacts on biodiversity: *The area contains important mountain catchments, several public and private nature reserves located predominantly in mountainous areas, a number of relatively large rivers of high biodiversity conservation value, and part of South Africa's first registered Biosphere Reserve (the Kogelberg Biosphere Reserve).*

The impact assessment: *The vision, planning principles and objectives for the SDF, were developed through stakeholder participation, and included a duty of care for biodiversity, facilitating spatial development consistent with ecological characteristics, and the sustainable use of natural resources. Key issues identified by stakeholders were the need for sound management of water, pollution prevention, control of invasive alien organisms, and conservation of their natural heritage.*

The decision and key lesson/s: *An approach was taken to arrive at an SDF that reflected both the biodiversity pattern and ecological processes of significance. The SDF comprised a set of spatial planning categories, each linked to a set of land-use recommendations. Spatial categories were informed by an analysis of the constraints of the existing environment (e.g. remnants of critically endangered vegetation and important catchments), opportunities for development (e.g. high potential agricultural land, nature-based tourism), and provision for persistence of ecological and evolutionary processes (through creation of ecological corridors along and across gradients at landscape scale). By adopting this approach, biodiversity pattern and process, as well as key ecosystem services, were safeguarded.*

In many areas of southern Africa, urban and industrial development is proceeding rapidly and natural areas are being transformed for other uses. These natural areas often provide valuable ecosystem services that ensure supply of good quality water, and support livelihoods by providing grazing for livestock, 'wild' food, fuel wood, materials for informal trade (e.g. craft), etc. They also provide areas for recreation, and some contain unique biodiversity. In rural areas of southern Africa, there is major conversion of natural habitat for agriculture, forestry, mining or other projects. There is growing recognition that impact assessment on a project-by-project basis fails to see the bigger picture: living landscapes and human wellbeing being supported by ecosystem services.

EXAMPLE: PLANNING WITH BIODIVERSITY AND ECOSYSTEM SERVICES, SOUTH AFRICA

Two interesting examples from South Africa, using an SEA-type approach, are described below: **Systematic Conservation Planning**, and a **Strategic Catchment Assessment**. Both approaches set clear objectives and/or targets, and/or identify core issues around which the SEA must focus. Both approaches rely heavily on a core group of key stakeholders to guide the process.

Systematic Conservation Planning⁹⁴. The objectives of systematic conservation planning are to ensure that biodiversity pattern is represented, and that the ecological and evolutionary processes that support that pattern are protected. It gathers and synthesises spatial data for a range of biodiversity features within a defined geographical area (e.g. habitat transformation, existing protected areas, vegetation or habitat types, areas delivering essential ecosystem services, future land use pressures, etc), and then identifies and evaluates possible options to meet conservation targets. These conservation targets (for ecosystems, ecosystem services, or species) are set, drawing on scientific information and taking into account the values of stakeholders in the study area. The best options are determined, allowing areas to be prioritised for biodiversity conservation and for safeguarding ecosystem services. This information can be used to inform spatial development plans and decision making on land use, to trigger more detailed EIA where priority areas could be affected by development, as well as to guide optimum management of different areas. It can be undertaken at different spatial scales and levels of detail.

Strategic Catchment Assessment has been carried out in the Umhlathuze municipal area⁹⁵. The objectives were to identify areas that should be protected in view of the value and importance of the environmental goods and services they provide, to identify areas for future development that would have minimum impact on the provision of these goods and services, as well as to identify planning and management controls that would need to be implemented. Seven strategic sustainability issues were identified (including water supply, sustainable delivery of ecosystem services, air quality and related health, biodiversity conservation, costs of dealing with pollution, etc.) A landscape assessment of catchment units was carried out to determine those areas that provided essential goods and services. This study was followed by a *status quo* assessment of these areas to determine which areas were in good, moderate or poor condition with regard to their ability to meet demands on them for ecosystem services, and the associated opportunities and constraints to development.

The issue of cumulative impacts on biodiversity and/or ecosystem services is best addressed at a landscape, regional or sectoral scale through SEA, not on a project-by-project basis. Examples are provided in Part C.5.

⁹⁴ Driver A, RM Cowling and K Maze (2003). *Planning for Living Landscapes: Perspectives and Lessons from South Africa*. Botanical Society of South Africa.

⁹⁵ Jordan T, N Diederichs, M Mander, T Markewicz (2005). "Integrating biodiversity in strategic environmental assessment and spatial planning – a case study of the Umhlathuze municipality, Richards Bay, South Africa. Paper presented at IAIA's SEA conference in Prague

Important to note:

Decision makers need to monitor development patterns and trends in order to identify either geographic areas or sectors in which cumulative effects could be significant. Some form of 'watching brief' of effects on biodiversity and ecosystem services by the authority or agency responsible for the natural environment is important in this respect.

SEAs are usually commissioned by a government authority or authorities, and co-ordinated and managed by environmental consultants, either alone or in partnership with that authority/ies. SEAs are predominantly funded by government. Specialist input is frequently required during the SEA process, and independent review may be appropriate to check the adequacy of the process and/or findings of either the specialist inputs and/or the SEA. In unusual circumstances, a particular industry or sector may commission or fund an SEA where it is seen to be an advantage to its strategic direction.



Victoria Falls is a good example of an area that would benefit from an SEA. It is a tourism pressure point that caters for lodges, whitewater rafting, hikers, bungee-jumping, scenic flights, golf courses and wildlife safaris - all of this in a World Heritage Site. © B.Walmsley and P.Tarr

Important to note:

SEAs should be undertaken by certified and independent environmental practitioners and specialists, to provide assurance of the quality of work.

In some instances, SEA is needed to satisfy the requirements of funding agencies such as the World Bank.

D.5 What questions do we want answered, and what information do we expect from an SEA?

Each and every SEA will want different questions answered, depending on its strategic level (i.e. policy, plan or programme) and on the nature of the particular planning or policy formulation. That is, since SEA *must be flexible* and shaped according to the particular requirements of the context, set Terms of Reference are difficult to prescribe. The SEA process and Terms of Reference should, however, always respond to the steps shown in Figure D-1.

As with all impact assessments, the risk of irreversible change to ecosystem services that underpin human wellbeing, tied to uncertainty, and the penalties for getting predictions wrong, are pivotal to the questions asked in SEA. Typical questions and associated information needs are given in Box D-3; these questions relate to the criteria and desired outcomes for impact assessment and decision making given in Box C-1.

Box D-3: Key questions to be answered in the SEA process

- Is the proposed activity consistent with existing protocols, policies, plans and/or programmes, as relevant?
- What are the reasonable alternatives that could meet the stated need for, purpose and desired outcomes of the policy or planning process?
- What are the probable effects – direct, indirect and cumulative - on biodiversity pattern and process of the different alternatives?
- What are the probable effects on ecosystem services (in the context of human wellbeing, livelihoods, and the resilience of society in general and vulnerable communities in particular) of the different alternatives?
- What are the probable effects of the different alternatives on social justice and equity, with regard to the use of biodiversity and ecosystem services?
- What mitigation measures are recommended for potentially significant negative effects associated with each alternative, and how feasible and effective are they likely to be?
- What is the capacity of the competent government institutions to monitor and enforce compliance with laws, regulations, standards and/or conditions, where the chances of the policy, plan or programme satisfying the criteria and meeting the desired outcomes of sustainable development (Box C-1) rely on that capacity?
- What levels of uncertainty and risk of significant impacts are associated with different alternatives?
- What are the opportunity costs associated with different alternatives?

- What potential opportunities are there for different alternatives to act as a catalyst for sustainable development, through direct, indirect, induced and/or cumulative effects in the short- to long-term?
- Which of the alternatives best meets the criteria and desired outcomes of sustainable development given in Box C-1?
- What are the recommendations for monitoring and the use of indicators during implementation, and do the responsible parties have sufficient capacity to carry out that monitoring?
- Is sufficient provision made for 'feedback loops' after implementation, to allow for corrective action or appropriate changes?
- What, if any, recommendations are there for additional surveys or studies, as appropriate, to inform optimum implementation? Do the responsible authorities/agencies have sufficient capacity to finance or undertake these surveys or studies?
- What is the 'framework' within which subsequent EIAs should be undertaken that fall within the ambit of the SEA? Guidance should be given on the triggers for EIA, parameters for optimising potential benefits and avoiding or minimizing risks and potentially significant negative impacts, where appropriate, and significance thresholds or limits of acceptable change.

D.6 What to look for when reviewing SEA

Review should seek to ensure that the SEA provides appropriate information to inform and guide the formulation of policy, plans and programmes towards the outcomes given in Box C-1.

Review should focus on the critical success factors given in Box D-1, and ensure that the right information (Box D-3) has been provided.

D.7 Decision-making criteria

The SEA process provides greater opportunity and flexibility with regard to working towards the best outcomes for sustainable development than project-level EIA, through its 'sustainability' driven approach.

The criteria for measuring the effectiveness of SEA and taking decisions based on SEA are the same for both EIA and SEA (Box C-1). However, SEA integrated with the planning process accommodates an iterative approach to assessment, evaluation and consideration of alternatives

throughout that process, rather than being geared to one fixed decision point at the end of the process, like EIAs.



Hot tips!

- **Call for SEA** where a proposed policy, plan or programme could affect landscapes and ecosystems that are known for their unique or important biodiversity, and/or for valued ecosystem services.
- **Call for SEA** where there is a risk of cumulative impacts of projects in a particular sector, or of projects in a particular geographical area, having a significant effect on biodiversity or ecosystem services.
- **Ensure that the SEA is integrated** into the planning process from the start, not done as an afterthought!
- **You need to know where you're trying to go in order to get there!** Deciding on a vision, desired outcomes, clear objectives and/or targets is essential to SEA.
- **Make sure that you consider carefully the links** between natural systems and socio-economic systems, so that the SEA protects those ecosystems that provide important services that promote human wellbeing.
- **Build strong partnerships** with other authorities, agencies and other key stakeholders in steering an SEA.
- **Use the decision criteria and desired outcomes** (Box C-1) as a constant guide.

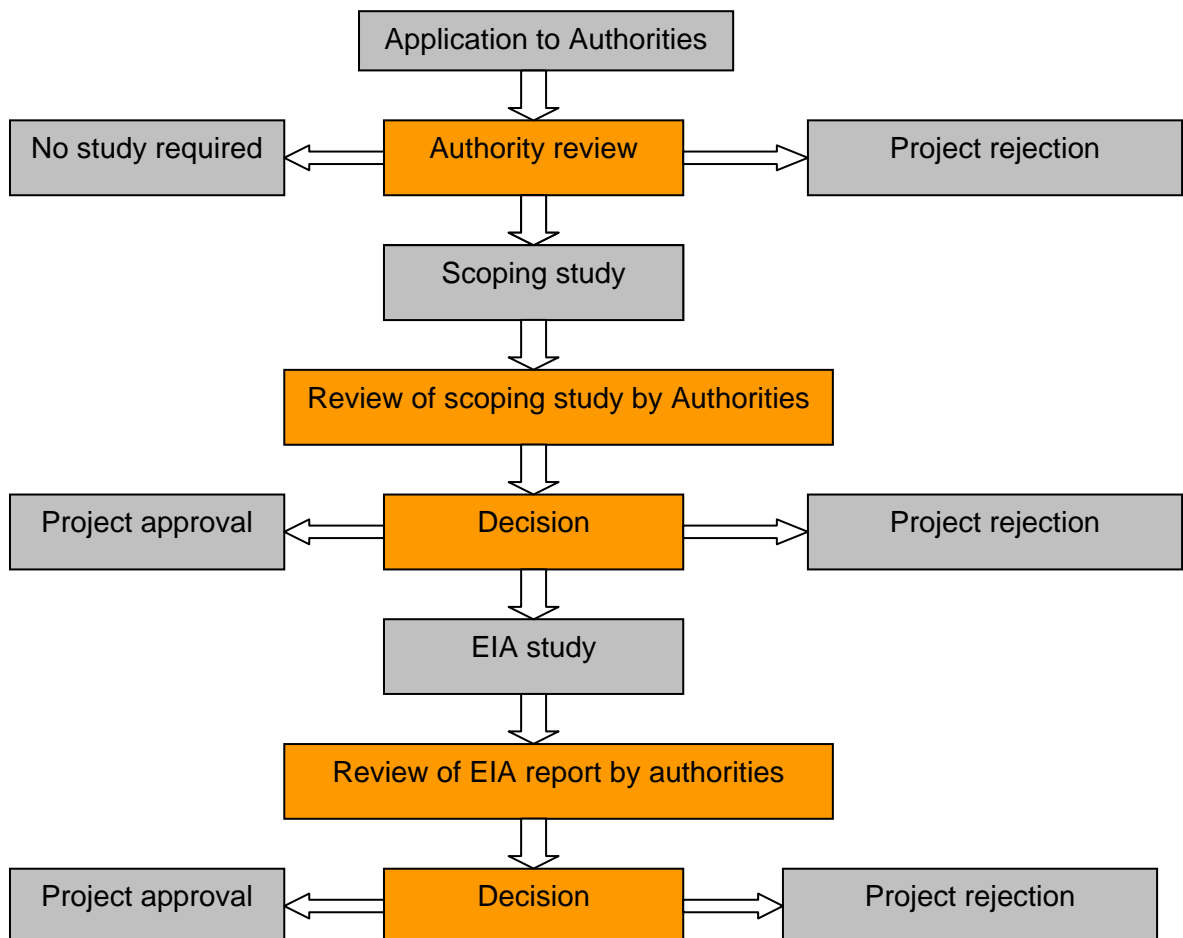
PART E: STEERING THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS

In this Part of the guidance document, you will find the following sections:

- E.1 Where decisions are made in a typical EIA process
- E.2 EIA process and project life cycle stages
- E.3 Guidance on applications and screening
- E.4 Guidance on scoping
- E.5 Guidance on Environmental Impact Assessments
- E.6 Guidance on Environmental Management Plans
- E.7 Guidance on writing letters of authorisation and conditions
- E.8 Checking implementation and compliance with letters of authorisation or Records of Decision

E.1 Where decisions are made in a typical EIA process

Figure E-1 shows where decision making occurs in a typical EIA process.



