"Capacity Building and Strengthening Institutional Arrangement"

Workshop: "Environmental Impact Assessment (EIA) (for Assessors)"

Environmental Impact Assessment and Natural Protected Areas

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Convention on Biological diversity

- Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the Convention recognizes that biological diversity is about more than plants, animals and micro organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live

- Party to: Convention Since: 2 June 1994 *(by Ratification)*
- Signature Date: 9 June 1992

Biodiversity: The Basis of Our Existence

- The first World Summit on Environment and Development in Rio de Janeiro (1992) emphasized the importance of biodiversity as the basis of our very existence, to be used wisely and sustainably and conserved for current and future generations. The main threats to global biodiversity are associated with human activities causing habitat loss or damage.

Impact assessment as a tool

- The Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS) recognize IA as an important decision-support tool to help plan and implement development with biodiversity "in mind."
- The Conventions require Signatories ("Parties") to apply EIA and SEA to proposals with potential negative impacts on biodiversity to help meet their objectives, so that development proposals respect mechanisms for the **conservation** of biodiversity, result in **sustainable use** of biodiversity resources, and ensure **fair and equitable sharing** of the benefits arising from use of biodiversity. IA provides opportunities to ensure that biodiversity values are recognized and taken into account in decision-making. Importantly, this involves a participatory approach with people who might be affected by a proposal.
- Considerable progress has been made in the application of IA to further the aims of the CBD and related conventions, but there is still a long way to go.

Operating principles

1. Screening.

Use biodiversity inclusive screening criteria to determine whether important biodiversity resources may be affected.

Biodiversity screening “triggers” for IA should include:

- Potential impacts on protected areas and areas supporting protecte species.
- Impacts on other areas that are not protected but are important for biodiversity (see box at right).
- Activities posing a particular threat to biodiversity (in terms of their type, magnitude, location, duration, timing, reversibility).
- Areas that provide important biodiversity services including extractive reserves, indigenous people’s territories, wetlands, fish, breeding grounds, soils prone to erosion, relatively undisturbed or characteristic habitat, flood storage areas, groundwater recharge areas, etc.

2. Scoping

Scoping leads to Terms of Reference for IA, defining the issues to be studied and the methods that will be used. Use scoping as an opportunity to raise awareness of biodiversity concerns and discuss alternatives to avoid or minimize negative impacts on biodiversity.

It is good practice to produce a scoping report for consultation. This should address the following issues (on the basis of existing information and any preliminary surveys or discussions):

1. The type of project, program, plan or policy, possible alternatives and a summary of activities likely to affect biodiversity
2. An analysis of opportunities and constraints for biodiversity (include “no net biodiversity loss” or “biodiversity restoration alternatives)

3. Expected biophysical changes (in soil, water, air, flora, fauna) resulting from proposed activities or induced by any socioeconomic changes
4. Spatial and temporal scale of influence, identifying effects on connectivity between ecosystems, and potential cumulative effects
5. Available information on baseline conditions and any anticipated trends in biodiversity in the absence of the proposal
6. Likely biodiversity impacts associated with the proposal in terms of composition, structure and function
7. Biodiversity services and values identified in consultation with stakeholders and anticipated changes in these (highlight any irreversible impacts)

8. Possible measures to avoid, minimize, or compensate for significant biodiversity damage or loss, making reference to any legal requirements
9. Information required to support decision making and summary of important gaps
10. Proposed IA methodology and timescale

Areas with “important biodiversity” are those that

- Support endemic, rare, declining habitats/species/genotypes.
- Support genotypes and species whose presence is a prerequisite for the persistence of other species.
- Act as a buffer, linking habitat or ecological corridor, or play an important part in maintaining environmental quality.
- 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 previously undisturbed habitat.
- Act as refugia for biodiversity during climate change, enabling persistence and continuation of evolutionary processes.
- Support biodiversity for which mitigation is difficult or its effectiveness unproven including habitats that take a long time to develop characteristic biodiversity.
- Are currently poor in biodiversity but have potential to develop high biodiversity with appropriate intervention.

3. Impact study and preparation of EIS.

Address biodiversity at all appropriate levels and allow for enough survey time to take seasonal features into account.

Focus on processes and services which are critical to human well-being and the integrity of ecosystems.

What main risks and opportunities for biodiversity.

Questions to ask:

At the gene level, to what extent will the proposal have significant effects on:

- Genetic diversity of species, particularly rare and declining species and those with identified as priorities in NBSAPs and/or subnational biodiversity plans?
- Opportunities for species populations to interact, e.g., by increasing habitat fragmentation and isolation?
- Risk of extinction?
- Persistence of locally-adapted populations?

At the species level, to what extent will the proposal:

- Alter the species-richness or species-composition of habitats in the study area?
- Alter the species-composition of communities?
- Cause some species to be lost from the area?
- Affect species identified as priorities in NBSAPs (*) and/or subnational biodiversity plans?
- Increase the risk of invasion by alien species?

(*) NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

At the ecosystem level, to what extent will the proposal:

- Change the amount, quality or spatial organization of habitat?
- Affect plans to enhance habitat availability or quality?
- Damage ecosystem processes and services, particularly those on which local communities rely?

Finally:

- If habitats will be lost or altered, is alternative habitat available to support associated species populations?
- Are there opportunities to consolidate or connect habitats?

Take an ecosystem approach and involve relevant stakeholders (including local communities).

Consider the full range of factors affecting biodiversity.

These include direct drivers of change associated with a proposal (e.g., land conversion and vegetation removal leading to loss of habitat—a key driver of biodiversity loss, emissions, disturbance, introduction of alien and genetically modified species, etc.); and indirect drivers of change which are harder to quantify, including demographic, economic, socio-political, cultural and technological processes or interventions.

Evaluate impacts of alternatives with reference to the baseline situation.

Compare against thresholds and objectives for biodiversity. Use NBSAPs, sub-national biodiversity plans and other conservation reports for information and objectives. Take into account cumulative threats and impacts resulting either from repeated impacts of projects of the same or different nature over space and time, and/or from proposed plans, programs or policies

- Biodiversity is influenced by cultural, social, economic and biophysical factors. Cooperation between different specialists in the IA team is thus essential, as is the integration of findings which have bearing on biodiversity.
- Provide insight into cause-effect chains. If possible, quantify the changes in quality and amount of biodiversity. Explain the expected consequences of any biodiversity losses associated with the proposal, including the costs of replacing biodiversity services if they will be damaged by aproposal.
- How do these relate to relevant biodiversity priorities and objectives or any legal obligations? Indicate the legal issues that create the boundary conditions for decision making.

4. Mitigation.

- Remedial action can take several forms, i.e., avoidance (or prevention), mitigation (including restoration and rehabilitation of sites), and compensation. Apply the "positive planning approach," where avoidance has priority and compensation is used as a last resort measure.
- Avoid "excuse"-type compensation. Look for opportunities to positively enhance biodiversity. Acknowledge that compensation will not always be possible; there will still be cases where it is appropriate to say "no" to development proposals on grounds of irreversible damage to biodiversity.

5. Review for decision-making.

Examine review of environmental reports with regard to biodiversity should be undertaken by a specialist with appropriate expertise, where biodiversity impacts are significant.

Depending on the level of confidentiality of public decision-making, consideration should be given to the involvement of affected groups and civil society.

6. Decision making.

Avoid pitting conservation goals against development goals; balance conservation with sustainable use for economically viable, and socially and ecologically sustainable solutions. For important biodiversity issues, apply the precautionary principle where information is insufficient and the no net loss principle in relation to irreversible losses associated with the proposal.

6. Management, monitoring, evaluation and auditing.

It is important to recognize that all prediction of biodiversity response to perturbation is uncertain, especially over long time frames.

Management systems and programs, including clear management targets (or Limits of Acceptable Change (LC)) and appropriate monitoring, should be set in place to ensure that mitigation is effectively implemented, unforeseen negative effects are detected and addressed, and any negative trends are detected.

Provision is made for regular auditing of impacts on biodiversity. Provision should be made for emergency response measures and/or contingency plans where upset or accident conditions could threaten biodiversity.

Article 14. Impact Assessment and Minimizing Adverse Impacts

1. Each Contracting Party, as far as possible and as appropriate, shall:

(a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

(b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;

(c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;

(d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

(e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.

COP 8- Eighth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity
Curitiba, Brazil, 20 - 31 March 2006

Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment

The Conference of the Parties to the Convention on Biological Diversity

For EIA

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

For SEA

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

Annex

VOLUNTARY GUIDELINES O BIODIVERSITY - INCLUSIVE ENVIRONMENTAL IMPACT ASSESSMENT CONTENTS

Although legislation and practice vary around the world, the fundamental components of an EIA would necessarily involve the following stages:

(a) Screening to determine which projects or developments require a full or partial impact assessment study;

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

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

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

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

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

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

1.Screening

Since legal requirements for EIA may not guarantee that biodiversity will be taken into account, consideration should be given to incorporating biodiversity criteria into existing, or the development of new, screening criteria. Important information for developing screening criteria can be found in national biodiversity strategies and action plans (NBSAPs) or equivalent documents. These strategies provide detailed information on conservation priorities and on types and conservation status of ecosystems.

Pertinent questions from a biodiversity perspective.

Taking into account the three objectives of the Convention, fundamental questions which need to be answered in an EIA study include:

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

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

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

To facilitate the development of screening criteria, the questions above have been reformulated for the three levels of diversity, reproduced in table 1 below.

Level of diversity	Conservation of biodiversity	Sustainable use of biodiversity
Ecosystem diversity 4/	Would the intended activity lead, either directly or indirectly, to serious damage or total loss of (an) ecosystem(s), or land-use type(s), thus leading to a loss of ecosystem services of scientific/ecological value, or of cultural value?	Does the intended activity affect the sustainable human exploitation of (an) ecosystem(s) or land-use type(s) in such manner that the exploitation becomes destructive or non-sustainable (i.e. the loss of ecosystem services of social and/or economic value)?
Species diversity 43/	Would the intended activity cause a direct or indirect loss of a population of a species?	Would the intended activity affect sustainable use of a population of a species?
Genetic diversity	Would the intended activity result in extinction of a population of a localized endemic species of scientific, ecological, or cultural value?	Does the intended activity cause a local loss of varieties/cultivars/breeds of cultivated plants and/or domesticated animals and their relatives, genes or genomes of social, scientific and economic importance?

Types of existing screening mechanisms include:

(a) *Positive lists* identifying projects requiring EIA (inclusion lists). A disadvantage of this approach is that the significance of impacts of projects varies substantially depending on the nature of the receiving environment, which is not taken into account. A few countries use (or have used) negative lists, identifying those projects not subject to EIA (exclusion lists). Both types of lists should be reassessed to evaluate their inclusion of biodiversity aspects;

(b) Lists identifying those *geographical areas* where important biodiversity is found, in which projects would require EIA. The advantage of this approach is that the emphasis is on the sensitivity of the receiving environment rather than on the type of project;

(c) *Expert judgement* (with or without a limited study, sometimes referred to as *initial environmental examination* or *preliminary environmental assessment*). Biodiversity expertise should be included in expert teams; and

(d) A *combination* of a list plus expert judgement to determine the need for an EIA.

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

(a) Categories of activities known to cause biodiversity impacts, including thresholds referring to size of the intervention area and/or magnitude, duration and frequency of the activity;

b) The magnitude of biophysical change that is caused by the activity; or

c) Maps indicating areas important for biodiversity, often with their legal status.

