Strategic Environmental Assessment and Biodiversity: Guidance for Practitioners

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Executive Summary

From 21 July 2004, Strategic Environmental Assessment (SEA) will be required for certain plans and programmes in all European Member States under Directive 2001/42/EC “on the assessment of the effects of certain plans and programmes on the environment” (the ‘SEA Directive’).

The SEA Directive is intended to help protect the environment and promote sustainable development. SEA involves predicting, evaluating and mitigating the environmental impacts of plans and programmes thereby integrating environmental considerations into strategic decision-making.

This guidance aims to ensure that biodiversity considerations are appropriately addressed in Strategic environmental assessments. It is hoped that it will assist people and organisations in England, Wales, Scotland and Northern Ireland to prepare plans and programmes in a wide range of sectors, carry out SEA, prepare SEA reports, and comment on biodiversity issues in SEA.

In the first three chapters the guidance runs through the definition of SEA and its legal requirements, and the how biodiversity fits in. Chapter four, the core of this guidance, explains step by step how biodiversity implications can be considered in SEA. While the links between SEA and other procedures: sustainability appraisal, "appropriate assessment" under the Habitats Directive, and project environmental impact assessment are examined in chapter 5.

A “toolkit” of more specific techniques for promoting biodiversity through SEA is set out in the final chapter.

Asesiadau Amgylcheddol Strategol a Bioamrywiaeth: Canllawiau ar gyfer ymarferwyr

Crynodeb Gweithredol

O 21 Gorffennaf 2004 ymlaen, fe fydd angen cynnal Asesiad Amgylcheddol Strategol (Strategic Environmental Assessment – SEA) wrth ymwneud â chynlluniau a rhaglenni arbennig ym mhob un o Aelod Wladwriaethau Ewrop yn ôl Cyfarwydded 2001/42/EC sy’n ymwneud ag asesu effeithiau cynlluniau a rhaglenni arbennig ar yr amgylchedd (‘Cyfarwyddeb SEA’).

Bwriad Cyfarwyddeb SEA yw cynorthwyo gyda’r gwaith o warchod yr amgylchedd a hyrwyddo datblygu cynaliadwy. Mae Asesiadau Amgylcheddol Strategol yn cynnwys rhagweld, gwerthuso a lliniaru’r effeithiau amgylcheddol a gaiff cynlluniau a rhaglenni, gan gynnwys ystyriaethau amgylcheddol yn y broses strategol o wneud penderfyniadau.

Nod y canllawiau yma yw sicrhau yr ymdrinnir ag ystyriaethau sy'n gysylltiedig â bioamrywiaeth mewn Asesiadau Amgylcheddol Strategol. Y gobaith yw y bydd yn cynorthwyo pobl a sefydliadau yng Nghymru, Lloegr, Yr Alban a Gogledd Iwerddon i lunio cynlluniau a rhaglenni mewn amrediad eang o sectorau, yn ogystal â chynnal Asesiadau Amgylcheddol Strategol, llunio adroddiadau ar Asesiadau a chyflwyno sylwadau ar faterion yn ymwneud â bioamrywiaeth mewn Asesiadau.

Yn nhair pennod gyntaf y canllawiau, diffinnir Asesiadau Amgylcheddol Strategol a'u gofynion cyfreithiol, a sonnir am fioamrywiaeth yn y cyd-destun arbennig yma. Mae pennod 4, sef calon a chraidd y canllawiau, yn esbonio fesul cam sut y gellir ystyried bioamrywiaeth mewn Asesiadau Amgylcheddol Strategol. Ym mhennod 5, trafodir y cysylltiad rhwng Asesiadau Amgylcheddol Strategol a gweithdrefnau eraill: gwerthuso cynaliadwyedd, "asesiadau priodol" dan y Gyfarwyddeb Cynefinoedd, ac asesu effeithiau amgylcheddol.

Yn y bennod olaf, ceir gwybodaeth am dechnegau mwy penodol y gellir eu defnyddio i hyrwyddo bioamrywiaeth trwy gyfrwng Asesiadau Amgylcheddol Strategol.

Contents

1. Introduction

Chapter aim:

To introduce this guidance document and explain its purpose, structure and intended application

Strategic environmental assessment (SEA) involves predicting, evaluating and mitigating the environmental impacts of policies, plans and programmes. From 21 July 2004, SEA will be required for certain plans and programmes in all European Member States under Directive 2001/42/EC. Biodiversity is an important aspect of the environment that needs to be considered in SEA.

This guidance aims to ensure that biodiversity considerations are appropriately addressed in SEA.

Chapter 1 (this chapter) explains the purpose and structure of the guidance.

Chapter 2 discusses what SEA is and the legal requirements for undertaking SEA.

Chapter 3 discusses biodiversity principles and considerations for SEA.

Chapter 4, the core of this guidance, explains step by step how biodiversity implications can be considered in SEA.

Chapter 5 explains the links between SEA and other procedures: sustainability appraisal, "appropriate assessment" under the Habitats Directive, and project environmental impact assessment.

Chapter 6 is a “toolkit” of more specific techniques for addressing biodiversity in SEA.

A bibliography and glossary are given at the end.

This guidance has primarily drawn on experience in development and appraisal of terrestrial plans and programmes. Pressures on the marine environment are increasing, but there is relatively little information available on marine biodiversity and on the impacts of marine activities. The current lack of robust and comprehensive systems for protection of marine biodiversity means that SEA in the marine environment must take a precautionary approach.

1.1 How to use this guidance: a route map for different users

The guidance is intended to assist people and organisations involved in strategic decision making and SEA in the United Kingdom to prepare plans and programmes in a wide range of sectors, carry out SEA, prepare SEA reports, and comment on biodiversity issues in SEA. The guide uses the colours and symbols below to denote sections of particular relevance to the different parties involved in the SEA process. These include:

® Responsible authorities: the authorities responsible for preparing the plan, carrying out the SEA (either internally or through consultants), and integrating the results into their plan-making processes. E.g. the local planning authority would be the responsible authority for a local land use plan; the Environment Agency for flood management plans in England and Wales.
Consultants often write some or all of the SEA report, or carry out specialist studies to support the SEA process

© Consultation bodies may provide data for use in SEA and comment on an SEA at various stages.

Consultation bodies must be consulted during the SEA process at several stages; screening; scoping the SEA – advising on what the SEA should cover, how, and in what depth; and on the environmental report and draft plan. They may also be involved in proposing alternatives to the plan, assessing the impacts of the alternatives, and proposing ways to minimise negative impacts

England	English Nature Environment Agency Countryside Agency English Heritage
N Ireland	Environment and Heritage Service
Scotland	Scottish Natural Heritage Scottish Environment Protection Agency Historic Scotland
Wales	Countryside Council for Wales Environment Agency (Wales) CADW Welsh Historic Monuments

¥ Important biodiversity information may be obtained from other interested parties and organisations including Local Planning Authority Ecologists, Local Record Centres, and museums, environmental NGOs including the Wildlife Trusts and the RSPB, local wildlife groups and local specialists.

The public can be involved at most stages of the SEA process. At a minimum they must be able to comment on the draft plan and SEA report; and have their comments taken into account in decision-making.

Representatives of the public – eg non-government organisations including RSPB and the Wildlife Trusts, or elected representatives – are sometimes consulted instead of (or in addition to) the wider public at early stages in SEA. Other countries and their public that might be affected by the plan must also be consulted on the draft plan and environmental report.

2. Strategic Environmental Assessment

Chapter aim:	**Chapter structure:**
To explain what SEA is and what legislation covers it	∉ What is SEA? ∉ What are the requirements of the SEA Directive? ∉ How is the Directive being implemented in the UK?

2.1 What is SEA?

The ultimate aim of SEA is to help protect the environment and promote sustainable development. SEA promotes sustainability via the integration of environmental considerations into strategic decision-making:

> *"SEA is a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision making on par with economic and social considerations"* (Sadler and Verheem, 1996).

For a given policy[1], plan or programme that requires SEA, the "responsible authority" writing the policy/plan/programme carries out the following general SEA process:

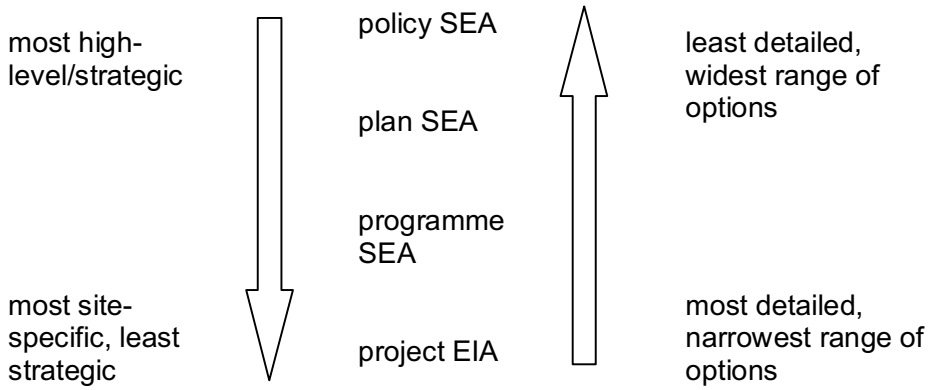
- ∉ identify the current baseline conditions and problems in the area, including relevant biodiversity objectives and other relevant policies, plans and programmes;
- ∉ identify and assess the likely impacts of the policy/plan/programme on the environment, including on biodiversity;
- ∉ consider relevant alternatives to the policy/plan/programme;
- ∉ reduce or avoid any significant negative impacts ("mitigation") and enhance positive benefits where possible;
- ∉ produce an environmental report;
- ∉ involve the public and other organisations;
- ∉ take the environmental information and public/organisation comments into account in decision-making;
- ∉ publish information about the decision;
- ∉ monitor the impacts of implementing the policy/plan/programme.

The basic SEA process is therefore similar to that of environmental impact assessment (EIA) for projects, but SEA is not carried out to the same level of detail (see Section 5.4). SEA is generally more broad-brush, less detailed and quantitative, and more focused on broad directions of change (see Figure 1) although the precise level of detail will depend on the particular plan/programme. This is necessary because to a large extent SEA must keep pace with the decision-making process, (although this is a two-way process

[1] Policies are not covered by the EC Directive on SEA, but are discussed here because some SEA systems eg for Canada do apply to them and because this guidance is also intended to be relevant to people and organisations in the UK carrying out policy-level SEA/appraisal as a matter of good practice or pursuant to other requirements. The Directive is discussed later in this chapter.

and the decision-making must incorporate sufficient time for SEA) which may need to consider many ideas and options in a short period of time. However, from a biodiversity point of view this represents a risk, in that important biodiversity considerations may be screened out of the process at an early stage due to lack of detailed information or understanding.

Figure 1 Characteristics of SEA



SEA can apply to a wide range of actions. The literature tends to distinguish between policies, plans and programmes[2]:

> "*a policy may… be considered as the inspiration and guidance for action, a plan as a set of co-ordinated and timed objectives for the implementation of the policy, and a programme as a set of projects in a particular area*" (Wood and Djeddour, 1992).

For brevity, this document refers to policies, plans and programmes generally as "plans".

2.2 What are the requirements of the SEA Directive?

The European Commission agreed Directive 2001/42/EC "on the assessment of the effects of certain plans and programmes on the environment" - the 'SEA Directive' - on 27 June 2001. The objective of the Directive is:

> '*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that… an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment'* (EC, 2001; Article 1)

The Directive requires SEA for "plans and programmes" that:

- are subject to preparation and/or adoption by an authority (Art. 2(a))[3]; **and**
- are required by legislative, regulatory or administrative provisions (Art. 2(a)); **and**

[2] European SEA requirements generally apply only to plans and programmes. Policies are also discussed here since SEA generally can also apply to policies.

[3] The parentheses ( ) refer to the section of the Directive that includes this requirement.

- ∉ are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use **and** set the framework for development consent of projects listed in the EIA Directive (Art. 3.2(a)); **or**
- ∉ in view of the likely effect on sites, require an appropriate assessment under the Habitats Directive (Art 3.2(b)) ("core scope" plans); **or**

- ∉ are other plans and programmes determined by Member States to set the framework for future development consent of projects (Art. 3.4); **and**
- ∉ are likely to have significant environmental effects("non-core scope" plans which require screening); **and**

- ∉ are begun after 21 July 2004 or are started before this date but completed after 21 July 2006 (Art. 13.3).

The Directive does not apply to

- ∉ policies;
- ∉ financial or budget plans and programmes;
- ∉ plans and programmes whose sole purpose is to serve national defence or civil emergency (Art. 3.8).

"Core scope" plans and programmes that "determine the use of small areas at local level" and "minor modifications" (Art. 3.3) require SEA where they are likely to have significant environmental effects. The Directive allows Member States to set up screening processes either by specifying types of plans and programmes that require SEA, or on a case-by-case basis, or both (Art. 3.5).

Table 1 summarises the SEA process for those plans and programmes that require SEA.

The SEA Directive refers to biodiversity, directly and indirectly, at several points. In its introductory justification, it notes that:

> "*The Convention on Biological Diversity requires Parties to integrate as far as possible and as appropriate the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans and programmes*".

When deciding whether a given "non-core scope" plan requires SEA, one of the screening criteria is whether the plan requires appropriate assessment under the Habitats Directive:

> "*An environmental assessment… shall be carried out for plans and programmes [which are likely to have significant environmental effects and] which, in view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of Directive 92/43/EEC*" (Art. 3.2(b)).

Section 5.3 explains this in more depth.

When determining whether plans are likely to have significant environmental effects, one criterion is their "effects on areas or landscapes which have a recognised national, Community or international protection status" (Annex II).

Biodiversity is also one of the aspects of the environment that must be considered in SEA. The SEA report should include an assessment of:

> "the likely significant effects on the environment, including on issues such as **biodiversity**, population, human health, **fauna, flora**, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors" (Annex 1f).

Flora and fauna are listed separately, as are the abiotic factors on which they depend.

The European Commission (2003) has published guidance that gives more details on how to interpret the SEA Directive.

Table 1. Requirements of the SEA Directive

Preparing an environmental report in which the likely significant effects on the environment of implementing the plan, and reasonable alternatives taking into account the objectives and geographical scope of the plan, are identified, described and evaluated. The information to be given is (Article 5 and Annex I): a) An outline of the contents, main objectives of the plan, and relationship with other relevant plans and programmes; b) The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan; c) The environmental characteristics of areas likely to be significantly affected; d) Any existing environmental problems which are relevant to the plan including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC; e) The environmental protection objectives, established at international, Community or national level, which are relevant to the plan and the way those objectives and any environmental considerations have been taken into account during its preparation; f) The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors. (These effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects); g) The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan; h) An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information; i) a description of measures envisaged concerning monitoring in accordance with Article 10; j) a non-technical summary of the information provided under the above headings The report must include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process to avoid duplication of the assessment (Article 5.2)
Consulting: ∉ authorities with environmental responsibilities, when deciding on the scope and level of detail of the information which must be included in the environmental report (Article 5.4) ∉ authorities with environmental responsibilities and the public, to give them an early and effective opportunity within appropriate time frames to express their opinion on the draft plan and the accompanying environmental report before the adoption of the plan (Article 6.1, 6.2) ∉ other EU Member States, where the implementation of the plan is likely to have significant effects on the environment in these countries (Article 7).
Decision-making Taking the environmental report and the results of the consultations into account in decision-making (Article 8)
Providing information on the decision: ∉ When the plan is adopted, the public and any countries consulted under Article 7 must be informed and the following made available to those so informed: ∉ the plan as adopted ∉ a statement summarising how environmental considerations have been integrated into the plan and how the environmental report of Article 5, the opinions expressed pursuant to Article 6 and the results of consultations entered into pursuant to Article 7 have been taken into account in accordance with Article 8, and the reasons for choosing the plan as adopted, in the light of the other reasonable alternatives dealt with; and ∉ the measures decided concerning monitoring (Article 9)
Monitoring the significant environmental effects of the plan's implementation (Article 10)

2.3 How is the Directive being implemented in the UK?

In the UK, the SEA Directive is being implemented through one implementing regulation per devolved administration:

In England, the Directive's requirements will be adhered to closely. SEA requirements for land use plans will be integrated with the evolving requirements for sustainable development (see Section 5.2).

In Wales, the Welsh Assembly Government will publish SEA regulations for Wales. These will cover relevant plans and programmes relating only to Wales: any cross-boundary plans and programmes between England and Wales will be covered by the UK Regulations. The Welsh Assembly plans to issue detailed guidance alongside its Regulations. As in England, for land use plans only, the SEA requirements will sit alongside other existing procedures for environmental and sustainability appraisal.

In Scotland, the Scottish Assembly has adopted a policy whereby SEA will be required for strategies as well as plans and programmes: this includes national level policies. Regulations on the Directive will be published by 21 July 2004; at a later stage, legislation about the wider application will go to Parliament, and SEA of strategies will probably be required by 2005.

In Northern Ireland regulations implementing the Directive will be introduced before 21 July 2004. The new legislation will apply to all relevant plans and programmes, and individual departments and non departmental public bodies will be responsible for preparing appropriate sectoral guidance. The Environment and Heritage Service will be the NI consultation body for SEA purposes.

Other guidance which is currently available or in preparation includes:

- ‘The Strategic Environmental Assessment Directive: Guidance for Planning Authorities’, ODPM, October 2003 , - covers English local and regional land use plans (www.planning.odpm.gov.uk). This is due to be replaced in mid-2004 by ‘Sustainability Appraisal Guidance of Regional Spatial Strategies and Local Development Frameworks’ – i.e. ODPM guidance on an integrated sustainability appraisal and SEA process (see Section 5.2).
- ‘Strategic Environmental Assessment: A Practical Guide’. ODPM generic guidance for non-planning authorities – expected summer 2004.
- Interim guidance for Scottish development plans (www.scottishexecutive.gov.uk /library5/planning/eadp-00.asp), by the Scottish Executive, September 2003.
- Northern Ireland development plans, by the Northern Ireland Department of Environment; due Spring 2004, and is likely to be based on the ODPM model.
- The Welsh Assembly Government will issue guidance for development plans, which will probably follow the Scottish guidance in its treatment of sustainability appraisal and SEA; followed by generic guidance covering specific sectors.
- The Environment Agency is developing good practice guidance for SEA to assist external organisations in carrying out SEA. This is due in 2004.
- The Department for Transport has commissioned guidance on SEA of Local Transport Plans. This is due in early summer 2004.

3. SEA and biodiversity

Chapter aim:	**Chapter structure:**
To explain general principles for the incorporation of biodiversity considerations in SEA	∉ What is biodiversity? ∉ What SEA can do for biodiversity ∉ Principles for incorporating biodiversity in SEA

This chapter explains the role of SEA in ensuring that biodiversity considerations are taken into account during plan-development, and sets out principles to follow when addressing biodiversity in SEA.

3.1 What is biodiversity?

Biodiversity is:

> *'The variability among living organisms from all sources including,* inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*.' (Convention on Biological Diversity (1992), Art. 2)

In other words, it is the variety of life on earth at all levels, from genes to worldwide populations of the same species; from communities of species sharing the same small area of habitat to worldwide ecosystems. Box 1 explains some of the different components and levels of biodiversity.

At each of these levels, it is necessary to evaluate biodiversity components in terms of:

- ∉ composition: what there is and how abundant it is
- ∉ structure: how biological units are organised in time and space
- ∉ function: the role different biological units play in maintaining natural processes and dynamics.

Biodiversity is a key component of the environment, and maintenance of biodiversity is a key test of sustainability because biodiversity:

- ∉ Is a vital, integral part of the planet's life support system;
- ∉ Is the basis for evolution and adaptation to a rapidly changing environment;
- ∉ Is a key component of a functioning environment for future generations;
- ∉ Is essential to maintain clean water, fertile soil and clean air, thereby providing the basis for existence and indirect economic benefits;
- ∉ Can be managed and used for economic benefit, for instance to produce crops, medicines, building materials, fuel and tools;
- ∉ Has economic and social values e.g. in leisure and recreation or tourism;
- ∉ Has educational, aesthetic and spiritual value, and so enriches our quality of life;
- ∉ It determines the distinctive character or 'feel' to an area, be it a chalk downland, estuary, woodland or moor;
- ∉ People value the existence of biodiversity and want it conserved.

(after RSPB,1996)

Box 1. Levels and components of biodiversity

Biodiversity depends fundamentally on a variety of ecological functions and processes. Many of the processes that reduce biodiversity – eg loss or isolation of habitats - operate at the ecosystem and landscape level. The Convention on Biological Diversity advocates an 'ecosystem approach' to assessment of impacts on biodiversity. This helps to ensure that the ecosystem processes that drive or support biodiversity are understood and that ecosystem health and viability can be maintained for the benefit of biodiversity. For example maintenance of river water quality in riverine ecosystems.

Where developments cross ecosystem boundaries (e.g. between watersheds), or affect large areas of land or water, it may be necessary to consider impacts on biodiversity at the landscape scale. Landscapes include overlapping or inter-related habitats for many different species. Many species have large ranges, so movement and exchange of genes can take place over considerable distances. For instance migratory species may rely on critical habitat that they do not use for most of the year, and that is located far from their other seasonal habitats. Environmental changes can also operate at very big scales (e.g. climate change).

Habitat amount, quality and spatial organisation affect genetic and species diversity. Habitat diversity describes the number and variety of habitats available within the landscape: landscapes with a large number and range of habitats usually support higher levels of species diversity than landscapes with a more limited range of habitats, but this does not necessarily make them more important. The Mongolian steppes, for example, have low habitat diversity, but support some very rare, threatened and endangered species, including the snow leopard. Landscapes with low habitat diversity can therefore still have a critical role in conserving biodiversity.

The majority of species require a variety of habitats: eg only just over one-third of priority species under the UK BAP are associated only with a single Broad Habitat. (Different broad habitat types are described in the UK BAP). The loss, fragmentation or decline in quality of a single habitat can therefore have a serious impact on the populations of a variety of species, even those not obviously associated with it.

Members of species (individuals) exist in populations and these may also be genetically distinct and locally adapted. Populations need to be of a certain size to remain stable, and must be distributed so they can interact with other populations to maintain genetic diversity. Loss of local populations can pose a global threat to a species.

