Commission for Environmental Assessment

# Biodiversity in EIA & SEA

## Background Document to CBD Decision VIII/28:

## Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment

CBD

Ramsar

CMS

IAIA - CBBIA


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# Biodiversity in EIA and SEA

## Background Document to CBD Decision VIII/28:

## Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment


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April 2006

Commission for Environmental Assessment

The Netherlands

| | | |
|---|---|---|
| Project proponent | : | Secretariat of the Convention on Biological Diversity |
| Project execution | : | Netherlands Commission for Environmental Assessment |
| Financial support | : | Government of the Netherlands |
| Cover | : | SevS/Roel Slootweg© |
| ISBN-10 | : | 90-421-1811-3 |
| ISBN-13 | : | 978-90-421-1811-9 |

**Foreword**

Achieving the 2010 target — to significantly reduce the rate of biodiversity loss — has become a paramount aim of the world's nations since the adoption of the target by the Convention on Biological Diversity (CBD) and the World Summit on Sustainable Development in 2002. Yet, as the Millennium Ecosystem Assessment concluded, an unprecedented effort will be needed to achieve this target. The loss of genetic diversity, species and ecosystems is proceeding apace as a result of habitat change, climate change, invasive species, overexploitation of resources and many forms of pollution.

*Global Biodiversity Outlook 2* demonstrates that, by and large, we already have the tools to face this challenge. What is needed is greater commitment to use these tools to systematically evaluate the economic, environmental and social outcomes of development projects — both positive and negative. We must consider the full range of options for carrying out a project, implementing a programme, or adopting a policy, including the option of rejecting a proposal if its impact would compromise achievement of the 2010 target.

Voluntary guidelines on biodiversity-inclusive impact assessment were endorsed by the eighth meeting of the Conference of the Parties to the CBD in Curitiba, Brazil (20-31 March 2006). They provide detailed guidance on whether, when, and how to consider biodiversity in both project- and strategic-level impact assessments. The guidelines are an elaboration and refinement of guidelines previously adopted by the CBD (Decision VI/7-A), the Ramsar Convention on Wetlands (Resolution VIII.9) and the Convention on Migratory Species (Resolution 7.2).

The case studies, background material and examples contained in the present document will help the reader to make full use of the guidelines when considering biodiversity in impact assessments. Many of the case studies were provided by members of the International Association for Impact Assessment (IAIA). Several IAIA annual conferences, participants in the IAIA project on Capacity-Building for Biodiversity and Impact Assessment (CBBIA), and government experts have reviewed the material.

We wish to express our deep gratitude to all those who have dedicated time and contributed expertise to the elaboration of the guidelines. We also thank the Netherlands Commission for Environmental Assessment for their contribution and for making this document available to the 26th Annual Conference of IAIA (Stavanger, Norway, 23-26 May 2006). It is our hope that the guidelines will help to ensure that impact assessments increasingly take into account biodiversity considerations and thereby make a direct contribution to the achieving the 2010 target.

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Ramsar Convention
on Wetlands

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Convention on
Migratory Species

**Table of contents**

## List of boxes, figures & tables



## Abbreviations

| | | |
|---|---|---|
| BAP | : | Biodiversity Action Plan |
| CBBIA | : | IAIA's Capacity Building project for Biodiversity in Impact Assessment |
| CBD | : | Convention on Biological Diversity |
| COP | : | Conference of Parties |
| EIA | : | Environmental Impact Assessment |
| EIS | : | Environmental Impact Statement (also EIA report) |
| EMP | : | Environmental Management Plan |
| IAIA | : | International Association for Impact assessment |
| MA | : | Millennium Ecosystem Assessment |
| MGDs | : | Millennium Development Goals |
| NBSAP | : | National Biodiversity Strategy and Action Plan |
| NEN | : | National Ecological Network |
| PPP | : | Policy, plan and/or programme |
| RSA | : | Republic of South Africa |
| SBSTTA | : | CBD Subsidiary Body on Scientific, Technical & Technological Advice |
| SEA | : | Strategic Environmental Assessment |
| SAP | : | Species Action Plan |
| ToR | : | Terms of Reference |
| UK | : | United Kingdom |

**Acknowledgements**

This document is based on contributions of many enthusiastic biodiversity and impact assessment professionals around the world. Inputs were provided as case studies, written comments on text proposals, oral contributions to discussions at IAIA conferences, and through the formal CBD review procedure. This document is the result of a process that started with the launch of a Biodiversity Section at the 1998 IAIA conference in Christchurch, New Zealand. It is impossible to sum up all individual contributions to this process, but this worldwide community of professionals is the first to acknowledge for its effectiveness in providing the biodiversity conventions with relevant inputs.

The project to produce comprehensive guidelines on EIA as well as SEA started in July 2004. It is part of IAIA's Action Programme on Biodiversity in Impact Assessment, endorsed by IAIA in 2001 (Cartagena) and updated in 2004 (Vancouver).

Financial support was provided by the Netherlands government through their support to the Secretariat of the Convention on Biological Diversity (special thanks to Aart van der Horst at the Ministry of Foreign Affairs and Arthur Eijs at the Ministry of Environment).

Case studies and other contributions were provided by (in alphabetical order): Susie Brownlie (RSA), Larry Burrows (UK), Marc van Dijk (Belgium), Thea Jordan (RSA), Clive George (UK), Arend Kolhoff (Netherlands), Vinod Mathur (India), Asha Rajvanshi (India), Ahmad Saeed (Pakistan), Marlies van Schooten (Netherlands), Roel Slootweg (Netherlands), Jo Treweek (UK), Bathu Uprety (Nepal) & Louis de Villiers (RSA). Thanks to Jo Treweek , technical programme manager, and Napeleon Tiapo, programme administrator, for liaising with the Capacity Building in Biodiversity and Impact Assessment (CBBIA) project of IAIA.

An earlier draft text was reviewed or commented upon by: Jill Adams (UK), Susie Brownlie (RSA), Helen Byron (UK), Mauricio Castro-Salazar (Costa Rica), Alissar Chaker (Lebanon), Juri Dusik (Czech Republic), Thea Jordan (RSA), Thomas Fisher (UK), Petrie van Gent (Netherlands), Clive George (UK), Vinod Mathur (India), Lisa Palframan (Canada), Maria Partidario (Portugal), Asha Rajvanshi (India), Bernt Rydgren (Sweden), Jo Treweek (UK) & Louis de Villiers (RSA).

Special thanks to Helen Byron, chair of the Ecology and Biodiversity section of IAIA, for continuous organisational and moral support; Liduina Wildenburg and Maike van der Zee at the secretariat of the Netherlands Commission of Environmental Assessment (NCEA) for being there at the right moments.

## Chapter 1. Introduction

Paragraph 1 of Article 14 of the Convention on Biological Diversity (CBD) identifies impact assessment as a key instrument for achieving the conservation, sustainable use and equitable sharing objectives of the Convention. In paragraph 5 of decision IV/10- C, the Conference of Parties (COP) recommended that appropriate issues related to environmental impact assessment be integrated into, and become an integral part of relevant sectoral and thematic issues under its programme of work. At its sixth meeting (The Hague 2002), the COP endorsed draft guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or processes and in strategic environmental assessment (Decision VI/7-A).

These 2002 guidelines were adopted with annotations describing their relevance to the Ramsar Convention by the eighth meeting of the Conference of Contracting Parties to the Convention on Wetlands (Ramsar, Iran, 1971) (Resolution VIII.9). The seventh meeting of the Conference of Parties to the Convention on Conservation of Migratory Species of Wild Animals welcomed the endorsement by CBD-COP of the guidelines and urged its Parties to make use of them as appropriate (Resolution VII.2).

CBD decision VI/7-A requests the Executive Secretary to prepare proposals for further development and refinement of the guidelines, in collaboration with relevant organisations, in particular the International Association for Impact Assessment (IAIA), incorporating all stages of the environmental impact assessment and strategic environmental assessment processes taking into account the ecosystem approach.

The Executive Secretary invited parties to contribute recent experiences in environmental impact assessment and strategic environmental assessment procedures that incorporate biodiversity-related issues. In addition, experiences in applying the guidelines contained in the annex to decision VI/7-A were readily accepted. Available case material was combined with contributions from the IAIA network in 2003 in an information document to SBSTTA (UNEP/CBD/SBSTTA/9/INF/18: Report on ongoing work), containing 51 references.

In 2004, the CBD Secretariat invited the Netherlands Commission for Environmental Assessment to take the lead in producing revised guidelines on biodiversity-inclusive environmental impact assessment (EIA) and strategic environmental assessment (SEA). In addition to the material provided by Parties, the Netherlands Commission for Environmental Assessment (NCEA) solicited relevant SEA case studies through the International Association for Impact Assessment and through its own network. These case studies, available through the Clearing-house mechanism of the Convention[1], were analysed for the development of the SEA guidance document (see Annex 1 for an overview of case contributions to this document).

During the production process it was decided to produce separate documents on EIA and SEA. The EIA document contains a refinement of the earlier guidelines, and does not deviate substantially from the earlier COP Decision VI/7-A. The SEA document however, is conceived as a totally new guidance document. Structure and character of both documents are widely different, emphasising the potentially great differences in procedure and contents between EIA and SEA.

The review process of various draft versions of the documents was elaborate. See table 1.1 for an overview of the entire production process.

This background document contains formal texts endorsed by the Conference of Parties in April 2006, i.e. the Decision on "*Impact assessment: Voluntary guidelines on biodiversity–inclusive impact assessment* " presented in chapter 2, the annex to the decision containing "*Voluntary guidelines on biodiversity-inclusive environmental impact assessment* " presented in chapter 5, and the draft "*guidance on biodiversity-inclusive strategic environmental assessment* " contained in annex II to the note by the Executive Secretary regarding voluntary guidelines on biodiversity-inclusive impact

[1] http://www.biodiv.org/programmes/cross-cutting/impact/search.aspx

assessment (UNEP/CBD/COP/8/27/Add.2), presented in chapter 6. The background document is complemented by a chapter (3) providing a description of biodiversity according to the definition and objectives of the Convention, a chapter (4) explaining the conceptual frameworks used in the guidelines, and a number of appendices. The annexes provide a list of case studies, used to draft the SEA Guidance (annex 1), an analysis of the ecosystem approach in relation to environmental assessment (annex 2), more general information on SEA and a summary of lessons drawn from the analysis of case studies on SEA.

*Table 1.1.: Production and review process of this document*

**Phase 1: analysis and writing** (September 2004)
- Solicited case studies on Biodiv in SEA
- Expand EIA guidelines
- Analysis of cases & outline of SEA guidelines
- Internal review
- First draft EIA guidelines and SEA guidance

**Phase 2: review** (from December 2004)
- External review: invited biodiversity (7) & SEA (5) practitioners
- Comments solicited through IAIA list (4)
- Second draft of documents
- CBD launches web-based case studies database
- CBD focal points invited for internet discussion
- IAIA conference (Boston, June 2005): discussions with members of the CBBIA network and conference workshop.
- Submission of final draft documents to CBD secretariat

**Phase 3: CBD process** (from July 2005)
- Production of information document to SBSTTA (UNEP/CBD/SBSTTA/11/INF/19).
- IAIA conference on SEA (Prague, Sept. 2005)
- Invitation to focal points of CBD-COP and SBSTTA to comment on documents
- Secretariat receives 7 formal reactions
- Preparation of draft text for COP decision (UNEP/CBD/ COP/8/27/Add.2)
- COP Decision VIII/27 (April 2006)

### How to use this document

The CBD, the Ramsar Convention and the CMS recognise impact assessment as an important tool to ensure that development is planned and implemented with biodiversity ‘in mind’. The CBD requires parties to apply impact assessment to projects, programmes, plans and policies with a potential negative impact on biodiversity. Considerable progress has been made in strengthening impact assessment as a tool to further the aims of the CBD and related conventions. However, practise shows that more work is needed.

Biodiversity is relevant to all types of impact assessment and should be addressed at all levels, from environmental impact assessment carried out for individual projects (EIA) to the strategic environmental assessment of policies, plans and programmes (SEA). Biodiversity values should be addressed in social impact assessment; health impact assessment may need to consider the role of biodiversity in disease transmission or biological control. Finally, biodiversity provides commodities for international trade that may be the subject of study in trade impact assessment (sometimes referred to as sustainability impact assessment).

Individual countries may redefine steps in the procedure to their needs and requirements as befits their institutional and legal setting. In order to be effective, the environmental impact assessment process, should be fully incorporated into existing legal planning processes and not be seen as an “add-on” process.

As a prerequisite, the definition of the term “environment” in national legislation and procedures should fully incorporate the concept of biological diversity as defined by the Convention on Biological Diversity, such that plants, animals and micro-organisms are considered at the genetic, species/community and ecosystem/habitat levels, and also in terms of ecosystem structure and function.

Environmental impact assessment procedures should refer to other relevant national, regional and international legislation, regulations, guidelines and other policy documents such as the national biodiversity strategy and action plan documents, the Convention on Biological Diversity and biodiversity related conventions and agreements including, in particular, the Convention on

International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals and the related agreements, the Convention on Wetlands (Ramsar, Iran, 1971), the Convention on Environmental Impact Assessment in a Transboundary Context; the United Nations Convention on the Law of the Sea; the European Union directives on environmental impact assessment, and the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources.

Consideration should be given to improving integration of national biodiversity strategy and action plans and national development strategies. Strategic environmental assessment should be used as a tool for such integration to promote the establishment of clear conservation targets through the national biodiversity strategy and action plan process. The use of those targets for the screening and scoping targets of environmental impact assessment and for developing mitigation measures should also help to improve integration..

Implementation of the guidelines on biodiversity-inclusive impact assessment requires the development of the necessary capacities with respect to the designation and capacitating abilities / scope of relevant institutions, the delivery of training and raising of awareness and the formation and facilitation of professional networks. The successful integration of biodiversity considerations as a component in impact assessments, both at project and the strategic level, requires an established and functional impact assessment system.

Capacity development programmes should be country-specific because the legislation, status of implementation and procedures of impact assessment within a given country are the result of cultural, socio-economic and natural conditions. The integration of a biodiversity component in impact assessment legislation and procedures requires the development of country-specific guidance and implementation by the competent authorities and relevant stakeholders in that country. The guidelines on biodiversity-inclusive environmental impact assessment (chapter 4) and the guidance on biodiversity –inclusive strategic environmental assessment (chapter 5) contain suggestions and elements that may be helpful in developing country-specific guidance.

## Chapter 2. CoP Decision VIII/28. Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment (*convention text*)

*The Conference of the Parties*

1. *Notes* that the Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or used by Indigenous and Local Communities (decision VII/16 F, annex) should be used in conjunction with the voluntary guidelines on biodiversity-inclusive environmental impact assessment contained in annex I and the draft guidance on biodiversity-inclusive strategic environmental assessment contained in annex II to the note by the Executive Secretary on voluntary guidelines on biodiversity-inclusive impact assessment (UNEP/CBD/COP/8/27/Add.2);

2. *Welcomes* the database of case-studies on biodiversity and impact assessment established under the clearing-house mechanism of the Convention [2]/ as a useful information-sharing tool, and *encourages* Parties, other Governments and relevant organisations to make use and contribute to its further development;

### A. Environmental impact assessment

3. *Endorses* the voluntary guidelines on biodiversity-inclusive environmental impact assessment contained in the annex to the present decision;

4. *Emphasises* that the voluntary guidelines on biodiversity-inclusive environmental impact assessment are intended to serve as guidance for Parties and other Governments, subject to their national legislation, and for regional authorities or international agencies, as appropriate, in the development and implementation of their impact-assessment instruments and procedures;

5. *Urges* Parties, other Governments and relevant organisations to apply the voluntary guidelines on biodiversity-inclusive environmental impact assessment as appropriate in the context of their implementation of paragraph 1 (a) of Article 14 of the Convention and of target 5.1 of the provisional framework of goals and targets for assessing progress towards 2010 and to share their experience, *inter alia*, through the clearing-house mechanism and national reporting;

*6.* *Encourages* those multilateral environmental agreements that have endorsed the guidelines contained in decision VI/7 A, in particular the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat and the Convention on the Conservation of Migratory Species of Wild Animals, to take note of, and if appropriate endorse the voluntary guidelines on biodiversity-inclusive environmental impact assessment contained in annex I to the present decision;

7. *Invites* other multilateral environmental agreements to take note of and if appropriate apply the voluntary guidelines on biodiversity-inclusive environmental impact assessment;

8. *Requests* the Executive Secretary to:

(a) Continue collaborating with relevant organisations, *inter alia* through the International Association for Impact Assessment and its project on capacity-building in biodiversity and impact assessment, to contribute to the development of necessary capacities for the application of the guidelines on biodiversity-inclusive environmental impact assessment taking into account the specific circumstances in which they are to be applied;

(b) Compile information on the experiences made by Parties, other Governments relevant organisations and practitioners in applying the guidelines to the circumstances in which they are to be applied, and to report to a meeting of the Subsidiary Body on Scientific, Technical and Technological Advice prior to a future meeting of the Conference of the Parties at which impact assessment will be reviewed;

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[2]/ http://www.biodiv.org/programmes/cross-cutting/impact/search.aspx

### B. Strategic environmental assessment

9. *Endorses* the draft guidance on biodiversity-inclusive strategic environmental assessment contained in annex II to the note by the Executive Secretary on voluntary guidelines on biodiversity-inclusive impact assessment (UNEP/CBD/COP/8/27/Add.2);

10. *Encourages* Parties, other Governments and relevant organisations to take into account as appropriate this guidance in the context of their implementation of paragraph 1 (b) of Article 14 of the Convention and other relevant mandates and to share their experience, *inter alia*, through the clearing-house mechanism;

11. *Invites* other multilateral environmental agreements to take note of the draft guidance on biodiversity-inclusive strategic environmental assessment and to consider its application within their respective mandates;

12. *Requests* the Executive Secretary to:

(a) Facilitate, in collaboration with the International Association for Impact Assessment and other relevant partners, capacity development activities focusing on the translation of the guidance on biodiversity-inclusive Strategic Environmental Assessment into practical national, sub-regional, regional or sectoral approaches and guidelines;

(b) Continue collaborating with the Economics and Trade Branch of the United Nations Environment Programme and other relevant organisations in developing practical guidance on assessing impacts of trade on biodiversity and in compiling and making available information on good practices and positive impacts of trade on biodiversity;

(c) Compile information on the experiences made by Parties, other Governments, organisations and practitioners in using the guidance;

(d) Prepare, for consideration by a meeting of the Subsidiary Body on Scientific, Technical and Technological Advice prior to a future meeting of the Conference of the Parties at which impact assessment will be reviewed, proposals on complementing this guidance with examples of its practical application.

This section provides an overview of the minimum knowledge required to address biodiversity in impact assessment. It describes how parties to the conventions have defined biodiversity, and summarises a number of related documents:

- Principles of the CBD[3]
- Ecosystem approach[4]
- IAIA principles on Biodiversity inclusive impact assessment[5]
- Conceptual framework to the Millennium Ecosystem Assessment[6]

The added subtitle, "the broad view" refers to the fact that many non-biodiversity experts in impact assessment may view the presented description of biodiversity as an all-encompassing concept. That is, it includes many aspects of impact assessment, already common practice without necessarily being described as biodiversity. This chapter will show that biodiversity indeed is a broad concept. Present-day impact assessment already effectively deals with many aspects of biodiversity. However, improvements and more consistency with the internationally agreed principles of the convention are needed. This can and will be done without creating any new impact assessment tools. The following elements will be addressed:

1. What is biodiversity. The CBD definition of biodiversity is provided, including a short description of the three commonly distinguished levels of biodiversity.
2. Objectives of biodiversity management describing the three CBD objectives, including guiding principles on how to address these objectives in impact assessment. The ecosystem approach is introduced as a framework for addressing the CBD objectives in a balanced way.
3. Ecosystem services are prominently introduced by the Millennium Ecosystems assessment. These provide an important means to translate biodiversity into decision makers language.
4. How to assess impacts on biodiversity explains the concept of drivers of change, and how these drivers of change affect biodiversity through their impacts on the composition, structure or key processes of biodiversity, the main aspects of biodiversity. Knowledge of changes to these aspects allow us to assess potential impacts on ecosystem services.
5. Biodiversity principles for impact assessment refer to the precautionary principle and no net loss principle, and stress the importance of stakeholders participation and information sharing between experts and local / indigenous groups.

## 3.1 What is biodiversity?

The Convention on Biological Diversity (CBD) defines biodiversity as "the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and

[3] http://www.biodiv.org/convention/articles.asp

[4] Convention on Biological Diversity: Decision V/6 Ecosystem Approach (http://www.biodiv.org/decisions/default.aspx?m=COP-05&id=7148&lg=0) and Decision VII/11 Ecosystem Approach (http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7748&lg=0))

[5] IAIA Special Publications Series No. 3 (July 2005). Biodiversity in Impact Assessment (www.iaia.org). Also available in French and Spanish.

[6] Millennium Ecosystem Assessment (2003). Ecosystems and Human Well-being: A Framework for Assessment. Island Press. (http://www.millenniumassessment.org/en/products.ehwb.aspx)

the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."  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.

Levels of biodiversity. Countries that have signed the CBD are required to implement policies to protect biodiversity at different levels:

- Ecosystems containing rich biodiversity, large numbers of threatened or endemic species, with social, economic, cultural or scientific significance, or relevant for key processes such evolutionary processes, and ecosystems of relevance to migrating species.
- Species and communities of species that are threatened in their existence, related to domesticated or cultivated species, and species with medicinal, agricultural, or other economic, social, cultural or scientific significance, and indicator species.
- Genotypes with social, scientific or economic significance.