14. If possible, biodiversity-inclusive screening criteria should be integrated with the development (or revision) of a national biodiversity strategy and action plan.

15. *Step 1*: According to the principles of the ecosystem approach, a *biodiversity screening map* is designed, indicating important ecosystem services. The map is based on expert judgement and has to be formally approved.

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

(a) Areas with *important regulating services in terms of maintaining biodiversity*:

Protected areas : depending on the legal provisions in a country these may be defined as areas in which no human intervention is allowed, or as areas where impact assessment at an appropriate level of detail is always required;

Areas containing *threatened ecosystems outside of formally protected areas*, where certain classes of activities (see step 2) would always require an impact assessment at an appropriate level of detail;

Areas identified as being important for the *maintenance of key ecological or evolutionary processes*, where certain classes of activities (see step 2) would always require an impact assessment at an appropriate level of detail;

Areas known to be *habitat for threatened species*, which would always require an impact assessment at an appropriate level of detail.

(b) Areas with *importantregulating services for maintaining natural processes with regard to soil, water, or air*, where impact assessment at an appropriate level of detail is always required. Examples can be wetlands, highly erodable or mobile soils protected by vegetation (e.g. steep slopes, dune fields), forested areas, coastal or offshore buffer areas; etc.

(c) Areas with *importantprovisioning services,*where impact assessment at an appropriate level of detail is always required. Examples can be extractive reserves, lands and waters traditionally occupied or used by indigenous and local communities, fish breeding grounds; etc.

(d) Areas with *importantcultural services*, where impact assessment at an appropriate level of detail is always required. Examples can be scenic landscapes, heritage sites, sacred sites; etc.

(e) Areas with *other relevant ecosystem services* (such as flood storage areas, groundwater recharge areas, catchment areas, areas with valued landscape quality, etc.); the need for impact assessment and/or the level of assessment is to be determined (depending on the screening system in place);

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

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

(a) Change of land-use or land cover, and underground extraction: above a defined area affected, EIA always required, regardless of the location of the activity - define thresholds for level of assessment in terms of surface (or underground) area affected;

(b) Change in the use of marine and/or coastal ecosystems, and extraction of seabed resources: above a defined area affected, EIA always required, regardless of the location of the activity - define thresholds for level of assessment in terms of surface (or underground) area affected;

(c) Fragmentation, usually related to linear infrastructure. Above a defined length, EIA always required, regardless of the location of the activity – define thresholds for level of assessment in terms of the length of the proposed infrastructural works;

(d) Emissions, effluents or other chemical, thermal, radiation or noise emissions - relate level of assessment to the ecosystem services map;

(e) Introduction or removal of species, changes to ecosystem composition, ecosystem structure, or key ecosystem processes responsible for the maintenance of ecosystems and ecosystem services (see appendix 2 below for an indicative listing) - relate level of assessment to ecosystem services map.

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

(a) *Categories of activities* that create direct drivers of change (extraction, harvest or removal of species, change in land-use or cover, fragmentation and isolation, external inputs such as emissions, effluents, or other chemical, radiation, thermal or noise emissions, introduction of invasive alien species or genetically modified organisms, or change in ecosystem composition, structure or key processes), taking into account characteristics such as: type or nature of activity, magnitude, extent/location, timing, duration, reversibility/irreversibility, irreplaceability, likelihood, and significance; possibility of interaction with other activities or impacts;

(b) *Where and when*: the area of influence of these direct drivers of change can be modelled or predicted; the timing and duration of influence can be similarly defined;

(c) A *map of valued ecosystem services* (including maintenance of biodiversity itself) on the basis of which decision makers can define levels of protection or conservation measures for each defined area.

2. Scoping

Consideration of mitigation and/or enhancement measures The purpose of mitigation in EIA is to look for ways to achieve the project objectives while avoiding negative impacts or reducing them to acceptable levels. The purpose of enhancement is to look for ways of optimizing environmental benefits.

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

Kind of information that should be requested in the terms of reference of an impact study if the project screening suggests that the proposed activity is likely to have adverse impacts on

biodiversity.

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

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

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

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

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

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

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

(h) Identify, in consultation with stakeholders, the current and potential ecosystem services provided by the affected ecosystems or land-use types and determine the values these functions represent for society

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

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

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

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

(m) Provide details on required methodology and timescale.

3. Assessment and evaluation of impacts, and development of alternatives

(a) Refinement of the understanding of the nature of the potential impacts identified during screening and scoping and described in the terms of reference. This includes the identification of indirect and cumulative impacts, and of the likely cause–effect chains;

(b) Identification and description of relevant criteria for decision-making can be an essential element of this stage;

(c) Review and redesign of alternatives; consideration of mitigation and enhancement measures, as well as compensation of residual impacts; planning of impact management; evaluation of impacts; and comparison of the alternatives;

(d) Reporting of study results in an environmental impact statement (EIS) or EIA report

Appendix 1

INDICATIVE SET OF SCREENING CRITERIA TO BE FURTHER ELABORATED AT NATIONAL LEVEL

Category A: Environmental impact assessment mandatory for :

Activities in protected areas (define type and level of protection);

Activities in threatened ecosystems outside protected areas;

Activities in ecological corridors identified as being important for ecological or evolutionary processes;

Activities in areas known to provide important ecosystem services;

Activities in areas known to be habitat for threatened species;

Extractive activities or activities leading to a change of land-use occupying or directly influencing an area of at minimum a certain threshold size (land or water, above or underground - threshold to be defined);

Creation of linear infrastructure that leads to fragmentation of habitats over a minimum length (threshold to be defined);

Activities resulting in emissions, effluents, and/or other means of chemical, radiation, thermal or noise emissions in areas providing key ecosystem services (areas to be defined);

Activities leading to changes in ecosystem composition, ecosystem structure or key processes / responsible for the maintenance of ecosystems and ecosystem services in areas providing key ecosystem services (areas to be defined).

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

Activities resulting in emissions, effluents and/or other chemical, thermal, radiation or noise emissions in areas providing other relevant ecosystem services (areas to be defined);

Activities leading to changes in ecosystem composition, ecosystem structure, or ecosystem functions responsible for the maintenance of ecosystems and ecosystem services in areas providing other relevant ecosystem services (areas to be defined);

Extractive activities, activities leading to a change of land-use or a change of use of inland water ecosystems or a change of use of marine and coastal ecosystems, and creation of linear infrastructure below the Category A threshold, in areas providing key and other relevant ecosystem services (areas to be defined).

Indicative List of Ecosystem Services

Regulating services responsible for maintaining natural processes and dynamics

Biodiversity-related regulating services

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

Land-based regulating services

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

Water related regulating services

- water filtering
- dilution of pollutants
- discharge of pollutants
- flushing / cleansing
- bio-chemical/physical purification of water
- storage of pollutants
- flow regulation for flood control
- river base flow regulation
- water storage capacity
- ground water recharge capacity
- regulation of water balance
- sedimentation / retention capacity
- protection against water erosion
- protection against wave action
- prevention of saline groundwater intrusion
- prevention of saline surface-water intrusion
- transmission of diseases
- suitability for navigation

Water related regulating services (ctd.)

- suitability for leisure and tourism activities
- suitability for nature conservation

Air-related regulating services

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

Provisioning services : harvestable goods
natural production :

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

Nature-based human production

- crop productivity
- tree plantations productivity
- managed forest productivity
- rangeland/livestock productivity
- aquaculture productivity (freshwater)
- mariculture productivity (brackish/salt water)

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

Supporting services necessary for the production of all other ecosystem services

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

Aspects of Biodiversity: Composition, Structure and Key Processes

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

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

Assessment of plans and projects significantly affecting Natura 2000 sites (884-EN-C)

Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (November 2001) (*)

These assessments required under Article 6(3) and (4) of the habitats directive (1) (referred to here as the Article 6 assessments) are required where a project or plan may give rise to significant effects upon a Natura 2000 site (2).

For the purposes of Article 6 assessments, Natura 2000 sites are those identified as sites of Community importance under the habitats directive or classified as special protection areas (SPAs) under the Birds Directive 79/409/EEC.

(*) Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992).

Article 6, paragraphs (3) and (4) state:

‘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.

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.'

The assessment requirements of Art. 6 establish a stage-by-stage approach.

Stage One:

Screening

The process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

Stage Two:

Appropriate assessment

The consideration of 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 are adverse impacts, an assessment of the potential mitigation of those impacts;

Stage Three:

Assessment of alternative solutions

The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site;

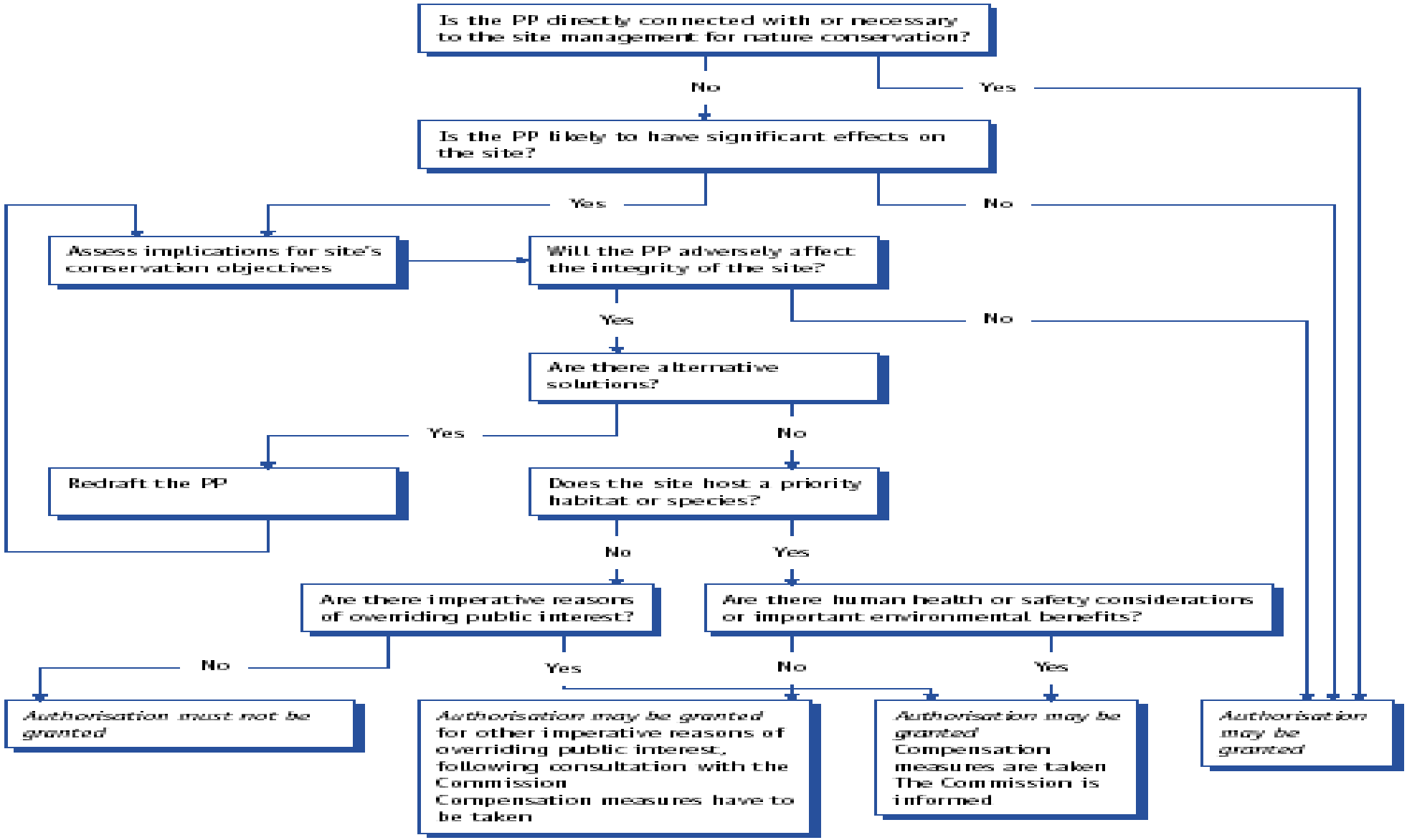
Stage Four:

Assessment where no alternative solutions exist and where adverse impacts remain

An assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest).

