

# **Principles for the use of Strategic Environmental Assessment as a tool for promoting the conservation and sustainable use of biodiversity**

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## **Abstract**

Strategic Environmental Assessment (SEA) has been identified as an important tool for helping to ensure that development is planned and implemented for the benefit of biodiversity by the Convention on Biological Diversity, the Ramsar Convention and the Convention for Migratory Species. SEA is seen as a way to overcome many limitations of project-level Environmental Impact Assessment (EIA) by allowing consideration of biodiversity at higher tiers of decision-making and planning.

This paper identifies some important principles that should be taken into account to ensure that biodiversity considerations are appropriately addressed in SEA, so that the conservation and sustainable use of biodiversity are pursued as fundamental objectives of strategic decision-making. The paper also sets out key considerations to take into account at different stages in the SEA process. The principles explored in this paper should be applicable in any country where SEA is practiced, even though legislation, methodologies and procedures vary widely.

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## Introduction

Biodiversity supports many livelihoods and provides essential goods and services to millions of people. However biodiversity values are often under-recognised and under-emphasised in development planning. The first World Summit on Environment and Development in Rio de Janeiro (1992) emphasised the importance of biodiversity as the basis of our very existence, to be used wisely and sustainably and conserved for current and future generations. The Rio Declaration firmly established the link between environmental issues and development, stating that:

“... *in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it*” (Principle 4).

Biodiversity decline worldwide is affecting the supply of ecosystem goods and services such as water, clean air, food and productive and fertile soil that support people's livelihoods and quality of life (e.g Brooks and Kennedy, 2004). Its decline is also beginning to affect critical global processes: for example loss of vegetative cover worldwide is a major contributory factor in escalating levels of carbon dioxide in the atmosphere and associated climate change.

The main threats to biodiversity globally are associated with human activities causing habitat loss or damage: these threats need to be carefully managed if significant, irreversible losses of biodiversity are to be avoided. The Millennium Ecosystem Assessment (2003) report *Ecosystems and Human Well-being: A framework for assessment* concludes that economic development has led to ecosystems being degraded more rapidly and extensively during the past 50 years than at any previous period in history, some 60 per cent of ecosystem services examined in the assessment being degraded or used unsustainably. The report also emphasizes that the international community needs to make environmental protection a top priority if it wants to meet the Millennium Development Goals<sup>5</sup>.

Environmental Impact Assessment (EIA) is a widely applied method for predicting the effects of a proposed activity on the environment (UNECE 1991), but EIA at the project-level has arguably been less effective for ecological and biodiversity considerations than for any other impact category (Treweek, 1999). A recurrent problem is that administrative and project boundaries rarely match distributions and patterns of biodiversity, whereas to understand the significance of impacts on biodiversity within a small development site, it may be necessary to understand processes operating within a whole catchment, ecosystem, or even country. Within the timeframes and geographic limits normally associated with project-EIA it is difficult to set up biodiversity studies that ‘capture’ or explain:

- longer term trends;
- ecosystem processes and interactions;
- the full range of cumulative threats and pressures acting on biodiversity resources;

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<sup>5</sup> <http://www.undp.org/mdg/abcs.html>

- implications of proposals for current and traditional uses of biodiversity;
- monitoring data needed to understand baseline trends or predict impacts.

Strategic Environmental Assessment (SEA) of policies, plans or programmes can provide opportunities to overcome these limitations: it can address wider or more fundamental considerations such as alternative solutions or locations for different types of activity as well as longer term requirements for information. It can also identify threats and opportunities for biodiversity at an earlier stage in the decision-making process. Perhaps most importantly, it can provide opportunities for people who need and use biodiversity to influence planning decisions and make sure that their needs and aspirations for biodiversity are recognized and taken into consideration.

SEA has therefore been identified in international agreements relating to biodiversity - notably the Convention on Biological Diversity (CBD), the Ramsar Convention on Wetlands (the Ramsar Convention) and the Convention on Migratory Species (CMS) - as an important tool for ensuring that conservation and sustainable use of biodiversity are pursued as fundamental objectives of strategic decision-making and planning. These Conventions have adopted Decisions and Resolutions relating to impact assessment (eg CBD, 1998, 2000, 2002 and 2003; Ramsar Convention, 2002 and 2004; CMS, 2002).

Much legislation on SEA makes explicit reference to biodiversity as a key issue that should be addressed (see for example the EU Directive 2001/42/EC on “the assessment of the effects of certain plans and programmes on the environment” (European Communities, 2001)). Efforts to provide guidance on how to integrate biodiversity considerations with strategic decision-making and planning have faced two important challenges. The first is to ensure that the SEA process is firmly focused on biodiversity uses and values and based on active participation with those people (now and in future) who depend on these. The second is to ensure that the SEA process allows robust analysis of how biodiversity is likely to respond to planned changes and whether it will remain viable, healthy and available to current and future generations.

This paper proposes some important principles that need to be taken into account to ensure that biodiversity considerations are appropriately included in SEA. These principles have been developed for consistency with those for impact assessment and biodiversity developed by the International Association for Impact Assessment (IAIA, 2004) and have also drawn on recent work by Flora and Fauna International on the Precautionary Principle (Coonie, 2004). The principles explored in this paper should be applicable in any country where SEA is practiced, even though SEA legislation, methodologies and procedures vary widely.

The paper also sets out key considerations to take into account at different stages in the SEA process. The paper draws on guidance produced in the UK on behalf of statutory nature conservation organizations and NGOs (Countryside Council for Wales *et al*, 2004). It also draws on general guidance on Biodiversity and SEA produced by IAIA which is intended to provide a starting point for more detailed country-level guidance

(IAIA, 2005). The CBD is also working on guidance on SEA and biodiversity, which will be based on review of a number of case studies.