### 3.2 Objectives of biodiversity management

The CBD has three main objectives. For each main objective a number of guiding principles is provided to be taken into account in the assessment of biodiversity-related impacts.

1. The conservation of biological diversity (i.e. maintaining earth's life support systems and maintaining future options for human development);
   - Ecosystem, species and genetic diversity are conserved to ensure that they persist into the future, providing a range of values for human well being. Priority is given to ensuring the protection of threatened, declining or endemic ecosystems, ecosystems which play a key role in providing ecosystem services (e.g. flood protection, supply of water and raw materials, genetic resources, etc.), unique habitats, endemic, threatened or declining species, species of known use or cultural value to society.
   - Priorities and targets for biodiversity conservation at international, national, regional and local level are respected, and a positive contribution to achieving these targets is made.
   - Some biodiversity is irreplaceable, for example when a species or habitat is lost which cannot be found anywhere else; in these situations such biodiversity must be protected since it cannot be replaced and may have unknown future values.
   - The persistence of ecosystems and species is promoted by making provision for, and/or maintaining, natural corridors between fragments of a particular ecosystem, and between/along different gradients (e.g. altitude, climatic, landscape, watershed gradients).
   - Habitats which play a vital role in supporting seasonal or migrant species are conserved.
   - Opportunities to enhance biodiversity through restoring, re-creating or rehabilitating natural habitat are used to optimum benefit. Unavoidable negative impacts on biodiversity are fully compensated by providing substitutes of at least similar biodiversity value (the latter is often referred to as the *no net loss* principle).
2. The sustainable use of its components (i.e. providing livelihoods to people, without jeopardising future options);
   - Life support systems and ecosystem services such as water yield, water purification, breakdown of wastes, flood control, storm and coastal protection, soil formation and conservation, sedimentation processes, nutrient cycling, carbon storage and climatic regulation, amongst others, are maintained, thus safeguarding livelihoods and keeping future options open for human development.

- Use of living materials is such that yield or harvest can be maintained over time, supporting lives and livelihoods.

3. The fair and equitable sharing of benefits arising from the use of genetic resources.
   - Benefits from commercial use of natural resources are shared fairly, giving due consideration to those who have traditionally had access to, and/or knowledge of those resources.
   - The likely needs of future generations, as well as those of current generations, are taken into account (intergenerational needs). That is, natural capital is not 'traded in' to meet short term needs in a manner which limits the freedom of future generations to choose their own development paths.

The ecosystem approach is considered to be the primary framework for addressing the three objectives of the Biodiversity Convention in a balanced way. The ecosystem approach is an approach for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. In addition, the ecosystem approach has been recognised by the World Summit on Sustainable Development as an important instrument for enhancing sustainable development and poverty alleviation (CBD Decision VII-11[7]). Humans, with their cultural diversity, are an integral component of many ecosystems. People and biodiversity depend on well-functioning ecosystems and processes; assessed in an integrated way, not constrained by artificial boundaries. The ecosystem approach is participative and requires a long-term perspective built on a biodiversity-based study area. It requires adaptive management to deal with the dynamic nature of ecosystems and the absence of complete understanding of their functioning. Annex 2 provides more information on the approach.

### 3.3 Ecosystem services: translating biodiversity into decision makers language

The Millennium Ecosystem Assessment (MA) provides an elaborate conceptual framework using the common denominator ecosystem services to describe all goods and services provided by biodiversity. The MA defines ecosystem services as "*the benefits that people obtain from ecosystems*". Ecosystem services influence human well-being, and thus represent a value for society. The concept of ecosystem services is a strong tool for impact assessment, as it provides a means to translate biodiversity into aspects of human well-being, which can be taken into account in decision making on proposed projects, programmes, plans or policies. Examples of ecosystem services are provided in appendix II.

Four categories of services are distinguished:

- Provisioning services: harvestable goods such as fish, timber, bush meat, fruits, genetic material.
- Regulating services responsible for maintaining biological diversity itself, including natural processes and dynamics, such as water purification, biological control mechanisms, carbon sequestration, pollination of commercially valuable crops, etc.
- Cultural services providing a source of artistic, aesthetic, spiritual, religious, recreational or scientific enrichment, or nonmaterial benefits.
- Supporting services necessary for the production of all other ecosystem services, such as soil formation, nutrients cycling and primary production.

Ecosystem services represent values for society. A policy, plan, programme or project may result in changes in these values. Impact assessment has to provide information on these changes resulting from

[7] Convention on Biological Diversity: Decision V/6 and Decision VII/11 Ecosystem Approach. (http://www.biodiv.org/decisions/default.aspx?m=COP-05&id=7148&lg=0) (http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7748&lg=0)

human initiatives. Decision making is about weighing these changes against each other, including those of alternative initiatives.

Decision making can be particularly challenging because different philosophical views and schools of thought conceive of the values of ecosystems differently. In the utilitarian (anthropocentric) concept of value, ecosystems and the services they provide have a value to human societies because people benefit from their use, either directly or indirectly (use values). People also value ecosystem services that they are not currently using (non-use values). A distinction can be made between:

- economic values: (i) direct income, for example by selling products; (ii) input to other activities by providing raw materials; (iii) indirect value by providing services that would require large investments - if not present - such as coastal protection by dunes or mangroves;
- social values: employment, safety, health, quality of life, social security, appreciation of the presence of animal and plant life, etc.
- ecological values or future (non-use) values, saving biodiversity and its so far unrecognised potential for future use.

The non-utilitarian approach considers biodiversity as having a value in itself (intrinsic value), irrespective of its contribution to human well-being. Although using incomparable expressions of values, both views are used in political decision making[8].

### 3.4 How to assess impacts on biodiversity?

The Millennium Ecosystem Assessment states that understanding the factors that cause changes in ecosystems and ecosystem services is essential to the design of interventions which enhance positive and minimise negative impacts. Such factors are called drivers of change and can be natural or human-induced. Impact assessment is primarily concerned with human-induced drivers of change. Natural drivers of change are important however, as they define background trends or changes against which human-induced changes need to be evaluated.

The design of the impact assessment process is such, that:

- The full range of factors that cause changes in biodiversity is considered:
    - direct drivers of change, which can be identified and measured, include the following groupings: (i) changes in land use and land cover, (ii) fragmentation and isolation, (iii) extraction, harvest, or removal of species, (iv) external inputs such as emissions, effluents, chemicals, (v) disturbance, (vi) introduction of invasive, alien and/or genetically modified species, (vii) restoration.
    - indirect drivers of change which can in turn influence the direct drivers, include (i) demographic, (ii) economic, (iii) socio-political, (iv) cultural and (v) technological processes or interventions.
- Differentiation is made between those drivers that can be influenced by a decision-maker (endogenous driver), and others which may be beyond the control of a particular decision-maker (exogenous drivers).
- The temporal, spatial and organisational scales at which a driver of change can be addressed, are defined.

Signatory countries (= parties) to the CBD must identify activities that are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects. The impacts resulting from drivers of change can, at each level of diversity, best be assessed in terms of the effect on one of the following aspects of biodiversity:

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[8] Chapter 6 of Ecosystems and human Well-being: A Framework for Assessment by the Millennium Ecosystem Assessment provides in-depth further reading. (www.millenniumassessment.org).

- Composition: what is there and how abundant (in a particular time frame); this is the most commonly known aspect of biodiversity. In real terms impact assessment often does not go beyond the description of effects on species composition of higher plant and animal species. Keystone species are of particular relevance; changes in populations of these species have greater impacts on ecosystems than would be expected from its relative abundance or total biomass; a limited change in the number of individuals has disproportional effects on the entire system.
- Structure (or pattern): how biological units are organised in time and space:
  - *spatial structure and scale* of the ecosystem in relation to the scale of the human intervention. Ecosystem 'scale' refers to the space it occupies and the way it changes over time. The scale of human intervention may be small in relation to the scale of an ecosystem (e.g. local erosion within a river basin or a minor development within an extensive ecosystem) or large (e.g. a major dam in that river basin). Human interventions with impacts at similar or larger scale (as compared to the ecosystem scale) are potentially more influential. An additional problem with assessments at large scale using data at coarse resolutions, is that these assessments may not detect fine-resolution processes.
  - *foodweb structure and interactions* that shape the flow of energy and the distribution of biomass: changes in the foodweb have immediate repercussion for the functioning of the entire system. For example, the introduction of the predatory non-indigenous Nile perch in lake Victoria has upset the entire ecosystem; dozens of specialised fish species feeding on algae have been eradicated, leading to a turbid and locally deoxygenised lake.
  - *linkages* to habitat of the same or different ecosystems, which provide an important 'playing field' for ecological processes and enable the goal of their persistence. These linkages are in contrast to a highly fragmented landscape where patches of natural habitat are effectively isolated.
- Key processes (including ecosystem function): which natural (i.e. physical and/or biological) and/or human-induced processes are of key importance for the creation and / or maintenance of ecosystems. For example, key physical processes are the sediment balance in a mangrove coast or a tidal mud flat, the inundation regime of wetlands, or fire in a fire-driven ecosystem; a key biological process is the grazing/browsing pattern in savannahs, or predation of coral reefs by starfish. Note that key processes can be driven by external factors (climate, tidal regime, sediment flow), or by internal ecosystem processes (nutrient and energy flow, population dynamics, etc.). In addition, human processes can be of key importance; a number of ecosystems (better referred to as land-use systems) have been created by centuries of human management; examples are high altitude meadows, heather lands and nutrient-poor grasslands. (Appendix III provides a non-exhaustive list of key processes responsible for the creation and maintenance of a number of ecosystems).

It is important to realise that potential impacts on biodiversity can be identified without having a complete description of that biodiversity. If an intervention is expected to result in changes of the composition, structure or key processes, there is a serious reason to expect that ecosystems and related ecosystem services will be affected. Further studies can be focussed on the aspect of biodiversity which is expected to be affected and on resulting impacts on associated ecosystem services. Especially for areas where available data on biodiversity are limited, this approach has the advantage of focussing costly data collection efforts on the relevant aspect of biodiversity (thus avoiding lengthy descriptive studies of all biodiversity aspects in the intervention area).

### 3.5 Biodiversity principles for impact assessment

No net loss. Further loss of biodiversity, in quantitative as well as qualitative terms, must come to a stand still. This implies that loss of irreplaceable biodiversity must be avoided, and loss of other biodiversity has to be compensated (in term of quality and quantity). For example, loss of an ecosystem service may be irreversible, but could foreseeably, be 'replaced' using appropriate technology, in some instances. Where possible, opportunities for biodiversity enhancement should be identified and supported.

The precautionary principle asks for a risk-averse and cautious approach in cases where impacts cannot be predicted with confidence, and/or where there is uncertainty about the effectiveness of mitigation measures. If the impacts on important biodiversity resources cannot be established with sufficient certainty, the activity is either halted until enough information is available, or a 'worst-case' scenario is adopted with regard to biodiversity impact, and the proposal, its implementation and management are designed to minimise risks to acceptable levels . (Disproportional use of the principle should be avoided, for example where societal stakes are high and biodiversity at risk is minimal, e.g. non-threatened or replaceable).

Local, traditional and indigenous knowledge is used in the impact assessment to provide a complete and reliable overview of issues pertaining to biodiversity. Views are exchanged with stakeholders and experts as valuable elements of that assessment. Information on biodiversity is consolidated.

Participation. Different groups or individuals in society have an interest (a stake) in the maintenance and/or use of biodiversity. Consequently, valuation of biodiversity and ecosystem services can only be done in negotiation with stakeholders. Stakeholders thus have a role in the impact assessment process.

## 4.1 Direct drivers of change: impact assessment framework

The conceptual framework behind the Guidelines on Biodiversity in Impact Assessment, first endorsed by the CBD in 2002, and further elaborated in this document, is developed under auspices of the International Association for Impact Assessment (see figure 4.1 below[9]). The framework has been developed for concrete interventions in the biophysical and social environment and provides a means to integrate biophysical and social processes in impact assessment.

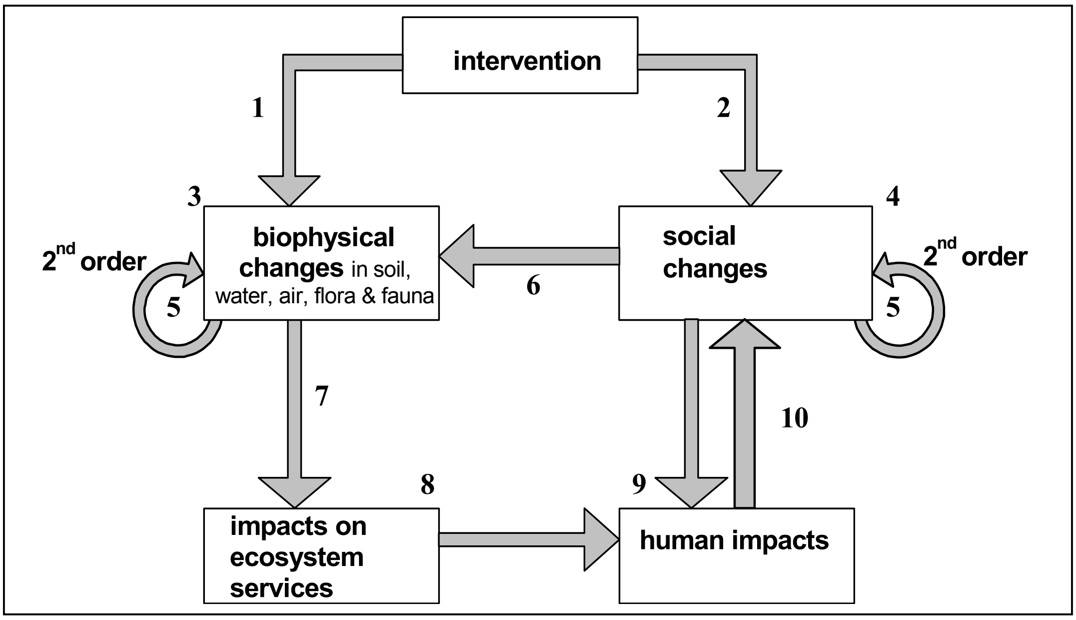


*Figure 4.1: Impact assessment framework[9]*

Physical (1) and social (and economic) (2) interventions lead to biophysical (3) and social (4) changes, each of these potentially leading to higher order changes (5). Some social changes may lead to biophysical changes (6). Within their range of influence and depending on the type of ecosystem under influence (7), biophysical changes may influence different aspects of biodiversity. If these impacts are significant, this has an impact on the ecosystem services provided by biodiversity (8). Impacts on ecosystem services will lead to a change in the valuation of these services by various stakeholders in society (9), thus affecting human well-being. People may respond to these changes in the value of ecosystem services and act accordingly (10), thus leading to new social changes.

The loops in this framework of thinking can in principle be endless; good participatory scoping, applying best available scientific and local knowledge, has to result in the most relevant impacts and associated cause-effects chains, that need to be studied / managed.

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[9] Adapted from Slootweg, R., F. Vanclay and M.L.F. van Schooten (2001). Function evaluation as a framework for integrating social and environmental impacts. *Impact Assessment and Project Appraisal* **19**: 19 - 28 (available at www.sevs.nl), further elaborated for biodiversity by Slootweg, R. & A. Kolhoff (2003) A generic approach to integrate biodiversity considerations in screening and scoping for EIA. *Environmental Impact Assessment Review* **23**: 657-681 (available at www.eia.nl).

## 4.2 Indirect drivers of change: Millennium Ecosystem Assessment framework

The Millennium Ecosystem Assessment (MA) is a four-year international work programme designed to meet the needs of decision-makers for scientific information on the links between ecosystem change and human well-being. It was launched by UN SG Kofi Annan in June 2001. Leading scientists from over 100 nations are conducting the MA.

The first product of the MA is a conceptual framework providing the thinking behind all ongoing work. Relevant features of the framework are explained below (see figure 4.2)[10]. The MA conceptual framework is fully consistent with the CBD Ecosystem Approach.

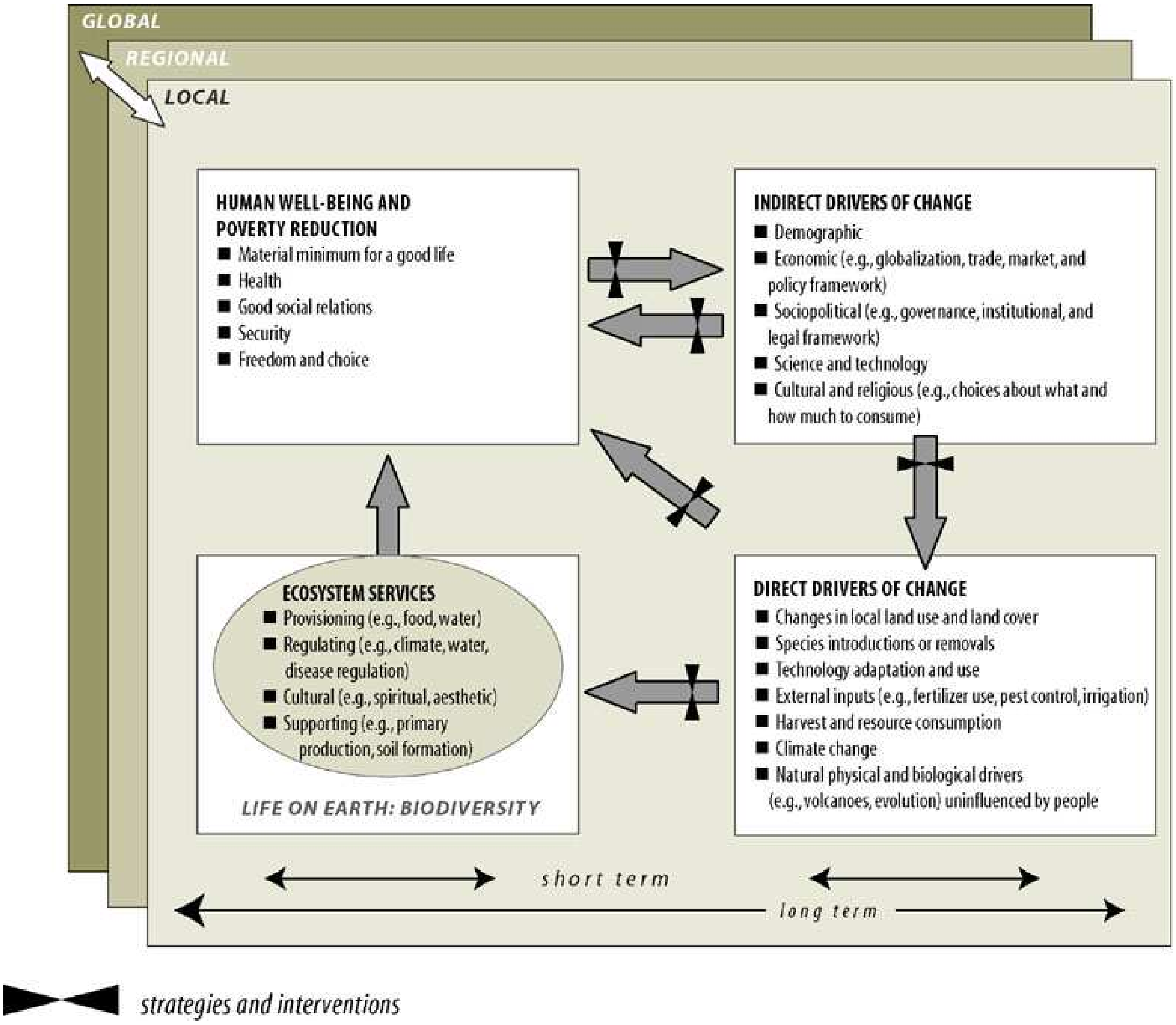


*Figure 4.2: Conceptual framework used by the Millennium Ecosystem Assessment.*

An important feature of the MA is the translation of biodiversity into **ecosystem services**, which contribute to human well-being and poverty reduction. Ultimately, humanity is fully dependent on the flow of ecosystem services. The degradation of ecosystems place a growing burden on human well-being and economic development. Ecosystem services are (i) provisioning services (harvestable goods

[10] Millennium Ecosystem Assessment (2003). Ecosystems and Human Well-being: A Framework for Assessment. Island Press. (http://www.millenniumassessment.org/ en/products.ehwb.aspx)

such as fish, timber, bush meat, fruits, genetic material), (ii) regulating services responsible for maintaining natural processes and dynamics (e.g. water purification, biological control mechanisms, carbon sequestration, pollination of commercially valuable crops, etc.), (iii) cultural services providing a source of artistic, aesthetic, spiritual, religious, recreational or scientific enrichment, or nonmaterial benefits, and (iv) supporting services necessary for the production of all other ecosystem services (e.g. soil formation, nutrients cycling and primary production). An ecosystem service is described in terms of stock, flow and resilience.

The performance of ecosystem services can be influenced by **drivers of change**. In the MA, a "driver" is any factor that changes an aspect of an ecosystem. A **direct driver** unequivocally influences ecosystem processes and can therefore be identified and measured to differing degrees of accuracy. An **indirect driver** operates more diffusely, often by altering one of more direct drivers, and its influence is established by understanding its effect on a direct driver. Demographic, economic, socio-political, cultural and technological processes can be indirect drivers of change. Actors can have influence on some drivers (**endogenous driver**), but others may be beyond the control of a particular actor or decision-maker (**exogenous drivers**).

The **geographical scale** at which strategies and interventions can affect a driver of change varies from local to global, and may work at widely different **time scales**. Consequently, the **organisational scale** at which to best address a driver of change needs to be assessed for each situation.