There are estimated to be between about 10 and 100 million species on earth: it is impossible to derive a precise figure. Species diversity is the variety of species within a community, a habitat or an ecosystem: some habitats (e.g. chalk grassland) are inherently species-rich, whilst others (e.g. acid grassland) are relatively species-poor. W*hich* species are present is important, not just how many there are: the species-richness of acid grassland may be increased by invasion of alien plants or weeds, but these species will not add to the habitat's biodiversity value, because its characteristic assemblage of species will have been altered.

Species share a distinct and recognisable genome, but within species-genetic variation may be considerable. Genes are the basic building blocks of biodiversity. Genetic diversity is a measure of the variety of genes within a species or a population. Genetic diversity is important because it allows species to adapt to changing environmental circumstances: the poorer its genetic base, the more vulnerable a species is to extinction. For instance crop monocultures can be wiped out by one pest or pathogen, whereas genetically diverse crops may have some resistant individuals.

Biodiversity decline is affecting the supply of environmental goods – water, clean air, food and productive and fertile soil – that support people's livelihoods and quality of life. The main threats to global biodiversity are associated with human activities causing habitat loss or damage. Worldwide, people are taking 40-50% of all primary production away from natural systems, and an unprecedented number of species (more than 12,000) are now threatened with extinction as a direct result of human activity. Rates of extinction are more than ten times 'normal' or recorded historical rates. Fires, fossil fuel use and soil cultivation have changed global carbon, nitrogen, phosphorus and sulphur cycles. Natural resources are being extracted faster than they are replenished, and ecosystems are being degraded. Many species-populations are being reduced and fragmented below viable sizes.

Conserving biodiversity is a global, long-term challenge and requires global, long-term solutions. The UK is signatory to several international agreements and conventions that promote biodiversity conservation and its sustainable use, and these help shape UK biodiversity policy/legislation (see below).

3.2 What SEA can do for biodiversity

SEA is intended to *help achieve a high level of environmental protection* and is identified in key international agreements (notably the Convention on Biodiversity and the Ramsar Convention) as an important tool for promoting the conservation and sustainable use of biodiversity. This is consistent with two key principles for the conservation and sustainable use of biodiversity:

- The *precautionary principle* implies a presumption in favour of biodiversity protection where the knowledge required to ensure effective mitigation or compensation for a significant adverse impact is lacking. It should also apply in situations where there is sufficient evidence to suggest that adverse impacts are possible, but not enough to confirm 'no significant impact'.

- The '*no net loss' principle* requires the status quo to be maintained in terms of quantitative and qualitative aspects of biodiversity (how much is there, what there it, how it is structured and distributed). The UK is signatory to international agreements based on the premise that further losses of biodiversity must be arrested.

SEA is particularly suited to protecting and enhancing biodiversity because it can

- build biodiversity objectives into plan development;
- provide an opportunity for those with an interest in, and responsibility for, biodiversity to influence plan-development;
- identify biodiversity-friendly alternatives;
- focus on the longer term and larger scales;
- consider all the threats affecting biodiversity in an area, enabling identification and assessment of cumulative threats and impacts;
- suggest effective mitigation strategies to ensure no net loss of biodiversity throughout the development and implementation of plans, allowing sufficient 'lead-time' to ensure that effective mitigation can be put in place;
- establish monitoring to provide necessary biodiversity data and to enable remedial measures to be taken.

In particular, SEA should follow the "*positive planning*" sequential approach:

- ∉ avoiding biodiversity loss or damage
- ∉ enhancing biodiversity where possible or securing opportunities for recovery
- ∉ compensating for unavoidable loss of biodiversity
- ∉ consolidating information on biodiversity (RTPI 1999, Oxford 2000).

Damage should always be avoided in the first instance if possible, mitigating only where impacts cannot be avoided and there are no alternative solutions. In particular, damage and loss should be avoided where biodiversity is particularly high, rare, threatened and difficult to replace or substitute. Opportunities to enhance biodiversity should be sought wherever possible. Table 2 summarises mechanisms for promoting positive planning.

Table 2 Mechanisms to support positive planning for biodiversity

Objective	Possible mechanisms	Examples of relevant legislation/policy
1. Protect existing habitats and species, particularly those with BAPs; mitigate for significant adverse impacts	Use development plans, policies and restrictive conditions to amend plans and working methods or exclude areas important for biodiversity; use conditions or agreements on design, methods, timing etc.; obtain information from surveys, SEA etc.	∉ Planning policy guidance ∉ Development plan policies ∉ Development control process – government policy related to conditions/ agreements (eg in England Sec. 106 obligations) ∉ EIA Regulations ∉ Use of planning conditions and obligations ∉ Wildlife legislation, eg Countryside Act 1981 (for species); Wildlife (NI) Order 1985 (for species) ∉ Habitats and Birds Directives ∉ Countryside & Rights of Way Act 2000 ∉ Badgers Act 1992 ∉ Development control advice (eg Note 10 EIA in NI)
2. Enhance existing and currently degraded habitats, create new habitat	Routinely look for opportunities to improve habitats, create habitat, introduce species, reduce fragmentation through corridor development, re-introduce appropriate management of existing or new sites, etc	∉ Berne Convention Article 11.2a ∉ Habitats Directive Articles 3 and 10 ∉ Regulation 37 of Natural Habitats (Conservation &c) Regulations 1994 ∉ Planning policy guidance ∉ Development plan policies ∉ Development control processes; conditions/obligations
3. Compensate for biodiversity losses where damage is unavoidable	Only where loss can be justified. Use precautionary principle	∉ Use of planning conditions and obligations ∉ Habitats Directive
4. Monitor and enforce to assess the success of enhancement, mitigation and compensation-measures	The SEA Directive asks for monitoring recommendations and requirements	∉ Development control processes –S.106 agreements etc.

Helping to implement biodiversity policy

Biodiversity policies should shape the decisions made by governments, agencies and other public bodies. SEA can help to ensure that plans are consistent with policies and priority actions for biodiversity conservation, protection and sustainable use, notably with systems for site-designation and species-protection and with the UK and Local BAPs.

® SEA must take account of all relevant BAPs and biodiversity strategies, and review the extent to which a plan proposal is consistent with these.

Helping to ensure the requirements of protected sites, habitats and species are met

SEA is an important tool for ensuring that the requirements relating to designated sites (Table 3) are met. Designated sites are important at a number of stages in the SEA process, including screening (determining the need for SEA), scoping (agreeing the scope of the study), developing and selecting alternatives and designing mitigation. Plan alternatives that are likely to damage a designated site should not be selected, or should be selected only for reasons of overriding public interest if effective, proven mitigation or compensation is possible. Mitigation proposals for unavoidable impacts on designated sites must ensure that the integrity of these sites and the viability of their habitats and species populations is maintained or restored.

SEA can also be used to address the requirements of protected species and their habitats *outside* designated sites. Biodiversity is not static: many species range widely, and systems of site protection do not always adapt quickly enough to keep pace with environmental change, e.g. to respond to climate change. SEA should therefore also identify and recognise non-designated areas which make a significant contribution to the habitat requirements of protected species, or which link such habitats (wildlife corridors). The role of the site or area in supporting the species should be considered, regardless of whether the species is actually present at the time when the SEA is carried out.

® SEA must also take into account systems and requirements for site designation and species protection. The SEA should address not only the existence of designated sites and features, but also the reasons why they are designated and their current status/condition. Searches should be carried out with the statutory agencies and with local records centres to identify recorded locations and distributions of protected and BAP species. The level of detail should be commensurate with the level of the strategic action in the planning hierarchy.

Supporting and enhancing wider biodiversity interests

Not all sites or areas that are particularly rich in biodiversity, sensitive to impacts on biodiversity, or otherwise requiring special management for biodiversity may be formally designated for nature conservation or recognised as critical for the conservation of protected species.

Table 3. Designated and protected sites (indicative list as new designations may appear particularly for nationally important marine sites)

Internationally and nationally designated sites:

- ∉ Natura 2000 (Special Protection Areas (SPA), and Special Area of Conservation (SAC), (and potential & candidate sites) - recognising the particular requirements of the Habitats Regulations.
- ∉ Ramsar convention sites.
- ∉ Sites of Special Scientific Interest (SSSI)/National Nature Reserves (NNRs) – recognising the new duties imposed on Section 28G Authorities under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000 for England and Wales).
- ∉ In NI Areas of Special Scientific Interest (ASSI) and NNRs, marine and terrestrial – Nature Conservation and Amenity Lands (NI) Order 1985 and Environment (NI) Order 2002.
- ∉ World Heritage Sites (Convention for the Protection of World Cultural and Natural Heritage, 1972)
- ∉ Biosphere Reserves (UNESCO Man and Biosphere Programme)
- ∉ Sites arising from the requirements of Article 10 of the Habitats Directive (Habitat Regulation 37) i.e. "Such features are those which, by virtue of their linear and continuous nature (such as rivers with their banks or the traditional systems marking field boundaries) or their function as stepping stones (such as ponds and small woods), are essential for the migration, dispersal and genetic exchange of wild species." (corridors and stepping stones)
- ∉ Marine Nature Reserves (Wildlife and Countryside Act 1981)
- ∉ Marine Environmental High Risk Areas (sensitive areas prone to oil pollution from shipping)
- ∉ Sites identified and designated under international agreements, eg OSPAR Marine Protected Areas (MPAs)

Local nature reserves and sites of local importance:

- ∉ Local Nature Reserves (LNRs) designated by local authorities under Section 21 of the National Parks and Access to the Countryside Act 1949 and Article 22 of the Nature Conservation and Amenity lands (NI) Order 1985 (some but not all LNRs are also designated as SSSI).
- ∉ Sites of local importance (variously called Sites of Importance for Nature Conservation (SINCs), SNCIs (Sites of Nature Conservation Importance), Sites of Biological Importance (SBIs), County Wildlife Sites (CWS) or 'second-tier sites'; and Regionally Important Geological/geo-morphological Sites (RIGS) and Sites of Local Importance for Earth Science)
- ∉ Sites which are of particular value in the context of built up areas (e.g. urban green spaces and 'brownfield sites' of demonstrable nature conservation value).
- ∉ Other sites of high biodiversity value.
- ∉ Voluntary sites, including Voluntary Marine Nature Reserves (VMNRs), Sites and Conservation Areas, and Sensitive Marine Areas (SMAs) - non-statutory marine areas that are nationally important and notable for their marine animal and plant communities or which provide ecological support to adjacent statutory sites.

Sites and areas hosting or used by protected species:

- ∉ Sites hosting species listed under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals)
- ∉ Sites hosting species listed under the Berne Convention (Annex 1 and 2 of the Convention on the Conservation of European Wildlife and Natural Habitats, 1979)
- ∉ Important Bird Areas (IBAs) identified by BirdLife International on the basis of internationally agreed criteria
- ∉ Sites hosting Red Data Book (RDB) species
- ∉ Sites hosting species in Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 or in the Wildlife (NI) Order 1985 for Northern Ireland.
- ∉ Sites with BAP national, regional or local priority species or that provide high quality habitat for priority species even it these are not currently present.

Areas with high biodiversity may include those that:

- Act as a corridor, link-habitat or 'stepping stone'.
- Act as a buffer or play an important part in maintaining environmental quality or critical ecosystem processes.
- Have important seasonal uses or are critical for migration.
- Support habitats, species populations, ecosystems that are vulnerable, threatened throughout their range and slow to recover.
- Support particularly large or continuous areas of semi-natural habitat.
- Support semi-natural habitats that take a long time to develop characteristic biodiversity, eg ancient semi-natural woodlands.
- Support biodiversity for which mitigation is difficult or its effectiveness unproven.
- Are currently poor in biodiversity but have potential to help achieve BAP targets

SEA helps to ensure that these wider biodiversity interests are recognised and taken into account.

¥ Local wildlife groups and other interested parties should pursue opportunities for enhancing wider biodiversity interests. These are more likely to be recognised and acted on if they have been formalised (e.g. the 'Rebuilding Biodiversity' partnership discussed at Box 12). Alternatively SEAs may provide opportunities to consolidate and implement such plans.

SEA can provide an opportunity to integrate biodiversity enhancement into plans, whether as mitigation or compensation for biodiversity damage or loss associated with the plan or in the form of wider enhancements. Such opportunities include:

- consolidation, enlargement or buffering of biodiversity-rich areas;
- enhancement of priority BAP habitat and potential habitats for target BAP species;
- improvements in environmental quality, eg to implement the requirements of the Water Framework Directive;
- creating new habitat;
- enhancing management in and around designated areas;
- identifying opportunities to allow spontaneous recovery of damaged or degraded sites to take place (particularly important for marine environments where restoration can be difficult, if not impossible);
- improving management to enhance biodiversity in undesignated habitats and sites;

Opportunities for enhancing biodiversity outside designated sites may be identified through consultation, or suggested as mitigation for losses of biodiversity associated with a plan-proposal. There may also be opportunities to seek biodiversity enhancements that perform wider functions, eg by promoting ecotourism, widening access to the countryside, attenuating floods or reducing soil erosion.

SEA also enables an *'ecosystem approach'* to be taken to land use planning and management, as promoted by the Ramsar Convention and Convention on Biological Diversity. This approach recognises that biodiversity depends on healthily functioning ecosystems and processes that have to be assessed and managed in an integrated way, not constrained by artificial boundaries. The ecosystem approach aims to ensure

that human activities and uses of biodiversity do not undermine the ecosystem functions and processes that sustain biodiversity in the longer term.

® Some plan alternatives that involve biodiversity enhancements may also be technically and economically preferable/ more sustainable in the longer term.
© Statutory consultees and local wildlife organisations should check that their plans and objectives for biodiversity have been taken into account and that opportunities for enhancement are optimised in identifying and selecting plan alternatives.

Encouraging stakeholder involvement and encouraging awareness

SEA provides an opportunity for people with an interest in biodiversity to review the implications of a plan for their objectives and initiatives, and to have early input into the development of alternatives that maximise opportunities for biodiversity.

© This includes statutory consultees ….
¥ ….and other interested parties and organisations.

The public must be given an opportunity to comment on the draft plan and environmental report, but can also be involved in earlier stages of the SEA process, e.g. scoping and identification of alternatives.

3.3 Principles for the incorporation of biodiversity in SEA

SEA should:

- ü Promote strategic thinking and action on biodiversity.
- ü Help to implement the precautionary and 'no net loss' principles.
- ü Help to ensure that biodiversity is protected and enhanced in the wider countryside.
- ü Promote 'positive planning' for biodiversity.
- ü Ensure that where biological resources are used, such use is sustainable.
- ü Ensure that non-renewable resources are used wisely.
- ü Help to develop and provide reliable baseline information about biodiversity.
- ü Ensure that conservation practice and policy is based upon a sound knowledge base.
- ü Ensure that the conservation of biodiversity is an integral part of programmes, policy and action.
- ü Ensure that statutory obligations are met with regard to biodiversity.
- ü Help ensure that plan proposals are consistent with national, regional and local targets for protection and enhancement of biodiversity, in particular those set out in Biodiversity Action Plans.
- ü Identify critical biodiversity issues that should be addressed through project-level EIA.
- ü Help to identify opportunities for enhancement, including consolidation of existing designated sites, enhanced connectivity between biodiversity hotspots.
- ü Help to ensure that mitigation is planned in advance of adverse impacts on biodiversity.

- ü Help to identify ongoing monitoring and survey requirements.
- ü Promote partnerships and consultation with a view to increasing awareness of biodiversity concerns and the role of planning in ensuring that biodiversity objectives are met.
- ü Ensure that individuals and communities as well as Governmental processes are involved in the conservation of biodiversity.

4. Biodiversity in the SEA process

Chapter aim:	**Chapter structure:**
To explain the main stages in the SEA process and identify key biodiversity considerations at each stage	This chapter is structured around the following stages in the SEA process: ∉ Screening ∉ Links to other plans and programmes ∉ Scoping ∉ Setting objectives, targets and indicators ∉ Describing the baseline ∉ Identifying options/alternatives ∉ Impact identification, prediction and evaluation ∉ Mitigation ∉ Monitoring ∉ Consultation and decision-making

This chapter explains the key biodiversity considerations that need to be taken into each stage of SEA.

4.1 Screening

Aim	® **Questions to ask**	© **Checks to carry out**
Determine whether formal SEA is required	∉ Does the plan automatically require SEA because it is a plan type that has been "screened in"? ∉ E.g. because it requires appropriate assessment under the Habitats Directive? ∉ Is it likely to have significant direct or indirect environmental [biodiversity] effects?	∉ Has biodiversity been fully considered during the screening process? ∉ Does the plan have direct or indirect effects on a Natura 2000 site? ∉ Is the plan likely to have a significant environmental [biodiversity] effect?

® Screening is normally done in collaboration between the responsible authority
® .. their consultants..
© …and the consultation bodies

Box 2 shows UK plans and programmes currently expected to require SEA in the UK.

Where a plan affects any site covered by the EU Habitats Directive, planning authorities have a statutory duty to comply with the Habitats Regulations 1994[4]. SEA is likely to be

[4] In Northern Ireland *The Conservation (Natural Habitats &c) Regulations (Northern Ireland) 1995.*

required for any plan which is likely to have an effect on a Natura 2000 site and require appropriate assessment: Section 5.3 discusses this in more detail.

Box 2. UK plans and programmes likely to require SEA

All

- ∉ Plans that require appropriate assessment (see Section 5.3)
- ∉ Some Community Strategies (see ODPM 2003 for detail)
- ∉ National Park Management Plans
- ∉ Offshore oil and gas licensing

England	**Wales**	**Scotland**	**N. Ireland**
∉ Local Development Plans/Frameworks	∉ Unitary Development Plans	∉ Development Plans	∉ Area Plans
∉ Unitary Development Plans	∉ Local Transport Plans		∉ Regional waste, transport and tourism plans
∉ Regional Planning Guidance/Regional Spatial Strategies	∉ National Waste Strategy for Wales		∉ Regional Development Strategy
∉ Spatial Development Strategy for London	∉ National Tourism Strategy for Wales		∉ Economic Development Strategy (eg Strategy 2010)
∉ Local Transport Plans	∉ Tir Gofal		
∉ Regional Transport Strategies	∉ Water Resource Plans		
∉ Structure Plans			
∉ Minerals Local Plans			
∉ Waste Local Plans			
∉ Regional Housing Strategies			
∉ Regional Economic Strategies			
∉ Regional Housing Strategies			
∉ Regional Waste Strategies			
∉ Shoreline Management Plans			
∉ Water Resource Management Plans			

For other plans and programmes, the decision of whether they require SEA will need to be made on a case-by-case basis. The key biodiversity input into this "screening" decision is the determination of whether a plan or programme is likely to have significant environmental [biodiversity] effects, using the criteria set out in Annex II of the Directive.

Box 3 cites Annex II in full. Annex II does not make specific reference to biodiversity, but potential adverse impacts on biodiversity should be considered in relation to all of the criteria. Table 4 explains how the key criteria might be interpreted for biodiversity.

In most cases, biodiversity issues of sufficient magnitude to influence a screening decision are likely to have a high enough profile that consultees and stakeholders would be well aware of them from the outset. However in some situations, knowledge of

biodiversity may not be sufficient. For example, information about likely biodiversity values and risks in the marine environment is often scarce, and plans to establish a network of 'Marine Protected Areas' based on thorough ecological analysis are incomplete. In such situations the precautionary principle should be applied; the plan should be "screened in" until there is enough information to justify a decision to screen it out.

Box 3. SEA Directive Annex II: Criteria for determining the likely significance of effects referred to in Article 3(5)

1. The characteristics of plans and programmes, having regard, in particular, to:

- the degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources,
- the degree to which the plan or programme influences other plans and programmes including those in a hierarchy,
- the relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development,
- environmental problems relevant to the plan or programme,
- the relevance of the plan or programme for the implementation of Community legislation on the environment (eg plans and programmes linked to waste-management or water protection).

2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to:

- the probability, duration, frequency and reversibility of the effects,
- the cumulative nature of the effects,
- the transboundary nature of the effects,
- the risks to human health or the environment (eg due to accidents),
- the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected),
- the value and vulnerability of the area likely to be affected due to:
- special natural characteristics or cultural heritage,
- exceeded environmental quality standards or limit values,
- intensive land-use,
- the effects on areas or landscapes which have a recognised national, Community or international protection status.

Table 4. Biodiversity considerations when determining likely significance of effects

Criteria for determining likely significance of effects referred to in Article 3(5)	Possible biodiversity considerations in screening: "Might the plan…"
The relevance of the plan for integration of environmental considerations in particular with a view to promoting sustainable development	…influence how environmental issues, including biodiversity, are dealt with in other policies, plans and programmes? This could include plans to enhance biodiversity in the wider countryside, eg to implement actions identified by biodiversity partnerships
Environmental problems relevant to the plan or programme	…exacerbate existing threats to biodiversity? ….involve activities already posing a threat to biodiversity in the study area?
The relevance of the plan or programme for the implementation of EC legislation on the environment	…affect other plans that protect or enhance environmental quality?
The probability, duration, frequency and reversibility of the effects	… have relatively certain effects? … have long-term effects (taking into account lengths of lifecycles)? ….have repeated impacts on the same biodiversity resources at such a frequency that their recovery might be compromised? … have irreversible impacts on biodiversity, ie impacts from which spontaneous recovery is impossible and there are no known effective mitigation techniques?
The cumulative nature of the effects	…affect areas where biodiversity is already exposed to significant threat, eg through habitat loss or fragmentation? … exacerbate space-crowding with significant effects on certain components of biodiversity or on a high proportion of the resource within the study area? …exacerbate environmental deterioration such that critical thresholds may be reached? …make a significant contribution to 'in-combination' or cumulative effects on biodiversity?
The magnitude and spatial extent of the effects	… lead to projects that are space- or resource-hungry, eg occupying large areas or using large volumes of water?
The value and vulnerability of the area likely to be affected due to: special natural characteristics or cultural heritage, exceeded environmental quality standards or limit values, intensive land-use	… affect areas of high biodiversity (whether designated or not) that could be threatened? …affect areas covered by BAPs?
The effects on areas or landscapes which have a recognised national, EC or international protection status	… affect Natura 2000 sites (see Section 5.3)? …affect Ramsar Convention sites … affect SSSIs/ ASSIs (see Section 28 of the Wildlife and Countryside Act)? … affect other designated sites? (See Table 3)

4.2 Links to other policies, plans and programmes

Aim	® Questions to ask	© Checks to carry out
Determine how this plan will influence the implementation of other plans and vice versa; clarify biodiversity policy and objectives	∉ What are relevant environmental / biodiversity policies and objectives? ∉ What other plans and programmes could affect, or be affected, by this plan? ∉ Does the plan conflict with any of these? If so, what should be done about it?	∉ Is the plan consistent with policy-requirements? ∉ Have links to all relevant environmental objectives, and other plans and programmes been considered? ∉ How should any conflicts be dealt with?

