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European Commission

Assessment of plans and projects significantly affecting Natura 2000 sites

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

M. O'Briain

European Commission
Environment DG

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Impacts Assessment Unit
School of Planning
Oxford Brookes University
Gipsy Lane
Headington
Oxford OX3 0BP
United Kingdom

Tel. (44-1865) 48 34 34
E-mail: wjweston@brookes.ac.uk

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1. Introduction

1.1. Nature of the document

This document has been produced to provide non-mandatory methodological help to carry out or review the assessments required under Article 6(3) and (4) of the habitats directive ([1]) (referred to here as the Article 6 assessments). These assessments are required where a project or plan may give rise to significant effects upon a Natura 2000 site ([2]). The development of this guidance is based upon research carried out on behalf of the European Commission's Directorate-General for the Environment (Environment DG). This research drew upon a review of existing literature and guidance in the EU and worldwide, and the experience gathered through case study material where assessments similar to those required by the directive have been carried out.

The guidance is designed principally for use by developers, consultants, site managers, practitioners, competent authorities and national agencies in the EU Member States and in the candidate countries. It is hoped that it will also be of interest to other organisations involved in the management of Natura 2000 sites.

This guidance must always be read in conjunction with the directives and national legislation, and within the context of the advice set out in the Commission services' interpretation document 'Managing Natura 2000 sites: The provisions of Article 6 of the "Habitats" Directive 92/43/EEC' ([3]) (referred to in this guidance as MN2000). MN2000 is the starting point for the interpretation of the key terms and phrases contained in the habitats directive and nothing in this guidance document should be seen as overriding or replacing the interpretations provided in MN2000. Furthermore, this guidance should not be read as imposing or suggesting any procedural requirements for the implementation of the habitats directive. Its use is optional and flexible since,

([1]) Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7).

([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.

([3]) See http://europa.eu.int/comm/environment/nature/home.htm.

under the principle of subsidiarity, it is for individual Member States to determine the procedural requirements deriving from the directive.

It is the responsibility of the competent authority in each Member State to make the key decisions within the Article 6(3) and (4) assessments. However, in this guidance document, the term 'assessment' is used as in environmental impact assessment (EIA). That is, it describes the whole process by which information is gathered by project or plan proponents, relevant authorities, nature conservation and other agencies, non-governmental organisations (NGOs), and the public and provided to the competent authority for consideration and evaluation. The competent authority then determines the outcomes of the assessment and reaches a decision. This recognises that the assessments required under Article 6 will rely on the gathering of information and data by a variety of stakeholders as well as consultation between them.

1.2. Structure

This document is made up of four main sections.

- Following this introduction, the general approach and principles underpinning the guidance are explained. The flow chart from MN2000 is included to demonstrate how the Article 6 assessments are structured. The flow chart indicates how the various stages of assessment suggested in this guidance relate to the requirements of Article 6(3) and (4).
- The next section contains the main stage-by-stage methodological guidance and includes subsidiary flow charts to illustrate the process for completing each stage. Each stage contains material from case studies, worked examples and suggestions on how the various assessments should be completed. The case study material presented in this guidance does not reveal the identity of sites and stakeholders. It is not the role of this document to debate the merits of individual assessments within decided cases. The case study and worked example material is presented here to help illustrate some of the methods used and to help to explain particular aspects of the assessment process. The approach used in this guidance is based on the use of checklists and matrices and these are set out within the stages of the assessment. A list of key references, including useful web sites, is then provided for further assistance.
- At the end of this guidance document there is a matrix reporting form to provide an overall summary of assessment. It can also be used as a review tool to check on the completion of the relevant assessments.
- The final section includes Annex 1, which provides some guidance on carrying out baseline ecological studies, and Annex 2, which contains blank assessment matrices.

2. General approach and principles

2.1. Explaining the guidance

The starting point for the development of this guidance is the habitats directive itself. 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.'

From MN2000, and from important cases and developing practice, it has become generally accepted that the assessment requirements of Article 6 establish a stage-by-stage approach. The stages proposed by this guidance document are:

***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;**

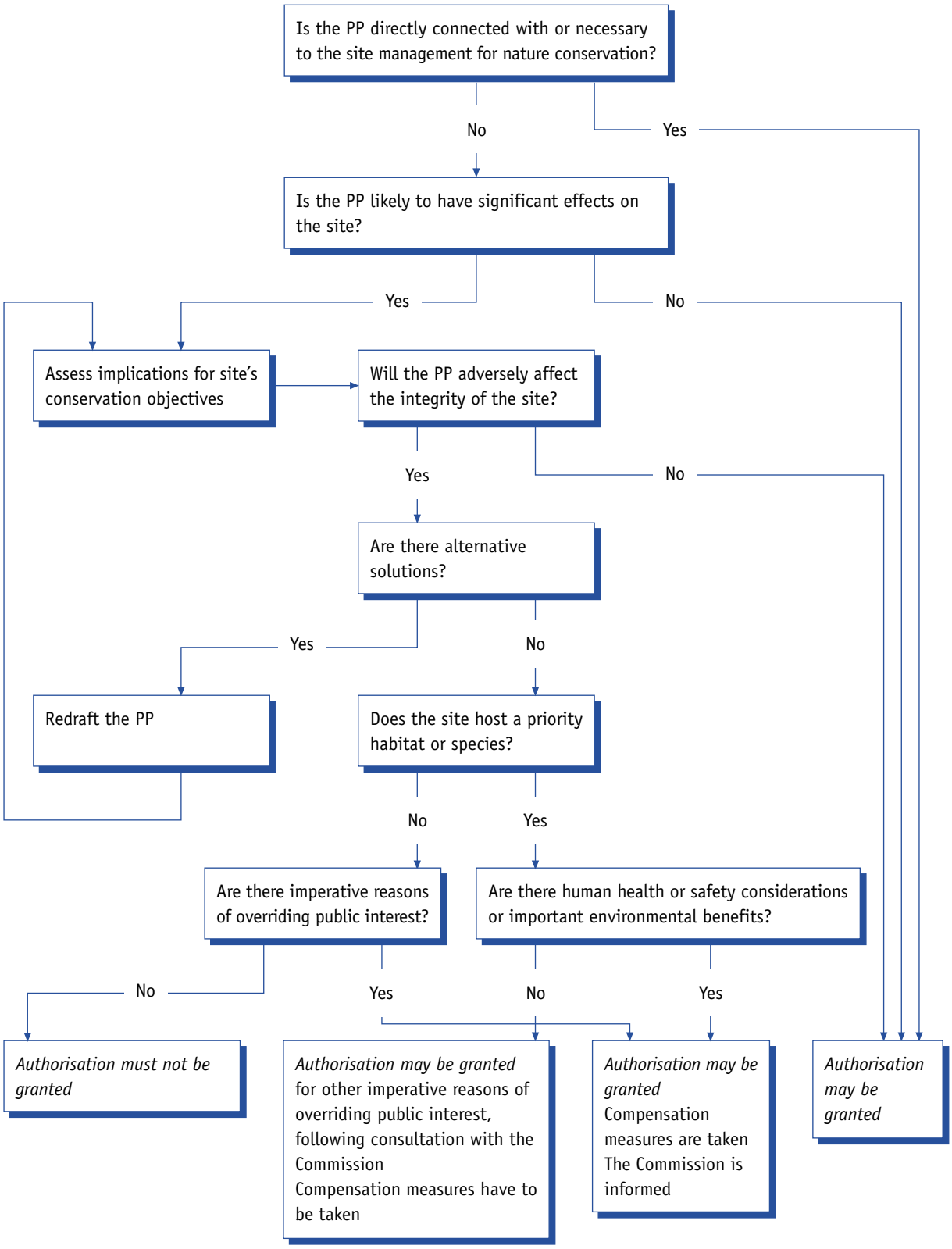
***Stage Two: Appropriate assessment* — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where 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).**

This document provides guidance for each stage of the assessment. Each stage determines whether a further stage in the process is required. If, for example, the conclusions at the end of Stage One are that there will be no significant impacts on the Natura 2000 site, there is no requirement to proceed further. The relationship of the four stages of this assessment guidance with the overall procedure established by Article 6(3) and (4) is illustrated below.

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



STAGES OF THE GUIDANCE

Screening:

See Stage One flow chart

Appropriate assessment:

See Stage Two flow chart

Assessment of alternative solutions:

See Stage Three flow chart

Assessment of compensatory measures:

See Stage Four flow chart

2.2. Approach to decision-making

The diversity of habitats, species (4), projects and plans that exist within the European Union and the variations between national regulations require the approach to the Article 6 assessments to be robust and yet flexible. A wide range of perspectives exists throughout the EU on the importance or value of sites and projects. For these reasons, the decisions made through the application of the methodology should attempt to be as transparent and objective as possible and at the same time should reflect the value judgments inherent in any environmental assessment. Implicit in the habitats directive is the application of the **precautionary principle**, which requires that the conservation objectives of Natura 2000 should prevail where there is uncertainty. 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 (European Commission, 2000a, p. 14).

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

(4) For a list of habitat types and species of Community interest, see the annexes to the birds and habitats directives. Further interpretation on habitat types covered by the habitats directive is contained in European Commission (1999).

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).