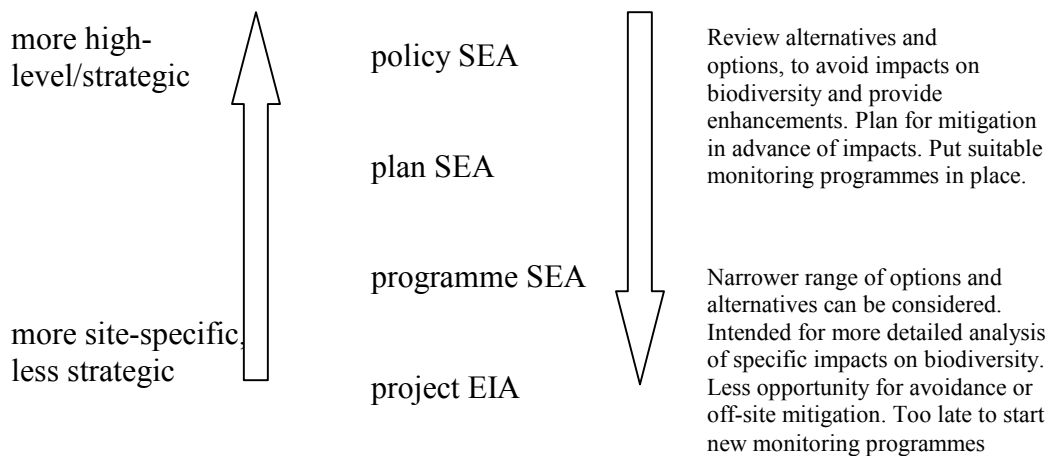
### What is SEA?

For the purposes of this paper, SEA is defined as environmental assessment of policies, plans and programmes, where "*a policy may... be considered as the inspiration and guidance for action, a plan as a set of co-ordinated and timed objectives for the implementation of the policy, and a programme as a set of projects in a particular area*" (Wood and Djeddour, 1992).

SEA is intended to promote sustainable development by integrating environmental considerations, including biodiversity, into strategic decision-making for a wide range of actions and development sectors. It is "*a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision making on a par with economic and social considerations*" (Sadler and Verheem, 1996).

The basic SEA process is similar to that of environmental impact assessment (EIA) for projects, but SEA is generally more broad-brush, less detailed and quantitative, and more focused on broad directions of change (see Figure 1). This is largely due to the need for SEA to keep pace with the decision-making process, which may need to consider many ideas and options in a short period of time.

**Figure 1 Characteristics of SEA in relation to EIA**



SEA requirements and methodologies vary considerably worldwide, but most SEA systems involve:

- Review of current environmental and social conditions and likely changes in these conditions in the absence of the proposed 'plan'.
- Identification of changes in environmental and social conditions if the proposed plan is implemented
- Recommendations for mitigation of any significant adverse effects and for monitoring of the effectiveness of the plan.

As for EIA, SEA is generally the responsibility of the plan-proponent who must either carry out SEA for their own plan, or commission consultants to carry out SEA on their behalf. However there are cases where SEAs have been carried out by NGOs or other interested parties to review sectoral plans independently. SEA legislation generally requires the proponent to publish a report summarizing the results of the SEA. They may also be required to carry out consultation during the SEA process and to demonstrate how the results of this consultation have been taken into account in finalizing their plan.

### **What is biodiversity and why should it be included in SEA?**

The CBD defines 'biodiversity' as:

*'The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.'* (Art. 2)

In other words, it is the variety of life on earth at all levels, from genes to worldwide populations of the same species; from communities of species sharing the same small area of habitat to worldwide ecosystems. It encompasses the different forms of life that are represented within a defined study area and also their relative abundance. The CBD refers to three main levels: the gene-, species- and ecosystem-level. Some prompts for questions to ask about possible impacts at these levels are given later in the paper.

### **What can SEA do for biodiversity?**

SEA can help to promote the conservation and sustainable use of biodiversity in several ways. Some of these are identified below. This section is not intended to provide a comprehensive list, but to illustrate some of the opportunities provided by SEA to raise the profile of biodiversity with planners and decision-makers and to mainstream biodiversity into the planning and implementation of development.

#### **1. Helping to implement biodiversity policy**

Policies and plans made by governments, agencies and other public bodies should be shaped or influenced by any biodiversity policies or plans that are in place, from international to local level. SEA provides opportunities to ensure that proposed plans are consistent with policies and priority actions for biodiversity conservation, protection and sustainable use. This might include international obligations under global conventions as well as any national policies for biodiversity or environmental protection. Any systematic or formal biodiversity plans should also be reviewed as part of the SEA process. In many

countries these are set out in National Biodiversity Strategies and Action Plans (NBSAPs) and associated local plans. Some countries are also developing 'biome'-specific or habitat-specific action plans.

## **2. Helping to ensure the requirements of protected areas, habitats and species are met.**

Requirements relating to protected areas and species should be respected when new development is planned. If SEA is to be used as a tool for the conservation of biodiversity, it must ensure that proposed plans are compatible with other mechanisms for biodiversity protection. Opportunities arise at the screening stage (e.g. requiring SEA for plans that might affect protected areas), at the scoping stage (ensuring that the SEA considers the implications of the proposed plan for protected biodiversity) or when developing and selecting alternatives and designing mitigation. SEA provides an opportunity to identify plan alternatives that will not conflict with management objectives for protected areas, or which make provision for mitigation or compensation to ensure the integrity of protected areas and the viability of their habitats and species populations is maintained or restored.

Not all areas that are particularly rich in biodiversity will necessarily be formally protected or recognised as critical for the conservation of protected species. Biodiversity is not static and systems of site protection do not always adapt quickly enough to keep pace with environmental change, e.g. in the UK review of climate change impacts addressed the need for flexible protected areas systems to allow species and habitats to adapt to climate change (Cook and Harrison, 2001). SEA can be used to make planners and decision-makers aware of areas without formal protection which nevertheless make a significant contribution to the habitat requirements of protected species, or which link such habitats (wildlife corridors).