® This stage is normally carried out by the responsible authority..
© … possibly with input from the consultation bodies.

The SEA report must explain the plan's relationship with other relevant plans and programmes (Annex I(a)) and relevant environmental protection objectives at international, Community or Member State level (Annex I(d)). The responsible authority must also demonstrate how these have been taken into account in the preparation of the plan (Article 9). This stage promotes coordination of planning and decision-making, both in the same and in other sectors and allows potential conflicts and opportunities to be identified. It can also identify opportunities to improve the management of biodiversity within the area affected by the plan. Failure to realise these opportunities will affect ability to manage biodiversity effectively through other mechanisms. As such, this stage should be carried out early in plan-making. It involves four steps:

1. Identify biodiversity objectives that might affect or be affected by the plan.
Relevant biodiversity objectives may be included in a wide range of policies and plans including:

- ∉ relevant national, regional and local Biodiversity Action Plans
- ∉ the UK Sustainable Development Strategy (1994, currently being revised)
- ∉ PPG9 "Nature Conservation" (1994, to be replaced by PPS9 in 2004)
- ∉ Welsh Technical Advice Note (TAN) 5, "Nature Conservation and Planning", 1996
- ∉ Scottish National Planning Policy Note (NPPG) 14, "Natural Heritage", 1999
- ∉ Northern Ireland PPS 2, "Planning and Nature Conservation", 1997 (due for review in 2004/5)
- ∉ Regional Sustainable Development Frameworks
- ∉ Regional Biodiversity Strategies.

The bibliography lists Web-links for some of these objectives. These may differ from the specific objectives ultimately selected for the SEA (which will be derived from these), in which case critical differences need to be identified and explained in the SEA report.

2. Identify other plans that might affect or be affected by the plan under consideration.
These can include:

- relevant local and regional land use plans (e.g. Local Development Frameworks, Unitary Development Plans, Development Plans, Regional Spatial Strategies)
- plans from the same and other sectors that affect the plan in question (e.g. transport plans affect energy plans; minerals and waste plans often affect each other; water resource plans can affect land use plans).

Links should be considered for current plans, plans in preparation and proposed future plans. Links may not be immediately obvious; for example, transport plans resulting in an expanded road-programme could have significant implications for mining of aggregate in sensitive locations. The relevant 'rule of thumb' tests should be:

- does the policy/plan/etc. set a framework/context or constraints for my plan?
- does my plan set a framework/context or constraints for the policy/plan/etc.?

3. Identify how each relevant objective/policy/plan/etc. affects or is affected by the plan. This is typically summarised in the form of an external compatibility matrix (see Section 6.11).

4. Identify conflicts, constraints or problems between the relevant plan and other policies, plans etc. and decide what to do about them.
This could be where there are conflicting objectives, or where actions proposed in one plan could constrain another. In such a case a choice needs to be made whether to:

- adjust the relevant plan to be consistent with the other policy/plan/etc.
- accept the conflict/constraint and document it in the SEA
- seek dialogue with other plan-makers and attempt to identify opportunities to adjust the other policy/plan/etc. to be consistent with the plan.

Box 4 gives an example of how links to other plans and programmes can be taken into account in plan-making.

Box 1 Links to other plans and programmes in the Sefton Unitary Development Plan

An Appraisal Group composed of officers from Sefton Borough Council assessed the draft Sefton Unitary Development Plan (UDP) in terms of how it related to existing Planning Policy Guidance notes (PPG) and the draft Regional Planning Guidance (RPG). The following quote explains how (some of) the results of this work were taken into account in the final UDP.

"The review of PPGs and draft RPG consisted of identifying issues that related to the 13 Sefton sustainability criteria and objectives. Where issues had been identified, the relevant Plan policies were checked to see whether the issues had been taken into account in policy wording and whether there were any gaps in policy coverage. A number of issues had not been covered, for example:

- PPG 12 'Development Plans': the Appraisal Group questioned whether the policies of the Plan protected the best and most versatile agricultural land and soils, and asked policy authors to include a policy within the Plan. A policy has now been included…

- the draft RPG: the Group noted the need for policies that minimise energy use through careful design, construction techniques etc. Policy authors considered that the issue was covered in the new Part 1 policy CS3 'Development Principles', but thought that the issue could be dealt with in more detail within Supplementary Planning Guidance"

Sefton Council (July 2002) Report on the Sustainability Appraisal of the First Deposit Draft

4.3 Scoping

Aim	® Questions to ask	Checks to carry out
Determine the "boundaries" and coverage of the SEA: key issues, assessment methods, data needed, level of detail needed, and who should be consulted. Scoping also provides an early opportunity to consult relevant organisations.	∉ What are the main biodiversity implications of the plan and its proposed activities? ∉ How should they be addressed (methods, level of detail)? ∉ Which biodiversity experts need to be involved? ∉ What alternatives should be considered to optimise biodiversity benefits and minimise harm?	© ∉ Have all relevant biodiversity interests and values (including economic, social and spiritual) been identified? ∉ Does the study area allow critical biodiversity interests to be 'captured'? ∉ Are the proposed techniques and methods are appropriate? ∉ Will suitable specialists be used? ∉ Is there is enough time to carry out surveys and studies, and are they appropriately scheduled? ¥ ∉ Will the biodiversity concerns of the consultation bodies be addressed in the SEA? ∉ Are there opportunities to enhance biodiversity that can be promoted? ∉ Are there alternatives that should be included?

® Scoping is a key stage in SEA. It is normally carried out jointly by the responsible authority…

© … and the consultation bodies.

¥ It is good practice to involve NGOs and the public at this stage, to ensure that all matters of concern are identified early and addressed appropriately in the SEA.

® It is good practice to hold scoping meetings or workshops early in the SEA process to give all parties the opportunity for input into the design of the SEA; and/or to circulate a scoping report for comment recording the findings of the scoping process and setting out the proposed way forward.

Table 5 lists questions that may assist in scoping for biodiversity: they set the framework for the following stages of baseline description, impact prediction and mitigation. The questions should be discussed with relevant consultation bodies and stakeholders early in the plan-making and SEA process.

The *study area* for addressing impacts on biodiversity may need to go beyond the boundaries of the area to which the plan applies. For example an SEA for a Catchment Flood Management Plan may need to take account of habitat use by birds in a neighbouring catchment and the role of both catchments in fulfilling overall habitat requirements. The larger the area covered by the proposed plan the more likely it is that it will be necessary to consider biodiversity impacts at wider (landscape)-scales.

(Inter)national and regional-level plans could affect considerable geographic areas, making it essential to consider wider spatial implications and potential trans-boundary effects. For such plans consultation with representatives from other countries or regions may be necessary.

Table 5. Scoping checklist for biodiversity

Are there any designated sites or protected species within the plan-area? (see Table 3)

Consider biodiversity components at the following levels. Which levels are represented in the plan in question? Are there possible impacts at these levels? Which level(s) can be studied most effectively?

bioregion	habitat	population
landscape	community	individual
ecosystem	species	gene

Formal designations tend to apply predominantly at the habitat and species level, but communities and individuals may also be protected. The size and composition of populations can be an important consideration in driving designation and is also often built into BAP national, regional and local targets.

Address the following questions to determine the scope of the SEA in relation to biodiversity composition, structure and function:

Composition

- What are the main components of biodiversity in the area affected by the plan (see above)?
- What is the distribution pattern and richness/abundance of biodiversity?
- How does biodiversity composition in the study area compare with that outside the study area (are there biodiversity components that are particularly unique, eg locally adapted populations? Are there components that are poorly conserved or represented elsewhere, or are they relatively ubiquitous?)
- Are there any flagship (popular, charismatic) biodiversity components in the area?
- Which biodiversity components are particularly vulnerable/sensitive to proposed plan-activities?
- What are trends in composition (eg. is biodiversity organization and composition stable or subject to rapid change, eg long term declines in species or habitat diversity?)

Structure

- Structural relationships include: connectivity, patchiness, fragmentation, vertical habitat differentiation, distribution of key physical features, availability of niches, seasonal availability of habitat, water availability.
- How are biodiversity components organised in time and space (location, distribution, variation)?
- What are the requirements or 'drivers' for high, or characteristic biodiversity to be maintained (e.g. environmental gradients)?

Function

- Consider how current levels and types of biodiversity are being maintained. Take an ecosystem perspective to identify important functional relationships, eg dependence of wetlands on hydrological processes; threat to semi-natural grassland communities from nutrient enrichment; relationship between aquatic invertebrates and water quality.
- What role do biodiversity components play in maintaining processes and dynamics, or supporting other biodiversity components (e.g. role of vegetative cover in retarding surface water run-off, habitat in providing a refuge for certain species)?
- What processes maintain boundaries and structure (competition, herbivory, predation, dispersal)?

- ∉ Are any threatened components present? What is their functional role? What are their requirements?
- ∉ What are the demographic processes determining the status of species populations (eg do populations rely on recruitment of new individuals from elsewhere, requiring the maintenance of mobility through the landscape?)

Scoping for the SEA of the Lower Parrett and Tone Flood Management Strategy identified that neighbouring catchments were used by Bewick's swans to meet their habitat needs. The SEA concluded that additional deep water roosts would not be required for Bewick's swans within the Parrett Catchment as they have adequate deep water roosts in the neighbouring catchment of the Rivers Brue and Axe. However additional safe deep water roosts are required for other species.

Table 6 provides guidance on how to determine which *level(s) of biodiversity* a particular SEA should address. Analysis of genetic level impacts is unlikely to be possible for purposes of SEA. However it is important to review risks and identify circumstances in which significant impacts could occur at this level. Mitigation recommendations may also have genetic level impacts: for instance landscaping and habitat restoration proposals might require species for which there are no local stocks (e.g. hawthorn used in new hedgerows often comes from the Netherlands). The provenance of species will be appropriate to discuss at the SEA level.

It is important to discuss the *objectives and indicators* to be used in the SEA at the scoping stage, to ensure that the SEA captures the information required to measure and monitor indicators. For example the reasons for which sites have been designated should be taken into account: clearly defined objectives that reflect the biodiversity interest of the area focus the SEA on clearly defined and measurable attributes, and help to ensure that statutory obligations will be met following plan-implementation.

® Consult with:
- ∉ English Nature, CCW, SNH, Environment and Heritage Service (EHS) in Northern Ireland
- ∉ Environment Agency (England and Wales), SEPA (Scotland)
- ∉ Local wildlife organizations including the local Wildlife Trusts
- ∉ RSPB
- ∉ Local Records Centres[5]
- ∉ Local and Regional Biodiversity Partnerships

about relevant levels of assessment, suitable approaches. Include early discussion about biodiversity objectives, indicators and targets

[5] Note that Local Records Centres differ in terms of resources and their ability to respond to inquiries. Figure 7 in Chapter 7 summarises current levels of activity of LRCs

¥ Scoping workshops with key consultees and perhaps the public can be held to allow early discussion of issues, including biodiversity. Quality of Life Capital Assessment[6] can be useful at the scoping stage to clarify the issues that different stakeholders consider to be important including different values of biodiversity (e.g. economic, social and aesthetic values) and to help identify relevant objectives and indicators. It is good practice to issue a scoping report for early consultation on the coverage of the SEA and to inform the development of alternatives for more detailed appraisal. Although this has resource implications, the benefits are likely to outweigh the costs.

[6] see www.qualityoflifecapital.org.uk

Table 6 What level(s) of biodiversity should the SEA address?

Level	Reason for inclusion	Typical impacts, activities or circumstances for which assessment at this level might be appropriate
Bioregion	The plan may have implications for biodiversity within a whole bio-region, eg all habitats and species in mountain situations in Britain or in a natural area in England	Disproportionate effects on one bioregion due to its restricted nature. e.g. plans involving increased access to remote mountainous regions with increasing levels of disturbance, or significant cumulative impacts on a species or habitat restricted to one bioregion, from a range of similar developments..
landscape	The plan will have wide-spread implications, affecting relatively large areas or the distribution and spatial organisation of habitats. Assessment at the landscape scale is the only way to identify and address cumulative threats and impacts on biodiversity.	∉ Barrier effects, restricting species-mobility ∉ Habitat fragmentation or isolation ∉ Land use changes ∉ Widespread disturbance ∉ Dispersed activity and/or development ∉ Opportunities to enhance connectivity of habitat ∉ Opportunities to buffer or consolidate areas of high biodiversity value
ecosystem	The plan may affect environmental quality with possible effects outside the immediate area of influence. Assessment at the ecosystem level is important where changes in environmental quality at one location could have implications for habitats, communities and species at other locations.	∉ Pollution of soil, air or water ∉ Hydrological changes ∉ Impacts on air or water ∉ Impacts on species that perform critical roles in an ecosystem (eg a top predator) ∉ Disruption to the structure and/or function of physical, chemical and/or ecological systems and processes Particularly appropriate for Catchment Flood Management Plans and to meet the requirements of the Water Framework Directive.
Habitat	The plan will alter the amount, quality or distribution of habitat for species. Assessment at this level is essential for priority BAP habitats.	Any impacts on the amount, quality or distribution of semi-natural habitat: land-take for development, disturbance, pollution, fragmentation and barrier effects.
community	The plan may change the characteristic composition of communities. Although usually driven by impacts on individual species, impacts on communities may give early-warning of impacts at the species-level. Also some communities are of acknowledged conservation value in their own right (‘farmland birds’, specific types of grassland community).	Areas where important communities occur should be identified as ‘constraints’ or identified as important for biodiversity. Plant and invertebrate communities are often under-recorded and under-protected. Ecosystem changes often influence community-composition.

Species	Assessment at the species level is essential for key BAP species. The SEA should also consider potential impacts on species that are known to be declining and generally threatened within the area of influence of the plan. Species can be useful as indicators and as a basis for monitoring, one being used to infer possible responses of others.	Impacts at the species-level may be caused by: ∉ Habitat loss or any change in the quality or distribution of habitat ∉ Disturbance ∉ Pollution ∉ Land use and management changes ∉ Changes in spatial arrangement of habitat within the landscape SEA for key species should address any possible impacts on their conservation status and distribution. These might include species of high conservation value (including target BAP species) and species useful as indicators.
population	The plan may affect locally adapted populations. Local changes in populations may have implications at the species-level.	A variety of cumulative impacts Any isolated population of a rare or declining species should be assessed in terms of population status and dynamics
individual	Assess at this level if individuals of rare or protected species may be affected, or if the individual's taxonomic identity is unclear (eg it is not clear exactly what species it is).	Localised impacts on habitat, eg for breeding: isolated roosts or nesting sites
Gene	Assess implications at the genetic level in any case where uniquely adapted genetic resources may be affected, including rare and declining species (typically Red Data Book species)	∉ Location-specific impacts on threatened genetic resources ∉ Climate change causing suitability of habitat to decline for populations that are already isolated ∉ Isolated populations of rare and declining species ∉ Locally adapted populations

4.4 Setting objectives, targets and indicators

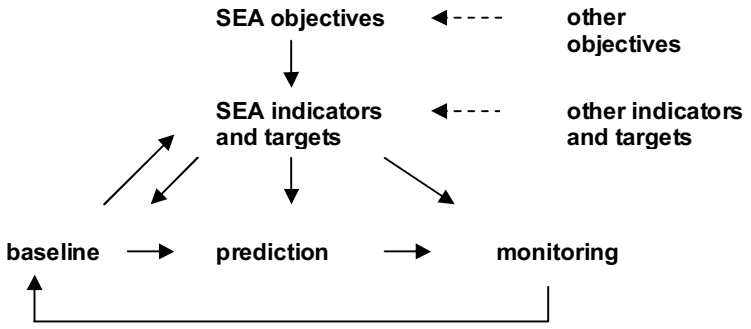
Aim	® Questions to ask	© Checks to carry out
Set a framework for describing the baseline environment and carrying out impact prediction, evaluation and monitoring	∉ Do existing objectives for biodiversity (see Section 4.2) incorporate all important biodiversity interests relevant to this plan? ∉ Are plan-specific objectives required to assess impacts? ∉ Is it possible to establish clear indicators and targets that allow objectives to be measured?	Are the plan's biodiversity objectives, indicators and targets consistent with those of other existing initiatives and plans (See Section 4.2)? Reasons for any significant differences need to be explained in the SEA report.

® This stage is normally carried out by the responsible authority
© …possibly with input from the consultation bodies.
¥ The results of public participation exercises (e.g. for the Community Strategy/Plan) may also provide useful input.

An *objective* is a statement of what is intended, specifying a desired direction of change. The achievement of objectives is normally measured by using *indicators*. Objectives can be expressed so that they are measurable, i.e. as *targets* (e.g. an objective to "enhance biodiversity" could be expressed as the target "restore and extend upland heathland habitats in the region by at least 200ha, by identifying good opportunities in Forest Design Plans and restocking proposals" (Dumfries and Galloway Local BAP). Setting SEA objectives, indicators and targets is not a requirement of the SEA Directive, but they make collecting data, making predictions, and monitoring the impacts of plans much easier (see Figure 2).

Where possible or practical "biodiversity" objectives should be complemented by objectives on the abiotic factors on which biodiversity depends: air, water, soil, climate change. This supports an 'ecosystem approach'.

Figure 2 Links between objectives, indicators and other aspects of SEA



Objectives must be sufficiently detailed to ensure that all critical biodiversity issues can be addressed. However they must also be measurable *primarily* on the basis of existing information and/or new information which can readily be collected for the SEA. To allow objectives or targets to be monitored, and assess whether they have been met, they should ideally be formulated following the SMART principle (Specific, Measurable, Achievable, Realistic, Time bound).

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

Some objectives and indicators for biodiversity are likely to apply to any SEA (for example 'meet relevant BAP targets'). However specific objectives and indicators that reflect the particular activities associated with a plan may also be required. It may be necessary to set objectives at different levels, to ensure that plans are consistent with international, national and local requirements for biodiversity. Examples of plan-specific objectives are given in Box 5. Figure 3 shows that, for hierarchical or 'nested' plans, it may be necessary to establish corresponding 'cascading' objectives.

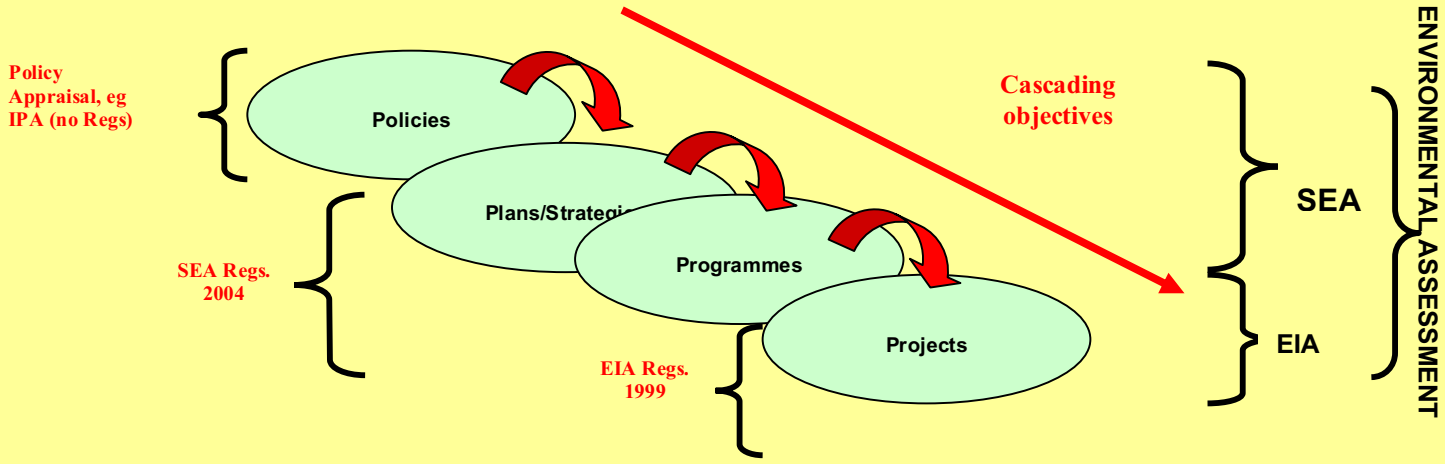


Figure 3. Schematic illustrating the relationship between SEA and EIA, and the scope of the corresponding Regulations (from EU Directives)

Box 5. Examples of plan-specific objectives and targets: Wyre Flood and Coastal Defence

A study was carried out to help inform the development of a coastal and tidal defence strategy for the tidal part of the River Wyre. "On the basis of the environmental information and the views expressed by consultees, environmental objectives were defined for the [river] frontage. These provide a basis for the evaluation of strategic options. The inclusion of a particular objective does not mean that it will necessarily be met by the strategy; indeed a number of objectives conflict with each other". The objectives and targets below are one example out of 39, of which 11 relate to nature conservation.

Assets	Objectives	Specific targets
Candidate Special Area of Conservation	All qualifying cSAC habitats should be maintained in situ in a favourable condition where technically possible and environmentally sustainable. If this cannot be achieved, habitat should be maintained until compensation habitat has been re-created elsewhere in accordance with the Habitats Regulations	∉ Large shallow inlets and bays: maintain existing area, distribution and quality, in particular: ∉ Intertidal boulder clay communities ∉ Intertidal boulder & cobble skears
		Mudflats and sandflats not covered by seawater at low tide: maintain existing area, distribution and quality, in particular: ∉ Intertidal sand communities ∉ Intertidal mud communities…
		Glasswort *Salicornia* spp and other annuals colonising mud and sand: maintain and where possible enhance existing range, distribution and quality of Glasswort *Salicornia* spp communities

Wyre Borough Council (July 2001) Wyre Flood and Coastal Defence Strategy Study Strategic Environmental Assessment.