2.3. Reporting and recording format

To facilitate the need for transparency, objectivity and flexibility, and to demonstrate that the precautionary principle has been applied, this guidance adopts a reporting format. Each stage is completed with a report or matrix to provide evidence of the assessments that have been carried out. However, to ensure that the recording and reporting of information are manageable and proportionate, the suggestion here is that 'evidence of assessment' matrices are only required to be completed where no further assessment is required. For example, if, during the screening stage, it is concluded that significant effects are likely, then there is no need to complete the evidence of assessment form, as it will be necessary to proceed to the next stage of assessment. Alternatively, if it is decided at that stage that there are no significant effects, then it would be necessary to record and report the information relied upon to draw this conclusion. The evidence of assessment matrices then stand as a record of the information gathered and the judgments reached in the assessment process. Examples of evidence of assessment matrices are provided at the end of each stage of the methodology.

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

To ensure compatibility and consistency with the requirements of Directive 85/337/EEC as amended by Directive 97/11/EC (the EIA directive), and in order to reflect the fact that many projects which are likely to affect Natura 2000 sites will be projects covered by the EIA directive, procedures have been included in this methodological guidance that are similar to those in common use in EIA. This guidance is also consistent with the general approach recommended in the European Commission's three guidance documents on screening, scoping and review in EIA ([5]). Furthermore, the scope of the recently adopted SEA directive ([6]) covers all plans that require an Article 6 assessment. 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.

This guidance has been designed to be compatible with general EIA procedures, and the Article 6 assessments can be easily integrated into a full EIA or SEA of a project or plan. As well as mirroring the stage-by-stage approach used in EIA, the methodology also includes other EIA procedural requirements such as:

- a description of the project or plan;
- a description of the baseline environment where it is relevant to the conservation objectives of the Natura 2000 site (e.g. soil, water, flora and fauna, climate and the interrelationships between these factors);
- the identification of impacts and assessment of their significance;
- the recording and reporting of the findings of the assessment.

([5]) European Commission (2001a, b and c).

([6]) Council directive on the assessment of the effects of certain plans and programmes on the environment (OJ L 197, 21.7.2001, p. 30).

2.5. 'In combination with other plans or projects'

MN2000 makes clear that 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. For 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.

It should also be remembered that cumulative impacts could result where impacted areas interact. An example of this would be where a proposed project is likely to reduce water levels in a Natura 2000 site. While that resource reduction in itself may not be significant, where there are existing fertiliser and pesticide residues reaching the site from nearby intensive farming, the lower water levels may mean higher concentrations of pollutants when run-off occurs, to an extent that the combined effect becomes 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 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.

This guidance document suggests a step-by-step approach to cumulative impact assessment and these steps need to be followed for the screening and appropriate assessment stages (Stages One and Two) of this guidance. A table explaining the steps for completing a cumulative assessment is provided in Box 2 in Section 3.1.3 within the screening stage.

2.6. Alternative solutions and mitigation

This guidance has been designed for use by developers, landowners, site managers, competent authorities, prescribed consultation bodies, national authorities, NGOs and the European Commission. The guidance may also be of value to the general public as it explains the process and procedures required by the habitats directive when projects or plans are likely to have impacts upon Natura 2000 sites. The research underpinning this guidance suggests that there is a good deal of disagreement between various stakeholders as to the difference between 'alternatives' and 'mitigation' and at what stages in Article 6 they should be considered. MN2000 provides the key interpretations that should be used to distinguish between alternatives and mitigation. For alternative solutions, MN2000 suggests that 'they could involve alternative locations (routes in cases of linear developments), different scales or designs of development, or alternative processes. The "zero-option" should be considered too' (MN2000, paragraph 5.3.1).

Project or plan proponents should consider alternative solutions at the earliest stages of development. The examination of alternative solutions by project or plan proponents may, in practice, be the first

([7]) A generic guide on cumulative impact assessment has been produced by the Environment DG (Hyder Consulting, 1999).

phase of the process, although procedurally it is the third phase in this methodology. However, to fulfil the requirements of the habitats directive, **it 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.

Competent authorities will at that stage consider a range of solutions. These may include those alternative solutions already considered by the proponent of a project or plan, but will also include other alternative solutions that may be suggested by other stakeholders. It must be recognised, therefore, that authorities may determine that further alternative solutions exist even where the proponent of a project or plan has demonstrated that a range of alternative solutions had been examined at the design stage. In reporting the assessment of alternative solutions, it will be important to record all alternative solutions considered as well as their relative impacts on a Natura 2000 site.

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' (paragraph 4.5.2). The research for this guidance document suggests that mitigation measures should be considered in accordance with a hierarchy of preferred options as illustrated below.

Approach to mitigation	Preference
Avoid impacts at source	Highest ↑
Reduce impacts at source	
Abate impacts on site	
Abate impacts at receptor	Lowest

Project and plan proponents are often encouraged to design mitigation measures into their proposals at the outset. However, it is important to recognise that the screening assessment should be carried out in the absence of any consideration of mitigation measures that form part of a project or plan and are designed to avoid or reduce the impact of a project or plan on a Natura 2000 site. The proponents' notion of effective levels of mitigation may vary from that of the competent authority and other stakeholders. To ensure the assessment is as objective as possible, the competent authority must first consider the project or plan in the absence of mitigation measures that are designed into a project. Effective mitigation of adverse effects on Natura 2000 sites can only take place once those effects have been fully recognised, assessed and reported. It will then be for the competent authority, on the basis of consultation, to determine what type and level of mitigation are appropriate.

2.7. Imperative reasons of overriding public interest

Following the determination of whether alternative solutions exist, it is necessary under Article 6(4) to consider whether there are or are not imperative reasons of overriding public interest (IROPI). This guidance document does not deal with any methodologies for the assessment of imperative reasons of overriding public interest, as this will be largely for national authorities to determine. MN2000 has the following to say on the IROPI test (paragraph 5.3.2):

'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 (see, for example, its fourth recital stating "Community's natural heritage") (see Annex I, point 10).

(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; short-term 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.

It is reasonable to consider that the "imperative reasons of overriding public interest, including those of a social and economic nature" refer to situations where plans or projects envisaged prove to be indispensable:

- within the framework of actions or policies aiming to protect fundamental values for citizens' lives (health, safety, environment);
- within the framework of fundamental policies for the State and society;
- within the framework of carrying out activities of an economic or social nature, fulfilling specific obligations of public service.'

In the case of priority habitats, projects and plans that are likely to give rise to adverse effects can only proceed 'if the evoked public interest concerns human health and public safety or overriding beneficial consequences for the environment, or if, before granting approval to the plan or project, the Commission expresses an opinion on the initiative concerned'.

The only distinction between the assessment of projects and plans affecting priority habitats and other Natura 2000 sites relates to the IROPI test. Therefore, this guidance does not make any further substantial distinctions between priority habitats and other Natura 2000 sites for the other stages of assessment suggested here.

Case studies suggest that the following may, in certain circumstances, be considered as IROPI, so long as they are supported with evidence:

- projects or plans where there is a demonstrable public or environmental need;
- projects or plans that are specifically targeted at improving public health and/or safety;
- projects or plans that are specifically targeted at safeguarding human life and property.

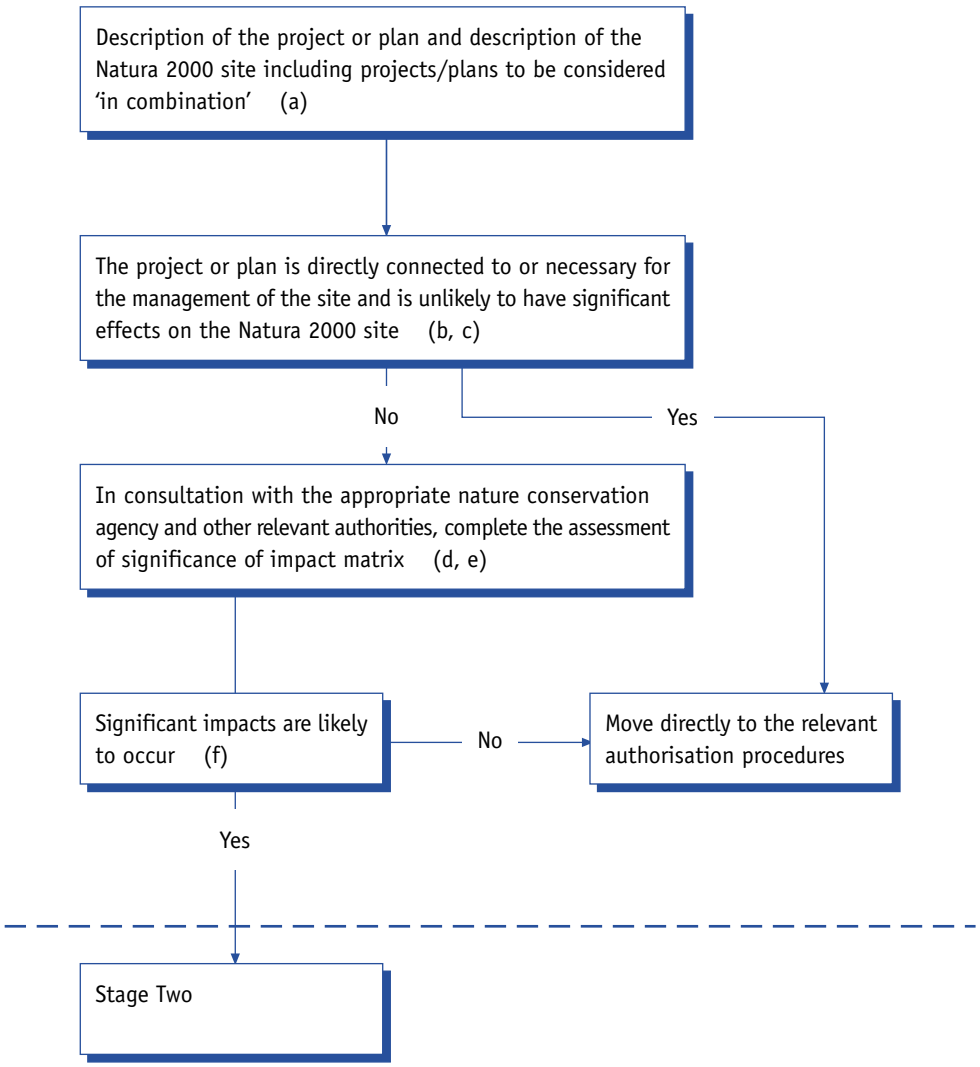
It should, of course, be noted that such considerations must be 'overriding' in the sense that they are of superior interest to the general interest of conserving the conservation status of a site. MN2000 also makes clear that projects or plans that serve only the interests of companies or individuals are not covered by the IROPI test. It should be further noted that an examination of these interests should only take place when it has been established that there is an absence of alternative solutions.