## **3. Building biodiversity enhancement into plans**

Because consultation and participation is an integral ingredient of the SEA process, SEA may provide opportunities to consolidate and implement biodiversity initiatives pursued by local stakeholders, NGOs and other partnerships. Opportunities for enhancing biodiversity may be identified through consultation and identified as an integral objective of a proposed plan, or suggested as mitigation to compensate for losses of biodiversity identified through SEA. There may also be opportunities to seek biodiversity enhancements that perform wider functions, e.g. by promoting ecotourism, attenuating floods or reducing soil erosion.

Enhancements might include:

- consolidation, enlargement or buffering of biodiversity-rich areas;
- improvements in environmental quality, eg securing a fresh water supply or reducing levels of pollution;
- creating new habitat;
- enhancing management in and around protected areas;

- identifying opportunities to allow spontaneous recovery of damaged or degraded sites to take place (particularly important for marine environments where restoration can be difficult, if not impossible);
- improving management to enhance biodiversity in unprotected habitats and sites.

#### **4. Encouraging an ‘ecosystem approach’**

The ‘ecosystem approach’ promoted by the Ramsar Convention and CBD<sup>6</sup> recognises that biodiversity depends on healthily functioning ecosystems and processes that have to be assessed and managed in an integrated way, not constrained by artificial boundaries. The ecosystem approach aims to ensure that human activities and uses of biodiversity do not undermine the ecosystem functions and processes that sustain biodiversity in the longer term. SEA is more able to adapt to an ecosystem approach than project-level EIA because it can take a wider perspective and incorporate participatory approaches with interested parties to identify important biodiversity uses and values. However there are currently few examples where SEA has adopted an ecosystem approach to identify important biodiversity or predict possible impacts on biodiversity.

#### **5. Ensuring active participation and consultation with people who need and use biodiversity**

SEA legislation in many countries requires proponents both to consult with interested parties and to provide evidence of how they have used the results of this consultation in developing and finalizing their plans. SEA can therefore provide an opportunity for people who depend on biodiversity to a) be informed about possible impacts of a proposed plan on biodiversity and b) ensure that the plan proponent is aware of their concerns and aspirations for biodiversity and takes them into account when developing and finalizing the plan. Sustainable development depends critically on stakeholder involvement and SEA *can* provide an opportunity for full stakeholder participation, but it is essential to observe traditional customs, use local languages and ensure that all interests are properly represented and able to engage in the process. Recent work by the South African Institute for Environmental Assessment (SAIEA) through a programme called ‘Calabash’ has researched cases to provide guidance on participatory techniques (see [www.saiea.com](http://www.saiea.com)).

#### **Principles for effective integration of biodiversity and SEA**

This section proposes principles for ensuring the effectiveness of SEA as a tool for the conservation and sustainable use of biodiversity. As explained in the introduction, these have been developed for consistency with IAIAs ‘Best Practice Principles for Biodiversity-inclusive Impact Assessment’ (IAIA, 2004). They also reflect the goals and objectives of the biodiversity-related Conventions.

##### *The ‘no net loss’ principle*

This requires the status quo to be maintained in terms of quantitative and qualitative aspects of biodiversity (what there is, how abundant it is, how it is structured and distributed). This principle is fundamental to evaluation of significance as it provides a threshold beyond which further losses of biodiversity will not be accepted without

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<sup>6</sup> <http://www.biodiv.org/programmes/cross-cutting/ecosystem/default.asp>

effective mitigation. The 'No Net Loss' principle is now enshrined in national policy in the Netherlands. However in other countries there is still an emphasis on damage limitation, for example the UK Government's Sustainable Development Strategy includes a commitment to achieve significant reductions in rates of biodiversity loss.

The 'No Net Loss' principle is intended to ensure both equity of impacts and the maintenance of access to important biodiversity for people and embodies the objectives of the CBD, which is firmly based on the premise that further losses of biodiversity must be arrested to ensure the conservation of biodiversity for current and future generations.

The 'No Net Loss' principle is not intended to imply that any loss of biodiversity is unacceptable: rather it is intended to promote sustainable development in which overall diversity of genes, species and ecosystems is maintained and significant reductions in abundance of biodiversity at these levels are avoided. Depending on existing plans and priorities for biodiversity, some trade-offs may be acceptable: for example, one habitat type being substituted for another in a location so long as the overall balance is maintained within the plan-area.

In countries with established biodiversity strategies, the principle of 'no net loss' is usually embodied in action plans which ask for maintenance or enhancement of biodiversity. For example the Local Biodiversity Action Plan for Dumfries and Galloway in Scotland (Dumfries and Galloway Council, 1999) specifies a target of "no net loss" ... of area or quality of raised bogs by 2005".

#### *The precautionary principle*

An important property of the precautionary principle is that the burden of proof lies with the proponent of an activity (e.g. Raffensperger and Tickner, 1999). Proponents of potentially environmentally damaging practices must demonstrate that their proposed activities are in fact safe or acceptable before they can go ahead: it is not incumbent on others to prove that the activities are harmful in order to have them stopped. In the context of SEA, the precautionary principle requires the proponent to provide evidence that no significant harm to important biodiversity will occur. There are examples where consent for proposals has been delayed to allow sufficient time for this kind of evidence to be gathered (Tucker and Treweek, 2004).

There is no one universally accepted definition of the precautionary principle. However, the commonly accepted basis for the principle is the problem of scientific uncertainty which characterizes most environmental decision making (Coonie, 2004). The most commonly cited definition of the precautionary principle in the environmental context is Principle 15 of the Rio Declaration which states that:

*"In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. 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".*

The precautionary principle is intended to promote action to avoid serious or irreversible harm in advance of scientific certainty of such harm (Cooney, 2004). This implies a presumption in favour of biodiversity protection where the knowledge required for effective mitigation or compensation for a significant adverse impact on valued biodiversity is lacking. It should also apply in situations where there is sufficient evidence to suggest that adverse impacts are possible, but not enough to confirm that ‘no significant impact’ will occur for valued biodiversity.