Table 7 lists some generic objectives and indicators which can be used as a starting point to develop biodiversity objectives and indicators fro specific SEAs. Possible additional sources include:

- ∉ Regional Sustainable Development Frameworks (from Regional Assemblies, Regional Observatories)
- ∉ Biodiversity Action Plans (from Local and Regional Biodiversity Partnerships, Wildlife Trusts)
- ∉ Natural Area Descriptions (from English Nature)
- ∉ Landscape Character Areas (from the Countryside Agency)
- ∉ Quality of Life Counts and Regional Quality of Life Counts (ODPM, HMSO)
- ∉ other relevant policies, plans etc. (see Section 4.2)
- ∉ existing monitoring programmes.

Table 7. Example biodiversity objectives and indicators

Objectives	Indicators
International/ national	
∉ Avoid damage to designated wildlife sites (national, international) and protected species	∉ Reported levels of damage to designated sites
∉ Meet SPA, SAC and Ramsar objectives ∉ Achieve favourable condition on internationally and nationally important wildlife sites	∉ Favourable condition of internationally and nationally important sites ∉ Reported condition of nationally important wildlife sites ∉ Site integrity based on condition of designated features of interest
∉ Meet UK BAP objectives ∉ Maintain or enhance BAP habitats and species in line with UK BAP targets	∉ Achievement of Biodiversity Action Plan objectives and targets (UK and country specific) is promoted
∉ Contribute to sustainable development ∉ e.g. reverse the long term decline in farmland birds	∉ National headline indicators, eg populations of farmland birds
Regional biodiversity interests	
∉ Meet Regional BAP objectives ∉ Maintain or enhance BAP habitats and species in line with targets	∉ Achievement of Biodiversity Action Plan objectives and targets (regional) is promoted
∉ Strengthen regional biodiversity partnerships and information	∉ Active partnerships and mechanisms for information gathering and sharing established
Local biodiversity interests	
∉ Maintain local biodiversity	∉ Number and area of Sites of Interest for Nature Conservation (SINCs) and Local Nature Reserves (LNRs) within the plan area (number and hectares) ∉ Number/area of Local Nature Reserves
∉ Meet local BAP targets	∉ Achievement of BAP targets (local)
∉ Encourage local access to and ownership of biodiversity ∉ Provide opportunities for people to come into contact with and appreciate wildlife and wild places	∉ Levels of recreation activity associated with biodiversity (eg visits to wildlife reserves or visitor centres) ∉ Achievement of 'Accessible Natural Greenspace Standards' (English Nature)
Biodiversity in the wider countryside	
∉ Enhance biodiversity in the wider countryside ∉ Restore the full range of characteristic habitats and species to viable levels ∉ Safeguard genetic resources by protecting species populations, and the habitats and ecological processes on which they depend	∉ Number of characteristic rare species and priority habitats ∉ Area and quality of habitat in relation to range-size requirements ∉ Area of land actively managed for nature conservation ∉ River quality objectives

It may also be useful to set targets for each indicator (quantified and/or directions of change) which can be used to help assess the nature and significance of impacts during impact assessment (see 4.7) and for monitoring.

4.5 Describing the baseline

Aim	® Questions to ask	© Checks to carry out
Establish a clear picture of: ∉ What biodiversity is present and how it is organised in time and space ∉ How it works (key functional relationships and interdependencies) ∉ Why it is important (including designated and protected status but also wider importance) ∉ What condition it is in and how it would develop in the absence of the plan	∉ What data on biodiversity exist and who holds them? ∉ Do we have all available information? ∉ Are there any important information gaps? How confident can we be in our conclusions? ∉ Are there additional data requirements to understand biodiversity impacts?	∉ No important baseline data have been missed ∉ Important impacts on biodiversity can be quantified, or information requirements have been identified

® This stage is normally carried out by the responsible authority or their consultant
© …with input from the consultation bodies
¥ .. and possibly other bodies and the public.

The SEA report must describe the relevant aspects of the current state of the environment in the study area and how these would be expected to change in the absence of the proposed plan. In other words, baseline conditions are those that would be expected under the 'no action' or 'minimum action' alternative. Biodiversity in areas likely to be significantly affected must be described in sufficient detail for impacts to be identified and evaluated. The baseline assessment should focus on the components of biodiversity "scoped in" by using Table 5 (the scoping checklist). This is likely to involve the steps identified in Box 6.

Table 8 summarises *information requirements and potential sources of information* for baseline descriptions, and Chapter 7 lists relevant information sources. The local records centres (LRCs) collate available species and habitat information at a county-level, though they differ in terms of resources and levels of activity. The LRCs participate in the Biodiversity Action Reporting System (BARS) for the National Biodiversity Network (NBN) which will be a major source of information for SEA[7] in time. The statutory agencies and NGOs may also hold biodiversity information. Results from any relevant national recording schemes should be drawn on (eg Butterfly Monitoring Scheme, BTO bird counts). Areas that are currently poor in biodiversity but have potential to help achieve BAP targets may be identified through formal initiatives or partnerships, for instance the 'Re-building Biodiversity Partnership in the South West'. Detecting such areas may require a landscape-scale approach using GIS (see Section 6.3).

[7] Local information should always be critically reviewed, in particular to clarify data limitations. Local Records Centres have their own systems for recording, storing and manipulating data. Most use GIS, particularly for recent records, making spatial searches relatively straightforward. The NBN Gateway project is exploring possibilities for presenting information about the relative geographical precision of species-records.

Box 6. Checklist for baseline description

1. **Consult widely** to obtain existing information. Baseline description will normally be carried out primarily using existing data and information, though some additional predictive analysis may be required to predict how biodiversity might be expected to develop and change, for example under climate change;

2. **Clarify the locations** of designated and other important sites for biodiversity and summarise reasons for designation;

3. **Produce land-use and habitat distribution maps** for the study area if possible;

4. **Review plan-related activities** and identify areas and biodiversity resources likely to be affected. The baseline should inventory known threats and pressures on important components of biodiversity within the study area, including:

- Land-take
- Invasion of non-native or overly dominant species
- Pollution (direct and diffuse)
- Lack of management or changes in traditional use
- Habitat isolation and fragmentation
- Disturbance
- Climate change

5. If appropriate (e.g. at smaller scales) carry out walk-over surveys or inventories for areas where biodiversity interest is high and activities are expected to occur.

6. **Confirm key biodiversity interests and considerations**, including the critical ecosystem functions and processes on which biodiversity depends, with consultation bodies and stakeholders;

7. **Identify key problems for biodiversity**. These include:

- negative trends in biodiversity over time
- aspects of biodiversity that are worse than, or likely to become worse than, relevant standards, thresholds and targets
- issues where there are not enough data to be able to judge the likely significance of future impacts.

® Check for presence of other areas of likely high biodiversity value (Table 3 plus non-designated sites). Check for known sites that host or are used by protected species.

Some aspects of biodiversity description may apply to any plan affecting that geographic area. Increasingly regional biodiversity partnerships and local planning authorities are seeking to develop biodiversity maps and databases that can be used to clarify the locations and distributions of important biodiversity resources. For example the South West Regional Biodiversity Partnership is developing a 'South West Naturemap' to support the Regional Environment Strategy and the Regional Spatial Strategy. However each plan will have specific aspects and characteristics that may require assessment of particular sub-sets of the overall biodiversity resource, or a focus on biodiversity components that will be effective indicators of impacts due to plan-activities. Therefore even where biodiversity base maps and databases are available, additional or more

focused biodiversity information is likely to be required: for instance an SEA of a Flood Management Strategy might focus on those priority BAP habitats and species most likely to be affected by changes in flooding or flood management. General biodiversity base-maps are unlikely to identify all areas used by otter or water vole, for example, but this information may be available from local records centres: the level of detail and search will need to be appropriate to the level of SEA.

Box 7 gives an example of *how baseline data can be structured* in a matrix format. Ideally such matrices will be supported by maps showing key biodiversity interests. The baseline should also discuss likely future trends: Box 8 gives an example.

The *level of detail* should correspond with the plan and its the proposed actions. SEAs of programmes are therefore likely to require more detailed information than SEAs for plans, as the former generally include site-specific actions (see Box 9).

Box 7. Example of quantitative baseline data: Cotswold District Council

As part of its development of guidance on SEA, the ODPM commissioned seven partial SEA case studies. One of these considered how baseline data could be summarised and presented for Cotswold District Council. The table below shows part of the data that were collected, organised to show quantified data, comparators and targets, trends and problems. Indirectly it also helps to identify data gaps that may need to be filled as part of the next SEA.

criterion	**indicator**	**quantified data (for CDC unless noted otherwise)**	**comparators and targets**	**trend**	**problems/ constraints**
Biodiversity	achievement of BAP targets	4682ha key wildlife sites, incl. NNR (343ha) + 31 SSSIs (513ha). Cotswold Water Park is key biodiversity. area with its own BAP	14262ha in Glos. CDC targets: prevent damage to priority local BAP habitats; maintain/ increase habitats in plan Table 2 of plan	quality not known?	
Character of built and natural environment	landscape and heritage designations: size/number + quality	1298km^2 AONB 6109 sites on SMR incl. 238 SAMs, 144 conservation areas	1364km2 in Glos.: about 80% of Cotswolds are designated AONB 18,122 in Glos. CC, incl. 451 SAMs, 238 conservation areas CDC target: prevent loss of listed buildings and SAMs, reduce buildings at risk by 10% year on year	quality not known?	AONB poses strong constraint on development (e.g. design and materials permitted)

(Levett-Therivel (2002) SEA Pilot 1: Cotswold District Council Local Plan First Review)

Table 8. Information requirements and sources for baseline assessment		
Requirement	**Source and availability**	**Additional considerations**
What is the number, distribution and extent of statutory and non-statutory nature conservation sites in the area covered by the plan?	Available from English Nature, CCW, SNH, DoENI And from Local Records Centres	Map locations and if possible boundaries of nature conservation sites
What is the distribution and extent of key habitats within the area covered by the plan? What is the distribution and extent of internationally important habitats (Annex I of the Habitats Directive), nationally important habitats (UK BAP Priority Habitats) and locally important habitats (regional and local BAP target habitats) within the area covered by the plan?	Data available for some counties and areas but data often have relatively low currency and require updating In some regions, 'core habitats' have been identified[8] UK BAP Priority habitats being mapped to GIS by Local Records Centres in England with English Nature-support, with a target date for completion of 2004. Some Annex I and local BAP targets are synonymous and covered by this or other local projects. Further resources required to complete and update coverage	Define the habitats to be included. These may include priority BAP habitats, other semi-natural habitats, potential habitats for BAP species. Review the need for more up-to-date information (e.g. additional aerial photography) Regional Biodiversity Strategies are being developed by Regional Biodiversity partnerships in some regions
What is the distribution of internationally important species (Annex 4 of the Habitats Directive), Nationally important species (UK BAP Priority Species) and locally important species (Local BAP target species) within the area covered by the plan?	For the majority of these species, Local Records Centres hold high quality information, collated on behalf of all sources including the statutory agencies and the voluntary recording community. The National Biodiversity Network will provide access to species data collated by national organisations and allow it to be viewed with local data.	Bear in mind the need to identify potential habitats for these species as well as habitats known to be used by them
Where are the hotspots and critically important areas for maintaining favourable conservation status of 'important' species within the area covered by the plan?	Various projects analyse raw data and presenting summary views for different purposes. These include the 'Rebuilding Biodiversity Project' (Wildlife Trusts, SW Region), the Somerset Econet Project (Somerset County Council/ SERC) and the SW Nature Map (English Nature/SW Regional Biodiversity Partnership). No specific exercises have been carried out to support the SEA Directive.	It is important for a consensus to be reached about priorities for biodiversity within the plan-area. Conflicting priorities make it difficult to establish clear objectives.
Are there any critical ecosystem processes or aspects of environmental quality/ condition?	Environment Agency may hold data on aspects of environmental quality, e.g. River Quality Indices, information on vulnerability of soils to erosion.	Review the environmental factors/conditions that promote high levels of biodiversity or that might cause a decline. These should be included in monitoring recommendations
If data to address the questions above are not yet fully available for the plan-area, can probable distributions be inferred from data that are available, or can new data readily be collected?		

[8] e.g. Rebuilding Biodiversity in the South West. New Landscapes for Wildlife and People

Box 8. Example of trends in a baseline description: Water management in California

The CALFED Bay-Delta Program aims to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System of San Francisco. The quote below comes from the baseline description in the CALFED SEA. It illustrates how trends and cumulative impacts can be described in an SEA baseline.

> *"Wetlands and related habitat are some of the most valuable natural resources in the Bay and Suisun Marsh. Most of the mudflats, tidal and seasonal marshes, and riparian woodland have been reduced by 50-80% over the past 140 years, primarily as a result of urban and agricultural development. Large areas that were once tidal marsh habitat have been transformed into salt ponds and agricultural land, reducing the shallow-water habitat available to fisheries resources. In addition, the Bay's open-water area has diminished by one-third, with wetland and riparian wildlife habitats eliminated or degraded. Seasonal stormflows have increased, and sediment and nutrient transport processes changed in the estuarine ecosystem"*.

(CALFED Bay-Delta Program (July 2000) Final Programmatic Environmental Impact Statement/Environmental Impact Report)

Box 9. Example of distinction between the data needed for plan and programme level SEA

Catchment Flood Management Plan (plan-level):

- ∉ Baseline assessment includes general description of biodiversity interests and threats.
- ∉ Designated sites are identified.
- ∉ SPA objectives and key bird species are listed.
- ∉ Little site-specific information is included.

Flood Management Strategy (programme-level):

- ∉ Baseline assessment specifies where favourable conditions are currently met and identifies key sites where flood management might alter habitat quality for SPA bird populations.
- ∉ Typical project-activities are identified and their main impacts.
- ∉ Habitats are mapped and habitat requirements for different species are explained

4.6 Identifying options and alternatives

Aim	® Questions to ask	© Checks to carry out
∉ Help identify options or alternatives for a plan that avoid, minimise, reduce or compensate for loss of or damage to biodiversity ∉ Help identify opportunities for biodiversity protection and enhancement or recovery.	∉ Are development activities needed or can the plan obviate this need (no/minimum action alternative) ∉ What would be the best alternative for biodiversity? ∉ If key problems for biodiversity have been identified during baseline assessment , what are ways of ameliorating the problems? ∉ Can alternatives be fine-tuned to enhance biodiversity or minimise impacts on it?	∉ Have appropriate alternatives been considered at the strategic as well as the detailed stages of plan-making? ∉ Have the alternatives that we have proposed been considered? ∉ Are the alternatives considered "real", or are they being used to justify the preferred alternative?

The identification of strategic alternatives is a key stage in SEA.

® It is normally carried out by the responsible authority..
© With possible input from the consultation bodies.
¥ It may also be useful to involve NGOs and the public at this stage, to ensure that an appropriate range of alternatives is considered.

The SEA report must outline the reasons for selecting the alternatives that have been considered and explain how alternatives were selected and assessed (Art. 9, Annex Ih). Alternatives can be considered at several stages of plan-making: strategic alternatives early on, and more detailed ones later. For instance the early stages of the development of a minerals plan could consider possibilities for recycling minerals, for sustainable transport of minerals, and for broad areas where extraction might be appropriate. The later stages would focus on appropriate sites.

∉ Alternatives can be "either/or" alternatives or "mix-and-match" alternatives that can be put together in different combinations. The former need to be compared in the SEA; the latter need to be assessed one by one, or in differing combinations, to determine whether they should be included in the plan or not (see Box 10). Where there are many possible alternatives, it may be helpful to propose "themes" of alternatives, e.g. reduce demand v. provide for existing trends; local v. international focus (see Box 11).

This guidance emphasises that plan-making should follow a sequential approach:

∉ *avoid* impacts where possible;
∉ *reduce* them if this is not possible;
∉ *compensate* for any remaining ones; and
∉ seek opportunities to *enhance* biodiversity at all times, eg by consolidating or connecting habitats.

Box 10. Different types of alternatives for a flood management strategy

'Either/or':
Construct tidal barrier or raise tidal banks: which is the best alternative?

'Mix and Match':
Raise tidal banks; dredge tidal reaches; widen watercourses to speed up evacuation of floodwater; increase capacity of pumping stations; increase use of winter-storage: which of these measures are acceptable and how can they best be combined?

Box 11. Example of themed either/or options: Minerals extraction policy for Surrey

Minerals "apportionments" – levels of minerals that each county is expected to provide - are set for counties through regional guidance and historic production levels. Surrey's Minerals Local Plan is responsible for identifying sites to meet these apportionments for Surrey. As part of the development of the Surrey Minerals Local Plan, four options were considered. Options 1, 2 and 3 are *either/or* options. Option 4 is *mix-and-match*, and can be linked to any of the other options:

Option 1: Environmental constraints. PPS7 requires potential mineral extraction sites within AONBs to be protected from extraction until all alternatives have been exhausted. The Habitats Directive and PPG9 require potential mineral extraction sites within SPA, SAC, Ramsar and SSSI designations to be protected from extraction unless it can be demonstrated that the site can be worked without harm to the integrity of the site. Where the site affects one of these designations, it is eliminated from consideration for extraction.

Option 2: Amenity constraints. Human amenity is set as top priority. Sites in designated environmental areas are brought into consideration in order to meet the apportionment.

Option 3: Environmental and amenity constraints. Designated sites and human amenity are protected. If there are insufficient sites to bring forward to meet Surrey's apportionment, the apportionment figures should be challenged.

Option 4: Sequential and criteria based test. Potential mineral working zones that have not come forward through the plan would be judged through a sequential and criteria based test:

- Consider sites outside AONB, SPA, SAC, RAMSAR and SSSI designations first using a criteria based assessment of archaeology/historic environment, ecology, landscape and hydrology and judged against criteria specified in the Plan
- If none are appropriate, the same criteria based assessment would be required for sites within these designations
- The developer will be expected to provide the appropriate information before the site will be considered.

(This SEA is still in development; information provided courtesy of Tom Jones, Surrey County Council)

Alternatives should also be chosen according to this hierarchy. Alternatives should be identified that *avoid or minimise* biodiversity impacts, for instance through demand management, choice of types and locations of development, and layout within particular sites:

- Conditions for achieving no net loss should be agreed
- Biodiversity damage should be avoided at source where possible
- Important habitats, species and landscape features should be retained and incorporated in the plan, and protected during plan-implementation
- Provision must be made for future management and monitoring.

Where possible, opportunities to *enhance* biodiversity should be sought at different scales e.g.:

- Identifying land suitable for biodiversity enhancement in development plans, areas within proposed development sites that can be managed for improved biodiversity, new areas of local nature conservation importance, and/or new wildlife corridors (see Box 12).
- Creation and management, or restoration, of threatened habitats or habitats that support a threatened species: examples are the major river restoration projects taking place in Denmark and the USA, and the 'managed retreat' method of managing coastal erosion practised in the UK.
- Design principles agreed at the strategic level with detailed design being considered later at the project level.
- Restoration to nature conservation use of structural earthworks or excavations for construction materials, once operations are complete (e.g. see Box 20).

It is important to take a flexible approach, taking advantage of opportunities as they arise, as well as planning for long-term enhancement. The need for ongoing management of new wildlife areas must also be considered.

Box 12. Example of how to promote biodiversity enhancements

'Rebuilding Biodiversity' is an initiative undertaken by the South West Wildlife Trusts (2002), intended to develop a logic for 'making choices about where scarce resources should be allocated, based on predicted best ecological outcomes'. The project has identified potential core habitat areas in the South West which offer opportunities for biodiversity enhancement. The criteria used to select these are very varied. Examples include:

- areas selected to maintain spatial representation of woodland throughout the landscape in areas where there is little woodland remaining
- areas selected for high restoration potential to heathland
- areas selected to maintain a diverse mosaic of habitats in one location
- areas selected for their existing concentration of habitat and potential for consolidation of this habitat.

Where an over-riding need for development is shown and loss or damage to biodiversity is unavoidable, *compensation* of similar quality and quantity to the biodiversity affected should be provided (Box 13 gives an example). Habitat creation and restoration are often proposed to mitigate adverse ecological impacts. However re-created or 'new' semi-natural habitats rarely substitute for existing semi-natural habitat in terms of

naturalness, continuity, and complexity. The more complex the species and structural composition of a habitat are, the more difficult it is to replicate. Most of today's rare habitats are the result of low intensity intervention or the prolonged absence of disturbance, and cannot be recreated in a short time. For this reason compensation should be regarded only as a last resort.

Box 13. Example of biodiversity compensation

The UK Government recently announced that it would provide habitat to compensate for that destroyed by port-related developments in Kent and Suffolk in 1997. Lappel Bank in Kent and Fagbury Flats in Suffolk were important coastal wildlife areas that supported large numbers of feeding and roosting wading birds and wildfowl including shelduck, ringed plovers, redshank and dunlin. The sites were omitted from the Medway Estuary SPA when it was classified in 1992 as they had already been earmarked for port development. The European Court of Justice ruled that member states were not authorised to take account of economic needs when designating SPAs and the House of Lords ruled in 1997 that the Secretary of State's actions concerning Lappel Bank had been unlawful. By this time the sites had already been developed, making compensation necessary. 45 ha compensatory habitat will be created as part of a 'managed retreat' scheme.

This retrospective approach to compensation is not ideal as it does not ensure continuity of habitat. SEA can help ensure that compensation is in place before losses are incurred.

4.7 Impact identification, prediction and evaluation

Aim	® Questions to ask	Checks to carry out
∉ Predict and evaluate the impacts of the plan and alternatives, including cumulative and indirect impacts ∉ Help to identify preferred alternative(s)	∉ What are impacts on biodiversity associated with this plan and alternatives? ∉ Are the impacts significant? ∉ Are cumulative impacts on biodiversity expected from the plan jointly with other activities (historic, current or planned)? ∉ What are the relative risks and opportunities for biodiversity associated with available alternatives? ∉ What is the preferred alternative?	© ∉ Have impacts on biodiversity been quantified and evaluated in local, regional, national and international contexts? ¥ ∉ Do we agree with the impacts identified as being significant? ∉ Do we agree with the preferred alternative?