2.8. Starting the assessment

This section has explained the general approach and principles underpinning this guidance. When carrying out the assessments, it will be necessary to refer to these principles and to key reference material including that provided at the end of this document.

This guide is divided into four stages to mirror the assessments required by the habitats directive. Each stage is preceded by a flow chart that explains, in graphic form, the assessment steps within each stage. The guidance assumes that the relevant stages will be completed in advance of any application for project or plan authorisation.

Stage One: Screening



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 outputs: Screening matrix (Figure 1)

Finding of no significant effects report (Figure 2)

3. The Article 6(3) and (4) methodology

3.1. Stage One: Screening

3.1.1. Introduction

This stage examines the likely effects of a project or plan, either alone or in combination with other projects or plans, upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. This assessment comprises four steps:

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.

To complete the screening stage, it will be necessary for the competent authority to gather information from a variety of sources. It may often be possible to make the screening decision using currently published material and consultation with the relevant nature conservation agencies. The approach to decision-making in this screening stage is to apply the precautionary principle proportional to the project or plan and the site in question. For very minor projects or plans, it may be possible for the competent authority to decide that there will be no significant effects on the basis of a description of the project alone. Similarly, that level of information may be sufficient to decide that there are likely to be significant effects for large projects or plans. Such decisions can be made on the basis of the competent authority's knowledge of the Natura 2000 site in question and the fact of its designation and conservation status. Where it is less obvious that there are or are not likely to be significant effects, a much more rigorous approach to screening will be necessary.

The application of the precautionary principle and the need for transparency of decision-making require that the conclusion that there are unlikely to be significant

environmental effects should be recorded and reported. For this reason, it will be considered good practice to complete a finding of no significant effects report (see below) where it has been objectively concluded that there are unlikely to be significant environmental effects on the Natura 2000 site. Where, without any detailed assessment at the screening stage, it can be assumed (because of the size or scale of the project or the characteristics of the Natura 2000 site) that significant effects are likely, it will be sufficient to move directly to the appropriate assessment (Stage Two) rather than complete the screening assessments explained below.

If the proposal is for a project to which the EIA directive applies or plans to which the SEA directive applies, then the trigger of 'significance' used to screen EIA projects or SEA plans is likely to also screen projects for an appropriate assessment. Where an environmental statement is required for a project or plan, it should normally be assumed that an appropriate assessment will also be required. It should also be assumed that if a project is likely to have a significant impact on a Natura 2000 site, a full EIA may be necessary.

3.1.2. Step One: Management of the site

MN2000 makes clear that, 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. Note also that should a measure designed for the conservation management of one site affect another site, then it will require assessment, as the conservation management measures are not specifically and directly targeted at that second site (MN2000, paragraph 4.3.3).

3.1.3. Step Two: Description of the project or plan

In describing the project or plan, it will be necessary to identify all those elements of the project or plan, alone or in combination with other projects or plans, that have the potential for having significant effects on the Natura 2000 site. The checklist in Box 1 provides the main type of project/plan parameters that will normally need to be identified. These parameters are illustrative only as it would be impossible in a document such as this to provide a comprehensive list. For some projects or plans, it may be necessary to identify these parameters separately for the construction, operation and decommissioning phases.

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	

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.

In order to ensure all impacts upon the site are identified, including those direct and indirect impacts that are a result of cumulative impacts (see Section 2.5 above), the steps outlined in Box 2 should also be completed.

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.

3.1.4. Step Three: Characteristics of the site

The identification of impacts upon the Natura 2000 site will require a characterisation of the site as a whole or of the areas where impacts are most likely to fall. Impact identification will also need to consider cumulative impacts from other projects or plans, and reference should be made to the cumulative assessment steps outlined in Box 2 above. There will be key aspects of the project or plan that will have impacts upon key characteristics of the site. The checklist in Box 3 lists some of the sources that will need to be consulted in order to identify the impacts of the project or plan on the Natura 2000 site. As with all checklists in this guidance, this list should be seen as illustrative only.

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	

3.1.5. Step Four: Assessment of significance

The next step of the screening stage is the assessment of the significance of the impacts identified in Step Three. The concept of 'significance' is discussed further in Annex 1, Section 4. The significance test may require little more than consultation with the relevant nature conservation agency. In other cases, particularly where there is a difference of opinion between stakeholders, it may be necessary to carry out further investigations to establish whether the effects on a project or plan are likely to be significant. A common means of determining the significance of effects is through the use of key indicators. Box 4 lists examples of indicators with suggestions as to how they can be used. Box 5 provides case study examples of how significance indicators have been applied to different types of projects/plans and sites. Some indicators, such as percentage of habitat lost, may be more significant for priority habitat types than for others because of their status.

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.

Where it has been decided to carry out further investigation, it will be important to make use of verifiable assessment techniques. In order that the test of significance of effects can be carried out in a systematic and objective manner, further checklists and matrices may be used. Figure 1 provides a worked example of the screening matrix suggested for use by this guidance.

In the identification of potential impacts, it is important to recognise which particular elements of a plan or project are likely to have impacts on a Natura 2000 site, or which elements might act in combination with other plans or projects to such effect. Relevant project elements may include requirements for the construction process, resource requirements, and physical requirements — width, depth, duration, etc. For plans, such elements may include details of individual project requirements within the plan, or they may relate to sectors of the plan such as agriculture, fisheries and energy.

Once the screening matrix has been completed, the decision could be in the form of one of two statements:

1. **it can be objectively concluded that there are not likely to be significant effects on the Natura 2000 site; or**
2. **the information provided either suggests that significant effects are likely or that sufficient uncertainty remains to indicate that an appropriate assessment should be carried out.**

3.1.6. Outcomes

Following the screening assessment, and where it has been concluded that significant effects are likely, or that there is not sufficient certainty to conclude otherwise, the next stage of this methodology should be followed. If, however, it can be concluded at this stage that there are unlikely to be significant effects on the Natura 2000 site, it should be good practice to complete the finding of no significant effects report (see Figure 2 at the end of this section) which should be made available to relevant stakeholders.

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.*

Note: For a blank matrix, see Annex 2.

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

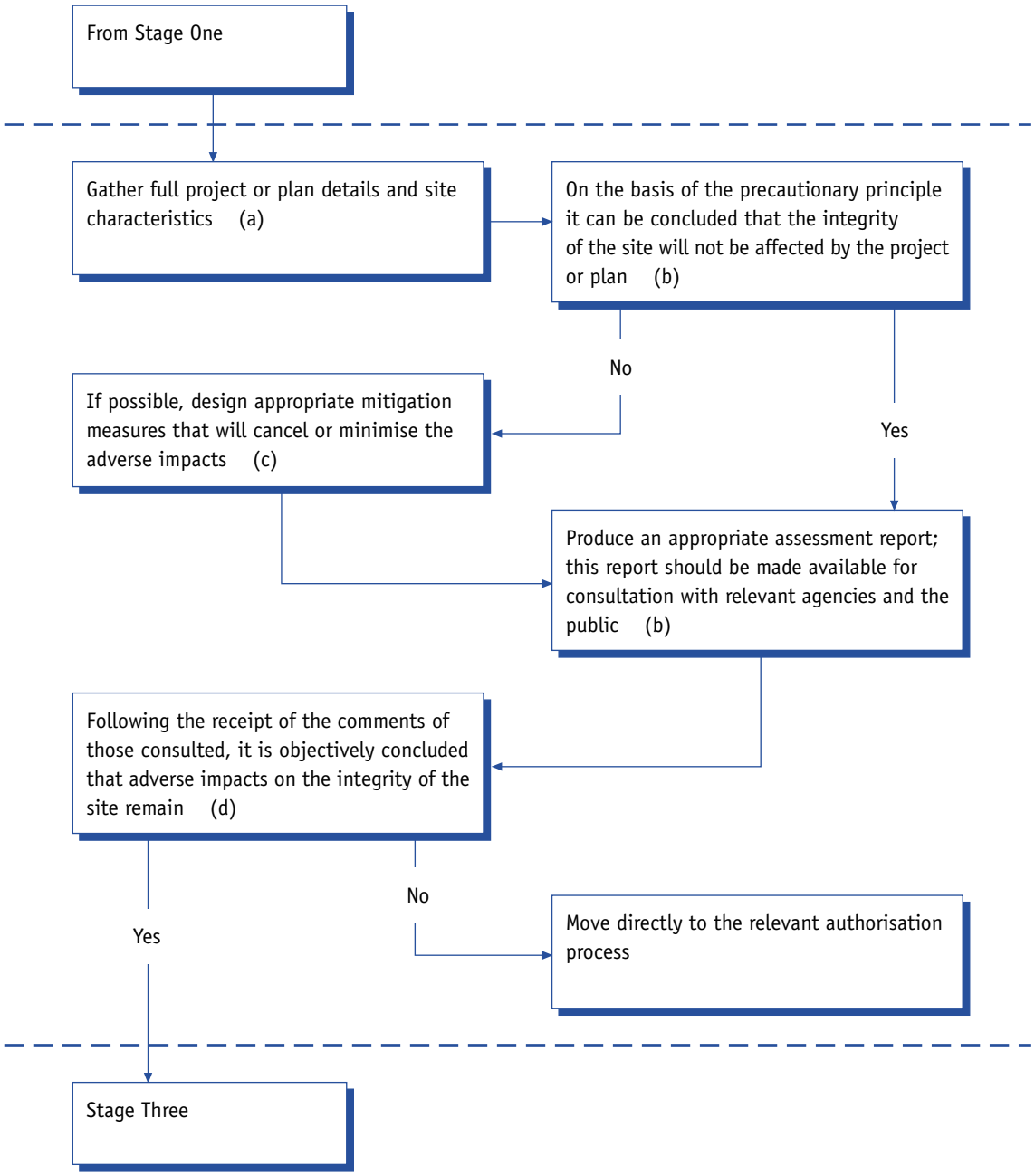
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
This could be the competent authority, project or plan proponent, or national or regional responsible government agency.	*This will include field studies, 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.