In practice, the precautionary principle has proved difficult and controversial to implement. Key challenges are the need to determine when biodiversity resources are important or valued enough to justify a precautionary approach and then to establish the degree of risk that significant harm might occur (Tucker and Treweek, 2004).

Factors that might be taken into account to strengthen the case for a precautionary approach include effects:

- that cannot be reversed or compensated for;
- of considerable or unprecedented intensity, magnitude, scale, extent, duration or frequency;
- on sensitive components;
- that will bring ecosystems near system thresholds or critical points of transition;
- on rare, unique or endangered components;
- on critical processes;
- on biodiversity for which there are no proven restoration techniques.

O’Riordan & Cameron (1994) emphasized the need to apply the precautionary principle to safeguard ‘ecological space’ (such that margins of ecosystem tolerance are not approached); promote the cause of intrinsic natural rights (the need to allow natural processes to function) and encourage proportionality or cost-effectiveness of responses. When recommending a precautionary approach, it is important to set out the cost implications of different responses in relation to risks and also to ensure that cost–benefit analyses include a weighting factor to account for ignorance (Gustavson, 2003).

It is important to develop a strong evidence-base for assertions that damage or harmful effects are likely to result (Tucker and Treweek, 2004) that can be used to develop robust ‘tests of likely significance’.

*SEA should consider biodiversity impacts at an appropriate level*

It is often stated that it is totally impractical for impact assessments (EIA or SEA) to study impacts at the genetic level, due to the difficulties of actually measuring or modeling genetic changes. However this does not mean that SEA should neglect genetic effects. It should consider impacts on biodiversity at an appropriate level to identify key threats and opportunities. For example it is possible to identify situations in which there is a strong likelihood that genetic impoverishment or isolation might occur or increase without necessarily having to make precise predictions. Note that to assess impacts at the gene-level it may be necessary to identify key ecosystem changes first or to consider risks at a landscape scale: many threats to genetic diversity – e.g. isolation of species

populations - operate at the ecosystem, landscape or global scale: SEA must therefore capture these processes as well as more local ones.

It is important not to be over-prescriptive about which levels of biodiversity should be addressed in any particular case. The questions set out in Table 1 can help to determine which levels of biodiversity should be considered.

**Table 1 Questions to assist in determining which levels of biodiversity should be considered in SEA**

Genetic Level
<p>Will the proposal:</p> <ul style="list-style-type: none"> <li>• Reduce genetic diversity, particularly for already rare and declining species, endemic species and populations and those with Species Action Plans?</li> <li>• Reduce opportunities for species populations to interact, eg by increasing habitat fragmentation and isolation?</li> <li>• Increase risk of extinction?</li> <li>• Affect locally adapted populations?</li> <li>• Affect important ecosystem services that depend directly on genetic diversity, eg pollination of crops?</li> </ul>
Species Level
<p>Will the proposal:</p> <ul style="list-style-type: none"> <li>• Alter the species-richness or species-composition of communities in the study area?</li> <li>• Cause some species to be lost from the area?</li> <li>• Affect the success of species action plans or objectives in National Biodiversity Strategies and Action Plans (NBSAPs)?</li> <li>• Increase the risk of invasion by alien species?</li> <li>• Change the amount, quality or spatial organisation of habitat?</li> <li>• Affect plans to enhance habitat availability or quality?</li> <li>• If habitats will be lost or altered, is alternative habitat available to support associated species populations and are there opportunities to consolidate or connect habitats?</li> </ul>
Ecosystem Level
<p>Will the proposal:</p> <ul style="list-style-type: none"> <li>• Change critical ecosystem processes, for example hydrological processes, levels of predation?</li> <li>• Reduce the overall productivity of the area?</li> <li>• Affect the provision of ecosystem services?</li> <li>• Affect overall biodiversity values?</li> </ul>

*Putting principles into practice*

Adopting these principles can be difficult if clear biodiversity planning priorities have not been established. However if systematic biodiversity planning is in place, SEA provides

an important bridge between this (e.g. as embodied in NBSAPs) and processes of development planning.

To ensure these principles can be adopted, SEA should identify opportunities to:

1. avoid or prevent biodiversity loss or damage in the first instance (e.g. by seeking alternatives that are not associated with biodiversity loss);
2. reduce or minimize negative effects (eg through modifications to the proposed plan in terms of activities, their timing, design of infrastructure)
3. enhance biodiversity where possible or secure opportunities for recovery (consistent with any policies or plans);
4. compensate for unavoidable loss of biodiversity (habitat creation schemes, species recovery plans, ecosystem replacement);
5. consolidate information on biodiversity (through consultation and monitoring).

This is consistent with the ‘positive planning’ approach advocated by the Royal Town Planning Institute (RTPI) in the UK (RTPI, 2001) and by IAIA in its best practice principles for biodiversity and impact assessment (IAIA, 2004). Damage should always be avoided in the first instance if possible, mitigating only where impacts cannot be avoided and there are no alternative solutions. In particular, damage and loss should be avoided where biodiversity is particularly valued by people or important for their welfare and livelihood and where it is rare, threatened and difficult to replace or substitute.

Opportunities to enhance biodiversity should be sought wherever possible. Development and biodiversity can complement one another and often, approaches that benefit biodiversity can also benefit business.

### **The SEA process**

The remainder of this paper attempts to identify important ‘insertion’ points for biodiversity in the SEA process. Key biodiversity considerations to take into account at each stage in the SEA process are summarised.