© Impact prediction is normally carried out by the responsible authority, possibly in discussions with the consultation bodies.

The SEA Directive requires SEAs to identify the likely significant effects of the plan on the environment. Biodiversity is one aspect of the environment that must be considered (Annex If). The SEA should also include assessment of possible significant effects of the plan on 'flora, fauna, soil, water, air, climatic factors and landscape'. Inter-relationships must be considered, as well as relevant secondary, cumulative, synergistic, short, medium and long term, permanent and temporary, positive and negative effects.

Predicting impacts

The scoping stage will have identified activities associated with the plan that might give rise to significant environmental effects. These must be reviewed in relation to the biodiversity interest of the study area as a whole and those areas where critical activities are concentrated. SEA should identify:

- ∉ the plan's impacts on all relevant levels of biodiversity (from the bio-regional to the gene level). Table 9 summarises the likely key impacts of plans in a range of sectors. As an example, Box 14 shows the relationship between activities and impacts for upland afforestation.
- ∉ the environmental conditions required to conserve or promote biodiversity; and
- ∉ the availability of restoration techniques.

Chapter 6 explains some of the techniques that can be used for impact prediction. Many require specialist input.

What the impact predictions look like will depend on the scale of the plan and how strategic it is (see Figure 1). Predictions can be expressed in broad terms, represented by symbols such as tick/cross, smiling/frowning face, green/amber/red, through to more

detailed, quantitative approaches. Policy and plan-level SEA will generally be less detailed and quantitative than programme-level SEA (e.g. Box 15), although even at these less detailed levels it is good practice to accompany symbols with written descriptions of the impacts to enable them to be better understood.

Table 9. Likely impacts of different sectoral plans on biodiversity

Sector	Habitat loss caused by land-take	Habitat isolation or fragmentation	Alteration of water or hydrological regime	Alteration of soil composition	Pollution (direct and diffuse)	Disturbance (e.g. by presence of people, vehicles, noise)	Introduction or invasion by non-native or overly dominant species	Edge effects	Genetic impacts	Behavioural impacts	Elevated mortality
Agriculture	V	V	V	V	V	V	V	V	V	V	V
Forestry	V	V	V	V	V	V	V	V		V	
Fisheries	V				V	V	V		V	V	V
Energy	V	V			V	V				V	V
Industry	V	V	V	V	V	V		V		V	V
Transport	V	V	V		V	V		V		V	V
Waste management	V		V		V						V
Telecommunications	V	V		V		V				V	V
Tourism	V	V			V	V				V	
Urban expansion, new development	V	V	V	V	V	V	V	V	V	V	V
Water and flood management	V	V	V	V	V	V	V	V	V	V	V

Box 14. Example of relationship between activities and impacts for upland afforestation

Afforestation programmes in the UK invariably involve losses of (often upland) habitat with associated fragmentation of remaining semi-natural habitat. This is often at a large scale. The preparation of the land and subsequent planting of the intended crop results in alteration of hydrological processes at the catchment level (due to increased run-off) and the composition of the soil (due to deep ploughing). Pollution impacts occur as a result of elevated reliance upon chemicals (fertilisers and pesticides). The establishment and subsequent management (including felling) of the afforested areas result in disturbance to the surrounding wildlife. Modern afforestation relies heavily upon non-native species to provide the crop (e.g. Sitka spruce). The provision of large blocks of forest has given rise to (often "hard") edge effects where one habitat (woodland) meets another (moorland), with little if any grading between the two. The presence of afforested areas has altered the behaviour of the species dependent on the original habitat (no longer present due to inappropriate feeding/breeding grounds; they are subject to elevated predator pressures, are out-competed by those "generalists" better able to adapt to the changed habitat conditions; and, they are less likely to move around the altered landscape mosaic, leading to isolation and associated genetic problems).

Box 15. Example of policy-level impact prediction: Impact of Common Agricultural Policy reforms promoting extensification of agriculture

"Extensification will occur leading to a reduction in grazing pressure on large areas of marginal land. There will be greater competition and take-up of agri-environment schemes and higher quality environmental outcomes. Sporting uses will become relatively more attractive and specific management may benefit biodiversity. Reduced livestock profitability and decreased stock numbers will threaten the management of key grassland habitats, particularly in arable or mixed farming areas. In the uplands commercial forestry will become more attractive at the expense of traditionally grazed habitats."

(DEFRA (April 2002) *Analyses of the Environmental Effects of Common Agricultural Policy Direct Aids*).

How much information and certainty is needed for adequate impact prediction will depend on the issue. As a rule of thumb, predictions should be as simple as they can be whilst fulfilling the precautionary principle, which implies that additional data on biodiversity should be sought where impacts cannot be predicted with certainty. On the other hand, many processes that reduce genetic diversity – e.g. loss or isolation of habits - operate at the ecosystem, landscape or global scale and SEA must capture these processes as well as more local ones. Different levels of detail may be needed for different aspects of a plan, e.g. general policies as opposed to specific proposals.

Carrying out SEA in accordance with the precautionary principle creates a need for biodiversity data, and presents an opportunity for enhanced coordination of existing biodiversity data and for collection of new data in relatively poorly studied situations (for example in marine contexts). The plan should consider how data collection could be improved.

Assessing cumulative effects

The SEA Directive requires the plan's wider cumulative and synergistic effects to be assessed (Annex If). Definitions are given in Box 16. Cumulative effects may occur if:

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

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

Box 16. Cumulative and indirect effects: definitions (based on ODPM, 2003)

Secondary or indirect effects are effects that are not a direct result of the plan, but occur away from the original effect or as a result of a complex pathway, e.g. a development that changes a water table and thus affects the ecology of a nearby wetland.

The effects caused by a plan together with other past, present or reasonably foreseeable actions are referred to as '*in-combination effects*' (see Box 26). They can arise, for instance, where several proposals each have insignificant effects but together have a significant effect; or where several individual effects of the plan (e.g. air, water, soil) have a combined effect on a particular receptor (e.g. threatened species).

Cumulative effects on biodiversity result from in-combination effects on biodiversity acting together with a host of processes that are insignificant when considered in isolation, but which collectively have a significant impact. Many of these threats to biodiversity may not form part of formal plans (eg negative effects on farmland birds caused by general changes in farming activity). Cumulative effects can be:

- *Additive*: the simple sum of all the effects (e.g. fertiliser inputs into a river);
- *Neutralising*, where effects counteract each other to reduce the overall effect (e.g. the effect on birds of gravel extraction at one site is neutralised by a new wildlife habitat created through reclamation of another nearby extraction site);
- *Synergistic* effects interact to produce a total effect greater than the sum of the individual effects. Synergistic effects often happen as habitats, resources or human communities get close to capacity. For instance a wildlife habitat can become progressively fragmented with limited effects on a particular species until the last fragmentation makes the areas too small to support the species at all.
- *Time crowding:* frequent, repetitive, and simultaneous impacts on environmental resource;
- *Space crowding:* high spatial density of impacts on an environmental system

See Cooper (2004) for more detail.

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

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

Table 10 provides an example of cumulative effects: the total landward and foreshore encroachment and foreshore disturbance that would occur as a result of two flood defence options over the next 50 years.

Table 10. Summary of cumulative impact of two flood defence options over the next 50 years

	Landward encroachment		Foreshore encroachment		Foreshore disturbance	
Total ha	Option 2	Option 3	Option 2	Option 3	Option 2	Option 3
	89	137	14	19	130	150

(Environment Agency, *Draft SEA of the Humber Estuary Shoreline Management Plan*, March 2004)

Evaluating significance

When evaluating the significance of impacts on biodiversity, it is necessary to consider
1. the characteristics of the biodiversity resource which are affected,
2. the environmental changes that would occur as a result of the plan activities (from the prediction stage), and
3. the nature of the impact.

Important *characteristics of the biodiversity resource* include:
- its state or condition (including measures of rarity, trends)
- its recoverability or replaceability
- the extent to which it can be substituted

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

Important *aspects of impacts* include:
- the types of change and their severity
- the scale and magnitude of environmental changes caused by the plan
- the duration of impacts.

Box 3 presented the criteria included in Annex II of the Directive for determining the likely significance of effects. Box 17 illustrates some of the factors that are likely to increase the significance of impacts on biodiversity.

Thresholds or targets can be used to evaluate impacts. This is relatively straightforward for BAP species and habitats, but less easy for 'wider biodiversity interests'. Determining significance often requires expert judgment and is therefore likely to require specialist input from professional ecologists.

Box 17. Factors likely to increase significance of impacts on biodiversity

Activities or environmental changes that:
…are of a similar type to and exacerbate existing threats to biodiversity
… have repeated impacts on the same biodiversity resources at such a frequency that their recovery might be compromised
…have long-term effects in relation to species-lifecycles
….have irreversible impacts on biodiversity, ie impacts from which spontaneous recovery is impossible and there are no known effective mitigation techniques
..affect areas where biodiversity is already exposed to significant threat, eg through habitat loss or fragmentation
… are crowded in one location, or have significant effects on certain components of biodiversity or on a high proportion of the resource within the study area
…exacerbate environmental deterioration such that critical thresholds may be reached
…make a significant contribution to 'in-combination' or cumulative effects on biodiversity
… result from projects that are space- or resource-hungry, eg occupying large areas or using large volumes of water
…affect areas covered by BAPs

Habitats can be classified in terms of their sensitivity to perturbation in order to assist in impact prediction (and the selection of appropriate mitigation measures). For example classification of saltmarsh plants in relation to their ability to recover from oil spillage to identify suitable sites for oil terminals that would be relatively resilient from a biodiversity point of view (Baker, 1979).

Comparing alternatives

Where the SEA considers either/or alternatives (see Section 4.6), it will need to summarise, compare and document them. This is often done using a matrix. For instance Table 11 shows a matrix which compares the impacts of six options for flood management in relation to biodiversity objectives.

To specifically address the biodiversity implications of alternatives the following stepwise approach is recommended:

1. Identify and review all feasible alternatives;
2. If viable alternatives are available, screen out any alternatives likely to affect a site of international or national importance for biodiversity: an alternative option damaging such a site should only be selected for reasons of over-riding public interest if no other suitable alternative is available;
3. For remaining alternatives, identify any significant impacts on biodiversity and review these. Consider whether impacts can be avoided by altering the design, timing or location of proposed activities;
4. Where it is not possible to re-design aspects of the plan to avoid impacts on biodiversity, consider whether the biodiversity affected will be able to recover independently or whether mitigation and/or compensation will be required;
5. If mitigation/compensation is required, are there tried and tested techniques available which can be used? Consider the likely recovery time for biodiversity with and without mitigation. Also consider the possible need for advance implementation of mitigation to avoid temporary loss of biodiversity during plan implementation.

Making trade-offs

Only rarely will a plan lead to decisions that improve all aspects of sustainability - social, economic and environmental. In most cases hard choices about trade-offs will need to be made. SEA does not determine decisions, but informs them. Making trade-offs is not part of the SEA process, but identifying the need for trade-offs and suggesting possible solutions that achieve as many plan objectives as possible is. Nevertheless, there are likely to be circumstances where choices have to be made between very different biodiversity interests. For example, creation of new saltmarsh to compensate for losses due to climate change and coastal squeeze might result in the loss of coastal and floodplain grazing marsh.

Table 11. Example of matrix to compare options, adapted from the Environment Agency's Lower Parrett and Tone Flood Management Strategy

	Option					
Measurable attribute/ target	**A**	**B**	**C**	**D**	**E**	**F**
Biodiversity, flora, fauna						
Area/ %/ proportion of sites in favourable condition	Deterioration in current designated interests but new and different interests would develop	No change	Possible reduction in uncontrolled flooding, for lower order events. Compensatory water management capability required. Risks associated with incomplete understanding of requirements	Reduction in depth and duration of flooding on one designated site Enhanced 'water feed' arrangements required to ensure favourable condition can be provided, together with agreed operating regime	As for D but introduces option for additional flood storage on new sites	Greater volumes of flood storage required. Could have some benefits in terms of increasing areas with splash flooding, increasing the area of land meeting favourable condition requirements
BAP habitats and species are maintained or enhanced in line with targets	Change in habitat for current priority BAP habitats and species, particularly associated with climate change	No change, possible highly localised impacts associated with works	Risks to some BAP species from works at specific locations	As for C	Possible benefits from winter flood storage, eg through additional Raised Water Level Areas (RWLAs)	Possible benefits from winter flood storage, eg through additional RWLAs
Area/ length of ditch/ % in favourable condition	Gradual loss of ditches as habitat features	No significant impact	No significant impact	Opportunities for localised improvements	Possible benefits for aquatic habitat: restored/new ditch networks associated with flood storage	Possible benefits for aquatic habitat and restored/new ditch networks associated with flood storage

4.8 Mitigation

Aim	® Questions to ask	Checks to carry out
∉ Avoid, reduce, ameliorate or compensate for adverse impacts where appropriate ∉ Determine significance of impacts after mitigation (residual impacts)	∉ What opportunities are there for avoiding impacts on biodiversity, reducing the severity of impacts, restoring existing damage, and enhancing biodiversity? ∉ What significant impacts on biodiversity remain after mitigation? ∉ Are there opportunities to compensate for these, e.g. through habitat restoration elsewhere?	© ∉ Will implementation of recommended mitigation measures result in biodiversity objectives being met? ∉ Are the recommended measures tried and tested and known to work? ∉ Will there be any temporary or permanent loss of biodiversity interest? ¥ ∉ Are there opportunities for enhancement of biodiversity interest in the 'wider countryside'? ∉ Have all available mitigation opportunities been identified?

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

Mitigation can take a wide range of forms, but due to the limited effectiveness of many ecological restoration measures, every effort should be made to avoid significant adverse impacts on biodiversity before resorting to other measures (using the avoid-reduce-compensate-enhance sequence). Some adverse effects might be *avoided* through changes to the plan, such as adding, deleting or refining aspects of the plan or bringing forward new alternatives (e.g. Box 18). Where environmental impacts cannot be avoided, it may be possible to *limit damage*. In some cases biodiversity would recover spontaneously if affected by proposed plan, and no "mitigation" other than time is required. In other cases, mitigation could be put into effect through provisions in later plans, requirements to carry out EIA for specific types of projects, etc. (e.g. Box 19).

Habitat creation and restoration are often promoted to mitigate adverse ecological impacts. However they are often ineffective or take a long time for satisfactory results to be achieved. *Compensation* should therefore only be used as a last resort, if loss of biodiversity is considered unavoidable. Mitigation banking can also be considered, possibly tied to BAP targets. This requires developers to compensate for loss or damage to any natural or semi-natural habitat by providing equivalent replacement habitat in terms of both quantity and quality). This technique is extensively used in the US for wetlands.

Biodiversity *enhancements* should be sought wherever possible, and provision of compensatory habitat through SEA offers significant opportunities for this. Box 20 gives an example of biodiversity enhancement.

Mitigation should aim to:

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

Box 18. Example of mitigation measures – changes to the plan identified through SEA: Sefton Unitary Development Plan

An Appraisal Group composed of officers from Sefton Borough Council assessed the impacts of the different chapters (e.g. on nature conservation) of the Sefton Unitary Development Plan. The assessment for two of the chapters is shown below. The score indicates whether the Appraisal Group found the chapter to be broadly positive or negative in terms of sustainability. The policy authors then adapted the plan in response to the main issues raised by the appraisal group. Their response – essentially a form of mitigation measure – is shown in the last column.

Chapter on	Main issues raised by Appraisal Group	Score	Response of Policy Authors
Nature Conservation	to make explicit the hierarchy of protection to give clearer guidance on how habitats can be enhanced to harmonise the language used in order to aid comprehension of the chapter	-/++	Policies changed to clarify the hierarchy of sites and the level of protection Reference made to habitat enhancement Consistent terms used in policies
Environmental Protection	need for a strategic policy to minimise environmental risk posed by developments	+	New policy included gives framework for managing the environmental risk of development

Sefton Council (July 2002) Report on the Sustainability Appraisal of the First Deposit Draft

Box 19. Example of measures to ensure that a plan is implemented appropriately: Importation of honeybees into Canada

The Canadian Food Inspection Agency undertook an SEA of the practices and rules for importing European honeybees, to ensure that imported honeybees are disease free and to prevent the introduction of other potentially harmful bee species into Canada (see also Section 4.3). Part of the measures put in place to prevent these problems are 1. protocols that outline detailed conditions that must be adhered to by importers in order to receive an import permit, and 2. a "Class Screening Project Report" which must be completed by importers who wish to import honeybees into Canada and submitted to the CFIA.

Box 20. Example of enhancement potential: Needingworth quarry, Cambridgeshire

Needingworth quarry, Cambridgeshire, will be turned into a huge new wetland over the next 30 years as sand and gravel is extracted and a new landscape created. The restoration of this 700-hectare site is happening due to a partnership between Hanson Aggregates and the RSPB, facilitated by Cambridgeshire County Council. The wetland will include nearly 40% of the UK biodiversity target for reed bed creation, will provide vital habitat for a range of wildlife (including bitterns) and 32 km of new rights of way. The project was awarded a RTPI National Planning Award in 2000 and described as setting 'a new standard for future restoration projects following mineral extraction on a major scale'. (RSPB, 2002)

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

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

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

4.9 Monitoring

® Aim	© Questions to ask
Propose a monitoring programme and auditing procedures	≠ What biodiversity issues need to be monitored? ≠ What indicators/measures are to be used as a basis for monitoring and who will be responsible for data collection? ≠ Is there a high level of uncertainty about predicted impacts or plan-outcomes for biodiversity? If so, recommend monitoring to reduce uncertainty.

The SEA Directive requires monitoring of "*the significant environmental effects of the implementation of plans and programmes in order,* inter alia, *to identify at an early stage uforeseen adverse effects, and to be able to undertake appropriate remedial action*" (Article 10).

Monitoring in SEA:

- allows the implementation of the plan to be checked, and remedial action to be triggered if unforeseen or undesirable negative impacts occur;
- helps to ensure that sufficient information about biodiversity is available for reliable impact predictions to be made in subsequent EIAs;
- helps to fill data gaps for the next round of SEAs (e.g. Box 21);
- makes it possible to compare predicted and actual effects for auditing and quality assurance of SEA; and
- increases the general availability of biodiversity data.

Box 21. Example of the need for monitoring: Extract from draft SEA for flood management on the Lower Parrett and Tone

"*Water level monitoring in both summer and winter is required to enable appropriate water management that will sustain nature conservation value and ensure that the needs of land managers can be met. Reliable information on water levels will become all the more important if there is a move away from relying on flooding to deliver water requirements on designated sites and towards a more managed system. [However] lack of comprehensive baseline data on topography, soil water levels and species distributions (particularly for plants and invertebrates) has constrained this ability.*

A network of gauge boards and remote sensors is required at key structures, including pumping stations, together with a system for monitoring, recording and reporting water levels. This would have to be combined with review and archiving of historical data to provide a historical context for any changes that are detected. The need for comprehensive monitoring of water levels will apply to other strategies for the Somerset Levels and Moors and should not be considered solely in relation to this strategy."

Environment Agency, 2003, Lower Parrett and Tone Flood Management Strategy draft SEA

Local Records Centres play an important part in biodiversity monitoring and are beginning to coordinate their activities regionally to ensure that data formats are compatible and information can be shared. The National Biodiversity Network will become increasingly important as a mechanism for storing monitoring data. Regional Observatories are increasingly important in the coordination of monitoring and provision of information. For instance Yorkshire's Regional Development Agency, Yorkshire Forward, has worked with the Regional Assembly to strengthen the Regional Observatory as a mechanism for delivery of data and information.

An SEA monitoring framework should be established setting out:

- What biodiversity information is needed to check whether the plan is being implemented correctly, and whether it is having unforeseen effects
- How much of this information is available or needs to be collected; by whom; and how often
- Thresholds for triggering remedial action, and what the remedial action should be
- Mechanisms for disseminating biodiversity information collected, e.g. in EIA or second-generation SEAs.

Table 12 gives a possible monitoring framework.

Table 12. Possible framework for SEA monitoring (ODPM, 2003)

SEA objective	What to monitor (indicator)	Where do monitoring data come from?	How often	When should action be considered?	What could be done if a problem is identified?
protect biodiversity at ecosystem, species and genetic levels	condition of designated sites and other sites of nature conservation importance	English Nature, National Biodiversity Network, Wildlife Trusts	every 2 years	When condition gets worse	consider ways of improving biodiversity protection, e.g. provision of wildlife corridors
improve air quality	air quality at monitoring points A, B and C	environmental health	monthly	When national air quality standards are exceeded	implementation of voluntary Air Quality Management Area

4.10 Consultation and decision-making

® Aim	© Questions to ask
Ensure that the opinions and information held by stakeholders are taken into account. Avoid conflict and enhance 'buy-in'.	∉ Have we been consulted? ∉ Have our concerns and interests been taken into account? ∉ Has consultation influenced the content and direction of the plan to benefit biodiversity interests?

The SEA Directive requires the responsible authority to provide early and effective opportunities for relevant 'environmental authorities' and the public to express their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or its submission to any relevant legislative procedure (Article 5). The responsible authority must also publish a statement when their plan is adopted which summarises how environmental – including biodiversity – issues have been taken into account in the plan-making process (Article 9).

SEA feeds into all stages of the plan-making process. As such, several rounds of SEA consultations may be necessary for a given plan, for instance:

- ∉ Screening: determining if a plan or programme requires an SEA (Article 3(6)).
- ∉ Scoping: deciding on the scope and level of detail of the information which must be included in the environmental report (Article 5(4)).
- ∉ Consulting more widely on the draft plan and accompanying environmental report (Article 6(2)).
- ∉ Decision to adopt: Information must be made available on the plan adopted, consultations, decisions made, and monitoring measures (Article 9(1)).

Techniques for *public* consultation are reviewed at Section 6.2. Chapter 1 lists the designated UK *environmental authorities* ('consultation bodies'): these may be consulted more often, and using different techniques, than the public. In England, the consultation bodies are producing joint guidance on the service and standards that they expect to provide in relation to the SEA Directive.