Flow chart of the Article 6(3) and (4) procedure (from MN2000) in relation to the stages of the guidance

CONSIDERATION OF A PLAN OR PROJECT (PP) AFFECTING A NATURA 2000 SITE



The Commission's COM(2000) 1 final 'Communication from the Commission on the precautionary principle' (European Commission, 2000a) states that the use of the precautionary principle presupposes:

- identification of potentially negative effects resulting from a phenomenon, product or procedure;
- a scientific evaluation of the risks which, because of the insufficiency of the data, their inconclusive or imprecise nature, makes it impossible to determine with sufficient certainty the risk in question

This means that the emphasis for assessment should be on objectively demonstrating, with supporting evidence, that:

- **there will be no significant effects** on a Natura 2000 site (Stage One: Screening); or
- **there will be no adverse effects** on the integrity of a Natura 2000 site (Stage Two: Appropriate assessment); or
- **there is an absence of alternatives** to the project or plan that is likely to have adverse effects on the integrity of a Natura 2000 site (Stage Three: Assessment of alternative solutions); or
- **there are compensation measures** which maintain or enhance the overall coherence of Natura 2000 (Stage Four: Assessment of compensatory measures).

Environmental impact assessment (EIA) and strategic environmental assessment (SEA)

Where projects or plans are subject to the EIA or SEA directives, the Article 6 assessments may form part of these assessments. However, **the assessments required by Article 6 should be clearly distinguishable and identified within an environmental statement or reported separately**.

Similarly, MN2000 makes clear that where a project is likely to have significant effects on a Natura 2000 site it is also likely that both an Article 6 assessment and an EIA, in accordance with Directives 85/337/EEC and 97/11/EC, will be necessary.

In combination with other plans or projects'

The phrase 'in combination with other plans or projects' in Article 3(3) refers to cumulative effects caused by the projects or plans that are currently under consideration together with the effects of any existing or proposed projects or plans.

When impacts are assessed in combination in this way, it can be established whether or not there may be, overall, an impact which may have significant effects on a Natura 2000 site or which may adversely affect the integrity of a site.

Example: a proposed road will pass some distance from a Natura 2000 site and the disturbance it will generate (noise etc.) will not significantly affect bird species important to the integrity of the site. However, if there are other existing or proposed projects or plans (e.g. a road on the other side of the Natura 2000 site), then total noise levels from all these projects taken together may cause disturbance that is assessed as significant.

Important issues in carrying out cumulative impact assessments (**7**) should be noted, including:

- the setting of boundaries for the assessment — this may be complicated where projects and other sources of impacts which are to be assessed together are not located close together, or where species or other wildlife factors such as sources of food are dispersed, etc.;
- establishing responsibilities for carrying out assessments where projects or plans are proposed plans or projects' by different proponents or controlled by different competent authorities;
- characterising of potential impacts in terms of causes, pathways and effects;
- where two or more sources of impacts act in combination to create a significant effect, taking particular care in assessing mitigation options and allocating responsibility for appropriate mitigation.

Alternative solutions and mitigation

They could involve alternative locations (routes in cases of linear developments), different scales or designs of development, or alternative processes.

The ‘‘zerooption’’ should be considered too’

Project or plan proponents should consider alternative solutions at the earliest stages of development.

I**t is for the competent authority to determine whether alternative solutions exist or not**, and this assessment should take place once the appropriate assessment stage has concluded that adverse effects are likely

- Mitigation is defined by MN2000 as ‘measures aimed at minimising or even cancelling the negative impact of a plan or project, during or after its completion’

Imperative reasons of overriding public interest

Following the determination of whether alternative solutions exist, it is necessary to consider whether there are or are not imperative reasons of overriding public interest (IROPI).

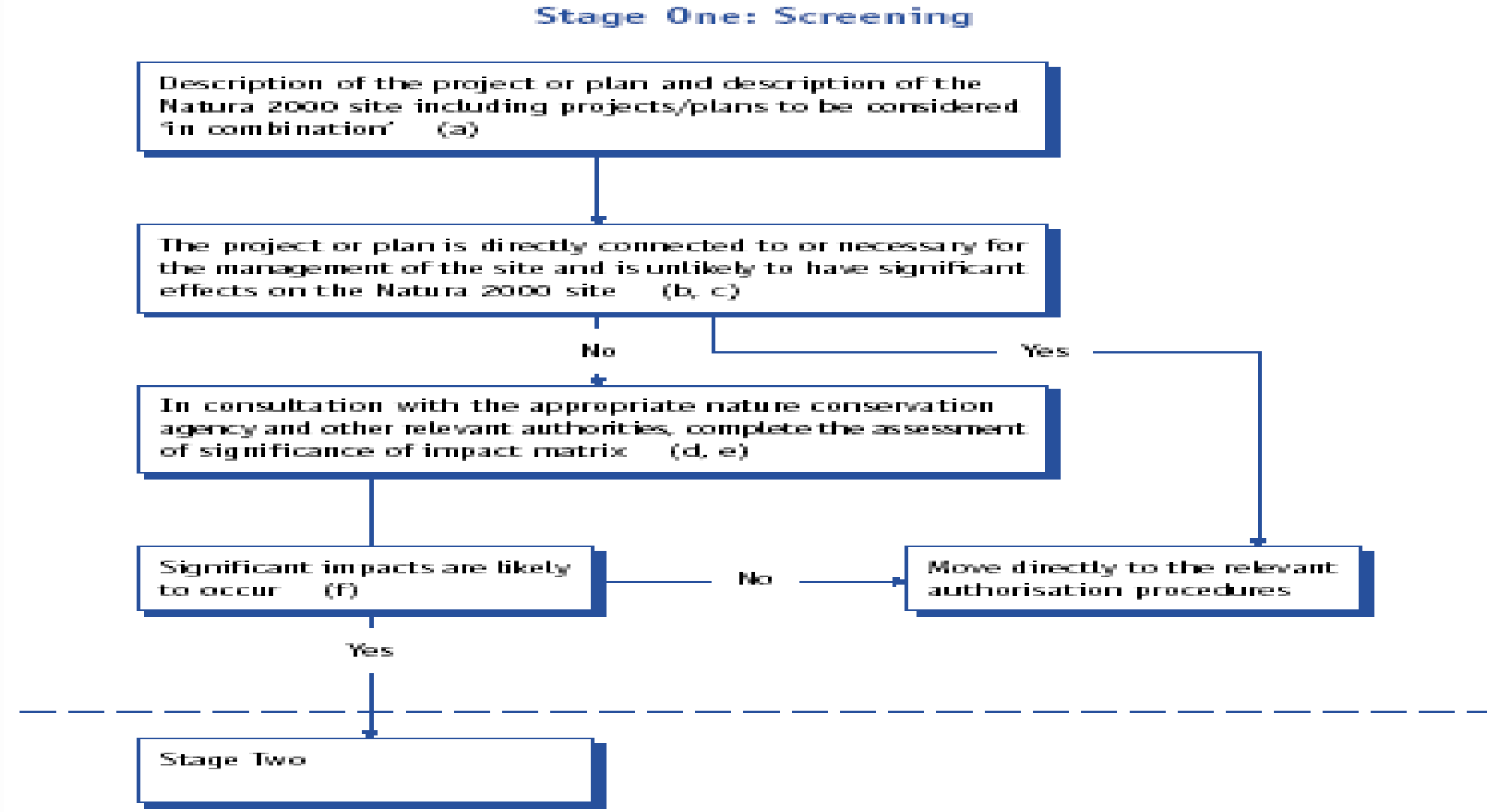
‘Having regard to the structure of the provision, in the specific cases, the competent national authorities have to make their approval of the plans and projects in question subject to the condition that the balance of interests between the conservation objectives of the site affected by those initiatives and the abovementioned imperative reasons weighs in favour of the latter.

This should be determined along the following considerations.

(a)The public interest must be overriding: it is therefore clear that not every kind of public interest of a social or economic nature is sufficient, in particular when seen against the particular weight of the interests protected by the directive

(b) In this context, it also seems reasonable to assume that the public interest can only be overriding if it is a long-term interest; shortterm economic interests or other interests which would only yield short-term benefits for society would not appear to be sufficient to outweigh the long-term conservation interests protected by the directive.

Starting the assessment



Notes

(a) In order to carry out an assessment of the project or plan, it is first necessary fully to characterise the project or plan and the receiving environment (see Section 3.1.4 below).

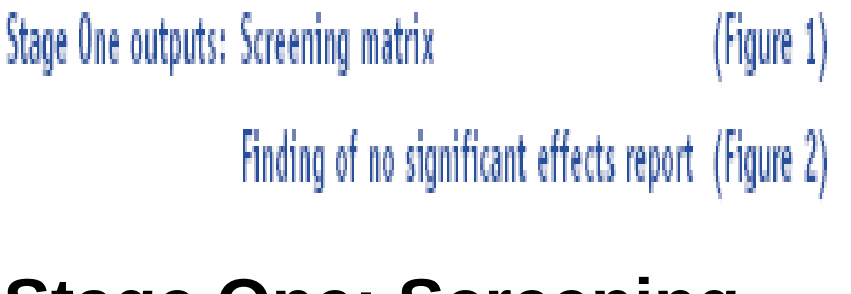
(b) The assessment must address effects from other plans/projects (existing or planned) which may act in combination with the plan/project currently under consideration and generate cumulative effects (see Section 2.5 above).

(c) Where a plan or project is directly connected to or necessary for the management of the site, and is unlikely to have significant effects on the Natura 2000 site, appropriate assessment is not required (see MN2000, paragraph 4.3.3).

(d) Institutions vary from Member State to Member State. The institution to be consulted may be the one responsible for the implementation of the habitats directive.

(e) Assessment of significance (see Section 3.1.5 below).

(f) This evaluation is made using the precautionary principle.



Stage One: Screening

1. determining whether the project or plan is directly connected with or necessary to the management of the site;

2. describing the project or plan and the description and characterisation of other projects or plans that in combination have the potential for having significant effects on the Natura 2000 site;

3. identifying the potential effects on the Natura 2000 site;

4. assessing the significance of any effects on the Natura 2000 site.**Article**

1- Management of the site

For a project or plan to be directly connected with or necessary to the management of the site', the 'management' component must refer to management measures that are for conservation purposes, and the 'directly' element refers to measures that are solely conceived for the conservation management of a site and not direct or indirect consequences of other activities.