The SEA process typically (but not invariably) includes the following stages:

- Screening (is SEA required?)
- Scoping (how should the SEA be carried out?)
- Describing the baseline (what is the environment like, including biodiversity, and how will it develop in the absence of the proposed plan?)
- Identifying options/alternatives (Is the best biodiversity option being considered?)
- Impact identification, prediction and evaluation (how will the different alternatives affect outcomes for biodiversity? How have impacts and outcomes been evaluated?)
- Mitigation (how can impacts on biodiversity be avoided, reduced or compensated for?)
- Monitoring (how should the plan be followed-up?)

- Consultation and decision-making (who should be involved, what information do they need, how can they be helped to participate?)

The overall aim is to determine the extent to which the proposed plan will change prospects for biodiversity conservation and its sustainable use. Will things be better or worse? Are there any opportunities to influence the plan for the benefit of biodiversity? For any policy, plan or programme that requires SEA, the following general questions should be asked with respect to biodiversity:

- What is the need for the proposed plan: what are its purpose and objectives and how do these relate to biodiversity?
- What are the baseline conditions and problems for biodiversity in the area affected by the plan, including biodiversity objectives and other relevant policies, plans and programmes?
- Who uses and depends on biodiversity in the area affected by the plan? How important is biodiversity to them and their livelihoods?
- What are the likely impacts of the policy/plan/programme on biodiversity and on people who need and use it?
- Are there alternatives to the proposed plan which are more 'biodiversity-friendly'?
- Is it possible to reduce or avoid any significant negative impacts ("mitigation") or to enhance positive benefits for biodiversity?
- Will current or traditional biodiversity uses and values be sustained/sustainable following implementation of the plan?

Whatever SEA process has been followed, the results of the SEA are usually summarized in a report, which should be made available for consultation to allow those with an interest in biodiversity to comment on the findings. The final SEA report should explain how the comments and views of stakeholders have been taken into account in finalizing the plan and should also explain how the effectiveness of the plan will be audited when it has been implemented. In some contexts alternative approaches to communication may be necessary to ensure active participation. Levels of literacy may be low and people may find it difficult both to access reports and to provide formal responses to them.

### **Screening**

Most SEA laws set out categories of plan for which SEA will be required. However there may be other plans where the need for SEA is determined on a case-by-case basis. The key biodiversity input into this "screening" decision is the determination of whether a plan or programme is likely to have significant effects on biodiversity, whether because of the importance of biodiversity in the area affected by the plan, or its sensitivity to the activities identified in the plan (see Table 2). Criteria may be set out in legislation. For example the EU Directive (European Communities, 2001) requires SEA for any plan likely to affect European designated sites. In countries where systematic biodiversity planning is carried out, (as in South Africa for example) biodiversity maps may be available to identify priority areas for biodiversity.

**Table 2 Biodiversity issues to consider when determining the need for SEA**

<b>Key issues to consider</b>	<b>Will the proposed plan:</b>
Influence of the plan in terms of sustainable development goals	<ul style="list-style-type: none"> <li>a. affect achievement of goals or objectives for biodiversity in other policies, plans and programmes?</li> <li>b. change levels or rates of use of biodiversity?</li> </ul>
Influence of the plan on values and uses of biodiversity	<ul style="list-style-type: none"> <li>a. damage or destroy biodiversity on which people depend for their livelihoods?</li> <li>b. damage or destroy biodiversity valued by people?</li> <li>c. reduce access to biodiversity for current or potential future users?</li> </ul>
Influence of plan in terms of environmental quality/ health	<ul style="list-style-type: none"> <li>a. exacerbate existing threats to biodiversity, e.g. by involving activities already posing a threat to biodiversity in the study area?</li> <li>b. cause critical impact thresholds (eg levels of pollution of a wetland) to be exceeded?</li> </ul>
The probability, magnitude, duration, frequency and reversibility of effects	<ul style="list-style-type: none"> <li>a. have relatively certain impacts on biodiversity?</li> <li>b. have large impacts on biodiversity?</li> <li>c. have long-term effects in relation to biological lifecycles?</li> <li>d. have repeated impacts on the same biodiversity resources at such a frequency that their recovery might be compromised?</li> <li>e. have irreversible impacts on biodiversity, ie impacts from which spontaneous recovery is impossible and there are no known effective mitigation techniques?</li> </ul>
Cumulative effects	<ul style="list-style-type: none"> <li>a. affect areas where biodiversity is already exposed to significant threat, eg through habitat loss or fragmentation?</li> <li>b. exacerbate space-crowding with significant effects on certain components of biodiversity or on a high proportion of the resource within the study area?</li> <li>c. exacerbate environmental deterioration such that critical thresholds may be reached?</li> <li>d. make a significant contribution to ‘in-combination’ or cumulative effects on biodiversity?</li> </ul>
The magnitude and spatial extent of the effects	lead to projects that are space- or resource-hungry, eg occupy large areas or use large volumes of water?
The value and vulnerability of the area likely to be affected	<ul style="list-style-type: none"> <li>a. affect protected areas or areas of important, threatened or vulnerable biodiversity?</li> <li>b. affect areas of high biodiversity, whether protected or not?</li> <li>c. affect areas covered by NBSAPs?</li> </ul>

## Scoping

The main purpose of scoping is to determine the "boundaries" and coverage of the SEA: key issues to be addressed, assessment methods, data and level of detail needed and who should be consulted or involved. Scoping provides an early opportunity to involve people and organizations with an interest in biodiversity and to clarify important issues and concerns. This includes an explanation of how impacts on biodiversity will be measured and evaluated. Table 3 provides a checklist to help decide how to address impacts on biodiversity and select suitable measures of biodiversity.

At the scoping stage it is necessary to consider:

- the main implications of the plan for biodiversity and people who use it;
- how biodiversity issues should be addressed (methods, level of detail, timeframe);
- the study area required to allow biodiversity interests to be addressed;
- whether biodiversity experts should be involved;
- what alternatives could be considered to optimise biodiversity benefits and minimise harm.