It can be helpful to record the results of consultation and to include them in the SEA report. Table 13 shows a possible structure for this. Box 22 shows an example.

Table 13. Possible structure for recording consultation responses

Organisation	Issue	Concern/ comment	How addressed in the SEA process	SEA report reference/ page number

Box 22. Example of responses to consultation: Wyre flood and coastal defence

A study was carried out to help inform the development of a coastal and tidal defence strategy for the tidal part of the River Wyre. This was informed by consultation with a range of organisations. The box shows how the results of consultation were documented and taken on board using a matrix. An extract of this is shown below.

Organisation	Description	Concern/comments
Lancashire Wildlife Trust	Importance of impact of various management options on species, habitats of biodiversity importance	Study Area SSSI / Biological Heritage Sites. Re-iterate concerns that potential impacts of preferred management options are fully assessed. Take account of new information e.g. otters, priority species, have been recorded higher up the Wyre during 2000
	Integrate proposed management options with other initiatives	Emphasise the need to consider the other initiatives in progress within the study area that may be fundamentally affected by the strategy outline
MAFF	Post project appraisal	The impact of coastal protection work at Morecambe Bay has led to conflict involving Lancaster City Council and fishermen who claim loss of earnings as a result of siltation effects. It is important that Shoreline Management Plan projects clearly identify their impacts on human driven activities in order to avoid potential litigation

Wyre Borough Council (July 2001) Wyre Flood and Coastal Defence Strategy Study SEA.

5. Links to other types of environmental assessment

Chapter aim:	Chapter structure:
To explain how SEA can be integrated with other forms of environmental assessment.	∉ Introduction ∉ Sustainability appraisal ∉ Appropriate assessment ∉ Environmental impact assessment ∉ Managing overlapping and tiered assessment processes

5.1 Introduction

A range of different assessment techniques already apply to policies, plans, programmes and their resulting projects; some overlap with SEA, and some will use SEA as a context or starting point. This chapter considers three of these in more detail:

- ∉ *Sustainability appraisal*: this is already normally carried out for some policies, plans and programmes, and will become mandatory under the forthcoming planning reforms. It is "broader" than SEA in that it also considers social and economic as well as environmental issues, but as currently carried out is not as "deep" as SEA in the rigour of its requirements.
- ∉ *Appropriate assessment* carried out under the Habitats Directive for plans[9], programmes and projects that affect Natura 2000 sites: many of its provisions for plans and programmes overlap with the biodiversity analysis required by the SEA Directive, and both need to feed into appropriate assessment for projects.
- ∉ *Environmental impact assessment* (EIA) has similar requirements to SEA but applies to projects, not plans and programmes. SEA-level decisions and data will affect EIA, and EIA data can support SEAs.

This chapter focuses particularly on appropriate assessment because of its implications for biodiversity. It concludes with some principles for managing overlapping and tiered assessment processes.

5.2 Environmental and sustainability appraisal

"Environmental appraisal" of policies, plans and programmes has been carried out in the UK since 1990 (DoE, 1990), and was broadened to "sustainability appraisal" in the late 1990s. Essentially appraisal involves identifying environmental objectives and indicators (e.g. air quality, urban "liveability") that could be affected by the plan; ensuring that the plan is in accordance with government environmental and planning advice; determining whether the plan's objectives/policies are internally consistent; and assessing the plan policies' likely effects on the environmental objectives.

[9] The Habitats Directive explicitly requires assessment for plans but not programmes. However a 'plan', under the Habitats Directive, may have the characteristics of a 'programme' under the SEA Directive, since it is impossible to provide a rigorous distinction between plans and programmes. (EC, 2003)

Most applications of environmental/sustainability appraisal have been at the local and regional level, supported by various guidance documents (e.g. DoE 1993, DETR 1999, NAW 2002). At the national level, integrated/sustainability appraisal is recommended by a range of documents (e.g. Cabinet Office, 2003; DEFRA, 1998), although it is unclear how consistently they are applied in practice. Under the proposed planning reforms of the Planning and Compulsory Purchase Bill, sustainability appraisal of English and Welsh land use plans will become mandatory. ODPM has commissioned guidance on sustainability appraisal of local and regional land use plans that integrates SEA: this is due in mid-2004.

Sustainability appraisals as currently carried out would fulfill many of the requirements of the SEA Directive, including a description of:

- main objectives of the plan and its relationship with other relevant plans and programmes;
- environmental protection objectives; and
- the likely significant effects of the plan or programme on the environment.

However, they often:

- do not describe the baseline environment;
- include little or no consideration of alternatives;
- do not make rigorous quantitative predictions;
- offer little in the way of clear mitigation measures; and
- are not consulted on (Therivel and Minas, 2002).

Biodiversity has not featured significantly in sustainability appraisal to date.

Where both SEA and sustainability appraisal need to be carried out for the same plan or programme, it is more efficient to integrate the processes. However two key provisos apply. Firstly, SEA's environmental considerations must not be diluted. Sustainability appraisal covers a broader range of issues than SEA. Many decision-makers like this because it allows them to show the full range of costs and benefits that they have taken into account in decision-making. However the down side of this is that the original *raison d'etre* for such appraisal– to take due account of the environment in decision-making – may become lost. Indeed, the ODPM (2003) guidance notes that: "Where sustainability appraisal objectives are used, care should be taken to ensure that a good balance is found between social, economic and environmental considerations and that the requirements of the Directive are fully met". More specifically, as appraisal is expanded to cover more issues, and thus becomes a more broad-brush, interdisciplinary process, consideration of the complex and technical aspects of biodiversity, and the weight that it is given in decision-making, must not be reduced. Addressing this potential pitfall is a strong part of the rationale for this guidance.

Secondly, SEA's emphasis on solving environmental problems must be maintained. To the extent that sustainability objectives can be achieved whilst also improving the environment, the two approaches are complementary rather than conflicting. However the consideration of future visions – promoted by sustainability appraisal's emphasis on testing the plan against sustainability objectives - should not mean that today's environmental problems are given less prominence.

5.3 Appropriate assessment

The Habitats Directive

The Directive on Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC - the "Habitats Directive" - is the key European legislation for protecting biodiversity. The Habitats Directive aims to "*contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies*." (Art. 2). It does this by identifying a pan-European network – Natura 2000 – of Special Protection Areas[10] and Special Areas of Conservation; and by protecting these sites against development through "appropriate assessment".

Box 23 cites the core "appropriate assessment" requirements of the Habitats Directive. Essentially, any "plan or project", alone or "in combination with" other plans or projects, that is "likely" to have a "significant" effect on a "site" requires "appropriate assessment". If, following appropriate assessment, it cannot be ascertained that the plan/project will not adversely affect the "integrity" of the site, then it should not be permitted unless there are no "alternative solutions" and it needs to be carried out for "imperative reasons of overriding public interest"; in such cases the Member State must take "all compensatory measures" necessary to ensure the overall coherence of the Natura 2000 network. Clearly, each of these key concepts is open to interpretation. Box 24 gives more detail on key terms. Box 25 lists key guidance on implementing the Habitats Directive.

Box 23. Habitats Directive Articles 6(3) and 6(4)

"6(3) Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

6(4) If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.
Where the site concerned hosts a priority natural habitat type and/or a priority species the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

[10] under Art. 4 of Directive 79/409 on the conservation of wild birds (the "Birds Directive")

Box 24. Interpretation of key words in Habitats Directive Articles 6(3) and 6(4)

Plan or project also includes programmes but not policies. A plan or project located some distance away from a site could still have significant effects on the site and could still require appropriate assessment.

In combination with refers to effects caused by projects/plans that are completed; approved but uncompleted; or not yet proposed. Completed plans and projects must also be taken into account if they have continuing effects on the site and point to a pattern of progressive loss of site integrity. Cumulative effects may also occur as a result of other pressures on sites, habitats and species that do not arise from defined plans or projects. An understanding of the baseline conservation status of the site is essential to carry out a cumulative effects analysis.

Likely implies a precautionary approach.

Significance of effects should be determined in relation to the specific features and environmental conditions of the protected sites concerned by the plan or project, taking particular account of the site's conservation objectives.

Sites include SPAs, SACs, Ramsar sites, and Candidate SPAs and SACs.

Appropriate assessment should focus on the implications for the site in view of the site's conservation objectives. It could usefully draw on the methodology of project environmental impact assessment. The appropriate assessment should be recorded and reasoned, else it does not fulfil its purpose and cannot be considered 'appropriate'.

The *integrity* of the site involves its ecological functioning. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives.

Alternative solutions could involve alternative locations, processes, scales or designs plus the 'zero-option'.

Imperative reasons of overriding public interest refers to situations where plans or projects envisaged prove to be indispensable within the framework of actions or policies aiming to protect fundamental values for citizens' lives (health, safety, environment); fundamental policies for the State and society; or carrying out activities of an economic or social nature, fulfilling specific obligations of public service". Various lawsuits (Miles, 2003) have determined that this is a provision that is difficult to achieve.

Compensatory measures aim to offset the negative impact of a project on the coherence of the Natura 2000 network and to provide compensation corresponding precisely to the negative effect on the species or habitat concerned. The compensatory measures constitute the 'last resort'.

Article 6 of the Habitats Directive is normally implemented using the following steps:

1. Screening - identify the likely impacts on a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and consider whether these impacts are likely to be significant.
2. Appropriate assessment - consider the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there may be adverse impacts, assess the potential mitigation of those impacts;

3. Assessment of less damaging alternative solutions - examine alternative ways of achieving the objectives[11] of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site;
4. Assessment of imperative reasons of overriding public interest – examine the nature of the plan or project's public interest and whether that should be considered both overriding and imperative; and
5. Assessment of compensatory measures - assess compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest, it is deemed that the project or plan should proceed (EC DGXI, 2001).

Implicit in the Habitats Directive is the application of the precautionary principle, which requires the conservation objectives of Natura 2000 to prevail where there is uncertainty. This means that for a plan or project to proceed the decision-maker should demonstrate, with supporting evidence, that:

- there will be no significant effects on Natura 2000 site (1. Screening); or
- there will be no adverse effects on the integrity of a Natura 2000 site (2. Appropriate assessment); or
- there are no alternatives to the project or plan that are likely to have less adverse effects on the integrity of a Natura 2000 site (3. Assessment of less damaging alternative solutions) and it should proceed for imperative reasons of overriding public interest (4. Assessment of imperative reasons of overriding public interest); and
- there are compensation measures which maintain or enhance the overall coherence of Natura 2000 (5. Assessment of compensatory measures).

A review of appropriate assessments (Miles, 2003) suggests that, since the Habitats Directive became operational in 1994, development plan policies that would adversely affect a European site are often removed from draft plans.

Box 25. Key guidance on the implementation of the Habitats Directive

- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC' (EC, 2000)
- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC DGXI, 2001)
- Conservation (Natural Habitats, &c.,) Regulations 1994 SI/1994/2716 (The Habitats Regulations 1994) and Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (The NI Habitats Regulations)
- English Nature's "Habitat Regulation Guidance Notes":
- HRGN 1 The Appropriate Assessment (1997)
- HRGN 2 The review of existing planning permissions and other consents (1997)
- HRGN 3 The determination of likely significant effect (1999)
- HRGN 4 Alone or in combination (2001)
- HRGN 6 The condition imposed on Permitted Development by the Habitat Regulations (2001)
- EU Habitats and Birds Directive: Handbook for Agency Permissions and Activities (2003)

[11] Defining these objectives is critical. Most developers define them in the private not the public interest. This fundamentally alters the basis on which such an assessment of alternatives is done. Given that the next test in Article 6(4) is one of reasons of overriding public interest, it is logical that in determining whether there is a less damaging alternative, one must assess that against the plan/project's public interest objectives. To do otherwise automatically limits the scope of the test in favour of the proponent as opposed to the Natura 2000 site.

Commonalities and differences

There are several commonalities between appropriate assessment and SEA:

- plans and programmes that require appropriate assessment are also likely to require SEA under the SEA Directive (art. 3.2(b));
- both give considerable emphasis to cumulative impacts and alternatives;
- both involve the preparation of an assessment report and consultation of authorities responsible for the environment.

However there are also key differences that must be taken into account when the two procedures are integrated, including:

- SEA focuses on and helps inform the plan-making process, whilst appropriate assessment focuses on and helps dictate the plan outcome as well as the plan-making process, i.e. the impact it may have on the integrity of designated sites;
- SEA considers biodiversity broadly, whilst appropriate assessment focuses on the integrity of designated sites;
- Under the Habitats Directive, if the plan is found to have a risk of an adverse impact on the integrity of the site, the plan can only be adopted under the limited conditions of Article 6(4). Under SEA, the environmental report and consultation findings must "be taken into account", but no corresponding thresholds exist.

Table14 summarises these and other differences.

Table 14. Key differences between SEA and appropriate assessment

	SEA Directive / SEA	Habitats Directive / appropriate assessment
screening	Complicated "and/or" approach. Plans and programmes that require appropriate assessment may also require SEA (art. 3.2(b))	"The term 'plan'... has a broad meaning, including land-use plans and sectoral plans or programmes but leaving out general policy statements. Plans and projects related to conservation management of the site… should generally be excluded" (EC 2000)
focus	Focuses on the decision-making process: competent authorities are expected to show that they have gone through the correct procedures when preparing their plan	Focuses on protecting the integrity of Natura 2000 sites
expertise needed	Normally carried out by generalists: the competent authority and/or planning or environmental consultants	Initial analysis normally carried out by ecological experts but final assessment carried out by the competent authority.
role of biodiversity	Broad: considers "the likely significant effects on the environment, including on issues such as biodiversity… fauna, flora… and the interrelationship between the above factors" (Annex I(f))	More limited: tests whether a plan affects specific designated sites and, where relevant, their surrounding area to assess whether the integrity of the designated sites should be adversely affected.
baseline data needed	Considers "relevant aspects" of the baseline environment, the environmental characteristics of areas likely to be significantly affected, and existing environmental problems, including those affecting Natura 2000 sites (Annex I,b-d)	More location-specific than SEA, in that any one assessment deals with a clearly defined site.
treatment of cumulative impacts	In impact assessment: The prediction of effects "should include secondary, cumulative, synergistic… effects" (Annex I(f)).	In screening: "Any plan or project... likely to have a significant effect… either individually or in combination with other plans or projects, shall be subject to appropriate assessment" (Art. 6(3)). In impact assessment: "determine whether or not the project or plan, either alone or in combination with other projects or plans, will have an adverse effect on the integrity of the site" (EC, 2000).

significance criteria	Annex II lists criteria for determining whether a given plan or programme will have "significant" effects, relating to 1. the characteristics of the plan/programme, and 2. the effects and the area likely to be affected. The "value and vulnerability of the area likely to be affected…" is one (out of 7) of the latter criteria.	"the significance of effects should be determined in relation to the specific features and environmental conditions of the protected site concerned by the plan or project, taking particular account of the site's conservation objectives" (EC, 2000)
links to project assessment	Different assessment processes apply to projects (EIA Directives 85/337 & 97/11) than to plans and programmes.	The same assessment process applies to plans and projects.
contents of the report	The contents of the environmental report are listed in Annex I. The report "shall include the information that may reasonably be required…" (Art. 5.2).	No formal contents list given: "[A]n assessment should be recorded… [and] sufficiently reasoned to allow the right decision to be taken... It could in its methodology usefully draw on the methodology envisaged by Directive 85/337/EEC" (EC, 2000).
consultation	Requires consultation of environmental authorities at the scoping stage; and consultation of environmental authorities and the public before the plan or programme is adopted (Art. 5.3, 6.1, 6.2).	The final decision rests with the competent authority: "The competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public" (Art. 6(3))
decision	Informs decisions: The environmental report and consultation results are "taken into account" in plan-making (Art. 8)	Constrains what decisions can be made: if the plan is found to risk an adverse effect on the integrity of the site, the plan can only be adopted under the limited conditions of Article 6(4).
provision of post-decision information	The public, environmental authorities, and other affected Member States must be informed on the decision and how environmental considerations were integrated in it (Art. 9)	No similar requirements. The European Commission must be informed of compensatory measures adopted (Art. 6(4)).
monitoring	Monitoring of the plan or programme's significant environmental effects is required (Art. 10.1)	The Directive does not require monitoring. However Art. 6(2) obliges Member States to take appropriate steps to avoid [likely] deterioration of SPAs/SACs: this implies that they should monitor the condition of SPAs/SACs to be able to detect deterioration and to intervene as appropriate. Similarly, the efficacy of any compensatory measures must be secured, which implies establishment of an appropriate monitoring regime. Article 11 imposes more general monitoring requirements for these habitats and species referred to in Article 2.

Integrating SEA and appropriate assessment

UK Government policy is that Articles 6(3) and (4) of the Habitats Directive (which relate to “appropriate assessment”) do not apply to development plans [PPG 9: Nature Conservation (2004), “*Development in this context does not include development plans, since the plan itself cannot authorise developments that would affect the site*]”. This policy is not, however, contrary to the need for an SEA to be carried out on *plans or programmes* as directed by 2001/42/EC. Government intends to apply the requirements of that Directive to Development Plans by virtue of Article 3(2)(a) rather than on the basis of their being subject to the requirements of the Habitats Directive (Article 3(2)(b)). The requirement for an “appropriate assessment” of development plans remains contrary to existing Government policy.

Authorities are only just starting to carry out integrated SEA and appropriate assessment, so there is not much practical experience to refer to. However the EC (2003) has issued guidance on how to interpret the SEA Directive, which includes some information on how SEA and appropriate assessment can be integrated:

> *"A combined procedure may be carried out provided it fulfils both the requirements of the SEA Directive and the Habitats Directive. In this case, the procedure has to include the procedural steps required by the SEA Directive, and the substantive test regarding the effect on protected sites required by the Habitats Directive."*

Figure 4 shows how the two processes can be integrated, and includes the EC (2003) advice. Box 26 shows how "in combination" effects can be addressed in appropriate assessment. Box 27 discusses links between plan and project level appropriate assessment.

Box 26. Cumulative and in-combination effects in appropriate assessment

By identifying in-combination effects, SEA can act as a scoping stage for appropriate assessment.

For Natura 2000 sites it is necessary to carry out an assessment of “in combination” effects, focusing on potential sources of impact due to recent or planned development and taking account of formal, or planned developments:

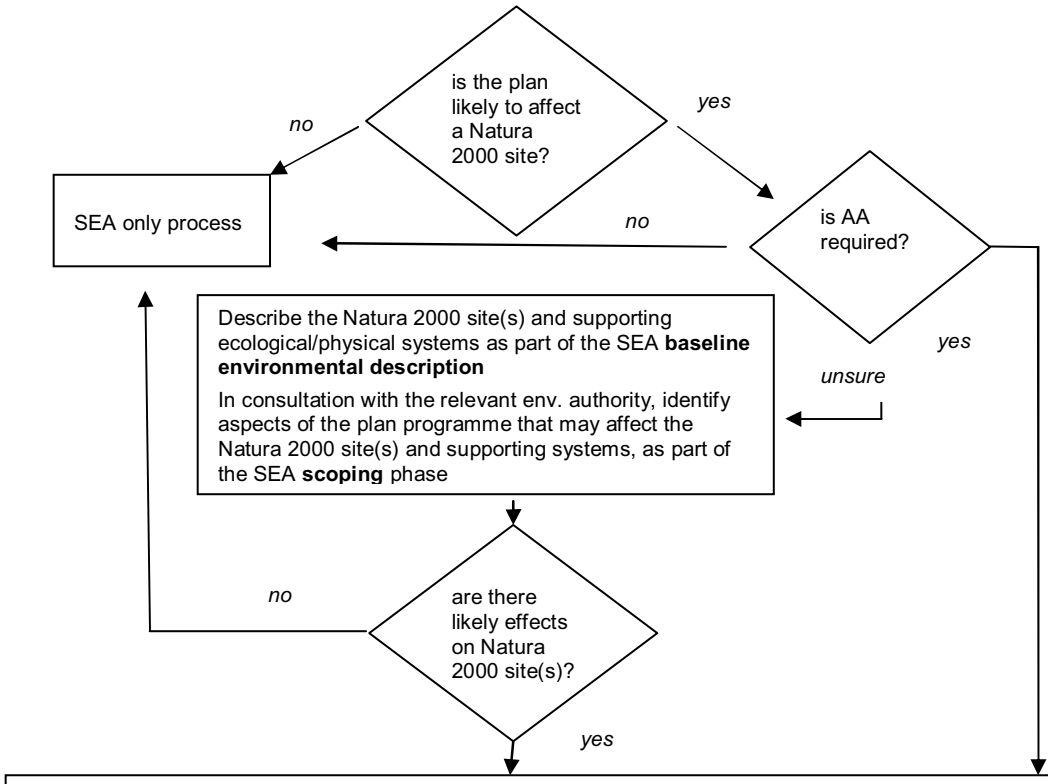
- Identify the spatial boundary of the affected site(s) and supporting ecological/ physical systems (the buffer). The size of the buffer will depend on the impacts involved. Ensure the totality of the SPA/SAC is looked at, not just that part of it within the particular plan administrative boundary.
- Identify any relevant draft, deposit or approved plans/policies/allocations (e.g. from the SEA stage of showing links to other plans and programmes) plus any existing, approved and proposed projects that fall within the buffer and may have an 'in combination' effect with the plan. They should be identified by the impact they cause, not the distance at which they are found.
- Predict the "in combination" effects of all relevant plans/policies/allocations, possibly using scenarios (e.g. assuming full roll-out of all proposed development). This should be done in consultation with the relevant statutory conservation body, the developer and the plan proponent. The precautionary principle should be used.

Appropriate assessment requires consideration of in-combination effects because they contribute to cumulative impacts on biodiversity. These may result from in-combination effects of development but also from a variety of other sources (see Section 4.7). For example, the Ouse Washes are deteriorating due to a change in the pattern of flood events, and many urban/semi-urban heaths are suffering urbanisation effects due to too many people using them. Neither is readily attributable to specific plans or projects. In assessing the significance of in-combination effects for biodiversity it will therefore be necessary to also consider the full range of factors affecting biodiversity status.