### 4.3 Links between both frameworks

The Impact Assessment framework provides a structure to describe direct drivers of change that result from human interventions. It establishes linkages between biophysical and social changes and provides insight in how interventions may lead to impacts, either through biophysical interventions or through social interventions. It makes a clear distinction between transitional biophysical and social changes (effect of human interventions that can be measured, modelled, predicted) and impacts that are defined by the local context (affected ecosystems, including associated stakeholders). It is a strong conceptual basis for impact assessment at levels where interventions in the social and biophysical environment are known, at project level but also at the level of strategic assessment for regional or sectoral plans.

The Millennium Assessment is not developed for such types of impact assessment, but aims at providing information for natural resources management polices. Its concepts are largely similar to the Impact Assessment framework, but more effectively serves the highest level of strategic assessment where interventions are not precisely known. The notion of indirect drivers of change, or in other words, diffuse societal processes that influence or even govern direct drivers of change, provides a strong concept to coherently describe chains of cause and effect at policy level.

N.B: The MA framework largely overlooks that social changes can also be considered direct drivers of change. For example, the creation of employment in a relatively uninhabited area will attract migrants that settle in the vicinity of the facility, occupying formerly uninhabited areas. There is nothing diffuse to this as it is a planned activity with predictable consequences.

Although conceptually similar, both frameworks have been developed for different settings and can be considered as complementary. Chapter 4 further elaborates within the context of SEA on the manner in which both frameworks are linked.

**CONTENTS**

## 5.1 Introduction

The guidelines are structured in accordance with the internationally accepted sequence of procedural steps characterising good-practice environmental impact assessment (EIA). [11]/ They aim at a better integration of biodiversity-related considerations into the EIA process.

National EIA systems are regularly being evaluated and revised. These guidelines are intended to assist national authorities, regional authorities or international agencies as appropriate in better incorporating biodiversity-related considerations during such a revision, at which a significant enhancement of the EIA system can be made. This also implies that further elaboration of practical guidelines is needed to reflect the ecological, socio-economic, cultural and institutional conditions for which the EIA system is designed.

The guidelines focus on how to promote and facilitate a biodiversity-inclusive EIA process. They do not provide a technical manual on how to conduct a biodiversity-inclusive assessment study.

Screening and scoping are considered critical stages in the EIA process and consequently receive particular attention. Screening provides the trigger to start an EIA process. During scoping relevant impacts are identified resulting in the terms of reference for the actual impact study. The scoping stage is considered critical in the process as it defines the issues to be studied and it provides the reference information on which the review of the study results will be based. Scoping and review usually are linked to some form of public information, consultation or participation. During scoping promising alternatives can be identified that may significantly reduce or entirely prevent adverse impacts on biodiversity.

## 5.2 Stages in the process

Environmental impact assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, [12]/ taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. The effective participation of relevant stakeholders, including indigenous and local communities, is a precondition for a successful EIA. Although legislation and practice vary around the world, the fundamental components of an EIA would necessarily involve the following stages:

a. *Screening* to determine which projects or developments require a full or partial impact assessment study;

b. *Scoping* to identify which potential impacts are relevant to assess (based on legislative requirements, international conventions, expert knowledge and public involvement), to identify alternative solutions that avoid, mitigate or compensate adverse impacts on biodiversity (including the option of not proceeding with the development, finding alternative designs or sites which avoid the impacts, incorporating safeguards in the design of the project, or providing compensation for adverse impacts), and finally to derive terms of reference for the impact assessment;

c. *Assessment and evaluation of impacts and development of alternatives*, to predict and identify the likely environmental impacts of a proposed project or development, including the detailed elaboration of alternatives;

d. *Reporting*: the environmental impact statement (EIS) or EIA report, including an environmental management plan (EMP), and a non-technical summary for the general audience;

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[11]/ See, for example, the International Association for Impact Assessment's principles of Environmental Impact Assessment best practice – www.iaia.org

[12]/ The terms project, activity and development are used interchangeably; there is no intended distinction between them.

e. *Review* of the environmental impact statement, based on the terms of reference (scoping) and public (including authority) participation;

f. *Decision-making* on whether to approve the project or not, and under what conditions; and

g. *Monitoring, compliance, enforcement and environmental auditing*. Monitor whether the predicted impacts and proposed mitigation measures occur as defined in the EMP. Verify the compliance of proponent with the EMP, to ensure that unpredicted impacts or failed mitigation measures are identified and addressed in a timely fashion.

### 5.3 Biodiversity issues at different stages of environmental impact assessment

## (a) 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. Screening criteria have to include biodiversity measures, or else there is a risk that proposals with potentially significant impacts on biodiversity will be screened out. The outcome of the screening process is a *screening decision*.

Since legal requirements for EIA may not guarantee that biodiversity will be taken into account, consideration should be given to incorporating biodiversity criteria into existing, or the development of new, screening criteria. Important information for developing screening criteria can be found in national biodiversity strategies and action plans (NBSAPs) or equivalent documents. These strategies provide detailed information on conservation priorities and on types and conservation status of ecosystems. Furthermore they describe trends and threats at ecosystem as well as species level and provide an overview of planned conservation activities.

*Pertinent questions from a biodiversity perspective.* Taking into account the three objectives of the Convention, fundamental questions which need to be answered in an EIA study include:

a. Would the intended activity affect the biophysical environment directly or indirectly in such a manner or cause such biological changes that it will increase risks of extinction of genotypes, cultivars, varieties, populations of species, or the chance of loss of habitats or ecosystems?

b. Would the intended activity surpass the maximum sustainable yield, the carrying capacity of a habitat/ecosystem or the maximum allowable disturbance level of a resource, population, or ecosystem, taking into account the full spectrum of values of that resource, population or ecosystem?

c. Would the intended activity result in changes to the access to, and/or rights over biological resources?

To facilitate the development of screening criteria, the questions above have been reformulated for the three levels of diversity, reproduced in table 5.1 below.

Types of existing screening mechanisms include:

- *Positive lists* identifying projects requiring EIA (inclusion lists). A disadvantage of this approach is that the significance of impacts of projects varies substantially depending on the nature of the receiving environment, which is not taken into account. A few countries use (or have used) negative lists, identifying those projects not subject to EIA (exclusion lists). Both types of lists should be reassessed to evaluate their inclusion of biodiversity aspects;
- Lists identifying those *geographical areas* where important biodiversity is found, in which projects would require EIA. The advantage of this approach is that the emphasis is on the sensitivity of the receiving environment rather than on the type of project;

- *Expert judgement* (with or without a limited study, sometimes referred to as *initial environmental examination* or *preliminary environmental assessment*). Biodiversity expertise should be included in expert teams; and
- A *combination* of a list plus expert judgement to determine the need for an EIA.

*Table 5.1 Questions pertinent to screening on biodiversity impacts*

| **Level of diversity** | **Conservation of biodiversity** | **Sustainable use of biodiversity** |
|---|---|---|
| Ecosystem diversity [13]/ | Would the intended activity lead, either directly or indirectly, to serious damage or total loss of (an) ecosystem(s), or land-use type(s), thus leading to a loss of ecosystem services of scientific/ecological value, or of cultural value? | Does the intended activity affect the sustainable human exploitation of (an) ecosystem(s) or land-use type(s) in such manner that the exploitation becomes destructive or non-sustainable (i.e. the loss of ecosystem services of social and/or economic value)? |
| Species diversity [13/] | Would the intended activity cause a direct or indirect loss of a population of a species? | Would the intended activity affect sustainable use of a population of a species? |
| Genetic diversity | Would the intended activity result in extinction of a population of a localised endemic species of scientific, ecological, or cultural value? | Does the intended activity cause a local loss of varieties/cultivars/breeds of cultivated plants and/or domesticated animals and their relatives, genes or genomes of social, scientific and economic importance? |

A *screening decision* defines the appropriate *level of assessment*. The result of a screening decision can be that:

- The proposed project is “fatally flawed” in that it would be inconsistent with international or national conventions, policies or laws. It is advisable not to pursue the proposed project. Should the proponent wish to proceed at his/her risk, an EIA would be required;
- An EIA is required (often referred to as category A projects);
- A limited environmental study is sufficient because only limited environmental impacts are expected; the screening decision is based on a set of criteria with quantitative benchmarks or threshold values (often referred to as category B projects);
- There is still uncertainty whether an EIA is required and an initial environmental examination has to be conducted to determine whether a project requires EIA or not; or
- The project does not require an EIA.

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[13]/ The scale at which ecosystems are defined depends on the definition of criteria in a country, and should take into account the principles of the ecosystem approach. Similarly, the level at which “population” is to be defined depends on the screening criteria used by a country. For example, the conservation status of species can be assessed within the boundaries of a country (for legal protection), or can be assessed globally (IUCN Red Lists).

*Biodiversity-inclusive screening criteria* set out circumstances in which EIA is justified on the basis of biodiversity considerations. They may relate to:

- Categories of activities known to cause biodiversity impacts, including thresholds referring to size of the intervention area and/or magnitude, duration and frequency of the activity;
- The magnitude of biophysical change that is caused by the activity; or
- Maps indicating areas important for biodiversity, often with their legal status.

A suggested approach to the development of biodiversity-inclusive screening criteria, combining the above types of criteria, includes the following steps: (i) design a biodiversity screening map indicating areas in which EIA is required; (ii) define activities for which EIA is required; (iii) define threshold values to distinguish between full, limited/undecided or no EIA (see appendix 1 for a generic set of screening criteria). The suggested approach takes account of biodiversity values (including valued ecosystem services) and activities that might impact drivers of change of biodiversity.

If possible, biodiversity-inclusive screening criteria should be integrated with the development (or revision) of a national biodiversity strategy and action plan. This process can generate valuable information such as a national spatial biodiversity assessment, including conservation priorities and targets, which can guide the further development of EIA screening criteria.

***Step 1:***According to the principles of the ecosystem approach, a *biodiversity screening map* is designed, indicating important ecosystem services (replacing the concept of sensitive areas – see appendix 2 below). The map is based on expert judgement and has to be formally approved.

Suggested categories of geographically defined areas, related to important ecosystem services, are:

- Areas with *important regulating services in terms of maintaining biodiversity*:
    - *Protected areas*: depending on the legal provisions in a country these may be defined as areas in which no human intervention is allowed, or as areas where impact assessment at an appropriate level of detail is always required;
    - Areas containing *threatened ecosystems outside of formally protected areas*, where certain classes of activities (see step 2) would always require an impact assessment at an appropriate level of detail;
    - Areas identified as being important for the *maintenance of key ecological or evolutionary processes*, where certain classes of activities (see step 2) would always require an impact assessment at an appropriate level of detail;
    - Areas known to be *habitat for threatened species*, which would always require an impact assessment at an appropriate level of detail.
- Areas with *important regulating services for maintaining natural processes with regard to soil, water, or air*, where impact assessment at an appropriate level of detail is always required. Examples can be wetlands, highly erodable or mobile soils protected by vegetation (e.g. steep slopes, dune fields), forested areas, coastal or offshore buffer areas; etc.
- Areas with *important provisioning services,* where impact assessment at an appropriate level of detail is always required. Examples can be extractive reserves, lands and waters traditionally occupied or used by indigenous and local communities, fish breeding grounds; etc.
- Areas with *important cultural services*, where impact assessment at an appropriate level of detail is always required. Examples can be scenic landscapes, heritage sites, sacred sites; etc.
- Areas with *other relevant ecosystem services* (such as flood storage areas, groundwater recharge areas, catchment areas, areas with valued landscape quality, etc.); the need for impact assessment and/or the level of assessment is to be determined (depending on the screening system in place);

- All other areas: no impact assessment required from a biodiversity perspective (an EIA may still be required for other reasons).

***Step 2**:* Define activities for which impact assessment may be required from a biodiversity perspective. The activities are characterised by the following direct drivers of change:

- Change of land-use or land cover, and underground extraction: above a defined area affected, EIA always required, regardless of the location of the activity - define thresholds for level of assessment in terms of surface (or underground) area affected;
- Change in the use of marine and/or coastal ecosystems, and extraction of seabed resources: above a defined area affected, EIA always required, regardless of the location of the activity - define thresholds for level of assessment in terms of surface (or underground) area affected;
- Fragmentation, usually related to linear infrastructure. Above a defined length, EIA always required, regardless of the location of the activity – define thresholds for level of assessment in terms of the length of the proposed infrastructural works;
- Emissions, effluents or other chemical, thermal, radiation or noise emissions - relate level of assessment to the ecosystem services map;
- Introduction or removal of species, changes to ecosystem composition, ecosystem structure, or key ecosystem processes responsible for the maintenance of ecosystems and ecosystem services (see appendix 2 below for an indicative listing) - relate level of assessment to ecosystem services map.

It should be noted that these criteria only relate to biodiversity and serve as an add-on in situations where biodiversity has not been fully covered by the existing screening criteria.

*Determining norms or threshold values for screening* is partly a technical and partly a political process the outcome of which may vary between countries and ecosystems. The technical process should at least provide a description of:

a. *Categories of activities* that create direct drivers of change (extraction, harvest or removal of species, change in land-use or cover, fragmentation and isolation, external inputs such as emissions, effluents, or other chemical, radiation, thermal or noise emissions, introduction of invasive alien species or genetically modified organisms, or change in ecosystem composition, structure or key processes), taking into account characteristics such as: type or nature of activity, magnitude, extent/location, timing, duration, reversibility/irreversibility, irreplaceability, likelihood, and significance; possibility of interaction with other activities or impacts;
b. *Where and when*: the area of influence of these direct drivers of change can be modelled or predicted; the timing and duration of influence can be similarly defined;
c. *map of valued ecosystem services* (including maintenance of biodiversity itself) on the basis of which decision makers can define levels of protection or conservation measures for each defined area. This map is the experts' input into the definition of categories on the biodiversity screening map referred to above under step 1.

## (b) Scoping

20. Scoping is used to define the focus of the impact assessment study and to identify key issues, which should be studied in more detail. It is used to derive terms of reference (sometimes referred to as guidelines) for the EIA study and to set out the proposed approach and methodology. Scoping also enables the competent authority (or EIA professionals in countries where scoping is voluntary) to:

a. Guide study teams on significant issues and alternatives to be assessed, clarify how they should be examined (methods of prediction and analysis, depth of analysis), and according to which guidelines and criteria;

b. Provide an opportunity for stakeholders to have their interests taken into account in the EIA;

c. Ensure that the resulting Environmental Impact Statement is useful to the decision maker and is understandable to the public.

During the scoping phase, promising alternatives can be identified for in-depth consideration during the EIA study.

*Consideration of mitigation and/or enhancement measures*: The purpose of mitigation in EIA is to look for ways to achieve the project objectives while avoiding negative impacts or reducing them to acceptable levels. The purpose of enhancement is to look for ways of optimising environmental benefits. Both mitigation and enhancement of impacts should strive to ensure that the public or individuals do not bear costs, which are greater than the benefits that accrue to them.

Remedial action can take several forms, i.e. *avoidance* (or prevention), *mitigation* (by considering changes to the scale, design, location, siting, process, sequencing, phasing, management and/or monitoring of the proposed activity, as well as restoration or rehabilitation of sites), and *compensation* (often associated with residual impacts after prevention and mitigation). A 'positive planning approach' should be used, where avoidance has priority and compensation is used as a last resort measure. One should acknowledge that compensation will not always be possible: there are cases where it is appropriate to reject a development proposal on grounds of irreversible damage to, or irreplaceable loss of, biodiversity.

Practical evidence with respect to mitigation suggests that:

- Timely and ample attention to mitigation and compensation, as well as the interaction with society, will largely reduce the risk of negative publicity, public opposition and delays, including associated costs. Specialist input on biodiversity can take place prior to initiating the legally required EIA process, as a component of the project proposal. This approach improves and streamlines the formal EIA process by identifying and avoiding, preventing or mitigating biodiversity impacts at the earliest possible stage of planning;
- Mitigation requires a joint effort of the proponent, planners, engineers, ecologists and other specialists, to arrive at the best practicable environmental option;
- Potential mitigation or compensation measures have to be included in an impact study in order to assess their feasibility; consequently they are best identified during the scoping stage;
- In project planning, it has to be kept in mind that it may take time for effects to become apparent.

The following sequence of questions provides an example of the kind of information that should be requested in the terms of reference of an impact study if the project screening suggests that the proposed activity is likely to have adverse impacts on biodiversity. It should be noted that this list of steps represents an iterative process. Scoping and impact study are two formal rounds of iteration; during the study further iterative rounds may be needed, for example when alternatives to the proposed project design have to be defined and assessed.

a. Describe the type of project, and define each project activity in terms of its nature, magnitude, location, timing, duration and frequency;

b. Define possible alternatives, including "no net biodiversity loss" or "biodiversity restoration" alternatives (such alternatives may not be readily identifiable at the outset of impact study, and one would need to go through the impact study to determine such alternatives). Alternatives include location alternatives, scale alternatives, siting or layout alternatives, and/or technology alternatives;

c. Describe expected biophysical changes (in soil, water, air, flora, fauna) resulting from proposed activities or induced by any socio-economic changes caused by the activity;

d. Determine the spatial and temporal scale of influence of each biophysical change, identifying effects on connectivity between ecosystems, and potential cumulative effects;

e. Describe ecosystems and land-use types lying within the range of influence of biophysical changes;

f. Determine, for each of these ecosystems or land-use types, if biophysical changes are likely to have adverse impacts on biodiversity in terms of composition, structure (spatial and temporal), and key processes. Give indication of the level certainty of predictions, and take into account mitigation measures. Highlight any irreversible impacts and any irreplaceable loss;

g. For the affected areas, collect available information on baseline conditions and any anticipated trends in biodiversity in the absence of the proposal;

h. Identify, in consultation with stakeholders, the current and potential ecosystem services provided by the affected ecosystems or land-use types and determine the values these functions represent for society (see box 5.1). Give an indication of the main beneficiaries and those adversely affected from an ecosystem services perspective, focusing on vulnerable stakeholders;

i. Determine which of these services will be significantly affected by the proposed project, giving confidence levels in predictions, and taking into account mitigation measures. Highlight any irreversible impacts and any irreplaceable loss;

j. Define possible measures to avoid, minimise or compensate for significant damage to, or loss of, biodiversity and/or ecosystem services; define possibilities to enhance biodiversity. Make reference to any legal requirements;

k. Evaluate the significance of residual impacts, i.e. in consultation with stakeholders define the importance of expected impacts for the alternatives considered. Relate the importance of expected impacts to a reference situation, which may be the existing situation, a historical situation, a probable future situation (e.g. the 'without project' or 'autonomous development' situation), or an external reference situation. When determining importance (weight), consider geographic importance of each residual impact (e.g. impact of local/regional/national/continental/global importance) and indicate its temporal dimension.

l. Identify necessary surveys to gather information required to support decision making. Identify important gaps in knowledge;

m. Provide details on required methodology and timescale.

One should bear in mind that not implementing a project may in some cases also have adverse effects on biodiversity. In rare cases the adverse effects may be more significant than the impacts of a proposed activity (e.g. projects counteracting degradation processes).

An analysis of current impact assessment practice [14]/ has provided a number of practical recommendations when addressing biodiversity-related issues:

- Beyond the focus on protected species and protected areas, further attention needs to be given to (i) sustainable use of ecosystem services; (ii) ecosystem level diversity; (iii) non-protected biodiversity; and (iv) ecological processes and their spatial scale;
- The terms of reference should be unambiguous, specific and compatible with the ecosystem approach; too often the terms of reference are too general and impractical;
- In order to provide a sound basis for assessing the significance of impacts, baseline conditions must be defined and understood and quantified where possible. Baseline conditions are dynamic, implying that present and expected future developments if the proposed project is not implemented (autonomous development) need to be included;

[14]/ See document UNEP/CBD/SBSTTA/9/INF/18.

- Field surveys, quantitative data, meaningful analyses, and a broad, long-term perspective enabling cause-effect chains to be tracked in time and space are important elements when assessing biodiversity impacts. Potential indirect and cumulative impacts should be better assessed;
- Alternatives and/or mitigation measures must be identified and described in detail, including an analysis of their likely success and realistic potential to offset adverse project impacts;
- Guidance for scoping on biodiversity issues in EIA needs to be developed at country-level, but should, where appropriate, also consider regional aspects to prevent transboundary impacts;
- Guidance for determining levels of acceptable change to biodiversity needs to be developed at country level to facilitate decision-making;
- Guidance on assessing and evaluating impacts on ecosystem processes, rather than on composition or structure, need to be developed at country level. The conservation of ecosystem processes, which support composition and structure, requires a significantly larger proportion of the landscape than is required to represent biodiversity composition and structure;
- Capacity development is needed to effectively represent biodiversity issues in the scoping stage; this will result in better guidelines for the EIA study.

### (c) Assessment and evaluation of impacts, and development of alternatives

EIA should be an iterative process of assessing impacts, re-designing alternatives and comparison. The main tasks of impact analysis and assessment are:

a. Refinement of the understanding of the nature of the potential impacts identified during screening and scoping and described in the terms of reference. This includes the identification of indirect and cumulative impacts, and of the likely cause–effect chains;
b. Identification and description of relevant criteria for decision-making can be an essential element of this stage;
c. Review and redesign of alternatives; consideration of mitigation and enhancement measures, as well as compensation of residual impacts; planning of impact management; evaluation of impacts; and comparison of the alternatives; and
d. Reporting of study results in an environmental impact statement (EIS) or EIA report.

Assessing impacts usually involves a detailed analysis of their nature, magnitude, extent and duration, and a judgement of their significance, i.e., whether the impacts are acceptable to stakeholders and society as a whole, require mitigation and/or compensation, or are unacceptable.