At this stage the relationships between the proposed plan and other policies, plans and programmes should also be reviewed to identify potential conflicts and opportunities. This promotes coordination of planning and decision-making whether within the same sector or between sectors and can help identify opportunities to improve the management of biodiversity within the area affected by the plan. As a minimum the following should be reviewed to identify any relevant biodiversity objectives:

- relevant national, regional and local Biodiversity Action Plans
- Sustainable Development Strategies
- Development plans.

SEAs should identify the likely significant effects of a proposed plan on the environment, including biodiversity. Methods for assessing significance therefore have to be identified and these should be agreed at the scoping stage. A common approach is to evaluate impacts in terms of objectives and indicators. 'Plan objectives' provide a basis for evaluating whether a plan has achieved its intended purpose. A different set of objectives ('SEA objectives') may be established purely for the SEA, to provide a basis for evaluating the environmental impacts of the proposed plan and its alternatives, including impacts on biodiversity. These might provide a working definition of what environmental sustainability actually means in the context of the proposed plan or provide a basis for deciding whether or not the plan will achieve 'no net loss' of biodiversity.

SEA objectives, indicators and targets can be related to outcomes (the state of the environment that should be reached) or inputs (how they can be reached; e.g. designations, management plans, funding for biodiversity). Generally outcome indicators are more appropriate for biodiversity as they represent "objective" environmental quality and stress the importance of actually achieving 'no net loss'. Input indicators can show clearly what actions are being taken, but these should always be linked to clear outcomes.

Some objectives and indicators for biodiversity are likely to apply to any SEA (for example ‘meet relevant NBSAP targets’). However specific objectives and indicators that reflect the particular activities associated with a plan may also be required. It may be necessary to set objectives at different levels, to ensure that plans are consistent with international, national and local requirements for biodiversity. If people who need and use biodiversity are involved in the establishment of SEA objectives, the SEA is more likely to be effective in appraising the plan in terms of their needs.

Production of a scoping report for consultation and scoping meetings can provide useful opportunities to discuss how biodiversity impacts will be addressed with interested parties.

**Table 3 Scoping checklist for biodiversity**

<p><b>Are there any protected areas or species within the area affected?</b>          Formal protection tends to apply predominantly at the ecosystem and species level, but also check for habitat used by protected species, including seasonal or migratory habitat.</p>									
<p><b>Consider biodiversity values and uses within the plan area</b>          Which people value, depend on and use biodiversity? Are their values and uses substitutable? How should they be consulted? What languages and methods are appropriate?</p>									
<p><b>Consider biodiversity at the following levels. Are there possible impacts at these levels? Which level(s) can be studied most effectively?</b></p> <table border="0"> <tr> <td>bioregion</td> <td>habitat</td> <td>population</td> </tr> <tr> <td>landscape</td> <td>community</td> <td>individual</td> </tr> <tr> <td>ecosystem</td> <td>species</td> <td>gene</td> </tr> </table>	bioregion	habitat	population	landscape	community	individual	ecosystem	species	gene
bioregion	habitat	population							
landscape	community	individual							
ecosystem	species	gene							
<p><b>Address the following questions to determine the scope of the SEA in relation to biodiversity composition, structure and function:</b></p>									
<p><i>Composition</i></p> <ul style="list-style-type: none"> <li>• What are the main components of biodiversity in the area affected by the plan (see above)?</li> <li>• What is the distribution pattern and richness/abundance of biodiversity?</li> <li>• How does biodiversity composition in the study area compare with that outside the study area (are there biodiversity components that are particularly unique, eg locally adapted populations? Are there components that are poorly conserved or represented elsewhere, or are they relatively ubiquitous?)</li> <li>• Which biodiversity components are particularly vulnerable/sensitive to proposed plan-activities?</li> <li>• What are trends in composition (eg. is biodiversity organization and composition stable or subject to rapid change, eg long term declines in species or habitat diversity?)</li> </ul>									
<p><i>Structure</i></p> <ul style="list-style-type: none"> <li>• Structural relationships include: connectivity, patchiness, fragmentation, vertical habitat differentiation, distribution of key physical features, availability of niches, seasonal availability of habitat, water availability.</li> <li>• How are biodiversity components organised in time and space (location, distribution, variation)?</li> <li>• What are the requirements or ‘drivers’ for high, or characteristic biodiversity to be maintained (e.g. environmental gradients)?</li> </ul>									
<p><i>Function</i></p> <ul style="list-style-type: none"> <li>• Consider how current levels and types of biodiversity are being maintained. Take an ecosystem perspective to identify important functional relationships, eg dependence of wetlands on hydrological processes; threat to semi-natural grassland communities from nutrient enrichment; relationship between aquatic invertebrates and water quality.</li> <li>• What processes maintain boundaries and structure (competition, herbivory, predation, dispersal)? What role do biodiversity components play in maintaining these processes and dynamics, or supporting other biodiversity components (e.g. role of vegetative cover in retarding surface water run-off, habitat in providing a refuge for certain species)?</li> <li>• Are any threatened components present? What is their functional role? What are their requirements?</li> <li>• What are the demographic processes determining the status of species populations (eg do populations rely on recruitment of new individuals from elsewhere, requiring the maintenance of mobility through the landscape?)</li> </ul>									

### **Baseline Conditions**

SEA is based on consideration of the effects of the proposed plan. It is therefore necessary to understand the current state of the environment in the study area and how this would be expected to change in the absence of the proposed plan. In other words, baseline conditions are those that would be expected under the 'no action' or 'minimum action' alternative.

The SEA should establish a clear picture of:

- biodiversity present and how it is organized in time and space;
- How it works (key functional relationships and interdependencies);
- Why it is important and to whom;
- What condition it is in and how it would develop in the absence of the plan.