Note: some SADC countries may have more or fewer decision making points in the process

Figure E-1: Decision points in the EIA process

E.2 EIA process and project life cycle stages

Figure E-2 links the EIA process with stages in a typical project life cycle.

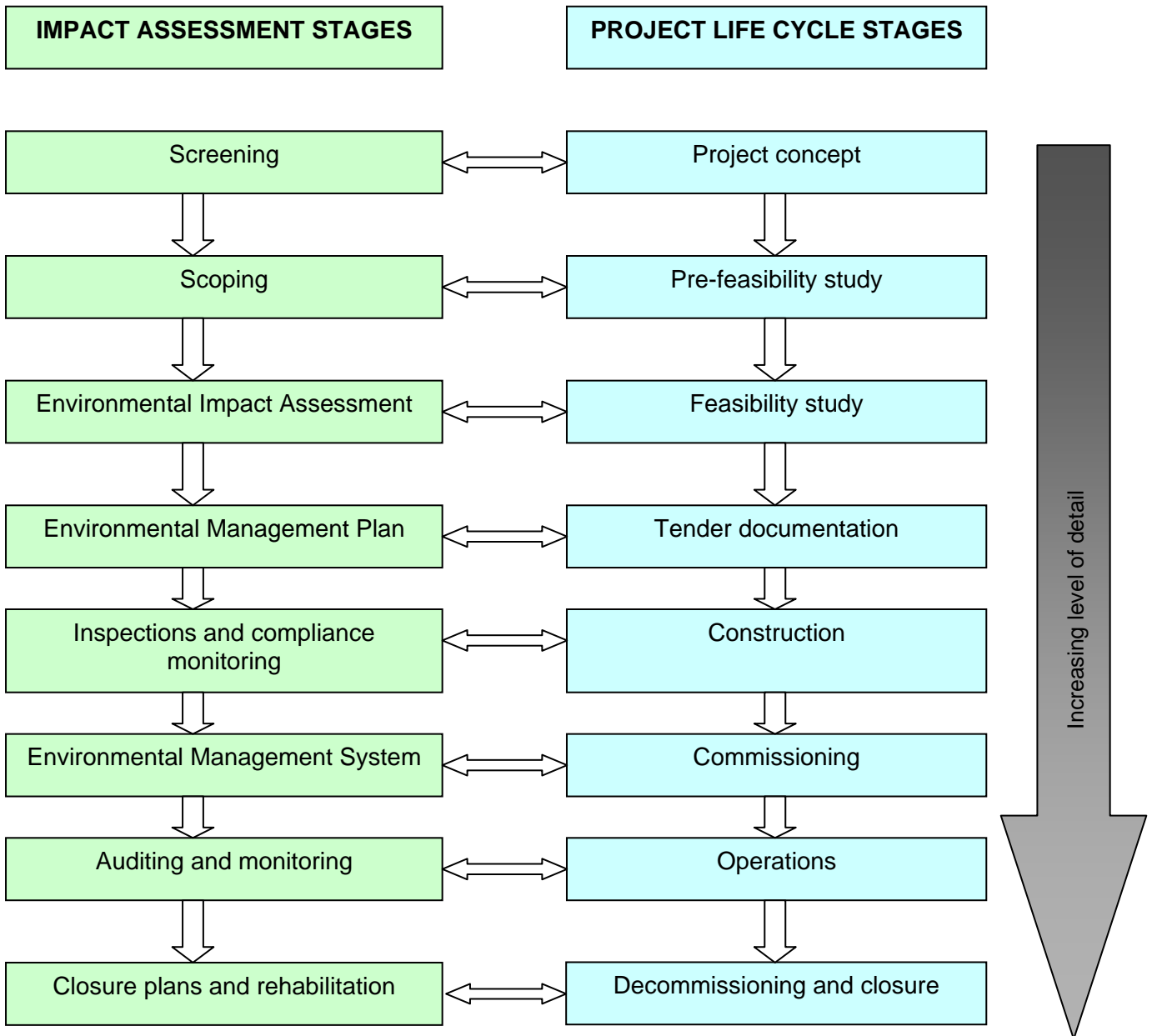


Figure E-2: Links between the EIA process and a typical project life cycle

Important to note: impact assessment process must stay in sync with the project life cycle

It is extremely important to ensure that the level of impact assessment is synchronised with the project life cycle. Many developers try and speed up the EIA process by commissioning an EIA while the project is still at pre-feasibility level. This means that there is a disconnect between the level of assessment (detailed) and the level of project planning and design (conceptual). It is meaningless to do a detailed assessment of a concept plan, or, conversely, to do a scoping report for a project which is already at final design.

E.3 Guidance on applications and screening

E.3.1 Aims and objectives of applications and screening

Screening is used to determine which proposals should be subject to EIA, to exclude those unlikely to have harmful environmental impacts and to indicate the level of assessment required (Box E-1)

The screening process should coincide with the project concept stage (Figure E-2).

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹⁶

- *Inadequate guidance from the environmental authority at the outset of the impact assessment with regard to their requirements of that impact assessment (e.g. Terms of Reference, specific answers needed from the impact assessment) often led to poor environmental reporting, inappropriate studies, and indecision on the part of that authority. There are also high levels of frustration by both consultants and proponents when the authorities repeatedly request more information after having approved the initial scope of work for each study component.*
- *Involvement of the authority from proposal inception, and at regular intervals in the planning and impact assessment process seemed to add considerable value to that process, build trust, and to contribute to sound decision making.*

E.3.2 Decision-making framework

In southern Africa, most countries have lists of activities which require different levels of assessment, e.g. just an initial assessment/scoping study or a full EIA (refer to Box 1 in the Introduction for the list of equivalent terms used in the region). Many of the SADC countries also have lists of sensitive environments which would trigger an EIA.

⁹⁶ Southern African Institute for Environmental Assessment (2006): *Situation Assessment in the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia

If in doubt, the decision maker should request a full EIA if any of the sensitive environments listed in Box E-1 are likely to be affected directly or indirectly by an activity.

Box E-1: Typical triggers for an EIA

Decision makers should ask for scoping to be undertaken and, after scoping, a full EIA if appropriate, where the proposed activity appears not to be consistent or compliant with the hierarchy of conventions, protocols, laws, policies, plans and strategies referred to in Box C-2, and/or if it would affect one or more of the following:

- A protected area.
- A threatened ecosystem located outside a protected area.
- Areas identified as being important for key ecological and evolutionary processes, including areas with a high level of endemism (such as regional or local ecological corridors, important habitat for threatened, protected or commercially valuable species, highly dynamic or unstable systems, or the need to maintain key processes which 'drive' ecosystems).
- Habitat for threatened, protected or local endemic species.
- Habitats that provide important ecosystem services (e.g. reserves of harvestable goods, wetlands or reefs which regulate water supply and protect or buffer coasts, natural or living landscapes or species having heritage or other cultural value, and unique opportunities offered by biodiversity to enhance development (e.g. ecotourism). etc).
- Areas traditionally used by local communities for natural goods or services.
- Downstream ecosystems (e.g. water storage or dam).
- The integrity of ecosystems (e.g. introduction or removal of species, harvest or extraction of indigenous species, pollution of air or water or soils).

If a proposed activity is inconsistent with international or national conventions, policies or laws, the decision maker should advise the proponent not to pursue their proposal in its current form, together with the reasons why. It is important that the developer should NOT be given the option of proceeding at their own risk, because as the level of the developer's investment increases, so does the pressure on the authority to approve the project.



Sensitive environments such as tropical islands must receive special consideration in development planning. In addition to supporting diverse and sometimes unique biodiversity, these environments are often extremely sensitive to disturbance. © P.Tarr

E.4 Guidance on scoping

E.4.1 Aims and Objectives of Scoping

Scoping is the process of determining the spatial and temporal boundaries and key issues to be addressed in an impact assessment. The main objectives of the scoping phase are:

- To focus the impact assessment on a manageable number of important questions on which decision-making is expected to focus;
- To ensure that only key issues and reasonable alternatives are examined;
- To inform the interested and affected parties and other key stakeholders about the project and to obtain their issues and concerns;
- To identify fatal flaws in the proposed project;
- To provide input to the project pre-feasibility study to assist the project proponent in his decision making; and
- To determine the appropriate methodology for the EIA if one is required.

The outcome of the scoping process is a Scoping Report which should include issues raised during the scoping process, appropriate responses, an evaluation of alternatives, the identification of fatal flaws and, where required, terms of reference for further specialist studies and the EIA.

The scoping phase should inform, and be informed by, the project pre-feasibility study (Figure E-2).

E.4.2 How to guide the scoping study

It is important at the outset that the environmental authority should consult with other relevant government departments, biodiversity agencies and line ministries (refer to Box C-3 in Part C) in order to determine/specify the scope of the scoping study with particular reference to:

- Appropriate boundaries for the study (time and space);
- Reasonable alternatives;
- A positive planning approach (opportunities and constraints);
- Relevant planning frameworks (protocols, laws, policies, standards, targets, etc); and
- Key stakeholders to involve in the process.

In some SADC countries, the authorities actively guide the scoping process by setting the terms of reference. In other countries, the scoping study cannot proceed until the proposed scope of work has been approved first by the authorities. Box E-2 contains a list of things that you should ask for in a proposed scoping process and make sure have been addressed in scoping documentation.

Box E-2: Ask for, or check the following in a scoping proposal and report

- Need and motivation for the project;
- Identification of constraints and key negative issues and how they may be avoided/controlled/reduced through project design, siting or routing alternatives;
- Identification of any potential opportunities to contribute to the conservation of biodiversity or ecosystem services (e.g. restoring degraded habitat, clearing of alien invasive organisms, wise management of ecosystems, etc.)
- Consistence/compliance with laws, policies, other thresholds;
- Identification of likely effects of project alternatives on biodiversity pattern and process;
- Identification of likely effects of project alternatives on ecosystem services;
- Identification of opportunity costs associated with any impacts on biodiversity or ecosystem services;
- Statement of confidence in findings;
- Explicit statements regarding gaps in information, uncertainties, risks;
- Qualitative assessment of the likelihood of significant indirect and/or cumulative effects relating to project alternatives;
- Clear statement of likely irreversible or irreplaceable impacts on biodiversity and/or ecosystem services, if known;
- Clear statement of any advantages for, or benefits to, biodiversity or ecosystem services;
- Feasibility and effectiveness of any mitigation measures.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹⁷

Problem areas regarding the scope of EIAs include:

- *Lack of consideration of the 'bigger context', namely international, national or regional value or importance of affected biodiversity;*
- *The inability of project-specific EIAs to address cumulative effects on biodiversity;*
- *Lack of consideration of ecosystem services and function, and lack of explicit linkage of those ecosystem services to social and economic systems.*

E.4.3 Decision making framework for assessing a Scoping Report

When you receive a scoping report, you have to consider a range of factors, including the biophysical, social, economic and cultural impacts of the proposed project. Figure E-3 provides a framework for making decisions about biodiversity issues. Reference should be made to Box C-1 in Part C for guidance on criteria and desired outcomes of decision making.