Note: For a blank version of this form, see Annex 2.

Stage Two: Appropriate assessment



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)

3.2. Stage Two: Appropriate assessment

3.2.1. Introduction

It is the competent authority's responsibility to carry out the appropriate assessment. However, as explained in the introduction to this guidance document, the assessment process will include the gathering and consideration of information from many stakeholders, including the project or plan proponents, national, regional and local nature conservation authorities and relevant NGOs. As with the EIA process, the appropriate assessment will usually involve the submission of information by the project or plan proponent for consideration by the competent authority. The authority may use that information as the basis of consultation with internal and external experts and other stakeholders. The competent authority may also need to commission its own reports to ensure that the final assessment is as comprehensive and objective as possible. Box 6 outlines the information required for this assessment stage.

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. The Commission services' guidance on Natura 2000 states that:

'The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives' (MN2000, paragraph 4.6(3)).

3.2.2. Step One: Information required

In order to ensure that adequate information is available to complete the appropriate assessment, it is suggested that the checklist in Box 6 be completed. Where information is not known or not available, further investigations will be necessary. The first step in this assessment is to identify the conservation objectives of the site and to identify those aspects of the project or plan (alone or in combination with other projects or plans) that will affect those objectives. Case study examples of site conservation objectives are provided below in Box 9. These objectives can normally be obtained from the Natura 2000 standard data forms for the site or, where available, from the site's management plan.

Where there are gaps in information, it will normally be necessary to supplement existing data with further survey fieldwork. In order to assist the non-specialist in understanding the fieldwork that may be necessary, a guide to ecological baseline studies and impact prediction and to the assessment of significance is provided in Annex 1 to this guidance.

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 provides a list of suggested sources for some of the information required at this stage.

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.

3.2.3. Step Two: Impact prediction

Predicting the likely impacts of a project or plan on a Natura 2000 site can be difficult, as the elements that make up the ecological structure and function of a site are dynamic and not easily measured. Predicting impacts should be done within a structured and systematic framework and completed as objectively as possible. This requires that the types of impact are identified — these are commonly presented as direct and indirect effects; short- and long-term effects; construction, operational and decommissioning effects; and isolated, interactive and cumulative effects. Box 8 provides an illustration of the range of impact prediction methods available.

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.

3.2.4. Step Three: Conservation objectives

Once the effects of the project or plan have been identified and predicted, it will be necessary to assess whether there will be adverse effects on the integrity of the site as defined by the conservation objectives and status of the site. Examples of conservation objectives are provided in Box 9.

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.

In carrying out the necessary assessments, it is important to apply the precautionary principle and the focus of the assessment should be on objectively demonstrating, with supporting evidence, that there will be no adverse effects on the integrity of the Natura 2000 site. Where this is not the case, adverse effects must be assumed.

From the information gathered and the predictions made about the changes that are likely to result from the construction, operation or decommissioning stages of the project or plan, it should now be possible to complete the integrity of site checklist in Box 10.

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.)?	

From the checklist in Box 10, it should be possible to determine whether or not the project or plan, either alone or in combination with other projects or plans, will have an adverse effect on the integrity of the site. Examples of impacts on the integrity of sites are provided in Box 11. If at this stage information or evidence is lacking, then adverse effects should be assumed. This determination should be recorded and reported, and a specimen matrix for recording the assessment is shown in Figure 4. Where it cannot be demonstrated that there will be no adverse effects on the site, it is necessary to devise mitigation measures to avoid, where possible, any adverse effects.

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.

3.2.5. Step Four: Mitigation measures

Mitigation measures need to be assessed against the adverse effects the project or plan is likely to cause (alone or in combination with other projects or plans). It will be for the competent authority to determine what level of mitigation is required and the authority should take into consideration suggestions from the relevant nature conservation authorities and NGOs as well as the project or plan proponent (case study examples of mitigation measures are provided in Box 12). Mitigation should always aspire to the top of the mitigation hierarchy (i.e. avoiding impacts at source), as explained in Section 2.6 of this guidance.

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.

Figure 3 provides a specimen mitigation measures assessment matrix as a means of presenting this information.

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.*
(ii)			
(iii)			
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.*
(ii)			
(iii)			

Note: For a blank version of this form, see Annex 2.

3.2.6. Outcomes

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.

The appropriate assessment report should be sent for consultation with the relevant nature conservation agencies and the public. A specimen report is provided in Figure 4.

Following the consultation period, and despite the application of mitigation measures, if the competent authority considers that residual adverse effects remain, then the project or plan may not proceed until after a Stage Three assessment has been completed and it has been objectively concluded that there is an absence of alternative solutions.

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.*

Note: For a blank version of this form, see Annex 2.

3.3. Stage Three: Assessment of alternative solutions

3.3.1. Introduction

This stage examines alternative ways of implementing the project or plan that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site. The assessment of alternative solutions flow chart outlines the process. Before a project or plan that either alone or in combination with other projects or plans has adverse effects on a Natura 2000 site can proceed, it must be objectively concluded that no alternative solutions exist. MN2000 states that 'it rests with the competent national authorities to make the necessary comparisons between these alternative solutions' (paragraph 5.3.1). MN2000 also states 'in this phase, therefore, other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria'. The examination of alternative solutions requires, therefore, that the **conservation objectives and status of the Natura 2000 site will outweigh any consideration of costs, delays or other aspects of an alternative solution**. The competent authority should not, therefore, limit its consideration of alternative solutions to those suggested by the project or plan proponents. It is the Member State's responsibility to consider alternative solutions, which could be located even in different regions/countries.

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).

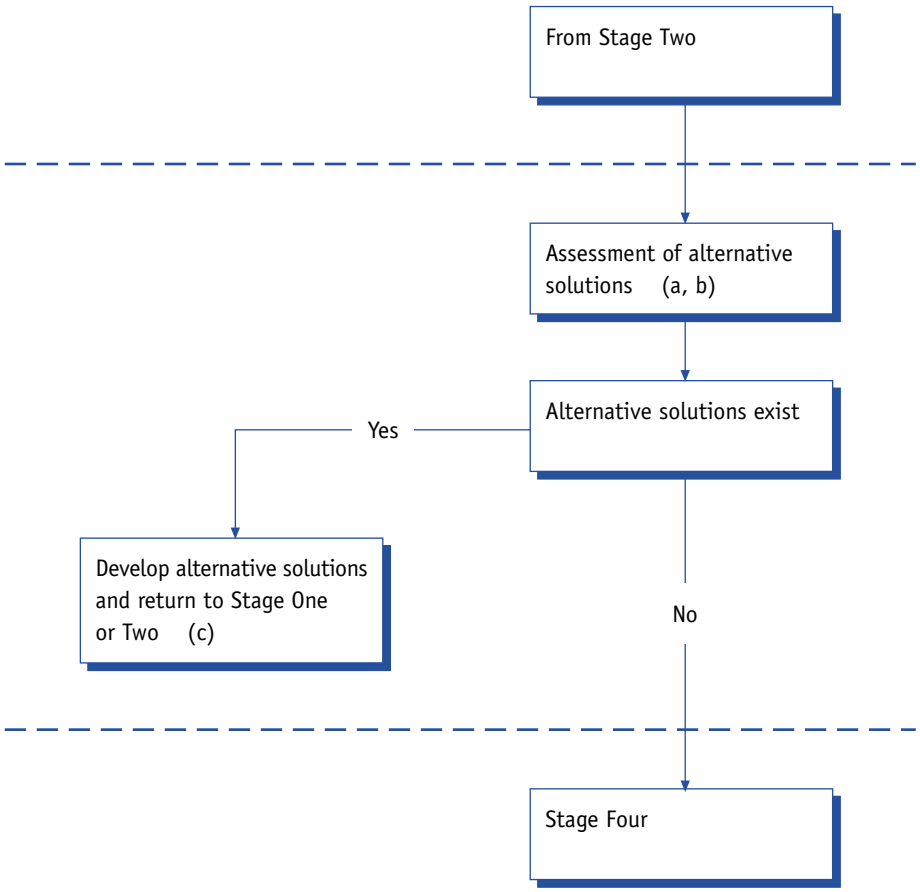
Here the alternative solutions were tested against their implication for the Natura 2000 site and as all these alternative solutions were judged as unsuitable, the proposal to build engineered hard defences was pursued.