Some aspects of biodiversity description may apply to any plan affecting the same geographic area. Increasingly, biodiversity maps and databases are being produced that can be used to clarify the locations and distributions of important biodiversity resources (status, distribution, risks, opportunities). However each plan will have specific aspects and characteristics that may require assessment of particular sub-sets of the overall biodiversity resource, or a focus on biodiversity components that will be effective indicators of impacts due to plan-activities. Therefore even where biodiversity base maps and databases are available, additional or more focused biodiversity information is likely to be required, as set out in Table 4. Biodiversity maps and databases do not always reflect levels of dependency, use or need by people, making a participatory approach essential.

**Table 4 Checklist for baseline biodiversity assessment**

<p><b>1. Consult widely</b> to obtain existing information and to confirm key biodiversity values, interests and dependencies in consultation with people who need and use biodiversity. Baseline description normally carried out primarily using existing data and information. Some additional study and analysis may be required to predict how biodiversity might develop and change (for example under climate change) in the absence of the plan;</p>
<p><b>2. Clarify locations and distributions</b> of important biodiversity, summarise main interests and produce maps if possible, identify critical ecosystem functions and processes on which biodiversity depends,</p>
<p><b>3. Review plan-related activities</b> and identify areas and biodiversity resources likely to be affected. The baseline should inventory known threats and pressures on important components of biodiversity within the study area, including:</p> <ul style="list-style-type: none"> <li>• Land-take</li> <li>• Removal of traditional access</li> <li>• Invasion of non-native or overly dominant species</li> <li>• Pollution (direct and diffuse)</li> <li>• Lack of management or changes in traditional use</li> <li>• Habitat isolation and fragmentation</li> <li>• Disturbance</li> <li>• Climate change</li> </ul>
<p><b>4. Identify risks for biodiversity.</b> These might be where the alternative will exacerbate:</p> <ul style="list-style-type: none"> <li>• negative trends in biodiversity over time</li> <li>• existing threats and pressures</li> </ul> <p>such that aspects of biodiversity that are likely to fall below relevant standards, thresholds and targets.</p> <p>Issues where there are not enough data to be able to judge the likely significance of future impacts.</p>
<p><b>5. Review levels of uncertainty</b>          Is enough known to judge the likely significance of future impacts?          Has everyone been consulted who should be consulted?</p>
<p><b>6. Identify opportunities</b> to enhance biodiversity in relation to desired outcomes for biodiversity</p>

**Options and alternatives**

It is an important role of the SEA to identify the best alternative for biodiversity and also to determine whether alternatives can be fine-tuned to enhance biodiversity or minimise impacts on it. SEA reports should therefore outline the reasons for selecting alternatives and explain how they were chosen and assessed. Alternatives can be "either/or" alternatives or "mix-and-match" alternatives that can be put together in different combinations. The former need to be compared in the SEA; the latter need to be assessed one by one, or in differing combinations, to determine whether they should be included in the plan or not.

Alternatives should be identified that avoid or minimise biodiversity impacts, for instance through demand management, choice of types and locations of development, and layout within particular sites. To do this:

- conditions for achieving no net loss should be agreed;
- biodiversity damage should be avoided at source where possible;
- important biodiversity values should be retained and incorporated in the plan, and protected during plan-implementation;
- Provision must be made for future management and monitoring.

Where there is an over-riding need for development and loss or damage to biodiversity is unavoidable, compensation of similar quality and quantity to the biodiversity affected should be provided. However re-created or 'new' systems rarely substitute for existing biodiversity and compensation should be regarded only as a last resort. There is also increasing evidence that people's dependence on biodiversity has been under-estimated and much economic development has failed to compensate people for their loss of access to biodiversity and to ecosystem services on which they depend.

### **Impacts**

The SEA should include assessment of effects on the environmental (bio-physical) factors and conditions that influence biodiversity (eg soil, water, air, climatic factors and landscape). It should also consider the relationships between these and socio-economic drivers of change to identify important changes in biodiversity. An ecosystem approach helps to identify important inter-relationships and to ensure that social as well as biophysical drivers are taken into account. As for EIA, SEA should identify any relevant cumulative, synergistic, short, medium and long term, permanent and temporary, positive and negative effects.

- What are impacts on biodiversity associated with this plan and alternatives?
- Are cumulative impacts on biodiversity expected from the plan jointly with other activities (historic, current or planned)?
- What are the relative risks and opportunities for biodiversity associated with available alternatives?
- What is the preferred alternative?

SEA should aim to identify the key cause-effect links which describe the pathway from proposed plan actions to outcomes for biodiversity.

SEA should identify:

- the plan's impacts on relevant levels of biodiversity;
- the plan's impact on values and uses of biodiversity;
- the environmental conditions required to conserve or promote biodiversity; and
- the availability of techniques to replace or substitute biodiversity and its uses and values.

When evaluating the significance of impacts on biodiversity, it is necessary to consider:

1. characteristics of the biodiversity resource affected (including importance and value),
2. the changes that would occur as a result of the plan activities.

Important characteristics of the biodiversity resource include:

- its value and importance to people who depend on it;
- its state or condition (including measures of rarity, trends);
- its recoverability or replaceability;
- the extent to which it can be substituted.

(Note that recoverability may be influenced by the proportion of the resource affected, or by the frequency and duration of threatening activities in relation to biological life-cycles etc).

Important aspects of impacts include:

- types of change, severity, scale and magnitude of bio-physical changes caused by the plan;
- frequency;
- duration;
- reversibility.

These may be influenced by social, economic and political factors which must also be taken into account.

For SEA, predictions can generally be expressed in broad terms, though more detailed, quantitative approaches may be appropriate where significant impacts are expected and strong evidence is required to support selection of a more appropriate alternative for biodiversity. Policy and plan-level SEA will generally be less detailed and quantitative than programme-level SEA.

Biodiversity is particularly vulnerable to cumulative threats and pressures. Natural systems rarely react in a simple, direct or straightforward way to external pressures. At certain thresholds additional disturbances can cause sudden decline or collapse in biodiversity. Cumulative effects occur when such thresholds of stability or viability are exceeded, causing biodiversity decline that cannot be attributed to any single action. Actions that appear insignificant when considered individually, in isolation, may nevertheless cause significant loss of biodiversity.