⁹⁷ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

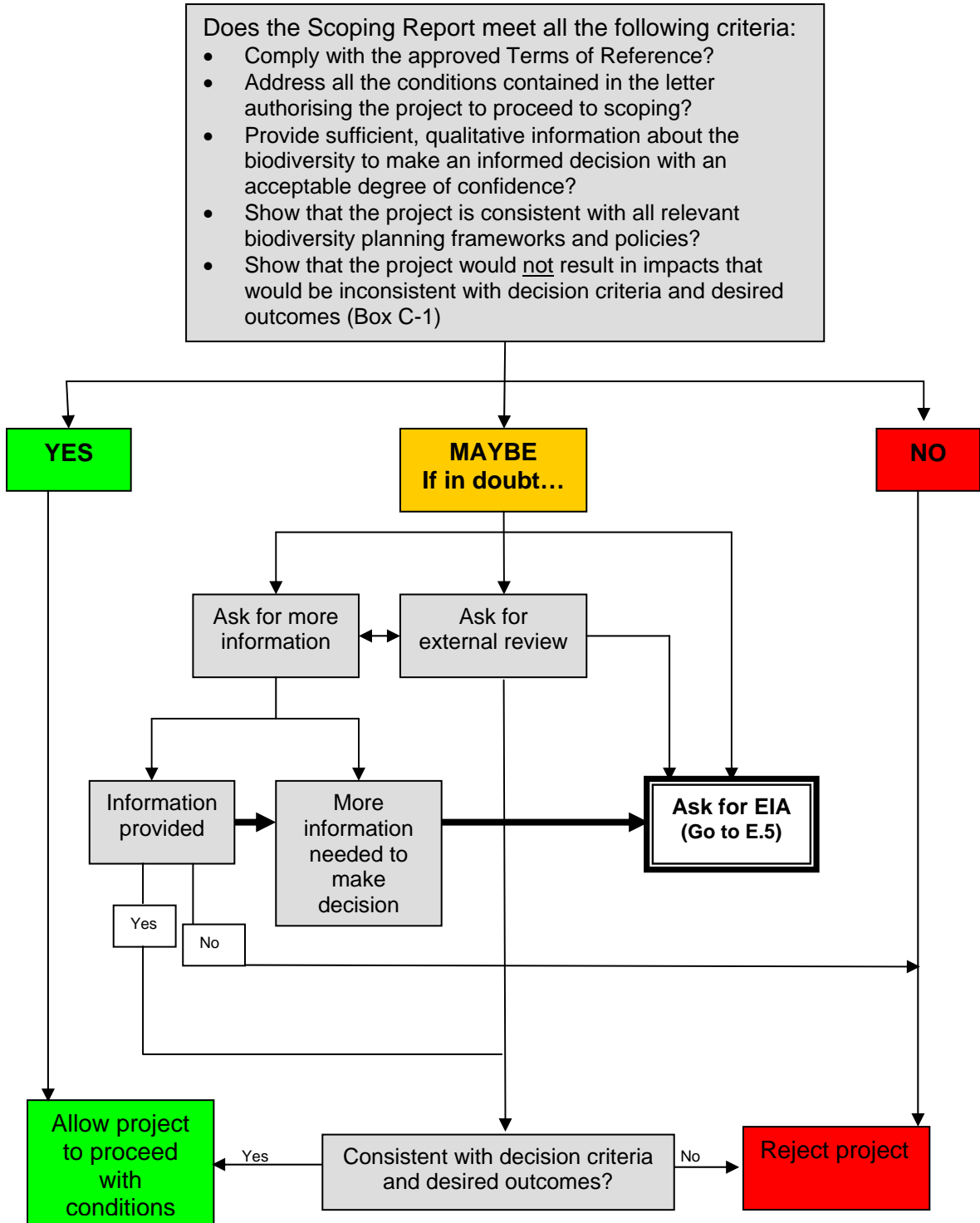


Figure E-3: Decision making framework for Scoping Report

E.5 Guidance on Environmental Impact Assessments

E.5.1 Aims and Objectives of the EIA

The EIA is the detailed study of the significant issues raised during the scoping phase. The main objectives of the EIA report are:

- To provide the decision maker with sufficient, quality information to enable him/her to make an informed decision;
- To ensure that the key issues and concerns raised by the interested and affected parties have been properly and meaningfully addressed;
- To continue providing information about the project to the interested and affected parties and other key stakeholders and to obtain their comments on alternatives and proposed mitigation; and
- To provide input to the project feasibility study to assist the project proponent in his decision making (Figure E-2).



The EIA study must be preceded by careful planning and scoping, so that subsequent specialist studies and impact analysis focus on the key issues. © P.Tarr

The outcome of the EIA phase is an EIA Report or Statement, which should include issues raised during the entire impact assessment process, demonstrated responses, a detailed project description, a detailed evaluation of project alternatives, specialist studies, an integrated synthesis of the specialist reports and a clear and concise summary of the impacts of the project on the receiving environment. The EIA reports also provide suggested mitigation measures, and impacts are rated on the basis of their significance before and after the recommended mitigation is applied.

Important to note: Beware of the mitigation myth!

*There is a growing trend in EIAs to place unwarranted faith in the ability of the contractor and developer to apply all the proposed mitigation measures successfully, all of the time. Even with the best will in the world, this is highly unlikely. Under this improbable scenario, impacts are reduced from High to Low, without any real critical analysis of what is being suggested. The decision maker then makes a decision on the project on the basis of its supposed 'low' impact significance. However, it would make more sense to evaluate the EIA report on the basis that not all mitigation will be 100% effective all of the time, and that a more realistic assessment would be to consider the impact rating **before** mitigation is applied.*

E.5.2 How to guide the EIA

It is important that the environmental authority should consult with other relevant government departments and line ministries (refer to Box C-3 in Part C) throughout the EIA process in order to determine/specify the scope of the EIA with particular reference to:

- Appropriate boundaries for the study (time and space);
- Reasonable alternatives;
- A positive planning approach (opportunities and constraints);
- Relevant planning frameworks (protocols, laws, policies, standards, targets, strategic development frameworks, zoning plans, etc); and
- Key stakeholders to involve in the process.

In some SADC countries, the authorities actively guide the EIA by setting the terms of reference. In other countries, the EIA study cannot proceed until the proposed scope of work has been approved first by the authorities. Box E-3 contains a list of things that you should ask for or check in a proposed EIA process, and make sure are explicitly addressed in the EIA documentation.

Box E-3: Ask for, or check the following in an EIA proposal and report

- Consistence/compliance with laws, policies, other thresholds;
- Assessment and evaluation of effects of project alternatives on biodiversity pattern and process;
- Assessment and evaluation of the effects of project alternatives on ecosystem services;
- Determination of the costs of compensating for impacts on ecosystem services;
- Quantification of the opportunity costs associated with any impacts on biodiversity or ecosystem services;
- Statement of confidence in findings;
- Explicit statements regarding gaps in information, uncertainties, risks;
- Probability of significant indirect and/or cumulative effects;
- Clear statement of likely irreversible or irreplaceable impacts on biodiversity and/or ecosystem services;
- Assessment and evaluation of effects on human livelihoods, access to and/or dependence on ecosystem services, and changes in resilience, health or vulnerability of affected communities. These effects may need to be addressed by specialists across disciplines (e.g. biodiversity, social, economic, health etc.) and the various findings must be integrated with each other and synthesized in the main EIA report.
- Clear statement of any advantages for, or benefits to, biodiversity or ecosystem services;
- Significance of impacts relative to thresholds, before and after planned, **realistic** mitigation;
- Feasibility and effectiveness of, and commitment to any mitigation measures.

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹⁸

Problems highlighted in EIAs included:

- *Poor Terms of Reference for specialist studies that did not specify that the process or functional aspects of biodiversity must be considered to ensure that indirect and cumulative effects are addressed effectively.*
- *Little consideration of the distributional effects on human wellbeing of impacts on biodiversity and ecosystem services.*
- *Unreliable and meaningless significance ratings, since they were not explicitly linked to relevant criteria such as targets, thresholds, standards, threatened status, etc.*
- *The use of a 'recipe' or 'checklist' approach to impact assessment by consultants who superficially complied with legal requirements but failed to address biodiversity and ecosystem service issues adequately.*

Where alternatives were adequately addressed, where biodiversity and ecosystem services were considered proactively as key informants to shaping a proposal, and the proposal was sensitive and responsive both to input from stakeholders and the strategic context, the outcome of the impact assessment was generally positive and resulted in a Record of Decision that was acceptable and not challenged.

E.5.3 Decision making framework for assessing an EIA

When you receive an EIA report, you have to consider a range of factors, including the biophysical, social, economic and cultural impacts of the proposed project. Figure E-4 provides a framework for making decisions about biodiversity issues in an EIA. Reference should be made to Box C-1 in Part C for guidance on criteria and desired outcomes of decision making.



Because most new EA legislation gives Interested and Affected Parties the right to appeal against the decision of the authorities, project authorization/denial must be very carefully considered in order to avoid unnecessary conflicts and costly time delays. This places government departments and local authorities under increasing pressure. © P.Tarr

⁹⁸ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

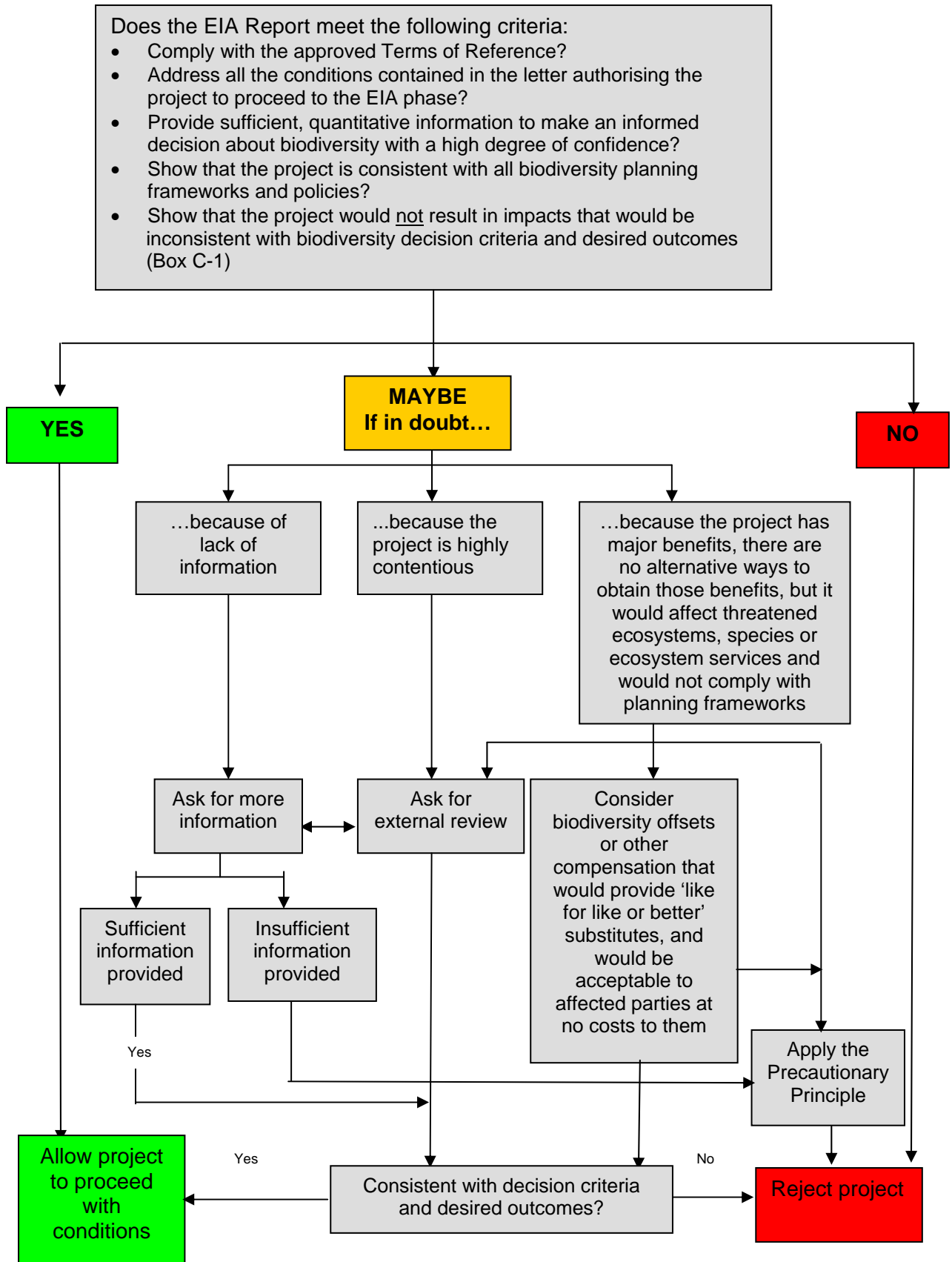


Figure E-4: Decision making framework for EIA Report

E.6 Guidance on Environmental Management Plans

E.6.1 Aims and Objectives of EMPs

While it is important to identify environmental issues (scoping), and then to analyse and quantify them in detail (EIA), this effort is of little value unless the management and mitigation measures are implemented on the ground through a well formulated Environmental Management Plan (EMP). An EMP can follow a decision based on scoping or after a full EIA.