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)**

3.3.2. Step One: Identifying alternative solutions

While it is the responsibility of the competent authority to consider whether alternative solutions exist, its determination will inevitably rely, to some extent, on information provided by the project or plan proponent. The first step in assessing whether alternatives exist is for the competent authority to identify the objectives of the project or plan. From that starting point, it is possible to identify a range of alternative ways of achieving the objectives of the project or plan and these alternatives can then be assessed against their likely impact upon the conservation objectives of the Natura 2000 site.

Crucial to the assessment of alternative solutions is the inclusion in the assessment of the 'do nothing' alternative.

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).

For each alternative, there must be a description and an indication of how it was assessed. Once all potential alternatives have been identified, they need to be assessed against their relative impact upon Natura 2000 sites.

3.3.3. Step Two: Assessing alternative solutions

Tasks to be carried out in assessing alternatives are listed in Box 14. An assessment of alternative solutions matrix is suggested and presented as a useful tool for the identification and assessment of alternatives (a worked example of this matrix is provided in Figure 5). The completed matrix can also be used to communicate the results of the assessment to the relevant stakeholders. Figure 6 provides an example of an alternative solutions assessment statement, which can be used for recording and assessing the alternative solutions that have been considered.

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.

3.3.4. Outcomes

Once the assessment of alternative solutions is complete, a record should be made of the agencies and other bodies that were consulted, their responses to consultation, why particular assessments have been made of alternatives (i.e. adverse, positive or neutral), and details of who carried out the assessment. A specimen form for an evidence of assessment of alternative solutions is shown in Figure 7. The purpose of this assessment is to determine whether or not it can be objectively concluded that there are no alternative solutions. If alternative solutions have been identified that will either avoid any adverse impacts or result in less severe impacts on the site, it will be necessary to assess their potential impact by recommencing the assessment at Stage One or Stage Two as appropriate. However, if it can be reasonably and objectively concluded that there is an absence of alternatives, it will be necessary to proceed to Stage Four of this assessment methodology.

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	The 'do nothing' alternative
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 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.*

Comparison with chosen project or plan

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).
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.

Note: A blank version of this statement is provided Annex 2.

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.*

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

3.4.1. Introduction

For sites that host priority habitats and species, it is necessary to consider whether or not there are human health or safety considerations or environmental benefits flowing from the project or plan. If such considerations do exist, then it will be necessary to carry out the Stage Four assessments of compensatory measures. If no such considerations exist, then establish whether there are other imperative reasons of overriding public interest (IROPI) before carrying out the Stage Four assessments. Where IROPI exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the site will be necessary before the project or plan can proceed. It is not the purpose of this guidance document to provide advice on the IROPI test. This stage of the guidance therefore concentrates solely on how compensatory measures may be considered. The Stage Four flow chart summarises this stage of the process.

3.4.2. Step One: Identifying compensatory measures

MN2000 makes clear that compensatory measures are only a last resort attempt to maintain the overall coherence of the Natura 2000 network as a whole (MN2000, paragraph 5.4.2). Based upon the case studies and the literature review completed for this guidance document, this would appear to be a common approach to compensatory measures, but such measures are often seen as having little guarantee of success. Examples of works that may be proposed as compensatory measures are provided in Box 15. Box 16 provides other examples used in actual cases.

Box 15: Examples of compensatory measures

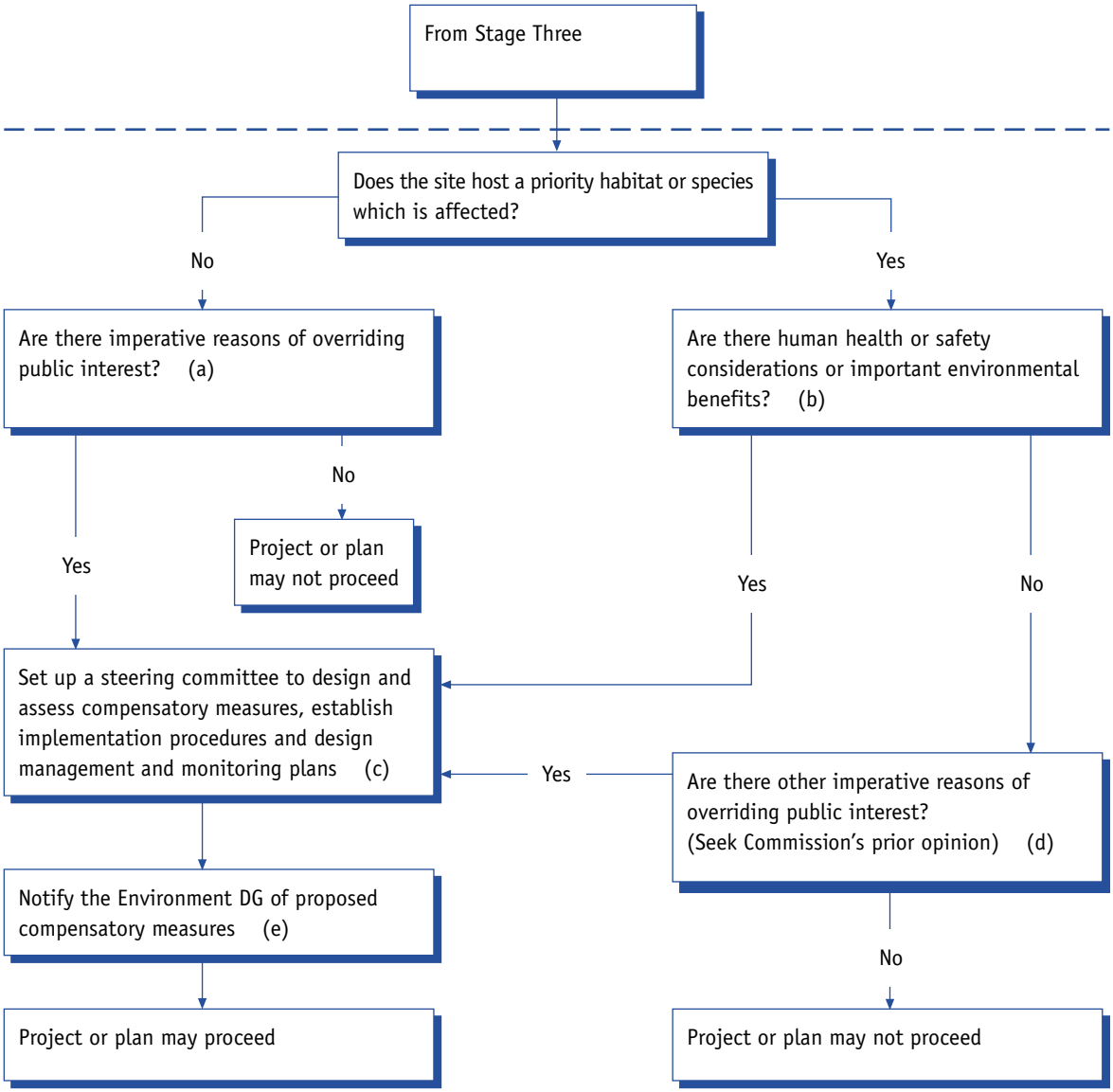
Compensatory measures appropriate to adverse effects on Natura 2000 sites consist of:

- **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).

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



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)

3.4.3. Step Two: Assessment of compensatory measures

Before a project or plan that will have an adverse impact on a Natura 2000 site can be permitted to proceed, it is necessary to justify the compensatory measures being offered to offset the negative impacts.

The maintenance and enhancement of the overall coherence of Natura 2000 will be the key test on which to assess 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.

A worked example of the assessment, using a matrix approach, is provided in Figure 8. A blank example of the matrix is provided in Annex 2.

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.

3.4.4. Outcomes

From the answers to the questions in the matrix in Figure 8, conclusions will be reached on whether or not the compensatory measures will be successful in maintaining or enhancing the overall coherence of the Natura 2000 network. The findings of the assessment should be recorded in the evidence of assessment matrix (compensatory measures) in Figure 9. However, the assessment of the compensatory measures does not cease there. It will be necessary, through legally binding mechanisms, to ensure that the long-term conservation interests of the Natura 2000 network are maintained. This will require the security of site tenure to be guaranteed, management plans to be drawn up with clear, achievable short-, medium- and long-term objectives, and for long-term monitoring mechanisms to be in place. Monitoring is particularly important to ensure that the conservation objectives of Natura 2000 are achieved. Monitoring has long been seen as a best practice in EIA, and is a requirement of the recently adopted directive on strategic environmental assessment.

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.*

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

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.*

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

3.5. Summary of assessment

The completion of the summary of assessment matrix in Figure 10 will help to provide evidence that the assessments required by the habitats directive have been completed. The proponents of projects or plans can use this summary as an *aide mémoire*. Competent authorities and others, including the European Commission's desk officers, may also use it for reviewing Article 6 assessments ([8]).

A detailed package for reviewing the information produced for the Article 6 assessments is provided in Section 3.6 below.

([8]) In case of information formally provided to the Commission according to the provisions of Article 6(4) first subparagraph or for an opinion under Article 6(4) second subparagraph, the relevant **standard format** elaborated by the Commission services should be used.

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)

3.6. Habitats directive Article 6(3) and (4) assessment review package

3.6.1. Introduction

This review package was developed out of research into the assessments for projects or plans required by Article 6(3) and (4) of the habitats directive. The package is based on similar review packages developed for the review of environmental statements (ES) within the environmental impact assessment (EIA) process. Unlike EIAs, however, the Article 6 assessments do not require the production of a single report such as an ES, and therefore this review package should be used as a systematic means of assessing a range of documentary evidence of the assessments carried out under Article 6. A further significant difference between this review package and those in use for ES is that it will not be necessary in all cases to complete all of the review. In many cases, the review will only be of the material used to determine whether particular stages in the Article 6 assessments have been completed satisfactorily. For example, if at the screening stage it is concluded that a project or plan will not have any significant effects on a Natura 2000 site, then the assessment process under Article 6 stops at that point.