2- Description of the project or plan

Box 1: Description of the project or plan checklist

Have these features of the project or plan been identified?	✓/✗
Size, scale, area, land-take, etc.	
Plan sector	
Physical changes that will flow from the project or plan (from excavation, piling, dredging, etc.)	
Resource requirements (water abstraction etc.)	
Emissions and waste (disposal to land, water or air)	
Transportation requirements	
Duration of construction, operation, decommissioning, etc.	
Plan implementation period	
Distance from Natura 2000 site or key features of the site	
Cumulative impacts with other projects or plans	
Other, as appropriate	

TOOLS Needed

Where a geographical information system (GIS) is available, this will be very useful in facilitating better understanding of the relationship between all elements in a plan or project and the particular attributes of the Natura 2000 site.

Box 2: Cumulative assessment

Steps in the assessment	Activity to be completed
Identify all projects/plans which might act in combination	Identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans.
Impact identification	Identify the types of impacts (e.g. noise, water resource reduction, chemical emissions, etc.) that are likely to affect aspects of the structure and functions of the site vulnerable to change.
Define boundaries for assessment	Define boundaries for examination of cumulative effects; note these will be different for different types of impact (e.g. effects upon water resources, noise) and may include remote (off-site) locations.
Pathway identification	Identify potential cumulative pathways (e.g. via water, air, etc.; accumulation of effects in time or space). Examine site conditions to identify where vulnerable aspects of the structure and function of the site are at risk.
Prediction	Prediction of magnitude/extent of identified likely cumulative effects.
Assessment	Comment on whether or not the potential cumulative impacts are likely to be significant.

The identification of impacts will require a characterisation of the site as a whole or of the areas where impacts are most likely to fall.

Box 3: Sources for impact identification

Have these sources been consulted?	✓/✗
The Natura 2000 standard data form for the site	
Existing and historical maps	
Land-use and other relevant existing plans	
Existing site survey material	
Existing data on hydrogeology	
Existing data on key species	
Environmental statements for similar projects or plans elsewhere	
State of the environment reports	
Site management plans	
Geographical information systems (see Section 3.2.3 below)	
Site history files	
Other, as appropriate	

Assessment of significance

Tools Needed: Indicators

Box 4: Examples of significance indicators

Impact type	Significance indicator
Loss of habitat area	Percentage of loss
Fragmentation	Duration or permanence, level in relation to original extent
Disturbance	Duration or permanence, distance from site
Population density	Timescale for replacement
Water resource	Relative change
Water quality	Relative change in key indicative chemicals and other elements

Box 5: Case study examples: Assessment of significance

Road and rail development across dry woodland sites: The significance of loss or change of habitat in this case was initially assessed in terms of percentage of habitat affected. However, in the final analysis, any loss of habitat was considered as being significant and alteration of the site, without the possibility of restoration, was also seen as significant.

Road project: In this case, the significance of impact was determined on the basis of the percentage of lost habitat within the site. Then the percentage loss of habitat was placed within the context of the total amount of this habitat type within the Member State. It was concluded that, as the habitat type was in decline, the loss of even 1 % of habitat would be significant.

Developments at an estuary site: In this case, the complex relationships between species and habitats were of prime concern. A matrix was developed, relating five types of bird (e.g. small feeding waders, roosting wildfowl) to three levels of sensitivity ('disturbance potential' throughout the year). Sensitivity was assessed as being high, moderate or low. May to August was identified as the period of lowest potential disturbance.

Planned construction work during a period of 'high' disturbance potential was seen as likely to cause significant impact (i.e. sufficient to prompt mitigation, which included the rescheduling of construction activity).

Water resource developments in semi-arid land: The consideration of significance began in this case with the establishment of a set of indicators for critical aspects of environment and socioeconomic conditions and included nature conservation area status and regional distribution of species according to habitat selection criteria. Impacts were measured in terms of percentage decrease in bird populations, likely species extinction, and disappearance of statutorily protected wetlands.

Figure 1: Worked example of the screening matrix for a tourism strategy (plan)

Brief description of the project or plan	*The proposed plan is a draft tourism strategy for an area that has undergone industrial decline and is in need of economic and environmental regeneration.*
Brief description of the Natura 2000 site	*The site comprises estuarine marshes. It is an SPA and Ramsar site listed for its important assemblage of wildfowl and waders: 1 % of the national breeding population and 29 % of the national wintering population of the key species are present.*

Assessment criteria

Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	1. *The plan proposes to remove derelict industrial buildings on the opposite bank to the Natura 2000 site.* 2. *The plan includes proposals for a coastal footpath. This may be routed in or near the site.* 3. *The plan includes proposals for demolition of existing wharf facilities upstream of the site and their replacement with new leisure and tourism boating and water sport facilities.*
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: ■ size and scale; ■ land-take; ■ distance from the Natura 2000 site or key features of the site; ■ resource requirements (water abstraction etc.); ■ emissions (disposal to land, water or air); ■ excavation requirements; ■ transportation requirements; ■ duration of construction, operation, decommissioning, etc.; ■ other.	1. *The engineering operation necessary for the clearance of the derelict industrial buildings will be less than 400 metres from the site boundary. The clearance of the site is likely to take six months (potential disturbance).* 2. *The coastal footpath may be routed in or near the site. The path corridor will be 4 metres wide and is likely to require some excavation to lay a gravel path and some stretches of the path are likely to require fencing (potential loss of area).* 3. *The new water-based leisure facilities will be 1 kilometre upstream of the site, will involve demolition and removal of existing buildings, construction of new facilities including a new marina for 20 yachts, moorings for 3 pleasure boats, and other facilities for water-based activities which will take several months to complete (potential disturbance).*

Describe any likely changes to the site arising as a result of: ■ reduction of habitat area; ■ disturbance to key species; ■ habitat or species fragmentation; ■ reduction in species density; ■ changes in key indicators of conservation value (water quality etc.); ■ climate change.	1. *The clearance of the derelict industrial site has the potential to cause disturbance to breeding birds by virtue of noise and human presence. The risk of pollutants being released into the river may also affect species' ability to utilise the site.* 2. *The coastal path scheme, unless diverted away from the site, has the potential to introduce large numbers of humans causing disturbance, and there may be some loss of habitat if the route passes through the site.* 3. *The proposed new water-based leisure and tourism facilities are likely to cause disturbance through increased river traffic.*
Describe any likely impacts on the Natura 2000 site as a whole in terms of: ■ interference with the key relationships that define the structure of the site; ■ interference with key relationships that define the function of the site.	*The chief risk is disturbance to breeding birds, which may result in a decrease in populations over time.*

Provide indicators of significance as a result of the identification of effects set out above in terms of: ■ loss; ■ fragmentation; ■ disruption; ■ disturbance; ■ change to key elements of the site (e.g. water quality etc.).	*1. Estimated degree of decrease in key species population.* *2. Degree of fragmentation and disturbance caused by the coastal path.* *3. Estimated degree of risk of pollution affecting the site if contamination is released during the clearance and demolition of existing buildings and site clearances.*
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	*On the basis of consultation with the relevant nature conservation agency, it has been concluded that significant effects are likely to arise as a result of disturbance from all three elements of the plan described above.*

Figure 2: Finding of no significant effects report

Name of project or plan	
Name and location of Natura 2000 site	*It would be helpful for a map or plan to be provided.*
Description of the project or plan	*Provide details of size, scale, the physical requirements of construction, operation and, where relevant, decommissioning.*
Is the project or plan directly connected with or necessary to the management of the site (provide details)?	
Are there other projects or plans that together with the project or plan being assessed could affect the site (provide details)?	*Define boundaries for the assessment, details of responsibilities regarding other projects or plans and the name and location of other projects or plans (maps will again be a useful tool to illustrate relationships).*

The assessment of significance of effects

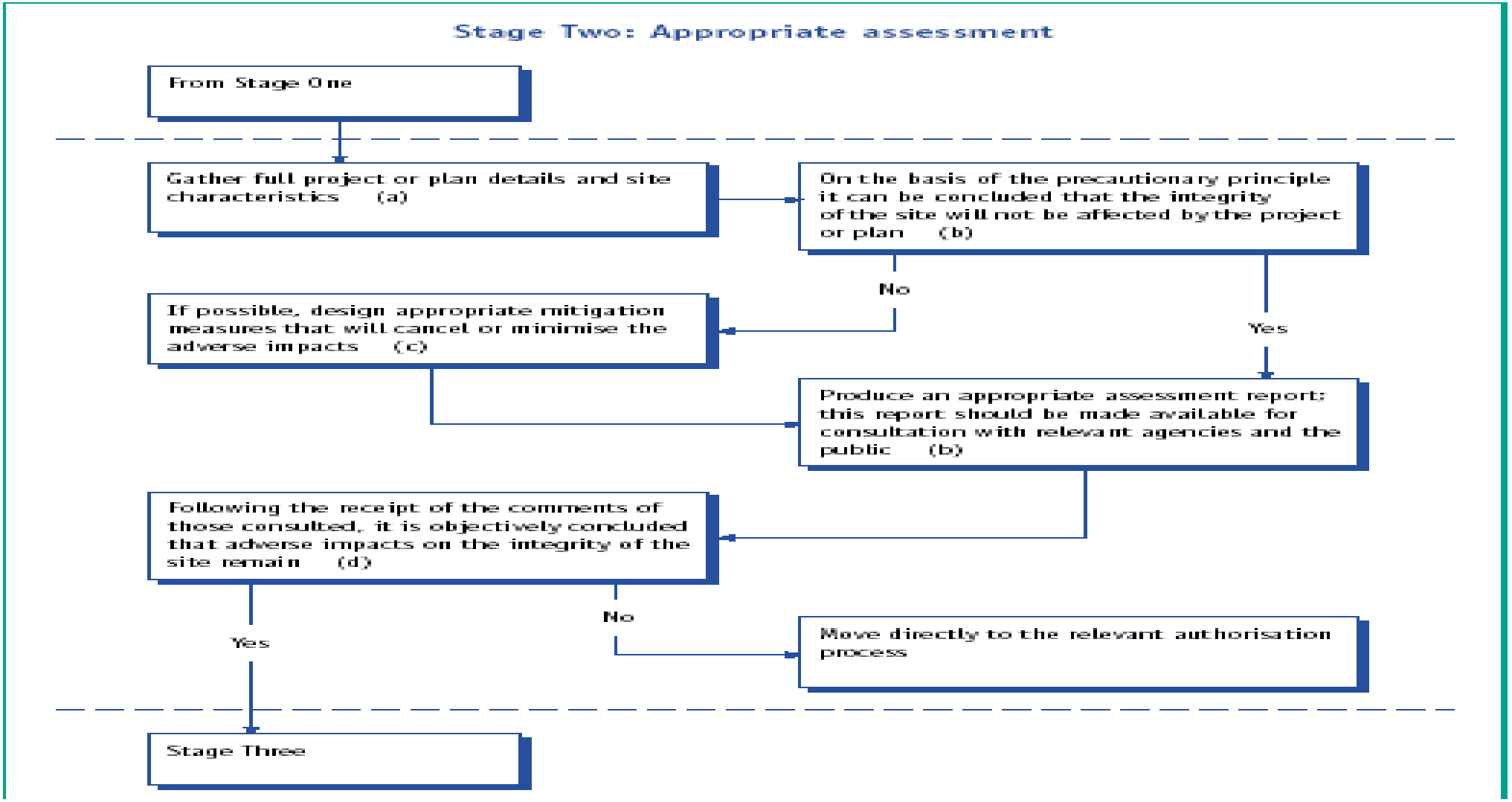
Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site.	*Include direct and indirect effects and explain how the assessment was carried out.*
Explain why these effects are not considered significant.	*This may be done with reference to key indicators of significance including degree of change to the site, duration of the project or plan, etc.*
List of agencies consulted.	*Provide contact name and telephone or e-mail address.*
Response to consultation.	*State whether the agencies consider the effects are significant or not.*

Data collected to carry out the assessment

Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
This could be the competent authority, project or plan proponent, or national or regional responsible government agency.	*This will include field studies, existing records, consultation with relevant agencies, etc.*	*This could include desktop study, full ecological assessment, etc. Indicate the degree of confidence that can be attributed to the results of the assessment.*	*Provide times and dates when the information can be viewed, and addresses and telephone numbers of the contact persons.*

Overall conclusions

Explain how the overall conclusion that there are no significant effects on this Natura 2000 site was arrived at.