The aims and objectives of the EMP are:

- To provide a detailed action plan for the implementation of the recommendations made in the impact assessment report;
- To provide goals and targets for environmental control that are measurable and auditable;
- To provide a basis on which the prospective contractor can accurately price for environmental management in his tender document;
- To specify particular roles, responsibilities and time scales;
- To provide a basis for monitoring compliance; and
- To provide a site management tool.

A meaningful EMP cannot be developed until the design and layout of the project have been finalised. The specified actions within the EMP must relate to definite project activities and not concepts or vaguely stated alternatives. In other words, both the impact assessment and project stages must be aligned at the same level of detail (Figure E-2).

It is essential to include the signed off and approved EMP in the invitations to tender for construction, otherwise it is both difficult and expensive to get the contractor to implement any of the required environmental management measures retrospectively.

Important to note: An EMP is NOT:

- *A vehicle for doing further studies;*
- *A vague set of broadly stated intentions by the consultant on behalf of the developer.*



These before and after pictures of a small mine show that rehabilitation after use is possible.
© B.Walmsley

E.6.2 How to guide the formulation of EMPs

The EMP is perhaps the least developed aspect of the impact assessment process in southern Africa, which may explain why it is also the activity which usually falls far short of its desired aims and objectives.

The EMP should adopt an holistic approach to environmental management and should cover all components of the environment: biophysical, social, cultural and economic.

Box E-4 contains a list of things that you should specifically ask for, or check in an EMP.

| Box E-4: Ask for, or check the following in an EMP |
|---|
| <p><u>General</u></p> <ul style="list-style-type: none"> ○ Preamble setting out: <ul style="list-style-type: none"> • The structure of the document • Useful contacts • A summary of applicable legislation and permits • Table showing applicable quality standards, guidelines and limits of acceptable change • Glossary of terms • List of abbreviations • Background information on the project and affected environment ○ Relevant environmental policy of the proponent and contractor ○ Specification of roles and responsibilities ○ Reporting structure (organogram) and frequency ○ A statement as to whether the EMP forms part of a larger management system, e.g. ISO 14001 |
| <p><u>Layout</u></p> <p>For each impact identified in the impact assessment report, the EMP must provide the following:</p> <ul style="list-style-type: none"> ○ A management objective ○ The management action to achieve the objective ○ The target, standard, guideline to be achieved ○ The person responsible for carrying out the action ○ The frequency of the action (if repeated) or the date for completion of the action. <p>Separate sections must be devoted to each stage of project execution:</p> <ul style="list-style-type: none"> ○ Construction ○ Commissioning ○ Operations |

- Decommissioning
- Closure

Within each major project phase, the EMP actions should be grouped by administrative area e.g. workshops, concrete batch plant, camp, etc., so that the person responsible for that area knows exactly what must be done with regards to environmental management and can be held directly responsible for any non-compliance.

DO NOT accept actions grouped by environmental component e.g. water, air, waste etc because then each area manager has to look through pages of the EMP to try and find out where their actions are. This makes the document less than useful. It also becomes impossible to audit when the actions relating to one workshop are scattered throughout the document.

Content

The EMP should include:

- Code of conduct, induction and environmental awareness training programmes
- Specified EMP compliance auditing programme, including checklists
- Specified programme for EMP review and update
- Document distribution and control methodology
- Schedule of incentives and penalties that will be applied
- Procedures to be followed for corrective actions, complaints and environmental incidents
- Specific plans to control a range of environmental issues by area of activity (see Box E-5 for checklists)
- Resettlement plan (if required)
- Compensation plan (if required)
- HIV/AIDS awareness and prevention plan
- Health and safety awareness programme for the local community
- Emergency procedures for a range of identified risks
- Public communication and disclosure plan

Monitoring Programme

For each element to be monitored (Box E-5) e.g. water quality, the EMP should specify:

- *What has to be monitored e.g. pH, SO₄, NO₃, PO₄, Fe, Mn, EC and suspended solids*
- *Where the monitoring stations should be e.g. provide map and precise coordinates of all sampling points*
- *Who is responsible for monitoring e.g. Environmental Control Officer or external consultancy*
- *Monitoring frequency e.g. monthly*

The EMP should provide monitoring/sampling protocols, chains of custody and the accredited laboratories that will be used for specific analyses.

The EMP should include an outline of the monitoring report formats to be used.

| Box E-5: Checklist of biodiversity and project aspects to include in an EMP and monitoring programme | | | |
|---|---|---|--|
| Checklist of biodiversity-related issues which may require management* | Checklist of project actions which may affect biodiversity for which environmental management actions may be required* | Checklist of aspects which may affect biodiversity and which require monitoring* | |
| Indigenous vegetation clearance and protection | Site establishment | Soil | |
| Invasive plant species removal and control | Fencing and security | Surface water | |
| Topsoil removal, handling and storage | Contractor's camp | Groundwater | |
| Spoil removal, transport and disposal | Lay down areas | Dust | |
| Erosion control and slope stabilisation | Temporary and permanent access roads and bridges | Gas | |
| Rehabilitation of disturbed areas | Fuel depots | Erosion | |
| Animal removal and protection | Concrete batch plants | Noise | |
| Invasive/rodent and scavenger control | Civil works (earthworks, foundations, piling, concrete works etc) | Vegetation | |
| Noise management | Workshops and wash bays | Animal indicator species | |
| Air quality, particularly dust and gas | Spray booths | Problem animals | |
| Surface water runoff and quality | Chemical and raw material storage areas | Aquatic biota (marine and freshwater) | |
| Groundwater runoff and quality | Hydrocarbon storage areas | Radiation | |
| Storm water runoff and control | Waste disposal sites for hazardous and non-hazardous material (permanent and temporary) | Rehabilitation work | |
| Effluent management | Temporary and permanent water supply systems | | |
| Hazardous waste management (transportation, storage, handling and disposal) | Temporary and permanent electricity supply structures | | |
| Non-hazardous solid waste management (transportation, storage, handling and disposal) | Sewerage systems and sewage treatment plants (permanent and temporary) | | |
| Land management | Tailings and slimes dams | | |
| Traffic management | Waste rock dumps | | |
| Off road driving management, temporary access roads and tracks | Effluent evaporation ponds and other containment and treatment facilities for liquid effluent | | |
| Vibration and blasting management | Borrow pits and quarries for construction materials | | |
| | Worker transportation | | |
| | Factory area | | |

| | | |
|--|---|--|
| | Receiving and Dispatch areas | |
| | Air emission sources e.g. chimneys, stacks | |
| | Scrap yard | |
| | Dredging and construction of berms, caissons, fill embankments, etc., in marine and freshwater environments | |
| | River crossings | |

* Please note that these lists are not inclusive of all issues, but merely serve as a guide to the more common aspects to be included in an EMP

E.6.3 Decision making framework for assessing EMPs

When you receive an EMP, you have to consider whether the measures and plans specified will actually eliminate, minimise or control the impacts identified in the impact assessment. A framework for making decisions about biodiversity issues in EMPs is provided in Figure E-5.

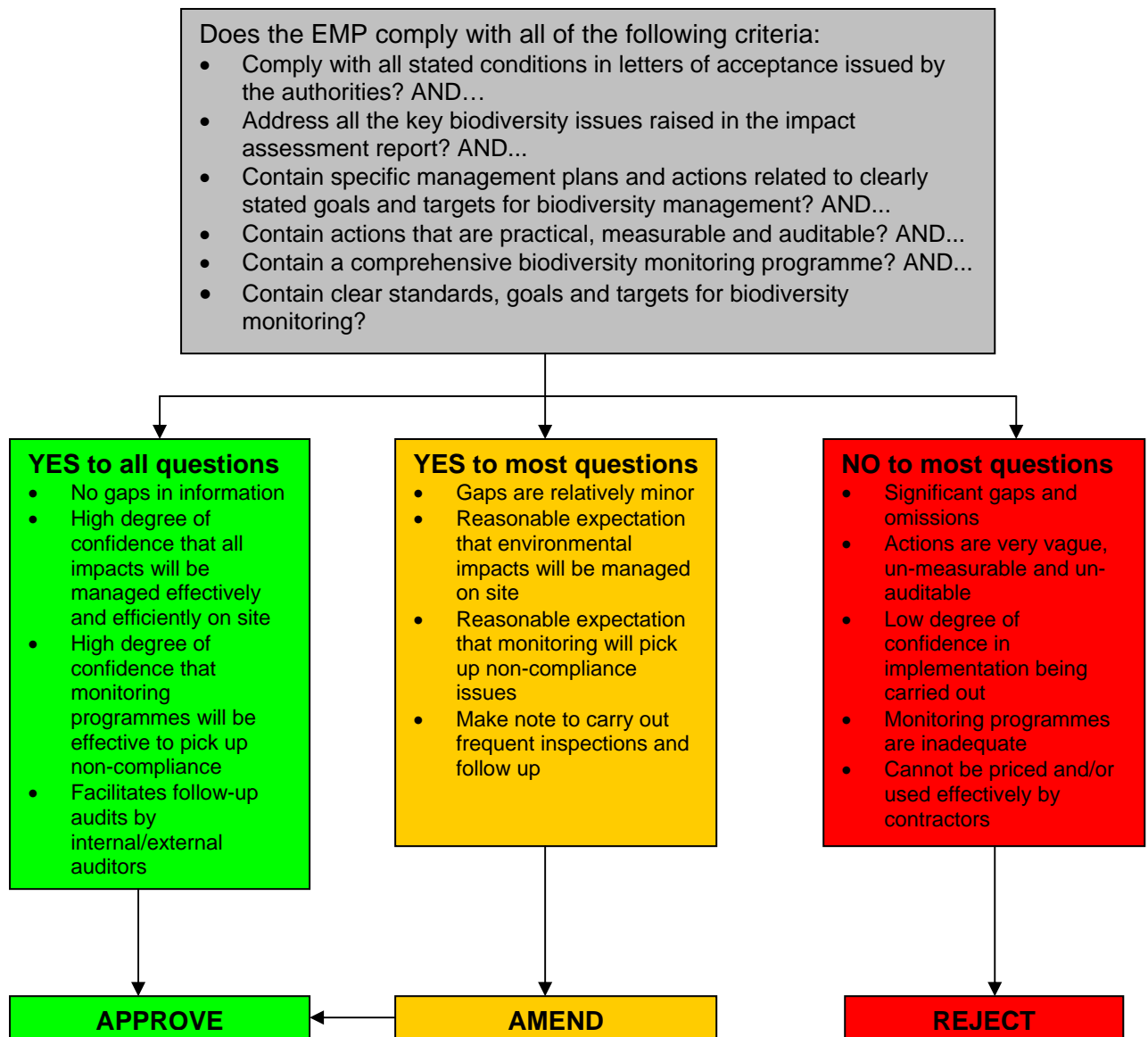


Figure E-5: Decision making framework for EMPs

E.7 Guidance on writing Letters of Authorisation or RoDs and conditions

Interesting to note: Findings of the Situation Assessment, Southern Africa⁹⁹

- *In a number of instances, the conditions of authorization deal with the mitigation and management of potentially significant or irreversible effects that have not been adequately addressed in the impact assessment.*
- *In one instance the RoD included as a condition of authorization the need to carry out an EIA on a crucial component of the proposed activity. The findings of this EIA should have informed decision making in the first instance.*
- *Critical measures to safeguard biodiversity were at times not explored prior to decision making, but included as either conditions or 'recommendations' with no legal standing. There is thus no assurance that such mitigation could or would take place.*
- *Letters of authorization or RoDs are vulnerable to appeal due to vague, inaccurate and/or inappropriate conditions of authorization, and/or ultra vires allocation of responsibility for their implementation.*

E.7.1 Aims and Objectives of the Letter of Authorisation

Letters of authorisation or Records of Decision usually have three major objectives:

1. To authorise formally in writing that a development may proceed.
2. To set out the reasons for the decision in writing.
3. To set out the terms and conditions under which the development is authorised.

E.7.2 How to write robust and explicit conditions

In order to avoid any confusion, the letter of authorisation must specify clearly:

- The name and contact details of the applicant;
- A precise description of the activity that is being authorised, preferably with the aid of a large-scale map. This is particularly important for multiple-phase developments, so that future phases cannot be 'included' under the current decision;
- The location and coordinates of the proposed activity;
- The criteria used in making the decision. This could include public comments, international obligations, legal instruments, regulations, policy objectives, spatial planning frameworks and any other biodiversity planning documents, lists, maps, etc.;
- The reasons for arriving at the decision;
- The dates for which the authorisation is valid;
- The lines of communication that must be followed including *inter alia*, the submission of reports;

⁹⁹ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

- The transfer of rights and obligations if there is a change of ownership of the project or property; and
- Specific conditions to protect the environment, including biodiversity and ecosystem services (see Box E-6).