3.6.2. Applying the review package

The amount of information necessary to complete each stage of the assessments, for different projects or plans and for different types of habitat, will inevitably vary. The review must reflect this and also that for some projects in some locations very little information will be required in order to draw objective conclusions, whereas in other cases, a great deal of information and evidence will be required. To reflect these differing information requirements, the approach to the application of the review package must be proportional to the level of information required. It will also be necessary to apply the precautionary principle in all cases, as this is an underlying principle of the habitats directive itself. The review is, therefore, not a simple yes/no assessment of the documentary evidence provided against the review criteria. The review must be more sophisticated and allow for proportional judgments to be made as to whether or not the information, evidence and assessment are acceptable in the context of the particular project or plan and the particular Natura 2000 site. A review grading system has been developed which reflects these requirements.

The review grades to be applied to the review criteria are as follows.

A = The information provided is complete, with no significant omissions, and the conclusions drawn can be reasonably and objectively accepted.

B = The information provided is not complete, but, in the circumstances of the particular case, the conclusions drawn can be reasonably and objectively accepted.

C = The information provided is not complete; there are significant omissions, and it will be necessary to seek clarification on certain issues before the conclusions drawn can be reasonably and objectively accepted.

D = The information provided is wholly inadequate and there can be no confidence in the conclusions drawn from the evidence.

The review package has nine sections:

1. Features of the project or plan;
2. Cumulative effects;
3. Description of the Natura 2000 site;
4. Screening;
5. Appropriate assessment;
6. Mitigation;
7. Alternative solutions;
8. Imperative reasons of overriding public interest;
9. Compensatory measures.

To carry out the review, it will first be necessary to identify and list all documents that are to be considered. These documents may include an ES, reports from consultancies, national, regional or local agencies, written evidence from project or plan proponents, the results of consultation exercises, legal documents that secure mitigation and/or compensatory measures, and, where produced, appropriate assessment reports and findings of no significant effects statements.

When applying the review package, the relevant documents need to be examined to assess their content against each of the review criteria within the various sections. Each criterion is then graded A to D and at the end of each section of the package an overall grade is given to that section. This overall grade will be based upon the individual grades awarded under each of the criteria. However, the overall grade may not necessarily reflect the largest number of single grades given within the section, as some of the criteria may be considered of more importance in the circumstances of the case than in others. So while, for example, in Section 1, seven of the nine criteria are awarded an A grade, the fact that there are no details of the size, scale, etc., of a project or plan may mean that overall the section is graded D. At the end of the package, there is a collation section which allows an overall grade to be awarded to the assessments that have been carried out. As with section grades, this will be based upon the adequacy of the individual assessments that have been completed.

3.6.3. Users of the review package

This review package can be used by the competent authorities, the appropriate nature conservation agencies and others to ensure that all the relevant material for the assessments has been provided and the assessments, and the conclusions drawn from them, have been carried out as transparently and objectively as possible. Furthermore, the review package can be used by Commission desk officers when dealing with requests for the examination of the Article 6 assessments.

Habitats directive assessment review package

Review criteria	Review grade	Comments
	1. Features of the project or plan	
1.1. The purpose(s) and objectives of the project or plan are fully explained		
1.2. Plans, diagrams and maps are provided which clearly identify the location of the proposed project or plan		
1.3. The size, scale, area and land-take/cover of the project or plan are fully explained		
1.4. Provides details of the physical changes that will take place during the various stages of implementing the project or plan		
1.5. Describes the resource requirements for the construction/operation and decommissioning of the project or plan (including water resources, construction material and human presence)		
1.6. Describes the timescales for the various activities that will take place as a result of implementing the project or plan (including likely start and finish dates)		
1.7. Describes any wastes arising, or other residues (including quantities), and their means of disposal		
1.8. Identifies any wastes and other residues (including quantities) that may be of particular concern in the context of the Natura 2000 site		
1.9. Describes any additional services required to implement the project or plan (including pipelines, overhead electricity lines, etc., their location and means of construction		
Additional criteria as required		
Overall grade, Section 1		
	2. Cumulative effects	
2.1. Identifies all projects or plans that may, in combination with the proposed project or plan, give rise to adverse effects on the Natura 2000 site		
2.2. Defines the boundaries used when identifying cumulative effects		
2.3. Defines the timescales over which cumulative effects have been considered		
2.4. Identifies the potential cumulative pathways		
Additional criteria as required		
Overall grade, Section 2		

Review criteria	Review grade	Comments
	3. Description of the Natura 2000 site	
3.1. Describes the site in terms of its physical area, habitat types, presence of key species, etc.		
3.2. Sets out in full the conservation objectives of the site including the factors that contribute to the conservation value of the site		
3.3. Explains any planned or contemplated nature conservation initiatives likely to affect the site in the future		
3.4. Explains the existing baseline conditions — including species and habitat dynamics and ecology (including seasonal fluctuations), the physical and chemical composition and the key structural and functional relationships that maintain the site's integrity		
3.5. Provides details of the value of the site to the Natura 2000 network (e.g. 15 % of population in the Member State)		
3.6. Provides an indication of how the baseline conditions of the site will change in the future in the absence of the project or plan		
3.7. Describes the methodologies used to gather information on the baseline conditions of the site		
3.8. Identifies the organisations consulted to gather information on the baseline conditions of the site		
3.9. Provides details of the organisations consulted to gather information on the baseline conditions of the site		
Additional criteria as required		
Overall grade, Section 3		
	4. Screening	
4.1. Where no significant impacts are predicted on the Natura 2000 site, a finding of no significant impacts statement is provided which clearly sets out why this conclusion has been drawn and provides evidence that the relevant nature conservation agencies and authorities are in agreement with this finding		
4.2. Where likely significant impacts are identified, these are clearly explained and where possible quantified		
4.3. Evidence is provided of the assessment methodologies uses in the screening process		
4.4. There is clear evidence in the documentation that sufficient account and assessment have been taken of the possibility of cumulative impacts from other projects or plans		
Additional criteria as required		
Overall grade, Section 4		

Review criteria	Review grade	Comments
5. Appropriate assessment		
5.1. The methods of assessment and prediction are clearly explained and the sources of information are provided and fully justified		
5.2. The effects of the project or plan on the conservation objectives of the site are explained in full		
5.3. The impact of the project or plan on the defining structure and functions of the site are fully explained		
5.4. Any loss of area of the site, or reduction in species population, is quantified and assessed in terms of its impact upon the conservation objectives of the site and its impact on key habitats and species		
5.5. Likely impacts on the site due to disturbance, disruption, fragmentation and chemical changes, etc. are fully assessed and explained		
Additional criteria as required		
Overall grade, Section 5		
6. Mitigation		
6.1. The competent authority has identified appropriate mitigation measures and these have been assessed in terms of their likely impacts		
6.2. There is clear evidence that the mitigation measures have been assessed against the 'mitigation hierarchy' (with the avoidance of adverse impact on the site being the preferred outcome)		
6.3. There is clear evidence that the mitigation measures have the support of the relevant nature conservation agencies		
6.4. There is clear evidence that the mitigation measures can be secured over the short, medium and long term through legal or financial mechanisms		
Additional criteria as required		
Overall grade, Section 6		
7. Alternative solutions		
7.1. All feasible alternative solutions have been identified and fully assessed in terms of their likely impacts upon the Natura 2000 site		
7.2. The identified alternatives have been reviewed and assessed by the relevant nature conservation agencies and the competent authority		
7.3. Any statement that there is an absence of alternative solutions is fully explained and fully justified		
Additional criteria as required		
Overall grade, Section 7		

Review criteria	Review grade	Comments
	8. Imperative reasons of overriding public interest	
8.1. The IROPI have been fully explored, explained and justified		
	9. Compensatory measures	
9.1. The nature of the compensatory measures is fully explained		
9.2. The compensatory measures have been fully assessed in terms of their ability to maintain the coherence of Natura 2000		
9.3. There is clear evidence (from past experience or detailed studies) that the compensatory measures will be successful		
9.4. There is clear evidence that the compensatory measures have been the subject of wide-ranging consultation with relevant agencies and organisations		
9.5. The features that make up the compensatory measures (e.g. area of land etc.) can be secured for their future nature conservation interest in the short, medium and long term		
9.6. The compensatory measures are the subject of an implementation plan that includes clear objectives and a monitoring and management regime		
9.7. There is evidence that, should monitoring reveal failures in the compensatory measures ability to achieve their original objectives, steps will be taken to address and rectify those failures		
Additional criteria as required		
Overall grade, Section 9		

Overall review grade for the Article 6 assessments of the case

Review section	Grade	Comments
1. Features of the project or plan		
2. Cumulative effects		
3. Description of the Natura 2000 site		
4. Screening		
5. Appropriate assessment		
6. Mitigation		
7. Alternative solutions		
8. Imperative reasons of overriding public interest		
9. Compensatory measures		
Overall grade for the assessments		

General overall comments on the adequacy of the assessments

KEY REFERENCES AND GUIDANCE

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http://europa.eu.int/comm/environment/eia/home.htm

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http://chm.environment.gov.au/general.publications.html

http://parkscanada.pch.gc.ca

http://www.igc.org/wri/sdis/impact/index.html

http://www.IUCN.org

http://www.oneworld.org/iied/

http://www.ramsar.org

Annex 1 Baseline survey, impact prediction and assessment

Contents

1. INTRODUCTION

This annex is provided to give an introduction to methods used in the assessment of impacts upon terrestrial, wetland, freshwater and marine environments at Natura 2000 sites. The methods outlined cover the stages of baseline surveys of fauna, flora and habitats, identification and predictions of likely effects, leading to an assessment of their importance.