Stage Two: Appropriate assessment
From Stage One
Gather full project or plan details and site characteristics (a)
On the basis of the precautionary principle it can be concluded that the integrity of the site will not be affected by the project or plan (b)
No
Yes
If possible, design appropriate mitigation measures that will cancel or minimise the adverse impacts (c)
Produce an appropriate assessment report; this report should be made available for consultation with relevant agencies and the public (b)
Following the receipt of the comments of those consulted, it is objectively concluded that adverse impacts on the integrity of the site remain (d)
No
Yes
Move directly to the relevant authorisation process
Stage Three

Notes

(a) This may make use of information gathered in Stage One, although it will also require more detailed information (see Sections 3.2.2 and 3.2.3 below).

(b) This assessment must be made on the basis of the precautionary principle (see Section 3.2.4 below).

(c) It is for the competent authority to determine what mitigation measures will be required (see Section 3.2.5 below).

(d) Make use of the checklist in Box 10 below.

Stage Two outputs: Appropriate assessment: Mitigation measures (Figure 3)

Appropriate assessment report (Figure 4)

Stage Two: Appropriate assessment

In this stage, the impact of the project or plan (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function.

Step One: Information required

Step Two: Impact prediction

Step Three: Conservation objectives

Step Four: Mitigation measures

Step One: Information required

Box 6: Information checklist for the appropriate assessment

Are these known or available?	✓/✗
Information about the project or plan	
Full characteristics of the project or plan which may affect the site	
The total range or area the plan will cover	
Size and other specifications of the project	
The characteristics of existing, proposed or other approved projects or plans which may cause interactive or cumulative impacts with the project being assessed and which may affect the site	
Planned or contemplated nature conservation initiatives likely to affect the status of the site in the future	
The relationship (e.g. key distances etc.) between the project or plan and the Natura 2000 site	
The information requirements (e.g. EIA/SEA) of the authorisation body or agency	

Are these known or available?	✓/✗
Information about the site	
The reasons for the designation of the Natura 2000 site	
The conservation objectives of the site and the factors that contribute to the conservation value of the site	
The conservation status of the site (favourable or otherwise)	
The existing baseline condition of the site	
The key attributes of any Annex I habitats or Annex II species on the site	
The physical and chemical composition of the site	
The dynamics of the habitats, species and their ecology	
Those aspects of the site that are sensitive to change	
The key structural and functional relationships that create and maintain the site's integrity	
The seasonal influences on the key Annex I habitats or Annex II species on the site	
Other conservation issues relevant to the site, including likely future natural changes taking place	

Box 7: Key information sources

Natura 2000 standard data forms and any site management plans that may exist.

Ecological information gathered for the screening stage of the assessment procedures.

Relevant nature conservation agencies and other bodies.

Relevant plans, current and historical maps, existing geological and hydrogeological survey material and any existing ecological survey material that may be available from landowners, site managers or nature conservation bodies.

Environmental impact statements, appropriate assessment reports and other documentary evidence where similar plans or projects have been assessed in the past.

Step Two: Impact prediction

Box 8: Impact prediction methods

Direct measurements, for example of areas of habitat lost or affected, can identify proportionate losses from species' populations, habitats and communities.

Flow charts, networks and systems diagrams identify chains of impacts resulting from direct impacts; indirect impacts are termed secondary, tertiary, etc. impacts in line with how they are caused. Systems diagrams are more flexible than networks in illustrating interrelationships and process pathways.

Quantitative predictive models provide mathematically derived predictions based on data and assumptions about the force and direction of impacts. Models may extrapolate predictions that are consistent with past and present data (trend analysis, scenarios, analogies which transfer information from other relevant locations) and intuitive forecasting. Normative approaches to modelling work backwards from a desired outcome to assess whether the proposed project will achieve these. Some commonly used models predict the dispersal of pollutants in air, soil erosion, sediment loading of streams, and oxygen sag in polluted rivers.

Geographical information systems (GIS) can be used to produce models of spatial relationships, such as constraint overlays, or to map sensitive areas and locations of habitat loss. GIS are a combination of computerised cartography, storing map data, and a database management system, storing attributes such as land use or slope. GIS enable the variables stored to be displayed, combined, and analysed speedily.

Information from previous similar projects may be useful, especially if quantitative predictions were made initially and have been monitored in operation.

Expert opinion and judgment can be derived from previous experience and consultations.

Step Three: Conservation objectives

Box 9: Examples of conservation objectives

For a chalk stream: In-channel vegetation should be dominated by named species; flows should be sufficient to sustain natural river processes; spring flows should be maintained; river substrate should continue to be clean gravels.

For an estuary site: Maintenance of the estuary feature, plus associated flora and fauna, in favourable condition.

For a coastal site: To maintain the status of the European features of this coastal site in favourable condition, allowing for natural change. Features include coastal shingle vegetation and lagoons (within a candidate special area of conservation (SAC), which is also an SPA).

For a marine site: To ensure that there is no net loss of area or change to the structure, biodiversity or distribution pattern of the highly sensitive communities within the site.

For a saltwater lagoon site: Subject to natural change, maintain the lagoon in favourable condition in respect of the key species' communities within the site.

Box 10: Integrity of site checklist

Conservation objectives

Does the project or plan have the potential to:	Yes/No
cause delays in progress towards achieving the conservation objectives of the site?	
interrupt progress towards achieving the conservation objectives of the site?	
disrupt those factors that help to maintain the favourable conditions of the site?	
interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	

Other indicators	
Does the project or plan have the potential to:	Yes/No
cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	
change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	
interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	
reduce the area of key habitats?	
reduce the population of key species?	
change the balance between key species?	
reduce diversity of the site?	
result in disturbance that could affect population size or density or the balance between key species?	
result in fragmentation?	
result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	

Box 11: Case study examples: Adverse impacts upon site integrity

Water abstraction from a chalk stream: The environmental protection authority determined in this case that potential adverse impacts on site integrity could not be ruled out in view of the difficulties in establishing whether the currently (at the time of the assessment) unfavourable condition of plant communities was due to natural variation or abstraction. Here the precautionary principle became the key to the assessment process.

Industrial developments: In this case, adverse effects were identified by reference to SPA and Ramsar Convention status plus national designations. Site integrity was linked to the area of the site that would be lost and the impacts upon birds, upon primary ecology of the site and upon invertebrates. This example shows the importance of understanding the structure and function of the site and the key dynamics of the interrelationship between species and habitats.

Docks development: It was determined that the planned single development at an estuary site would not substantially adversely affect the nature conservation interests of the site, but some detrimental effect was expected. As the statutory nature conservation authority remained concerned about the continued attrition of the types of habitats present, the authority maintained an objection to the development on the basis of the precautionary principle.

Ports development: The national nature conservation agency concluded that there was insufficient knowledge about the tidal sediment regime at this location to determine whether any change in the regime would result in adverse effects on the integrity of the site as a whole. The risk of adverse effects on site integrity was sufficient to require mitigation and monitoring – again illustrating the importance of applying the precautionary principle.

Step Four: Mitigation measures

To assess mitigation measures, the following tasks must be completed:

- list each of the measures to be introduced (e.g. noise bunds, tree planting);
- explain how the measures will avoid the adverse
- impacts on the site;
- explain how the measures will reduce the adverse impacts on the site.

Then, for each of the listed mitigation measures:

- provide evidence of how they will be secured and implemented and by whom;
- provide evidence of the degree of confidence in their likely success;
- provide a timescale, relative to the project or plan, when they will be implemented;
- provide evidence of how the measures will be monitored, and, should mitigation failure be identified,how that failure will be rectified.

Box 12: Case study examples: Mitigation

Road and rail developments across dry habitats: In this case, mitigation measures for impacts included appropriate scheduling of construction works to avoid or reduce disturbance of fauna or destruction of nests and shelters, and the erection of screens to prevent bird strikes, collisions and electrocutions. Also, strengthened land planning regulation was recommended to reduce induced effects in the surrounding area.

A railway project in a mountain area: In this case, the developer was required to submit a visitor management plan including an approved monitoring scheme to ensure that adverse effects could be avoided.

River docks development: Where a channel was to be dredged and quays constructed at a riverside site, monitoring surveys were proposed to assess the success of mitigation measures to ensure invertebrate recolonisation of the area.

Industrial development: Mitigation for a cluster of major projects included the rescheduling of construction activities, a code of construction practice to avoid or reduce intrusion and disturbance, and the screening of the major work site and its workers from birds using the Natura 2000 site.

Figure 3: Appropriate assessment: Mitigation measures

List measures to be introduced.	Explain how the measures will avoid the adverse effects on the integrity of the site.	Explain how the measures will reduce the adverse effects on the integrity of the site.	Provide evidence of how they will be implemented and by whom.
(i)	*Provide details of the mitigation, explaining the factors which will address the adverse effects.*		*This may include details of legally binding agreements that should be completed in advance of project or plan authorisation.*

List mitigation measures (as above).	Provide evidence of the degree of confidence in their likely success.	Provide a timescale, relative to the project or plan, when they will be implemented.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
(i)	*This may include evidence from similar projects or plans or support from the relevant nature conservation agency.*	*Some mitigation may be designed into the project or plan; in some cases, it will be additional mitigation that needs to be either in place before the project or plan authorisation or as soon as possible afterwards.*	*Securing a monitoring scheme and dealing with any mitigation failure may be through legally binding agreements that should be completed in advance of project or plan authorisation.*

Following the completion of the appropriate assessment, it should be considered best practice for the appropriate authority to produce an appropriate assessment report which:

- describes the project or plan in sufficient detail for members of the public to understand its size, scale and objectives;
- describes the baseline conditions of the Natura 2000 site;
- identifies the adverse effects of the project or plan on the Natura 2000 site;
- explains how those effects will be avoided through mitigation;
- sets out a timescale and identifies the mechanisms through which the mitigation measures will be secured, implemented and monitored.