Box E-6: Guidelines for writing conditions

The conditions must be:

- **Clearly and explicitly stated**, indicating what is required, who is responsible, when it should happen, where it applies, why it is required and how it must be carried out (if known); e.g. don't say 'initiate an investigation into...' when what is meant is to 'implement the findings' of such investigation.
- **Consistent** with each other and not conflicting;
- **Practical** e.g. don't say "no work shall be done in the rainy season". This is impractical. Rather give explicit instructions to deal with the issues around working in the rainy season such as: "construct stormwater cut-off trenches to accommodate the 1:100 year flood", or "provide catch dams to contain runoff and settle out the sediment load";
- **Measurable** e.g. don't say "keep disturbance to a minimum". This is a commonly encountered condition. It cannot be measured because there is no quantifiable target. Rather say: "demarcate the construction zone as per plan and do not allow any disturbance of the environment beyond this zone". Any disturbance outside the demarcated area can then be measured and reported on.
- **Auditable** e.g. don't say "there will be no erosion". With the best will in the world, erosion will happen and as a result the auditor will always find this a non-compliant issue. Rather set quantitative targets e.g. "erosion channels with a mean depth of 20cm shall not cover more than 10% of [specified] area". Or use a more outcomes-based approach and state that "suspended sediment at the sampling site immediately downstream of the site will not exceed 20mg/l".
- **Based on specific targets and goals**. The targets and goals must be consistent with published national standards e.g. water quality or air quality standards, or must comply with biodiversity targets set by the conservation authorities or must be consistent with stated goals in the EIA, e.g. x% of the area will be set aside for conservation.

E.8 Checking implementation and compliance with Letters of Authorisation

Interesting to note: Findings of the Situation Assessment, Southern Africa¹⁰⁰

There is no clear picture from either authorities or key stakeholders on the existence or effectiveness of checks on implementation after decision making, although most participants in the study were of the opinion that checks were inadequate.

¹⁰⁰ Southern African Institute for Environmental Assessment (2006). *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa*. Windhoek, Namibia.

E.8.1 Aims and Objectives of compliance monitoring

This section examines the role of the authorities in compliance monitoring. The main aims of compliance monitoring by the authorities are to:

- Evaluate the adherence by the contractors and developer to the conditions attached to the letter of authorisation;
- To check compliance with the Environmental Management Plan (EMP) and any other legal requirements referred to in the letter of authorisation;
- To assess the contractor's and applicant's effectiveness in implementing the conditions of authorisation and the EMP; and
- To recommend how and where improvements could be made to ensure compliance, enhance environmental performance and promote sustainability of the development.

E.8.2 Departmental/Ministry site audits and inspections

Most SADC countries make provision for post-EIA audits or inspections by the authorities. In some countries, post-EIA auditing or inspection can result in criminal prosecutions being made for non-compliance.

Four different aspects of auditing are addressed below, namely: composition of the audit team, the audit process, the audit report, and the frequency of audits or inspections.

Audit team

The audit team should comprise a lead auditor with additional auditors commensurate with the size of the operation being audited. A filling station construction site could be done by one person, whereas a large mine and smelter site may need a team of 3-4 auditors. The lead auditor should preferably be certified as an environmental auditor, but at the very least should have at least 5 years of applicable experience in environmental management relating to the subject being audited.

The auditors' names should be clearly stated on the audit report.

Audit process

It is good practice to develop an audit protocol prior to the audit, using specific questions regarding compliance which can be answered with a judgment rating, such as "compliant", "partially compliant", "not compliant", "not applicable". The audit may just be of the conditions contained in the letter of authorisation or the latter may make specific reference to compliance with an approved EMP. The audit protocol therefore needs to be directed at exactly what is to be audited. The audit protocol should be in the form of a table with headings provided in Box E-7:

| Box E-7: Suggested layout of an audit protocol | |
|---|---|
| ○ | Item reference number (cross-reference to the conditions contained in the letter of authorisation and/or EMP) |
| ○ | Environmental conditions as listed in the letter of authorisation, and/or the EMP requirement , posed as an auditable statement or question e.g. “Are drip trays being used where necessary in the [name] workshop?” |
| ○ | Audit judgment e.g. “Partial compliance” |
| ○ | Audit finding e.g. “Drip trays are present under all drum outlets, but from direct inspection of the ground (ref photo) and work practices observed by AN Person during the audit, it would appear that drip trays are not being used during vehicle servicing. This finding is corroborated by the presence of [BTEX, light petroleum products etc] in the last [number] groundwater monitoring results in Borehole X.” |
| ○ | Corrective action required e.g. “While the concentrations of [state determinants] are not yet over the stated standards, the trend is rising and corrective measures need to be taken as a matter of priority. These include: training of personnel in the workshop; excavation and removal of contaminated soil to [state place]; purchase of additional drip trays; etc” |
| ○ | Priority ranking (very high, high, medium, low) e.g. High |
| ○ | Responsible person e.g. Safety Health and Environment Manager; Workshop Foreman, Contractor |
| ○ | Date for completion e.g. within one month from [date]. |

The audit should commence with an opening meeting with the developer and/or contractors to outline the audit programme and to establish the audit scope (geographical, legal and administrative). The audit team should then commence the audit covering work areas, documentation, roles and responsibilities. The principal audit methods include:

- Observation;
- Document checks;
- Interviews;
- Photographs;
- Verification and cross-checking; and
- Measurement and sampling, if serious doubts arise.

The audit should end with a close-out meeting with site management to present the key findings and to highlight any serious liabilities which may need urgent attention.

The audit protocol should be arranged by work area, so that the foreman and/or SHE Officer in each area can be held directly responsible for the findings, e.g. each contractor’s work area, workshops, waste disposal site, etc.

Each finding should be substantiated with:

- An actual result or reading, and/or
- Monitoring trends, and/or
- Attributed statements, and/or
- Direct observation by the auditor, and/or
- Photographs, and/or
- Documentary evidence (receipts, agreements, permits etc).

In some cases it may be necessary to take spot samples, (e.g. pH readings) to verify data provided, if there is some doubt as to the veracity of the data, or to take measurements on the ground or on plans, e.g. to verify areas that have been rehabilitated.

Audit report

The final audit report should be submitted no more than 2 weeks after the audit has been completed. The report should clearly set out:

- the audit team;
- the scope of the audit;
- any constraints or limitations placed on the auditors;
- the aims of the audit;
- the methods used;
- a list of persons interviewed; and
- a list of all the work areas visited.

The completed checklists (protocol) should form the body of the audit report and a quantitative analysis of the findings must be provided. If the same procedure is followed for each audit, it is then possible to monitor progress towards full compliance. The report should conclude with a clear set of recommendations for corrective action, ranked according to priority. Each action should have a responsible person assigned to it and a date by which it should be started/completed.

Audit frequency

This will be determined by the nature of the development, the length of the construction programme, its location, the degree of confidence that can be placed in the implementation of the EMP being carried out and the degree of compliance. Sites with good environmental management may not need to be audited as frequently as those with a more suspect track record.



Hot tips!

- Make sure that the **EIA process is in sync with the project life cycle.**
- **Strong authority guidance results in a robust EIA process.**
- Use the decision making frameworks to **ensure consistency in decision making.**
- **Co-operate closely** with other line ministries and authorities to ensure consistency.
- **Beware of the 'Mitigation Myth'** and critically question the promises and intentions made to lower impact significance.
- **Use the decision criteria and desired outcomes** (Box C-1) as a constant guide to determine the adequacy of biodiversity studies in the assessment reports.
- **The Scoping and EIA documents have little value unless the commitments are implemented on the ground!** Check the adequacy of the EMP and conduct compliance audits.
- **It is worth writing tightly worded and comprehensive Records of Decision or Letters of Authorisation** to avoid conflict, appeals and non-compliance later on.

PART F: SECTOR GUIDELINES

In this part you will find guidance on the key activities and impacts associated with various sectors. The sectors have been selected on the basis of the project EIAs most commonly received by the Authorities in the SADC region.¹⁰¹ The sectors covered in this Part include:

- Mining and quarrying (opencast, open pit and underground)
- Hydropower (dams, run-of-river, pumped storage)
- Thermal power generation (oil, coal, gas and biogas-fired power stations)
- Power transmission
- Offshore oil and gas developments
- Roads and bridges
- Agriculture and forestry (irrigation, dry land arable, grazing, animal production, plantations, orchards, vineyards etc)
- Water resources development (dams, reservoirs, pipelines, canals, inter-basin transfers)
- Water-based infrastructure and related activities (ports, harbours, marinas, jetties, shipping, water-based recreation)
- Peri-urban and urban fringe developments (housing, golf courses, water treatment works, landfills, commercial developments etc)
- Ecotourism (lodges, trails, safaris, fly fishing, canoeing, rafting, game viewing, bird watching, camping, conservation areas, diving, snorkelling etc)

For each sector there is a list of typical activities which are commonly associated with each stage in the project life cycle:

- Planning/design/exploration
- Construction
- Operations
- Decommissioning and closure

The listed activities are merely indicative and most projects will either have additional or fewer activities depending on the circumstances.

Associated with each list of project activities, there is a list of the main biodiversity impacts which may occur if no mitigation is applied. Again, these lists of potential impacts are indicative and not exhaustive. The impacts have not been listed in any order of importance because this will differ from

¹⁰¹ Southern African Institute for Environmental Assessment (2003): *EIA in Southern Africa*. Windhoek, Namibia

project to project. However, the lists should act as a useful checklist for the compilers and reviewers of EIAs in these sectors.

While this Part has focussed on project-level guidance, it should be noted that national policies and trade agreements can have significant direct and indirect impacts on biodiversity, particularly those policies and trade agreements relating to: agriculture, energy, water, forestry, land tenure and resettlement. Large scale land use changes resulting from radical shifts in policy can have widespread impacts on the ability of ecosystems to provide 'free' goods and services in a sustainable manner. It is therefore imperative that policies and trade agreements should be subjected to SEA to ensure that the direct, indirect and cumulative impacts on biodiversity are minimised.

MINING AND QUARRYING

Open cast, open pit and underground

Main Exploration Activities

- Survey and mapping
- Establish cut lines
- Trenching, pitting, drilling and bulk sample collection
- Trial mining
- Pilot plant construction and operation
- Exploration camp
- Servicing vehicles and equipment (fuel and lubricant management)
- Waste disposal



Main Impacts of Exploration on Biodiversity

- Temporary disturbance of species at local level
- Temporary local loss of habitat
- Road collisions
- Dust smothering of vegetation
- Poaching and firewood collection by workers
- Introduction of alien species
- Sediment runoff
- Opening up remote areas which could result in biodiversity impacts

Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Overburden removal and blasting
- Access roads and tracks
- Fence construction
- Contractor's camp, yard and workshops
- Waste dump establishment and waste disposal
- Bulk earthworks
- Concrete batch plant
- Building and plant construction
- Installation of temporary and permanent services (water, sewage, power, telecoms, etc)
- Laying of pipes and conveyors
- Stormwater drainage and effluent management

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation along access roads
- Sedimentation of streams, rivers and wetlands
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation and loss of ecological corridors
- Local loss of species
- Introduction of alien spp e.g. through seeds on vehicles and equipment
- Providing access to remote areas and indirectly putting pressure on ecological goods and services

- Labour force
- Construction traffic

- Loss of access to ecological goods and services by local communities with resultant impacts on livelihoods
- Indirect impacts on biodiversity due to resettlement of local communities to other areas

Main Operational Activities*

- Drilling and blasting
- Waste rock dumps
- Ore conveyance (road, conveyor, cableway)
- Processing plant
- Smelter or refinery
- Heap leach, bioreactors
- Acid plant
- Tailings and/or slimes disposal
- Slag and/or process waste dumps
- Water abstraction and use
- Effluent disposal
- Hazardous materials storage and disposal
- Industrial waste disposal
- Traffic
- Workshops, offices, accommodation etc

Main Impacts of Mine Operations on Biodiversity

- Direct loss of habitat
- Direct loss of spp in the area
- Road collisions with birds and animals
- Direct and indirect loss of habitat through water pollution, dust smothering, acid rain, air pollution, reduction in river flows, soil contamination
- Impact on vegetation due to lowering of water table resulting from groundwater abstraction
- Effects of greenhouse gases on climate change and subsequent effects on biodiversity
- Habitat fragmentation
- Interruption and/or loss of migration corridors and disturbance of source-sink relationships
- Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower spp resilience
- Alien spp invasion (plants, pests, vermin, water weeds)

Main Decommissioning and Closure Activities

- Presence of open pit
- Rehabilitation of dumps
- Removal of all structures and waste
- Water pollution control measures

Main Impacts of Mine Closure on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Creation of new/different habitats
- Potential for invasive spp
- Physical traps for wildlife e.g. open pits, shafts, trenches.