Available biodiversity information is usually limited and descriptive, and cannot be used as a basis for numerical predictions. There is a need to develop biodiversity criteria for impact evaluation and measurable standards or objectives against which the significance of individual impacts can be evaluated. The priorities and targets set in the National Biodiversity Strategy and Action Plan process can provide guidance for developing these criteria. Tools will need to be developed to deal with uncertainty, including criteria on using risk assessment techniques, precautionary approach and adaptive management.

A number of practical lessons with respect to the study process have emerged including that the assessment should:

a. Allow for enough survey time to take seasonal features into account, where confidence levels in predicting the significance of impacts are low without such survey;
b. Focus on processes and services, which are critical to human well-being and the integrity of ecosystems. Explain the main risks and opportunities for biodiversity;

c. Apply the ecosystem approach and actively seek information from relevant stakeholders and indigenous and local communities. Address any request from stakeholders for further information and/or investigation adequately. This does not necessarily imply that all requests need to be honoured; however, clear reasons should be provided where requests are not honoured;

d. Consider the full range of factors affecting biodiversity. These include direct drivers of change associated with a proposal (e.g. land conversion, vegetation removal, emissions, disturbance, introduction of invasive alien species or genetically modified organisms, etc.) and, to the extent possible, indirect drivers of change, including demographic, economic, socio-political, cultural and technological processes or interventions;

e. Evaluate impacts of alternatives with reference to the baseline situation. Compare against legal standards, thresholds, targets and/or objectives for biodiversity. Use national biodiversity strategies and action plans and other relevant documents for information and objectives. The vision, objectives and targets for the conservation and sustainable use of biodiversity contained in local plans, policies and strategies, as well as levels of public concern about, dependence on, or interest in, biodiversity provide useful indicators of acceptable change;

f. Take account of cumulative threats and impacts resulting either from repeated impacts of projects of the same or different nature over space and time, and/or from proposed plans, programmes or policies;

g. Recognise that biodiversity is influenced by cultural, social, economic and biophysical factors. Cooperation between different specialists in the team is thus essential, as is the integration of findings, which have bearing on biodiversity;

h. Provide insight into cause – effect chains. Also explain why certain chains do not need to be studied;

i. If possible, quantify the changes in biodiversity composition, structure and key processes, as well as ecosystem services. Explain the expected consequences of the loss of biodiversity associated with the proposal, including the costs of replacing ecosystem services if they will be adversely affected by a proposal;

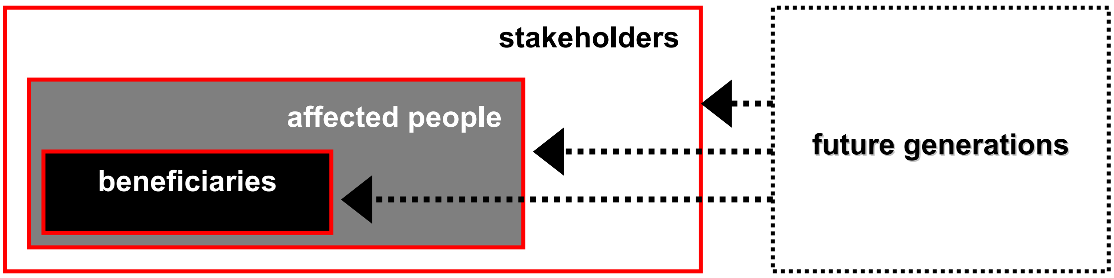
j. Indicate the legal provisions that guide decision-making. List all types of potential impacts identified during screening and scoping and described in the terms of reference and identify applicable legal provisions. Ensure that potential impacts to which no legal provision applies are taken into account during decision-making.

**Box 5.1: Stakeholders and participation**

Impact assessment is concerned with (i) information, (ii) participation and (iii) transparency of decision-making. Public involvement consequently is a prerequisite for effective EIA and can take place at different levels: informing (one-way flow of information), consulting (two-way flow of information), or "real" participation (shared analysis and assessment). In all stages of EIA public participation is relevant. The legal requirements for and the level of participation differ among countries, but it is generally accepted that public consultation at the scoping and review stage are essential; participation during the assessment study is generally acknowledged to enhance the quality of the process.

With respect to biodiversity, relevant stakeholders in the process are:

- Beneficiaries of the project - target groups making use of, or putting a value to, known ecosystem services which are purposefully enhanced by the project;
- Affected people – i.e. those people that experience, as a result of the project, intended or unintended changes in ecosystem services that they value;
- General stakeholders – i.e. formal or informal institutions and groups representing either affected people or biodiversity itself.
- Future generations – "absent stakeholders", i.e. those stakeholders of future generations, who may rely on biodiversity around which decisions are presently taken.




There is a number of potential constraints to effective public participation. These include:

- **Deficient identification** of relevant stakeholders may make public involvement ineffective;
- **Poverty**: involvement requires time spent away from income-producing tasks;
- **Rural settings**: increasing distance makes communication more difficult and expensive;
- **Illiteracy**: or lack of command of non-local languages, can inhibit representative involvement if print media are used;
- **Local values/culture**: behavioural norms or cultural practice can inhibit involvement of some groups, who may not feel free to disagree publicly with dominant groups;
- **Languages**: in some areas a number of different languages or dialects may be spoken, making communication difficult;
- **Legal systems**: may be in conflict with traditional systems, and cause confusion about rights and responsibilities for resources;
- **Interest groups**: may have conflicting or divergent views, and vested interests;
- **Confidentiality**: can be important for the proponent, who may be against early involvement and consideration of alternatives.

Also refer to decision VII/16 F containing the Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities.

### (d) Reporting: the environmental impact statement (EIS)

The environmental impact statement consists of: (i) a technical report with annexes, (ii) an environmental management plan, providing detailed information on how measures to avoid, mitigate or compensate expected impacts are to be implemented, managed and monitored, and (iii) a non-technical summary.

The environmental impact statement is designed to assist:

- The proponent to plan, design and implement the proposal in a way that eliminates or minimises the negative effect on the biophysical and socio-economic environments and maximises the benefits to all parties in the most cost-effective manner;
- The Government or responsible authority to decide whether a proposal should be approved and the terms and conditions that should be applied; and
- The public to understand the proposal and its impacts on the community and environment, and provide an opportunity for comments on the proposed action for consideration by decision makers. Some adverse impacts may be wide ranging and have effects beyond the limits of particular habitats/ecosystems or national boundaries. Therefore, environmental management plans and strategies contained in the environmental impact statement should consider regional and transboundary impacts, taking into account the ecosystem approach. The inclusion of a non-technical summary of the EIA, understandable to the interested general audience, is strongly recommended.

### (e) Review of the environmental impact statement

The purpose of the review of the environmental impact statement is to ensure that the information for decision makers is sufficient, focused on the key issues, and is scientifically and technically accurate. In addition, the review should evaluate whether:

- The likely impacts would be acceptable from an environmental viewpoint;
- The design complies with relevant standards and policies, or standards of good practice where official standards do not exist;
- All of the relevant impacts, including indirect and cumulative impacts, of a proposed activity have been identified and adequately addressed in the EIA. To this end, biodiversity specialists should be called upon for the review and information on official standards and/or standards for good practice to be compiled and disseminated.

Public involvement, including the full and effective participation of indigenous and local communities, is important in various stages of the process and particularly at this stage. The concerns and comments of all stakeholders are adequately considered and included in the final report presented to decision makers. The process establishes local ownership of the proposal and promotes a better understanding of relevant issues and concerns.

Review should also guarantee that the information provided in the environmental impact statement is sufficient for a decision maker to determine whether the project is compliant with or contradictory to the objectives of the Convention on Biological Diversity.

The effectiveness of the review process depends on the quality of the terms of reference defining the issues to be included in the study. Scoping and review are therefore complementary stages.

Reviewers should as far as possible be independent and different from the persons/organisations who prepare the environmental impact statement.

### (f). Decision-making

Decision-making takes place throughout the process of EIA in an incremental way from the screening and scoping stages to decisions during data-collecting and analysis, and impact prediction, to making choices between alternatives and mitigation measures, and finally the decision to either refuse or authorise the project.

Biodiversity issues should play a part in decision-making throughout. The final decision is essentially a political choice about whether or not the proposal is to proceed, and under what conditions. If rejected, the project can be redesigned and resubmitted. It is desirable that the proponent and the decision-making body are two different entities.

It is important that there are clear criteria for taking biodiversity into account in decision-making, and to guide trade-offs between social, economic and environmental issues including biodiversity. These criteria draw on principles, objectives, targets and standards for biodiversity and ecosystem services contained in international and national, regional and local laws, policies, plans and strategies.

The precautionary approach should be applied in decision-making in cases of scientific uncertainty when there is a risk of significant harm to biodiversity. Higher risks and/or greater potential harm to biodiversity require greater reliability and certainty of information. The reverse implies that the precautionary approach should not be pursued to the extreme; in case of minimal risk, a greater level of uncertainty can be accepted. Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management have been developed under the Precautionary Principle Project, a joint initiative of Fauna & Flora International, IUCN-The World Conservation Union, ResourceAfrica and TRAFFIC, and are available in English, French and Spanish at: http://www.pprinciple.net/.

Instead of weighing conservation goals against development goals, the decision should seek to strike a balance between conservation and sustainable use for economically viable, and socially and ecologically sustainable solutions.

### (g) Monitoring, compliance, enforcement and environmental auditing

EIA does not stop with the production of a report and a decision on the proposed project. Activities that have to make sure the recommendations from EIS or EMP are implemented are commonly grouped under the heading of "EIA follow-up". They may include activities related to monitoring, compliance, enforcement and environmental auditing. Roles and responsibilities with respect to these are variable and depend on regulatory frameworks in place.

Monitoring and auditing are used to compare the actual outcomes after project implementation has started with those anticipated before implementation. It also serves to verify that the proponent is compliant with the environmental management plan (EMP). The EMP can be a separate document, but is considered part of the environmental impact statement. An EMP usually is required to obtain a permission to implement the project. In a number of countries, an EMP is not a legal requirement.

Management plans, programmes and systems, including clear management targets, responsibilities and appropriate monitoring should be established to ensure that mitigation is effectively implemented, unforeseen negative effects or trends are detected and addressed, and expected benefits (or positive developments) are achieved as the project proceeds. Sound baseline information and/or pre-implementation monitoring is essential to provide a reliable benchmark against which changes caused by the project can be measured. Provision should be made for emergency response measures and/or contingency plans where unforeseen events or accidents could threaten biodiversity. The EMP should define responsibilities, budgets and any necessary training for monitoring and impact management, and describe how results will be reported and to whom.

Monitoring focuses on those components of biodiversity most likely to change as a result of the project. The use of indicator organisms or ecosystems that are most sensitive to the predicted impacts is thus appropriate, to provide the earliest possible indication of undesirable change. Since monitoring often has to consider natural fluxes as well as human-induced effects, complementary indicators may be appropriate in monitoring. Indicators should be specific, measurable, achievable, relevant and timely. Where possible, the choice of indicators should be aligned with existing indicator processes.

The results of monitoring provide information for periodic review and alteration of environmental management plans, and for optimising environmental protection through good, adaptive management at all stages of the project. Biodiversity data generated by EIA should be made accessible and useable by others and should be linked to biodiversity assessment processes being designed and carried out at the national and global levels.

Provision is made for regular auditing in order to verify the proponent's compliance with the EMP, and to assess the need for adaptation of the EMP (usually including the proponent's license). An environmental audit is an independent examination and assessment of a project's (past) performance. It is part of the evaluation of the environmental management plan and contributes to the enforcement of EIA approval decisions.

Implementation of activities described in the EMP and formally regulated in the proponent's environmental license in practice depends on the enforcement of formal procedures. It is commonly found that a lack of enforcement leads to reduced compliance and inadequate implementation of EMPs. Competent authorities are responsible for enforcing pertinent impact assessment regulations, when formal regulations are in place.

**Appendix 1: Indicative set of screening criteria to be further elaborated at national level** [15]/

**Category A: Environmental impact assessment mandatory for**:

- Activities in protected areas (define type and level of protection);
- Activities in threatened ecosystems outside protected areas;
- Activities in ecological corridors identified as being important for ecological or evolutionary processes;
- Activities in areas known to provide important ecosystem services;
- Activities in areas known to be habitat for threatened species;
- Extractive activities or activities leading to a change of land-use occupying or directly influencing an area of at minimum a certain threshold size (land or water, above or underground - threshold to be defined);
- Creation of linear infrastructure that leads to fragmentation of habitats over a minimum length (threshold to be defined);
- Activities resulting in emissions, effluents, and/or other means of chemical, radiation, thermal or noise emissions in areas providing key ecosystem services (areas to be defined); [16]/
- Activities leading to changes in ecosystem composition, ecosystem structure or key processes [17]/ responsible for the maintenance of ecosystems and ecosystem services in areas providing key ecosystem services (areas to be defined).

**Category B: The need for, or the level of environmental impact assessment is to be determined for:**

- Activities resulting in emissions, effluents and/or other chemical, thermal, radiation or noise emissions in areas providing other relevant ecosystem services (areas to be defined);
- Activities leading to changes in ecosystem composition, ecosystem structure, or ecosystem functions responsible for the maintenance of ecosystems and ecosystem services in areas providing other relevant ecosystem services (areas to be defined);
- Extractive activities, activities leading to a change of land-use or a change of use of inland water ecosystems or a change of use of marine and coastal ecosystems, and creation of linear infrastructure below the Category A threshold, in areas providing key and other relevant ecosystem services (areas to be defined).

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[15]/ *Note*: These criteria only pertain to biodiversity and should therefore be applied as an add-on to existing screening criteria.

[16]/ For a non-exhaustive list of ecosystem services, see appendix 2 below.

[17]/ For examples of these aspects of biodiversity, see appendix 3 below.

## Appendix 2:Indicative list of ecosystem services

**Regulating services** responsible for maintaining natural processes and dynamics

*Biodiversity-related regulating services*

- maintenance of genetic, species and ecosystem composition
- maintenance of ecosystem structure
- maintenance of key ecosystem processes for creating or maintaining biodiversity

*Land-based regulating services*
- decomposition of organic material
- natural desalinisation of soils
- development / prevention of acid sulphate soils
- biological control mechanisms
- pollination of crops
- seasonal cleansing of soils
- soil water storage capacity
- coastal protection against floods
- coastal stabilisation (against accretion / erosion)
- soil protection
- suitability for human settlement
- suitability for leisure and tourism activities
- suitability for nature conservation
- suitability for infrastructure

*Water related regulating services*
- water filtering
- dilution of pollutants
- discharge of pollutants
- flushing / cleansing
- bio-chemical/physical purification of water
- storage of pollutants
- flow regulation for flood control
- river base flow regulation
- water storage capacity
- ground water recharge capacity
- regulation of water balance
- sedimentation / retention capacity
- protection against water erosion
- protection against wave action
- prevention of saline groundwater intrusion
- prevention of saline surface-water intrusion
- transmission of diseases
- suitability for navigation
- suitability for leisure and tourism activities
- suitability for nature conservation

*Air-related regulating services*
- filtering of air
- carry off by air to other areas
- photo-chemical air processing (smog)
- wind breaks
- transmission of diseases
- carbon sequestration

**Provisioning services**: harvestable goods
*Natural production*:
- timber
- firewood
- grasses (construction and artisanal use)
- fodder & manure
- harvestable peat
- secondary (minor) products
- harvestable bush meat
- fish and shellfish
- drinking water supply
- supply of water for irrigation and industry
- water supply for hydroelectricity
- supply of surface water for other landscapes
- supply of groundwater for other landscapes
- genetic material

*Nature-based human production*
- crop productivity
- tree plantations productivity
- managed forest productivity
- rangeland/livestock productivity
- aquaculture productivity (freshwater)
- mariculture productivity (brackish/saltwater)

**Cultural services** providing a source of artistic, aesthetic, spiritual, religious, recreational or scientific enrichment, or nonmaterial benefits.

**Supporting services** necessary for the production of all other ecosystem services

- soil formation,
- nutrients cycling
- primary production.
- evolutionary processes

**Appendix 3: Aspects of biodiversity: composition, structure and key processes**

| **Composition** | **Influenced by:** |
|---|---|
| Minimal viable population of:<br>(a) legally protected varieties/cultivars/breeds of cultivated plants and/or domesticated animals and their relatives, genes or genomes of social, scientific and economic importance;<br>(b) legally protected species;<br>(c) migratory birds, migratory fish, species protected by CITES;<br>(d) non-legally protected, but threatened species (cf. IUCN Red List of Threatened Species); species which are important in local livelihoods and cultures. | - selective removal of one or a few species by fisheries, forestry, hunting, collecting of plants (including living botanical and zoological resources);<br>- fragmentation of their habitats leading to reproductive isolation;<br>- introducing genetically modified organisms that may transfer transgenes to varieties / cultivars / breeds of cultivated plants and/or domesticated animals and their relatives;<br>- disturbance or pollution;<br>- habitat alteration or reduction;<br>- introduction of (non-endemic) predators, competitors or parasites of protected species. |
| **Structure** | **Influenced by:** |
| *Changes in spatial or temporal structure*,<br>at the scale of relevant areas, such as:<br>(a) legally protected areas;<br>(b) areas providing important ecosystem services, such as (i) maintaining high diversity (hot spots), large numbers of endemic or threatened species, required by migratory species; (ii) services of social, economic, cultural or scientific importance; (iii) or supporting services associated with key evolutionary or other biological processes. | Effects of human activities that work on a similar (or larger) scale as the area under consideration. For example, by emissions into the area, diversion of surface water that flows through the area, extraction of groundwater in a shared aquifer, disturbance by noise or lights, pollution through air, etc. |
| *Food web structure and interactions:*<br>Species or groups of species perform certain roles in the food web (functional groups); changes in species composition may not necessarily lead to changes in the food web as long as roles are taken over by other species. | All influences mentioned with *composition* may lead to changes in the food web, but only when an entire role (or functional group) is affected. Specialised ecological knowledge is required. |
| *Presence of keystone species*:<br>Keystone species often singularly represent a given functional type (or role) in the food web. | All influences mentioned with composition that work directly on keystone species. This is a relatively new, but rapidly developing field of ecological knowledge. Examples are:<br>- sea otters and kelp forest<br>- elephants and African savannah<br>- starfish in intertidal zones<br>- salmon in temperate rainforest<br>- tiger shark in some marine ecosystems<br>- beaver in some freshwater habitats<br>- black-tailed prairie dogs and prairies |

| Key processes (selected examples only) | Influenced by: |
|---|---|
| Sedimentation patterns (sediment transport, sedimentation, and accretion) in intertidal systems (mangroves, mudflats, seagrass beds) | Reduced sediment supply by damming of rivers; interruption of littoral drift by seaward structures |
| Plant-animal dependency for pollination, seed dispersal, nutrient cycling in tropical rainforests | Selective removal of species by logging, collecting or hunting |
| Soil surface stability and soil processes in montane forests | Imprudent logging leads to increased erosion and loss of top soil |
| Nutrient cycling by invertebrates and fungi in deciduous forests | Soil and groundwater acidity by use of agrochemicals. |
| Plant available moisture in non-forested, steeply sloping mountains | Overgrazing and soil compaction lead to reduced available soil moisture |
| Grazing by herbivorous mammals in savannahs | Cattle ranching practises |
| Succession after fire, and dependence on fire for completion of life-cycles in savannahs | Exclusion of fire leads to loss of species diversity |
| Available nutrients and sunlight penetration in freshwater lakes | In-flow of fertilizers and activities leading to increased turbidity of water (dredging, emissions) |
| Hydrological regime in floodplains, flooded forests and tidal wetlands | Changes in river hydrology or tidal rhythm by hydraulic infrastructure or water diversions |
| Permanently waterlogged conditions in peat swamps and acid-sulphate soils | Drainage leads to destruction of vegetation (and peat formation process), oxidisation of peat layers and subsequent soil subsidence; acid sulphate soils rapidly degrade when oxidised |
| Evaporation surplus in saline / alkaline lakes | Outfall of drainage water into these lakes changes the water balance |
| Tidal prism and salt/freshwater balance in estuaries | Infrastructure creating blockages to tidal influence; changes in river hydrology change the salt balance in estuaries. |
| Hydrological processes like vertical convection, currents and drifts, and the transverse circulation in coastal seas | Coastal infrastructure, dredging. |
| Population dynamics | Reduction in habitat leads to dramatic drop in population size, leading to extinction |

## CONTENTS

## 6.1 Introduction

Strategic environmental assessment (SEA) is now widely applied, and an increasing number of countries have integrated, or are in the process of integrating, SEA into their national procedures for environmental assessment. This guidance is intended to assist in better incorporating biodiversity during this process. The target audience of this document consequently are those involved in the process of establishing SEA systems. These typically are national authorities but can also include regional authorities or international agencies.

The generic nature of this guidance implies that further elaboration of its practical application is needed to reflect the ecological, social-economic, cultural and institutional conditions for which the SEA system is designed. The focus of the guidance is on how to guarantee a biodiversity-inclusive SEA process. The guidance does not intend to provide a technical manual for practitioners on how to carry out a biodiversity-inclusive assessment study.

This guidance is not structured according to a given procedure. The principal reason is that good practice SEA should ideally be fully integrated into a planning (or policy development) process. Since planning processes differ widely, there is, by definition, no typical sequence of procedural steps in SEA. Moreover, there is no general agreement on what a typical SEA procedure might be. It is intended to provide guidance on how to integrate biodiversity issues into the SEA, which in turn should be integrated into a planning process. Because the planning process may vary between countries, the SEA is not described as separate process but as an integral component of the applicable planning process.