Figure 4: Worked example of an appropriate assessment report for a wind turbine (project)

Assessment of the effects of the project or plan on the integrity of the site

Describe the elements of the project or plan (alone or in combination with other projects or plans) that are likely to give rise to significant effects on the site (from screening assessment).	*The project consisted of five wind turbines and ancillary development on a hill adjacent to the Natura 2000 site. The wind turbines were in the flight path of one of the site's major winter roost areas for an internationally important bird species. The likely significant impacts included the potential for bird collision and disturbance.*
Set out the conservation objectives of the site.	*To maintain the favourable conservation status of the site as the largest concentration of specific bird species in the country (9 % of national population).*
Describe how the project or plan will affect key species and key habitats. Acknowledge uncertainties and any gaps in information.	*There was considerable disagreement over the scientific evidence available on likely bird collision with the wind turbines. The assessment was based upon a calculation of risk. However, as there was little hard evidence, the precautionary principle was applied and adverse effects were assumed to be likely.*

Describe how the integrity of the site (determined by structure and function and conservation objectives) is likely to be affected by the project or plan (e.g. loss of habitat, disturbance, disruption, chemical changes, hydrological changes and geological changes, etc.). Acknowledge uncertainties and any gaps in information.	*The potential for collision, particularly by juvenile and sub-adult birds, could result in population reduction. Noise from the turbines could also cause disturbance — particularly significant in breeding periods. This could also reduce the breeding population size.*
Describe what mitigation measures are to be introduced to avoid, reduce or remedy the adverse effects on the integrity of the site. Acknowledge uncertainties and any gaps in information.	*Mitigation measures considered included:* ■ *lowering the height of the turbines;* ■ *redesigning the layout of the turbines;* ■ *increasing the distance between the turbines.* *The results of these measures were judged to be uncertain in the overall assessment of the impact on the site.*

Results of consultation

Name of agency(ies) or body(ies) consulted	Summary of response
National nature conservation agency	*It cannot be assumed that no adverse effects will result from the project.*
National nature conservation NGO	*This project has the long-term potential for causing the loss of the conservation interest in the site and should not be allowed to proceed.*
Local nature conservation NGO	*This is a site with national and international nature conservation importance and this project is likely to reduce the conservation value of the site and should not be permitted to proceed.*
National wind-energy operators' association	*There is no evidence that birds are at all affected by wind turbines and there is no evidence that the birds will be in any danger of collision.*

Stage Three: Assessment of alternative solutions

Box 13: Case study examples: Assessment of alternative solutions

Flood protection works at a coastal site: Three groups of alternative solutions were considered in connection with a flood defence protection scheme entailing construction of a clay embankment and other works:

1. continue with current management (unsustainable since the defence ridge is diminishing with threats to the Natura 2000 site);
2. do nothing/full retreat (not feasible as this would result in the loss of species for which the site was designated);
3. hold the line by recharging a shingle ridge (costly and unlikely to be sustainable in the long term).

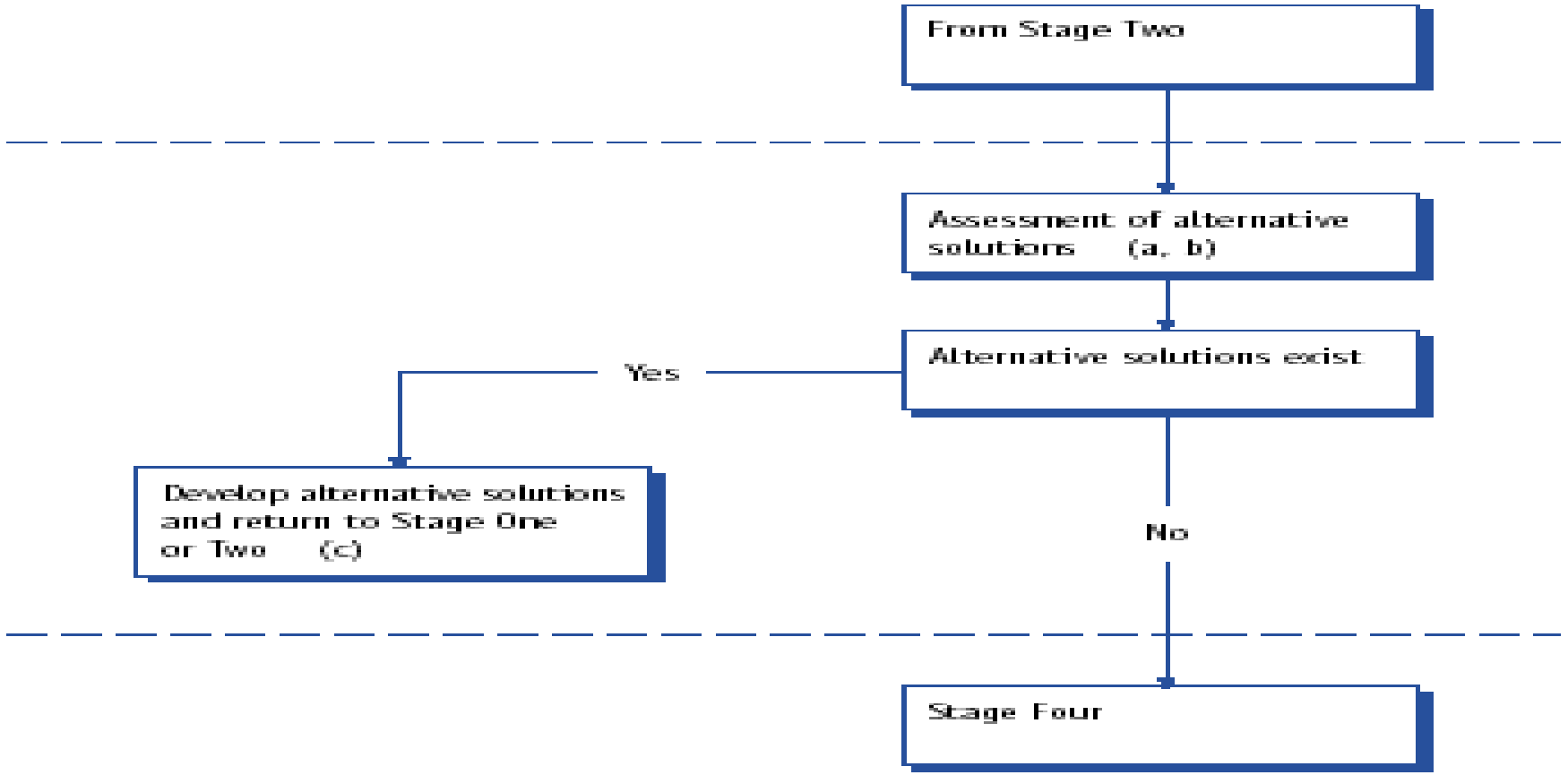
Here the alternative solutions were tested against their implication for the Natura 2000 site and as all these alternative solutions were judged as unsuitable, the proposal to build engineered hard defences was pursued.

Water resource developments in a semi-arid area: An SEA of irrigation and hydrology development plans concluded was carried out to identify alternative solutions. Based on an assessment of the implications of the alternative solutions on the Natura 2000 site, it was concluded that economic diversification that did not rely on irrigation needed to be more carefully considered. It could not be concluded, therefore, that there was an absence of alternative solutions.

Foul water drainage project: In one case, 10 alternative locations for a sewage treatment works were assessed on the basis of their relative impacts on the Natura 2000 site.

Road project: The alternative solutions assessed included routes, alignments, carriageway widths and single and dual-carriageway options. The fact that alternative routes existed that did not adversely affect the Natura 2000 site meant that it could not be concluded, therefore, that there was an absence of alternative solutions.

Stage Three: Assessment of alternative solutions



Notes

(a) For types of alternative solutions, see Section 3.3.2.

(b) For assessment of alternative solutions, see Section 3.3.3 and Box 14.

(c) Return to Stage One to screen alternative solutions which are new projects or plans or to Stage Two if the alternative solutions are amendments to the current project or plan.

Stage Three outputs: Assessment of alternative solutions matrix (Figure 5)

Alternative solutions assessment statement (Figure 6)

Evidence of assessment matrix (alternative solutions) (Figure 7)

Step One: Identifying alternative solutions

Possible alternative solutions may include variants of:

- locations or routes;
- scale or size;
- means of meeting objectives (e.g. demand management);
- methods of construction (e.g. 'silent piling');
- operational methods;
- decommissioning methods at the end of a project's life;
- scheduling and timescale proposals (e.g. seasonal working).

Step Two: Assessing alternative solutions

Box 14: How to assess alternative solutions

Consult relevant agencies and other bodies.

Make use of the information gathered to complete the screening and appropriate assessment stages of the Article 6 assessments.

Identify and characterise the key objectives of the project or plan.

Identify all alternative means of meeting the objectives of the project or plan.

Provide as much information as possible, acknowledge gaps in information, and provide sources of information.

Assess each alternative against the same criteria used in the appropriate assessment to assess the impact of the proposed project or plan on the conservation objectives of the site.

Apply the precautionary principle to the assessment of all alternatives.

Figure 5: Worked example of the assessment of alternative solutions matrix for a road project

Assessment of alternative solutions

The description and objectives of the project or plan

As part of the European Union's Structural Fund transport operational programme, to connect a peripheral regional centre to the national road network. The project is the construction of a 5 kilometre stretch of dual-carriageway road along the existing road corridor.

The 'do nothing' alternative

The existing single-carriageway road is unsuitable for the heavy goods vehicles that currently use it due to its width, alignment and condition. Without this new road, the existing road is likely to deteriorate further and become increasingly congested causing delays and a possible increase in road accidents.

Predicted adverse effects of the project or plan on the Natura 2000 site following the appropriate assessment

The Natura 2000 site is a residual alluvial forest (Alnion glutinoso-incanae) and therefore a priority habitat listed in Annex I to the habitats directive. The road project would result in the diversion of the river that runs through the wood and the loss of a significant number of trees and habitat. The river diversion would have adverse effects on the water table and water regime that characterises the habitat. The loss of trees and habitat would increase the vulnerability of the wood to further deterioration.

Possible alternative solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation objectives of Natura 2000 (greater or less adverse effects).
	Comparison with chosen project or plan	
	Alternative locations/routes	
Alternative One *Southern route avoiding the river but bisecting the wood*	*Proponent's assessment based upon likely delays and extra cost — no detailed assessment of impact on the wood.*	*While avoiding the need to divert the river, there would still be adverse effects caused by loss of habitat and fragmentation.*
Alternative Two *Southern route avoiding the wood*	*Proponent's assessment based upon likely delays and extra cost.*	*No direct adverse effects; however, future plans to allow the wood to colonise adjacent farmland to the south would be affected.*
Alternative Three *Northern route taking the road much further away from the wood*	*Proponent's assessment based upon likely delays and extra cost, impact on farm fragmentation, and impact on archaeological sites.*	*NGO commissioned assessment demonstrates no direct or indirect adverse effects on the Natura 2000 site.*

Alternative size and scale

Alternative One *Reduced carriageway width for section that passes through wood*	*Assessment based on reduced land-take. Assessment within the environmental report published with the plans for the project.*	*NGO's assessment demonstrated that adverse effects remain through loss of trees and habitat and potential for windthrow.*
Alternative Two *Slight realignment to move section through the wood slightly to the north to avoid the wood*	*Proponent's assessment of impacts included the loss of dwellings, required by the realignment. Assessment within the environmental report published with the plans for the project.*	*NGO's assessment suggested that there would be reduced direct adverse effects on the site. However, the potential for windthrow remains as does the potential for adverse impacts during construction due to disturbance and excavations, which may temporarily affect the water regime.*

Alternative means of meeting objectives (e.g. demand management)

Alternative One		
Proactive measures to direct goods traffic to existing rail network	*Assessed against the objectives of the project.*	*No direct or indirect adverse effects on the Natura 2000 site.*

Conclusions on assessment of alternatives

A range of alternatives have been considered by the competent authority, which in this case is also the project proponent. The alternatives that have been assessed have different impacts on the Natura 2000 site. Some of the alternatives, which were initially rejected by the proponents due to cost and delay, have less or no impact on the Natura 2000 site. It therefore cannot be objectively concluded that there is an absence of alternative solutions.

Note 1: A blank version of this matrix is provided in Annex 2.

Note 2: This worked example does not deal with all the types of alternative solutions set out in the blank matrix at the end of this report, as only the actual alternative solutions studied have been included here.