**Note: Activities and impacts associated with water supply, transmission lines and roads are addressed in the respective sector guidelines.*

HYDROPOWER

Dams, pumped storage, run of river

Main Planning and Design Activities

- Site selection
- Choice of technology
- Positioning of turbines (above ground, underground, in the dam wall)
- Operational parameters (base load, peaking power)
- Site layout and design options

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- the conservation status of the river
- the presence of important downstream conservation areas
- fish migration patterns and fisheries
- the importance of riverine vegetation for habitat, erosion control, ecosystem functioning and provision of goods and services
- the flood regime and the importance of wetlands in regulating floods
- sediment movement
- water flow characteristics
- water quality and the importance of wetland loss on downstream water quality
- the impact on the country's ability to meet international obligations with regard to biodiversity protection



Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Blasting
- Quarrying for fill materials
- Water diversion works and coffer dams
- Access roads and tracks
- Fence construction
- Contractor's camp, yard and workshops
- Waste disposal
- Bulk earthworks
- Building and plant construction
- Concrete batch plant
- Installation of temporary and permanent services (water, sewage, power, telecoms)
- Dam filling
- Traffic
- Labour force

Main Impacts of Construction on Biodiversity**

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation
- Alteration of sediment dynamics in streams, rivers
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation
- Local loss of species
- Interruption of migration routes, especially fish
- Loss of ecological corridors
- Introduction of aquatic alien spp.
- Providing access to remote areas and indirectly putting pressure on ecological goods and services
- Loss of access to ecological goods and services by local communities with resultant impacts on livelihoods
- Indirect impacts on biodiversity due to resettlement of local communities

Main Operational Activities*

- Impoundment of water
- Controlled release of water to suit operational requirements
- Drawdown of water level in impoundments
- Power generation
- Dredging/sluicing and disposal of silt
- Hazardous materials storage and disposal
- Industrial waste disposal
- Workshops
- Employee accommodation

Main Impacts of Hydropower Operations on Biodiversity

- Direct loss of habitat and species (direct inundation and loss of flow upstream of tailrace)
- Change in habitat from flowing river to an impoundment
- Indirect loss of downstream habitat and spp through perturbation in river flows and flood regime, altered physical and chemical characteristics of water
- Altered patterns of erosion and silt deposition downstream of the installation
- Habitat fragmentation
- Interruption and/or loss of migration corridors especially for fish
- Changes in predator-prey relationships
- Alien spp invasion (terrestrial and aquatic weeds)

Main Decommissioning and Closure Activities

- Removal of all structures

Main Impacts of Closure on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Creation of new/different habitats
- Potential for invasive species.

**Note: Activities and impacts associated with quarries, water supply, transmission lines and roads are addressed in the respective sector guidelines.*

*** See also sector guidance on water development infrastructure*

THERMAL POWER GENERATION

Oil, coal, gas, biogas

Main Planning and Design Activities

- Site selection
- Secondary effects relating to the sourcing of energy (mines, gas wells, biodiesel plant production etc)
- Choice of technology
- Operational parameters (base load, peaking power)
- Site layout and design

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- proximity to proclaimed conservation areas;
- proximity to, or effect on priority ecosystems identified in the country's NBSAP;
- impact on country's ability to meet international obligations pertaining to biodiversity protection;
- fatal flaws relating to permanent loss of species or habitat.



Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Access roads and tracks
- Fence construction
- Contractor's camp, yard and workshops
- Waste dump establishment and waste disposal
- Bulk earthworks
- Concrete batch plant
- Building and plant construction
- Installation of temporary and permanent services (water, sewage, power, telecoms, etc)
- Laying of pipes and conveyors
- Stormwater drainage and effluent management
- Labour force
- Construction traffic

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation along access roads
- Sedimentation of streams, rivers, wetlands
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation
- Local loss of species
- Introduction of alien spp through seed transfer from vehicles and equipment

Main Operational Activities*

- Combustion of raw materials to generate heat
- Turbines and generators
- Cooling units
- Exhaust stacks
- Switchyard
- Compressors and boilers
- Liquid fuel storage tanks
- Cooling water intake and outlet structures
- Water storage facilities
- Waste water treatment plant
- Hazardous materials storage and disposal
- Industrial waste disposal
- Workshops

Main Impacts of Thermal Power Station Operations on Biodiversity

- Direct loss of habitat and spp in the area
- Road collisions with animals and birds
- Impact of heated effluent discharge to receiving waters on aquatic fauna and flora
- Indirect loss of habitat through water utilisation (for cooling), pollution, dust smothering, acid rain, air pollution (CO₂, SO_x, NO_x), reduction in river flows, soil contamination, effects of greenhouse gas emissions on climate change etc
- Habitat fragmentation
- Interruption and/or loss of migration corridors and source-sink relationships
- Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower spp resilience
- Alien spp invasion into disturbed, areas

Main Decommissioning and Closure Activities

- Removal of all structures and waste
- Water pollution control measures
- Rehabilitation of all waste dumps

Main Impacts of Power Station Closure on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Creation of new/different habitats
- Potential for invasive spp

**Note: Activities and impacts associated with mining, oil and gas production, water supply, transmission lines and roads are addressed in the respective sector guidelines.*

POWER TRANSMISSION

Main Planning and Design Activities

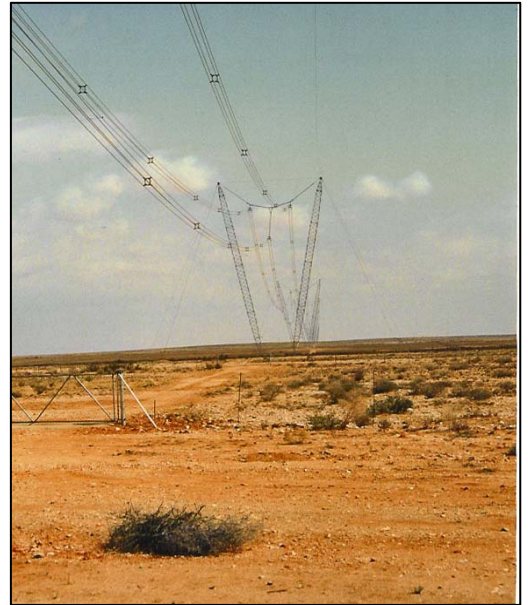
- Route selection
- Substation site selection

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try

and avoid or minimise many of the impacts during later project stages:

- proximity to proclaimed and future conservation areas;
- proximity to sensitive ecosystems, especially pans, dams, rivers, lagoons, estuaries, cliffs and ridge lines where birds congregate to roost, breed and feed;
- proximity to, or effect on priority ecosystems identified in the country's NBSAP;
- areas of high botanical importance;
- impact on country's ability to meet international obligations pertaining to biodiversity protection;
- fatal flaws relating to permanent loss of species or habitat.



Main Construction Activities

- Vegetation clearance or trimming along the route
- Access roads and tracks
- Foundation excavation and concreting
- Pylon erection
- Line stringing and tensioning
- Contractor's camp, yard and workshop
- Waste disposal
- Labour force

Main Impacts of Construction on Biodiversity

- Dust smothering of vegetation
- Erosion of stream- and river banks
- Erosion of hillsides during access road construction
- Poaching and firewood collection by construction workforce
- Local and temporary disturbance of species due to the presence of people, vehicles and helicopters
- Possible introduction of alien spp through the introduction of seeds by vehicles

Main Operational Activities

- Routine line inspections
- Occasional maintenance

Main Impacts of Transmission Lines on Biodiversity

- Bird mortalities resulting from collisions with the lines during flight
- Bird mortalities resulting from electrocution. This occurs when bird droppings touch a live wire while the bird is perched on the pylon
- The pylons provide good perching spots for raptors and there is often increased predation along transmission line routes, especially in arid areas with few natural perches, leading to changes in predator-prey relationships
- Pylons provide attractive nesting sites for several species of birds
- Indirect effects of increased access to remote areas along powerline routes and subsequent loss of spp through hunting, habitat destruction and transformation
- Cleared servitudes or wayleaves act as corridors for invasive plant invasions
- Ongoing erosion of access roads
- Possible increase in veld fires

Main Decommissioning Activities

- Removal of all structures and waste

Main Impacts of Transmission Line Decommissioning on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Potential for invasive spp

OFFSHORE OIL AND GAS

Main Exploration, Planning and Design Activities

- Choice of development solutions
- Pipeline route selection
- Shooting seismic

Main Impacts of Exploration, Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the exploration, planning and design stage:

- Noise and sound waves from shooting seismic
- Disturbance of marine mammals and seabirds from increased vessel and helicopter activities
- Waste and effluent disposal from exploration vessels
- Disturbance of the seafloor and coral reefs by anchors
- Risks of accidental oil spillage



Main Construction Activities*

- Well drilling and logging from drilling rig or semi-submersible unit
- Well testing and flaring (if necessary)
- Pipeline laying
- Construction of pipeline landfall facilities
- Supply base/port facilities
- Land-based contractor's camp, yard and workshops
- Helicopter operations
- Service vessel activity
- Waste management
- Disposal of produced water

Main Impacts of Construction on Biodiversity

- Impacts on benthic fauna from the discharge of drilling mud and drill cuttings
- Impacts on fish and fisheries due to the discharge of produced water, sewage, galley wastes, ship/rig runoff etc**
- Impacts on seabirds and marine life (especially crustaceans) from accidental oil spills
- Disturbance of marine mammals and seabirds due to increased vessel and helicopter activity
- Temporary and locally permanent loss of habitat for near shore and beach organisms during the construction of pipeline land fall structures
- Possible introduction of alien species through discharge of ballast water and vessel hulls
- Emission of CO₂, NO_x, SO_x, VOCs from flares, exhaust emissions with indirect impacts on biodiversity as a result of climate change, acid rain and nitrogen fall-out
- Illegal disposal of hazardous and industrial waste at sea resulting in pollution and ingestion by marine fauna leading to chronic and acute effects and mortalities
- Fishing exclusion zones around well development facilities could place pressure on other fishing areas
- Bioaccumulation of heavy metals in seabirds, mammals, fish and crustaceans with impacts on spp physiology, food chain functioning and possible toxic health effects in humans

Main Operational Activities (platforms or sub-sea manifolds)

- Presence of a production platform, with:
 - Flare gas and recovery systems
 - Power generation plant
 - Flow lines and return lines
 - Accommodation for platform staff
 - Waste management system
 - Sewage plant
 - Helicopter operations
 - Service and supply vessels
 - Disposal of produced water and other process chemicals

Main Impacts of Oil and Gas Production on Biodiversity

- Impacts on fish and fisheries due to the discharge of produced water, sewage, galley wastes, ship/platform runoff etc**
- Impacts on seabirds and marine life (especially crustaceans) from accidental oil spills, blow outs
- Disturbance of marine mammals and seabirds due to helicopter activity
- Emission of CO₂, NO_x, SO_x, VOCs from flares, exhaust emissions with indirect impacts on biodiversity as a result of climate change, acid rain

- CO₂ injection and storage
- OR
- Remote operation of sub-sea manifolds, with:
 - Flow lines, control umbilicals, gas/oil pipeline, corrosion inhibitor pipelines
 - Pipeline landfall structures
 - Land-based gas conditioning plant
 - Effluent and waste disposal

- and nitrogen fall-out etc
- Illegal disposal of hazardous and industrial waste at sea resulting in pollution and ingestion by marine fauna leading to chronic and acute effects and mortalities
- Fishing exclusion zones around well development facilities and platforms could place pressure on other fishing areas Bioaccumulation of heavy metals in seabirds, mammals, fish and crustaceans with impacts on spp physiology, food chain functioning and possible toxic health effects in humans

Main Decommissioning Activities

- Abandonment/removal of all sub-sea structures
- Removal of platform
- Decommissioning of wells
- Demolition and removal of land-based structures

Main Impacts of Oil and Gas Decommissioning on Biodiversity

- Return of species to area
- Return of fishing boats to area
- Improvement in water quality
- Risk of oil and other contamination during rig stripping, well closure and rig removal

**all activities associated with oil and gas field development up to the point of delivery to a refinery, LNG plant or ship or power station.*

*** the main pollutants are: BTEX, naphthalene, poly-aromatic hydrocarbons (PAHs), phenols, aliphatic hydrocarbons, heavy metals, process chemicals e.g. flocculants, corrosion and hydrate inhibitors and organic pollutants etc*

ROADS AND BRIDGES

Main Planning and Design Activities

- Route selection
- Gradient design
- Surface design and geometry
- Bridge site selection

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- Proximity to proclaimed and future conservation areas;
- Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers, coastal zones, estuaries and any area identified in the country's NBSAP;
- Avoid habitat fragmentation;
- Minimise the need for cut and fill;
- Minimise number of river crossings;
- Impact on country's ability to meet international obligations pertaining to biodiversity protection;
- Fatal flaws relating to permanent loss of species or habitat.