Situations in which SEA is applied and the scope of the assessments, are all varied. The SEA process therefore needs to be structured to reflect the specific situation. SEA is not a mere expansion of an EIA and it does not usually follow the same stages as an EIA. The approach and language used are therefore conceptual in nature.

The guidance is fully consistent with the Ecosystem Approach (decision V/6 and VII/11). It focuses on people-nature interactions and the role of stakeholders in identifying and valuing potential impacts on biodiversity. For the identification of stakeholders and the valuing of biodiversity, the concept of ecosystem services as elaborated by the Millennium Ecosystem Assessment (MA) provides a useful tool. It translates biodiversity into (present and future) values for society. It provides a mechanism to 'translate' the language of biodiversity specialists into language commonly understood by decision makers. The guidance is consistent with the MA conceptual framework and terminology.

The guidance intends to facilitate the ability to contribute to Goal 7 of the Millennium Development Goals, i.e. to '*ensure environmental sustainability*', and its target 9 to '*integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources'*.

## 6.2 Strategic environmental assessment applies a multitude of tools

Strategic environmental assessment has been defined as 'the formalised, systematic and comprehensive process of identifying and evaluating the environmental consequences of proposed policies, plans or programmes to ensure that they are fully included and appropriately addressed at the earliest possible stage of decision-making on a par with economic and social considerations'. [18]/ Since this original definition, the field of SEA has rapidly developed and expanded, and the number of definitions of SEA has multiplied accordingly. SEA, by its nature, covers a wider range of activities or a wider area and often over a longer time span than the environmental impact assessment of projects. SEA might be applied to an entire sector (such as a national policy on energy, for example) or to a geographical area (for example, in the context of a regional development scheme). SEA does not replace or reduce the need for project-level EIA (although in some cases it can), but it

[18]/ Based on Sadler and Verheem, 1996. Strategic Environmental Assessment. Status, Challenges and Future Directions, Ministry of Housing, Spatial Planning and the Environment, The Netherlands: 188 pp.

can help to streamline and focus the incorporation of environmental concerns (including biodiversity) into the decision-making process, often making project-level EIA a more effective process. SEA is nowadays commonly understood as being proactive and sustainability-driven, whilst EIA is often described as being largely reactive. Annex 3 provides more general information on SEA.

### Strategic environmental assessment vs. integrated assessment

SEA is a rapidly evolving field with numerous definitions and interpretation in theory, in regulations, and in practice. SEA is required by legislation in many countries and carried out informally in others. There are also approaches that use some or all of the principles of SEA without using the term SEA to describe them. However, practices in SEA and related approaches show an emerging continuous spectrum of interpretation and application. At one end of the continuum, the focus is mainly on the biophysical environment. It is characterised by the goal of mainstreaming and up-streaming environmental considerations into strategic decision-making at the earliest stages of planning processes to ensure they are fully included and appropriately addressed. The 2001 SEA Directive of the European Union and SEA Protocol to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) are examples of this approach. At the other end of the spectrum is an approach, which addresses the three pillars of sustainability and aims to assess environmental, social and economic concerns in an integrated manner. Depending on the needs of SEA users and the different legal requirements, SEA can be applied in different ways along this spectrum using a variety of methodologies.

Accordingly, SEA is referred to as “a family of tools that identifies and addresses the environmental consequences and stakeholder concerns in the development of policies, plans, programmes and other high level initiatives”. [19]/ In more specific terms, the Netherlands Commission for Environmental Assessment [20]/ describes SEA as a tool to:

1. Structure the public and government debate in the preparation of policies, plans and programmes;
2. Feed this debate through a robust assessment of the environmental consequences and their interrelationships with social and economic aspects;
3. Ensure that the results of assessment and debate are taken into account during decision making and implementation.

This means that *stakeholder involvement, transparency* and *good quality information* are key principles. SEA is thus more than the preparation of a report; it is a tool to enhance good governance. SEA can be a formal procedure laid down by law (e.g. the SEA Directive of the European Union) or used flexibly/opportunistically.

### Parallel to or integrated within a planning process?

SEA is designed in accordance with the national context and the characteristics of the planning processes in which SEA is applied. Traditionally, SEA is often applied as a stand-alone process parallel to planning, intended to support the decision making at the end of the planning process. More recently, SEA has been further developed into its most effective form: integrated into the planning process, bringing stakeholders together during key stages of the planning process and feeding their debate with reliable environmental information (figure 6.1). In some cases, where planning procedures are weak or absent; SEA may structure or effectively represent the planning process.

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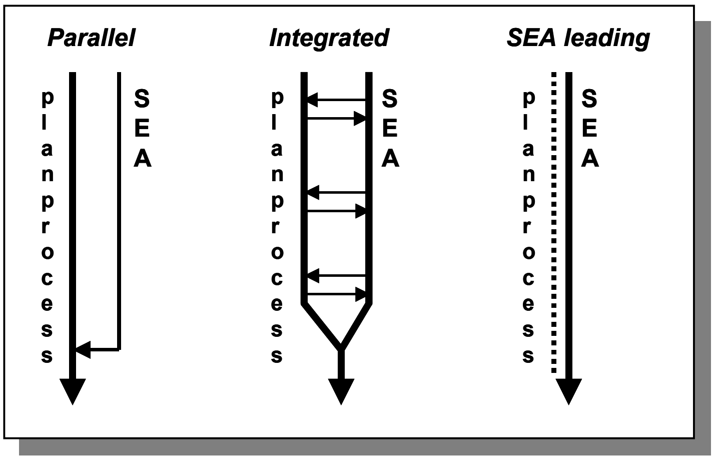
[19]/ OECD Development Assistance Committee Network on Environment and Development Cooperation – Task Team on Strategic Environmental Assessment.

[20]/ Netherlands Commission for Environmental Assessment: Strategic Environmental Assessment - Views and Experiences (fact sheet at http://www.eia.nl/nceia/products/publications.htm).

Ideally, SEA is integrated throughout the development process of a specific legislation, policy, plan or programme, starting as early as possible. However, even when decisions have already been taken, SEA can play a meaningful role in monitoring implementation - for example, to decide on necessary mitigating actions or to feed into future reviews of decisions. SEA may even take on the form of a sectoral assessment used to set the agenda for future policies and plans.

There is no typical sequence of procedural steps to define an SEA process. By definition SEA is situation-specific.

*Figure 6.1: Combinations of SEA and planning process*




## Steps in the SEA process

SEA aims at better strategies, ranging from legislation and country-wide development policies to sectoral and spatial plans. In spite of the wide variation in application and definitions, all good practice SEAs comply with a number of performance criteria and with common procedural principles. [21]/ When a decision on the need for an SEA has been taken, "good practice SEA" can be characterised by the following phases: [22]/

- *Phase 1*: Create transparency:
  - (i) Announce the start of the SEA and ensure that relevant stakeholders are aware that the process is starting;
  - (ii) Bring stakeholders together and facilitate development of a shared vision on (environmental) problems, objectives, and alternative actions to achieve these;
  - (iii) Examine, in cooperation with all relevant agencies, whether the objectives of the new policy or plan are in line with those in existing policies, including environmental objectives (consistency analysis).
- *Phase 2*: Technical assessment:
  - (iv) Elaborate terms of reference for the technical assessment, based on the results of stakeholder consultation and consistency analysis;
  - (v) Carry out the actual assessment, document its results and make these accessible. Organise an effective quality assurance system of both SEA information and process.

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[21]/ See IAIA Strategic Environmental Assessment Performance Criteria. IAIA Special Publications Series No. 1, January 2002.

[22]/ OECD Development Assistance Committee Network on Environment and Development Cooperation – Task Team on Strategic Environmental Assessment.

- *Phase 3*: Use information in decision-making:
  - (vi) Bring stakeholders together to discuss results and make recommendations to decision-makers.
  - (vii) Make sure any final decision is motivated in writing in light of the assessment results.
- *Phase 4*: Post-decision monitoring and evaluation:
  - (viii) Monitor the implementation of the adopted policy or plan, and discuss the need for follow-up action.

SEA is flexible, i.e. the scope and level of detail of the above steps can differ depending on time and resources available: from rapid (2-3 months) to comprehensive (1-2 years). The extent of documentation is also highly variable – in some SEAs, particularly where decision-makers are involved throughout, the process is of paramount importance, whilst in others reporting assumes greater importance.

### 6.3 Why give special attention to biodiversity in SEA and decision-making?

Important reasons to pay attention to the effective incorporation of biodiversity in environmental assessment are summarised below:

***Legal obligations***. A reason to pay particular attention to biodiversity in SEA is a legal national, regional or international obligation to do so. A number of legal obligations can be distinguished:

- *Protected areas and protected species*: ecosystems, habitats and species can have a form of legal protection, ranging from strictly protected to restrictions on certain activities.
- *Valued ecosystem services* can be subject to some form of legal regulation triggering the need for environment assessment. Examples are fisheries and forestry activities, coastal protection (by dunes or forested wetlands), water infiltration areas for public water supply, recreational areas, landscape parks, etc. (See box 6.1 on ecosystem services in their regulatory context).
- Lands and waters traditionally occupied or used by indigenous and local communities represent a special case of ecosystem services.
- International treaties, conventions and agreements such as the World Heritage Convention, Ramsar Convention, the UNESCO Man and Biosphere Programme or Regional Seas agreements. By becoming a Party to these agreements, countries agree to certain obligation to manage these areas according to internationally agreed principles.

***Facilitation of stakeholder identification***. The concept of biodiversity-derived ecosystem services provides a useful tool to identify potentially affected groups of people. Ecosystems are multifunctional and provide multiple services. By applying the ecosystem approach and focusing on ecosystem services in describing biodiversity, directly and indirectly affected stakeholders can be identified and, as appropriate, invited to participate in the SEA process.

***Safeguarding livelihoods***. The identification of stakeholders through recognition of ecosystem services can lead to a better understanding of how the livelihoods of people who depend on biodiversity will be affected. In many countries, especially in developing countries, a large proportion of rural society is directly dependent on biodiversity. As these groups may also belong to the poorer and less educated strata of society, they may go unnoticed as they are not always capable to participate meaningfully in an SEA process (see box 6.2).

***Sound economic decision making***. Ecosystem services such as erosion control, water retention and supply, and recreational potential can be valued in monetary terms, thus providing a figure on potential economic benefits and/or losses caused by the implementation of planned activities.

**Box 6.1: Ecosystem services in their regulatory context**

SEA provides information on policies, plans and programmes for decision makers, including their consistency with the regulatory context.

It is important to realize that ecosystem services often have formal recognition by some form of legal protection. Legislation often has a geographical basis (e.g. protected areas) but this is not necessarily always the case (e.g. species protection is not always limited to demarcated areas). Of course, the legal context in any country or region is different and needs to be treated as such.

Some examples of ecosystem services linked to formal regulations:

*Ecosystem service*: preservation of biodiversity:

- Nationally protected areas/habitats, protected species;
- International status: Ramsar convention, UNESCO Man and Biosphere, World Heritage Sites
- Subject to national policies such as the U.K. Biodiversity Action Plans (BAP), or regional regulations such as the European Natura 2000 Network.
- Marine Environmental High Risk Areas (sensitive areas prone to oil pollution from shipping)·
- Sites identified and designated under international agreements, e.g. OSPAR Marine Protected Areas
- Sites hosting species listed under the Convention on the Conservation of Migratory Species of Wild Animals or the Convention on International Trade in Endangered Species of Wild Flora and Fauna
- Sites hosting species listed under the Bern Convention (Annex 1 and 2 of the Convention on the Conservation of European Wildlife and Natural Habitats, 1979)

*Ecosystem service*: provision of livelihood to people:

- Extractive reserves (forests, marine, agriculture)
- Areas of indigenous interest
- Touristic (underwater) parks (service: maintaining biodiversity to enhance tourism)

*Ecosystem service*: preservation of human cultural history / religious sites:

- Landscape parks
- Sacred sites, groves
- Archaeological parks

*Other ecosystem services*, in some countries formally recognized:

- Flood storage areas (service: flood protection or water storage)
- Water infiltration areas (service: public water supply)
- Areas sensitive to erosion (service: vegetation preventing erosion)
- Coastal defences (dunes, mangroves) (service: protecting coastal hinterlands)
- Urban or peri-urban parks (service: recreational facilities to urban inhabitants)
- Ecosystem functioning (soil biodiversity, pollination, pest control)

**Box 6.2: Stakeholders and participation**

Impact assessment is concerned with: (i) information, (ii) participation and (iii) transparency in decision making. Public involvement consequently is a prerequisite for effective impact assessment and can take place at different levels: informing (one-way flow of information), consulting (two-way flow of information), or "real" participation (shared analysis and assessment). In all stages of the process public participation is relevant. The legal requirements for and the level of participation differ among countries, but it is generally accepted that public consultation at the scoping and review stage are minimally required; participation during the assessment study is generally acknowledged to enhance the quality of the process.

With respect to biodiversity, three groupings of stakeholders can be distinguished. (N.B: note that the categories represent three levels, each higher level encompassing the earlier category):

- **Beneficiaries** of the policy, plan or programme - target groups making use of or putting a value to known ecosystem services which are purposefully enhanced by the policy, plan or programme;
- **Affected (groups of) people** – i.e. those people that experience, as a result of the policy, plan or programme, intended or unintended changes in ecosystem services that they value;
- **General stakeholders:**

- National or local government institutions having a *formal government responsibility* with respect to the management of defined areas (town & country planning departments, etc.) or the management of ecosystem services (fisheries, forestry, water supply, coastal defence, etc.);
- Formal and informal institutions *representing affected people* (water boards, trade unions, consumer organizations, civil rights movements, ad hoc citizens committees, etc.);
- Formal and informal institutions *representing (the intrinsic value of) biodiversity* itself (non-governmental nature conservation organizations, park management committees, scientific panels, etc.).
- The *general audience* that wants to be informed on new developments in their direct or indirect environment (linked to transparency of democratic processes).
- Stakeholders of *future generations*, who may rely on biodiversity around which we make decisions. Formal and informal organizations are increasingly aware of their responsibility to take into account the interests of these '*absent stakeholders'.*

In general it can be observed that the role of institutionalized stakeholders becomes more important at higher strategic levels of assessment; at lower level the actual beneficiaries and affected people will become more important.

There is a number of potential constraints to effective public participation. These include:

- *Poverty*: involvement means time spent away from income-producing tasks;
- *Rural settings*: increased distances make communication more difficult and expensive;
- *Illiteracy*: or lack of command of non-local languages, can inhibit representative involvement if print media are used;
- *Local values/culture*: behavioural norms or cultural practice can inhibit involvement of some groups, who may not feel free to disagree publicly with dominant groups (e.g. women versus men);
- *Languages*: in some areas a number of different languages or dialects may be spoken, making communication difficult;
- *Legal systems*: may be in conflict with traditional systems, and cause confusion about rights and responsibilities for resources;
- *Interest groups*: may have conflicting or divergent views, and vested interests;
- *Confidentiality*: can be important for the proponent, who may be against early involvement and consideration of alternatives.

***Cumulative effects on biodiversity*** are best anticipated at a strategic level. By applying the principles of the ecosystem approach the cumulative effects of activities on those ecosystem services which support human well-being can be addressed. At the same time, it is appropriate to define levels of acceptable change or desired levels of environmental quality at the strategic (ecosystem or catchment) level.

***Maintaining the genetic base of evolution for future opportunities***. The conservation of biodiversity for future generations is one important aspect of sustainability. It seeks to maintain options for the wealth of yet unknown potential uses of biodiversity. Moreover, maintaining the capacity of biodiversity to adapt to changing environments (e.g. climate change) and to continue providing viable living space for people is critical to human survival. Any long-term sustainability assessment has to make provisions for safeguarding that capacity.

***Benefiting society***. By promoting/facilitating sustainable solutions to development needs SEA is benefiting society as a whole.

### 6.4 <u>What</u> biodiversity issues are relevant to SEA

## Biodiversity in SEA – different perspectives

The spectrum of SEA ranging from those with a focus on the biophysical environment to broadly sustainability-oriented SEA focussed on the social, economic and biophysical environments, results in different perspectives on biodiversity in SEA. Although the Convention text is very clear on how biodiversity should be interpreted, day-to-day practice shows widely different interpretations. Some prominent differences are discussed below:

***Biodiversity conservation as nature conservation***. SEA traditionally focuses on the biophysical environment. Other instruments are used to represent the economic and social interests of stakeholders. Biodiversity therefore tends to be considered from a nature conservation perspective in which protection rather than sustainable or equitable use of biodiversity is highlighted. In this manner nature conservation becomes segregated from, and potentially conflicting with, economic and social development.

The problem with the sectoral approach in conventional impact assessment is that responsibility for biodiversity is divided between a number of sectoral organisations. For example, the exploitation of fish or forest resources, agriculture, water quality and quantity management all have to do with (sustainable) use of biodiversity, but regulations and policies are defined by different entities that do not refer to their activities as sustainable use of biodiversity.

***Biodiversity for social and economic well-being***. In recent years, environmental assessment practices have been adopted in most developing countries. In these countries the biophysical environment, including biodiversity, is not only looked at from a nature conservation perspective, but as the provider of livelihoods. Especially in rural areas the main objective of development is the social and economic improvement of the situation of poor communities. Both social/economic and biophysical environments are seen as complementary and consequently an integrated assessment approach has been developed in many of these countries. Biodiversity conservation and sustainable use are equally important issues in SEA; decision makers have to deal with the equitable sharing of benefits derived from biodiversity, including those derived from the utilisation of genetic resources, in societies characterised by unequal distribution of wealth. Such integrated approaches reflect a broad perspective on biodiversity in accordance with the Convention and the Millennium Development Goals.

***Merging perspectives***. Both the integrated and sectorally divided approaches are converging as it is being realised that the environment, including its biodiversity components, provides goods and services that cannot be assigned to a sector (biodiversity provides multiple goods and services simultaneously) or a geographically defined area (goods and services are not limited to protected areas only). At the same time it is generally recognised that certain parts of the world are of such importance for the conservation of biodiversity, that these areas should be safeguarded for the future and require strict protective measures.

***Time and space***. From a biodiversity perspective spatial and temporal scales are of particular importance. In conventional SEA, the planning horizon is often linked to economic planning mechanisms with planning horizons of around 15 years. Assessing the impacts on biodiversity generally requires a longer time horizon. Biophysical processes such as soil formation, forest (re)growth, genetic erosion and evolutionary processes, effects of climatic changes and sea level rise, operate on far longer time scales and are rarely taken into account in conventional SEAs. A longer time horizon is required to address the fundamental processes regulating the world's biological diversity.

Similarly, flows of energy, water and nutrients link the world's ecosystems. Effects in an area under assessment may have much wider biodiversity repercussions. The most visible example is the linkage of ecosystems on a global scale by migratory species; on a continental or regional scale ecosystems are linked by hydrological processes through rivers systems and underground aquifers; on a local scale pollinators, on which important commercial species depend, may have specific habitat needs beyond the boundaries of an SEA. Biodiversity considerations may consequently require a geographical focus that exceeds the area for which an SEA is carried out.

***Opportunities and constraints*** **versus** ***cause-effect chains***. Biodiversity underpins ecosystem services on which human well-being relies. Biodiversity thus represents a range of opportunities for, and constraints to, sustainable development. Recognition of these opportunities and constraints as the point of departure for informing the development of policies, plans and programmes at a strategic level enables optimal outcomes for sustainable development. The question at SEA level is therefore "how does the environment affect or determine development opportunities and constraints?" This approach contrasts with the largely reactive approach adopted in project EIA, where the key question being asked is "what will the effect of this project be on the environment?"

Two broad approaches can be used in SEA: the reactive cause-effect chain approach where the intervention is known and the cause-effect chain are fairly clear (comparable to EIA), and the 'bottom up' opportunities and constraints of the natural environment approach where the environment effectively shapes the policy, programme or plan. The latter is most often used in land use planning/spatial planning where interventions are potentially wide-ranging and the objective is to tailor land uses to be most suited to the natural environment.

## Biodiversity in this guidance

The way in which biodiversity is interpreted in this document has been described in detail in chapter 3. The most important features are summarised below:

- In SEA, biodiversity can best be defined in terms of the *ecosystem services* provided by biodiversity. These services represent ecological or scientific, social (including cultural) and economic values for society and can be linked to stakeholders. Stakeholders can represent biodiversity interests and can consequently be involved in an SEA process. Maintenance of biodiversity (or nature conservation) is an important ecosystem service for present and future generations but biodiversity provides many more ecosystem services (see appendix 2 of the Voluntary guidelines on biodiversity-inclusive Environmental Impact Assessment).
- *Direct drivers of change* are human interventions (activities) resulting in biophysical and social effects with known impacts on biodiversity and associated ecosystem services (see box 6.3).
- *Indirect drivers of change* are societal changes, which may under certain conditions influence direct drivers of change, ultimately leading to impacts on ecosystem services (see box 6.4).
- *Aspects of biodiversity*: To determine potential impacts on ecosystem services, one needs to assess whether the ecosystems providing these services are significantly impacted by the policies, plans or programmes under study. Impacts can best be assessed in terms of changes in

composition (what is there), changes in structure (how is it organised in time and space), or changes in key processes (what physical, biological or human processes govern creation and/or maintenance of ecosystems).

- Three levels of biodiversity are distinguished: genetic, species, and ecosystem diversity. In general, the ecosystem level is the most suitable level to address biodiversity in SEA. However, situations with a need to address lower levels exist.

## Biodiversity "triggers" for SEA

To be able to make a judgement if a policy, plan or programme has potential biodiversity impacts, two elements are of overriding importance: (i) affected area and ecosystem services linked to this area, and (ii) types of planned activities that can act as driver of change in ecosystem services.