Figure 6: Alternative solutions assessment statement

Describe the alternative solution that would avoid or minimise significant impacts on the Natura 2000 site.	Explain why the proposed project or plan is favoured over the other alternative solutions assessed.
This may include a reassessment of the project or plan against the criteria used in Stage Two of this guidance.	*This should be based upon its relative effects on the Natura 2000 site. For example, will the alternative have greater or less adverse impacts on the site?*

Provide an overall statement to explain why it is considered that in this instance there are no alternative solutions that would avoid reducing the conservation value of the Natura 2000 site.

This statement should include reference to evidence of assessment and the comments of the relevant nature conservation agency and the competent authority.

Figure 7: Evidence of assessment matrix (alternative solutions)

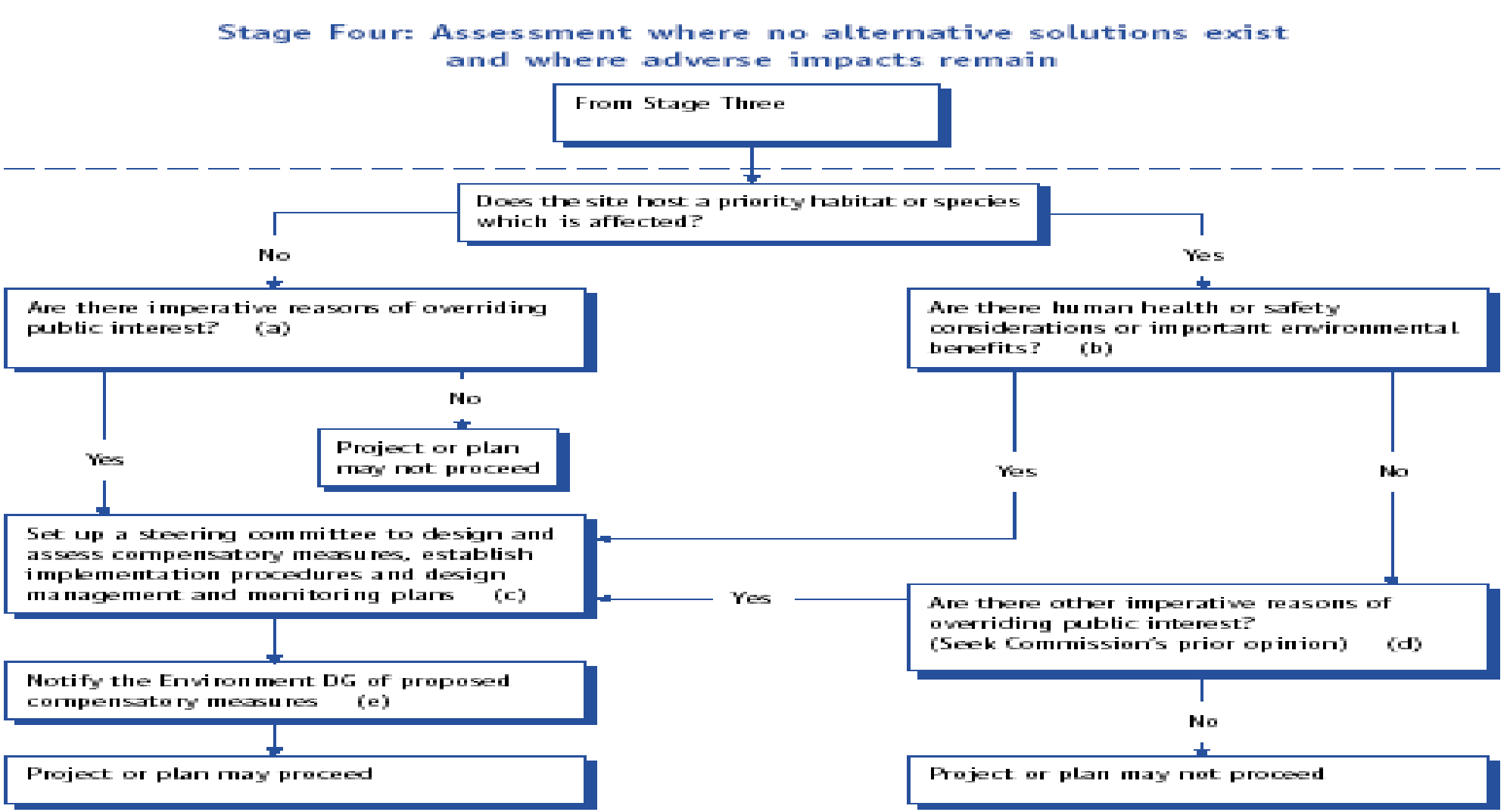
Consultation on alternative solutions

List of agencies consulted	Response to consultation	Impact of alternatives on the Natura 2000 site are considered adverse	Impact of alternatives on the Natura 2000 site are considered positive or neutral
Provide contact name and telephone or e-mail address, date of consultation, etc.		*Explain the adverse effects and, where possible, refer to relevant assessments and documentary evidence.*	*Explain why the project or plan will not have adverse effects and, where possible, refer to relevant assessments and documentary evidence.*

Data collected to carry out the assessment

Who carried out the assessment?	*This could be the competent authority, project or plan proponent, or relevant responsible government agency.*
Sources of data	*These may include details from baseline studies, field studies, existing records, etc.*
Level of assessment completed	*This could be a full EIA, desk study, etc. It will be important to provide an assessment of the degree of confidence in the results of the assessment.*
Where can the full results of the assessment be accessed and viewed?	*Provide times and dates when the information can be viewed, and addresses and telephone numbers of the contact persons.*

Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain proceed.



Notes

(a) The IROPI concept is discussed in MN2000, paragraph 5.3.1.

(b) For a discussion of human health and safety considerations, see MN2000, paragraph 5.5.2.

(c) Compensatory measures are additional to normal practices and should provide compensation corresponding precisely to the loss to the Natura 2000 network (see Section 3.4.2 and Box 15).

(d) The Commission will provide a prior opinion on the relevance of the IROPI which are being invoked (see MN2000, paragraph 5.5.3).

(e) A relevant form is provided in MN2000, Annex IV.

Stage Four outputs: Compensatory measures assessment matrix (Figure 8)

Evidence of assessment matrix (compensatory measures) (Figure 9)

Summary of Article 6(3) and (4) assessments (Figure 10)

Step One: Identifying compensatory measures

Box 15: Examples of compensatory measures

Compensatory measures appropriate to adverse effects on Natura 2000 sites consist of:

- restoration — restoring the habitat to ensure the maintenance of its conservation value and compliance with the conservation objectives of the site;
- creation — creating a new habitat on a new site or through the enlargement of the existing site;
- enhancement — improving the remaining habitat proportional to that which is lost due to the project or plan;
- preservation of habitat stock — measures to prevent further erosion of the coherence of the Natura 2000 network.

These compensatory measures need to be assessed to ensure that they:

- are appropriate to the site and the loss caused by the project or plan;
- have the ability to maintain or enhance the overall coherence of Natura 2000;
- are feasible;
- can be operational by the time the damage to the site is effected (unless this can be proved unnecessary in the circumstances of the case).

Step Two: Assessment of compensatory measures

To be acceptable, compensatory measures should:

- address, in comparable proportions, the habitats and species negatively affected;
- relate to the same biogeographical region in the same Member State and be in as close proximity as possible to the habitat that has been adversely affected by the project or plan;
- provide functions comparable to those which justified the selection criteria of the original site;
- have clearly defined implementation and management objectives so that the compensatory measures can achieve the maintenance or enhancement of Natura 2000 coherence.

Box 16: Case study examples: Compensatory works

Port development at an estuary site: At a harbour site where channel deepening would lead to a loss of mudflats, the compensatory measure of creating a new intertidal habitat was proposed and accepted. The target land was already under the ownership of the developer and planning permission for the compensatory measure had been obtained in advance of the approval of the project that would adversely affect the Natura 2000 site.

Docks development: It was proposed that the loss of 10 % of a riverside site, which includes SPA and candidate SAC areas, would be compensated for by a gain of compensatory feeding habitat following the eradication of grassland. However, local NGOs considered the compensatory measures to be more damaging to nature conservation interests than the project itself. The compensatory measures were therefore not considered acceptable.

Road and rail developments across semi-arid habitats: Where habitats were lost or threatened by transport infrastructure proposals in an area of steppe and woodland, compensatory proposals included recreation of habitat for *Falco Naumanni* via the purchase of irrigated land and its conversion to dryland farming, plus the restoration of derelict land. Areas of community interest were also to be recreated within the protected sites. All the compensatory measures were agreed and implementation provisions put in place prior to the authorisation of the project.

Flood defence works at a coastal site: Where a flood defence protection scheme was expected to lead to losses of habitat (e.g. 12 % loss overall), proposed compensatory measures included 26 hectares of grazing marsh to be converted to habitats suitable for the SPA species potentially affected by the scheme. These measures were made the subject of consultation and agreement prior to project authorisation.

Major road project: There were residual adverse effects following the consideration of mitigation for a major road project. A draft compensation plan was produced for public consultation. Following consultation, the plan was redrafted and sent to the relevant nature conservation agencies for their views. The plan contained details of how disruption to species and destruction of habitat would be compensated, a set of compensation objectives based upon guide species targets, an implementation timescale, the costs of compensation measures, and proposals for monitoring and evaluation.

Urban redevelopment at a coastal site with river barrage: Following a proposed loss of nearly 200 hectares of a priority national nature conservation site, a steering committee, including the national countryside protection agency, a major conservation NGO and the project proponents, guided the creation of compensatory measures, including the creation of a new wetland reserve of 400 hectares (partly converted agricultural land). Elements of the compensation plan included ensuring long-term ownership and management, setting bird targets for the new reserve to meet SPA status, and monitoring arrangements.

Figure 8: Worked example of the compensatory measures assessment matrix for harbour works (project)

Name and brief description of the project or plan and how it will adversely affect the Natura 2000 site

The proposal is to provide navigable deep water within an existing port facility and the disposal of dredged material onto mudflats that form part of a Natura 2000 site. These works would result in the loss of a significant area of the intertidal mudflats.

Description of the compensatory measures

Dredged material will be used to recharge the intertidal mudflats in the harbour and 4 hectares of intertidal habitat will be created at an existing nearby area of marshland. A managed realignment will compensate for the intertidal habitat lost as a result of the dredging. The area and quality of the available habitat for the birds using the site will be maintained.