Full details of these methods cannot be provided for the range of species and habitats encountered across Europe, so readers are directed to a number of publications where more comprehensive information can be obtained; web sites with other useful data are listed under 'Key references and guidance'. The methods described are essentially those used in environmental impact assessment and cumulative effects assessment. The involvement of highly trained ecologists will be necessary for survey and assessment work.

1.1. What is expected in the 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. Next, the type and magnitude of the likely impacts of that development on the flora and fauna of the site are predicted. This in turn leads to the suggestion of alternatives to the proposal, mitigation measures designed to minimise or avoid the predicted impacts, or to the rejection of the proposal if this is considered necessary. Finally, a monitoring programme will be outlined, indicating which components of the site are to be monitored, at what interval, and by whom.

Communities and ecosystems intergrade. Freshwater wetlands include ecosystem gradients from open waters to semi-terrestrial systems such as peatlands and marshes, and these intergrade with terrestrial systems such as grassland, heathland and woodland. In designing and managing an ecology assessment, it must be remembered that:

- no single ecologist can be expected to deal with all aspects of an ecological assessment and it may be necessary to employ specialists for different taxonomic groups and/or ecosystems;
- particular taxonomic groups or ecosystem types cannot be considered in isolation, so the work and findings of the team members must be coordinated;
- the ecological assessment should be coordinated with other work dealing with environmental systems such as climate, soils and water, which are major ecosystem components.

1.2. Identification of potential impacts

The effects of each project on the environment will be unique, due to its construction, operation, duration and location. These effects can be limited to on-site effects (e.g. direct removal of vegetation) but may also occur off-site (e.g. increased nutrient loading leading to eutrophication). There are, however, some common ways in which effects can be classified and these help to focus on the nature of impacts and their likely magnitude. Many environmental practitioners consider a development in terms of its potential physical, chemical and biological effects.

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 transmission

lines), large-scale extraction (coal mines, gold) and 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.

1.3. What components of the ecosystem should be investigated?

Most ecosystems consist of a large number of components that could be affected by a particular project. Among these are components sometimes referred to as 'decision variables' because they are critical in evaluating the terrestrial environment that could be affected, in predicting the likely effects of the project on it, and in measuring those effects. The justification for these decision variables should be included in the documentation. Components most useful to study may be as follows.

- *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.

2. BASELINE STUDIES

2.1. Introduction

Baseline studies determine the state of the environment in the project area without the project. They form the mainstay of assessment and require that specialists be consulted at the earliest stages of the planning proposal. As well as providing expertise, specialists must understand the needs of the developer and the assessing agency. A brief study outlining requirements must be agreed by all the interested parties and adhered to. Good consultation and sufficient resources underlie success.

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 for

example. 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.

It should be possible to compile some of the information required for terrestrial assessment from a desk study. Maps and aerial photographs may be useful to establish whether there have been substantial changes in topographic features such as coastal erosion. However, the existing information may be inadequate and/or out of date, in which case new surveys should be conducted wherever appropriate.

2.2. Field surveys

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. Sampling methods should be **repeatable and, in most cases, quantitative data should be obtained**. Proponents selecting consultants to undertake field studies should expect them to be familiar with, and have practical experience of, the methods required to sample the decision variables selected. This annex does not provide detailed sampling methods; rather it gives an indication of those aspects of field surveys which should be considered and incorporated into the study.

A comprehensive floral and/or faunal census will be needed when a desk study or survey indicates either species, populations or communities listed under the habitats and/or birds directive, or habitats suitable for such species, or when a desk study indicates that the development may have a significant impact on an area recognised as having high nature-conservation interest or within the boundaries of a site known to contain significant species, populations or communities. Similarly, when the desk study indicates that there are vulnerable habitats present which have an associated rare assemblage of flora and/or fauna, further surveying will be desirable.

The initial information is provided by the Natura 2000 data forms; the detailed knowledge local experts may provide and the findings of previous fieldwork within the area should be sought.

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.

Where important species are likely to be impacted, the size of the population as a percentage of the local, regional, national and international populations should be indicated wherever possible. Also, the distribution of the plants' range in relation to the total amount of available habitat should be determined. Where migratory species are likely to be affected, the size of each population as a percentage of the local, regional, national and international populations should be indicated wherever possible.

2.3. Plant and habitats surveys

Habitats surveys are a major component of the ecology assessment. The following guidance intends principally to direct the planning and execution of such surveys, with an indication of the sampling options available. It is important to remember that the focus of all habitats surveys must be the area to be disturbed.

Ideally, field surveys for the plants and habitats should include all vascular plants, bryophytes, lichens and fungi. It is therefore necessary to employ 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.

Plants and habitats surveys differ in terms of their intensity of effort and are influenced by the vegetation composition of the overall study site, the time and resources available, and the expertise of the person(s) undertaking the surveys. A three-stage approach is suggested.

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 a community — 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 elucidate a complex community pattern, or to determine the relationships between species or communities and one or more critical factors. Stage 3 surveys may not be necessary for assessment under Article 6 of the habitats directive.

2.4. Birds

Census techniques for birds are very well developed — see Bibby et al. (1992) for techniques available for the census of a wide range of bird species (waders, raptors, migratory and non-migratory passerines, coastal seabirds, etc.) as well as how to interpret the findings of the census, and how to go about monitoring them. Hockin et al. (1992) provide further examination of the effects of disturbance to birds.

Where a development is likely to affect scarce breeding species, the appropriate survey technique employed will depend upon the species under consideration and the habitat(s) in which it is found. All methods involve extensive site walking and require expertise in the recognition of calls. They are affected by seasonal variation (breeding and non-breeding seasons) and by time of day (early morning is the most appropriate sampling time for the majority of species). An adequate bird census relies upon repeat sampling (early morning visits at weekly intervals, variation in route direction to encompass as much of the site as possible, records of position and time of sighting). Several factors affect census accuracy, including density of habitat and of birds, how conspicuous the birds are, and weather.

A general bird survey might incorporate one or a combination of the following techniques (see Bibby et al., 1992, for further details).

- *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.

Where the development potentially impacts on a species or population considered to be of local importance, most surveys will involve at least one (and preferably several) site visits, to coincide with the birds' presence on the site, but timed so as to minimise disturbance, away from periods of incubating eggs or feeding young.

Developments which potentially impact on roosting or feeding areas of migratory species should be accompanied by data indicating peak site use by the species under consideration, for a minimum of the last five years. If this is not available, then surveys should be conducted for those species, on a monthly basis for the duration of the species' utilisation of the site.

Special circumstances — nocturnal bird surveys. The most successful method of detection for these nocturnal species is to employ a combination of spotlighting in suspected hunting/breeding territories and playback tapes of their call to initiate territorial response (see Bibby et al., 1992, for details).

2.5. Mammals

The majority of mammals are more difficult to survey than birds. Casual observations/call recognition or known presence linked to tracks, scats and other tell-tale territory marks are often used in surveys. Many of the techniques employed to sample the fauna within a habitat require a reasonably high degree of competence to undertake and are very often time-consuming. Despite this, mammal surveys must form an integral part of the overall ecological assessment of a potential development site.

Mammal shelters (nests, holes, dens, etc.) tend to be relatively easy to detect; droppings and grass cuttings along their feeding pathways are useful mammal signs, whilst some have a particularly evident browsing mechanism. Carnivores and some rodents create characteristic forage areas as they search for vegetation or invertebrates. Highly skilled surveyors can identify mammals from faeces, the remains of prey items, sounds and odours. Most mammal surveys, however, involve the examination of tracks or actual capture of the mammals themselves. Tracks tend to be found in muddy areas where they come to drink and casts of tracks may be used to help in identification using appropriate literature. For details of mammal survey methods, see Wemmer et al. (1996).

The presence of certain species can be ascertained using taped calls of the species under consideration — these taped calls are responded to by any individual on-site. This is a useful, non-invasive method for gaining an understanding of the mammal fauna of the site. For nocturnal, arboreal species, a combination of high-power (100 W) spotlighting in suspected hunting/breeding territories and playing taped calls is a useful method.

Bat species can be located using ultrasonic bat detectors. Each bat species emits its own echolocating call at a particular frequency that can be tuned into using a commercially available detector such as the 'Anabat'. Use of these detectors is commonplace when undertaking bat surveys for the purposes of EIA and despite some problems can provide a reliable indication of bat species presence on site.

Most methods for surveying mammals and many methods for estimating their abundance require the mammal to be captured. Specific techniques and traps are needed for mammals of particular sizes in various habitats, such as pitfall traps, Longworth or Sherman traps for small terrestrial mammals, Elliott traps for arboreal mammals, and mist nets and harp traps for bats. Capture should be carried out by licensed experts. Jones et al. (1996) provide a full discussion of the variety of techniques available for the capture of medium-sized to large mammals, and it is recommended that this text be consulted before commencement. The breeding patterns of the suspected species should be accommodated into the timing of the surveys.

It is usually more appropriate to attempt to identify the presence of medium-sized and large mammals via less invasive methods. The principal method is to employ the use of 'hair tubes'. These are plastic tubes baited with a suitable attractant which have a sticky tape rim which the animal rubs against in order to obtain the bait. The tape removes some of the animal's hair which is subsequently removed for analysis.