To assess cumulative effects on biodiversity, it is necessary to understand:

- What other plans, projects and activities are likely to take place
- Threats to biodiversity associated with these other plans, projects and activities
- Other background threats
- Vulnerability of biodiversity to additional threats
- Thresholds, 'limits of acceptable change', carrying capacity, 'points of no return'
- Recovery mechanisms and time required for recovery from impacts.

Cumulative effects may occur if:

- Repeated similar actions affect the same biodiversity resource (e.g. noise disturbances)
- Numerous different actions affect the same biodiversity resource within a certain area or timeframe (e.g. within a development zone)
- Actions take place that can reasonably be expected to lead directly to other, related actions

An important benefit of SEA is that it can allow remedial action for cumulative effects to be undertaken before critical thresholds are reached.

### **Mitigation**

Mitigation measures are actions taken to alleviate adverse effects, whether by controlling the sources of impacts, or the exposure of ecological receptors to them (Treweek, 1999). One of the main benefits of SEA is that it allows mitigation action to be taken earlier in the decision-making process, so that significant adverse impacts on biodiversity can be avoided.

The SEA should identify opportunities for avoiding impacts on biodiversity, reducing the severity of impacts, restoring existing damage, and enhancing biodiversity. It should also identify any significant impacts on biodiversity that would remain after mitigation and determine whether implementation of recommended mitigation measures would result in biodiversity objectives being met.

Mitigation can take a wide range of forms, but due to the limited effectiveness of many ecological restoration measures, every effort should be made to avoid significant adverse impacts on biodiversity before resorting to other measures (using the avoid-reduce-compensate-enhance sequence). Some adverse effects might be avoided through changes to the plan, such as adding, deleting or refining aspects of the plan or bringing forward new alternatives. Where environmental impacts cannot be avoided, it may be possible to limit damage. In some cases biodiversity would recover spontaneously if affected by proposed plan, and no "mitigation" other than time is required. In other cases, mitigation could be put into effect through provisions in later plans, requirements to carry out EIA for specific types of projects, etc.

Biodiversity enhancements should be sought wherever possible, and provision of compensatory habitat through SEA offers significant opportunities for this.

### **Mitigation should aim to:**

- Keep options open and flexible, so that further measures or other strategies can be put in place in the future;
- Involve 'no-regret' options which deliver benefits that exceed their costs;
- Find win-win options that contribute to the plan's desired outcomes and also improve biodiversity;
- Avoid decisions that will make it more difficult to improve biodiversity in the future.

SEAs should provide outline descriptions of the proposed mitigation measures, indicate how and when they would be implemented, and propose how they might be modified if unforeseen post-project ecological impacts manifest themselves. Where appropriate, authorities should make use of planning conditions or legal agreements to secure mitigation, compensation, or new benefits for nature conservation interests.

Once strategic-level decisions have been made, the impacts of specific projects or operations on biodiversity can be mitigated using:

- Spatial measures, e.g. enhancing representative networks of protected areas
- Agreeing permanent or temporary 'no-go' or 'no exploitation' areas
- Level controls, e.g. limits on extraction of a resource or on volume or concentration of a discharge;
- Best practice (including appropriate technological advances).

### **Monitoring**

Monitoring in SEA:

- allows the implementation of the plan to be checked, and remedial action to be triggered if unforeseen or undesirable negative impacts occur;
- helps to ensure that sufficient information about biodiversity is available for reliable impact predictions to be made in subsequent EIAs;
- makes it possible to compare predicted and actual effects for auditing and quality assurance of SEA; and
- increases the general availability of biodiversity data

An SEA monitoring framework should be established setting out:

- What biodiversity information is needed to check whether the plan is being implemented correctly, and whether it is having unforeseen effects.
- What indicators/measures are to be used as a basis for monitoring
- How much of this information is available or needs to be collected; by whom; and how often.
- Who will be responsible for data collection.
- Thresholds for triggering remedial action, and what the remedial action should be.
- Mechanisms for disseminating biodiversity information collected, e.g. in EIA or second-generation SEAs.

### **Conclusions**

SEA has considerable potential for helping to deliver the objectives of the CBD and other biodiversity-related international agreements. To achieve this, it is essential to set out the parameters for success, so that the implications of different plan-alternatives for biodiversity can be understood.

To help achieve the conservation and sustainable use of biodiversity, SEA must be used to develop a plan which:

- complies with legal requirements for biodiversity.
- is consistent with international obligations and national biodiversity policy.

- helps to meet national and local priorities/objectives for biodiversity.
- meets any quality standards or 'limits of acceptable change' agreed with stakeholders.
- results in equitable distribution of impacts among affected parties, including future generations.
- is based on reliable information and an acceptable level of confidence in predictions.
- achieves no net loss of biodiversity, consistent with the goals of the CBD and with international principles for best practice in impact assessment (IAIA, 2004).

Effective SEA is:

- undertaken as an integral part of plan development, allowing feedback from the SEA process into the design of the plan. As for project-EIA, SEA should therefore be undertaken by the plan-proponent or by a consultant on their behalf;
- carried out in participation with interested people, parties and organizations;
- exposed to independent and objective scrutiny;
- a mechanism for ensuring that necessary biodiversity information is available for subsequent project-EIAs within the plan area.

Biodiversity considerations should not be addressed in isolation and must be seen as fundamental to the delivery of sustainable development objectives. While this paper has proposed a precautionary approach and the application of the principle of 'no net loss', further advice and guidance is required to explain how these can be defined in practice. Stronger evidence is also required of the role of biodiversity in supporting livelihoods and alleviating poverty, so that biodiversity values and ecosystem services receive appropriate emphasis in planning and decision-making.

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