Assessment questions	Response
How were compensatory measures identified?	*Through consultation with the national nature conservation agency, relevant NGOs, landowners, etc., through a steering group.*
What alternative measures were identified?	*A number of other sites were considered for the replacement habitat but the chosen site met the nature conservation agency's criteria.*
How do these measures relate to the conservation objectives of the site?	*The measures are a 'like-for-like' replacement that is sufficiently close to the Natura 2000 site to be considered capable of recreating the ecological conditions of the lost site.*
Do these measures address, in comparable proportions, the habitats and species negatively affected?	*The area of new habitat is the same as that being lost, with further compensatory areas planned for the future.*

How would the compensatory measures maintain or enhance the overall coherence of Natura 2000?	*The compensatory measures would be a direct replacement for the existing site and future plans would expand and further maintain and enhance the coherence of Natura 2000.*
Do these measures relate to the same biogeographical region in the same Member State?	*Yes.*
If the compensation measures require the use of land outside the affected Natura 2000 site, is that land under the long-term ownership and control of the project or plan proponent or relevant national or local authority?	*The land is to be secured through purchase and through a legal agreement between the relevant parties.*
Do the same geological, hydrogeological, soil, climate and other local conditions exist on the compensation site as exist on the Natura 2000 site adversely affected by the project or plan?	*Some work will be necessary to enable the site to have the same conditions as the lost habitats. However, the nature conservation agency considers intertidal habitat replacement to be a 'proven technique'.*
Do the compensatory measures provide functions comparable to those that had justified the selection criteria of the original site?	*The nature conservation agency considers that once the site has been secured and the legal protection measures are in place, the site will meet the terms of reference for inclusion in the Natura 2000 network. The boundaries of the SPA will be adjusted to include the area of newly created habitat.*
What evidence exists to demonstrate that this form of compensation will be successful in the long term?	*The nature conservation agency is of the opinion that there are good grounds to conclude that the compensatory measures have a reasonable prospect of success. However, estuaries are complex and dynamic systems and there are uncertainties as to whether the compensatory site will ever be an exact replacement for the lost habitat.*

Figure 9: Evidence of assessment matrix (compensatory measures)

Consultation on compensatory measures

List of agencies consulted	Response to consultation	Compensatory measures were considered acceptable	Compensatory measures were not considered acceptable
Provide contact name and telephone or e-mail address, and date of consultation. State whether these bodies were part of a steering group that helped to devise the compensation and have agreed on issues such as long-term management and monitoring.			

Data collected to carry out the assessment	
Who carried out the assessment?	*This may include the competent authority, project or plan proponent, or relevant responsible government agency.*
Sources of data	*These may include details from baseline studies, field studies, existing records, national archives, databases, etc.*
Level of assessment	*This could be a full EIA, desktop study, etc. It will be important to provide an assessment of the degree of confidence in the results of the assessment.*
Where can the full results of the assessment be accessed and viewed?	*Provide times and dates when the information can be viewed, and addresses and telephone numbers of the contact persons.*

Figure 10: Summary of Article 6(3) and (4) assessments
Details of the project or plan and agencies and bodies involved
Name and brief description of project or plan
Name, Natura 2000 code number and description of the site(s)
List of agencies and other bodies consulted during the assessment
List of assessment documents and reports and their authors
List of all other relevant documents reviewed as part of the assessment
The application of Article 6(3) and (4) assessments
Stage One Results of preliminary impact identification and assessment of significance of impacts
Stage Two Assessment of the impact on the integrity of the site(s) and assessment of mitigation measures
Stage Three Assessment of alternatives
Stage Four IROPI test and assessment of compensatory measures
Overall summary of the remaining conservation status of the site(s)

Ecology Assessment

The ecology assessment aims to provide an understanding of the composition and ecological importance of the species, communities and ecosystems within the impact area of the proposed development, and their likely response to that disturbance.

Identification of potential impacts

The effects of each project on the environment will be unique, due to its construction, operation, duration and location.

Physical effects.

Physical alteration of the environment can include the direct clearing of vegetation and accompanying impacts on flora and fauna, creation of barriers to movement of terrestrial species and (most commonly) direct alteration of habitat.

Physical effects may be large-scale and therefore highly evident, though they may also be much smaller and less evident. Direct alteration of the habitat most often involves the loss of a habitat type to some form of built development. However, losses can also occur as a result of drainage schemes for reclamation purposes, disposal of unwanted on-site materials (top soil and overburden), etc.

Creation of barriers.

The creation of barriers may affect the movements of many species of terrestrial organism, including the breeding migrations crucial for the maintenance of some species/populations. Apart from the localised and often intensive effects associated with physical alteration of habitats, there may be other, more far-reaching effects associated with physical alteration of the terrestrial environment. Linear projects (roads, pipelines, and overhead transmissionlines), large-scale extraction (coal mines, gold) an major urban housing schemes remove large tracts of habitat, thus affecting the home range/migratory routes of many terrestrial organisms.

Chemical effects.

The most commonly encountered are changes in nutrient status, introduction of hydrocarbons, and changes in pH leading to heavy metal contamination. Changes in nutrient status can occur directly (such as tailing storage dams from mineral treatment processes), as a consequence of human activity (such as the disposal of sewage sludge) or indirectly by disturbance to areas which have large amounts of nutrient ‘locked up’ in their soil profile. Many vegetation/habitat types are of a low nutrient status and any nutrient inputs tend to result in the invasion of noxious species at the expense of the native species. Activities that alter the pH of the soil are also of particular concern.

Biological effects — flora

A frequent large-scale problem is the introduction of non-native plant species, perhaps via landscaping work following construction.

Non-native plants (often tree species) introduce a range of potential problems. They may grow more vigorously than native species, and quickly out-compete them; they tend to be established via unfavourable techniques such as deep ploughing; and they can dramatically alter the drainage regime of a given habitat. Other problems include increased pesticide application and the introduction of new genetic stocks of species already present in an area, perhaps detrimentally altering the genetic structure of the resident species.

Biological effects — fauna.

- A major issue surrounds the ‘opening-up’ of previously inaccessible tracts of land to non-native animals, particularly foxes, dogs and feral cats. Non-native animals compete with native species for food and resources, and often have no natural predators acting as control agents.
- Trapping non-native species may lead to non-target species also being trapped.

What components of the ecosystem should be investigated?

- *Components of value to humans* (economically important animals and habitats, species of value for ecotourism).
- *Components of intrinsic value* (rare or endangered species, or habitats that support particularly diverse assemblages, or contain particularly charismatic species).
- '*Keystone' components*. Some 'keystone' species may have a large or disproportionate effect on a habitat or community structure, in relation to their abundance or size, leading to a cascade effect on other components of the ecosystem.
- *Components as indicators of change,* reflecting the 'health' of that ecosystem. These indicators include: assemblages of organisms and populations of species, toxicological response and biomagnification of toxic substances.

BASELINE STUDIES

Establishing the impact area is vital but often difficult, as the boundaries to the majority of habitats are indeterminate. In this situation, the impacts of abiotic factors change, in relation to season forexample. It may, therefore, be necessary to revise the boundaries of the impact area in the light of emerging information, and any study must account for this.

Surveys should include physical parameters such as exposure, geology, and topography, as much of the interest in habitats is linked to the physical characteristics of the area.

If necessary, field ecologists must develop new, or adapt existing, survey methodologies to provide information of a standard that allows predictions to be made. The study area surveyed should include as many habitat types and taxonomic groups as possible.

Data obtained from field surveys should provide an objective basis for the assessment process.

Other situations prompting new survey work include:

- where the desk study indicates that the area to be affected contains species considered important at the local level;
- where species are likely to interact with the operation of the development;
- where a population has an important function within the habitats in and around the proposed development site;
- where the impact of the development will lead to significant habitat changes. For example, the removal of grazing animals in certain grassland habitats.

The focus of all habitats surveys must be the area to be disturbed.

Ideally, field surveys for the plants and habitatsshould include all vascular plants, bryophytes,lichens and fungi. It is therefore necessary toemploy the skill of experts who are able to identify these groups.

Five important factors in the planning of a detailed

- field survey are:
- sample size;
- sampling pattern (e.g. random, stratified, etc.);
- species abundance measures;
- environmental factors;
- methods of data analysis.

- *Stage 1 survey*. Provide a general description of the habitat(s) and vegetation types within the study area, presenting a list of the species in the area.
- *Stage 2 survey*. Provide further information on targeted sites within the overall study site. This requires an indication of species importance within acommunity — achieved by the collection of quantitative vegetation data. Stage 2 surveys should describe and classify the vegetation according to commonly accepted schemes.
- *Stage 3 survey*. Intense sampling to provide detailed quantitative information on species populations and communities. This is most often required to elucidated a complex community pattern, or to determine the relationships between species or communities and one or more critical factors.

Birds- A general bird survey might incorporate one or a combination of the following techniques

- *Territory mapping* — can be used to determine densities, locations and territories.
- *Line transect* — involves walking transects of fixed length and location at a standardised speed.
- *Point counts* — involves the use of randomly located points at which observations are made and is a useful technique in the understanding of bird/habitat associations.

Methods of impact prediction

- *Direct measurements*, for example of areas of habitat lost or affected, proportionate losses from species populations, habitats and communities.
- *Flow charts, networks and systems diagrams* to identify chains of impacts resulting from direct impacts;
- indirect impacts are termed secondary, tertiary, etc.
- impacts in line with how they are caused. Systems diagrams are more flexible than networks in illustrating interrelationships and process pathways;

Quantitative predictive models to provide mathematically derived predictions based on data and assumptions about the force and direction of impacts. Models may extrapolate predictions that are consistent with past and present data (trend analysis, scenarios, analogies which transfer information from other relevant locations) and intuitive forecasting. Normative approaches to modelling work backwards from a desired outcome to assess whether the proposed project will achieve these aims

Some commonly used models predict the dispersal of pollutants in air, soil erosion, sediment loading of streams, and oxygen sag in polluted rivers.

Geographical information systems (GIS) used to produce models of spatial relationships, such as constraint overlays, or to map sensitive areas and locations of habitat loss. GIS are a combination of computerised cartography, storing map data, and a database-management system storing attributes such as land use or slope. GIS enable the variables stored to be displayed, combined, and analysed speedily.

Information from previous similar projects may be useful, especially if quantitative predictions were made and have been monitored in operation.

- *Expert opinion and judgment* derived from previous experience and consultations.

- *Description and correlation*: physical factors (water regime, noise) may be directly related to distribution and abundance of species. If future physical conditions can be predicted then it may be possible to predict future abundance on this basis.
- *Carrying capacity analysis* involves identifying the threshold of stress below which populations and ecosystem functions can be sustained. Carrying capacity analysis involves the identification of potentially limiting factors, and mathematical equations are developed to describe the capacity of the resource or system in terms of the threshold imposed by each limiting factor.

- *Ecosystem analysis*

This approach aims to provide a broad regional perspective with a holistic framework. Three basic principles of ecosystem analysis are (i) taking the 'landscape level' view of ecosystems, (ii) use a suite of indicators including community level and ecosystem-level indices and (iii) taking into account the many interactions amongst ecological components which are involved in maintaining ecosystem function.

ASSESSMENT OF SIGNIFICANCE - Factors

- the character and perceived value of the affected environment;
- the magnitude, spatial extent and duration or anticipated change;
- the resilience of the environment to cope with change;
- confidence in the accuracy of predictions of change;
- the existence of policies, programmes, plans, etc. which can be used as criteria;
- the existence of environmental standards against which a proposal can be assessed (e.g. air quality standards, water quality standards);
- the degree of public interest and concern in the environmental resources concerned and the issues associated with a proposed project;
- scope for mitigation, sustainability and reversibility.

For Ramsar wetlands, an impact is significant if:

- areas of wetland are destroyed or modified;
- there is a major or measurable change in the natural hydrological regime of the wetland (e.g. changes to the timing, duration and frequency of ground and surface water flows to and within the wetland);
- the habitat or lifecycle of native species dependent on the wetland is seriously affected;
- there is a major and measurable change in the physico-chemical status of the wetland (e.g. salinity, pollutants, nutrients, temperature, turbidity;
- invasive species are introduced into the wetlands.

Similarly, for listed migratory species, an impact is to be deemed significant if it:

- modifies (including by fragmenting, altering fire regimes, altering nutrient cycles or hydrological cycles) destroys or isolates an area of habitat important to the survival of the species;
- introduces invasive species into an important habitat of the species;
- seriously disrupts the lifecycle (breeding, feeding migration or resting behaviour) of an ecologically meaningful proportion of the population of the species.