Having identified in-combination effects:

- Assess the conservation status of the affected site(s) and determine whether or not it is favourable – seek advice from the relevant statutory conservation body.
- Identify any causal factors giving rise to actual or likely deterioration of the site’s favourable conservation status (normally carried out as part of the baseline assessment) and review in relation to the potential impacts of the plan.
- Do these threats increase the risks to biodiversity from in-combination effects of other proposals?

Figure 4. Integrating SEA and appropriate assessment[12]



Consider **alternative** ways of achieving the plan/programme's objectives that minimise environmental impacts, including impacts on the integrity of Natura 2000 sites. This could include changing the plan/programme.

Predict and evaluate impacts of the plan/programme and alternatives on the environment, including on biodiversity generally and on the integrity of Natura 2000 sites specifically. The predictions should include cumulative/in-combination effects. Identify significant negative impacts, including on Natura 2000 sites. In cases of uncertainty, apply a precautionary approach.

Mitigate significant negative impacts on biodiversity generally. Mitigation can include rules for project-level implementation, e.g. requirements for EIA or project-level appropriate assessment or removal of Permitted Development Rights for some projects. This may be appropriate for establishing a project-level decision-making framework where an “adverse effect” is uncertain and where it is considered that mitigation measures are likely to be successful in removing any potential adverse effect. Where the effects are less amenable to mitigation or there is too little information available to predict those effects, then ruling out aspect of the plan should be considered unless it can manifestly pass the alternatives/"imperative reasons of overriding public interest" tests.

"Effects on protected sites and on selected species in accordance with the Habitats Directive are part of [the SEA's **environmental report**]. It may, however, be preferable to describe them in a separate chapter as the findings on such effects are binding for the decision of the competent authorities on the plan or programme." (EC, 2003)

"The [SEA] **consultation** also includes the effects of the plan or programme on the sites and species, which are specially protected under the Habitats Directive." (EC, 2003)

Make decision: "If the plan or programme is found to adversely affect the integrity of the site concerned ,the plan or programme may be adopted only under the limited conditions described in Article 6 of the Habitats Directive. For other effects on the environment, the relevant national legislation under the Habitats Directive describes the conditions under which the plan or programme may be adopted." (EC, 2003)

"The **statement summarising how environmental considerations have been integrated into the plan or programme** also includes the decision about whether the plan or programme conforms to the Habitats Directive." (EC, 2003)

"The effects on the environment of implementing the plan or programme have to be **monitored**. This monitoring includes effects on the sites and species protected under the Habitats Directive." (EC, 2003)

[12] assuming that appropriate assessment can also apply to plans and programmes: see text at beginning of this section

Box 27 Links between plan and project level appropriate assessment

Plan-level appropriate assessment or SEA may identify site allocations or types of projects that should not proceed, and remove them from that plan. This would obviate the need for project-level appropriate assessment for those sites or projects. Similarly, project-level appropriate assessment may identify plan allocations that should not have been made because of their impact on Natura 2000 sites (Miles, 2003).

Agreement in principle about the nature of compensatory measures reached at the plan level can allow developers to move forward on individual projects which could have an adverse effect on a site but which are considered likely to meet the no alternatives and imperative reasons of overriding public interest tests.

5.4 Environmental Impact Assessment

EIA aims to minimise the environmental harm of development projects by identifying and mitigating their impacts before they are approved and built. It involves identifying whether the project requires EIA, identifying key issues for analysis, describing the existing baseline environment, describing the proposed project and alternatives, predicting the project's environmental impacts, and attempting to avoid or minimise any negative impacts. This information is normally prepared by the developer, delivered as an "environmental statement" to the competent authority (e.g. the local planning authority) with the planning application, made available for comment by the public and statutory consultees, and considered by the competent authority when a decision about the proposed project is taken.

In European Member States, EIA is required through EC Directive 85/337 *on the assessment of the effects of certain public and private projects on the environment* (amended by Directive 97/11): the "EIA Directive". In the UK the EIA Directive has been translated into several regulations, notably the Town and Country Planning (Environmental Impact Assessment) Regulations(SI99/293); the Scottish and Northern Ireland EIA Planning Regulations (Scottish Statutory Instrument 1999 No 1 The Environmental Impact Assessment (Scotland) Regulations 1999) and Statutory Rule 1999 No. 73 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999).

The EIA Directive actively deals with many types of impacts on biodiversity. It requires EIA for many projects, including those for the restructuring of rural land holdings, the use of uncultivated land or semi-natural areas for intensive agriculture, initial afforestation or deforestation for the purposes of conversion to another type of land use, intensive fish farming, and reclamation of land from the sea, where these are likely to have a significant environmental impact. Its criteria for significance include the environmental sensitivity of the area, with wetlands, coastal zones, and other areas currently under stress in Europe specifically cited. The environmental impacts that have to be discussed in EIA include those on "fauna, flora, soil, water air… and the inter-relationship between the above factors", although biodiversity is not specifically mentioned.

However EIA has arguably been less effective for ecological and biodiversity considerations than for any other impact category (Treweek, 1999). One problem is the frequent mismatch between administrative/project boundaries and patterns of biodiversity. To understand the significance of impacts on biodiversity within a small development site, it may be necessary to understand its status within a whole

catchment, ecosystem, or even country. Within the timeframes and geographic limits normally associated with EIA it is difficult to set up biodiversity studies that capture:

- Longer term trends
- Landscape- or ecosystem-scale impacts
- Cumulative effects
- Information about all relevant threats and pressures acting on biodiversity resources
- Information about the processes and functions that influence biodiversity
- The monitoring data needed to understand baseline trends or predict impacts

SEA is often seen as a way of overcoming these limitations. It also addresses wider or more fundamental considerations such as alternative solutions, strategic locational issues or cumulative impacts. It identifies threats and opportunities for biodiversity at an earlier stage in the decision-making process, and thus helps to avoid significant adverse impacts on biodiversity and identify opportunities to enhance biodiversity.

EIA is the precursor to SEA, the SEA Directive is heavily based on the EIA Directive[13], and SEA and EIA interact at several stages (see Table 15). One screening criterion for SEA is whether the plan or programme sets a framework for projects requiring EIA. EIAs and SEAs can share baseline data, monitoring systems, and impact predictions, as long as assumptions are correct and the data are up to date. Requiring EIA for specified projects, project types or locations can act as a mitigation measure in SEA.

Table 15. Links between SEA and EIA

	SEA affects EIA	**EIA affects SEA**
screening	SEA can identify specific projects that require EIA, or areas in which proposed projects should be accompanied by EIA. It can also "scope out" impacts, i.e. identify impacts that do not need to be covered at the EIA level	The SEA Directive (art. 3.2(b)) requires SEA to be carried out for plans and programmes that are likely to have significant environmental effects and that set the framework for future development consent of types of projects that require EIA.
baseline data	Baseline data collected for EIAs can inform SEAs and vice versa (though care should be taken to ensure that the baseline is up to date)	
impact prediction	Predictions made in EIAs can inform SEAs and vice versa (though care should be taken to ensure that assumptions etc. are still correct).	
mitigation	One form of plan-level mitigation is to require EIA for specific types of projects or locations	
monitoring	EIA monitoring data can inform SEA and vice versa	

5.5 Managing overlapping and tiered assessment processes

Clearly there are considerable overlaps between SEA, sustainability/environmental appraisal, and appropriate assessment. In addition, one SEA can often set a framework for other SEAs or project EIAs, or could come "under" a higher-level SEA. For instance the SEA of a Regional Spatial Strategy will affect the SEAs of the Local Development Frameworks under it. Hence, a "tiered" approach to SEA is necessary.

[13] and other countries' SEA legislation has often piggy-backed on their EIA legislation

This guidance has already discussed some specific aspects of these overlaps and tiers (e.g. Sections 4.8-4.9, 5.2-5.4). More generally, the following principles apply to overlaps and tiering (adapted from DfT, 2004):

Do:

- carefully consider how to use any findings of earlier assessments and opportunities to share information between parallel assessments (e.g. Local Transport Plans and land use plans);
- follow nationally and regionally agreed sustainability criteria and principles;
- clearly identify the role of subsequent assessments and highlight major issues that will influence or constrain the next stage…
- ... but keep the SEA strategic: avoid getting drawn into itemising every single item that requires further action (e.g. species surveys)
- record assumptions and uncertainties relating to the assessment to help subsequent assessments
- consider monitoring requirements.

Don't:

- start from scratch unless it is clear that there is genuinely no useful information available from previous planning cycles and related appraisals;
- assume that the findings of earlier assessments are up to date and accurate. Make appropriate checks;
- repeat large amounts of data from an earlier assessment in new context in which it is not appropriate;
- be afraid of identifying some issues which are appropriate to assess in more detail in subsequent assessments (where they will be carried out).

6. Toolkit

Chapter aim:	**Chapter structure:**
To briefly discuss tools for identifying, predicting, evaluating and mitigating biodiversity impacts.	∉ Expert judgment ∉ Public participation ∉ Spatial analysis techniques ∉ Land-use partitioning analysis ∉ Integrated Habitat System ∉ Network analysis ∉ Scenario/sensitivity analysis ∉ Multi-criteria analysis ∉ Vulnerability analysis ∉ Risk assessment ∉ Compatibility appraisal

This chapter introduces key tools used in identifying, predicting, evaluating and mitigating strategic-level impacts on biodiversity. Table 16 summarises possible applications for these tools. Much of this information is taken from Therivel (2004).

Table 16. Possible applications of SEA tools

Type of technique	**Technique**	**SEA stage**					
		Describe baseline	**Identify impacts**	**Predict impacts**	**Evaluate impact significance**	**Suggest mitigation**	**Ensure plan is internally coherent**
Qualitative, participatory	Expert judgment	V	V	V	V	V	V
	Public participation	V	V	V	V	V	V
Mapping and simple spatial analysis	Spatial analysis techniques	V	V	V	V	V	
	Land unit partitioning analysis			V			
Impact prediction and evaluation	Integrated Habitat System	V			V	V	
	Network analysis	V	V	V		V	
	Scenario/sensitivity analysis			V		V	
	Multi-criteria analysis				V		
	Vulnerability analysis	V		V	V		
	Risk assessment			V	V		
Sound planning	Compatibility appraisal					V	V

6.1 Expert judgment

Expert judgment involves one or more experts with relevant specialisms analysing and discussing an issue. It can be used to collect data, develop alternatives, analyse and rank them, predict impacts, and suggest mitigation measures. Expert judgment is relatively quick and cheap, can cope with unquantifiable and partial data, can lead to innovative solutions, and can foster information-sharing between the experts. However it has the potential for bias depending on who is involved, and may be non-replicable.

Example of expert judgment: Oxfordshire Wildlife & Landscape Study

Historically the focus for biodiversity conservation has centred around designated sites. Less than 4% of Oxfordshire is designated, resulting in the biodiversity importance of the wider countryside being under-represented. In 2001 a three-year national project to explore the relationship between biodiversity and landscape character was initiated in Oxfordshire which aims to guide future development consent procedures, avoiding damage to sensitive landscapes and habitats.

A detailed landscape character assessment and biodiversity appraisal was carried out using the Landscape Description Unit (LDU) framework. This required recording large scale biodiversity information (habitats present, size, extent, proximity and condition where possible). A scoring system was devised through expert judgment based on the type and range of habitats falling within each LDU, with every LDU given a “bioscore” by experts. This was used to generate a “biomap” of the county, which can be used to identify “hotspots” and to highlight those LDUs which support a particular priority habitat. The information can also be used to identify variation in quality between each LDU.

6.2 Public participation

Most funding for biodiversity management is allocated to activities which maximise the global values of biodiversity – usually conservation of globally rare species and habitats. But biodiversity is also valued locally, particularly by people who have strong immediate dependence on the variety of nature and long-standing rights over local natural resources. The public often have more understanding of their local biodiversity, and the problems it faces, than external “experts”. Public involvement may generate better conservation of local biodiversity, some of which will contribute to national and international conservation efforts and can promote democratic governance. On the other hand, local residents are not always aware of key local biodiversity issues; they may focus on visible "cute" aspects of biodiversity (like bunnies) instead of aspects that may be seen as more important by experts (like habitat fragmentation); and may have a hard time taking on board the more complex aspects of biodiversity (like management continuity).

As public concerns about biodiversity management grow, there is increasing demand for communication between local and global approaches to valuing, and hence managing, biodiversity. Taking account of the views of the public regarding what they would like in relation to “their” biodiversity necessitates some form of survey and/or public meetings. It may also require information provision to the public about biodiversity and its benefits. Public participation techniques may be time-consuming, particularly where many participants or survey respondents are involved.

Further information on public participation techniques can be found at Audit Commission (2000), Environmental Change Institute (2002), IIED and Wilcox (1994).

Example of public participation: ECONET

The European funded Life ECOnet Project is exploring with local people in Cheshire (UK) and Abruzzo and Emilia-Romagna (Italy) the best ways of creating networks connecting areas for wildlife, and demonstrating how it is possible to use these networks to make land use planning and management more sustainable. The project will use the latest GIS, digital aerial photography and landscape ecology to analyse the landscapes of Cheshire, Abruzzo and Emilia-Romagna. This will identify habitats of high value for wildlife as well as areas with the potential for the creation of new habitats and wildlife corridors.

Extensive discussions will be held with all stakeholders to raise awareness of the concept of ecological networks, and to seek their support and active participation. The network will be pieced together in a number of ways. Parts are already in place, for example, as nature reserves and country parks. Elsewhere, the network will be incorporated where possible in existing rural and urban initiatives, and by using whatever grant schemes are available. Opportunities for the creation of new habitats by "green generators", such as quarries, derelict land and landfill sites, will also be explored.

6.3 Spatial analysis techniques using maps/GISs

Geographical information systems (GISs) link attribute data to map data. Map data (spatial reference points) are essentially points or lines on a map. Attribute data are characteristics of map-features, for instance land use of an area or slope of a road. GISs are thus are a combination of a computerised cartography system that stores map data, and a database management system that stores attribute data. Links between map data and attribute data allow maps of the attribute data to be displayed, combined and analysed with relative speed and ease.

GISs are often only used to map data, eg for baseline survey. However they can also carry out a range of analytical tasks. For instance they can calculate areas of habitat and distances between patches of habitat, identify viewing areas from a point, construct buffer zones round sensitive areas, draw contour-lines using interpolated values between points, and superimpose maps to produce combined maps.

GISs give easily understandable results that can be used for public participation, are applicable at all scales, allow location-specific impacts to be clearly visualized, and can give long-term cost savings in map-making. Their zoning features and ability to consider several layers of information at a time can be used in sensitivity mapping. On the other hand, they require an appropriate computer system, compilation or purchase of (possibly expensive) data, and specialist skills to manipulate and analyse these data. They can be used only for impacts that have a spatial component and they can only carry out a relatively limited range of analytical tasks: essentially they provide data description rather than real spatial analysis. Further information on GIS can be found at European Environment Agency (1998) and Rodriguez-Bachiller (2000).

Example of GIS: Where to manage and create habitat for individual species

GIS can be used to identify optimum locations for habitat enhancement for a priority BAP species. For example Stone-curlew (*Burhinus oedicnemus*), one of the rarest birds in the UK with an estimated breeding population of less than 300 pairs. Possible breeding locations in the Chilterns Natural Area, a former breeding area for the species, were identified by overlaying several different data sets. An examination of the literature and correspondence with field biologists revealed that stone curlew nest site selection under arable conditions is heavily driven by sites, which are:

- on a slope less than 15∀;
- on arable land;
- greater than 1 kilometre from a major road or motorway;
- on the preferred free draining soils groups;
- on arable land which has at least 30 hectares of unimproved grassland within one kilometre;
- greater than two hectares in size.

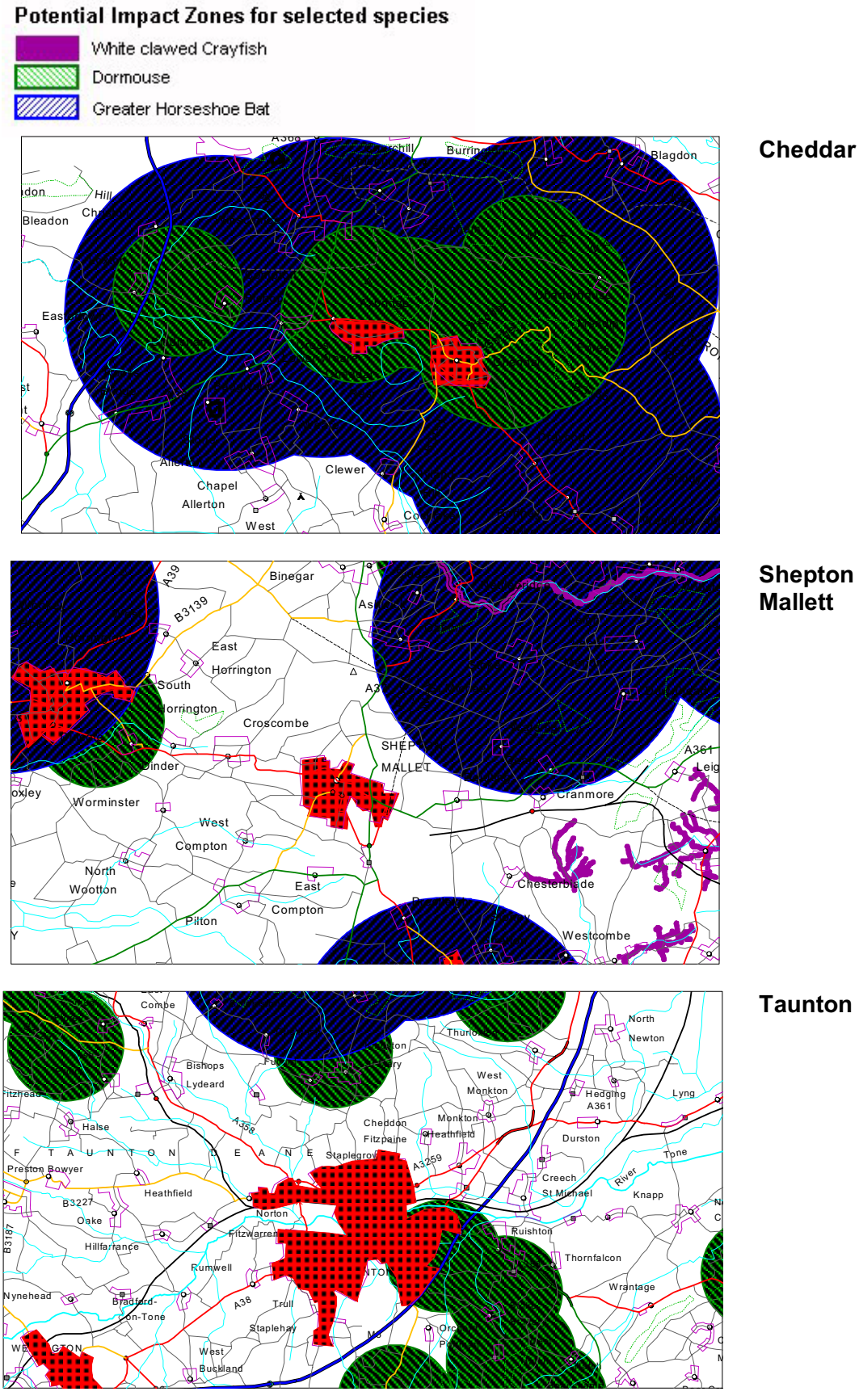
These criteria were used as parameters to search the baseline environmental data held in a GIS. Individual maps of the criteria were combined in the GIS database to allow the identification of those sites which fulfilled all the criteria. Thr final map represents all of the land parcels in the Chiltern Hills which are deemed potential stone curlew breeding sites based upon previous knowledge of the birds' specific abiotic nesting requirements.

Example of GIS: Somerset ECOnet

The Somerset ECOnet is a computer-based GIS developed by Somerset County Council and the Somerset Environmental Records Centre (SERC). It aims to provide information about the likely ranges and habitat use of protected, priority and important species of fauna across the county, allowing consideration of species-requirements to be taken into account in decision-making at an early stage in the development of a plan. The Somerset ECOnet has deliberately placed an emphasis on species rather than sites, recognising that many species are not confined to protected areas, but range more widely in the countryside. The project will eventually cover all European protected species, UK BAP species and IUCN red list threatened species that occur in the county; 56 species have been included to date. The project is currently being used in an SEA of the Somerset Structure Plan review.

Figures 5 shows impact zones for three important species, i.e. locations where they have been recorded combined with a buffer based on their known 'home range'. In considering potential biodiversity impacts on these three species, Cheddar is the settlement that is the most constrained. Shepton Mallet is the least constrained, and Taunton is constrained in its immediate surroundings only to the south east.

Figure 5. Potential impact zones for selected species



Example of using GIS for conflict resolution

Biodiversity maintenance and in particular enhancement can often conflict with other potential land uses. Often there are limited resources available with which to achieve this maintenance and enhancement, leading to debate about which habitat should be conserved and enhanced at the expense of another. GIS can be used to demonstrate where biodiversity maintenance and enhancement could and should take place whilst taking into account other land use requirements.

Known habitats and species of interest within the study area are identified and mapped in relation to other land uses. The known and theoretical expansions in all land uses, including biodiversity (obtained from the BAP process), are then mapped. In the case of biodiversity maintenance and enhancement the impacts of development can be "buffered" by establishing a "no land-use change" zone around the actual area of biodiversity interest.

A recent English Nature project took this approach one step further to resolve conflicts over which habitat type(s) should be created in one of their Natural Areas. The Chilterns Natural area has 3 key habitats identified for expansion under the regional and national BAP process – unimproved chalk grassland, deciduous (predominantly beech) woodland and scrub. Currently there is spatial conflict between the parcels of land in that (i) only a limited number of parcels can realistically be "changed" and (ii) at face value these parcels are equally suitable to conversion to any one of these habitats.

Several experts were consulted to develop a set of decision rules which aimed to identify the most suitable management option for a land parcel in the Natural Area based on its form and spatial position in the landscape. The rules were coded in a GIS and applied to the land use data for the Natural Area. This allowed land parcels suitable for management for each of the target habitats to be identified. Part of the decision rules are shown below.