Main Construction Activities*

- Vegetation clearance along the route
- Topsoil removal and storage
- Development of borrow pits and quarries
- Blasting of cuttings
- Fill operations
- Excess spoil disposal
- Grading, earthmoving, laying of base course and sub-base layers
- Construction of river crossings including river diversion works, earthworks, brick and concrete work, etc
- Installation of culverts and construction of stormwater drains
- Establishment of temporary access roads and tracks
- Site establishment including construction of contractor's camp, yard and workshop areas, fencing, establishment of water supply
- Waste disposal (hazardous and non-hazardous)
- Temporary ablation facilities
- Creosoting yard
- Asphalt plant and application of wearing course
- Diesel tanks and refuelling point
- Concrete batch plant
- Aggregate stockpiles
- Toll plaza construction (if a toll road)
- Labour force

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of vegetation
- Dust smothering of vegetation
- Erosion of stream- and river banks
- Alteration of drainage lines and perturbation of wetlands
- Erosion of hillsides during cut and fill activities
- Poaching and firewood collection by construction workforce and itinerant job seekers
- Local and temporary disturbance of species due to the presence of people and vehicles and blasting activities
- Possible introduction of alien spp and scavengers
- Contamination of water courses from sediment, bitumen waste, general waste and litter, hydrocarbon spills from vehicles and equipment
- Soil contamination from hydrocarbon spills
- Soil compaction
- Temporary or permanent disruption of ecological corridors and migration routes
- Increase in road kills due to construction traffic

Main Operational Activities

- Occasional maintenance
- Traffic flow
- Secondary developments
- Toll gate operation (if a toll road)

Main Impacts of Roads and Bridges on Biodiversity

- Indirect effects on biodiversity and ecosystem services due to increased access to remote areas along new roads and subsequent land use impacts including settlements, agriculture, tourism
- Noise disturbance
- Secondary development along road
- Animal and bird collisions

- Permanent disruption of ecological corridors and migration routes linking different ecosystems or across altitudinal gradients
- Possible introduction of alien invasive spp

Main Decommissioning Activities

- Removal of all construction facilities
- Ripping, grading and contouring
- Landscaping, topsoil replacement and rehabilitation

Main Impacts of Road and Bridge Decommissioning on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Potential for invasive spp

** Activities relating to the development of borrow pits and quarries are covered under Mining. Secondary impacts resulting from road construction e.g. agriculture, tourism are addressed under the relevant sectors.*

AGRICULTURE AND FORESTRY

Irrigation, dry land arable, animal production, grazing, plantations, orchards, vineyards

Main Planning Activities

- Decision regarding use of GMOs
- Crop/animal type selection
- Choice of irrigation system (if required)
- Source of suitable quantity and quality of water for irrigation
- Location of market and transportation options
- Climate and soil investigations

Main Impacts of Planning on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- Proximity to proclaimed and future conservation areas;
- Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers and any priority area identified in the country's NBSAP;
- Avoid habitat fragmentation;
- Unknown impacts of GMOs on local species diversity
- Impact on country's ability to meet international obligations pertaining to biodiversity protection;
- Fatal flaws relating to permanent loss of species or habitat;
- Unsustainable water use could compromise downstream environments and other users.



Main Construction Activities

- Clearance of vegetation
- Establishment of irrigation system (pumps, pipes etc) if required
- Construction of tunnels, hothouses, if required
- Fencing
- Construction of farm buildings, sheds, packing areas, storage, animal production facilities etc
- Construction of access roads and tracks

Main Impacts of Construction on Biodiversity

- Permanent loss of vegetation
- Habitat fragmentation
- Interruption of ecological corridors and migration paths
- Erosion and stream sedimentation
- Draining of wetlands

Main Operational Activities

- Tilling of soil (if required)
- Sowing or planting
- Fertilisation and soil conditioning
- Application of pesticides, herbicides and fungicides
- Irrigation (if necessary)
- Cropping or harvesting
- Processing and packing

Main Impacts of Agriculture and Forestry on Biodiversity

- Monoculture leads to loss of species diversity
- Population explosions (e.g. rodents, graminivores) and ecosystem perturbation
- Introduction of persistent organic pollutants in soils and water bodies resulting in acute and chronic effects in animals through direct and

- Transportation of products
- Disposal of animal wastes
- Disposal of agri-chemical wastes

- indirect uptake and bioaccumulation
- Return flows from irrigated fields can lead to increased salinisation of receiving water bodies leading to ecosystem changes and loss of species diversity
- Increased eutrophication of water bodies from elevated nitrogen and phosphate loads in runoff and seepage water, resulting in the growth of algae and invasive water plants with a concomitant change in benthic species as well as physico-chemical characteristics of the water.
- Potential for faecal contamination of drinking water from feedlots and stock watering points
- Reduction in downstream flows due to irrigation quotas and forest uptake
- Erosion and increased sediment yield from fields, overgrazed areas and clear-felling
- Over-cropping may lead to soil nutrient depletion and compaction
- Potential for genetically modified, invasive and alien spp to displace native spp
- Loss of, or interruption of ecological corridors linking different ecosystems or across altitudinal gradients
- Conflicts with wildlife (e.g. elephants) which may be attracted to crops

Main Decommissioning Activities

- Cease agricultural activities, remove all fences and structures

Main Impacts of Decommissioning on Biodiversity

- Slow return of biodiversity

WATER RESOURCES DEVELOPMENT

Dams, reservoirs, pipelines, canals, inter-basin transfers

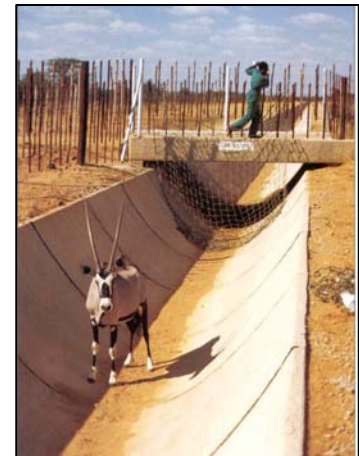
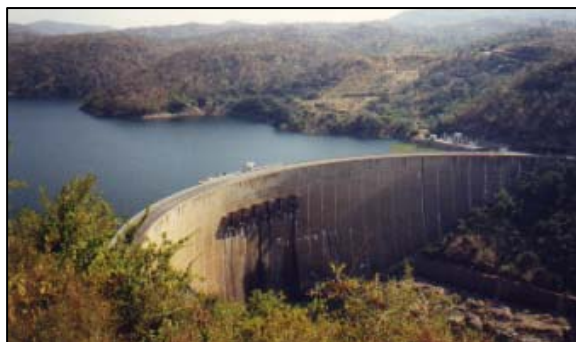
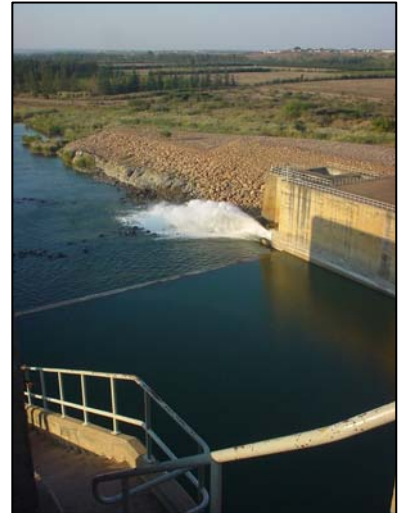
Main Planning and Design Activities

- Site and route selection
- Choice of design
- Selection of alternative schemes

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- the conservation status of the river and dam basin
- the presence of important downstream conservation areas or priority areas identified in the country's NBSAP
- fish migration patterns and fisheries
- the importance of riverine vegetation for habitat, erosion control, ecosystem functioning and provision of goods and services
- the flood regime and the importance of wetlands in regulating floods
- sediment movement
- water flow characteristics
- water quality and the importance of potential wetland loss on downstream water quality
- impact on the country's ability to meet international obligations with regard to biodiversity protection.



Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Trench excavation for pipes and canals
- Blasting and tunnelling (if required)
- Quarrying for fill materials
- Water diversion works and coffer dams
- Access roads and tracks
- Fence construction
- Contractor's camp, yard and workshops
- Waste disposal
- Bulk earthworks
- Building and plant construction
- Concrete batch plant
- Installation of temporary and permanent services (water, sewage, power, telecoms)
- Reservoir construction
- Dam filling
- Traffic
- Labour force

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation
- Alteration of downstream sediment dynamics in streams, rivers, wetlands
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation
- Local loss of species
- Introduction of aquatic alien spp.
- Providing access to remote areas and indirectly putting pressure on ecological goods and services
- Loss of access to ecological goods and services by local communities with resultant impacts on livelihoods
- Indirect impacts on biodiversity due to resettlement of local communities

Main Operational Activities*

- Impoundment of water
- Controlled release of water to suit operational requirements
- Drawdown of water level in impoundments
- Dredging and disposal of silt from dams
- Water transfer
- Canal operation

Main Impacts of Water Projects on Biodiversity

- Direct loss of habitat and species
- Change in habitat from flowing river to an impoundment
- Indirect loss of downstream habitat and spp through perturbation in river flows and flood regime, altered physical and chemical characteristics of water
- Altered patterns of erosion and silt deposition downstream
- Habitat fragmentation
- Interruption and/or loss of migration corridors especially for fish
- Canals can act as death traps for all species or barriers to movement
- Changes in predator-prey relationships
- Alien spp invasion (terrestrial and aquatic weeds)
- Possible transfer of spp between catchments.

Main Decommissioning and Closure Activities

- Removal of all structures

Main Impacts of Closure on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Creation of new/different habitats
- Potential for invasive spp

**Note: Activities and impacts associated with quarries, transmission lines, roads and water-based recreation are addressed in the respective sector guidelines.*

WATER-BASED INFRASTRUCTURE AND RELATED ACTIVITIES

Ports, harbours, marinas, jetties, shipping, water-based recreation

Main Planning and Design Activities

- Site selection
- Choice of design and layout
- Alternative schemes

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- the conservation status of the marine/lake/river environment
- the importance of river banks and shores for habitat, erosion protection, ecosystem functioning and provision of goods and services
- the flood and tidal regimes
- water and sediment movement and obstruction
- water quality



Main Construction Activities*

- Shoreline vegetation clearance
- Water diversion works
- Dredging and disposal of dredge spoil
- Blasting (in some cases)
- Bulk earthworks
- Piling and concrete work including batch plant
- Construction of groynes, breakwaters and other protection works
- Landside construction of buildings and related infrastructure
- Access roads and tracks
- Contractor's camp, yard and workshop
- Waste disposal
- Construction traffic
- Labour force

Main Impacts of Construction on Biodiversity

- Direct loss of coastal/shore/bank vegetation and faunal habitat
- Temporary or permanent interruption of ecological corridors
- Possible release of toxic substances during dredging and dredge spoil disposal activities
- Smothering of benthic fauna due to dredge spoil disposal
- Increased turbidity due to dredging, spoil disposal, re-suspension of fines and other construction activities will affect light penetration and ecosystem functioning
- Accidental hydrocarbon spills will have acute, chronic and lethal effects on marine and shoreline organisms
- Introduction of alien organisms and plants from construction equipment and machinery
- Effects of blasting on marine mammals, seabirds, fish and fisheries

Main Operational Activities*

- Arrival and departure of vessels
- Loading and offloading of vessels
- Boat launching
- Handling, storage, conveyance and transfer of cargo including containers, break bulk cargoes, diesel and oil, liquid products and bulk materials
- Marine services including boat cleaning, painting, repairing, welding etc
- Ongoing dredging of channels
- Commercial fishing operations and processing facilities

Main Impacts of water-based infrastructure & recreation on biodiversity

- Introduction of alien spp from boats and discharge of ballast water
- Erosion of banks and shorelines by boat wakes leads to loss of breeding sites for birds and other organisms
- Impact of oil spills on seabirds, marine, inter-tidal and shore organisms (acute and chronic effects, mortality)
- Depletion of fish stocks due to over-fishing
- Indiscriminate fishing methods, quota exceedance