When any one or a combination of the conditions below apply to a policy, plan or programme, special attention to biodiversity is required in the SEA of this policy, plan or programme.

- ***Important ecosystem services***. When an area affected by a policy, plan or programme is known to provide one or more important ecosystem services, these services and their stakeholders should be taken into account in an SEA. Geographical delineation of an area provides the most important biodiversity information as it is possible to identify the ecosystems and land-use practices in the area, and identify ecosystem services provided by these ecosystems or land-use types. For each ecosystem service, stakeholder(s) can be identified who preferably are invited to participate in the SEA process. Area-related policies and legislation can be taken into account (see box 6.2 above);
- ***Interventions acting as direct drivers of change***. If a proposed intervention is know to produce or contribute to one or more drivers of change with known impact on ecosystem services (see box 6.3), special attention needs to be given to biodiversity. If the intervention area of the policy, plan or programme has not yet been geographically defined (e.g. in the case of a sector policy), the SEA can only define biodiversity impacts in conditional terms: impacts are expected to occur in case the policy, plan or programme will affect certain types of ecosystems providing important ecosystem services. If the intervention area is known it is possible to link drivers of change to ecosystem services and its stakeholders;
- ***Interventions acting as indirect drivers of change***. When a policy, plan or programme leads to activities acting as indirect driver of change (e.g. for a trade policy, a poverty reduction strategy, or a tax measure), it becomes more complex to identify potential impacts on ecosystem services (see box 6.4). In broad terms, biodiversity attention is needed in SEA when the policy, plan or programme is expected to significantly affect the way in which a society:
    - Consumes products derived from living organisms, or products that depend on ecosystem services for their production;
    - Occupies areas of land and water; or
    - Exploits its natural resources and ecosystem services.

**Box 6.3: Direct drivers of change..**

..are human interventions (activities) resulting in biophysical and social/economic effects with known impacts on biodiversity and associated ecosystem services.

Biophysical changes known to act as a potential driver of change comprise:

- *Land conversion*: the existing habitat is completely removed and replaced by some other form of land use or cover. This is the most important cause of loss of ecosystem services.
- *Fragmentation* by linear infrastructure: roads, railways, canals, dikes, powerlines, etc. affects ecosystem structure by cutting habitats into smaller parts, leading to isolation of populations. A similar effect is created by isolation through surrounding land conversion. Fragmentation is a serious reason for concern in areas where natural habitat are already fragmented.
- *Extraction of living organisms* is usually selective since only few species are of value, and leads to changes in species composition of ecosystems, potentially upsetting the entire system. Forestry and fisheries are common examples.
- *Extraction of minerals, ores and water* can significantly disturb the area where such extractions take place, often with significant downstream and/or cumulative effects.
- *Wastes (emissions, effluents, solid waste), or other chemical, thermal, radiation or noise inputs*: human activities can result in liquid, solid or gaseous wastes affecting air, water or land quality. Point sources (chimneys, drains, underground injections) as well as diffuse emission (agriculture, traffic) have a wide area of impact as the pollutants are carried away by wind, water or percolation. The range of potential impacts on biodiversity is very broad.
- *Disturbance of ecosystem composition, structure or key processes*: appendix 2 of the EIA guidelines contains an overview of how human activities can affect these aspect of biodiversity.

Some social changes can also be considered to be direct drivers of change as they are known to lead to one of the above-mentioned biophysical changes (non-exhaustive):

- *Population changes* due to permanent (settlement/resettlement), temporary (temporary workers), seasonal in-migration (tourism) or opportunistic in-migration (job-seekers) usually lead to land occupancy (= land conversion), pollution and disturbance, harvest of living organisms, and introduction of non-native species (especially in relatively undisturbed areas).
- *Conversion or diversification of economic activities*: especially in economic sectors related to land and water, diversification will lead to intensified land use and water use, including the use of pesticides and fertilizers, increased extraction of water, introduction of new crop varieties (and the consequent loss of traditional varieties). Change from subsistence farming to cash crops is an example. Changes to traditional rights or access to biodiversity goods and services falls within this category. Uncertainty or inconsistencies regarding ownership and tenure facilitate unsustainable land use and conversion.
- *Conversion or diversification of land-use*: for example, the enhancement of extensive cattle raising includes conversion of natural grassland to managed pastures, application of fertilizers, genetic change of livestock, increased grazing density. Changes to the status, use or management of protected areas is another example.
- Enhanced transport infrastructure and services, and/or enhanced (rural) accessibility; *opening up of rural areas* will create an influx of people into formerly inaccessible areas.
- *Marginalisation and exclusion* of (groups of) rural people: landless rural poor are forced to put marginal lands into economic use for short term benefit. Such areas may include erosion sensitive soils, where the protective service provided by natural vegetation is destroyed by unsustainable farming practices. Deforestation and land degradation are a result of such practices, created by non-equitable sharing of benefits derived from natural resources.

**Box 6.4: Indirect drivers of change..**

*..are societal changes, which may under certain conditions influence direct drivers of change, ultimately leading to impacts on ecosystem services.*

The performance of ecosystem services is influenced by drivers of change. In the Millennium Ecosystem Assessment (MA) conceptual framework, a “driver” is any factor that changes an aspect of an ecosystem. A direct driver unequivocally influences ecosystem processes and can therefore be identified and measured to differing degrees of accuracy. In the case of activities that have no obvious biophysical consequences it becomes more complex to define impacts on ecosystem services. The MA conceptual framework provides a structured way of addressing such situations.

Activities without direct biophysical consequences exert their influence through indirect driver of change. These operate more diffusely, often by altering one or more direct drivers, and its influence is established by understanding its effect on a direct driver.

Indirect driver of change can be:

- *Demographic*: e.g. population size and rate of change over time (birth and death rates), age and gender structure, household distribution by size and composition, migration pattern, level of educational attainment;
- *Economic* (macro): e.g. global economic growth and its distribution by country;
- *Socio-political*: e.g. democratisation and participation in decision making, decentralisation, conflict resolution mechanisms, privatisation;
- *Scientific and technological processes*: e.g. rates of investment in R&D, rate of adoption of new technologies, changes in productivity and extractive capabilities, access to and dissemination of information;
- *Cultural and religious values*: values, beliefs and norms influences behaviour with regard to the environment

Actors can have influence on some drivers (endogenous driver), but others may be beyond the control of a particular actor or decision-maker (exogenous drivers).

## 6.5 How to address biodiversity in SEA

### The assessment framework

Figure 6.2 depicts the conceptual framework used in these guidelines. It integrates the MA conceptual framework with a more detailed integrated impact assessment framework, describing pathways of activities to impacts. It positions the biodiversity triggers, i.e. (1) affected ecosystem services, and activities producing direct (2) or indirect (3) drivers of change in ecosystem services.

Activities resulting from a policy, plan or programme lead to biophysical changes and/or social/economic changes (activity 1 in figure 6.2). Social/economic changes influence human well-being directly, but some of these changes may in turn also lead to biophysical changes (for example in-migration of people leads to occupation of land). Within their spatial and temporal range of influence, biophysical changes may influence the composition or structure of ecosystems, or influence key processes maintaining these ecosystems. Activities resulting in this type of biophysical changes are referred to as direct drivers of change. The ecosystem services provided by impacted ecosystems may be affected, thus affecting groups in society who depend on these services for their well-being. People may respond to changes in the value of ecosystem services and act accordingly, thus leading to new social/economic changes. Good participatory scoping and application of the best available scientific and local knowledge results in the identification of most relevant impacts and associated cause-effect chains that need further study in the SEA.

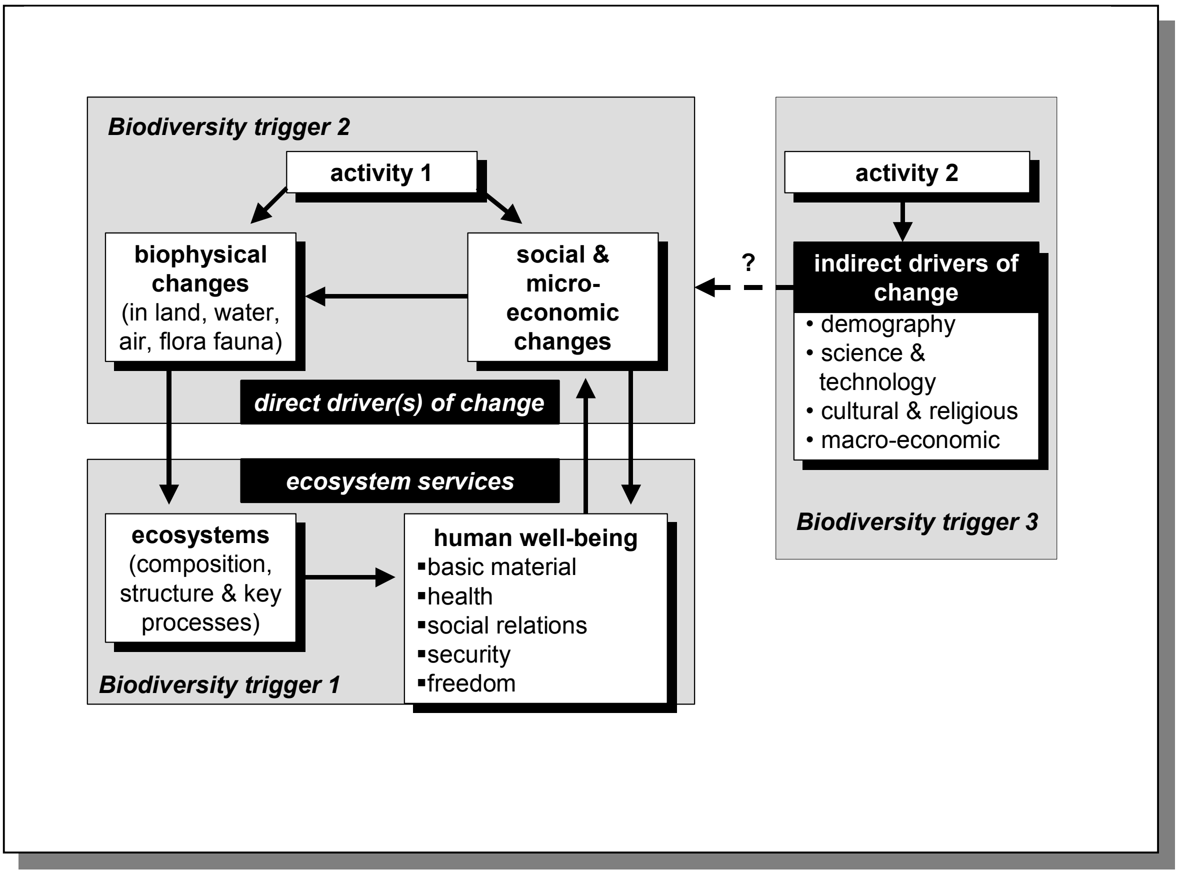


*Figure 6.2. Assessment framework (explanation in main text)*

Identifying impacts on ecosystem services resulting from indirect drivers of change (activity 2 in figure 6.2) is a more challenging task. As the figure shows, the links between indirect and direct drivers of change have not yet been fully established. The scenario development under the MA provides further elaboration of the linkages between indirect and direct drivers of change in biodiversity.

## Identifying potential biodiversity impacts through biodiversity triggers

***Trigger 1***: The area influenced by the policy, plan or programme provides important ecosystem services:

*Focus*: Area-oriented policies, plans or programmes without precisely defined activities. Biodiversity can be described in terms of ecosystem services providing goods and services for the development and/or well-being of people and society. The maintenance of biodiversity (for future generations or because biodiversity is considered to have an intrinsic value) is often emphasised as a special ecosystem service, described in terms of conservation status of ecosystem, habitats and species, possibly supported by legal protection mechanisms;

*This trigger is often associated with* the 'bottom up' opportunities and constraints of the natural environment approach, as may be used in land use planning/spatial planning where interventions are potentially wide-ranging and the objective is to develop suitable land uses in line with the natural conditions;

*Summary of procedure*:

- Identify ecosystems and land-use types in the area to which the policy, plan or programme applies (human land-use can be considered as an attempt by humankind to maximise one or few specific ecosystem services, for example productivity in agriculture, often at the cost of other services). Identify and map ecosystem services provided by these ecosystems or land-use types;
- Identify which groups in society have a stake in each ecosystem service; invite such stakeholders to participate in the SEA process. Identification and valuation of ecosystem services is an iterative process initiated by experts (ecologists, natural resources specialists) but with stakeholders playing an equally important role. The frequency of reliance on ecosystem goods or services should not necessarily be used as an indication or measure of their value because ecosystem services on which local communities rely even on an occasional basis can be critical to the resilience and survival of these communities during surprise or extreme natural conditions;
- For absent stakeholders (future generations), identify important protected and non-protected biodiversity which is representative of species, habitats and/or key ecological and evolutionary processes (for example by applying systematic conservation planning or similar approaches);
- Ecosystem services identified by experts but without actual stakeholders may represent an unexploited opportunity for social, economic or ecological development. Similarly, ecosystem services with conflicting stakeholders may indicate overexploitation of this service representing a problem that needs to be addressed.

***Trigger 2***: The policy, plan or programme is concerned with interventions producing direct drivers of change:

*Focus*: As explained above, interventions resulting from a policy, plan or programme can directly, or through socio-economic changes, lead to biophysical changes that affect ecosystems and services provided by these ecosystems. Impacts on ecosystem services can only be defined as potential impacts, since the location of the intervention or the area where its influence is noticed may not be known;

*This trigger is often associated with* policies, plans or programmes without defined geographical area of intervention, such as sectoral policies, or policies, plans or programmes producing social/economic drivers of change which cannot be geographically demarcated;

*Summary of procedure*:

- Identify drivers of change, i.e. activities leading to biophysical changes known to affect biodiversity (see box 6.3);
- Within the administrative boundaries (province, state, country) to which the policy, plan or programme applies, identify ecosystems sensitive to the expected biophysical changes. Within these administrative boundaries sensitive ecosystem can be identified. The SEA needs to develop a mechanism to avoid, mitigate or compensate potential negative impacts to these ecosystems including the identification of less damaging alternatives.

***Triggers 1 and 2 combined***: The policy, plan or programme concerns activities producing direct drivers of change in an area with important ecosystem services:

*Focus*: Knowledge of the nature of interventions and the area of influence allows relatively detailed assessment of potential impacts by defining changes in composition or structure of ecosystems, or changes in key processes maintaining ecosystems and associated ecosystem services;

*This combination of triggers is often associated with* SEAs carried out for programmes (resembling complex, large-scale EIAs). Examples are detailed spatial plans, programme level location and routing alternatives or technology alternatives;

*Summary of procedure*: The procedure is a combination of the procedures for trigger 1 and 2, but the combination allows for greater detail in defining expected impacts:

- Identify direct drivers of change and define their spatial and temporal range of influence;
- Identify ecosystems lying within this range of influence (in some cases species or genetic level information may be needed);
- Describe effects of identified drivers of change on identified ecosystems in terms of changes in composition or structure of biodiversity, or changes in key processes responsible for the creation or maintenance of biodiversity;
- If a driver of change significantly affects either composition, or structure, or a key process, there is a very high probability that ecosystems services provided by the ecosystem will be significantly affected;
- Identify stakeholders of these ecosystem services and invite them to participate in the process. Take into account the absent (future) stakeholders.

***Trigger 3***: The policy, plan or programme is concerned with interventions affecting indirect drivers of change.

An example of such a trigger would be trade liberalisation in the agricultural sector and the effects this might have on biodiversity. A study carried out within the framework of the Convention on Biological Diversity synthesised existing approaches and assessment frameworks. [23]/

Baseline conditions, trends and characteristics of the production and socio-economic systems determine whether indirect consequences will affect biodiversity. This SEA works with a combination of economic modelling studies, empirical evidence from literature, case-study analysis and causal chain analysis. Biodiversity impact is described in very broad terms, mainly as changes in surface area and species richness. Groupings of countries with comparable characteristics are studied in further detail by selecting one country per grouping in which an in-depth case-study is carried out. The difficulty in the identification of biodiversity-related impacts lies in the definition of impact mechanism.

More research and case material is needed to elaborate this biodiversity trigger. The MA methodology is potentially valuable to identify linkages between indirect and direct drivers of change. The scenarios working group of the MA considered the possible evolution of ecosystem services during the twenty-first century by developing four global scenarios exploring plausible future changes in drivers, ecosystems, ecosystem services, and human well-being. The reports on global and sub-global assessments may also provide suitable material.

Figure 6.3 provides a summary overview of the way in which potential biodiversity impacts of a policy, plan or programme can be identified. It starts with the identification of potential biodiversity triggers in the policy, plan or programme to be analysed, including: (i) an area with valued ecosystem services; (ii) activities affecting direct drivers of change; (iii) activities affecting indirect drivers of change; or a combination of (i) and (ii) where activities with known drivers of change influence a known area with valued ecosystem services. If one of these triggers is present in the policy, plan or programme, the flow chart shows the type of information that can and should be obtained in the SEA process. The link between indirect and direct drivers of change is characterised by complex interactions, many of which are presently subject to intense research efforts worldwide.

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[23]/ See UNEP/CBD/COP/7/INF/15.

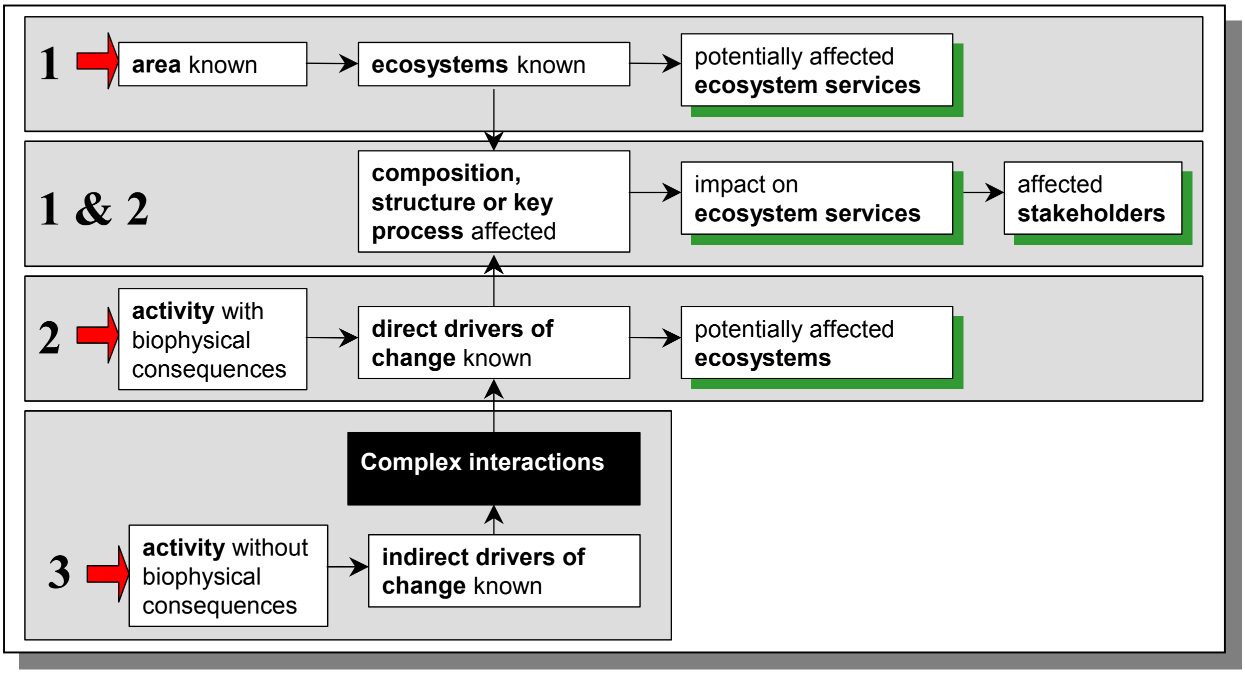


*Figure 6.3. Summary overview of procedure to define biodiversity impacts starting with one or a combination of biodiversity triggers.*

The appendix to the present guidance provides a summary overview of the conditions under which a strategic environmental assessment should place particular attention to biodiversity issues and how they should be addressed.