Current land use	**Desirable land use change, with qualifications**
Improved grassland	**a) If close to unimproved grassland:** 1. convert unimproved grassland; or 2. keep as improved grass to provide for stock on unimproved grass **b) If close to deciduous woodland:** 1. convert to woodland; or 2. convert to scrub **c) If close to scrub:** 1. convert to scrub; or 2. convert to unimproved grassland or woodland

(Lee and Thompson, 2004; Lee et al., 2001)

6.4 Land use partitioning analysis

Linear infrastructure cuts across land and divides it into smaller parcels. This affects nature conservation because it fragments habitats. Land use partitioning analysis identifies, assesses and records the effect of infrastructure construction on the size and quality of areas of non-fragmentation. For both the before (baseline without the infrastructure) and after (with the infrastructure) scenario it:

- identifies non-fragmented areas
- identifies areas of high nature conservation/landscape/etc by overlaying various designations and land uses, eg national parks, woodland
- grades the areas of non-fragmentation according to their surface area and quality
- represents the gradings on a map.

A comparison of the gradings before and after proposed infrastructure developments indicates the impact of the infrastructure on land use partitioning.

Land use partitioning analysis deals with a topic that would otherwise be poorly (or not) considered, and gives a good visual representation of impacts. However it requires GIS and much data; is expensive and time-consuming; and is limited to only a few topics. Further information on land use partitioning analysis can be found at European Environment Agency (1998): see spatial analysis techniques.

6.5 Integrated Habitat System

The Integrated Habitat System (IHS) aims to provide an integrated approach to the collection, management and analysis of habitat data in the UK; optimise use of existing habitat data through effective translation; and provide a basis for overviews of the habitat resource, for biodiversity planning and other purposes

The HIS was developed by the Somerset Environmental Records Centre (SERC) in consultation with other organisations over the last four years. It consists of:

- the integrated classification, demonstrating the hierarchical relationships between all Biodiversity Broad Habitats, Biodiversity Priority Habitats and Annex 1 Habitats Directive Habitats: in the UK;
- definitions of over 400 categories;
- a software translation tool, including translation of Phase 1, Nature Conservancy Council/ Royal Society for Nature Conservation (RSNC) and National Vegetation Classification data into BAP priority habitats and the full IHS;
- manuals for field survey and air photo interpretation; and
- protocols for GIS data capture, management and analysis.

The IHS has been in operational use at SERC since 1999, in the Kent Wildlife Habitat Survey since 2000 and is built into the National Biodiversity Network South West Pilot Habitat Inventory Project commissioned by English Nature. The latest version incorporates recent changes in BAP Priority Habitat coverage, and is available on CD-ROM (www.somerc.com).

Example of Integrated Habitat System:
The Kent Habitat Survey 2003

The Kent Habitat Survey is a comprehensive GIS-based study of Kent and Medway's countryside and coast. The Survey provides up to date information on the extent and quality of semi-natural habitats. Where possible, changes to this resource between 1995 and 2003 were also identified. The results will help guide current and future activities and inform decision-making to conserve and enhance Kent's wildlife.

Aerial photograph Copyright UK Perspectives.
Figure 6a. 1999 Aerial Photography and Ordnance

The Survey involved interpreting aerial photographs of the County and selected field surveys of key habitats including UK Biodiversity Action Plan (BAP) Priority Habitats. Habitats were classified using the Integrated Habitat System (IHS).

Figure 6a shows aerial photographs overlaid with Ordnance Survey data. Habitat parcels from the 1995 Habitat Survey are shown for the same area in Figure 6b. Each parcel represents a different habitat determined by field survey. Figure 6c shows the results of the 2003 Habitat Survey determined by a combination of aerial photo interpretation and field survey. These results were recorded in a GIS.

LandLine Copyright Ordnance Survey.
Figure 6b. 1995 Phase 1 survey habitat parcels showing semi-natural habitats only

Analysis of change between semi-natural habitats was performed by overlaying the 2003 data onto the 1995 data. Habitat 'gains' and 'losses', as well as 'no change' were identified according to how habitat parcels overlapped with each other.

LandLine Copyright Ordnance Survey.
Figure 6c. 2003 IHS survey habitat parcels derived from API and selected field surveys

Further information may be obtained by contacting:

Natural Environment Team, Environmental Management Strategic Planning Directorate, Invicta House, County Hall, Maidstone , Kent ME14 1XX
tel: 01622 221538 web: www.kent.gov.uk/biodiversity

The Kent Landcover Survey was suppported by:
Kent County Council, Kent District Councils, English Nature, Environment Agency, Defence Estates, Kent Downs Area of Outstanding Natural Beauty, Kent Wildlife Trust

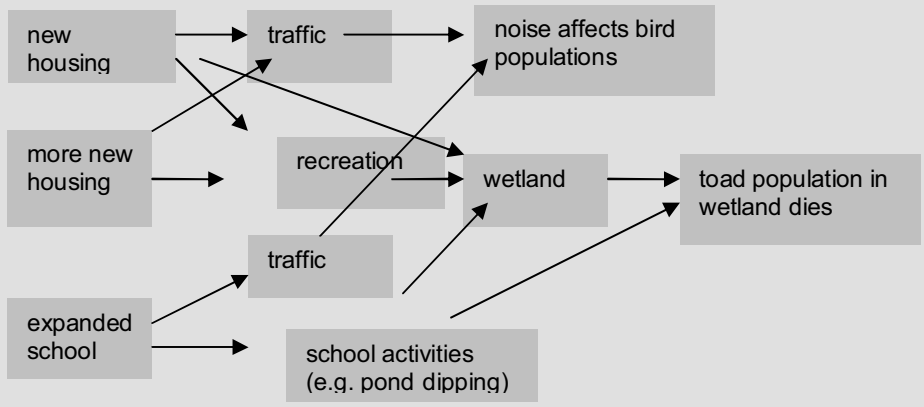
6.6 Network analysis

Network analysis – also called cause-effect analysis or causal chain analysis - recognizes that environmental systems consist of a complex web of relationships, and that many activities' impacts occur at several stages removed from the activity itself. It aims to identify the key cause-effect links which describe the pathway from initial action to ultimate environmental outcome. It involves drawing the direct and indirect impacts of an action as a network of boxes (activities, outcomes) and arrows (interactions between them). This can help to identify assumptions made in impact predictions, unintended consequences of the strategic action, cumulative impacts, and possible constraints to effective implementation of a strategic action.

Network analyses are easy to understand, quick and cheap, and can be used in public participation. However they can miss important impacts if not done well, and do not deal well with spatial impacts or impacts that vary over time.

Example of network analysis (adapted from ODPM, 2003)

The example below assumes that several housing developments and a new school are built near a wetland which hosts a rare toad species.



6.7 Scenario/sensitivity analysis

The impacts of a strategic plan/action, or the relative benefits of different options often depend on variables outside the strategic action's control. For instance whether BAP targets are achieved under a strategic plan/action may depend on whether a motorway is widened or funding for woodland management is available. Scenarios can be generated to describe these different possibilities, and the strategic action's impacts can be predicted based on these scenarios. Comparison of the strategic action's impacts for different scenarios – sensitivity analysis – allows an analysis of the strategic action's robustness to different possible futures.

Scenario/sensitivity analysis reflects uncertainties, gives ideas for reducing uncertainties, leads to more robust strategic actions, and supports the precautionary principle. However it can be time and resource intensive. Further information on scenario/sensitivity testing can be found at Finnveden *et al*. (2003).

6.8 Multi-criteria analysis

MCA -- also called multiple attribute analysis or multi-objective trade-off -- analyses and compares how well different alternatives achieve different objectives, and helps to identify a preferred alternative. MCA involves:

1. For each type of impact/indicator, choosing relevant assessment criteria.
2. Identifying alternatives for consideration, for instance different approaches to managing a habitat or different development scenarios.
3. Scoring how each alternative affects each indicator.
4. Assigning a weight (value of importance) to the indicator.
5. Aggregating the score and weight of each alternative.

MCA acknowledges that society is composed of diverse stakeholders with different goals and values, and that some impacts "matter" more than others; can be used in a variety of settings, including public participation; and can compare alternatives. On the other hand, it can be used to 'twist' data; and it can lead to very different results depending on who establishes the weightings and scoring systems. Further information about MCA can be found at Economics for the Environment Consultancy (1999) and Glasson *et al*. (2004).

Example of MCA: choice of housing sites

Assume that planners are considering three locations for a new housing development: A, B and C. They are concerned about noise, wildlife sites, and landscape. Assessment criteria for wildlife could be: +2 greatly improves quality of designated wildlife sites, +1 somewhat improves their quality, down to -2 greatly reduces their quality. The planners feel that A=+2, B=-2, C=+1 for wildlife sites. They make similar judgments for noise and landscape. They would then rank wildlife sites in comparison with noise and landscape: in this example, for instance, they assume that noise is three times as important as wildlife or landscape. The table below shows the final aggregation: B would be the preferred location.

Criterion	**Weight** (w)	**Location**					
		A		B		C	
		score (a)	a x w	A	a x w	a	a x w
Noise	3	0	0	+1	+3	-2	-6
Wildlife	1	+2	2	-2	-2	+1	+1
Landscape	1	-2	-2	0	0	0	0
Total			**0**		**+1**		**-5**

6.9 Vulnerability analysis

Vulnerability analysis combines GIS and MCA to assess the impacts of an activity on the vulnerability of an area. Vulnerability in this context is the combination of sensitivity and a valuation of the system. A typical vulnerability analysis involves:

1. Defining the impacts and receptors for which the vulnerability assessment will be carried out. For instance a motorway network might have the following receptors:

impact:	*receptors:*
habitat destruction	flora and fauna
barrier impact	fauna, people (local transport)
disturbance	Fauna
noise disturbance	People
fragmentation	landscape, flora and fauna

2. Preparing vulnerability maps that show, for each receptor, 1. the sensitivity of the receptor in relation to the impacts, and 2. evaluation criteria used to value the system (e.g. 0 = not vulnerable up to 4 = very vulnerable).

3. Overlaying the vulnerability maps to form maps of all the factors that affect a receptor, using GIS. For instance all the vulnerability maps for flora (habitat destruction, fragmentation) can be 'added' together using weightings based on the standardized classes (e.g. very vulnerable has four times the weight of somewhat vulnerable; habitat destruction is twice as important as fragmentation). The weighted overlays allow areas of high vulnerability to be identified.

4. Using GIS, overlaying the expected impacts associated with different development options onto the vulnerability maps. This indicates the expected locations of impacts for different receptors and/or impacts. GIS can then be used to add together the weighted impacts to identify those alternatives with the least impacts. The end-result is a series of maps showing the vulnerability of areas overlaid with possible developments, and graphs comparing alternatives in terms of their (weighted) impacts.

Vulnerability analysis allows spatial impacts to be described quantitatively and can be used at all scales. However it can be costly and time-intensive, only works with impacts that can be mapped, and "hides" value judgments about the sensitivity and value of receptors. Further information can be found at van Straaten (1999).

Example of vulnerability analysis: landscape assessment at Staffordshire County Council

Staffordshire County Council, in partnership with the Countryside Agency, has developed a character based approach to landscape assessment to map the quality or strength of character of the landscapes of the Structure Plan Area. A method for assessing and mapping general sensitivity to change of landscape units has also been developed. This relationship between sensitivity and quality allows the most appropriate measures for the conservation, enhancement or regeneration of landscapes to be determined. This has resulted in the identification of five types of landscape policy zones, covering the whole of the plan area, which now replace the previous non-statutory Special Landscape Area designation. This approach to landscape policy has now been adopted as Supplementary Planning Guidance in the current Staffordshire and Stoke on Trent Structure Plan (1996-2011) (www.sbap.org.uk.html).

6.10 Risk assessment

Risk assessment estimates the risk that products and activities cause to human health, safety and ecosystems. It involves identifying possible hazards (eg oil spills), identifying and analysing their consequences (eg on birds, on the local economy), and estimating their frequency. It results in statements about the probability of a specified event, e.g. 1 in 1,000 chance of an oil spill in area X in a given year; or about consequences, e.g. 50 bird deaths due to oil contamination per year.

Risk assessment can be used to compare alternatives on the basis of the risk that they cause and can incorporate the precautionary principle. However it often does this by extrapolating risks at high dose levels of a pollutant to low dose levels, with consequent uncertainties; the results can vary widely depending on the assumptions made; and where it is used in cost-benefit assessment, the values placed on human life or ecosystems can be highly contentious.

6.11 Compatibility appraisal

Compatibility appraisal aims to ensure that the strategic action is internally coherent and consistent with other strategic plans/actions. An *internal compatibility matrix* plots different components of the strategic plan on one axis and the same components on the other axis. Matrix cells are filled in by asking 'is this component compatible with that component or not?' Where incompatibility is found, one or both statements may need to be changed.

An *external compatibility matrix* plots the strategic plan/action (normally as a whole) against other relevant (normally higher- and equal-level) strategic plans/actions. Matrix cells are filled in by listing those components of the strategic action that fulfill the requirements of the other strategic actions, or explaining how the evolving strategic action should take the requirements into account. Where no components in the strategic action fulfill the others' requirements, or where they conflict, then this may need to be redressed.

Compatibility appraisal can help to clarify trade-offs and is easy to understand. However it is subjective and can be time consuming. More information can be found at ODPM (2003).

Example of internal compatibility appraisal: District X Local Plan

The matrix below shows the compatibility of several of the SEA objectives for the District X Local Plan (it is a partial matrix only). The possible conflict between biodiversity and economic objectives in this plan is clear.

1								
2	√							
3	√	√						
4	√	√	√					
5	?	?	-	-				
6	-	-	-	-	-			
7	?	?	?	?	√	-		
8	X	X	?	√	X	-	?	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

√ compatible
X incompatible
- no link

1 To conserve and enhance biodiversity at ecosystem, species and genetic levels
2 To conserve and enhance the present number of designated sites
3 To minimise the amount of waste going to landfill
4 To reach and maintain standards for ecological, biological and chemical water quality
5 To reduce the need to travel by private car
6 To actively encourage all sections of communities to participate in decision-making
7 To support and enhance the economies of main town centres
8 To promote diversification of rural enterprises

7. Bibliography and Useful Websites

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Useful Websites

European agencies

- European Commission, www.europa.eu.int
- European Community home page for environmental assessment: includes legal context for both EIA and SEA, www.europa.eu.int/comm/environment/eia/home.htm
- European Environment Agency, www.eea.eu.int

UK Government Departments and Agencies

- Countryside Agency, responsible for the countryside and rural affairs: www.countryside.gov.uk
- Countryside Council for Wales (CCW) – statutory body advising on biodiversity (etc) in Wales: www.ccw.gov.uk
- Department of the Environment, Food and Rural Affairs: www.defra.gov.uk
- English Nature, statutory body advising on biodiversity (etc) in England. Website gives details of Natural Areas and corresponding BAP targets, and includes GIS data and maps of statutory sites plus selected BAP habitat distribution data www.english-nature.org.uk
- Joint Nature Conservancy Committee. Advisory committee to the Government on nature conservation, www.jncc.org.uk
- Environment Agency, responsible for water, fisheries and waste regulation in England and Wales. www.environment-agency.gov.uk/yourenv
- Environment Agency (Wales): www.environment-agency.gov.uk/regions/Wales
- Environment and Heritage Service (NI): statutory body advising on biodiversity (etc) in Northern Ireland www.ehsni.gov.uk
- Office of the Deputy Prime Minister: responsible for planning and the regions. www.odpm.gov.uk
- Scottish Environmental Protection Agency (SEPA). www.sepa.org.uk
- Scottish Natural Heritage : statutory body advising on biodiversity (etc) in Scotland www.snh.org.uk

Regional Observatories and Information Partnerships, Intelligence Units

(www.regionalobservatories.org.uk):

- East Midlands, www.eastmidlandsobservatory.org.uk
- East of England, www.eastofenglandobservatory.org.uk
- London, www.london.gov.uk
- North East, www.n-e-region.com
- North West, www.nriu.co.uk
- South East, www.southeast-ra.gov.uk
- South West, www.swro.info, www.swenvo.org.uk
- West Midlands, www.wmra.gov.uk

- Yorkshire and the Humber, www.yorkshirefutures.com

Non-Governmental Organisations

- **Botanical Society of the British Isles**: information on plant distribution and abundance, www.bsbi.org.uk
- **British Butterfly Conservation Society**: information on butterflies (www.butterfly-conservation.org
- **British Trust for Ornithology**: information on bird distribution, abundance and trends www.bto.org
- **Campaign for the Protection of Rural Wales**: www.cprw.org.uk
- **National Biodiversity Network**: The network provides access to a wide range of biodiversity information held by different Record Centres. The NBN Gateway site allows you to view distribution maps and download UK wildlife data by using a variety of interactive tools, www.searchnbn.net; www.nbn.org.uk, www.nfbr.org.uk
- **Natural History Museum**: provides species lists and specialist taxonomic expertise. www.nhm.ac.uk
- **Plantlife**: information on plant protection programmes, survey schemes, and nature reserves managed by the Plantlife organisation, www.plantlife.org.uk
- **Royal Society for the Protection of Birds**: wide range of information relating to birds, including RSPB reserves www.rspb.org.uk
- **Wildlife Trusts**: Main website for all wildlife trust organisations in UK, www.wildlifetrusts.org.uk

Other sources of biodiversity data

- **Biodiversity Action Plans**: Main website for BAPs in Britain which details all 45 Habitat Action Plans; 391 Species Action Plans and over 160 Local Biodiversity Action Plans, www.ukbap.org
- **Convention on Biological Diversity.** Up to date information on action resulting from the 1992 and 2002 Summits. www.biodiv.org
- **Countryside survey 2000** sponsored by DEFRA and NERC (Natural Environment Research Councils), www.cs2000.org.uk
- **Endangered Species**: Information on all UK and global endangered species: www.arkive.org.uk
- **Global Biodiversity Information Facility,** www.gbif.org
- **Local Records Centres**: There is an active programme of LRC development within the National Biodiversity Network, that aims to complete the UK network by 2010. Contact details for each LRC can be obtained from www.nfbr.org.uk
- **Quality of Life Counts**: wide range of Government quality of life data, www.sustainable-development.gov.uk/sustainable/quality99
- **Multi-Agency Geographic Information for the Countryside** (MAGIC), www.magic.gov.uk (ward-level GIS data)- a large and growing source of environmental GIS datasets which can be selected and combined online.
- **Quality of Life Assessment**: Approach promoted by English Nature, English Heritage, the Countryside Agency and the Environment Agency as a tool for maximising environmental, economic and social benefits in land-use planning: www.qualityoflifecapital.org.uk
- **Regional Quality of Life Counts**: wide range of Government quality of life data, at the regional level, www.sustainable-development.gov.uk/indicators/regional/2001
- **UK clearinghouse for biodiversity**: details legislation and provides links to other biodiversity websites. www.chm.org.uk
- **UK Department for Trade and Industry:** SEA consultation website for marine oil and gas activity, www.offshore-sea.org.uk
- **Ulster Museum** (NI) source of for geological and biological records and information www.habitats.org.uk

8. Glossary

Appropriate assessment	Assessment of plans and projects likely to have a significant effect on a European Site as required by Article 6(3) of the Habitats Directive (see Sec. 5.3).
Biodiversity	'The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.' (Convention on Biodiversity (1992), Art. 2)
Biodiversity Action Plan (BAP)	Any formal inter-agency plan produced by Parties to the Convention on Biodiversity, setting out actions to restore or enhance the status of species and habitats of conservation importance and concern. May be local, regional or national. Each Local Biodiversity Action Plan works on the basis of partnership to identify local priorities and to determine the contribution they can make to the delivery of the national Species and Habitat Action Plan targets. Often, but not always, LBAPs conform to county boundaries.
Conservation objectives	At the time a European Site is proposed, a citation is produced which identifies the interest or conservation features for which the site is designated. The conservation objectives for the site ensure the interest features are being maintained in a favourable condition on the site. These objectives define what constitutes favourable condition for each feature by describing broad targets, which should be met if the feature is to be judged favourable.
Consultation bodies	Organisations who must be consulted in the SEA process. Section 1.1 lists who they are in the UK.
Cumulative impacts	Impact(s) which results from the incremental effects of an action when added to other past, present and reasonably foreseeable future actions.
Environmental impact assessment (EIA)	The process by which information about the environmental effects of a project is collected, analysed, and taken into account by the relevant decision making body before a decision is given on whether the development should go ahead.
Favourable conservation status	For habitats, status is considered favourable when: the natural range and area it covers are stable and increasing; and, the specific structure and functions necessary to its long term maintenance exist and are likely to exist into the foreseeable future. For species, status is considered favourable when: population dynamics data indicate that it is maintaining itself on a long term basis as a viable component of its natural habitat; the natural range is neither being reduced or is likely to be reduced into the foreseeable future; and, there is, and will continue to be, sufficient required habitat to maintain its populations on a long-term basis.
Indicator	A measure of variable over time.
Indirect impacts	Impacts that are not a direct result of the strategic action, but occur

	away from the original impact and/or as a result of a complex pathway.
Mitigation	A measure to avoid, reduce or compensate for significant adverse impacts.
Mitigation Banking	A formal mechanism for compensating for environmental damage. It involves the identification of land similar to that affected by the proposal in terms of type, area and quality. Developers can set up their own 'banks' or purchase credits in banks established by others to compensate in advance for any adverse effects associated with their intended actions.
Monitoring	Surveying and interpretation of results carried out for the express purpose of detecting trends over time. For purposes of SEA monitoring is carried out to determine whether impacts occur as predicted, to detect unforeseen changes and to provide a basis for remedial action. Monitoring usually focuses on certain key indicators.
Objective	A statement of what is intended, specifying a desired direction of change.
Plan	A set of co-ordinated and timed objectives for the implementation of a policy.
Policy	The inspiration and guidance for action, setting a framework for subsequent plans and programmes.
Programme	A proposed set of linked projects or a series of similar or related projects proposed within a particular area.
Project	The execution of construction works or of other installation or schemes, or other interventions in the surroundings and landscape (Directive 97/11/EC).
Responsible authority	The authority responsible for preparing the plan or programme and carrying out the SEA.
Strategic Environmental Assessment (SEA)	A systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision making on par with economic and social considerations (Sadler and Verheem, 1996).
Target	Detailed, quantitative objectives that can be monitored.