- Solid waste disposal from wharf operations and vessels
 - Effluent and runoff disposal from wharf and wharf-side factories, processing plants and stockpiles
 - Motorised water sports including: yachting, boating, water-skiing, jet skis
 - Re-fuelling and provisioning of boats
 - Discharge of ballast water
- and illegal catch sizes affect species diversity and population sizes
 - Impacts of litter and waste on fish, marine mammals and shoreline fauna
 - Direct and indirect effects on sensitive ecosystems e.g. coral reefs, mangrove swamps, estuaries etc due to perturbations in wave, current and sediment transport regimes resulting in shoreline accretion and/or erosion
 - Noise and disturbance from boat-based recreation on bird breeding and feeding sites
 - Impacts on water quality due to erosive effects of wind and water on loose material stockpiles e.g. coal, iron ore, manganese, titanium etc
 - Impacts on water quality and marine organisms from runoff and effluent disposal from shore-based activities e.g. fish processing factories
 - Toxic effects of anti-fouling paints on aquatic/marine organisms resulting in growth and development effects
 - Impact of ship movements on marine mammals e.g. dugongs, whales and other cetaceans
 - Bioaccumulation of toxins in edible marine organisms e.g. mussels, crabs, lobsters with indirect effects on human health
 - Loss of subsistence fisheries and marine harvesting areas

Main Decommissioning and Closure Activities

- Removal of all structures

Main Impacts of Closure on Biodiversity

- Re-colonisation of disturbed areas by fauna and flora
- Creation of new/different habitats
- Potential for invasive spp

**Note: Activities and impacts associated with water supply, transmission lines and roads are addressed in the respective sector guidelines.*

PERI-URBAN AND URBAN FRINGE DEVELOPMENTS

Housing, golf courses, water treatment works, landfills, commercial

Main Planning and Design Activities

- Zoning applications
- Land purchase
- Design and layout alternatives
- Provision for bulk services (water, power)
- Infrastructure requirements (roads)
- Site selection processes
- Market demand studies

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- extension of urban edge into 'greenfields' sites and green belt areas;
- high demand for limited water resources places stress on existing schemes and requires possible development of new schemes with all the related impacts on biodiversity;
- Unsustainable water use could compromise downstream environments and other users;
- Proximity to proclaimed and future conservation areas;
- Impact on sensitive ecosystems, especially areas of high botanical importance, wetlands, rivers, ridges and any priority area identified in the country's NBSAP;
- Avoid habitat fragmentation;
- Impact on country's ability to meet international obligations pertaining to biodiversity protection;
- Fatal flaws relating to permanent loss of species or habitat.



Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Construction and/or upgrading of roads
- Fence and wall construction
- Contractor's camp, yards and workshops
- Concrete batch plant
- Waste disposal
- Bulk earthworks
- Installation of bulk services (water, sewerage, power, telecoms)
- Site development and building construction
- Transportation of all raw materials to site
- Construction traffic
- Labour force

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation
- Sedimentation of streams, rivers
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation
- Local loss of species
- Loss of ecological corridors
- Introduction of alien spp, especially plants and animals (pets)
- Loss of access to ecological goods and services by local communities with resultant impacts on

livelihoods

- Indirect impacts on biodiversity due to resettlement of local communities

Main Operational Activities*

- High water consumption
- Increased stormwater runoff, sewage volumes and return flows
- Application of fertilisers, pesticides, herbicides and fungicides in gardens, parks, golf courses etc
- Groundwater abstraction
- Greater energy requirements
- Increased traffic and noise
- Landscaping with alien species and irrigation
- Increased waste production

Main Impacts of Urban Fringe Developments on Biodiversity

- Direct loss of habitat and/or habitat transformation
- Habitat fragmentation
- Direct loss of spp in the area due to loss of habitat, road and powerline collisions
- Indirect loss of habitat through water pollution, dust smothering, air pollution, reduction in river flows, soil contamination
- Interruption and/or loss of migration corridors and perturbation of source-sink relationships
- Indirect impact on food web functioning through bioaccumulation of metals, loss of diversity, lower spp resilience
- Alteration in predator-prey relationships
- Reduction in river flows resulting in impacts on fish migration and breeding and other aquatic organisms
- Lowering of the groundwater table will impact on rooting depths of plants, especially trees
- Alien spp invasion (plants, birds, pets, pests, vermin, water weeds)

**Note: Activities and impacts associated with water supply, transmission lines, energy generation, provision of construction materials and roads are addressed in the respective sector guidelines.*

ECOTOURISM

Lodges, trails, safaris, fly fishing, canoeing, rafting, game viewing, bird watching, camping, conservation areas, diving, snorkelling

Main Planning and Design Activities

- Zoning applications
- Land purchase
- Site and route selection
- Alternatives assessment
- Opportunities and constraints analysis
- Layout and design options

Main Impacts of Planning and Design on Biodiversity

The following impacts on biodiversity need to be taken into consideration during the planning and design stage in order to try and avoid or minimise many of the impacts during later project stages:

- proximity to proclaimed conservation areas;
- proximity to, or effect on priority ecosystems identified in the country's NBSAP;
- impact on country's ability to meet international obligations pertaining to biodiversity protection;
- fatal flaws relating to permanent loss of species or habitat.
- Increased demand for limited water resources places stress on existing schemes and requires possible development of new schemes with all the related impacts on biodiversity;
- Unsustainable water use could compromise downstream environments and other users;



Main Construction Activities*

- Vegetation clearance
- Topsoil stripping
- Construction and/or upgrading of roads
- Fence and wall construction
- Contractor's camp, yards and workshops
- Concrete batch plant
- Waste disposal
- Bulk earthworks
- Installation of bulk services (water, sewerage, power, telecoms)
- Site development and building construction
- Transportation of all raw materials to site
- Construction traffic
- Labour force

Main Impacts of Construction on Biodiversity

- Temporary and permanent loss of habitat
- Road collisions with animals, birds
- Dust smothering of vegetation
- Sedimentation of streams, rivers
- Poaching and firewood collection by workforce and itinerant job seekers
- Habitat fragmentation
- Local loss of species
- Loss of ecological corridors
- Introduction of alien spp.
- Indirect impacts on biodiversity due to resettlement of local communities

Main Operational Activities*

- Water consumption
- Increased stormwater runoff, sewage volumes and return flows
- Application of fertilisers, pesticides, herbicides and fungicides in gardens, landscaped areas etc
- Groundwater abstraction

Main Impacts of Ecotourism Developments on Biodiversity

- Direct loss of habitat and/or habitat transformation
- Habitat fragmentation
- Direct loss of spp in the area due to loss of habitat, road and powerline collisions
- Indirect loss of habitat through water pollution, dust smothering, air pollution, reduction in river

- Energy needs
 - Increased traffic
 - Landscaping with alien species and irrigation
 - Increased waste production
- flows, soil contamination, boat wake erosion, trampling etc
- Interruption and/or loss of migration corridors and source-sink relationships due to fence construction
 - Water abstraction could result in a reduction in river flows resulting in impacts on fish migration and breeding and other aquatic organisms
 - Lowering of the groundwater table will impact on rooting depths of plants, especially trees
 - Introduction of alien spp e.g. trout will affect native spp and predator-prey relationships
 - Improved conservation of spp and habitats
 - Need for game management to control population
 - Improved awareness of biodiversity conservation issues by the public through exposure to the environment
 - Re-introduction of locally extinct spp
 - Re-instatement of natural vegetation and removal of alien plants
 - Loss of access to ecological goods and services by local communities with resultant impacts on livelihoods

**Note: Activities and impacts associated with water supply, transmission lines, water-based infrastructure development and roads are addressed in the respective sector guidelines.*

APPENDIX 1: COMMON IMPACT ASSESSMENT TERMINOLOGY

Many of the terms explained in previous sections (e.g. risk, uncertainty and the precautionary principle, irreversible impacts, amongst others, are central to the assessment and evaluation of impacts on biodiversity and ecosystem services. The terms given below are generic to most, if not all, impact assessments. They are presented in alphabetical order for ease of reference.

- **Alternatives**

A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The “no-go” alternative constitutes the ‘without project’ option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

- **Assessment and evaluation of impacts**

Assessment of impacts means using a systematic and explicit approach to determine the extent, duration and magnitude of impacts. The evaluation of impacts involves determining their potential significance.

- **Direct, indirect and cumulative impacts¹**

Decision makers need to know the direct, indirect and cumulative impacts of a proposed activity on the environment, if they are to take informed decisions in line with sustainable development.

- **Direct impacts** are those that take place at the same time and in the same space as the activity. E.g. clearing of natural vegetation for agriculture.
- **Indirect impacts** occur later in time or at a different place from the activity. E.g. extraction of groundwater for irrigation leads to changes in the water table and affects distant water users.
- **Cumulative impacts** are the combined or additive effects on biodiversity or ecosystem services over time or in space. They may seem to be insignificant when seen in isolation, but collectively they have a significant effect.

¹ Cooper, L.M. 2004. *Guidelines for Cumulative Environmental Assessment in SEA of plans*. EMPG Occasional Paper, May 2004. <http://www.env.ic.ac.uk/research/empg>

- **Impact assessment**

A process that is used to identify, predict and assess the potential positive and negative impacts of a proposed project (including reasonable alternatives) on the environment and to propose appropriate management actions and monitoring programmes. Impact assessment is used to inform decision-making by the project proponent, relevant authorities and financing institutions. The process includes some or all of the following components: screening, scoping, impact assessment and decision-making.

- **Issue**

A context-specific question that asks “what, or how severe, will the impact of some activity/aspect of the development be on some element of the environment?”.

- **Monitoring**

Actions taken to observe, take samples or measure specific variables in order to track changes, measure performance of compliance, and/or detect problems.

- **Offset**

An offset replaces or provides ‘like for like or better’ substitutes for residual negative impacts on biodiversity. Such offsets could include formal commitment to managing substitute areas of comparable or greater biodiversity value for conservation, entering into a secure and permanent conservation agreement with the conservation authority, setting aside protected natural areas, establishing a trust fund for biodiversity conservation, thereby enabling land acquisition or management, etc. Offsets focus on areas of recognised value to biodiversity conservation, and on ensuring the persistence of landscape-scale processes.

- **Opportunity cost**

The net benefit to society that could be obtained by the ‘next best’ development alternative.

- **Scenarios**

A description of plausible future environmental or operating conditions that could influence the nature, extent, duration, magnitude/intensity, probability and significance of the impact occurring (e.g. concentration of sulphur dioxide emissions during normal operations vs during upset conditions; dispersion of atmospheric pollutants during normal wind conditions vs during presence of an inversion layer).

- **Scoping**

The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision-making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the

scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialists.

- **Screening**

A decision-making process to determine whether or not a development proposal requires environmental assessment, and if so, what level of assessment is appropriate. Screening is usually administered by an environmental authority or financing institution.

- **Significance**

A term used to evaluate how severe an impact would be, taking into account objective or scientific data as well as human values. A specific significance rating should not be confused with the acceptability of the impact (i.e. an impact of low significance is not automatically “acceptable”).

- **Significance thresholds**

A *significance threshold* is the level at which impacts on biodiversity would change a significance rating, e.g. from low to medium, or medium to high. These thresholds are often linked to current societal values which determine what would be acceptable or unacceptable to society and may be expressed in the form of legal standards or requirements (e.g. for water quality, protected areas, ecosystems or species, requirement to make provision for the ‘ecological reserve’ in river systems, etc.), as objectives or targets for biodiversity conservation (e.g. in the National Biodiversity Strategy and Action Plan), protocols (e.g. SADC protocols), guidelines (e.g. for managing sensitive or dynamic ecosystems), or conservation status of species or ecosystems (e.g. Red List or CITES species, threatened ecosystem, centre of endemism, biodiversity ‘hotspot’).

The significance of potential impacts on biodiversity thus needs to be explicitly interpreted within the context of international conventions, a SADC context, and national, provincial and local laws, policies, plans and strategies, which reflect the values of broader society. The evaluation of impact significance should thus take into account not only the current biodiversity and known trends in the affected area that are likely to affect biodiversity, but also any vision, objectives or targets for that area.

Some environmental management systems make use of upper and lower ‘limits of acceptable change’ or thresholds within which activity is permitted (e.g. a range of acceptable conditions for that particular ecosystem).

Thresholds of potential concern is another term used, in particular by managers of freshwater systems. The thresholds are linked to a hierarchy of targets for managing biodiversity and ecosystems, rather than just defining a single desired outcome or endpoint. The hierarchy may

include a range of 'warning' signs of increasing intensity of ecosystem degradation that trigger action to halt or reverse that degradation, and 'danger' signs indicating that there is unacceptable deterioration and radical steps need to be taken.

- **Trigger**

A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input.

- **Vulnerable communities**

Those communities who rely heavily on those ecosystem goods and/or services likely to be negatively affected (e.g. subsistence communities, communities where livelihoods are based on the harvest of natural resources) or who live in dynamic, sensitive or harsh ecosystems, where extreme conditions (e.g. drought, floods, earthquakes, landslides) make them particularly vulnerable to additional negative impacts.