*Appendix:* **Summary overview of when and how to address biodiversity in SEA**

| Biodiversity triggers in policy, plan or programme | **When is biodiversity attention needed** | **How to address biodiversity issues** |
|---|---|---|
| *Trigger 1*<br>Area known to provide important ecosystem services | *Does the policy, plan or programme influence:*<br>Important ecosystem services, both protected (formal) or non-protected (stakeholder values)<br>Areas with legal and/or international status;<br>Important biodiversity to be maintained for future generations | *Area focus*<br>Systematic conservation planning for non-protected biodiversity.<br>Ecosystem services mapping.<br>Link ecosystem services to stakeholders.<br>Invite stakeholders for consultation. |
| *Trigger 2*<br>Policy, plan or programme affecting direct drivers of change<br>(i.e. biophysical and non-biophysical interventions with biophysical consequences known to affect ecosystem services) | *Does the policy, plan or programme lead to:*<br>Biophysical changes known to significantly affect ecosystem services (e.g. land conversion, fragmentation, emissions, introductions, extraction, etc.)<br>Non-biophysical changes with known biophysical consequences (e.g. relocation / migration of people, migrant labour, change in land-use practices, enhanced accessibility, marginalisation). | *Focus on direct drivers of change and potentially affected ecosystem*<br>Identify drivers of change, i.e. biophysical changes known to affect biodiversity.<br>Within administrative boundaries to which the policy, plan or programme applies, identify ecosystems sensitive to expected biophysical changes. |
| *Combined triggers 1 & 2*<br>Interventions with known direct drivers of change affecting area with known ecosystem services | Combination of triggers 1 and 2 above | *Knowledge of intervention and area of influence allows prediction of impacts on composition or structure of biodiversity or on key processes maintaining biodiversity*<br>Focus on direct drivers of change, i.e. biophysical changes known to affect biodiversity. Define spatial and temporal influence.<br>Identify ecosystems within range of influence.<br>Define impacts of drivers of change on composition, structure, or key processes.<br>Describe affected ecosystems services and link services to stakeholders.<br>Invite stakeholders into SEA process.<br>Take into account the absent (future) stakeholders. |
| *Trigger 3*<br>Policy, plan or programme affecting indirect drivers of change, but without direct biophysical consequences | *Are indirect drivers of change affecting the way in which a society*:<br>produces or consumes goods,<br>occupies land and water, or<br>exploits ecosystem services? | *More research and case material needed*<br>MA methodology potentially valuable to identify linkages between indirect and direct drivers of change. |

## Annex 1: Case study contributions

**Invited cases through IAIA's Capacity Building on Biodiversity in Impact Assessment programme:**

South Africa: Mhlathuze strategic catchment assessment - a tool for sustainable land use management and planning. *Thea van der Wateren*

India: Ecological evaluation of the site proposed for nuclear power station near Nagarjunasagar-Srisailam Tiger Reserve. *Asha Rajvanshi & Vinod Mathur*

India: SEA of proposed Human River irrigation project, Maharashtra State. *Asha Rajvanshi & Vinod Mathur*

Nepal: Biodiversity considerations in strategic environmental assessment A case of Nepal water plan. *Batu Krishna Uprety*

Pakistan: National Conservation Strategy – paving the way for SEA. *IUCN Pakistan Ahmad Saeed*

**Contributions received through the IAIA network:**

United Kingdom: Integration of biodiversity issues in to SEA. Case study Somerset County Council. *Larry Burrows*

United Kingdom: SEA of the Lower Parrett and Tone Flood Management Strategy, Somerset. *Jo Treweek*

Belgium: Sigma Plan: flood safety in the Scheldt river valley and its tributaries. *Resource Analysis, Belgium*

European Union: Integrated impact assessment of international trade policy and agreements: the EU's austainability impact assessments of proposed WTO agreements on agriculture and forest products. *Clive George*

**Draft publications from the Journal of Environmental Assessment Policy and Management, special issue on Biodiversity in SEA** (Volume 7, No. 2, June 2005):

Sweden: Impacts of region-wide urban development on biodiversity in SEA. *Berit Balfors, Ulla Mörtberg, Peter Brokking & Mikael Gontier.*

South Africa: Systematic biodiversity planning in the Cape floristic region and succulent Karoo, South Africa: enabling sound spatial development frameworks and improved impact assessment. *Susie Brownlie.*

The Netherlands: Biodiversity in SEA for spatial plans – 5 Experiences from The Netherlands. *Arend Kolhoff & Roel Slootweg.*

**Prepared by the Netherlands Commission for Environmental Assessment:**

Bolivia: SEA on the Santa Cruz – Puerto Suarez Corridor.

The Netherlands: SEA for the policy plan for the supply of drinking water and Industrial water.

The Netherlands: Partial revision of the national policy on shell mining.

The Netherlands. SEA on the routing of the Zandmaas / Maasroute.

## Annex 2 : Important features of the Ecosystem Approach

**Convention decisions.**

The ecosystem approach was endorsed by the Convention on Biological Diversity in 2001 (Decision V/6). The original document contained 12 principles and additional guidance on implementation. further guidance was provided in a document refining and elaborating the approach, based on an assessment of experiences in the implementation of the approach (Decision VII/11). A selective summary of the approach is provided below, differentiating potential roles of private and public sectors and civil society.

The ecosystem approach is considered the primary framework for addressing the three objectives of the Biodiversity Convention - conservation, sustainable use and equitable sharing of benefits derived from biodiversity - in a balanced way.

The Conference of Parties of the convention recommends Parties (member states) to undertake focussed activities in partnership with the private sector to deepen the understanding and further application of the approach.

**The ecosystem approach**

The ecosystem approach is a strategy for the integrated management of land, water and living resources. The application of the ecosystem approach will help to reach a balance of all three objectives of the Convention: conservation; sustainable use and fair and equitable sharing ofbenefits arising from the utilisation of genetic resources. In addition, the ecosystem approach has been recognised by the World Summit on Sustainable Development as an important instrument for enhancing sustainable development and poverty alleviation.

The ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of many ecosystems.

The ecosystem approach provides an integrating framework for implementation of objectives of the Convention. The approach incorporates three important considerations:

(a) Management of living components is considered alongside economic and social considerations at the **ecosystem level of organisation**; not simply a focus on managing species and habitats;

(b) If management of land, water, and living resources in equitable ways is to be sustainable, it must be integrated and work **within the natural boundaries** and utilise the natural functioning of ecosystems;

(c) **Ecosystem management is a social process**. Many interested communities must be involved through the development of efficient and effective structures and processes for decision-making and management.

There is no single correct way to achieve the ecosystem approach to management of land, water, and living resources. The underlying principles can be translated flexibly to address management issues in different social contexts.

There are a number of options for implementation of ing the ecosystem approach. According to the convention text the principles can be incorporated into the design and implementation of national biodiversity strategies and action plans and regional strategies, or incorporate the ecosystem approach principles into policy instruments, mainstreaming in planning processes, and sectoral plans. The convention text has a strong focus on responsibilities of government authorities, explained by the fact that signatory parties of the convention are national governments. A number of principles are the prime responsibility of government, but others may be equally taken up by the private sector, by civil society or can be interpreted as a shared responsibility.

**Principles of the ecosystem approach**

The ecosystem approach is governed by 12 principles.

Principle 1: *The objectives of management of land, water and living resources are a matter of societal choice.* Different sectors of society view ecosystems in terms of their own economic, cultural and societal needs. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Key-words in the accompanying guidelines refer to the process of decision making: transparency of decision making, accountability, stakeholder interests, equal access to information of all involved, and equitable capacity to be involved (referring to less privileged groups). The need to include the interests of future generations is highlighted.

Consequences: this principle is of utmost importance to all parties involved in any decision making process involving biological diversity (or natural resources in general), as it defines in general terms the "rules of the game".

Principle 2: *Management should be decentralized to the lowest appropriate level*. This principle of subsidiarity is well known; practical experience stresses the need for a mechanism to coordinate decisions and management actions at different organisational levels. Furthermore, good governance arrangements ask for clear accountabilities. If no appropriate body is available at certain management level, a new body may be created, an existing body modified, or a different level chosen. Without institutional arrangements that support and coordinate decision-making authorities, their work is worthless.

Consequences: this principle relates to the so-called tiering in impact assessment, where government develops policies, plans and programmes subject to strategic environmental assessment (SEA), while (lower) government and the private sector perform project-level environmental and social impact assessments. It is in the interest of the private sector that a mechanism for SEA is in place in order to clearly define accountabilities.

Principle 3: *Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems*. Effects of interventions are not confined to the point of impact, and can influence other ecosystems. Time-lags and non-linear processes are likely to occur. In case of effects elsewhere, relevant stakeholders and technical expertise have to be brought together. Feed-back mechanisms to monitor the effects of interventions should be established.

Consequences: impact assessment is the tool to address these issues, at project-level by a project proponent, at strategic level by government authorities.

Principle 4: *Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: (a) Reduce those market distortions that adversely affect biological diversity; (b) Align incentives to promote biodiversity conservation and sustainable use; (c) Internalize costs and benefits in the given ecosystem to the extent feasible*. Many ecosystems provide economically valuable goods and services and it is therefore necessary to understand and manage ecosystems in an economic context. Frequently, economic systems do not make provisions for the many, often, intangible values derived from ecological systems. In this regard it should be noted that ecosystem goods and services are frequently undervalued in economic systems. Even when valuation is complete, most environmental goods and services have the characteristic of "public goods" in an economic sense, which are difficult to incorporate into markets. Deriving economic benefits is not necessarily inconsistent with attaining biodiversity conservation and improvement of environmental quality.

Consequences: The private sector, as well as government authorities, should incorporate social and economic values of ecosystem goods and services in impact assessment and resource management decisions.

Principle 5: *Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach*. The conservation and, where appropriate, restoration of ecosystem interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species. Given the complexity of ecosystem functioning, management must focus on maintaining, and where appropriate restoring the key structures and ecological processes rather than just on individual species. However, vulnerable and economically important, species have to be monitored to avoid loss of biodiversity. Management of ecosystem processes has to be carried out despite incomplete knowledge of ecosystem functioning.

Consequences: Focus on maintenance of ecosystem structures and key processes and avoid too much focus on species only.

Principle 6: *Ecosystems must be managed within the limits of their functioning*. There are limits to the level of demand that can be placed on an ecosystem while maintaining its integrity and capacity to continue providing the goods and services that provide the basis for human well-being and environmental sustainability.

Consequences: Our current understanding is insufficient to allow these limits to be precisely defined, and therefore a precautionary approach linked to adaptive management, is advised. Depending on the rigour of the scoping procedure, impact assessment procedures cater for the precautionary approach; an environmental management plan would have to define the consequences of adaptive management.

Principle 7: *The ecosystem approach should be undertaken at the appropriate spatial and temporal scales*. Failure to take scale into account can result in mismatches between the spatial and time frames of the management and those of the ecosystem being managed.

Consequences: Given that ecosystem components and processes are linked across scales of both time and space, management interventions need to be planned to transcend these scales. Developing a nested hierarchy of spatial scales may be appropriate in some circumstances. Project-level EIA is often not sufficient to deal with these scales; higher level SEA provides a systematic approach to such a nested hierarchy.

Principle 8: *Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term*. Management systems tend to operate at relatively short time scales, often much shorter than the timescales for change in ecosystem processes.

Consequences: Adaptive management should take into account trade-offs between short-term benefits and long-term goals in decision-making processes. The private sector is primarily interested in the life-time of a project; political decision making has to address long-term objectives that create the boundary conditions for activities.

Principle 9: *Management must recognise that change is inevitable*. Natural and human-induced change in ecosystems is inevitable; therefore management objectives should not be construed as fixed outcomes but rather the maintenance of natural ecological processes. Traditional knowledge and practise may enable better understanding of ecosystem change and help in developing adaptation measures.

Consequences: The notion that maintenance of ecological processes is more important than fixed outcomes may in some cases bear important consequences for the formulation of environmental management plans. Besides technical knowledge, local knowledge also provides relevant clues.

Principle 10: *The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity*. Biological resources provide goods and services on which humanity ultimately depends. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum, from strictly protected to human-made ecosystems.

Consequences: impact assessment should not be limited to looking at presence of protected areas only. Areas with important ecosystem services, not necessarily protected, may also require special management measures. Extensive stakeholder consultation is an important tool in identifying important biodiversity-related goods and services.

Principle 11: *The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices*. Information from all sources is critical to arriving at effective ecosystem management strategies. Sharing of information with all stakeholders is equally important.

Consequences: As well as technical information, knowledge, experience and perceptions of stakeholders, local populations may provide important insights in the effect of proposed management interventions / decisions. Sharing knowledge is fundamental for effective participation of stakeholders. For the industry, sharing of sometimes classified information may pose difficulties, especially in early stages of development. Nevertheless, it should be stressed that active sharing of information and knowledge creates a better basis of trust, a sense of ownership, and overall support for an activity.

Principle 12: *The ecosystem approach should involve all relevant sectors of society and scientific disciplines*. The integrated management of land, water and living resources requires increased communication and cooperation, (i) between sectors, (ii) at various levels of government (national, provincial, local), and (iii) among governments, civil society and private sector stakeholders.

Consequences: Procedures and mechanisms should be established to ensure effective participation of all relevant stakeholders and actors during the consultation processes, decision making on management goals and actions. Government, industry and civil society have a shared responsibility to achieve real sustainability.

## Annex 3: Additional information on SEA

### The advantages of SEA

SEA meets the need for more holistic, integrated and balanced strategic decision making as called for in many initiatives, including the 2002 World Summit on Sustainable Development. Also, SEA serves Millennium Development Goal 7 to 'integrate the principles of sustainable development into country policies and programmes and helps reverse the loss of environmental resources.'

The final objective of SEA is to contribute to sustainable development, poverty reduction and good governance. Advantages of SEA to decision makers are:

- Enhanced credibility of their decisions in the eyes of stakeholders, leading to swifter implementation;
- Improved economic efficiency because potential environmental stumbling blocks for economic development are better known;
- The broader approach of SEA keeps the process aware of promising alternatives
- A better understanding of the cumulative impact of a series of smaller projects, thus preventing costly and unnecessary mistakes;
- Better insight in the trade-offs between environmental, economic and social issues, enhancing the chance of finding win-win options;
- More knowledge of the social feasibility of a decision, thus avoiding resistance from unhappy local groups, bad image for planners, useless mitigating measures and simply missing the bigger picture;
- Easier assessment at the project level because strategic discussions, e.g. on locations, have already been brought to a conclusion.

### SEA and EIA: a hierarchy of tiered instruments

SEA is described as a tiered or layered process in which decisions on a higher level influence decision making at lower level. In an idealised situation the process starts with a policy broadly describing objectives and setting the context for proposed actions, usually with a sectoral or geographic scope. Policy objectives are translated into an action plan, further operationalised in programmes; actual implementation is done through projects (see figure). Impact assessment at project level is governed by, often legally embedded, EIA procedures, while impact assessment for policies, plans and programmes is done through SEA.

SEA aims to complement project-level EIA. EIA is limited in the development of alternatives since higher strategic decisions have already been taken. SEA can help streamline EIA processes, particularly if it is undertaken in a tiered manner upstream from project considerations – at the level of policies, plans and programmes. SEAs at this level will consider broader environmental issues likely to be common to multiple project initiatives in a sector or in a region. It can thus have the effect of focusing subsequent EIA processes on impacts specific to individual proposals – and therefore improving efficiency and effectiveness of the overall process.

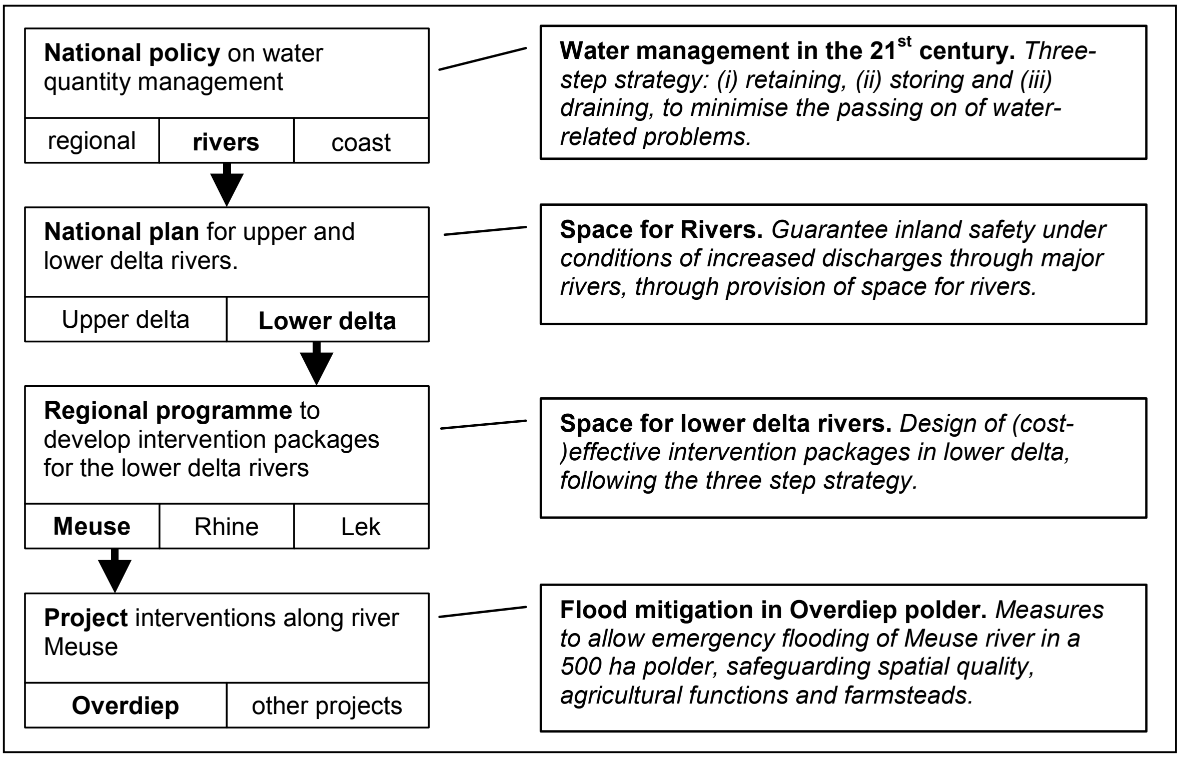


*Figure: hierarchy of policies, plans and programmes: an example from the Netherlands*

***Characteristics of SEA and EIA***

| **SEA** | **EIA** |
|---|---|
| takes place at earlier stages of the decision making cycle | takes place at the end of the decision making cycle |
| pro-active approach to help development of proposals | reactive approach to development of proposals |
| considers broad range of potential alternatives | considers limited number of feasible alternatives |
| early warning of cumulative effects | limited review of cumulative effects |
| emphasis on meeting objectives and maintaining systems | emphasis on mitigating and minimising impacts |
| broader perspective and lower level of detail to provide a vision and overall framework | narrower perspective and higher level of detail |
| multistage process, continuing and iterative, overlapping components | well-defined process, clear beginning and end |
| focuses on sustainability agenda and sources of environmental deterioration | focuses on standard agenda and symptoms of environmental deterioration |

The key steps of SEA resemble those in EIA. However, the actual tasks during those steps may be quite different.

***Steps in SEA and EIA***

| | SEA | EIA |
|---|---|---|
| **Screening** | Mostly decided case by case | Projects requiring EA are often listed |
| **Scoping** | Combination of political agenda, stakeholder discussion and expert judgement | Combination of local issues and technical checklists |
| **Public partici-pation** | Focus on representative bodies | Often include general public |
| **Assessment** | More qualitative (expert judgement) | More quantitative |
| **Quality review** | Both quality of information and stakeholder process | Focus on quality of information |
| **Decision making** | Comparison of alternatives against policy objectives | Comparison against norms and standards |
| **Monitoring** | Focus on plan implementation | Focus on measuring actual impacts |

**IAIA Performance Criteria on SEA[24]**

A good-quality Strategic Environmental Assessment (SEA) process informs planners, decision makers and affected communities on the sustainability of strategic decisions, facilitates the search for the best alternative and ensures a democratic decision-making process. This enhances the credibility of decisions and leads to more cost- and time-effective EA at the project level. For this purpose, a good-quality SEA process:

**Is integrated**

- Ensures an appropriate environmental assessment of all strategic decisions relevant for the achievement of sustainable development.
- Addresses the interrelationships of biophysical, social and economic aspects.
- Is tiered to policies in relevant sectors and (transboundary) regions and, where appropriate, to project EIA and decision making.

**Is sustainability-led**

- Facilitates identification of development options and alternative proposals that are more sustainable.

**Is focused**

- Provides sufficient, reliable and usable information for development planning and decision making.
- Concentrates on key issues of sustainable development.
- Is customised to the characteristics of the decision making process.
- Is cost- and time-effective.

[24] IAIA Special Publication Series No. 1. Strategic Environmental Assessment Performance Criteria. (http://www.iaia.org/Non_Members/Pubs_Ref_Material/pubs_ref_material_index.htm)

**Is accountable**

- Is the responsibility of the leading agencies for strategic decisions to be taken.
- Is carried out with professionalism, rigor, fairness, impartiality and balance.
- Is subject to independent checks and verification.
- Documents and justifies how sustainability issues were taken into account in decision making.

**Is participative**

- Informs and involves interested and affected public and government bodies throughout the decision making process.
- Explicitly addresses their inputs and concerns in documentation and decision making.
- Has clear, easily-understood information requirements and ensures sufficient access to all relevant information.

**Is iterative**

- Ensures availability of the assessment results early enough to influence the decision-making process and inspire future planning.
- Provides sufficient information on the actual impacts of implementing a strategic decision, to judge whether this decision should be amended and to provide a basis for future decisions.

## Annex 4: Summary of lessons from case studies on biodiversity in SEA

This section discusses a number of issues in some more detail, making use of the case material which has been collected in the process of preparing these guidelines.

### 1. Biodiversity trigger 1: PPP affecting an area with known ecosystem services

Two case studies, both from South Africa have been analysed as examples of this category. The first case provides evidence of the economic and social sense it makes to maintain biodiversity for the services it provides. It shows a good example of mapping and monetisation of ecosystem services in a known geographical area as an input for informed decision making on priorities for interventions. It strongly emphasises the value of the concept of ecosystem services as a means to translate biodiversity information into spatial planning and the language of decision makers.

- An SEA has been carried out for the planning of open space in UMhlathuze, a rapidly developing and urbanising municipality in South Africa. River catchments provided an effective environmental entity for assessing synergistic impacts of urban development. A strategic catchment assessment had to provide criteria for measures of protection and planning of development in non-developed lands. It accounted for the balance between supply of environmental goods and services provided by the natural environment and the demand for these goods and services by people. A status quo report of each catchment indicated required management actions where needed. Important benefits derived from ecosystem services included water supply and regulation, flood and draught management, nutrient cycling and waste management; these 'free' ecosystem services provided a calculated economic benefit of R 1.7 billion annually. Monetisation of ecosystem services made decision makers react much more openly to the need for conservation measures, even when reputed for not listening to biodiversity arguments[25].