Another non-invasive method which is particularly useful in detecting cryptic species is the examination of scat. The collection and identification of large terrestrial mammal scat provide a useful indication of the species utilising the study site and their distribution across it. Predator scat examination can be particularly revealing as this will contain the bones, hairs, scales, and feathers of some of the fauna of the area. Scat identification is a skilled process and should only be undertaken by a recognised authority.

2.6. Amphibians and reptiles

A key factor for reptile and amphibian surveys is time of day as temperature influences distribution and activity patterns of these cold-blooded animals. The high mobility and great diversity of reptiles make them difficult to survey.

For the purposes of ecology assessment, reptile surveys most often take the form of direct observation along a transect within different habitat types, or involve the use of pitfall traps placed in a grid system across the study area. Amphibian survey techniques are well developed in the literature (see Heyer et al., 1994, for comprehensive treatment of all aspects of amphibian monitoring and measurement, which include complete species inventories, audio transects, trapping, larvae sampling).

2.7. Terrestrial invertebrates

Even a limited search will reveal many individuals to be identified, which requires the skills of an expert, particularly if they are to be identified at species level. Before undertaking an invertebrate survey, it is important to establish its aims as this dictates the types and levels of techniques employed. The aims might be to produce a full species list (unlikely, as this is very time-consuming), a representative list indicative of all the vegetation communities present on site, a list of notable (rare) species or a classification of invertebrate communities using indicator species.

Brooks (1993) advises on the questions that should be addressed before beginning any survey: where and when to sample, how many samples and of what, and the sampling method. Ideally, sampling patterns should reflect the level of habitat diversity, but should be feasible in terms of both effort and time. Sampling should occur during the time of year when most insects are in the adult phase of their life cycle (thus minimising problems with juveniles), but will be repeated throughout the year, paying particular attention to weather conditions. Attention is normally directed to notable species, representative species (of the habitat/vegetation type) or indicator species. Sampling techniques for invertebrates are described by Morris et al. (1995), and include direct observation and identification; transect walking; netting; sampling of the ground layer, soil or from plant surfaces; and methods of trapping, for later identification and analysis, using pitfall traps, malaise traps, sticky traps, water traps, light traps or emergence traps.

2.8. Analysis of data and interpretation of results

Data analysis must be considered at the initial planning stages of ecology assessment studies to ensure that the data collected can be used to address issues identified during the scoping phase.

Generally, it is not possible, feasible or economical to investigate a decision variable by sampling the whole population in the area of interest (Winer et al., 1991; Underwood, 1997), so samples are taken in an objective way, and we assume that they are representative of the entire population present. Statistics are used to evaluate how much confidence we can have in the sample representing the population and providing a sound basis for decision-making.

Despite their relative complexity, statistical tests allow researchers to assess whether differences in sampling are likely to represent true differences between treatments or are merely a chance effect. A critical step in the process is defining hypotheses that can be tested. Green (1979) and Underwood (1990) provide a good background to the logic of statistical testing in ecology. Most ecological studies employ two basic kinds of test:

- univariate tests where hypotheses about a single dependent variable and its relation to one or more independent variables are examined;
- multivariate tests which essentially cluster groups of objects according to their similarity or dissimilarity (Clarke, 1993).

Within each of these types, there is a division between parametric and non-parametric tests. Parametric tests are based on measures of central tendency (the mean) and dispersion (the standard deviation) and assume a normal distribution of the data. Non-parametric tests are based on ranks that do not assume an underlying distribution in the data. Descriptions of these techniques can be found in a number of texts such as Siegel and Castellan (1988) and Winer et al. (1991). The techniques provide ecologists with a variety of analytical tools for assessing the overall structure of the assemblages of organism examined, and to enable them to consider the likely response from a particular population of species to a potential impact.

Statistical tests should compel researchers to collect data within a logical framework to address specific questions of concern. The more specific the question, the more likely we are to obtain an unambiguous result, i.e. was there a difference or not? A potential difficulty of statistical tests is that it is often difficult to present the non-technical implications of statistical tests to decision-makers and interested parties.

3. IMPACT PREDICTION

3.1. Introduction

Having determined the scope of work required (Section 1) and described the existing terrestrial environment that may be affected (Section 2), it is necessary to predict or forecast what would happen to the environment in the presence of the proposed project. The significance of predicted effects must be assessed, so that interested parties can compare and evaluate the predicted positive and negative impacts. Impacts should be predicted as precisely as possible, with the basis of these predictions made clear. Wherever possible, predictions should be presented in such a way as to make them testable, as the outcomes of the tests can then be directly linked to the monitoring programme.

3.2. Inputs for impact prediction

Predicting the response (if any) of a decision variable to a disturbance can be difficult and, in the absence of firm scientific information, requires a precautionary approach. The following information is needed to predict the magnitude of the likely impacts:

- a good understanding by ecologists of the nature of the proposed development, including project design, construction activities and timing;
- detailed predictions of physical and chemical changes (often provided by other specialists) resulting from the proposed development;
- a description of habitats and selected decision variables;
- knowledge of how decision variables respond to the proposed disturbance;
- knowledge of the outcomes of similar projects elsewhere;
- knowledge of past, existing or other approved projects nearby which may cause interactive or cumulative impacts with the project being assessed.

3.3. Methods of impact prediction

Predicting impacts for a proposed project should be done within a structured framework (see Morris and Therivel, 1995; Thomas, 1998). This requires that the type of impacts be identified — these are commonly presented as:

- direct and indirect effects;
- short and long-term effects;
- construction, operational and decommissioning effects;
- isolated, interactive and cumulative effects.

Methods include:

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; see CEQ, 1997, pp. A-13–18)

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 (see Morris and Therivel, 1995, pp. 132-138 and CEQ, 1997, pp. A-19–23). 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. (See Appendix D of Morris and Therivel, 1995.)

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 (see CEQ, 1997, pp. A-33–36) 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 (see CEQ, 1997, pp. A-37–42). 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.

4. ASSESSMENT OF SIGNIFICANCE

Assessment is the process of evaluating the importance or significance of project/plan impacts (whether adverse or beneficial). In most cases, this is essentially a judgment, built up from a number of factors, but it may also be made more objective with the use of criteria and standards. Glasson et al. (1999) believe that assessment is often simple and pragmatic rather than drawing on complex and sophisticated analysis. The assessment of significance will be based upon factors such as the following:

- the character and perceived value of the affected environment;
- the magnitude, spatial extent and duration of 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.

An alternative approach is to specify what constitutes a significant impact in particular circumstances. This approach has been used in Australia under the Commonwealth Environment Protection and Biodiversity Conservation Act of 1999. Significance criteria are set out for various types of resource, e.g. declared Ramsar wetland, listed threatened species and ecological communities, the marine environment, etc. 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 wetland.

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.

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Annex 2
Blank assessment forms

Figure 1: Screening matrix

Brief description of the project or plan

Brief description of the Natura 2000 site

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.

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.

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.

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.

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.).

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.

Figure 2: Finding of no significant effects report matrix

Name of project or plan			
Name and location of Natura 2000 site			
Description of the project or plan			
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)?			
The assessment of significance of effects			
Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site.			
Explain why these effects are not considered significant.			
List of agencies consulted: provide contact name and telephone or e-mail address.			
Response to consultation.			
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?

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)			
(ii)			
(iii)			
List mitigation measures (as above).	**Provide evidence of the degree of confidence in their likely success.**	**Provide 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)			
(ii)			
(iii)			

Figure 4: Appropriate assessment report

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).
Set out the conservation objectives of the site.
Describe how the project or plan will affect key species and key habitats. Acknowledge uncertainties and any gaps in information.
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.
Describe what mitigation measures are to be introduced to avoid or reduce the adverse effects on the integrity of the site. Acknowledge uncertainties and any gaps in information.

Results of consultation

Name of agency(ies) or body(ies) consulted	Summary of response

Figure 5: Assessment of alternative solutions matrix

Assessment of alternative solutions

The description and objectives of the project or plan

The 'do nothing' alternative

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

Comparison with chosen project or plan

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).

Alternative locations/routes

Alternative One

Alternative Two

Alternative Three

Alternative size and scale

Alternative One

Alternative Two

Alternative Three

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

Alternative One

Alternative Two

Alternative Three

Figure 5: Assessment of alternative solutions matrix (continued)

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 methods of construction	
Alternative One		
Alternative Two		
Alternative Three		
	Alternative operational methods	
Alternative One		
Alternative Two		
Alternative Three		
	Alternative decommissioning methods	
Alternative One		
Alternative Two		
Alternative Three		
	Alternative timescales	
Alternative One		
Alternative Two		
Alternative Three		
	Conclusions on assessment of alternatives	

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.

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.

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 (explain)	Impact of alternatives on the Natura 2000 site are considered positive or neutral (explain)

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?

Figure 8: Compensatory measures assessment matrix

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

Description of the compensatory measures

Assessment questions	Response
How were compensatory measures identified?	
What alternative measures were identified?	
How do these measures relate to the conservation objectives of the site?	
Do these measures address, in comparable proportions, the habitats and species negatively affected?	
How would the compensatory measures maintain or enhance the overall coherence of Natura 2000?	
Do these measures relate to the same biogeographical region in the same Member State?	
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?	
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?	
Do the compensatory measures provide functions comparable to those that had justified the selection criteria of the original site?	
What evidence exists to demonstrate that this form of compensation will be successful in the long term?	

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

Data collected to carry out the assessment

Who carried out the assessment	
Sources of data	
Level of assessment	
Where can the full results of the assessment be accessed and viewed?	

European Commission

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