The second case provides a mechanism to focus on maintenance of biodiversity as an ecosystem service to future generations. Unique and important biodiversity needs to be preserved in a situation of overwhelming presence of non-protected biodiversity, without jeopardising the need of the country to develop.

- Since 2000, municipalities in South African have to prepare Spatial Development Frameworks and carry out associated SEAs. In two regions systematic biodiversity planning was applied to support this process in an attempt to improve effective consideration of biodiversity in Environmental Assessment. Most biodiversity in South Africa, including priority areas for conservation, does not fall within existing protected areas. Changing land use patterns have a major impact on biodiversity. Under such conditions sound SEA in land-use planning is critical to decision making. Systematic biodiversity planning aims at conserving a representative sample of species / habitats and key ecological and evolutionary processes. The focus on priority areas allows for recognition of competing land uses and development needs. It sets target for conservation and defines limits of acceptable change within which human impacts have to be kept. Although driven by conservation objectives, the process is very similar to SEA and outputs are easily integrated in the SEA process[26].

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[25] Van der Wateren, Thea, Diederichs, Nicci, Mander, Myles, Markewicz, Tony and O'Connor, Tim (2004) Mhlathuze Strategic Catchment Assessment, Richard bay, South Africa. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. UMhlathuze Municipality

[26] Brownlie, S., de Villiers, C., Driver, A., Job, N. And Von Hase, A. (2005). Systematic Biodiversity Planning in the Cape Floristic Region and Succulent Karoo, South Africa: Enabling Sound Spatial Development Frameworks and Improved Impact Assessment. Journal of Environmental Assessment Policy and Management Special Edition on SEA and Biodiversity.

The combination of the two South African cases provides an excellent example of how to combine conservation of biodiversity and its ecosystems services for future generations when protection is largely lacking, with present-day sustainable use of biodiversity derived ecosystem services.

Translating biodiversity into ecosystem services is an effective means to make biodiversity tangible in impact assessment. Services represent ecological, social and economic values for society and can consequently be linked to stakeholders. Stakeholders can speak on behalf of biodiversity and can consequently be involved in an SEA process. A case from the UK showed that by taking an ecosystem services approach with active involvement of stakeholders, an important contribution to the definition of viable SEA alternatives was made.

The availability of Biodiversity Action Plans (BAPs) and Species Action Plans (SAPs) provided biodiversity objectives for an SEA on a local flood management strategy in the UK. Within the wetland ecosystem, priority habitats and priority species have been defined in the BAP. Furthermore, ecosystem services were considered an important economic asset of the region, with biodiversity based tourism as the most important sector. Opportunities to use wetlands for flood attenuation provided additional important benefits. Flood management was considered to be a key driver of change, as flooding is a key ecological process in wetlands. The study area was defined on the basis of likely limits of impacts. For the assessment it was considered appropriate to identify risks and the main ecological processes likely to affect outcomes for biodiversity in relation to objectives for the area. Public participation was action-oriented, focussed on identifying preferred changes to achieve outcomes compatible with stakeholder interests; local knowledge was an important source of information. Biodiversity specialists were able to provide effective flood control alternatives based on optimisation of flood attenuation as an ecosystem services[27].

A case from the Waddensea in the Netherlands shows that natural ecosystems provide multiple services. Exploitation of one service leads to potential impacts on others when key ecosystem processed are affected. Stakeholder involvement reoriented the SEA study to be more focussed on these key processes, instead of looking at the exploited ecosystem service only.

- The Netherlands national policy on large-scale extraction of shells in marine environment required an SEA. Shell mining also takes place in protected areas, representing important international ecosystem services for the maintenance of pathways of migratory birds and breeding grounds of North Sea fish, tourism, etc. Focus of the permitting procedure was on whether shell deposits (the ecosystem service) was not overexploited; in other words the natural regeneration of shell deposits was studied in relation to exploitation pressure. However, the mining process itself also influences key ecological processes, essential to other ecosystem services. Bottom morphology and related bottom life were consequently included in the SEA study. Stakeholder contributions highlighted the lack of knowledge on the function of shells and shell banks in the ecosystems. As a result more alternatives were included in the study. The study concluded that natural re-growth fully compensates mining; it was concluded however that key ecological processes should define mining conditions. Potential mining locations were ranked according these conditions. In small parts of the area the precautionary principle was applied because too little was known on the function of shell banks and mining was prohibited. An interesting equity discussion erupted. Shell mining was a monopolised business; the SEA process triggered a discussion on public tender procedures for other interested operators. This request was granted[28].

A case from the Scheldt river in Belgium shows that restoration and conservation of biodiversity was sought after as a means to optimise other ecosystem services provided by the river, representing social

[27] Jo Treweek (2004). United Kingdom: Strategic Environmental Assessment of the Lower Parrett and Tone Flood Management Strategy, Somerset, England. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA.

[28] Marlies van Schooten (2004) The Netherlands: SEA for the National Policy Plan on Shell mining. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. SevS consultants.

and economic values, in this case safety from flooding and navigability and accessibility of the Antwerp port.

- The Sigma plan intends to guarantee safety against inundations in the valley of the Scheldt river and its tributaries. The study area incorporates over 250 kilometres of river valley. Most of it is subjected to twice-daily tides and much of the valley would be inundated every day were it not for the presence of dikes. The freshwater tidal areas are unique to North-western Europe. Construction of dikes resulted in considerable loss of the original biodiversity and its flood retention capacity as an ecosystem service. Partial restoration of this biodiversity and its associated flood retention function is still feasible. Nature conservation was an important element in the SEA. However, nature conservation is not seen as an end in itself, but as a way to obtain a "solid and robust" ecological system in the estuary, capable of supporting intense shipping activities (accessibility of Antwerp port). Other ecosystem services addressed by the SEA study are pollution breakdown and recreation.[29]

The cases presented in this guidelines document are a selection of good-practice cases. In reality, many aspects of biodiversity will often go unnoticed in SEA as the concept of ecosystem services does not yet receive wide recognition. As stated earlier, many of the ecosystem services are considered to be the responsibility of sector departments (fisheries, irrigation department, public works department, etc.) without an obvious link to biodiversity-related issues and usually don't consider their activities in an integrated, cross-sectoral manner. This explains that many ecosystem services go unnoticed, thus losing an opportunity to describe the actual values of biodiversity. In summary: ecosystem services are linked and interdependent. SEA focused on biodiversity can help to show these links and thus prevent the optimisation of one service causing degradation of another, equally valuable or even more valuable service.

## 2 Biodiversity trigger 2: PPP producing direct drivers of change

Direct drivers of change are human interventions (activities) leading to biophysical and social changes with known impacts on ecosystems and associated ecosystem services. Two cases illustrate that even without concrete knowledge of where activities or impacts are geographically located, there are ways to describe biodiversity impact in general terms, design mitigation measures, and provide guidance for further study at lower level of assessment. The first case from the Netherlands illustrates a sectoral policy without predefined locations of interventions but with a clear driver of change, i.e. a change in hydrology of surface waters and underground aquifers.

- The SEA for the Netherlands National Policy on Water Supply focussed on the most important biophysical effect of water extraction, i.e. a change in the hydrology of underground aquifers and surface waters. A major issue at national scale is the desiccation of various types of landscapes, predominantly old land-use types, primarily converted wetlands, rich in biodiversity and highly valued for characteristic "Dutch" landscape features. Quantitative information on potential impacts of water extraction was considered necessary. The national scale of the study forced the study team to focus on simple vegetation indications for hydrological changes. Combination of potential hydrological changes (modelled) with nationally available vegetation data provided a computational model identifying potentially sensitive areas that require special attention. This information served the purpose of national decision making. Further elaboration of the policy into concrete plans and programmes requires further site-specific field observations to quantify potential impacts.[30].

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[29] Marc van Dijk (2005). SEA of the Sigma plan for flood safety and ecological restoration of the Scheldt river. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. Resource Analysis, Antwerp, Belgium.

[30] Marlies van Schooten (2004). The Netherlands: SEA for the National Policy Plan on Industrial and Drinking Water Supply. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. SevS consultants.

The second case from Bolivia illustrates a programme with known area of intervention, but with unknown area of influence. It shows the importance of using SEA in a broad, integrated manner, including social and economic processes as the major driver of change in ecosystem services.

- An SEA for a 600-km road in Bolivia identified social and economic impacts as the main drivers of change associated to the road scheme. Economic development, creation of employment and immigration from the Andean highlands were considered main pressures on ecosystem services as these would lead to increased land conversion, without exactly knowing where these pressures would appear. The potential influence of the road is immense and identification of impacts at each individual ecosystem, impossible. Instead, and inventory of major types of ecosystems in the entire region was made, processes of key importance for the maintenance of these system were identified, and potential impacts induced by road development were identified. A hierarchy was designed, assigning types of ecosystem into categories with differing levels of protection. An extensive monitoring and mitigation programme accompanied the road scheme, including assistance to management of national parks in the region and social support programmes[31].

A case from Sweden takes biophysical changes resulting from urban development (= the driver of change) as the basis for identifying indicators to measure change in biodiversity. The case focuses on biodiversity conservation as important ecosystem service. The case has similarities to the systematic biodiversity planning case from South Africa; non-protected biodiversity is taken into account.

- Urban planning of the area surrounding Stockholm (Sweden) requires strategic decision making modelled after urban expansion in a biodiversity rich environment. A biodiversity analysis at ecosystem level was carried out to support the SEA process. The analysis resulted in (i) operational targets for biodiversity conservation translating biodiversity policies into concrete objectives for the region, (ii) distinctive indicators for habitat change, (iii) reliable prediction methods, and (iv) sensible scenarios for future urban growth as a base for comparison. The indicators were linked to the major <u>biophysical changes</u> resulting from the driver of change, in this case of urban development being: habitat loss, isolation/fragmentation, and disturbances[32].

Similarly biophysical changes were used as indicators to model the impacts of major interventions in river hydrology (= the driver of change) in the Netherlands. This case further illustrates the concept of ecosystem services and shows that ecosystem level information provides sufficient information for decision making.

- An SEA for a river management project along the river Meuse in the Netherlands had to analyse potential combinations of seemingly contradictory ecosystem services: flood control, shipping and nature restoration. A reduction of peak flows in the river as a safety precaution, was the main objective. The SEA took a historical perspective and portrayed major services of the ecosystems throughout the ages – biodiversity has been managed and exploited to such an extent that the resulting ecosystems depend on human management as a key process to maintain their appreciated features. Based on this information four alternatives were developed. Water depth, flood duration and groundwater level were considered key biophysical changes affecting biodiversity. These were modelled in a computational model and linked to the requirements of different 'ecotypes'. It provided sufficient information to compare alternatives, although further field observations are required for future detailed intervention planning[33].

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[31] Consorcio Prime Engenharia / Museo Noel Kempff Mercado / Asociación Potlatch (2004) Evaluación ambiental estratégica y revisión / complementación del eeia del corredor de transporte santa cruz – puerto suárez. Resumen ejecutivo.

[32] Balfors, B., Mörtberg, U., Brokking, P. and Gontier, M. (2005). Impacts of Region-Wide Urban Development on Biodiversity in Strategic Environmental Assessment. Journal of Environmental Assessment Policy and Management Special Edition on SEA and Biodiversity.

[33] Marlies van Schooten (2004). The Netherlands: SEA on the routing the River Meuse (Zandmaas / Maasroute) Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. SevS consultants.

The availability of biodiversity inventory data greatly enhances SEA studies by allowing computational models to link computed biophysical changes to indicator species or ecosystems. Effects of the interventions can be estimated at a level of detail which is sufficient for strategic decision making.

**3. Aspects of biodiversity**

Impacts on biodiversity can best be described in terms of changes in composition (what is there), or changes in structure (how is it organised in time and space), or changes in key processes (what physical, biological or human processes govern creation and maintenance of ecosystems).

A case from Nepal shows that prior knowledge on the effect of a biophysical change to a specific aspect of biodiversity provides a means to focus an SEA study. In this case forestry (= driver of change) leads to selective removal of trees (biophysical change), affecting species composition.

- Plan level SEAs were carried out in Nepal to assess the environmental impacts of District Forestry Plans. Forestry practices were considered to impact on biodiversity by changing the species composition of forests; consequently, this became the focus of the study. The SEA resulted in recommendations on to the inclusion of conservation principles in forestry activities[34].

From India two examples were provided where the need for an SEA was triggered by protected species, but where the SEA study focussed on ecosystem and foodweb structure to provide relevant and sufficient information.

- SEA was used in India as a diagnostic tool to assess site alternatives for a nuclear power facility. The facility was partially projected on one of India's prominent tiger reserves. The facility also affected traditional land use practices. Regulations limited the study area to a 25 km radius. Within this radius protected areas and ecologically sensitive areas were defined. The study focused on contiguity of habitats for endangered species (such as tiger, leopard, Indian wolf and others) and the area needed for predators to have sufficient stock of prey animals. In other words, the study focussed on ecosystem structure: the spatial structure of habitat and foodweb structure[35].
- An SEA approach was followed in India to review an EIA of a planned dam and irrigation scheme which resulted in deadlock. The deadlock resulted from a lack of attention to wildlife (including tigers) migration routes. The SEA aimed at enhancement of conservation planning and mediation to steer environmental decision making. Again vital habitat links (corridors) and foodweb structure were the focus of study. The creation of a new reservoir provided important new habitats; the design of a canal created fragmentation of major habitats. Redesign of a new migration corridor upstream of the canal mitigated this problem, and the SEA resulted in renewed decision making[13].

Changes in key processes as a means to identify impacts on ecosystem services appear in the earlier described cases on flood management in UK and the Netherlands, and in the shell mining case from the Netherlands.

**4. Levels of biodiversity.**

Three levels are distinguished (genetic, species, ecosystems) but in general, the ecosystem level is the most suitable level to address biodiversity in SEA, as most cases above have shown. Even in cases where the trigger to start an SEA was at species level (protected tigers in India), the studies focussed on ecosystem structure. Similarly, the Nepal case focuses on species composition only and does not go into further detail of individual species. In other studies individual species only serve the purpose of being an indicator for changes in key ecosystem processes. The large extent of study areas, the limited

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[34] B. Uprety (2005): Integration of Biodiversity Aspects in Strategic Environmental Assessment of Nepal Water Plan and Environmental Impact Assessment of Operational Forest Management Plans in Nepal

[35] Rajvanshi & V. Matur (2004). Integrating Biodiversity into Strategic Environmental Assessment. Case Studies from India. Wildlife Institute of India, Dehradun, India.

resources available for SEA, and a lesser level of detail required for strategic decision making explain this focus on more generic biodiversity issues and a 'loss' of focus on species level information.

However, situations where there is a need to address lower levels, do exist. A case from the UK shows that for local level plans it may be needed and possible that the SEA looks at species level information. The limited extent of the study area and the presence of many protected species in non-protected areas required detailed analysis of these species. As in the Swedish case, the study focussed on indicator species for each biophysical change in order to reduce data collection effort.

- In the UK A Local Transport Plan required an SEA. In an area well-known for its species diversity, the SEA focussed on species and their habitats. Roads were considered to lead to a number biophysical changes: barrier effects (for example cutting of routes to foraging areas of bats), road mortality, emission into air and water, hydrological changes and fragmentation of habitats. For each effect a 'focal species' was used as an indicator. Many protected species rely on unprotected countryside and species-level attention. Furthermore, the study included alternatives that would minimise impacts on priority habitat as listed in the Biodiversity Action Plan[36].

## 5. Legal protection - a word of caution.

A case from the Netherlands shows the far-reaching influence of a formal system for protected areas as well as a policy for the enhancement of this system because this may lead to insufficient attention to non-protected biodiversity. It forces spatial planners to take biodiversity into account and it defines the setting for SEA of such plans. Similarly formal policies trigger biodiversity attention within SEA through Biodiversity Action Plans in the UK and in many other countries.

- Analysis of four spatial planning SEAs at national, provincial and municipal level in the Netherlands revealed the overwhelming importance of the National Ecological Network (NEN, predecessor to and part of the European Natura 2000 network of protected areas). The NEN is intended to create a continuous network of protected areas; the area has been formally defined, but in broad terms. All spatial plans coinciding with the NEN have to include nature restoration measures in order to comply with the NEN policy and SEAs strictly assess proposed alternatives on this aspect. The focus consequently is on ecosystems; species level diversity does not play a role as the NEN includes species-related protected areas (EU birds & habitat directives). Further biodiversity attention is focussed on restoration of key hydrological processes in existing protected areas. Since most activities focus on enhancing the quality of existing nature and increasing the surface area of protected area, non-protected biodiversity is lost out of sight[37].

The down-side of this powerful Dutch policy on the National Ecological Network is that non-protected biodiversity and ecosystem services - other than maintenance of biodiversity – will be placed out of focus in spatial planning, and even in the SEAs of such plans. SEA is supposed to picture the impacts of plans on protected and non-protected biodiversity. The built-in argument is that if biodiversity is not protected, it probably is not worth taking into account and it consequently does not appear in the SEA. The UMhlathuze strategic catchment assessment (South Africa) provided very strong arguments that non-protected and non-threatened biodiversity still represent highly valued ecosystem services.

Public participation may be the key to biodiversity-inclusive SEA in cases where this is not triggered by objectives of the study or by formal regulations. In a number of cases public participation lead to a broader perspective of biodiversity resulting in formulation of different alternatives. The UK flood

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[36] Larry Burrows (2004). United Kingdom: Integration of Biodiversity Issues into SEA: Somerset Country Council. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. Somerset County Council, UK.

[37] Arend Kolhoff & Roel Slootweg (2005). Biodiversity in SEA for spatial plans – experiences from The Netherlands. Journal of Environmental Assessment Policy and Management Special Edition on SEA and Biodiversity.

management case and the Dutch shell mining case both show that public participation resulted in enhanced studies, including a significant contribution to formulation of viable alternatives.

### 6. Scale issues: extent and grain size.

The required level of detail in a study depends on a variety of factors, such as the spatial and temporal scale of the study, the number of relevant issues to be studied, the severity of decision making implications, available human and financial resources, etc. From a biodiversity perspective two scale aspects are important:

- The **extent** of the study, in terms of size of the area and time scale under consideration. Physical, biological or social processes work on different scales in time and space. The extent of the study is not necessary limited by geographical limits or by the time horizon of the policy or plan under assessment. It is important to know the relevant process to be studied and define the extent of the study accordingly.
- The **level of detail**, in ecology often referred to as **grain size**, of the study. An important determinant of the required level of detail is the level of decision making. Looking at the idealised tiered structure of SEA, in general a higher level of decision making, such as policy decisions, require lower level of detail. Descending from policy to programmes and plans the required level of detail increases while in some cases (but definitely not always) the extent of the study area is reduced. The availability of information and financial resources, and priorities expressed by stakeholders during the scoping process will further define the level of detail at which the study needs to be carried out.

Biodiversity has fine grain and large extent. In studying biodiversity fine grain has to be sacrificed for a large extent, or reciprocally, a requirement for fine-grain information often limits the extent of the study. Some practical examples show how the dilemma of large extent and fain grain of biodiversity can be addressed in different situations. They show that biodiversity aspects composition, structure and key process provide a good means to focus the assessment and to limit data gathering requirements:

- **Limited extent with high level of detail: focus on species composition**. Selective logging by forestry activities primarily affects species composition. SEAs for district forestry plans in Nepal concentrated on the effects of forestry on forest composition and looked at species level information only. The extent of the study was limited, so species level information could be obtained[38].
- **Very large extent and low level of detail: focus on key processes**. Hydrological processes are critical for the maintenance of wetlands. Road construction potentially affects hydrology. An SEA for a 600 km road in Bolivia concentrated on hydrology as a key process (apart from social aspect not elaborated here); because the road crossed wetlands of international importance hydrological changes needed to be avoided or mitigated. Even though the extent of the study area was of such magnitude that further detailed biodiversity analysis was not feasible, the focus on hydrology provided enough relevant information for decision making[39].
- **Medium extent and reduced level of detail: focus on ecosystem structure.** An SEA for the siting of a nuclear power plant in India focussed on the connectivity of tiger habitats. The highly

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[38] B. Uprety (2005): Integration of Biodiversity Aspects in Strategic Environmental Assessment of Nepal Water Plan and Environmental Impact Assessment of Operational Forest Management Plans in Nepal.

[39] Consorcio Prime Engenharia / Museo Noel Kempff Mercado / Asociación Potlatch (2004) Evaluación ambiental estratégica y revisión / complementación del eeia del corredor de transporte santa cruz – puerto suárez. Resumen ejecutivo.

endangered and strictly protected tiger triggered the study, but the study focussed on ecosystem structure, thus avoiding unnecessary detailed surveys[40].

**Large extent, high level of detail: strong focus on key process and indicator species.** An SEA for a National Drinking Water Policy in the Netherlands concentrated on the main biophysical effects of water extraction (hydrological change). The extent of the study was large (the entire nation); defining a limited number of vegetation indicators for impact determination provided the required level of detail for policy decisions. The availability of detailed vegetation inventories facilitated the use of computer technology to highlight areas sensitive to hydrological changes.[41]

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[40] A. Rajvanshi & V. Matur (2004). Integrating Biodiversity into Strategic Environmental Assessment. Case Studies from India. Wildlife Institute of India, Dehradun, India.

[41] M.L.F. van Schooten (2004). SEA for the National Policy Plan on Industrial and Drinking Water Supply, the Netherlands. Case study compiled for the drafting of CBD guidelines on Biodiversity in SEA. SevS consultants.

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